

Attachment K. Part list and Tune up Procedure

Please see the following pages

PARTS LIST

(SMD/ INSERT)

MODEL : AT-400 CONTROL B/D

DATE : APRIL.20.2001

NO	Parts Name	Specifications	Description		
			EA		
1	CAP,TANTAL,SMD,0.1U/35,A	35MCS104MATER	EA	1	C618
2	CAP,TANTAL,SMD,0.47U/35,A	35MCS474MATER	EA	2	C669,687
3	CAP,TANTAL,SMD,2.2U/16,A	16MCS225MATER	EA	2	C667,671
4	CAP,TANTAL,SMD,4.7U/16,A	16MCM475MATER	EA	2	C609,649
5	CAP,TANTAL,SMD,1U/25,A	25MCS105MATER	EA	1	C675
6	CAP,TANTAL,SMD,10U/10,A	10MCM106MATER	EA	1	C677
7	HIGH CAPACITOR	GRM42-6Y5V225Z16PE	EA	4	C622,624,655,681
	CAP,TANTAL,SMD,4.7U/16,A	16MCM475MATER			
8	CAP-CER,1608,SMD	GRM39COG020C50PT	EA	1	C619
9	CAP-CER,1608,SMD	GRM39COG220J50PT	EA	1	C652
10	CAP-CER,1608,SMD	GRM39COG101J50PT	EA	4	C651,674,676,686
11	CAP-CER,1608,SMD	GRM39COG221J50PT	EA	6	C657~661,673
12	CAP-CER,1608,SMD	GRM39COG331J50PT	EA	2	C627,631
13	CAP-CER,1608,SMD	GRM39COG471J51PT	EA	1	C663
14	CAP-CER,1608,SMD	GRM39X7R102K50PT	EA	28	C601,603,604,608,611,612,614,615~617,620,621,623, C625,626,650,654,664,682,684,688~691,696,709~711
15	CAP-CER,1608,SMD	GRM39X7R122K50PT	EA	1	C670
16	CAP-CER,1608,SMD	GRM39X7R472K50PT	EA	1	C678
17	CAP-CER,1608,SMD	GRM39X7R562K50PT	EA	2	C628,630
18	CAP-CER,1608,SMD	GRM39X7R103K51PT	EA	1	C701
19	CAP-CER,1608,SMD	GRM39X7R153K51PT	EA	1	C629
20	CAP-CER,1608,SMD	GRM39X7R333K50PT	EA	2	C685,699
21	CAP-CER,1608,SMD	GRM39X7R473K50PT	EA	1	C683

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NO	Parts Name	Specifications	Description		
			EA		
22	CAP-CER,1608,SMD	GRM39Y5V104Z25PT	EA	8	C610,613,665,668,695,679,680,694
23	CAP-CER,1608,SMD	GRM39Y5V224Z50PT	EA	2	C653,656
24	RES,CF,5%,SMD	CR1/16W 000JV	EA	3	R702,807,813
25	RES,CF,5%,SMD	CR1/16W 4R7JV	EA	2	R694,695
26	RES,CF,5%,SMD	CR1/16W 100JV	EA	1	R662
27	RES,CF,5%,SMD	CR1/16W 220JV	EA	2	R628,681
28	RES,CF,5%,SMD	CR1/16W 101JV	EA	1	R611
29	RES,CF,5%,SMD	CR1/16W 471JV	EA	3	R609,610,708
30	RES,CF,5%,SMD	CR1/16W 102JV	EA	3	R685,697,699
31	RES,CF,5%,SMD	CR1/16W 222JV	EA	2	R615,693
32	RES,CF,5%,SMD	CR1/16W 472JV	EA	9	R617,620,629,636,645,704,706,715,799
33	RES,CF,5%,SMD	CR1/16W 682JV	EA	1	R717
34	RES,CF,5%,SMD	CR1/16W 822JV	EA	1	R630
35	RES,CF,5%,SMD	CR1/16W 103JV	EA	3	R657,707,716
36	RES,CF,5%,SMD	CR1/16W 123JV	EA	2	R639,690
37	RES,CF,5%,SMD	CR1/16W 153JV	EA	2	R656,680
38	RES,CF,5%,SMD	CR1/16W 183JV	EA	3	R637,647,651
39	RES,CF,5%,SMD	CR1/16W 223JV	EA	9	R619,633,641,666-669,688,705,
40	RES,CF,5%,SMD	CR1/16W 333JV	EA	2	R613,622
41	RES,CF,5%,SMD	CR1/16W 393JV	EA	6	R626,627,631,632,650,654
42	RES,CF,5%,SMD	CR1/16W 473JV	EA	9	R623,638,649,652,653,660,684,686,822
43	RES,CF,5%,SMD	CR1/16W 683JV	EA	2	R643,646
44	RES,CF,5%,SMD	CR1/16W 823JV	EA	2	R655,691

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			EA		
45	RES,CF,5%,SMD	CR1/16W 104JV	EA	21	R601~604,608,612,621,634,679,682,683,692,696,698 R700,701,703,719,802,803,808
46	RES,CF,5%,SMD	CR1/16W 124JV	EA	2	R663,689
47	RES,CF,5%,SMD	CR1/16W 154JV	EA	1	R618
48	RES,CF,5%,SMD	CR1/16W 224JV	EA	3	R614,635,644
49	RES,CF,5%,SMD	CR1/16W 274JV	EA	1	R624
50	RES,CF,5%,SMD	CR1/16W 334JV	EA	1	R616
51	RES,CF,5%,SMD	CR1/16W 105JV	EA	1	R676
52	C/RESISTOR	RC2012 9.1KF	EA	1	R678
53	C/RESISTOR	RC2012 15KF	EA	1	R677
54	IC,VOLTAGE DET	XC61AN4002MR	EA	1	U611
55	IC,LINEAR,OPAMP,SMD	LM2902M	EA	2	U601,603
56	IC,LINER,SWITCH,SMD	MC14066BDR2	EA	1	U610
57	IC,ASP,SMD	FX828D5	EA	1	U606
58	IC,CPU,SMD	UPD75P3018AGK-be9	EA	1	U605
59	IC,MEM,EEPROM,SMD	24C16I-2.7	EA	1	U604
60	IC,LINEAR,REG,SMD	TK11250AM	EA	1	U602
61	IC,LINEAR,AUDIO AMP,DIP	NJM2073D	EA	1	U607
62	TR,SW,SMD	KRA302	EA	5	Q601,602,603,617,623
63	TR,SW,SMD	KTA2014	EA	1	Q612
64	TR,SW,SMD	BCX-51	EA	1	Q615
65	TR,SW,SMD	KTA1001Y	EA		
66	TR,SW,SMD	KTC4075GR	EA	3	Q609,610,616

SEMICONDUCTOR DATA SHEETS

(SMD/ INSERT)

MODEL : AT-400B B/D

DATE :April.15.2001

NO	Parts Name	Specifications	UNIT	Q'TY	Description
1	CAP,TANTAL,SMD,0.2U	35MCS204MATER	EA	1	C138
2	CAP,TANTAL,SMD,1U/16V	25MCS105MATER	EA	1	C317
3	CAP,TANTAL,SMD,4.7U/16,V	16MCM475MATER	EA	6	C219,220,325,327,504,508
4	CAP,TANTAL,SMD,10U/6.3	10MCM106MATER	EA	1	C323
5	CAP,TANTAL,SMD,47U/6,A	10MCS476MATER	EA	1	C312
6	HIGH CAPACTOR	GRM42-6Y5V225Z16PE	EA	8	C135,136,301,304,305,413,434,502
	CAP,TANTAL,SMD,4.7U/16,A	16MCM475MATER			
7	IC,LINEAR,REG,SMD	TK11250AM	EA	1	U502
8	IC,LINEAR,REG,SMD	TK11455AM	EA	1	U302
9	IC,IF DET,SMD	BA4116FV	EA	1	U101
10	IC,LINEAR,OPAMP,SMD	NJM2107F	EA	1	U202
11	IC.SMD	MC14066B	EA	1	U102
12	IC,PLL,SMD	U2781B	EA	1	U301
13	IC.SMD	M68732HA	EA	1	U201
14	FET,MIXER,SMD	3SK240	EA	1	Q102
15	TR,SW,SMD	2SC4226	EA	12	Q101,103,106,122,123,301,401,402,404,405,407,408
16	TR,SW,SMD	2SC3356	EA	1	Q207
17	TR,SW,SMD	KRC411	EA	5	Q104,105,204,403,406
18	TR,SW,SMD	KTA1298	EA	1	Q502
19	TR,SW,SMD	KRA302	EA	3	Q409,410,501
20	TR,SW,SMD	XP4311	EA	1	Q208
21	TR,SW,SMD	KDS121	EA	1	D501
22	DIODE,SW,SMD	HSM88ASTL	EA	2	D102,202

SEMICONDUCTOR DATA SHEETS

(SMD/ INSERT)

MODEL : AT-400B B/D

DATE :April.15.2001

NO	Parts Name	Specifications	UNIT	Q'TY	Description
23	DIODE,SW,SMD	UPP9401	EA	2	D101,201
24	DIODE,SW,SMD	MA862-TX	EA	1	D203
25	DIODE,VVC,SMD	1SV270	EA	9	D103,105,107,109,111,401~404
26	DIODE,VVC,SMD	1SV229 T8	EA	1	D405
27	DIODE,RECTI,SMD	S1G	EA	1	D502
28	FUSE,3A,SMD	3216CP(3A)	EA	1	F101
29	REZONATOR	JTBM455C24	EA	1	X101
30	OSC,2nd LO,X-TAL	44.845/30PPM	EA	1	X102
31	VC TCXO	5609A-ANT51(12.8MHz)	EA	1	TCX301
32	CRYSTAL FILTER	45M08B	EA	2	FL101
33	CERAMIC FILTER	LTM455HTU	EA	1	FL103
34	CERAMIC FILTER	LTM455FW	EA	1	FL102
35	SEMI VR,3pi,SMD	TMC3KB203	EA	5	VR101,302,303,501,502
36	SEMI VR,3pi,SMD	TMC3KB204	EA	1	VR301
37	TRANS,MC152,SMD	E558ANA-100050	EA	4	T101~104
38	COIL,AIR,SMD,23nH	451505L(23nH)	EA	4	L101,201~203
39	CHIP,COIL,SMD,0805	0805AS-6R8J-01(6.8nH)	EA	2	L102,408
40	CHIP,COIL,SMD,0805	0805AS-010J-01(10nH)	EA	1	L407
41	CHIP,COIL,SMD,0805	0805AS-022J-01(22nH)	EA	5	L207,404,403,405,406
42	CHIP,COIL,SMD,0805	0805AS-033J-01(33nH)	EA	2	L103,109
43	CHIP,COIL,SMD,0805	0805AS-047J-01(47nH)	EA	1	L104
44	CHIP,COIL,SMD,0805	0805AS-R68J-01(680nH)	EA	3	L108,401,402
45	CHIP,COIL,SMD,1008	1008AS-1R0J-01(1uH)	EA	2	L204,206

SEMICONDUCTOR DATA SHEETS

(SMD/ INSERT)

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NO	Parts Name	Specifications	UNIT	Q'TY	Description
46	CHIP,COIL,SMD,1008	1008AS-1R8J-01(1.8uH)	EA	1	L106
47	CONNECTOR SMD	CH-20ASG-F	EA	1	CON101
48	PCB,4LAYER,1.2T	AT-400(4LAYER,1.2T)	EA		

3. THEORY OF OPERATION

INTRODUCTION

AT-400B is a micro size 90 channel portable FM transceiver constructed with a microprocessor controlled, temperature compensated Phase Locked Loop (PLL) frequency synthesizer. The radio features a double conversion receiver and a direct FM transmitter modulator. A special integrated circuit provides support to sub-audible signaling (CTCSS & DCS) and most of the receiving parts are switched off periodically in the power save mode to reduce battery current drain during standby.

The Block Diagram RF and Control Circuit Diagrams for AT-400B shall be used in associate with the following circuit description.

CIRCUIT DESCRIPTIONS

1) PHASE-LOCK LOOP (PLL) CIRCUIT

*** REFERENCE OSCILLATOR**

The reference oscillator consists of TCX301 in U301 with a frequency of 12.8MHz. The reference oscillator frequency is stabilized by the thermistor TH303 and drives a divider to produce a comparison frequency. This comparison frequency is selected by decoding the first three bits of the data input from microcomputer.

*** PROGRAMMABLE DIVIDER**

The programmable divider in U301 consists of a two-modulus prescaler with a 7bit control register followed by a 11-bit internal programmable divider. The overall division ratio is selected by a single 19-bit word located on the serial data bus.

*** PHASE COMPARATOR**

A digital-type phase comparator in U301 with output (pin 15, 16) and an open drain lock detect output (pin 7) compares divided VCO frequency with the comparison frequency. It generates a correction voltage that is applied to a low-pass filter consisting of R305, R306, R307, R401 and C315, C316, C317, C318, C401 then sent to the VCO circuit.

*** VCO CIRCUIT**

The transmit/receive frequency is directly generated by the Colpitts oscillation circuit contains Q402, Q405. The oscillation frequency is variable by applying the VCO control voltage to variable to variable capacitors D401, D402, D403 and D404, 407, 408, 409. To switch between the transmit and receive frequencies, Q402 turn on, and Q401 (VCO for transmission) oscillates when the T/R pin is low.

2) TRANSMITTER

*** MIC AMP CIRCUIT**

Voice signal from the microphone are applied to microphone amplifier U601 through CON601 . U601 contains a low-pass filter that has a 6dB/oct response between 300Hz and 3 kHz and eliminates harmonics

above 3 kHz. The pre-emphasized audio signal is applied to VR303 from U606 pin 22 to adjust maximum frequency deviation.

* VCO AND AMPLIFIER

The VCO signal output is amplified by Q202 and then fed to power module U201.

* POWER AMPLIFIER CIRCUIT

U201 is provided approximately 7.5V DC power source.

RF power output is adjusted by variable resistors VR501 (High Power) and VR502 (Low Power).

Signals from U210 is supplied through antenna switch D201 to a low-pass filter made up of L101, L102, L103 and C101-C104, then applied to Antenna Jack.

3) RECEIVER

* ANT SWITCHING CIRCUIT

Signals from antenna connector fed to the antenna switching circuit through the low pass filter consisting of L101, L102, L103 and C101-C104. In receive mode, D201 is turned off, isolates the antenna from the transmitter circuit and matching circuitry, so that the incoming signals are fed to the RF amplifier through L104.

* RF AMPLIFIER CIRCUIT

The signals from the switching circuit are fed to the RF amplifier Q101 through a band pass filter made up of molded coil, var diode and capacitor.

* FIRST MIXER CIRCUIT

The amplified signals are fed to Gate 1 of the first mixer Q102 through C123.

First local oscillator signal is supplied to Gate 2 of Q102 from the PLL circuit through C122 to convert the RF signals into 21.4MHz first IF signal.

* IF CIRCUIT

The first IF signals from Q102 are fed to the matched pair crystal filter FL101, then IF signals are amplified in Q103. And those signals are fed to U101 which is composed of the second local oscillator, second mixer, limiter amplifier, quadrature detector and active filter circuit. The second local oscillator at 20.945MHz with X101 and is fed to the second mixer with the first IF signals to convert into 455kHz second IF signals..

The second IF signals leave through pin 3, and are fed to external ceramic filters FL102, FL122 which has excellent selectivity, then fed to U101 (pin 5) again to be amplified and detected. Narrow /Wide band are switched by diode D107, D108, Q106, Q107

The detected AF signals are output from pin 9.

* AUDIO AND SQUELCH CIRCUIT

The detected audio signals are put through a 6dB/oct de-emphasis circuit made up of C699 and R690. The signal is then applied to audio power amplifier U607 through the volume control SVR601 to obtain enough power to driver the speaker.

Part of the recovered noise signal is fed to the integrated operational amplifier inside U101, which, with R122, R123, C148, C149 makes up an low pass filter. The DC signal detected by U101 (pin13) reaches the integrated DC amplifier in U101 which has hysteresis to prevent jitter. The sensitivity of squelch is adjusted by VR101.