

*EEPS-30866-0

RELAY AND RELAY DRIVER TEST PROCEDURE

- GROUND TP12 (RUN/TEST). VERIFY THAT RELAYS K1-K5, AND K22 FOR 30 MHz TUNERS, ARE CLOSED.
- GROUND TP11 (ELEMENTS IN/OUT) AND TP12 (RUN/TEST). VERIFY THAT RELAYS K6-K21, AND K23 FOR 30 MHz TUNERS, ARE CLOSED. VERIFY THAT RELAYS K1-K5 ARE OPEN.
- INDIVIDUALLY CHECK EACH RELAY BY:
 - DISCONNECTING EITHER END OF L9.
 - APPLYING 13.8 V TO THE SWITCHED A+ INPUT (GRN).
 - GROUNDING THE APPROPRIATE TEST POINT TO ACTIVATE RELAY (TP1-TP8, TP17-TP28).
- RECONNECT AND SOLDER L9. REMOVE GROUND FROM TP11 AND TP12.

VSWR DETECTOR TEST PROCEDURE

- CONNECT RF OUT TERMINAL TO ANTENNA OR DUMMY LOAD.
- APPLY +5 V TO TP13 TO ENABLE SLOW TUNING MODE (SWITCHING AT 2 Hz RATE).
- TURN ON RADIO TO APPLY SWITCHED A+ TO TUNER.
- MONITOR VOLTAGE AT U6-11 AND J8-39. VOLTAGE AT U6-11 SHOULD GRADUALLY DROP DURING THE TUNING SEQUENCE AS THE MATCHED CONDITION IS APPROACHED. U8-39 SHOULD BE LOW FOR APPROXIMATELY ONE SECOND DURING THE TUNING SEQUENCE.

PHASE DETECTOR TEST PROCEDURE

- DISCONNECT ANTENNA FROM RF OUT TERMINAL.
- (T1960A AND T1962A MODELS ONLY.) CONNECT A 560 PF CAPACITOR FROM RF OUT TERMINAL TO GROUND.
- GROUND TP11 AND TP12. UNSOLDER AND REMOVE EITHER END OF R112.
- APPLY 3 WATT RF SIGNAL TO RF INPUT TERMINAL.
- VARY FREQUENCY OF RF INPUT. MEASURE VOLTAGE AT U8-1. VOLTAGE SHOULD BE LOW WHEN INPUT FREQUENCY IS ABOVE 7.5 MHz.
- RECONNECT AND SOLDER R112. REMOVE GROUND FROM TP11 AND TP12.

Automatic Antenna Tuner Troubleshooting Chart

parts list

TLA6102A RF Board
TLA6112A RF Board
PL-6966-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: +80-20%; 25 V unless otherwise stated:
C1	21-82372C07	05 uF
C3	21-82133G22	8 pF ± 5 pF; 500 V
C4	21-82372C07	05 uF
C5	21-82133G22	8 pF ± 5 pF; 500 V
C6, 7	21-82372C07	05 uF
C8, 9	21-84493B56	47 pF ± 5%; 100 V
C11, 12	21-82187B20	001 uF ± 10%; 100 V
C13, 17	21-82372C07	05 uF
C19 thru 29	21-82372C07	05 uF
C30, 31	21-82204B37	20 pF ± 5%; 100 V
C32	21-840846	15 pF ± 5%; 100 V
C33	23-82783B14	1 uF ± 10%; 15 V
C34	21-82187B20	001 uF ± 10%; 100 V
C35, 36	21-82372C07	05 uF
C38 thru 40	21-82372C07	05 uF
C41	21-82187B20	001 uF ± 10%; 100 V
C42	21-82372C07	05 uF
C43	21-82187B20	001 uF ± 10%; 100 V
C44	21-82372C07	05 uF
C48	21-82187B08	220 pF ± 10%; 500 V
C49	21-82187B07	05 uF
C50	21-82187B08	220 pF ± 10%; 500 V
C51	21-83596E21	01 uF; 200 V
C52 thru 54	21-82372C07	05 uF
C55	21-83596E21	01 uF; 200 V
C56, 57	21-82372C07	05 uF
C60	23-84858C01	15 uF ± 20%; 25 V
C61	21-82187B08	220 pF ± 10%; 500 V
C62	21-82372C07	05 uF
C64 thru 68	21-82372C07	05 uF
C69	23-84858C01	15 uF ± 20%; 25 V
C70, 71	21-82372C07	05 uF
C72	23-84858C01	15 uF ± 20%; 25 V
C75, 78	21-82372C07	05 uF
C81	8-868594	0.22 uF ± 10%; 100 V
C84, 85	21-82372C07	05 uF
C88, 89	21-82372C07	05 uF
C90, 91	21-84494B98	1000 pF ± 5%; 500 V
C92	21-84494B99	510 pF ± 3%; 500 V
C93	21-82372C07	05 uF
C94	21-84494B99	510 pF ± 3%; 500 V
C95	21-84857K29	250 pF ± 5%; 500 V
C96	21-82372C07	05 uF
C97, 98	21-84857K29	250 pF ± 5%; 500 V
C99	21-82372C07	05 uF
C100	21-84494B06	120 pF ± 5%; 500 V
C101	21-82372C07	05 uF
C106 thru 109	21-82372C07	05 uF
C111 thru 113	21-82372C07	05 uF
C116, 119, 122	21-82372C07	05 uF (TLA6102A only)
C125 thru 127	21-82372C07	05 uF
C128 thru 130	21-82372C03	1.0 uF
C131	21-82372C03	0.1 uF (TLA6102A only)
C132	21-82372C07	05 uF (TLA6102A only)
C133	21-82372C03	0.1 uF (TLA6102A only)
C134	21-82372C07	05 uF
C135	21-82372C03	0.1 uF
C144	21-82204B42	27 pF ± 10%; 3000 V (TLA6102A)
	or 21-82204B57	50 pF ± 10%; 3000 V (TLA6112A)
C145	21-82204B57	50 pF ± 10%; 3000 V (TLA6102A)
	or 21-82204B56	100 pF ± 5%; 3000 V (TLA6112A)
C146	21-82204B56	100 pF ± 5%; 3000 V (TLA6102A)
C147 thru 149	21-82204B55	200 pF ± 5%; 3000 V (TLA6102A)
C150	21-82372C07	05 uF
C162 thru 165	21-82428B35	01 uF; 500 V
C166 thru 175	21-82372C07	05 uF
C176, 177	23-84538G02	4.7 uF ± 20%; 20 V
C178 thru 181	21-82204B85	50 pF ± 5%; 5000 V
C182	23-84538G02	4.7 uF ± 20%; 20 V
C183	21-82372C03	0.1 uF
C184	21-82372C07	05 uF
		crystal:
Y1	48-82141M01	3.58 MHz crystal
		diode: (see note)
CR1, 2, 3	48-83654H01	silicon
CR4	48-82466H13	silicon
		fuse:
F1	65-83770F01	3/4 amp; 125 V
		relay:
K1, 2, 3	80-83290M04	2 form "A"; 250 V
K4, 5	80-83290M01	1 form "A"; 250 V
K6, 7, 8	80-83290M04	2 form "A"; 250 V
K10	80-83290M05	2 form "A"; 400 V
K11	80-84803F02	1 form "A"; 800 V
K12 thru 15	80-84803F05	1 form "A"; 2500 V
K16, 17, 21	80-84803F01	1 form "A"; 5000 V
K18, 19, 20	80-84803F01	1 form "A"; 5000 V (TLA6102A only)
		coil, rf: microhenries: unless otherwise stated
L1 thru 7	24-82549D37	choke: 100 uH
L8, 9	24-83397L01	choke: 30 uH
L21 thru 23	24-82549D37	choke: 100 uH

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L24	24-84388M01	choke: 0.08 uH
L25	24-84388M02	choke: 0.15 uH
L26	24-84388M03	choke: 0.29 uH
L27	24-84388M04	choke: 0.55 uH
L28	24-84388M05	choke: 1.05 uH
L29	24-84388M06	choke: 1.99 uH
L30	24-84882M01	choke: 3.80 uH
L31	24-84882M02	choke: 7.24 uH
L32	24-84882M03	choke: 13.78 uH
L33	24-84882M04	choke: 26.25 uH
L38 thru 41	24-82549D37	choke: 100 uH
L42, 43	24-82549D09	choke: 15 uH
L44	24-82549D37	choke: 100 uH
		transistor: (see note)
Q1 thru 15	48-869706	NPN; Darlington
Q16, 17	48-869680	NPN; type M9680
Q18 thru 20	48-869706	NPN; Darlington
Q21, 22, 23	48-869706	NPN; Darlington (TLA6102A only)
Q24 thru 31	48-869642	NPN; type M9642
Q32, 33	48-869643	PNP; type M9643
		resistor, fixed ± 5%; 1/4 W: unless otherwise stated
R1	6-124A65	4.7k
R3, 4	6-124A31	180
R6, 7	6-124A73	10k
R8	6-124A25	100
R10, 11	6-124A57	2.2k
R12	6-124A49	1k
R14	6-124A57	2.2k
R16, 17	6-124A57	2.2k
R19	6-124A57	2.2k
R20	6-124A49	1k
R21	6-124A81	22k
R22, 23	6-124A65	4.7k
R24	6-124A93	68k
R25, 26, 27	6-124A65	4.7k
R28 thru 30	6-124C73	10k ± 10%
R31	6-124A31	180
R32	6-124A53	1.5k
R33	6-124A85	33k
R35	6-124A85	33k
R38	6-124C73	10k ± 10%
R39	6-124A53	1.5k
R40	6-124A49	1k
R41, 42	6-124C37	330 ± 10%
R43	6-124A49	1k
R44	6-124C37	330 ± 10%
R45	6-124A49	1k
R46	6-125A29	150; 1/2 W
R47	6-124A73	10k
R49	6-124A49	1k
R50	6-124A41	420
R51	6-124C89	47k ± 10%
R57	6-124A69	6.8k
R58	6-124A61	3.3k
R61	6-124C89	47k ± 10%
R62	6-124A31	180
R63	6-124A91	56k
R64	6-124A77	15k
R65, 66	6-124A73	10k
R67, 68	6-124A49	1k
R69	6-124C89	47k ± 10%
R70 thru 74	6-124C73	10k
R75	6-125C97	100k ± 10%; 1/2 W
R80, 81	6-124C51	1.2k ± 10%
R82, 83	6-124A65	4.7k
R84, 85, 86	6-124A65	4.7k (TLA6102A only)
R87, 88, 89	6-124C51	1.2k ± 10%
R90, 91, 95	6-125C43	560 ± 10%; 1/2 W
R92, 93, 94	6-125C43	560 ± 10%; 1/2 W (TLA6102A only)
R96	6-124A09	22
R97 thru 101	6-124A49	1k
R102	6-124A25	100
R103 thru 106	6-124C73	10k ± 10%
R107, 108	6-124A49	1k
R109	6-124A61	3.3k
R110	6-124C89	47k ± 10%
R111, 112, 113	6-124C73	10k
R114, 115	6-124A43	560
R116	6-124A65	4.7k
R118	6-124C97	100k ± 10%
R119 thru 122	6-124C73	10k ± 10%
R123, 124	6-124A81	22k
R125	6-124A17	47
R126	6-124A89	47k
R127	6-124A83	27k
R128	6-124A65	4.7k
		transformer:
T1, 2	25-83727K01	25 turns
		integrated circuit: (see note)
U1, 2	51-84561L54	type MC10115
U3	51-84561L55	type MC10131
U4	51-84561L76	type MC7805
U5	51-84561L65	type CA3081
U6	51-84371K74	type MC3302

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
U7	51-82884L02	type MC14049B
U8	51-82848M40	type 8048
U9	51-82884L74	type MC14503
		voltage regulator:
VR1	48-82256C26	Zener: 3.3 V
VR2, 14 thru 16	48-82256C39	Zener: 20 V
VR17	48-82256C12	Zener: 5.6 V
VR18, 19	48-82256C15	Zener: 5.1 V
		mechanical parts
	3-134169	SCREW, tapping; 4-40 x 1/4"
	9-84186L01	SOCKET (IC) 40 contact
	42-10217A20	STRAP, tie; 2 used
	29-83883C09	LUG, crimp terminal; 6 used
	14-83967A05	WASHER, shoulder; 2 used
	26-84354M01	SHIELD, plate
	26-84352M01	SHIELD, detector
	26-84354M01	SHIELD, PC board

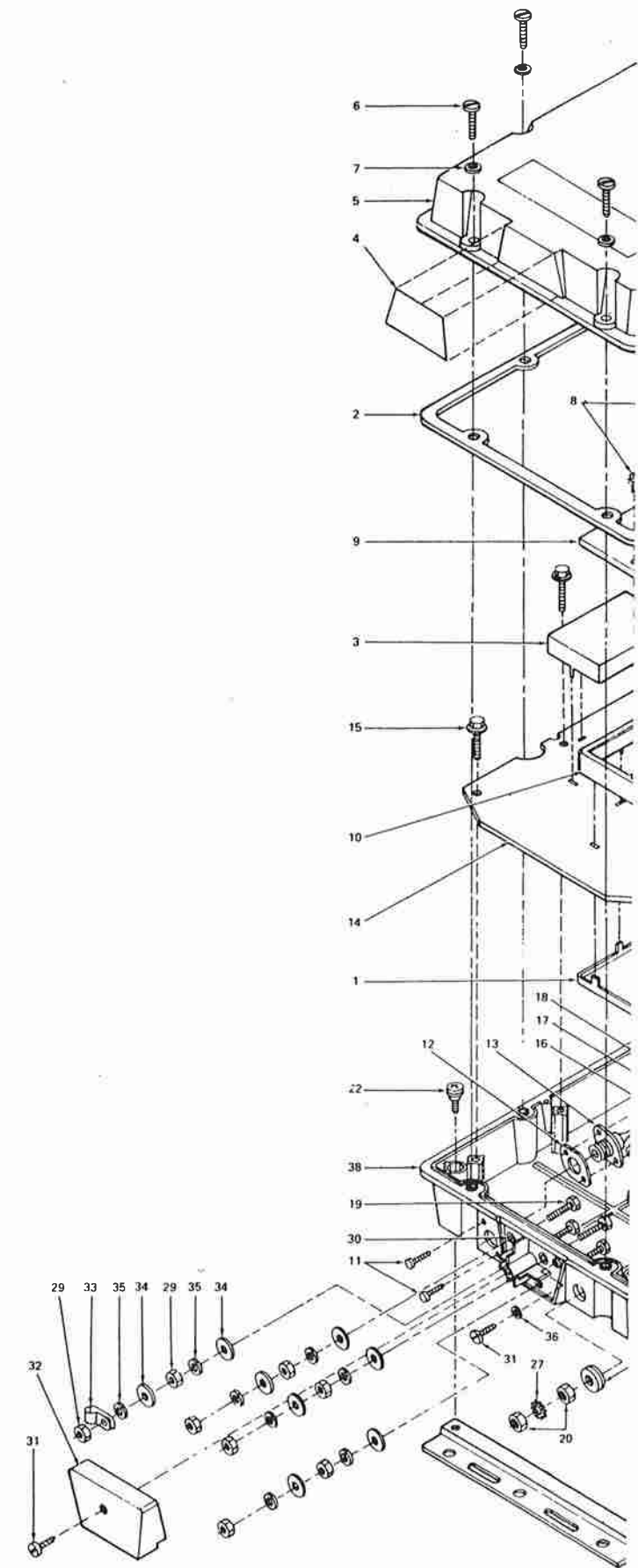
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

THN6410A Housing Antenna Tuner PL-6967-A

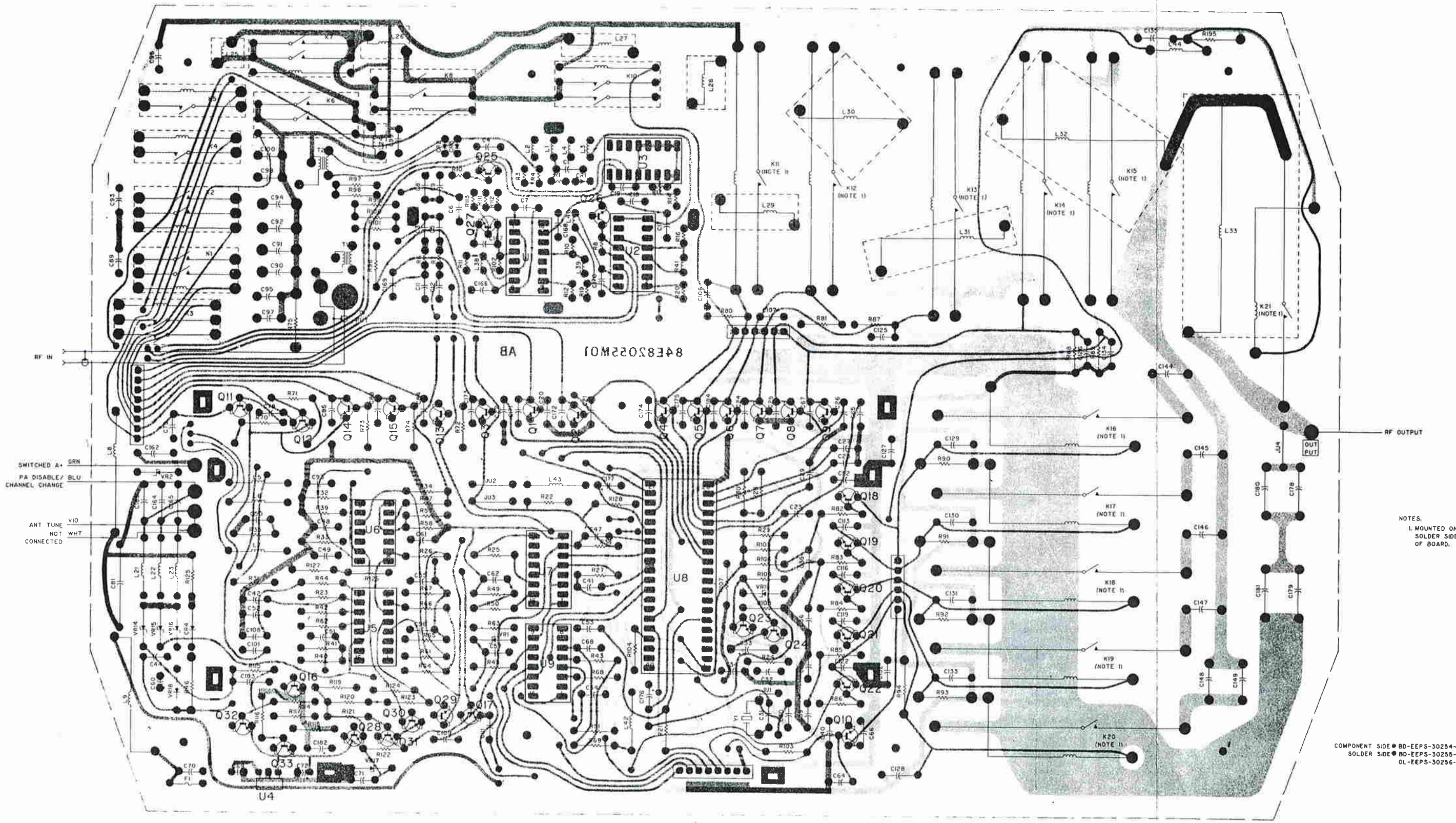
ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	26-84354M01	SHIELD, plate (p/o TLA6102A)
2	32-83756K01	GASKET, housing
3	26-84352M01	SHIELD, detector (p/o TLA6102A)
4	33-84560L01	NAMEPLATE antenna tuner
5	15-83578K03 or 15-83578K06 or 15-84363M03	HOUSING, top
6	3-129955	SCREW, machine; 8-18 x 7/8"; 3 used
7	4-129364	WASHER, flat; #8; 8 used
8	3-134169	SCREW, tapping; 4-40 x 1/4"; 2 used
9	15-84355M01	SHIELD, cover
10	26-84353M01	SHIELD, PC board (p/o TLA6102A)
11	3-82898M01	SCREW, machine; 4-40 x 1/2"; 2 used
12	32-84647D01	GASKET UHF, cable
13	1-80733D97	CABLE and CONNECTOR ASSEMBLY includes: RECEPTACLE, female single contact LUG, soldering CABLE, coaxial RG58/AU; 10.5"
14	84-82055M01	BOARD printed circuit (p/o TLA6102A)
15	3-139946	SCREW, tapping; 8-18 x 1"; 9 used
16	4-114970	WASHER, flat; #4; 2 ea.
17	4-139952	LOCKWASHER; #6 split; 2 used
18	2-120486	NUT, 4-40 x 1/4 x 3/16"; 2 used
19	3-139343	SCREW, machine; 10-32 x 3/4"; 4 used
20	2-9644	NUT, 1/4-20 x 3/16"; 5 used
21	47-83033M01	ROD, threaded; 1/4 x 20
22	3-82898M02	SCREW, machine; 10-32 x 3/8"; 4 used
23	4-11008A02	WASHER, sealing; 4 used
24	14-82884M01	INSULATOR, feed-thru
25	32-82894M01	GASKET, standoff; 2 used
27	4-139951	LOCKWASHER, 1/4 external; 4 used
28	29-835302	LUG, ring tongue
29	2-138684	NUT, 10-32 x 5/16 x 1/8"; 8 used
30	4-11007A04	WASHER, nylon #10; 4 used
31	3-139102	SCREW, tapping 8-18 x 1/2"; 3 used
32	14-84495M01	INSULATOR, cable
33	42-10283A20	CLAMP, cable
34	4-8285	WASHER, flat; #10; 8 used
35	4-400368	LOCKWASHER, #10; 8 used
36	42-10128A10	"O" RING; 2 used
37	3-138419	SCREW, tapping; 1/4-20 x 7/8"
38	15-84363M01	HOUSING, antenna tuner
39	7-84362M01	BRACKET, antenna mounting; 2 used
40	14-84960M01	INSULATOR

TKN8119A Mobile Antenna Matching Harness PL-6968-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	5-7889	EYELET
	29-5238	LUG, soldering
	29-10210A05	TERMINAL, 1/4"
	29-835302	LUG, ring tongue; 1/4"
	29-847817	LUG, ring tongue; 3/8"
	10-9401	BRAID, 22"
	30-82345	CABLE, coaxial RG-8/u; 20"



Automatic Antenna Tuners 2-18 MHz



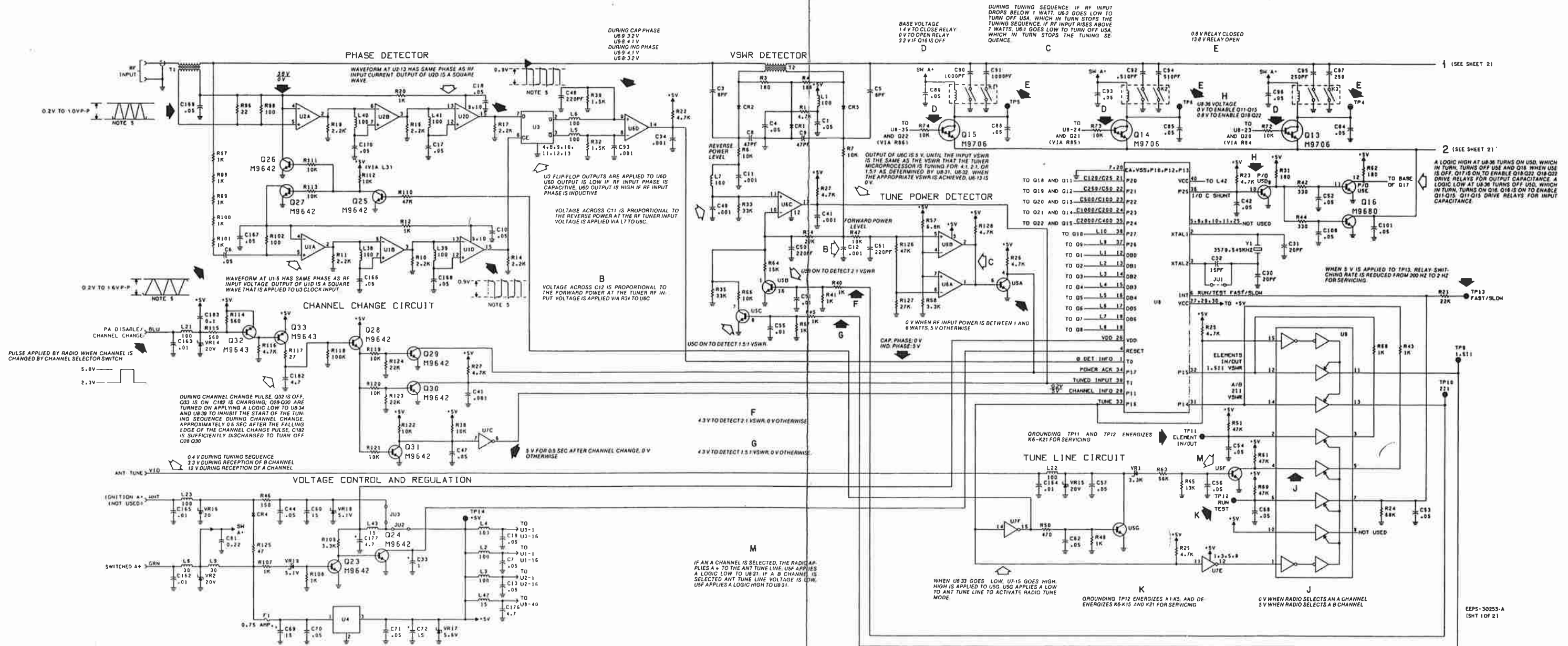
NOTES:
1. MOUNTED ON
SOLDER SIDE
OF BOARD.

COMPONENT SIDE ● 8D-EEPS-30254-O
SOLDER SIDE ● 8D-EEPS-30255-O
OL-EEPS-30256-A

SHOWN FROM COMPONENT SIDE

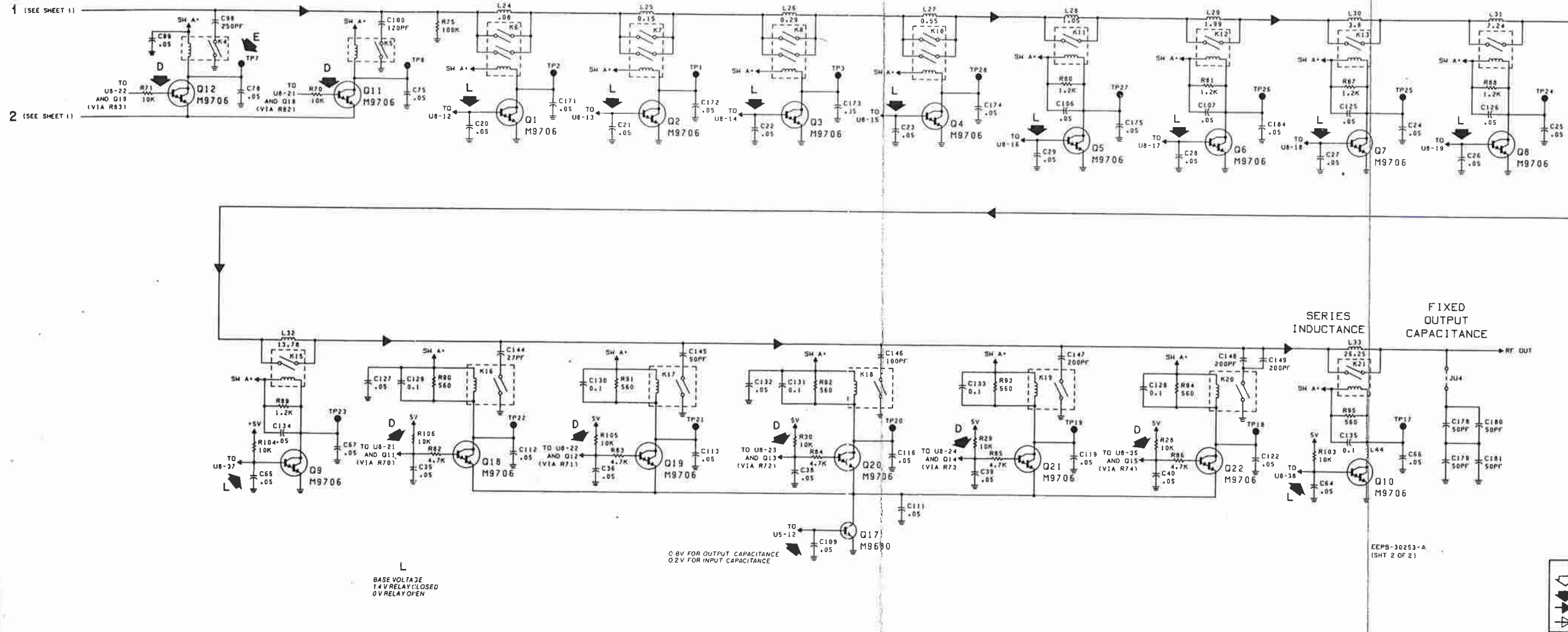
Automatic Antenna Tuners

2-18 MHz



Automatic Antenna Tuner Schematic Diagram

Automatic Antenna Tuners 2-18 MHz



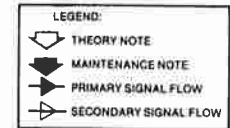
- NOTES
- UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS; CAPACITOR VALUES ARE IN MICROFARADS; INDUCTOR VALUES ARE IN MICROHENRIES
 - THIS DIAGRAM SHOWS POSITIVE LOGIC
LOGIC "1" 2 TO 5 V DC
LOGIC "0" 0 TO 1.9 V DC
 - SOME INTEGRATED CIRCUITS ON THIS BOARD ARE CMOS DEVICES
 - IC TYPES AND CONNECTIONS FOR THIS BOARD ARE AS FOLLOWS:

REFERENCE DESIGNATION	TYPE	VCC	GND
U1, U2	MC10115	1.16	8
U3	MC10131	1.16	8
U4	MC7805CP	1	2
U5	CA3081	3	15
U6	MC3302	3	12
U7	MC14049B	1	8
U8	8046	40.26	20
U9	MC14503	16	8

- PHASE DETECTOR WAVEFORMS AND VOLTAGES ARE MEASURED DURING TUNING SEQUENCE WITH A 2 MHz, 3 WATT LEVEL AT TUNER RF INPUT
- VOLTAGE SHOWN ABOVE LINE IS MEASURED DURING TUNING SEQUENCE. VOLTAGE SHOWN BELOW LINE IS MEASURED UNDER ALL OTHER CONDITIONS. FOR EXAMPLE 3.6V
0.7
- MEASURED WITH TUNER COMPLETELY MISMATCHED AND A 2 MHz, 3 WATT SIGNAL AT TUNER RF INPUT.

JUMPER TABLE

MODEL	JU1	JU2	JU3	JU4
T1959A	IN	IN	OUT	IN
T1961A	IN	IN	OUT	IN
T1962A	IN	IN	OUT	IN



Automatic Antenna Tuner
Schematic Diagram