

TK-2100/TK-3100/TK-3101 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 8 ohms dummy load at any time during the tuning and connected to a DC voltmeter and an audio distortion meter or a SINAD measurement at all the time during the tuning.

1-1 ADJUSTING MODE:

Connect with the RADIO and Personal Computer to COMPUTER PROGRAMING INTERFACE (KPG-8,or KPG-22)

1-2 TUNING ITEMS

- FREQUENCY ADJUST
- RF POWER
- STANDARD BATTERY VOLTAGE
- SQUELCH THRESHOLD LEVEL(Tight)
- SQUELCH THRESHOLD LEVEL(Open)
- QT DEVIATION(Wide)
- DQT DEVIATION(Wide)
- QT DEVIATION(Narrow)
- DQT DEVIATION(Narrow)

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 38 waves.

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

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

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
Frequency Tune
RF Power
Battery
Squelch(Tight)
Squelch(Open)
QT Deviation(Wide)
DQT Deviation(Wide)
QT Deviation(Narrow)
DQT Deviation(Narrow)

2-1-2 Use[↓][↑]keys select Tuning Item [Frequency Tune] then press [Enter].

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

2-1-4 Select Tuning Item [RF Power] then press [Enter].

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

2-1-6 Select Tuning Item [BATTERY] then press [Enter].

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

2-1-8 Select Tuning Item [Squelch(Tight)] then press [Enter].

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

2-1-10 Select Tuning Item[Squelch(Open)] then press [Enter].

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

2-1-12 Select Tuning Item [QT Deviation(Wide)] then press [Enter].

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

2-1-14 Select Tuning Item [DQT Deviation(Wide)] then press [Enter].

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

2-1-16 Select Tuning Item [QT Deviation(Narrow)] then press [Enter].

2-1-17 Use[←][→]keys to adjust the level then press [Enter].

2-1-18 Select Tuning Item [DQT Deviation(Wide)] then press [Enter].

2-1-19 Use[←][→]keys to adjust the level then press [Enter].

TK-3100/TK-3101 CIRCUIT DESCRIPTION

The KENWOOD model TK-3100 and TK-3101 are UHF/FM hand-held transceiver designed to operate in the frequency range of 460 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 460 to 470MHz.

1.1 FRONT-END RF AMPLIFIER

An incoming signal from the antenna is applied to on RF amplifier (Q203) after passing through a transmit/receive switch circuit (D102 is off) and a 2-pole LC filter. After the signal is amplified (Q203), the signal is filtered by a 3-pole LC filter 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 (Q202) to become a 38.85MHz first intermediate frequency (1st IF) signal. The first IF signal is fed through two monolithic crystal filters (MCFs:XF200) to further remove spurious signals.

1.3 IF AMPLIFIER

The first IF signal is amplified by Q201, and then enters IC200 (FM processing IC). The signal is heterodyned again with a second local oscillator signal within IC200 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 IC200.

1.4 AUDIO AMPLIFIER

The recovered audio signal obtained from IC200 is amplified by IC300 (1/4) low pass-filter by IC300(2/4) and high-pass filtered by Q300 (3/4) and Q300 (4/4), and de-emphasized by R303 and C306. The audio signal is then passed through an audio frequency switch (Q303). 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 (IC302).

1.5 SQUELCH AND MUTE CIRCUIT

The output signal from the squelch circuit, which consists of IC200, 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 IC500 (1/2), passed through microphone mute circuit (Q503), limited and pre-emphasized by IC500 (2/2). The signal component above the audio pass-band circuit is attenuated by splatter filter comprised of

Q501 and Q502.

2.2 MODULATOR CIRCUIT

The output from the microphone amplifier passes through a variable resistor (VR501) for maximum deviation adjustment and is applied to a varactor diode (D5) 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 Q100, is amplified to approximately 17dBm by Q101 and Q102. This amplified signal is passed to the power amplifier Q105 and Q107, which consists of a 2-stage FET 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 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 D101 and D102. D21 is 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). The voltage comparator IC100 (2/2) compares the voltage obtained by the above drain current with a reference voltage, set using the microprocessor and. An APC voltage proportional to the difference between the sensed voltage and the reference voltage appears at the output of IC100 (1/2). This output voltage controls the gate of FET power amplifier, which keeps the transmitter output power constant. The transmitter output power can be varied 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 12.8MHz reference oscillator signal is divided at IC1 by a fixed counter to produce the 5 or 6.25kHz reference frequency. The VCO output signal is buffer amplified by Q2, then divided in IC1, 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 IC1. 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 Q4 in transmit mode and Q3 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 D1 and D3 in receive mode). The T/R pin is set high in receive mode causing Q5 and Q7 to turn off Q4, and turn on Q3, and is set low for transmit mode. The outputs from Q3 and Q4 are amplified by

Q6 and outputted to the buffer amplifiers.

3.3 UNLOCK DETECTOR CIRCUIT

If a pulse signal appears at the LD pin of IC1, an unlock condition occurs, the DC voltage, obtained from D7, R6 and C1, 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 CHANNEL SELECTOR INPUT CIRCUIT

The key switches and channel selector information are entered directly into the microprocessor (IC403).

4.2 RESET CIRCUIT

When the power is initially turned on, IC400 detects a 5V reference voltage rise, then output a high level signal to reset the microprocessor (IC403).

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 IC404. 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 (squellch 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 Q406 to disable [5C] and [5M].

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 (IC403). 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 IC300 (1/4) are the QT and DQT tones and are low pass filtered by IC301 and passed to the microprocessor for decoding.

*** ** SEMICONDUCTOR PARTS LIST ***** PAGE 1
FOR MODEL : EX2730
(TK-3100, TK-3101 ,X57-5660-10)
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CURCUIT SYMBOL	PARTS NUMBER	DESCRIPTION
D1	MA2S376	VARIABLE CAPACITANCE DIODE,FREQUENC CONTROL
D2	MA2S376	VARIABLE CAPACITANCE DIODE,FREQUENC CONTROL
D3	MA2S376	VARIABLE CAPACITANCE DIODE,FREQUENC CONTROL
D4	MA2S376	VARIABLE CAPACITANCE DIODE,FREQUENC CONTROL
D5	MA360	VARIABLE CAPACITANCE DIODE, TX MODULATION
D6	MA2S111	DIODE,CURRENT STEERING
D7	MA2S111	DIODE,UNLOCK DETECT
D100	HSC277	DIODE,RF SWITCH
D101	HVC131	DIODE,ANTENNA SWITCH
D102	HSC277	DIODE,ANTENNA SWITCH
D200	HSC277	DIODE,RF SWITCH
D300	DA221	DIODE,LIMITTER
D400	B30-2156-05	LED, TX
D401	B30-2157-05	LED,BUSY
D500	1SS372	DIODE,AGC DETECT
D501	DAN222	DIODE,REVERCE PROTECTION
D502	1SR154-400	DIODE,REVERCE PROTECTION
IC1	MB15A02	IC,PHASE LOCKED LOOP SYSTEM
IC100	NJM2904V	IC,AUTOMATIC POWER CONTROL
IC200	TA31136FN	IC,IF SYSTEM
IC300	NJM2902V	IC,AUDIO AMP ACTIVE FILTER
IC301	NJM2904V	IC,ACTIVE FILTER
IC302	TA7368F	IC,AUDIO POWER AMP
IC400	PST9140NR	IC,RESET SWITCH
IC401	AT2408N10SI2.5	IC,EEPROM
IC402	RN5VL45C	IC,VOLTE NEW
IC403	38267E8GPJTXAK	IC,MICRO PROCESSOR
IC404	S-81350HG-KD	IC,VOLTAGE REGURATER
IC500	NJM2100V	IC,AUDIO AMP
Q1	2SC4649(N,P)	TRANSISTOR,TRIPLER
Q2	2SC5108(Y)	TRANSISTOR,RF AMP
Q3	2SK508NV(K52)	FET,VCO RX
Q4	2SC4226(R24)	TRANSISTOR,VCO TX
Q5	2SJ243	FET,DC SWITCH
Q6	2SC5108(Y)	TRANSISTOR,RF BUFFER AMP
Q7	UMC4	TRANSISTOR,DC SWITCH
Q8	2SC4617(S)	TRANSISTOR,RIPPLE FILTER
Q100	2SC5108(Y)	TRANSISTOR,RF AMP
Q101	2SC5108(Y)	TRANSISTOR,RF AMP
Q102	2SC4988	TRANSISTOR, TX PRE-DRIVE
Q103	2SK1824	FET,DC SWITCH
Q104	FMMT718	TRANSISTOR,DC SWITCH
Q105	2SK2596	FET, TX FINAL
Q106	2SK1824	FET,DC SWITCH
Q107	2SK2595	FET, TX DRIVE
Q108	DTC114EE	TRANSISTOR,DC SWITCH

Q109	DTA144EE	TRANSISTOR,DC SWITCH
Q200	DTA114EE	TRANSISTOR,DC SWITCH
Q201	2SC4649(N,P)	TRANSISTOR,IF AMP
Q202	3SK228	FET,MIXER
Q203	3SK228	FET,RF AMP
Q300	2SC4617(S)	TRANSISTOR,AUDIO MUTE SWITCH
Q302	2SK1824	FET,AUDIO MUTE SWITCH
Q303	DTA144EE	TRANSISTOR,DC SWITCH
Q304	DTC144EE	TRANSISTOR,DC SWITCH

*** ** SEMICONDUCTOR PARTS LIST ***** PAGE 2
 FOR MODEL : EX2730
 (TK-3100, TK-3101 ,X57-5660-10)
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CURCUIT SYMBOL	PARTS NUMBER	DESCRIPTION
Q305	2SA1362(GR)	TRANSISTOR,DC SWITCH
Q306	DTC144EE	TRANSISTOR,DC SWITCH
Q307	2SK1588	FET,AUDIO MUTE SWITCH
Q400	DTC114EE	TRANSISTOR,DC SWITCH
Q401	DTC114EE	TRANSISTOR,DC SWITCH
Q402	DTA114YE	TRANSISTOR,DC SWITCH
Q403	DTC144EE	TRANSISTOR,BEAT SHIFT SWITCH
Q404	UMG3N	TRANSISTOR,DC SWITCH
Q405	UPA672T	FET,DC SWITCH
Q406	MP5A02	TRANSISTOR,DC SWITCH
Q407	UMG3N	TRANSISTOR,DC SWITCH
Q408	DTA123JE	TRANSISTOR,DC SWITCH
Q500	2SK1824	FET,DC SWITCH
Q501	2SC4617(S)	TRANSISTOR,ACTIVE FILTER
Q502	2SC4617(S)	TRANSISTOR,ACTIVE FILTER
Q503	2SC4919	TRANSISTOR,MIC MUTE/AGC
Q504	DTA144EE	TRANSISTOR,DC SWITCH
Q505	DTA143ZE	TRANSISTOR,DC SWITCH