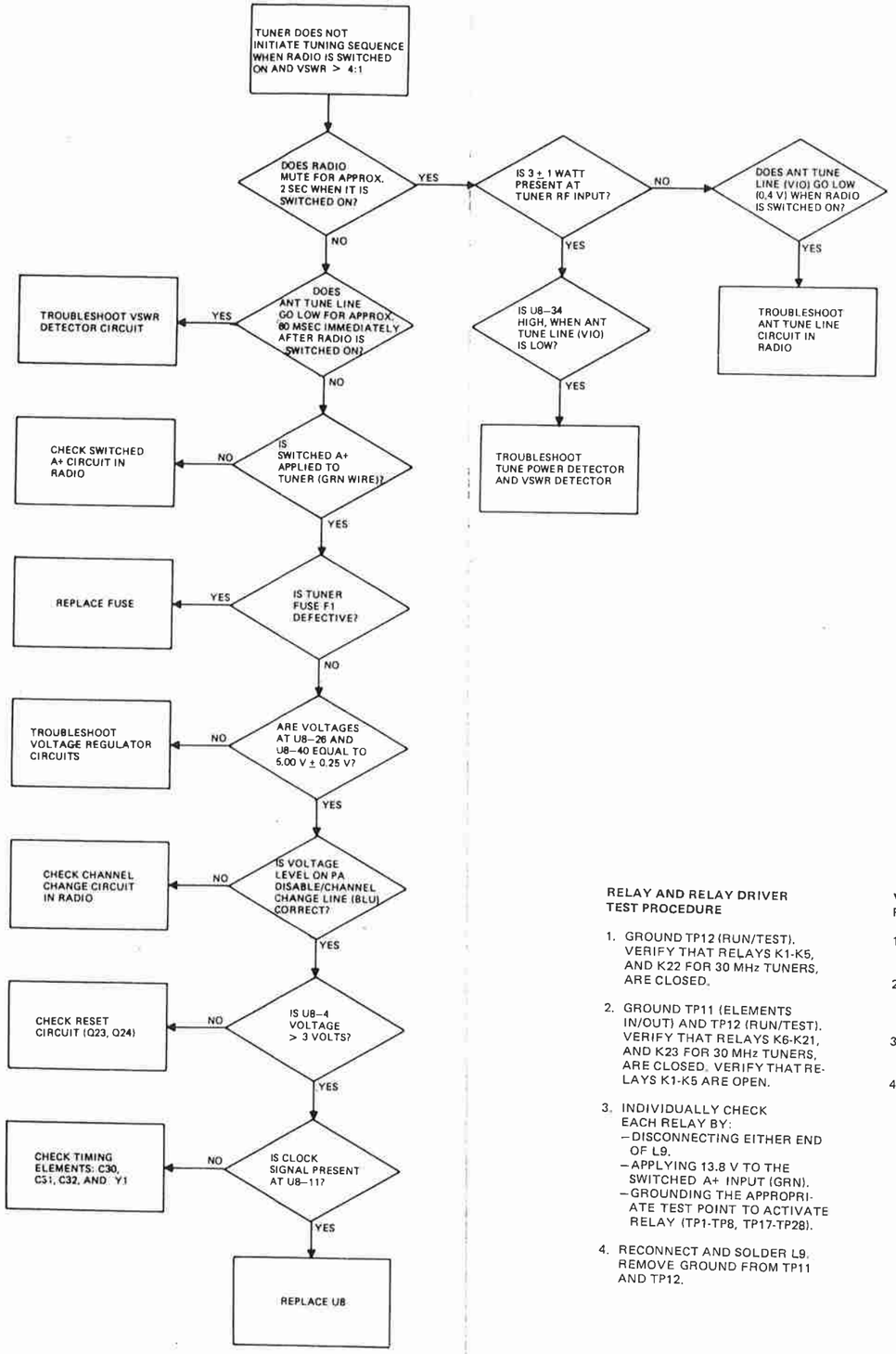
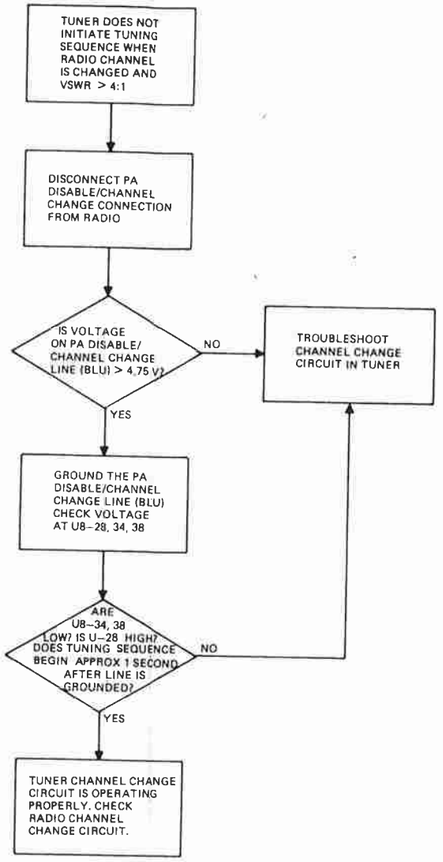
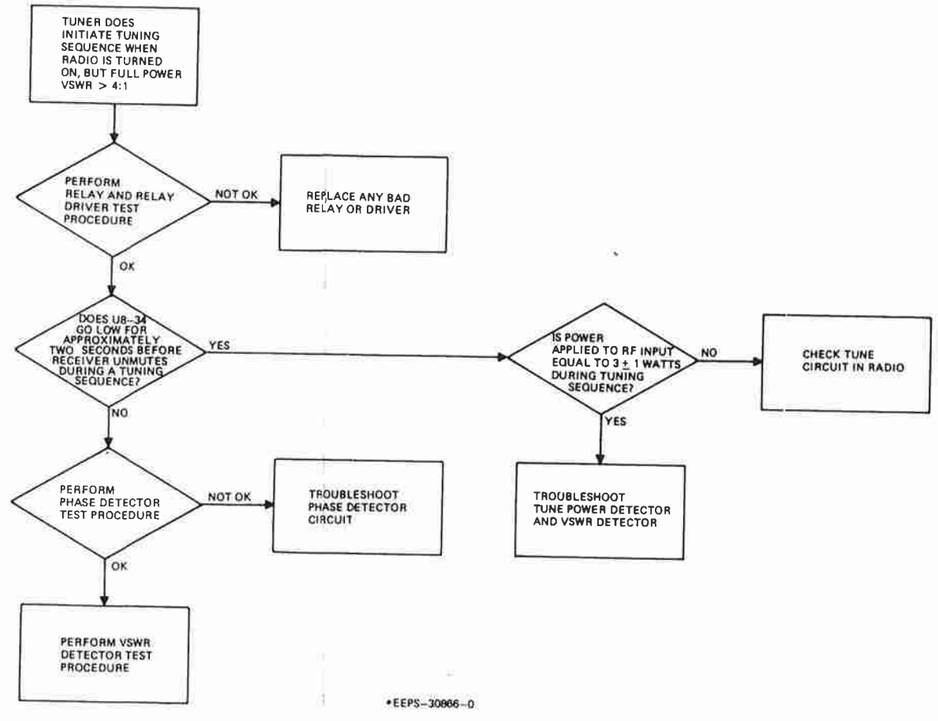






*EEPS–30866–0

RELAY AND RELAY DRIVER TEST PROCEDURE

1. GROUND TP12 (RUN/TEST). VERIFY THAT RELAYS K1-K5, AND K22 FOR 30 MHz TUNERS, ARE CLOSED.
2. 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.
3. 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).
4. RECONNECT AND SOLDER L9. REMOVE GROUND FROM TP11 AND TP12.

VSWR DETECTOR TEST PROCEDURE

1. CONNECT RF OUT TERMINAL TO ANTENNA OR DUMMY LOAD.
2. APPLY +5 V TO TP13 TO ENABLE SLOW TUNING MODE (SWITCHING AT 2 Hz RATE).
3. TURN ON RADIO TO APPLY SWITCHED A+ TO TUNER.
4. 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

1. DISCONNECT ANTENNA FROM RF OUT TERMINAL.
2. (T1960A AND T1962A MODELS ONLY.) CONNECT A 560 PF CAPACITOR FROM RF OUT TERMINAL TO GROUND.
3. GROUND TP11 AND TP12. UNSOLDER AND REMOVE EITHER END OF R112.
4. APPLY 3 WATT RF SIGNAL TO RF INPUT TERMINAL.
5. VARY FREQUENCY OF RF INPUT. MEASURE VOLTAGE AT U8-1. VOLTAGE SHOULD BE LOW WHEN INPUT FREQUENCY IS ABOVE 7.5 MHz.
6. 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
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%; 500 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
	14-83967A03	WASHER, shoulder; 2 used
	26-84354M01	SHIELD, plate
	26-84352M01	SHIELD, detector
	26-84354M01	SHIELD, PC board

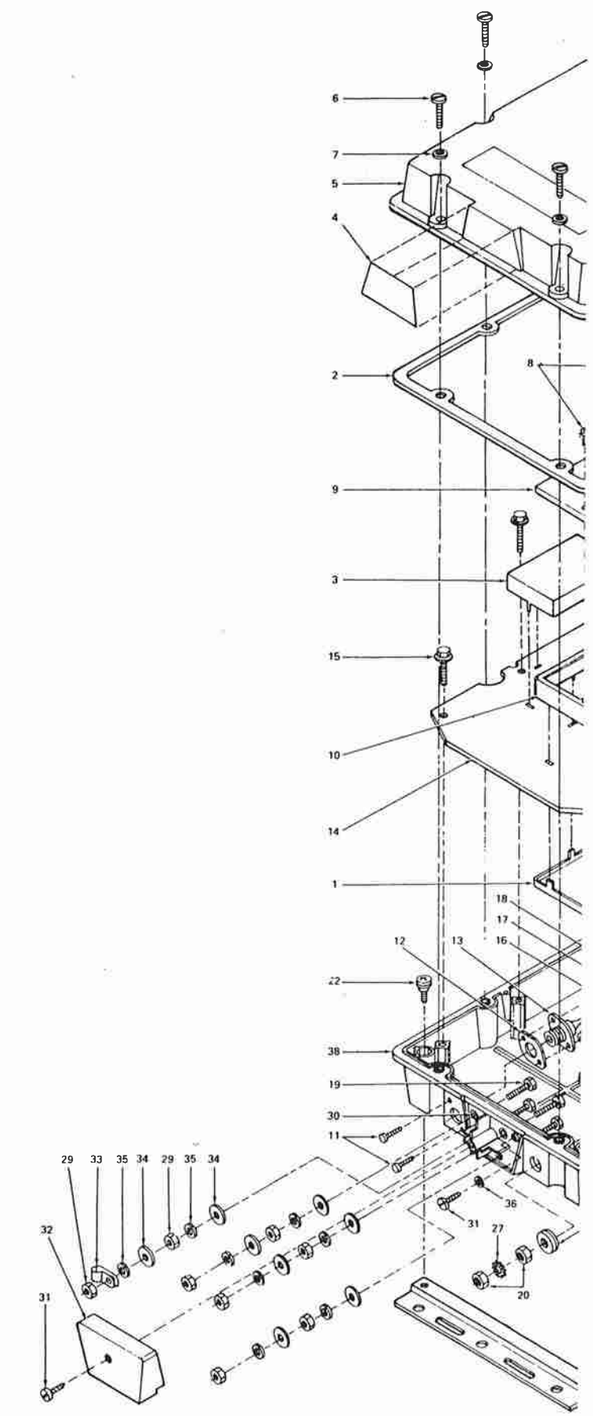
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

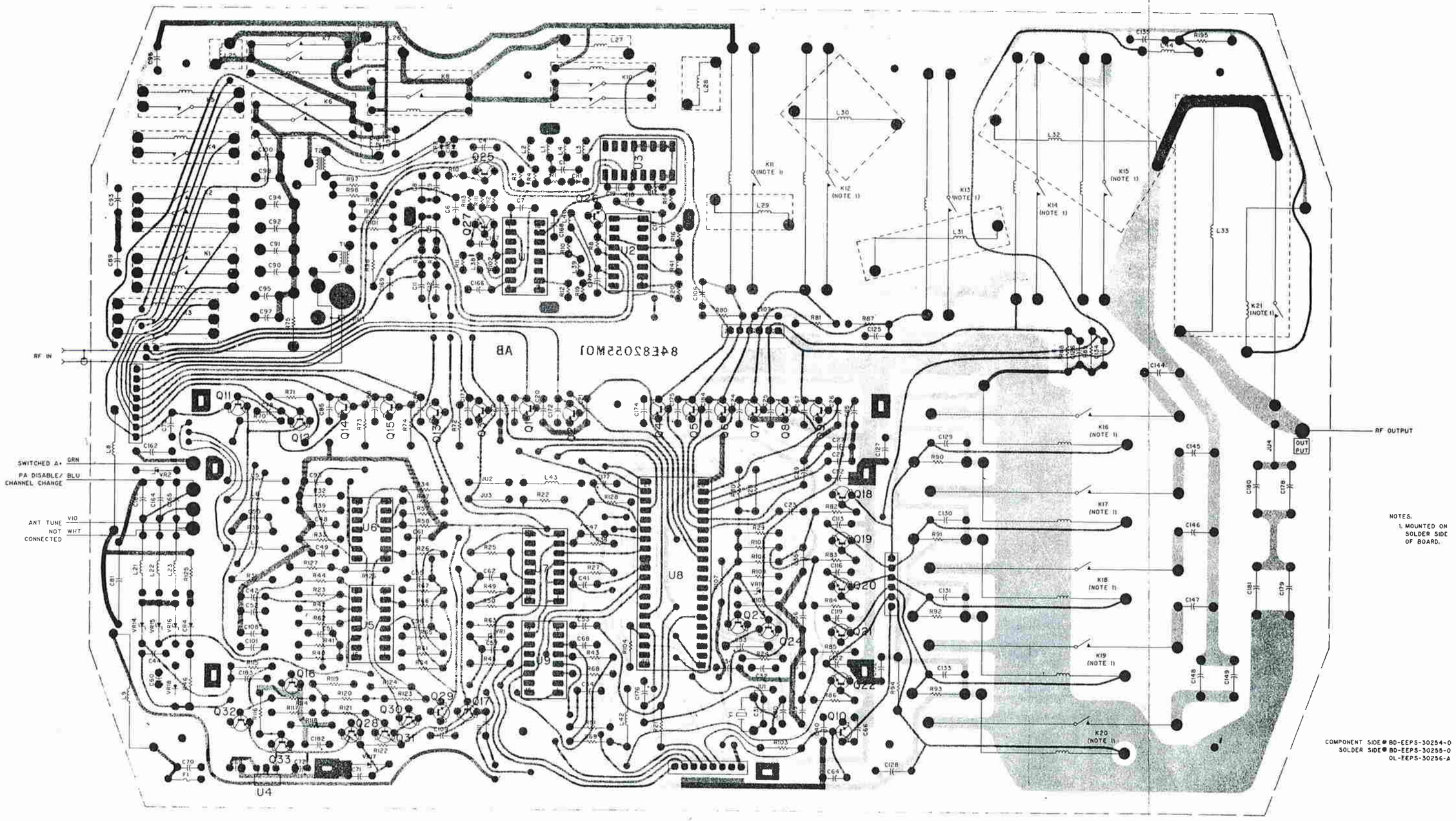
THN6410A Housing Antenna Tuner — PL-6967-A

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:
	9-82442E13	RECEPTACLE, female single contact
	29-10261A10	LUG, soldering
	30-475378	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 3/36"; 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	3-8289802	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"

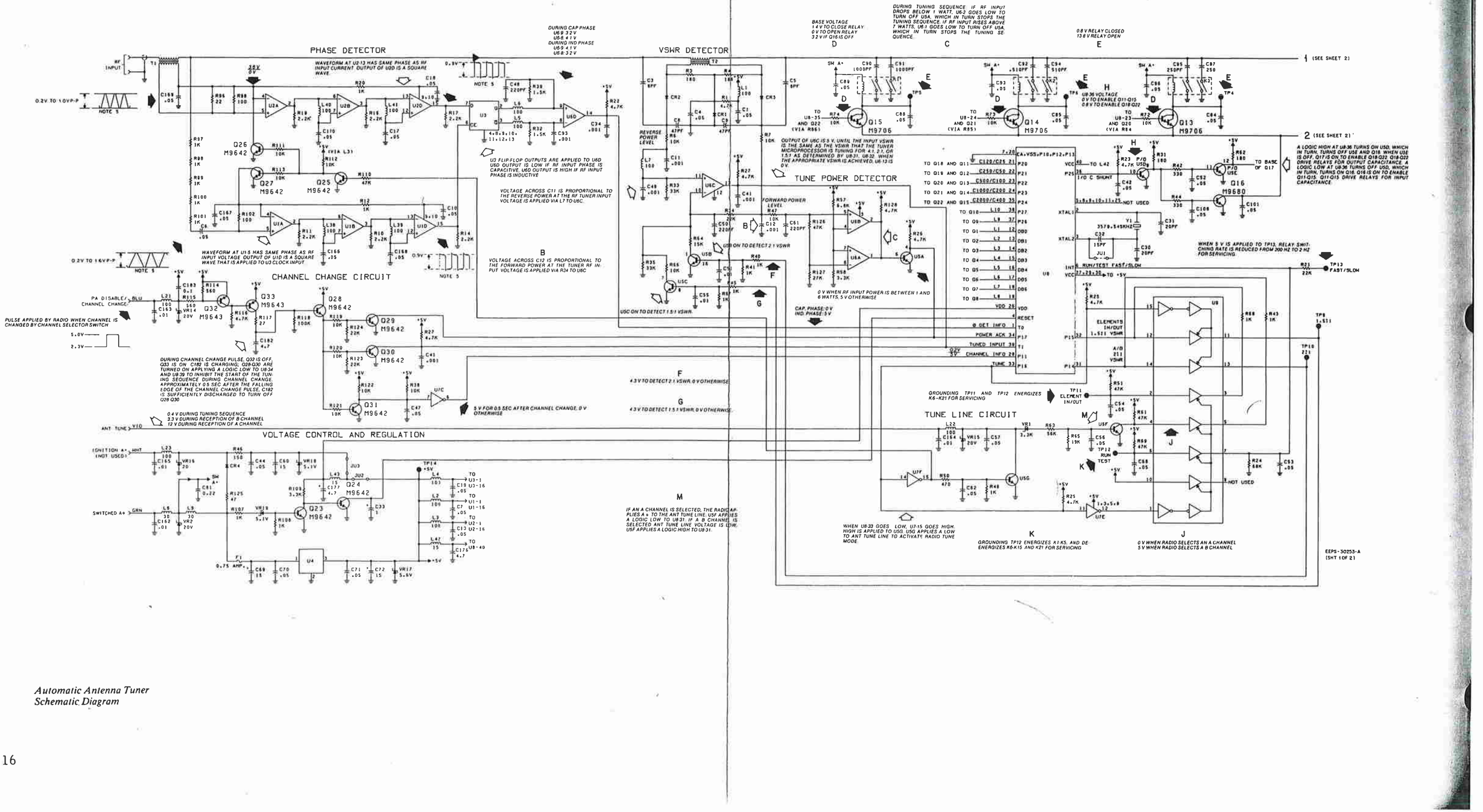




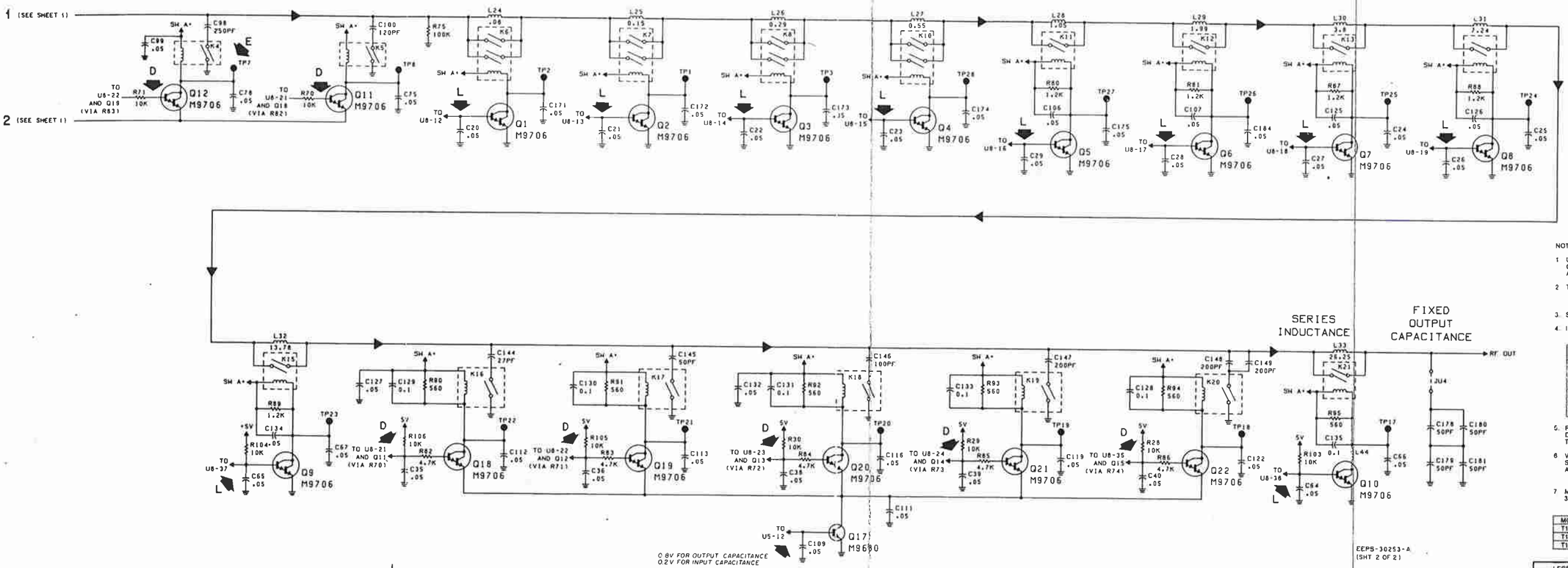
SHOWN FROM COMPONENT SIDE

Automatic Antenna Tuners

2-18 MHz



Automatic Antenna Tuner
Schematic Diagram



NOTES:

1. UNLESS OTHERWISE INDICATED: RESISTOR VALUES ARE IN OHMS; CAPACITOR VALUES ARE IN MICROFARADS; INDUCTOR VALUES ARE IN MICROHENRIES
2. THIS DIAGRAM SHOWS POSITIVE LOGIC
   LOGIC "1" 2 TO 5.4 V DC
   LOGIC "0" 0 TO 1.8 V DC
3. SOME INTEGRATED CIRCUITS ON THIS BOARD ARE CMOS DEVICES
4. 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	—	15
U6	MC3302	3	12
U7	MC14049B	1	8
U8	8048	40, 26	20
U9	MC14503	16	8

5. PHASE DETECTOR WAVEFORMS AND VOLTAGES ARE MEASURED DURING TUNING SEQUENCE WITH A 2 MHZ, 3 WATT LEVEL AT TUNER RF INPUT.
6. VOLTAGE SHOWN ABOVE LINE IS MEASURED DURING TUNING SEQUENCE, VOLTAGE SHOWN BELOW LINE IS MEASURED UNDER ALL OTHER CONDITIONS. FOR EXAMPLE $\frac{3.6\,V}{0\,V}$
7. MEASURED WITH TUNER COMPLETELY MISMATCHED AND A 2 MHZ, 3 WATT SIGNAL AT TUNER RF INPUT.

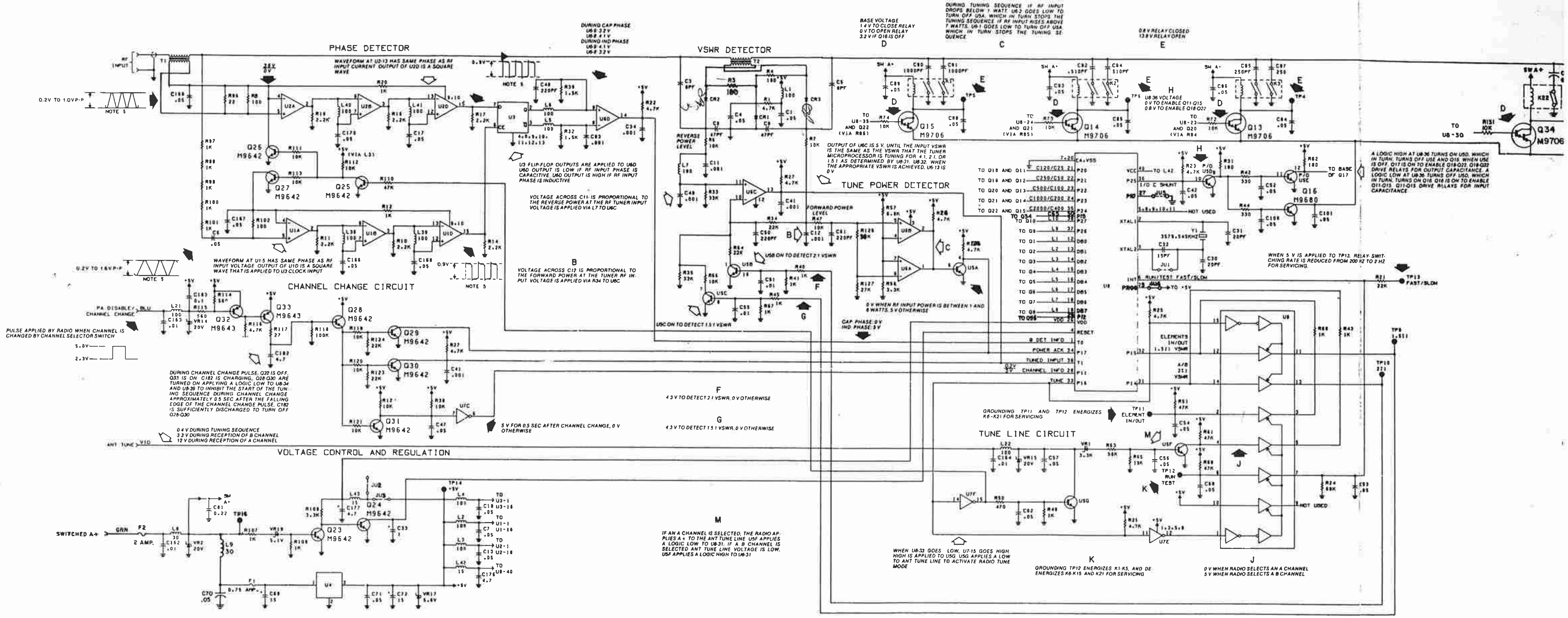
JUMPER TABLE

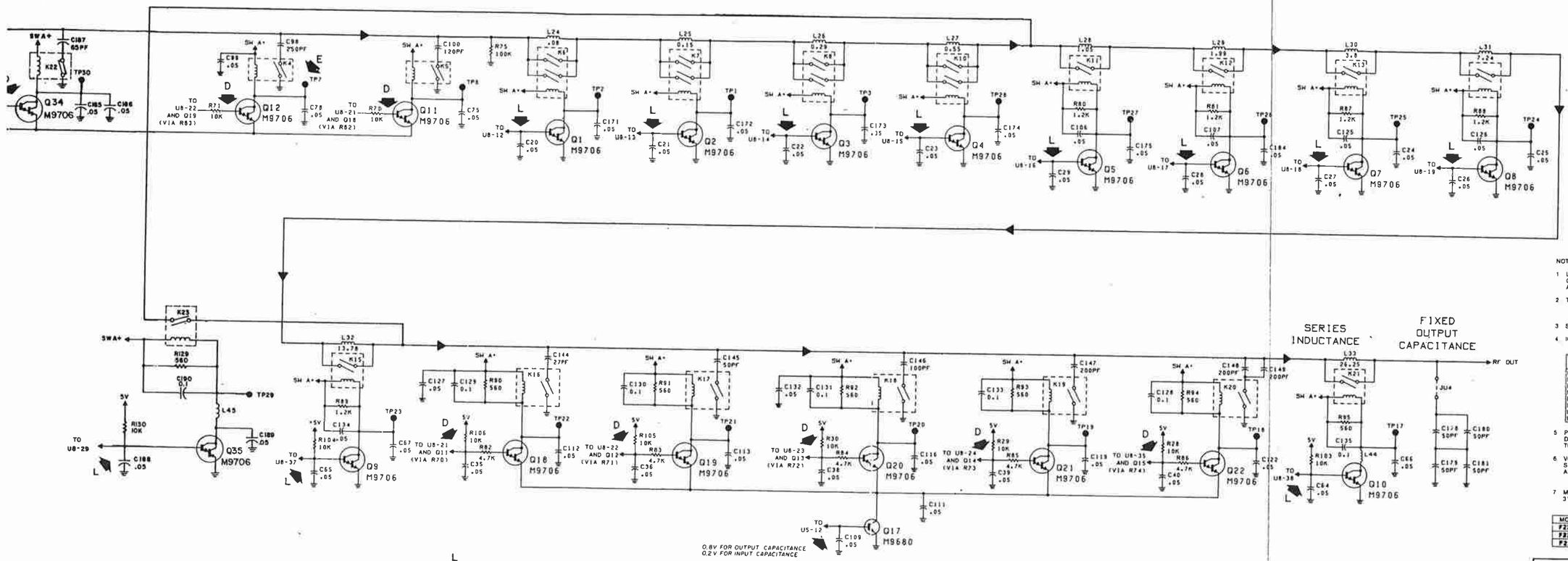
MODEL	JU1	JU2	JU3	JU4
T1959A	IN	IN	OUT	IN
T1961A	IN	IN	OUT	IN
T1962A	IN	IN	OUT	IN

LEGEND:
- THEORY NOTE
- MAINTENANCE NOTE
- PRIMARY SIGNAL FLOW
- SECONDARY SIGNAL FLOW

EEPS-30253-A (SHT 2 OF 2)

Automatic Antenna Tuner Schematic Diagram


PHASE DETECTOR
VSWR DETECTOR
TUNE POWER DETECTOR
CHANNEL CHANGE CIRCUIT
VOLTAGE CONTROL AND REGULATION
TUNE LINE CIRCUIT
RF INPUT
0.2V TO 1.0VP-P
NOTE 5
0.2V TO 1.6VP-P
WAVEFORM AT U2-13 HAS SAME PHASE AS RF INPUT CURRENT OUTPUT OF U2D IS A SQUARE WAVE
WAVEFORM AT U1-5 HAS SAME PHASE AS RF INPUT VOLTAGE OUTPUT OF U1D IS A SQUARE WAVE THAT IS APPLIED TO U3 CLOCK INPUT
DURING CAP PHASE U6-9 3.2 V U6-8 4.1 V DURING IND PHASE U6-9 4.1 V U6-8 3.2 V
U3 FLIP-FLOP OUTPUTS ARE APPLIED TO U6D. U6D OUTPUT IS LOW IF RF INPUT PHASE IS CAPACITIVE. U6D OUTPUT IS HIGH IF RF INPUT PHASE IS INDUCTIVE
VOLTAGE ACROSS C11 IS PROPORTIONAL TO THE REVERSE POWER AT THE RF TUNER INPUT VOLTAGE IS APPLIED VIA L7 TO U6C
B
VOLTAGE ACROSS C12 IS PROPORTIONAL TO THE FORWARD POWER AT THE TUNER RF INPUT VOLTAGE IS APPLIED VIA R34 TO U6C
BASE VOLTAGE 1.4 V TO CLOSE RELAY 0 V TO OPEN RELAY 3.2 V IF Q16 IS OFF
D
DURING TUNING SEQUENCE IF RF INPUT DROPS BELOW 1 WATT U6-2 GOES LOW TO TURN OFF U5A, WHICH IN TURN STOPS THE TUNING SEQUENCE. IF RF INPUT RISES ABOVE 7 WATTS, U6-1 GOES LOW TO TURN OFF U5A WHICH IN TURN STOPS THE TUNING SEQUENCE
C
0.8 V RELAY CLOSED 13.8 V RELAY OPEN
E
H
U8-36 VOLTAGE 0 V TO ENABLE Q11-Q15 0.8 V TO ENABLE Q18-Q22
OUTPUT OF U6C IS 5 V, UNTIL THE INPUT VSWR IS THE SAME AS THE VSWR THAT THE TUNER MICROPROCESSOR IS TUNING FOR 4:1, 2:1, OR 1.5:1 AS DETERMINED BY U8-31, U8-32. WHEN THE APPROPRIATE VSWR IS ACHIEVED, U6-13 IS 0 V
REVERSE POWER LEVEL
FORWARD POWER LEVEL
U5B ON TO DETECT 2:1 VSWR
U5C ON TO DETECT 1.5:1 VSWR
0 V WHEN RF INPUT POWER IS BETWEEN 1 AND 8 WATTS, 5 V OTHERWISE
CAP PHASE: 0 V IND PHASE: 5 V
A LOGIC HIGH AT U8-36 TURNS ON U5D, WHICH IN TURN, TURNS OFF U5E AND Q16. WHEN U5E IS OFF, Q17 IS ON TO ENABLE Q18-Q22. Q18-Q22 DRIVE RELAYS FOR OUTPUT CAPACITANCE. A LOGIC LOW AT U8-36 TURNS OFF U5D, WHICH IN TURN, TURNS ON Q16. Q16 IS ON TO ENABLE Q11-Q15. Q11-Q15 DRIVE RELAYS FOR INPUT CAPACITANCE
TO BASE OF Q17
TO U8-30
WHEN 5 V IS APPLIED TO TP13, RELAY SWITCHING RATE IS REDUCED FROM 200 HZ TO 2 HZ FOR SERVICING.
TP13 FAST/SLOW
PA DISABLE/CHANNEL CHANGE
PULSE APPLIED BY RADIO WHEN CHANNEL IS CHANGED BY CHANNEL SELECTOR SWITCH
DURING CHANNEL CHANGE PULSE, Q32 IS OFF, Q33 IS ON. C182 IS CHARGING. Q28-Q30 ARE TURNED ON APPLYING A LOGIC LOW TO U8-34 AND U8-39 TO INHIBIT THE START OF THE TUNING SEQUENCE DURING CHANNEL CHANGE. APPROXIMATELY 0.5 SEC AFTER THE FALLING EDGE OF THE CHANNEL CHANGE PULSE, C182 IS SUFFICIENTLY DISCHARGED TO TURN OFF Q28-Q30
5 V FOR 0.5 SEC AFTER CHANNEL CHANGE, 0 V OTHERWISE
0.4 V DURING TUNING SEQUENCE 3.3 V DURING RECEPTION OF B CHANNEL 12 V DURING RECEPTION OF A CHANNEL
ANT TUNE
F
4.3 V TO DETECT 2:1 VSWR, 0 V OTHERWISE
G
4.3 V TO DETECT 1.5:1 VSWR, 0 V OTHERWISE
SWITCHED A+
2 AMP.
M
IF AN A CHANNEL IS SELECTED, THE RADIO APPLIES A+ TO THE ANT TUNE LINE. U5F APPLIES A LOGIC LOW TO U8-31. IF A B CHANNEL IS SELECTED ANT TUNE LINE VOLTAGE IS LOW, U5F APPLIES A LOGIC HIGH TO U8-31
GROUNDING TP11 AND TP12 ENERGIZES K6-K21 FOR SERVICING
TP11 ELEMENT IN/OUT
TP12 RUN TEST
WHEN U8-33 GOES LOW, U7-15 GOES HIGH. HIGH IS APPLIED TO U5G. U5G APPLIES A LOW TO ANT TUNE LINE TO ACTIVATE RADIO TUNE MODE
K
GROUNDING TP12 ENERGIZES K1-K5, AND DE-ENERGIZES K6-K15 AND K21 FOR SERVICING
J
0 V WHEN RADIO SELECTS AN A CHANNEL 5 V WHEN RADIO SELECTS A B CHANNEL



NOTES:

1. UNLESS OTHERWISE INDICATED: RESISTOR VALUES ARE IN OHMS; CAPACITOR VALUES ARE IN MICROFARADS; INDUCTOR VALUES ARE IN MICROHENRIES.
2. THIS DIAGRAM SHOWS POSITIVE LOGIC:
   LOGIC "1": 2 TO 5.4 V DC
   LOGIC "0": 0 TO 1.8 V DC
3. SOME INTEGRATED CIRCUITS ON THIS BOARD ARE CMOS DEVICES
4. 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	—	15
U6	MC3302	3	12
U7	MC14049B	1	8
U8	8048	40, 26	20
U9	MC14503	16	8

5. PHASE DETECTOR WAVEFORMS AND VOLTAGES ARE MEASURED DURING TUNING SEQUENCE WITH A 2 MHZ, 3 WATT LEVEL AT TUNER RF INPUT.
6. VOLTAGE SHOWN ABOVE LINE IS MEASURED DURING TUNING SEQUENCE. VOLTAGE SHOWN BELOW LINE IS MEASURED UNDER ALL OTHER CONDITIONS FOR EXAMPLE: 3.8 V / 0 V
7. MEASURED WITH TUNER COMPLETELY MISMATCHED AND A 2 MHZ, 3 WATT SIGNAL AT TUNER RF INPUT.

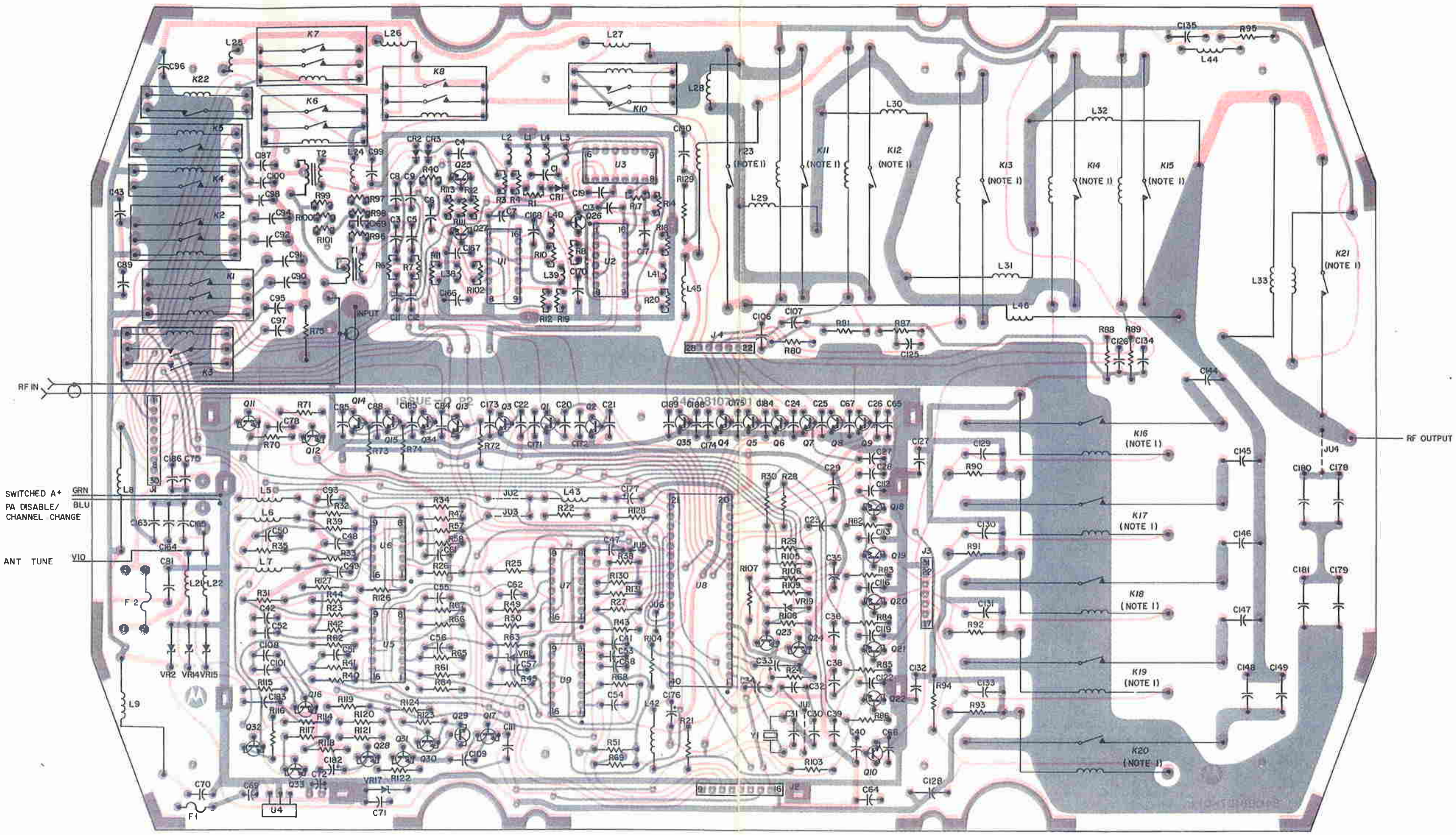
JUMPER TABLE

MODEL	JU1	JU2	JU3	JU4	JU5	JU6
F2260A	IN	OUT	IN	IN	OUT	IN
F2252A	IN	OUT	IN	IN	OUT	IN
F2239A	IN	OUT	IN	IN	OUT	IN

73C02926636-0

LEGEND:
- THEORY NOTE
- MAINTENANCE NOTE
- PRIMARY SIGNAL FLOW
- SECONDARY SIGNAL FLOW

Automatic Antenna Tuners
2-30 MHz



NOTE I. MOUNTED ON SOLDER SIDE OF BOARD.

SHOWN FROM COMPONENT SIDE

OVERLAY	● 79D02926G65-0
SOLDER SIDE	79D02926G66-0
COMPONENT SIDE	79D02926G67-0

parts lists

FLA5502A RF Board PL-0175-O

Reference Symbol	Motorola Part No.	Description
		Capacitors
C1	21-82372C07	.05 uF +80-20% 25 V
C2		not used
C3	21-82133G22	8 ±.5 pF 500 V
C4	21-82372C07	.05 uF +80-20% 25 V
C5	21-82133G22	8 ±.5 pF 500 V
C6, C7	21-82372C07	.05 uF +80-20% 25 V
C8, C9	21-84493B56	47 pF ±5% 100 V
C10		not used
C11, C12	21-82187B20	.001 uF ±10% 100 V
C13	21-82372C07	.05 uF +80-20% 25 V
C14-C16		not used
C17	21-82372C07	.05 uF +80-20% 25 V
C18		not used
C19-C29	21-82372C07	.05 uF +80-20% 25 V
C30, C31	21-82204B37	20 pF ±5% 500 V
C32	21-00840H46	15 pF ±5% 100 V
C33	23-82783B14	1 uF ±10% 15 V
C34	21-82187B20	.001 uF ±10% 100 V
C35, C36	21-82372C07	.05 uF +80-20% 25 V
C37		not used
C38-C40	21-82372C07	.05 uF +80-20% 25 V
C41	21-82187B20	.001 uF ±10% 100 V
C42, C43	21-82372C07	.05 uF +80-20% 25 V
C44-C46		not used
C47	21-82372C07	.05 uF +80-20% 25 V
C48	21-82187B08	220 pF ±10% 500 V
C49	21-82187B20	.001 uF ±10% 100 V
C50	21-82187B08	220 pF ±10% 500 V
C51	21-83596E21	.01 uF +80-20% 200 V
C52-C54	21-82372C07	.05 uF +80-20% 25 V
C55	21-83596E21	.01 uF +80-20% 200 V
C56, C57	21-82372C07	.05 uF +80-20% 25 V
C58-C60		not used
C61	21-82187B08	220 pF ±10% 500 V
C62	21-82372C07	.05 uF +80-20% 25 V
C63		not used
C64-C68	21-82372C07	.05 uF +80-20% 25 V
C69	23-84538G23	15 uF ±20% 20 V
C70, C71	21-82372C07	.05 uF +80-20% 25 V
C72	23-84538G23	15 uF ±20% 20 V
C73, C74		not used
C75	21-82372C07	.05 uF +80-20% 25 V
C76, C77		not used
C78	21-82372C07	.05 uF +80-20% 25 V
C79, C80		not used
C81	08-83813H11	.22 uF ±10% 75 V
C82, C83		not used
C84, C85	21-82372C07	.05 uF +80-20% 25 V
C86, C87		not used
C88, C89	21-82372C07	.05 uF +80-20% 25 V
C90, C91	21-84494B98	.001 uF ±5% 500 V
C92	21-84494B99	510 pF ±3% 500 V
C93	21-82187B20	.001 uF ±10% 100 V
C94	21-84494B99	510 pF ±3% 500 V
C95	21-84857K29	250 pF ±5% 500 V
C96	21-82372C07	.05 uF +80-20% 25 V
C97, C98	21-84857K29	250 pF ±5% 500 V
C99	21-82372C07	.05 uF +80-20% 25 V
C100	21-84494B06	120 pF ±5% 500 V
C101	21-82372C07	.05 uF +80-20% 25 V
C102-C105		not used
C106-C109	21-82372C07	.05 uF +80-20% 25 V
C110		not used
C111-C113	21-82372C07	.05 uF +80-20% 25 V
C114, C115		not used
C116	21-82372C07	.05 uF +80-20% 25 V
C117, C118		not used
C119	21-82372C07	.05 uF +80-20% 25 V
C120, C121		not used
C122	21-82372C07	.05 uF +80-20% 25 V
C123, C124		not used
C125-C127	21-82372C07	.05 uF +80-20% 25 V
C128-C131	21-82372C03	.1 uF +80-20% 25 V
C132	21-82372C07	.05 uF +80-20% 25 V
C133	21-82372C03	.1 uF +80-20% 25 V
C134	21-82372C07	.05 uF +80-20% 25 V
C135	21-82372C03	.1 uF +80-20% 25 V
C136-C143		not used
C144	21-82204B42	27 pF ±10% 300 V
C145	21-82204B57	50 pF ±5% 300 V
C146	21-82204B56	100 pF ±5% 300 V
C147-C149	21-82204B55	200 pF ±5% 200 V
C150-C161		not used
C162-C164	21-82428B35	.01 uF +80-20% 500 V
C165		not used
C166-C175	21-82372C07	.05 uF +80-20% 25 V
C176, C177	23-84538G02	4.7 uF ±20% 20 V
C178-C181	21-82204B85	50 pF ±5% 500 V
C182	23-84538G02	4.7 uF ±20% 20 V
C183	21-82372C03	.1 uF +80-20% 25 V
C184-C186	21-82372C07	.05 uF +80-20% 25 V
C187	21-84857K40	65 pF ±2% 500 V
C188, C189	21-82372C07	.05 uF +80-20% 25 V
C190	21-82372C03	.1 uF +80-20% 25 V
		Diodes (see note 1)
CR1-CR3	48-83654H01	silicon
		Fuses
F1	65-83770F01	3/4 A 125 V
F2	65-02069C18	2 A 250 V
		Connectors
J1	28-02208K04	9 pins
J2	28-02208K03	8 pins
J3, J4	28-02208K08	7 pins
		Relays
K1-K3	80-83290M04	2 form A, 250 V
K4, K5	80-83290M01	1 form A, 250 V
K6-K8	80-83290M04	2 form A, 250 V
K9		not used
K10	80-83290M05	2 form A, 400 V
K11	80-84803F02	1 form A, 800 V
K12-K15	80-84803F05	1 form A, 2500 V
K16-K20	80-84803F01	1 form A, 5000 V
K21		part of 01-98209904
K22	80-83290M01	1 form A, 250 V
K23	80-84803F01	1 form A, 5000 V
		Coils
L1-L7	24-82549D37	choke, 100 uH
L8, L9	24-83397L01	choke, 30 uH
L21, L22	24-82549D37	choke, 100 uH
L24	24-84388M01	choke, .08 uH
L25	24-84388M02	choke, .15 uH
L26	24-84388M03	choke, .29 uH
L27	24-84388M04	choke, .55 uH
L28	24-08465K01	choke
L29	24-84882M01	choke, 3.80 uH
L30	24-84388M06	choke, 1.99 uH
L31	24-84882M02	choke, 7.24 uH
L32	24-84882M03	choke, 13.78 uH
L33	24-84882M04	choke, 26.25 uH
L34-L37		not used
L38-L41	24-82549D37	choke, 100 uH
L42, L43	24-82549D09	choke, 15 uH
L44, L45	24-82549D37	choke, 100 uH
L46	24-08505K01	inductive short
		Transistors (see note 1)
Q1-Q15	48-00869706	NPN Darlington, M9706
Q16, Q17	48-00869680	NPN, M9680
Q18-Q22	48-00869706	NPN Darlington, M9706
Q23-Q31	48-00869642	NPN, M9642
Q32, Q33	48-00869643	PNP, M9643
Q34, Q35	48-00869706	NPN Darlington, M9706
		Resistors: ohms ±5% 1/4 W unless otherwise stated
R1	06-11009C65	4700
R2		not used
R3, R4	06-11009C31	180
R5		not used
R6, R7	06-11009C73	10k
R8	06-11009C25	100
R9		not used
R10, R11	06-11009C57	2200
R12	06-11009C49	1000
R13		not used
R14	06-11009C57	2200
R15		not used
R16, R17	06-11009C57	2200
R18		not used
R19	06-11009C57	2200
R20	06-11009C49	1000
R21	06-11009C81	22k
R22, R23	06-11009C65	4700
R24	06-11009C93	68k
R25-R27	06-11009C65	4700
R28-R30	06-11009C73	10k
R31	06-00125A31	180, 1/2 W
R32	06-11009C53	1500
R33	06-11009C85	33k
R34	06-11009C81	22k
R35	06-11009C85	33k
R36, R37		not used
R38	06-11009C73	10k
R39	06-11009C53	1500
R40, R41	06-11009C49	1000
R42	06-11009C37	330
R43	06-11009C49	1000
R44	06-11009C37	330
R45	06-11009C49	1000
R46		not used
R47	06-11009C73	10k
R48		not used
R49	06-11009C49	1000
R50	06-11009C41	470
R51	06-11009C89	47k
R52-R56		not used
R57	06-11009C69	6800
R58	06-11009C61	3300
R59, R60		not used
R61	06-11009C89	47k
R62	06-00125A31	180, 1/2 W
R63	06-11009C91	56k
R64	06-11009C81	22k
R65, R66	06-11009C73	10k
R67, R68	06-11009C49	1000
R69	06-11009C89	47k
R70-R74	06-11009C73	10k
R75	06-00125C97	100k ±10% 1/2 W
R76-R79		not used
R80, R81	06-11009C51	1200
R82-R86	06-11009C65	4700
R87-R89	06-11009C51	1200
R90-R95	06-00125C43	560 ±10% 1/2 W
R96	06-11009C09	22
R97-R101	06-11009C49	1000
R102	06-11009C25	100
R103-R106	06-11009C73	10k
R107, R108	06-11009C49	1000
R109	06-11009C61	3300
R110	06-11009C89	47k
R111-R113	06-11009C73	10k
R114-R115	06-11009C43	560
R116	06-11009C65	4700
R117	06-11009C11	27
R118	06-11009C97	100k
R119-R122	06-11009C73	10k
R123, R124	06-11009C81	22k
R125		not used
R126	06-11009C87	39k
R127	06-11009C83	27k
R128	06-11009C65	4700
R129	06-00125C43	560 ±10% 1/2 W
R130, R131	06-11009C73	10k
		Transformers
T1, T2	25-83727K01	25 turns
		Integrated circuits (see note 1)
U1, U2	51-84561L54	61L54
U3	51-84561L55	61L55
U4	51-84561L76	61L76
U5	51-84561L65	61L65
U6	51-84371K74	71K74
U7	51-82884L02	CMOS, 84L02
U8	51-08022K01	microprocessor, 874
U9	51-82884L74	84L74
		Zener diodes (see n
VR1	48-82256C26	3.3 V
VR2	48-82256C39	20 V
VR3-VR13		not used
VR14, VR15	48-82256C39	20 V
VR16		not used
VR17	48-82256C12	5.6 V
VR18		not used
VR19	48-82256C15	5.1 V
		Crystal (see note 2
Y1	48-82141M01	3.58 MHz

Reference Symbol	Motorola Part No.	Description
R57	06-11009C69	6800
R58	06-11009C61	3300
R59, R60		not used
R61	06-11009C89	47k
R62	06-00125A31	180, 1/2 W
R63	06-11009C91	56k
R64	06-11009C81	22k
R65, R66	06-11009C73	10k
R67, R68	06-11009C49	1000
R69	06-11009C89	47k
R70-R74	06-11009C73	10k
R75	06-00125C97	100k ±10% 1/2 W
R76-R79		not used
R80, R81	06-11009C51	1200
R82-R86	06-11009C65	4700
R87-R89	06-11009C51	1200
R90-R95	06-00125C43	560 ±10% 1/2 W
R96	06-11009C09	22
R97-R101	06-11009C49	1000
R102	06-11009C25	100
R103-R106	06-11009C73	10k
R107, R108	06-11009C49	1000
R109	06-11009C61	3300
R110	06-11009C89	47k
R111-R113	06-11009C73	10k
R114-R115	06-11009C43	560
R116	06-11009C65	4700
R117	06-11009C11	27
R118	06-11009C97	100k
R119-R122	06-11009C73	10k
R123, R124	06-11009C81	22k
R125		not used
R126	06-11009C87	39k
R127	06-11009C83	27k
R128	06-11009C65	4700
R129	06-00125C43	560 ±10% 1/2 W
R130, R131	06-11009C73	10k
		Transformers
T1, T2	25-83727K01	25 turns
		Integrated circuits (see note 1)
U1, U2	51-84561L54	61L54
U3	51-84561L55	61L55
U4	51-84561L76	61L76
U5	51-84561L65	61L65
U6	51-84371K74	71K74
U7	51-82884L02	CMOS, 84L02
U8	51-08022K01	microprocessor, 8749
U9	51-82884L74	84L74
		Zener diodes (see note 1)
VR1	48-82256C26	3.3 V
VR2	48-82256C39	20 V
VR3-VR13		not used
VR14, VR15	48-82256C39	20 V
VR16		not used
VR17	48-82256C12	5.6 V
VR18		not used
VR19	48-82256C15	5.1 V
		Crystal (see note 2)
Y1	48-82141M01	3.58 MHz

Reference Symbol	Motorola Part No.	Description
		Hardware
	01-80726D53	wire & lug
	01-80726D54	wire & lug
	01-80726D56	wire & lug
	01-98209904	Relay Assembly, includes:
	75-80202C01	pad
K21	80-84803F01	relay
	03-00134169	tapping screw, 4-40 x 1/4
	09-84186L01	40-contact socket for U8
	14-83967A03	shoulder washer, 2 used
	26-84354M01	shield
	26-84352M01	shield
	26-84353M01	shield
	42-02226C04	fuse holder, 2 used
	42-10217A02	tie strap
	42-10217A20	tie strap
	84-08107K01	printed circuit board

Notes:

1. For optimum performance, order diodes, transistors and integrated circuits by Motorola part numbers.

2. When ordering quartz crystals or ceramic resonators, specify carrier frequency, crystal or resonator frequency, and crystal or resonator type number.

FHN5513A Antenna Tuner Housing **PL-0178-O**

Reference Symbol	Motorola Part No.	Description
	01-02718G13	RF lead
	01-80726D50	ground lead
	01-80733D97	RF cable and connector
	02-00009644	nut, 1/4-20, 5 used
	02-00120486	nut, 4-40, 2 used
	03-00134169	tapping screw, 4-40 x 1/4
	03-00134184	tapping screw, 4-40 x 5/16
	03-00138035	screw, 6-32 x 3/8, 13 used
	03-00138419	captive screw, 1/4-20 x 7/8
	03-02432C48	screw, 6-32 x 5/8, 2 used
	03-02432C85	screw, 10-32 x 3/8, 4 used
	03-02433C25	screw, 4-40 x 3/8, 2 used
	03-82898M01	screw, 4-40 x 1/2
	03-84686E01	captive screw, 6-32 x 7/16
	04-00114970	flat washer, 1/4
	04-00139951	lock washer, 1/4, 4 used
	04-00139952	lock washer, #4, 2 used
	04-02439C03	lock washer, #6, 3 used
	04-02439C05	lock washer, #10, 4 used
	04-02440C03	flat washer, #6, 3 used
	04-10057A13	insulating washer
	04-10058B19	plastic washer
	04-11008A02	sealing washer, 4 used
	07-02431C02	sprocket bracket
	07-02431C03	sprocket
	07-08453H01	bracket
	14-82884M01	feedthrough insulator
	15-08462H01	housing
	15-84355M01	shield cover
	27-08452H01	chassis
	29-00835302	ring tongue lug
	31-02340C09	terminal block
	32-82894M01	stand-off gasket, 2 used
	33-08323K01	nameplate
	42-10217A02	tie strap, 3 used
	42-10283A20	cable clip
	47-83033M01	threaded rod, 1/4-20
	54-08321K01	label
	54-08473K01	label
	54-83379A01	label, high voltage, 2 used
	58-08021K01	fitting
	58-08021K02	fitting