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Cobra150GTL DX

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Version 1.1

Preliminary Information (There will be updates)

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RECEIVER SECTION

Ref #	Function	Manufacture	Device #
Q1	SQ CONTROL	KEC	KTC3875Y
Q3, 4	NB	KEC	KTC3880
Q5	NB	KEC	KTK211
Q6	NB S/W	KEC	KTA1505Y
Q7	NB S/W	KEC	KTC3880
Q11	RF AMP	KEC	KTK211
Q19	RF GAIN AMP	KEC	KTC3880
Q22	1ST MIXER	KEC	KTC3875Y
IC-2	SQ, METER, AGC CONTROL	INTEGRAL	IL324
IC-1	FM DET	UTC	UTC3361
Q31	ANL	KEC	KRC112

AUDIO SECTION

Ref #	Function	Manufacture	Device #
Q17, 63	AUDIO PRE AMP	KEC	KTC3875Y
IC-6	AUDIO POWER AMP	SGSTOMSON	TDA2003
IC-4AB	MIC PRE AMP/FM LPF	KEC	KIC4558
Q44	MOD ALC S/W	KEC	KTC3875
Q43	MOD ALC S/W	KEC	KTA1504
Q64	AM ALC SENSE	KEC	KTC3875
Q56, 58	ALC CONTROL	KEC	KTC3876
Q57	ALC CONTROL	KEC	KTA1505
Q59	FM S/W	KEC	KRC110S
Q39	FM TX S/W	KEC	KRC112S
Q42	FM TX S/W	KEC	KRA102S
Q67	HI/LO S/W	KEC	KRC102S
Q65	RF POWER CONTROL	TOSHIBA	2SA1943
Q66	RF POWER CONTROL	KEC	KTA1001
Q68	RF POWER CONTROL	KEC	KTC3875
Q32	ECHO S/W	KEC	KTC3875
Q77	ECHO S/W	KEC	KRC111
Q76	PA S/W	KEC	KRC111
Q13	PA AMP		KEC
IC502	ECHO IC	HOLTEK	HT8970
IC-501	ECHO AMP	KEC	KIA4558
IC11	AM MOD AMP	SGSTOMSON	TDA2005

TX SECTION

Ref #	Function	Manufacture	Device #
IC26	MIER	KEC	KIA6058F
Q12	BUFFER AMP	KEC	KTC3880
Q69	PRE DRIVER	KEC	KTC3880
Q71	PRE DRIVER	SANYO	2SC2314
Q72	DRIVER	MITSUBISHI	RD06HHF1
Q73, Q74	POWER	MITSUBISHI	RD16HHF1

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PLL SECTION

Ref #	Function	Manufacture	Device #
IC7	CONTROL & PLL	SANYO	LC7152
Q53	10.695MHz OSC	KEC	KTC3880
Q75	10.695MHz OSC BUFF	KEC	KTC3880
Q37	VCO OSC	KEC	KTC3880
Q36, 38	VCO AMP	KEC	KTC3880
IC8	CPU IC	TOSHIBA	TMP87CH21DF
IC6	E-PROM	INTERGRAL	IL24C02

POWER SUPPLY SECTION

Ref #	Function	Manufacture	Device #
IC-10	8V REGULATOR	KEC	78LO8
IC-5, IC25	5V REGULATOR	KEC	78SO5
Q2	TX S/W	KEC	KTA200
Q57	TX S/W	KEC	KRC110S
Q14	RX S/W	KEC	KRA200
Q55	RX S/W	KEC	KRC102
Q9	PA S/W	KEC	KRC112

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SET DC POWER SUPPLY VOLTAGE AT 13.8VOLT DC.
WATTMETER (50 OHM) TO THE ANTENNA CONNECTOR

PLL CIRCUIT ALIGNMENT PROCEDURE :

(1) SET TRANSCEIVER TO FREQUENCY **28.000MHz**

(2) WHILE IN RECEIVER MODE, CONNECT OSCILLOSCOPE DC PROBE TO **TP1** (SEE PARTS LOCATION).

(3) ADJUST **T712** AND OBSERVE THE DC LEVEL SWING BETWEEN 0.2 TO +7 VOLT DC. THEN SET THE DC LEVEL TO 2.8 VOLT

(4) CHANGE TO **BAND D**, CHECK THE DC LEVEL SHOULD BE < 6V

(5) WHILE IN RECEIVER MODE, CONNECT OSCILLOSCOPE DC PROBE TO TP2 (SEE PARTS LOCATION).

(6) ADJUST **T713** FOR MAXIMUM LEVEL

(7) SET RECEIVER TO FREQUENCY **28.000MHz**. CONNECT OSCILLOSCOPE PROBE TO **TP4** OF CON2 AND MAXIMIZE RF LEVEL THROUGH **T717.**

(8) WHILE IN RECEIVER MODE, CONNECT FREQUENCY COUNTER PROBE TO **TP3** (SEE PARTS LOCATION).

(9) SET THE FREQUENCY **28.000MHz** BY MOVING TUNE SWITCH THEN ADJUST TRIMMER **CT1** TO FREQUENCY **17.305MHz**

CARRIER OSCILLATOR PORTION PROCEDURE :

(1) SET TRANSCEIVER TO FREQUENCY **28.000MHz**

(2) PRESS TO PTT

(3) WHILE IN TRANSMIT AM/FM MODE.

(4) ADJUST **CT2** TO OBTAIN **28.000MHz** READING.

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RF AMP CIRCUITS ALIGNMENT PROCEDURE :

1.RX ALIGNMENT

-AM

(1) CONNECT THE PROVE OF RF SIGNAL MEASURING EQUIPMENT BETWEEN GROUND AND ANNTENA POINT. SET THE SINAD OF SSG TO -47dBm AND THEN ADJUST **T703,704,705,706,707,708,710** FOR MAXIMUM READING ON THE EQUIPMENT.

(2) AT -47 dBm SIGNAL, SQUELCH KNOB AT MAX. ALIGN THE SQUELCH CLOSE TO OPEN AT **RV2** WITH HYSTERISIS OF 2 - 5 dB.

(3) AT 100 uV SQUELCH AT MINIMUM AND MODUALTION AT OFF CONDITION ALIGN **RV15** FOR S-9 SPECS 50 - 200 uV.

(4) INSERT THE NB TESTER TO ANTENNA, MIN.SQUELCH, MAX. VOLUME, CONNECT OSCILLOSCOPE TEST PROBE TO COLLECTOR OF **Q6** AND ADJUST **T701** TO MAXIMUM READING OF EQUIPMENT.

-FM

(1) CHANGE TO FM BAND .
SET THE SINAD OF SSG TO -47dBm AND THEN ADJUST **T702** MAXIMUM READING ON THE EQUIPMENT.

2.TX ALIGNMENT

(1) SET TRANSCEIVER TO FREQUENCY 29.7000MHz **BAND D**.

(2) TEST EQUIPMENT CONNECTION. AT THE BOTTOM CONNECT RF POWER METER, RF VTVM AND OSCILLOSCOPE TO ANTENNA JACK.

(3) ADJUST **T718,719,720,721,722.723** COILS TO OBTAIN THE MAXIMUM INDICATION ON RF VTVM

(4) ADJUST **L21** TO SET POWER LEVEL FROM 15 WATTS NO MODULATION.

(5) WHILE IN AM TX MODE HI/LOW SWITCH TO LOW, NO MODULATION ADJUST **RV9** TO OBTAIN RF CARRIER POWER OF 4W ON RF POWER METER.

(6) SWITCH TO LOW POWER AND ADJUST **RV4** TO OBTAIN 95% MODULATION TO ALL BANDS.

(7) WHILE IN AM. TX. MODE. AF SIGNAL 30mV ADJUST **RV12** TO OBTAIN 95% MODULATION.

(8) ON ALL BANDS WHILE IN AM TX MODE NO MODULATION AND HI/LOW SWITCH TO HIGH ADJUST **RV1** SO THAT THE METER INDICATE RF = 9 (S9)

(9) WHILE IN FM. TX. MODE. AF SIGNAL 30mV ADJUST **RV5** TO OBTAIN 2.5KHz DEVIATION.

(10) INSERT 100 OHM DUMMY LOAD TO ANTENNA AND SWITCH TO FM LOW POWER, NO MODULATION, CALIBRATION MODE WHILE IN TX MODE, ADJUST CALIBRATION KNOB TO ATTAIN CAL LEVEL ON METER.

(11) SWITCH TO SWR MODE AND ADJUST **RV17** TO SET SWR =2.

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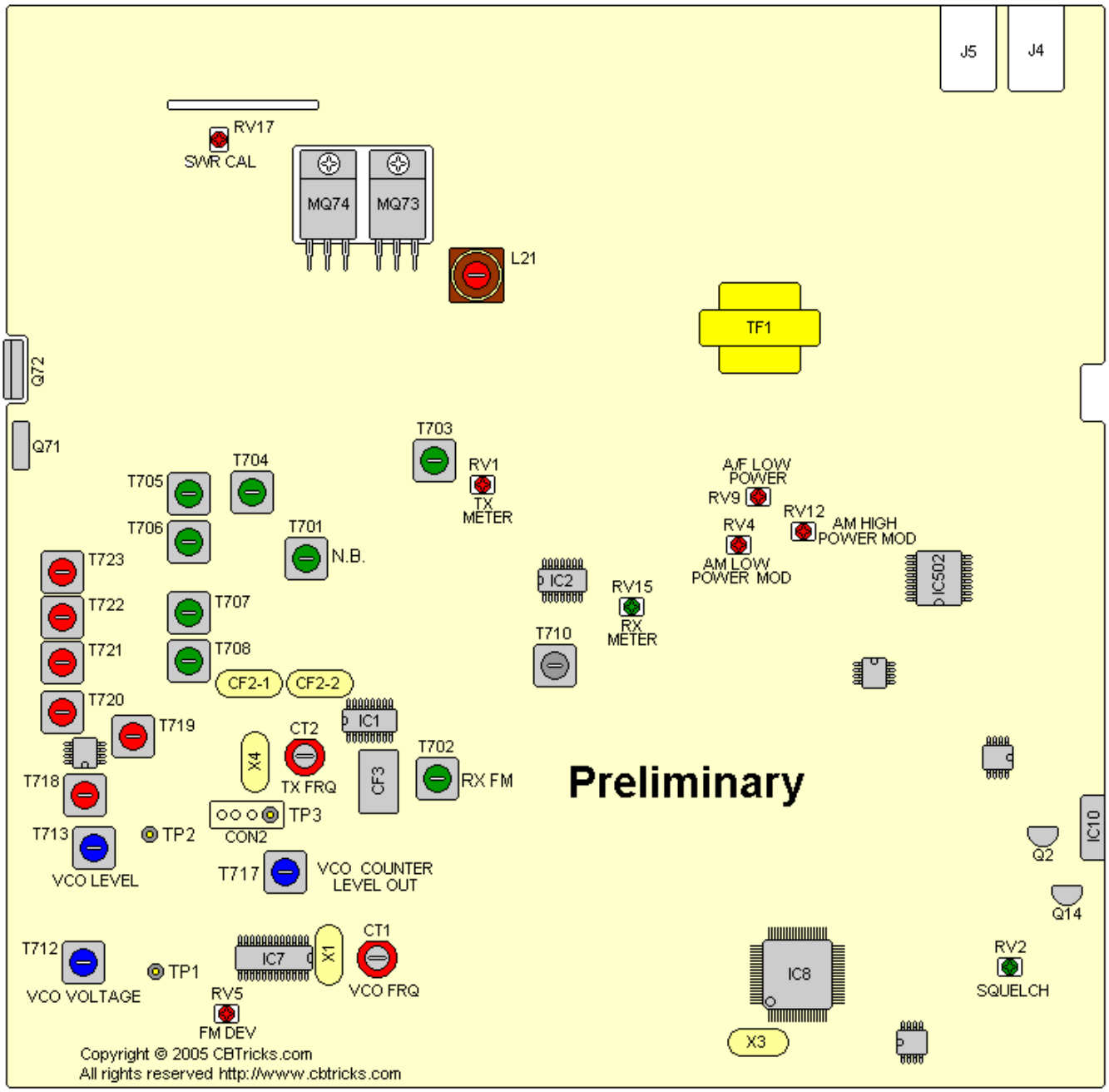

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A description of all circuits and devices provided for determining and stabilizing frequency:
Frequency (from 28.000mhz to 29.695mhz) of transmitting, as receiving, frequencies are provided by PLL (phase locked loop) circuitry. The purpose of the PLL is to provide a multiple number of frequencies from VCO (voltage controlled oscillator) with quartz crystal accuracy and stability from one crystal oscillator reference frequency.

Therefore the VCO frequency is as accurate and stable as the crystal oscillator itself. The reference crystal oscillator frequency is 10.240Mhz. And the VCO frequency 17.305mhz or local oscillators 10.695Mhz is mixer to obtain 28mhz band transmit frequency. And accurate as the 10.240mhz crystal oscillators. Therefore the TX frequencies are as stable and accurate as the 10.240mhz crystal oscillators. Stable and accurate within 18ppm over the temperature range between-30°C and 50°C, the transmitted frequencies are also stable within 25ppm over the same temperature range.

DESCRIPTION OF FREQUENCY DETERMINING CIRCUIT:

To eliminate frequency drift to power supply variation. A regulated supply is provided for PLL operation. The regulator consists of a regulated IC10 (8v) the 10.240Mhz crystal oscillator active part is included in the PLL IC7.
See equivalent circuit block diagram of the PLL IC7.

VCO AND FREQUENCY MIXER.

The VCO circuit consists of following, Variator (DC voltage dependent variable capacitor) diode D30, D31 tuning coil T712. The oscillator of VCO frequency is done by a Q37 and T713.

The resulting 28Mhz output frequency is filtered by T720, T721, T722, T723, Q69 is a pre-amplifier, but is also as go-no go type switch when illegal transmit frequency is generated. The logic circuit determining the illegal frequencies is located inside the PLL IC7.

Q71, Q72 is a driver circuit for TX output. And Q73, Q74 is the final power amplifier the class AB type amplifier output, signal is filtered by low pass filter consisting of L230, L231, L22, L24, C305, C306, C311, C620, C621 make up a series resonant and the remaining l/C represents low pass filter.

DESCRIPTION OF ANY CIRCUITS OR DEVICES EMPLOYED FOR SUPPRESSION OF :
SPURIOUS RADIATION

When two frequencies are mixed in non-linear devices to obtain a desired output frequency, almost unlimited number of spurious frequencies are generated at the same time. The undesired spurious frequencies are restudied from the differences and the summations of the two frequencies and their harmonics. The far-out frequencies can easily be filtered out. But the most difficult frequencies are those close to the desired output center frequency.

A frequency mixer circuit used in this unit because it is far better than a mixer circuit in eliminating spurious. Also important factors contributing to spurious are poor ground path.

Following steps are taken to eliminate spurious level TP will below 60db :
(1) Frequency mixer circuit is employed.
(2) Ground path of the printed circuit board is carefully laid out.
(3) Adequate band pass filter circuits are employed to eliminate spurious at the frequency mixer output.

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LIMITING MODULATION

Since the nominal microphone (dynamic MIC) output level is about 0.6mv. The overall gain of the audio amplifier is set so that 3mv (at 1khz) will modulate RF signal to 50% then a very effective ALC (automatic level control) circuit.
It is used to limit audio gain so as not to over modulate beyond 95% the dynamic range of the ALC circuit for this purpose is effective over 50 db input increase. The output audio level is sensed by Q64 and set by resistor RV12. A positive going signal will trigger open the Q43, Q44.

LOW POWER

When all the coils are adjusted for peak, the RF power output shall not exceed 4.4 watts at low power mode.

SUPPRESSION OF HARMONICS RADIATION

The class AB type amplifier output signal is filtered by low pass filter consisting of L230, L231, L22, L24, C305, C306, C311, C620, C621 make up a series resonant circuit and the remaining l/C represents low pass filter.
The harmonics radiation are suppressed by these filter circuits sufficiently and reduced to below 60db.