1. Theory of Operation

1.1 The *SYNTOR X* low-band transmitter uses discrete component design. It consists of four major blocks: the low-level amplifier (LLA), the power amplifier (PA), the PIN diode antenna-switch/harmonic-filter (HF) combination, and the directional coupler (DC). The harmonic filter also acts as the first low-pass section for the receiver.

1.2 The frequency synthesizer generates a 75-mW RF output at the transmit carrier frequency. This is applied to the controlled, one-stage LLA (Q801). The gain of the LLA and the output power of the radio change with variations in the control voltage.

1.3 The RF signal passes from the LLA to the final amplifier, where it is applied to the driver stage (Q802). The driver delivers as much as 30 watts of RF power to the input of the final amplifier. Consisting of two devices (Q803 and Q804) in a push-pull configuration, the final amplifier boosts the final output power to the rated 100 watts.

1.4 The power control circuit on the common circuits board monitors the following parameters: forward power, reflected power, current to the finals, temperature of the finals, and control voltage. It does so in order to level RF power and protect the PA from burnout.

1.5 The power control circuit monitors forward and reflected power with the help of the directional coupler. The directional coupler detects forward and reflected power and sends any detected dc voltage to the power control circuit. When forward power is above or below the set point, the power control circuit adjusts the gain of the low-level amplifier by adjusting the control voltage to that stage. This monitoring holds output power constant over many operating conditions. However, when reflected power reaches levels that may damage the transmitter, the power control circuit reduces the output power until the reflected power returns to a safe level. (Excessive reflected power is usually due to a poor antenna installation or a bad RF connection.)

1.6 The power control circuit monitors dc current to final devices Q803 and Q804 in order to protect them from over-dissipation. It senses this current by measuring the voltage drop across R813. The current limit cut-in point is set by R917. When current to the finals exceeds the limit set by R917, the control circuit reduces the control voltage, thus reducing power out and current drain.

1.7 The power control circuit senses the temperature of the PA through thermistor RT801, which is near the flange of Q803. When the flange temperature exceeds 95°C, the control circuit lowers the control voltage in order to protect the PA from excessive temperatures. The feedback loop through VR900 always limits the control voltage to a maximum of 11 volts, thus protecting low-level amplifier device Q801 from over-dissipation.

2. Functional Tests

Note

The Synthesizer Section of this manual has information on troubleshooting the transmit frequency, audio deviation, and modulation.

2.1 PRELIMINARY

Connect the radio to a proper wattmeter, dummy load, and 13.4 V dc supply. Make adjustments to R917 and R908 on the solder side of the common circuits board.

Caution

Key the transmitter only while making adjustments.

2.2 CONTROL AND PROTECTION TESTS

2.2.1 Power Set (R908)

(1) Set CURRENT LIMIT (R917) fully clockwise.

(2) Set POWER SET (R908) fully clockwise.

(3) Key the transmitter and observe the wattmeter. The power output should be 20–30 W and should increase to more than 120 W as you turn POWER SET (R908) counterclockwise.

2.2.2 Thermal Protection

(1) Set CURRENT LIMIT (R917) fully clockwise.

(2) Adjust POWER SET (R908) to 105 W.

(3) Touch a soldering iron to RT801 (near the flange of Q803). The power output should decrease as RT801 heats up.

2.2.3 Reflected Power (VSWR) Protection

(1) Set CURRENT LIMIT (R917) fully clockwise.

(2) Key the transmitter and adjust POWER SET (R908) for 110 W.

Caution

The following test requires transmission without a dummy load. Therefore be careful to key the transmitter only long enough verify proper operation of the equipment.

(3) Remove the 50-ohm load from the radio. Key the transmitter briefly and verify that the output power is 30–60 watts.

2.3 RF AMPLIFICATION TESTS

2.3.1 Injection

(1) Disconnect the RF drive signal to the Low-Level Amplifier from the synthesizer (J801).

(2) Connect a 50-ohm terminated RF millivoltmeter to the synthesizer's transmitter injection plug (P801). Residual RF drive to the Low-Level Amplifier in the receive mode should be less than -5 dBm. Transmitter injection in the transmit mode should be greater than $+16$ dBm.

2.3.2 Low-Level Amplifier

(1) Set the POWER SET (R908) and CURRENT LIMIT (R917) to maximum.

(2) Key the transmitter. Using a millivoltmeter with a high-impedance probe, check the base and collector of the LLA (Q801), getting as close to the device as possible, and verify that the LLA has at least 10 dB of gain. (The collector pad should be 10 dB higher than the base.)

Transmitter Troubleshooting Procedure

Step	Symptom	Procedure	Normal Indication	If Normal	If Abnormal
1	Suspected Transmitter Failure	Measure RF output power at antenna connector.	Rated power	No transmitter malfunction	High power—perform Transmitter Control and Protection Circuit Troubleshooting Procedure. No power—go to 2. Low-power—go to 3.
2	No Output Power	a. Set R908 and R917 fully clockwise. Observe Meter 5.	Greater than 5 μA	Go to b.	Go to 3.
		b. Measure dc voltage across antenna relay coil during Tx.	5 V	Go to c.	Check coil continuity (dc resistance approx. 160 ohms.); if good, troubleshoot relay drive circuitry.
		c. Check reed switch continuity.	Continuous during Tx	Go to d.	Replace Switch.
		d. Check harmonic filter and output cable for shorts and discontinuities.	See schematic.	Go to 3.	Repair defect.
3	Low Output Power	a. Measure dc level at collector of Q802.	Greater than 11 V	Go to b.	Perform Transmitter Control and Protection Circuit Troubleshooting Procedure.
		b. Measure RF signal level of VCO buffer output.	+22 dBm min.	Perform Power Amplifier Troubleshooting Procedure	Perform Synthesizer Troubleshooting Procedure.

Troubleshooting Procedure for Power Control and Protection Circuitry

PRELININARY: Set R917 fully clockwise and R908 fully counterclockwise as viewed on the solder side of the common circuits board. Key the transmitter for the following tests. Voltage reference is B – (the internal casting).

Step	Symptom	Procedure	Normal Indication	If Normal	If Abnormal
1	No Control Voltage or Low Control Voltage	a. Measure keyed 9.4 V, P401-8.	9.4 V	Go to b.	Check Q3 and Q4 on personality board.
		b. Measure $\overline{\text{PA ENABLE}}$, P1401-10.	0 volts during transmit	Go to c.	Check adapt line, Q5, or Q6.
		c. Measure U900-1.	2–7.5 volts	Replace Q906 or Q904.	If 0 volts, go to d.
		d. Measure U900-3.	1.67 volts	Go to e.	Check R905 and R906 if greater than 1.67 V.
		e. Measure U900-2.	0–1.67 volts	Replace U900.	If greater than 1.67 V, go to f.
		f. Remove CR901. Measure U900-1.	2–7.5 volts	Go to 2a.	Go to g.
		g. Remove CR903. Measure U900-1.	2–7.5 volts	Go to 3a.	Go to h.
		h. Remove CR900. Measure U900-1.	2–7.5 volts	Check VR900 and R907 for shorts.	Go to i.
		i. Remove CR902. Measure U900-1.	2–7.5 volts	Go to 4g.	Go to j.
		j. Unplug P953 from the directional coupler. Measure U900-2.	0–1.67 volts	Check directional coupler.	Determine source that holds U900-2 above 1.67 volts.
2	Current Limit Amplifier Failure	a. Set R917 fully clockwise. Disconnect cathode of CR901. Measure cathode of CR901.	0–1.5 volts	Reconnect CR901.	Go to 2b.
		b. Measure voltage across R930.	.46–.50 volts	Check R923.	Go to 2c.
		c. Measure base of Q905.	.86–1.3 volts	Check R918.	If base is greater than 1.3 volts, replace Q905. If base is less than .86 volt, go to 2e.
		d. Measure U900-7.	7.5–8.5 volts	Check R928 and VR901.	Go to 2e.
		e. Measure U900-6.	5.0–5.9 volts	Go to 2f.	Check A+, R915, or R916.
		f. Measure U900-5.	5.0–5.9 volts	Replace U900.	Check R922, R924, R910, R920, R917, R919, R814, R816, and R813.

Troubleshooting Procedure for Power Control and Protection Circuitry (continued)

Step	Symptom		Procedure	Normal Indication	If Normal	If Abnormal
3	Thermal Protection Failure	a.	Disconnect cathode CR903. Measure U900-14.	0–1.6 volts	Check CR903 and R909.	Go to 3b.
		b.	Measure U900-12.	1.67 volts	Go to 3c.	Check R905 and R906.
		c.	Measure U900-13.	0–1.67 volts	Replace U900.	Go to 3d.
		d.	Turn off power to radio. Disconnect P951 from common circuits board. Measure resistance between B – and black temp-sense wire at P951.	101k ohms (less if chassis is warm)	Check R901, R903, R934, and R904.	Check L818, RT801, and R815 on the PA.
4	Reverse-Power-Protection Failure	a.	Disconnect cathode of CR902. Disconnect RF drive from PA. Measure U900-8.	0 volts	Go to 4c.	Go to 4b.
		b.	Unplug J953 from directional coupler. Measure U900-18.	0 volts	Go to 4c.	Determine source that holds Pin 10 above 0 volts.
		c.	Connect RF drive to transmitter. Disconnect dummy load from antenna connector. Key up briefly and measure.	3–6 volts	System o.k.	Check R914 and R911 or replace U900.

3. HLB4092A Directional Coupler

3.1 DESCRIPTION

The HLB4092A directional coupler detects forward and reflected power. Three color coded wires on P953 connect the directional coupler to the common circuits board, and one coaxial cable connects it to the output of the PA board while another connects it to the antenna connector.

3.2 THEORY OF OPERATION

3.2.1 Transformer T950 induces RF voltages on the forward port and on the reflected port proportional to the forward and reflected power levels, respectively. Each port consists of a 50-ohm load and an RF-to-dc detector circuit, and both operate in the same way.

3.2.2 The 50-ohm load of the forward port consists of R952 and R953, and that of the reflected port consists of R954 and R955. The RF voltage on the forward port is detected, rectified, and converted to a dc level by R950, CR950, and C957. Likewise, the RF voltage on the reflected port is detected, rectified, and converted to dc by R951, CR951, and C958.

3.3 FUNCTIONAL TESTS

3.3.1 Preliminarv

Connect the radio to a proper wattmeter, dummy load, and a 13.4-volt dc supply.

Caution

Key the transmitter only while making adjustments. (Make adjustments from the bottom of the radio and through the common circuits board.)

3.3.2 Forward DC Detected Voltage Test

(1) Set POWER SET (R908) fully clockwise.

(2) Set CURRENT LIMIT (R917) fully counterclockwise.

(3) Remove plug P953 from the common circuits board. Connect a voltmeter across FORWARD DETECT, Pin 1 (brown), and REFERENCE, Pin 2 (black), with Pin 2 being the negative connection.

(4) Key the transmitter and observe radio output power. Slowly turn CURRENT LIMIT (R917) clockwise until the output power rises to 100 ±5 watts. The voltmeter should read between 4.0 and 6.0 dc volts.

3.3.3 Reflected DC Detected Voltage Test

Note

For this test, connect the radio to a proper throughline wattmeter, a 13.4 V dc supply, and two dummy loads in parallel.

(1) Set POWER SET (R908) fully clockwise.

(2) Set CURRENT LIMIT (R917) fully counterclockwise.

(3) Remove plug P953 from the common circuits board. Connect a voltmeter across REFLECTED DETECT, Pin 3 (red), and REFERENCE, Pin 2 (black), with Pin 2 being the negative connection.

(4) Key the transmitter and observe radio forward output power. Slowly turn CURRENT LIMIT (R917) clockwise until the forward output power rises to 100 ±5 watts.

(5) Check the reflected output power with the throughline wattmeter. It should be 11 ±3 watts. The voltmeter should read between 0.5 and 2.0 dc volts.

Troubleshooting Procedure for Directional Coupler

Step	Symptom	Procedure	Normal Indication	If Normal	If Abnormal
1	Suspected Coupler Failure	Perform functional tests.	See functional test paragraphs.	No coupler problem	No power out, go to 2. Either forward or reflected voltage wrong, go to 3.
2	No power out	Check coaxes for continuity through the coupler. **Note** The coupler *does* have a dc short from the coax center conductor to the coax shield.	Continuous	Remove cover. Locate and fix RF shorts to the cover.	Check board and coax solder connections, runners to and from T950, and T950 primary.
3	Forward or reflected dc voltages too high or low	a. Remove the coupler cover and recheck.	See functional test paragraphs.	Locate and fix dc short to cover.	Go to b.
		b. Check all circuit R-L-C's.	See schematic.	Go to c.	Repair defect.
		c. Check RF voltage on T950 side of C950 and C951 during reflected detect functional test.	P_{fwd} = 100 watts P_{refl} = 11 watts both ±3 watts VC950 = 3.5Vrms VC951 = 1.2Vrms both ±0.5Vrms	Locate and repair PCB problem. Cut runner, solder short, etc.	Replace T950.

Troubleshooting Procedure for PIN Diode Antenna Switch: Receive Mode

Note: This analysis assumes that an applied signal is good through the LPF up to C824.

Symptom	Procedure	Normal Indication	If Normal	If Abnormal
Receive path degrades signal strength by more than 0.5 dB.	a. Check Reg. 9.6 voltage on PA board.	9.6 V	Go to b.	Repair 9.6 V circuitry and recheck signal path.
	b. Check voltage at ungrounded lead of R970.	~1.2 V dc	If there are no shorts or opens around C824 and C972, replace CR971 and CR972.	(1) Varies significantly: check R982, R970 for right values. (2) Zero: Go to c.
	c. Measure voltage at emitter of Q980.	~8.9 V	Go to d.	Zero: replace CR983.
	d. Check voltage at cathode of CR980.	~2.0 V dc	Go to e.	Zero: check for opens between Q980 base and ground; if none, replace Q980.
	e. Check voltage at collector of Q980.	—	—	(1) ~8.9 V: check for open path to R970. (2) Zero: check for shorts past the collector of Q980.

Troubleshooting Procedure for PIN Diode Antenna Switch: Transmit Mode

Note: The following analysis assumes that the transmitter is working into a 50-ohm load, the LPF is OK, and the directional coupler is working right.

Symptom	Procedure	Normal Indication	If Normal	If Abnormal
TX PIN diode overdissipates and changes color. (Replace TX PIN diode CR970.)	a. Check keyed 9.4 V on PA board.	9.4 V	Go to b.	Repair K9.4 V circuitry. (Note: this may be caused by a low resistance or short of the K9.4 lines on the PA board.)
	b. Check voltage at ungrounded lead of R970.	~8.5 V dc	—	(1) Zero: check for opens from K9.4 through R970 to B–. (2) Low: Check components and values from K9.4 through R970 to B–. If there are no shorts or opens around C824 and C972, replace CR971 and CR972.
RX PIN diodes CR971 and CR972 discolor or their solder liquifies during transmit. (After completing this procedure, be sure to check the receiver.)	a. Check voltage during transmit at cathode of CR980.	~8.5 V dc	Go to b.	Zero: check for opens from K9.4 to cathode of CR980, direction of CR980, and that CR980 is working properly.
	b. Check for PA spurs (instability). (Note: This check uses a spectrum analyzer.)	No spurs	Go to c.	Repair PA and check CR981 (5.6 V zener) for correct placement and operation; be sure entire switch has correct parts.
	c. Check CR981 for correct placement and operation, and be sure entire switch has correct parts.	—	Go to d.	Take required corrective action.
	d. Measure dc voltage at anode of CR972.	–90.0 V dc	Check for ac short at anode of CR972.	Very low or zero: check loop of C970, CR973, CR974, CR975, R972 for opens or short, R971 (47k Ω) for opens.

parts list

HLB4094A PA Board — MXW-1712-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed, µF ±5%, 100V unless otherwise stated
C801	08-11051A13	.1, 63V
C802	21-84494B06	120 pF, 500V
C803	21-84494B11	200 pF, 500V
C804	21-84494B30	34 pF, 500V
C805	08-11051A13	.1, 63V
C806	08-11051A17	.47, 63V
C807	21-84494B03	80 pF, 500V
C808	21-84494B19	470 pF, 300V
C809	08-82905G21	.018 ±10%
C810	21-84494B11	200 pF, 500V
C811	21-00868823	345 ±3%, 500V
C812	21-84395B13	300 pF, 250V
C813	21-84494B11	200 pF, 500V
C814	21-84857K06	565 pF ±3%, 500V
C815, 816	08-82905G21	.018 ±10%
C819, 820	21-84494B06	120 pF, 500V
C821	21-84395B04	120 pF, 250V
C822	21-84395B05	130 pF, 250V
C823	21-84395B07	60 pF, 250V
C824	21-80240G59	.001, 350V
C825, 826	08-11051A17	.47, 63V
C827	23-11013C54	10 ±20%, 15V, tantalum
C828	08-84637L03	.0012, 630V
C829	08-84637L22	.22 ±10%
C830	08-84637L21	.15 ±10%
C832	08-84637L22	.22 ±10%
C833	23-82601A05	50 +150, −10%, 25V, electrolytic
C834–836	08-11051A17	.47, 63V
C837	21-11015A01	.001 +80, −20%
C839	21-11015A07	.01 +80, −20%
C840	21-11015A01	.001 +80, −20%
C841	21-84494B03	80 pF, 500V
C890	21-84395B19	43 pF, 250V
C891	21-84395B31	14 pF, 350V
C892	21-84395B70	63 pF ±2%, 350V
C893	21-84395B67	43 pF ±2%, 350V
C894–896	21-84395B68	56 pF ±2%, 350V
C897	21-84395B66	36 pF ±2%, 350V
C898	21-84395B65	84 pF ±2%, 350V
C899	21-84395B07	60 pF, 250V
C970–972	21-83596E24	.0033 ±10%, 200V
C973	08-11051A13	.1 ±5%, 63V
C980	21-82372C10	.05 ±20%, 25V
C981	21-83596E37	.01 +70, −30%
C982, 984, 985	21-83596E24	.0033 ±10%, 200V
C986	21-83596E37	.01 +70, −30%
C987, 989	21-83596E24	.0033 ±10%, 200V
		diode (see note)
CR970	48-80236E11	pin
CR971, 972	48-83510F04	silicon
CR973–975	48-83654H01	silicon
CR980, 981	48-82466H01	silicon rectifier
CR982	48-82256C12	zener, 5.6V
CR983	48-82466H01	silicon rectifier
		connector receptacle
J801	09-80001F01	phono jack
		coil
L801	24-11030B15	10.5 turns, white
L802	24-11030B13	8.5 turns, green
L803	24-82835G30	1.3 µH, choke brown/orange/gold
L804	24-11030D05	inductor, blue
L805	24-11030D01	inductor, red
L806	24-83977B01	ferrite choke
L807	24-80277A17	airwound
L808, 809	24-83977B01	ferrite choke
L810	24-80135J06	air wound
L811	24-82835G32	.6 µH, choke blue/yellow/silver
L812	24-80036A02	ferrite choke, .5 turn
L813	24-84235B04	4.5 turns
L814	24-80036A02	ferrite choke, .5 turn
L815	24-80110B13	airwound
L816–818	24-80139G05	10 µH ±10%
L819	76-84069B01	ferrite bead
L890	24-80135J05	airwound
L891	24-80135J04	airwound
L892	24-80135J03	airwound
L893	24-80135J02	airwound
L894	24-80135J01	airwound
L975	24-80139G05	10 µH ±10%
L980	24-82549D03	1000 µH
L981, 982	24-80139G05	10 µH ±10%
		transistor (see note)
Q801	01-80701T17	transistor and insulator, type M9859
Q980	48-00869762	PNP, type 69762
		thermistor
RT801	06-83600K09	100k ±15%

HLB4094A PA Board — MXW-1712-O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		resistor, fixed, Ω ±5%, ¼ W unless otherwise stated
R801	06-11009C19	56
R802	01-80740T17	resistor and bead
R802	06-11009C39	390
R803, 804	06-00126B70	1.8, 1 W
R805	06-11045A01	10, ½ W
R806	06-00127C19	56 ±10%, 2 W
R807, 809	06-00126B63	5.6, 1 W
R810	17-82036G27	18, 2 W
R811	06-11009C41	470
R812	06-80037G11	2.7, ½ W
R813	17-80165C01	shunt
R814	06-11009A51	1.2k
R815	06-11009C49	1k
R970	06-11045A89	47k, ½ W
R971	17-82291B44	59 ±3%, 3 W
R972	06-11009C73	10k
R980, 981	06-11009A43	560
R982	06-11045A36	300, ½ W
		transformer
T801	24-80099B01	input transformer
T802	25-80229J02	output transformer
		mechanical parts
	26-80149J01	capacitor shield
	26-80287H01	harmonic filter PA shield
	26-80298H01	harmonic filter shield, 5 used
	29-80014A01	coax terminal clip, 2 used
W987–989	01-80739T09	jumper

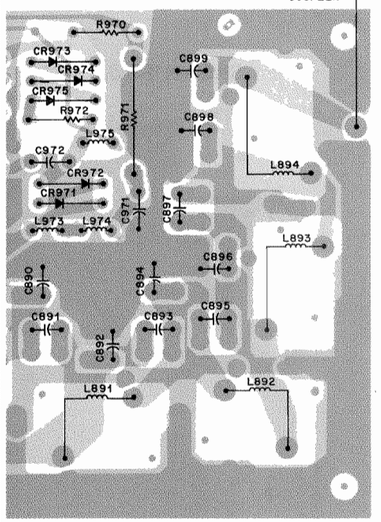
HLN4814A Power Amplifier Hardware — MXW-1717-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed, pF ±5%, 100V
C889	21-11014H41	47
		coil
L880–889	76-84069B04	ferrite core bead
L900	76-83466K01	ferrite core bead
		mechanical parts
	03-10911A11	machine screw (M3 × .5 × 8)
	02-00007003	hex nut (8-32 × 5/16 × 1/8)
	02-10971A63	hex nut (M3.5 × .6), 2 used
	02-80006A01	spanner nut
	03-10911A11	machine screw (M3 × 0.6 × 8), 3 used
	03-10943M16	machine screw (3.5 × .6 × 10)
	03-10943M15	machine screw (3.5 × .6 × 8), 5 used
	03-10943M17	machine screw (3.5 × .6 × 13)
	04-00114522	5/8" lockwasher
	04-82345A01	shoulder washer
	14-80103B01	exciter heatsink insulator
	26-80016B02	exciter heatsink
	29-00003023	solder lug
	26-80129K01	harmonic filter heatsink
	55-84300B04	handle
	01-80244H01	PA shield
	15-84763M01	chassis
	32-80080A01	antenna collector gasket
	32-80084A01	stud device gasket, 2 used
	43-80013B01	standoff

HKN4202A Interconnect Cable — MXW-2141-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	39-82717M01	receptacle contact
	42-35424B01	4" cable tie, 2 used
	15-84301K16	connector housing, 2-contact
	09-80053D01	connector housing, female
	09-80163D01	receptacle, 8 used

Schematics, Circuit Board Diagrams, and Parts Lists for Transmitter and Power Amplifier
PEW-1719-O
(Sheet 1 of 2)
8/28/85



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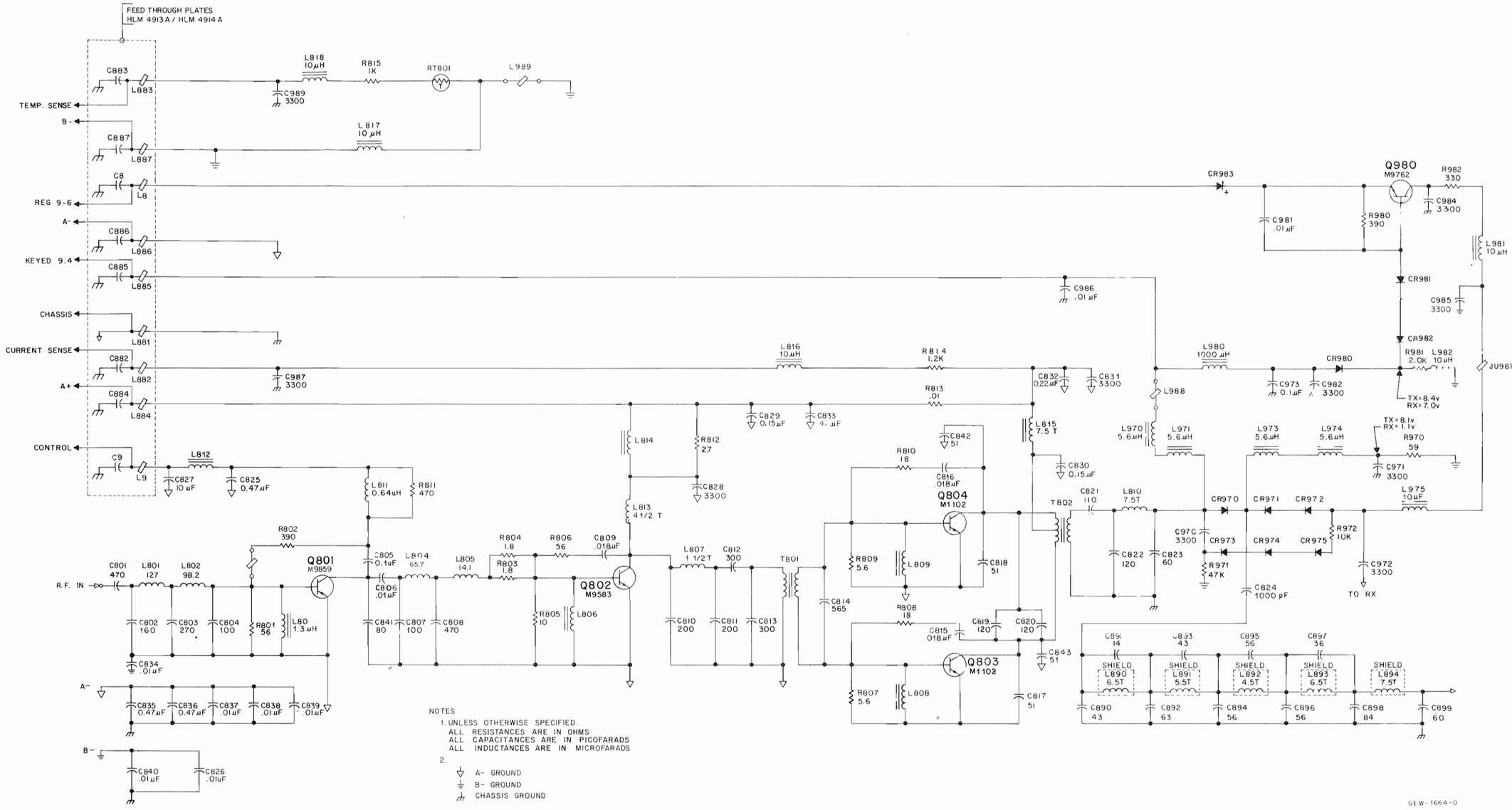
COMPONENT SIDE — GEW-1701-O
OVERLAY — GEW-1702-O



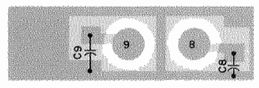
NOTES
1. UNLESS OTHERWISE SPECIFIED.
ALL RESISTANCES ARE IN OHMS
ALL CAPACITANCES ARE IN PICOFARADS
ALL INDUCTANCES ARE IN MICROFARADS
2.
A- GROUND
B- GROUND
CHASSIS GROUND

GEW-1664-O

W-1713-O

2-PIN PA FEEDTHRU

SHOWN FROM SOLDER SIDE



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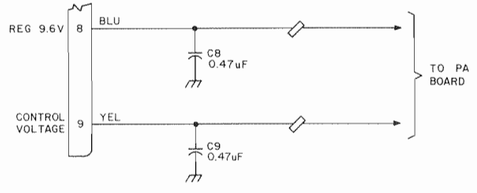
COMPONENT SIDE — GBW-1707-O
OVERLAY — GBW-1708-O



NOTE
INDICATES CHASSIS REFERENCE

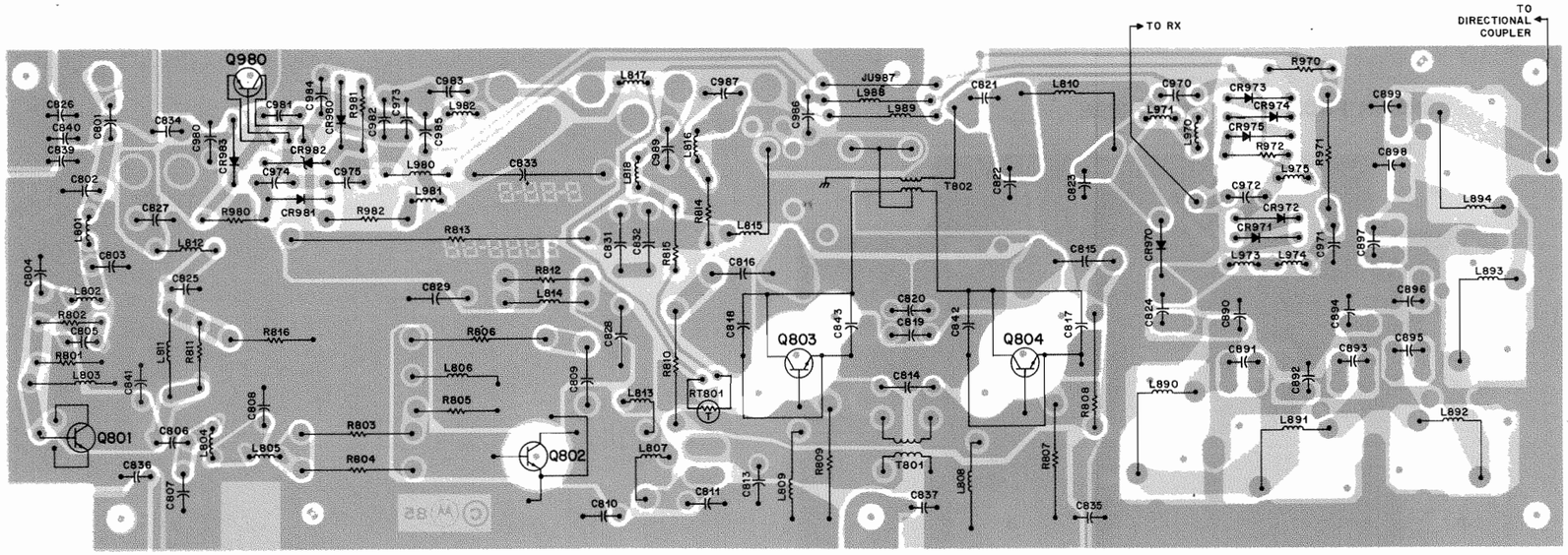
GBW-1722-O

parts list

HLN4914A Two-Pin Feedthrough Board — MXW-1714-O

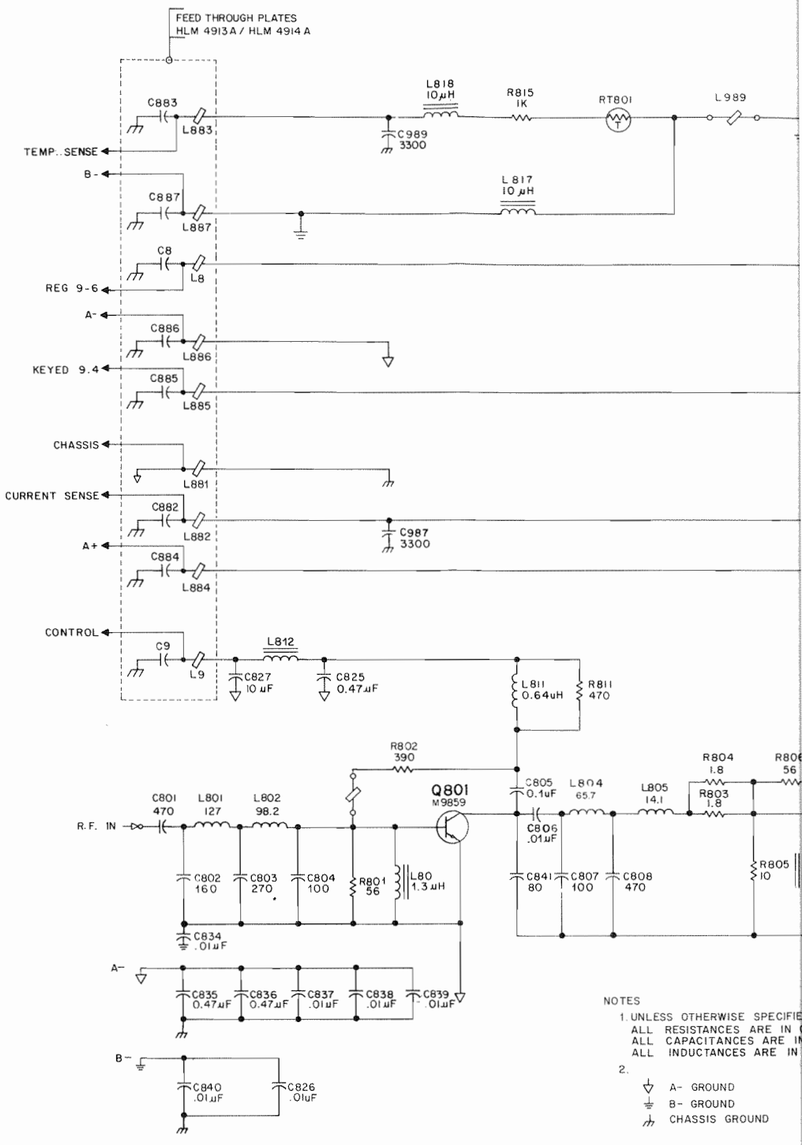
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed
C8, 9	21-60521D33	.047 µF ±10%, 25V
		coil
L8, 9	76-84069B04	ferrite bead
		connector
	28-80123J01	male, 2 used

PA BOARD



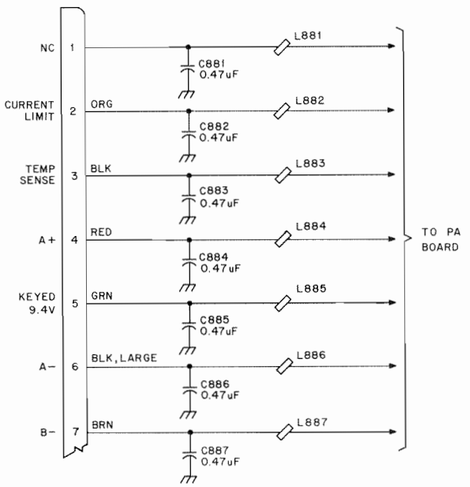
SHOWN FROM COMPONENT SIDE

SOLDER SIDE — GEW-1700-O
COMPONENT SIDE — GEW-1701-O
OVERLAY — GEW-1702-O



NOTES
1. UNLESS OTHERWISE SPECIFIE
ALL RESISTANCES ARE IN
ALL CAPACITANCES ARE IN
ALL INDUCTANCES ARE IN
2.
A- GROUND
B- GROUND
CHASSIS GROUND

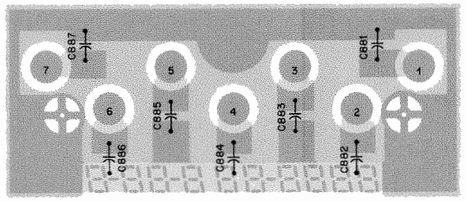
7-PIN PA FEEDTHRU



NOTE:
INDICATES CHASSIS REFERENCE

GCW-1721-O

SHOWN FROM SOLDER SIDE



SOLDER SIDE — GBW-1703-O
COMPONENT SIDE — GBW-1704-O
OVERLAY — GBW-1705-O

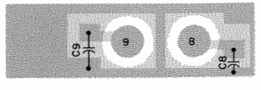
parts list

HLN4913A Seven-Pin Feedthrough Board — MXW-1713-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed
C882–887	21-84547A07	.047 μF ±20%, 100V
		coil
L881–887	76-84069B04	ferrite bead

2-PIN

SHOWN FROM SOLDER SIDE



SOLDER SIDE — GBW-1706-O
COMPONENT SIDE — GBW-1707-O
OVERLAY — GBW-1708-O

parts list

HLB4083A Transmit Buffer Board — MXW-1967-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed, pF ±5%, 50V unless otherwise stated
C1501	21-11031A36	75
C1502, 1503	21-11031A42	130
C1504–1509	21-11032B13	.10 µF +80, –20%
C1510	21-11031A19	15
C1511	21-11031A30	43
C1512, 1513	21-11022B13	.10 µF +80, –20%
C1514	23-11013C54	10 µF
C1515	21-11038A46	75
		diode (see note)
CR1501	48-80154K01	hot carrier
		coil
L1501	24-84411B03	brown
L1502	24-84411B01	white
L1503	24-80138G06	10 µH ±10%
L1504	24-83397L13	.82 µH, gray/red
L1505	24-82835G36	.57 µH, inductor
L1506	24-80138G06	10 µH ±10%
L1507	24-82723H11	.2 µH, brown/brown
		connector plug
P1500	09-80001F01	phono jack
P1501	09-84279D01	female connector
P1501	29-80146B01	terminal
P1502	28-82365D02	connector
P1503, 1504	29-80146B01	terminal
		transistor (see note)
Q1501	48-84939C31	NPN, type M3931
Q1502	48-80182D39	NPN, type M8239
Q1503	48-80214G01	PNP, type M1401
		resistor, fixed, Ω ±5%, ⅛ W unless otherwise stated
R1501	06-11024A01	10
R1502	06-11024A25	100
R1503	06-11024A01	10
R1504	06-11024A64	4.3k
R1505	06-11024A56	2k
R1506	06-11024A31	180
R1507	06-11024A09	22
R1508	06-11024A31	180
R1509	06-11024A56	2k
R1510	06-11024A45	680
R1511	06-11024A19	56
R1512	06-11024A49	1k
R1513	06-11024A64	4.3k
R1514	06-11024A45	680
R1515	06-11024A01	10
R1516	06-11024A45	680
R1517	06-11009C10	24
R1518	06-11009C19	56
		mechanical parts
	26-80121A01	IF shield, 2 used
	26-83595M01	shield detector, component side
	26-84243B03	shield
	26-80189H01	transmit buffer shield
	29-10134A89	terminal lug
	64-80191H02	transmitter buffer plate
	14-84277D25	connector housing

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number.

HLB4092A Directional Coupler Board — MXW-1715-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed, µF ±5%, 100V unless otherwise stated
C950	21-83596E36	.01 +60, –40%, 250V
C951	21-11015A07	.01 +80, –20%
C953	21-11014H19	5.6 pF ±.5 pF
C954–956	21-11015A07	.01 +80, –20%
C957, 958	08-11051A12	.068, 63V
		diode (see note)
CR950, 951	48-84616A01	hot carrier
		coil
L950–952	24-80139G05	10 µH
		resistor, fixed, Ω ±5%, ¼ W unless otherwise stated
R950	06-11009A25	100, ½ W
R951	06-11009E25	100
R952–955	06-11045A25	100, ½ W
		transformer
T950	25-80295H01	directional coupler

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number.

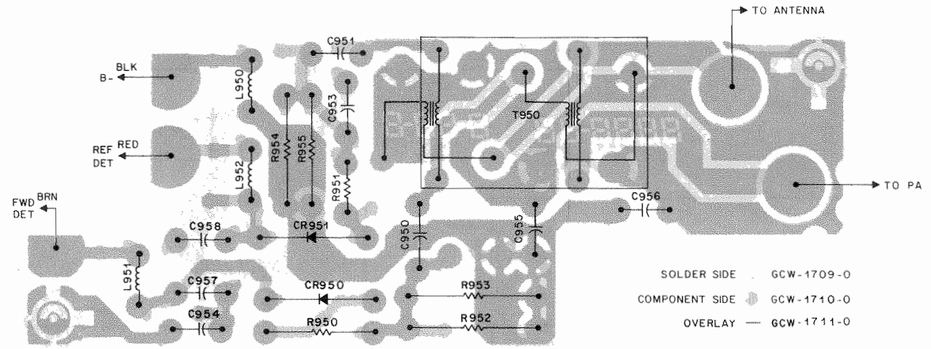
HLN4837A Directional Coupler Hardware — MXW-1716-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed
C961–963	21-82812H03	1000 pF +100, –0%, 500V
		connector receptacle
J970	09-84066C02	single pin, female
		coil
L983, 984	76-83466K01	ferrite core coil
		connector plug
P953	15-84301K19	3-contact connector housing
		non-referenced items
	03-10943M16	tapping screw (3.5 × .6 × 10), 2 used
	04-80003F02	insulator washer, 3 used
	05-00135247	eyelet (.152 × .187), 2 used
	42-35424B01	4" cable tie
	15-80107H01	directional coupler housing
	15-80108H01	directional coupler cover
	43-80294H02	PCB spacer, 2 used
	32-80284H01	directional coupler gasket
	39-82717M01	receptacle contact, 3 used
	42-10217A02	tie strap (.091 × 3.62), 3 used
	01-80723T89	interconnect cable
	01-80739T01	antenna connector cable

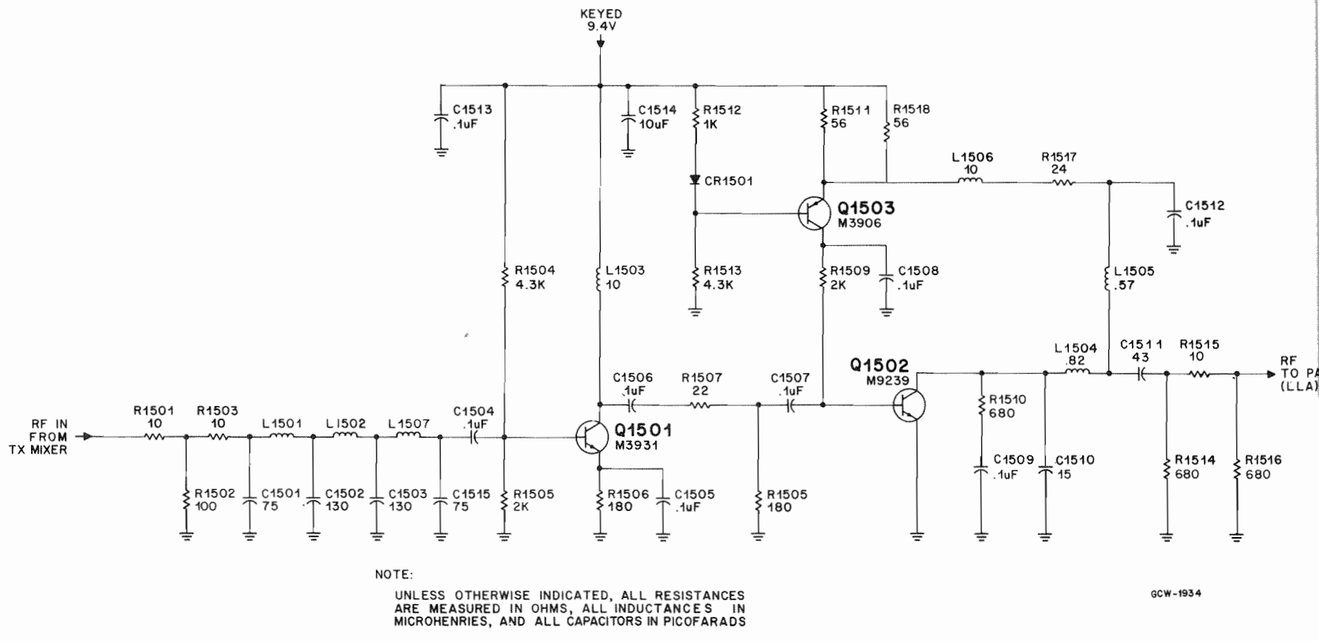
HLB4093A RF Power Transistors — MXW-1718-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed, pF ±5%, 500V unless otherwise stated
C817, 818	21-84494B01	51
C842, 843	21-84494B04	100
C888	21-11015B01	100 ±10%, 100V
		transistor (see note)
Q802	48-00869583	NPN, type M9583
Q803, 804	48-84411L02	NPN, type M1102
		resistor, fixed, Ω unless otherwise stated
R808	17-82036G27	18 ±5%, 2 W

DIRECTIONAL COUPLER



SHOWN FROM SOLDER SIDE



NOTE:

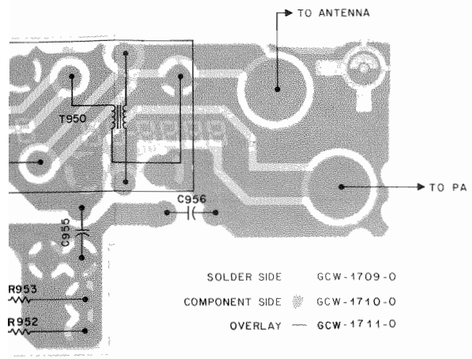
UNLESS OTHERWISE INDICATED, ALL RESISTANCES ARE MEASURED IN OHMS, ALL INDUCTANCES IN MICROHENRIES, AND ALL CAPACITORS IN PICOFARADS

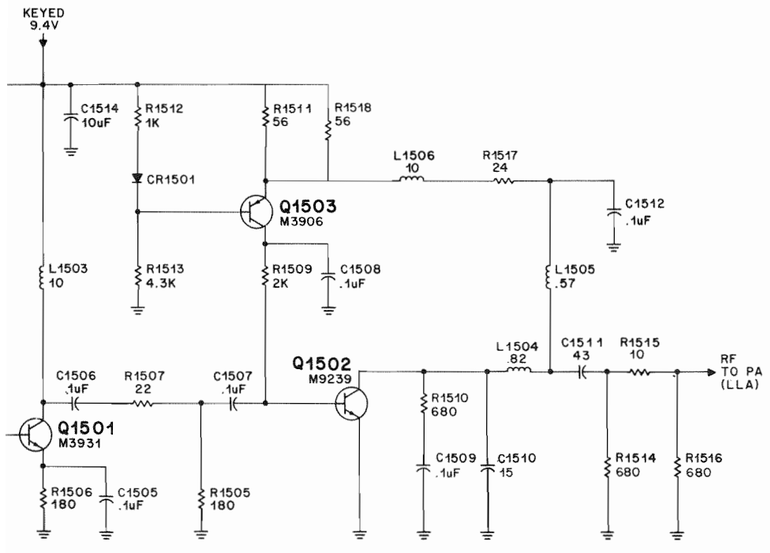
GCW-1934

RF OUT

Schematics, Circuit Board Diagrams, and Parts Lists for Transmitter and Power Amplifier
PEW-1719-O
(Sheet 2 of 2)
8/28/85

AL COUPLER



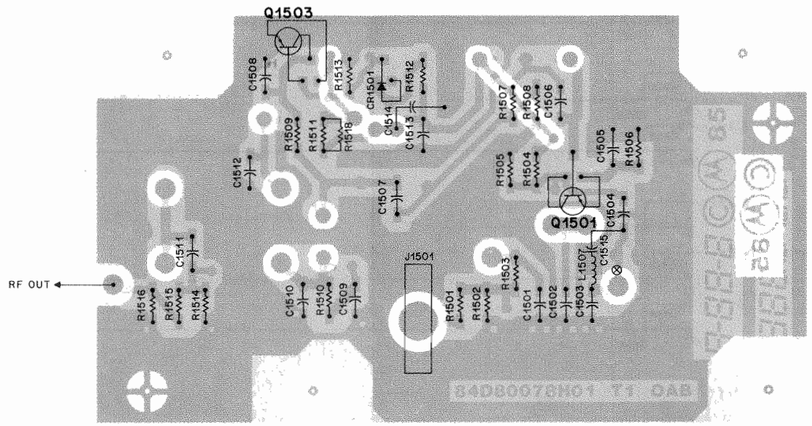


ICATED, ALL RESISTANCES
S, ALL INDUCTANCES IN
CAPACITORS IN PICOFARADS

GCW-1934

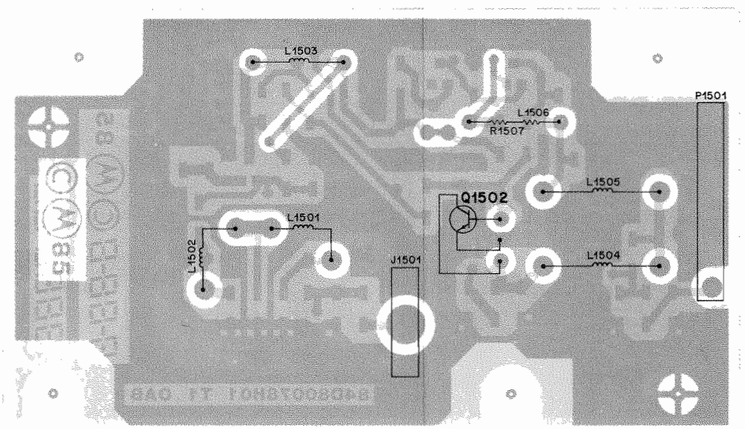
TRANSMIT BUFFER

SHOWN FROM SOLDER SIDE

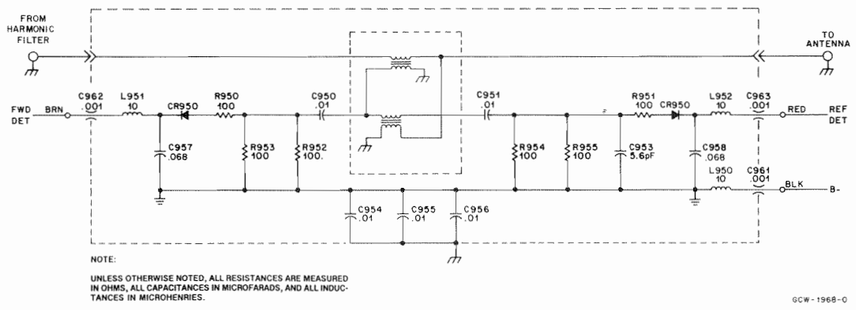


SOLDER SIDE GCW-1963-0
COMPONENT SIDE GCW-1964-0
OVERLAY — GCW-1965-0
⊗PLATING CUT SOLDER SIDE

SHOWN FROM COMPONENT SIDE



SOLDER SIDE GCW-1963-0
COMPONENT SIDE GCW-1964-0
OVERLAY — GCW-1966-0



NOTE:

UNLESS OTHERWISE NOTED, ALL RESISTANCES ARE MEASURED IN OHMS, ALL CAPACITANCES IN MICROFARADS, AND ALL INDUCTANCES IN MICROHENRIES.

GCW-1968-0