

MAINTENANCE MANUAL

800 MHz POWER AMPLIFIER BOARD

19C851822G1

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DESCRIPTION

Power Amplifier Board 19C851822G1 is used in the MDX, MTD, MVS, and TMX-8825 800 MHz mobile radios. This board is located under the top cover of the radio.

The PA Board amplifies the ten watt output of the RF Board to a level of approximately thirty watts over frequency ranges of 806-825 MHz and 851-866 MHz without retuning the transmitter.

The thirty watt output is connected back to the RF Board where it is coupled through a PIN diode antenna switch, the low-pass filter, and the directional coupler to provide twenty-five watts power output at the antenna connector.

Refer to the applicable Combination Manual for the Interconnection Diagram and mechanical layout of this board.

CIRCUIT ANALYSIS

Power Amplifier

The PA Board consists of a single stage RF power amplifier in a common base configuration. Also included on the board is a diode for reverse power protection. Two small jacks are used to connect approximately ten watts of drive to

the PA Board and to take the thirty watt output from the final amplifier.

A+ power is supplied to six pin connector J903 through feedthru capacitor assembly A903. Diode D151 provides reverse polarity protection. If the A+ power polarity is accidentally reversed, D151 conducts, causing the A+ fuse in the power cable to blow, removing power from the radio and preventing serious damage.

A+ is supplied to the collector of power transistor Q151 through a network consisting of inductors L155 and L156, resistor R151 and capacitors C158, C159, and C160. In addition to enhancing stability, these components also prevent RF from getting onto the A+ line.

The driver output from the RF Board (10 watts and 50 ohms impedance) is matched to the emitter of Q151 by capacitors C151, C152, C153, and C161 and inductors L151 and L153. Inductor L152 provides a DC return for class "C" operations.

Once the drive is amplified to approximately thirty watts by Q151, the transistor is matched back up to 50 ohms by capacitors C154, C155, C156, and C162, and inductors L154 and L157. Capacitor C157 is a DC blocking capacitor to prevent DC voltage from appearing on the amplifier output. The amplified signal is coupled through a coaxial cable to the RF Board that contains the transmitter filter, antenna switch, and power leveling circuitry.

Other non-amplifier related signals are routed through the PA Board for distribution to other boards in the radio. These include **A+**, **SWITCHED A+**, **RELAY** and **VOL/SQ HI**. A wiring harness plugs into connector J151 for this purpose.

SERVICE NOTES

The PA Board is easily checked without removing it from the radio. RF input (J153) and output (J152) impedances are 50 ohms.

Remove all power from the radio when servicing the PA Board. The power switch for the radio does not remove A+ power from the PA Board.

There are nine chip mica capacitors on the PA Board. Four of these chips (C152, C153, C161, and C162) are on the transistor leads (Q151). If any are removed, replace them with a new part since they are easily damaged. Place them in the exact positions shown in the outline diagram.

WARNING

The transistor (Q151) contains Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken, or abraded, the escaping dust may be hazardous if inhaled. Use care when replacing the transistor.

Failure to do this reduces amplifier gain, bandwidth, and efficiency. C154 and C155 are vertically mounted, uncased mica capacitors. They must mount against Q151.

PA TRANSISTOR REPLACEMENT

1. Remove the two retaining screws securing PA transistor Q151 to the chassis assembly.
2. Remove and discard the four mica chip capacitors on the transistor leads (C152, C153, C161, and C162). The capacitors are virtually impossible to remove without damage. Remove and save uncased mica capacitors C154 and C155.
3. Unsolder the six leads of the transistor, and remove it from the printed board. Be careful not to damage the board.
4. Remove all excess solder from the board near Q151. Clean the board to allow the new transistor to be properly positioned. Refer to Figure 1 and trim the new transistor leads (if required) to the lead lengths of the removed transistor.
5. Apply silicone grease to the back of the replacement transistor and place the transistor in the mounting cut-out. Make sure that the emitter and collector leads are not reversed.
6. Replace the transistor mounting screws using a moderate torque of 0.5 Newton-meter (4.5 inch-pounds).
7. Solder the six transistor leads to the printed board.
8. Re-install C154 and C155. Install the new replacement capacitors C152, C153, C161, and C162 in the exact positions shown on the outline diagram. Solder carefully to prevent damaging them. NOTE: Capacitors C161 and C162 mount against C152 and C155 respectively.
9. Remove any remaining flux from the board.

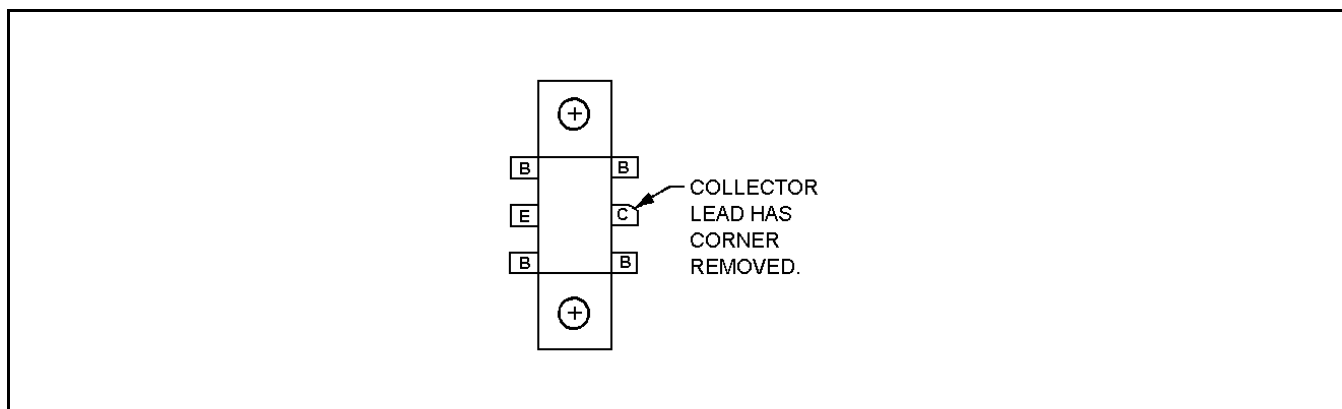
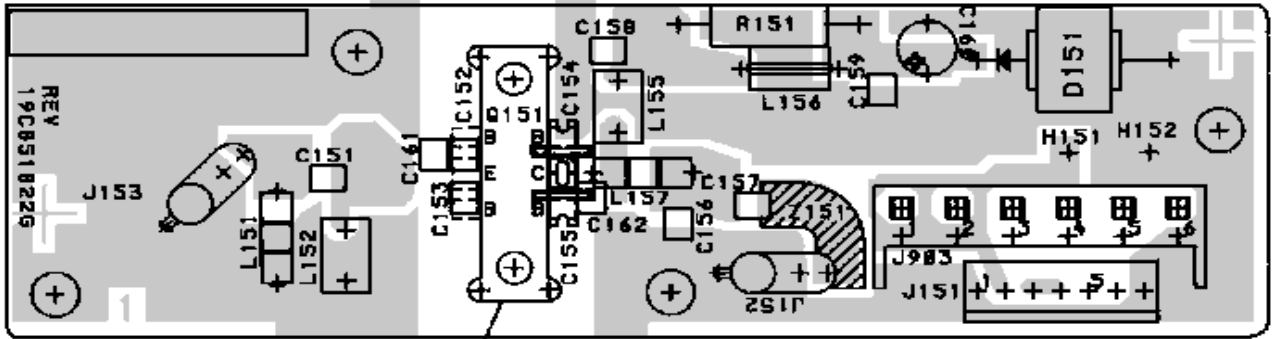


Figure 1 - PA Transistor Lead Identification

COMPONENT SIDE

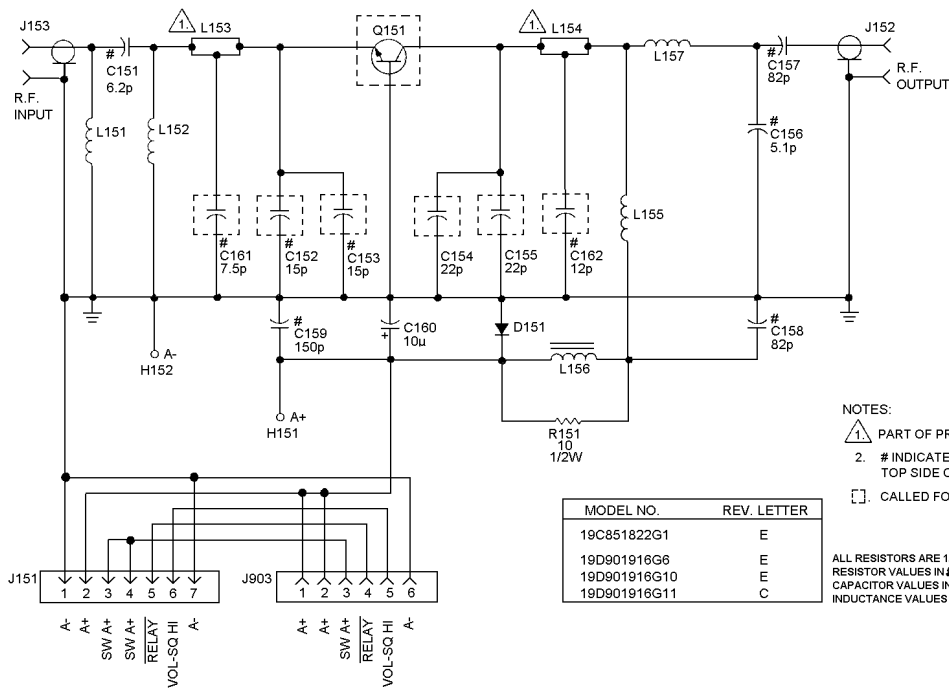


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C152, C153, C154, C155, C161,
C142 & Q151 ARE SHOWN FOR
REFERENCE ONLY, ASSEMBLED
AT NEXT HIGHER ASSEMBLY.

(19C851822, Rev. 3)
(19C851821, Rev. 2)

POWER AMPLIFIER BOARD



- NOTES:
- 1. PART OF PRINTED WIRE BOARD.
 - 2. # INDICATES CHIP COMPONENT LOCATED ON TOP SIDE OF BOARD.
 - CALLED FOR ON NEXT HIGHER ASM, 19D901916.

MODEL NO.	REV. LETTER
19C851822G1	E
19D901916G6	E
19D901916G10	E
19D901916G11	C

ALL RESISTORS ARE 1/8 WATT UNLESS OTHERWISE SPECIFIED.
 RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER K OR M.
 CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER μ , n OR p.
 INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR μ .

POWER AMPLIFIER BOARD

(19C851818, Sh. 1, Rev. 5)

**POWER AMPLIFIER BOARD
19C851822G1**

SYMBOL	PART NUMBER	DESCRIPTION
		----- CAPACITORS -----
C151	19A705108P8	Mica: 6.2 pF \pm .25 pF, 500 VDCW.
C152 and C153	19A705108P17	Mica: 15 pF \pm 5%, 500 VDCW.
C154 and C155	19A701413P45	Mica: 22 pF \pm 5%, 100 VDCW.
C156	19A705108P6	Mica: 5.1 pF \pm .25 pF, 500 VDCW.
C157 and C158	19A705108P35	Mica: 82 pF \pm 5%, 500 VDCW, temp coef 0 +50PPM/ $^{\circ}$ C.
C159	19A705108P80	Mica Chip: 150 pF \pm 5%, 100 VDCW, temp coef 0 + 50 PPM/ $^{\circ}$ C.
C160	19A703314P10	Electrolytic: 10 μ F -10+50%, 50 VDCW; sim to Panasonic LS Series.
C161	19A705108P10	Mica: 7.5 pF \pm .25 pF, 500 VDCW.
C162*	19A705108P15	Mica Chip: 12 pF \pm 5%, 500 VDCW, temp coef. 0 + 100 PPM/ $^{\circ}$ C.
		----- DIODES -----
D151	19A700082P1	Rectifier, silicon; sim to MR751.
		----- JACKS -----
J151	19A700072P33	Printed wire: 7 contacts rated @ 2.5 amps; sim to Molex 22-27-2071.
J152 and J153	19B801342P1	Connector, RF.
J903	19A705245P1	Printed wire: 6 contacts, sim to Molex10-02-1062.
		----- INDUCTORS -----
L151	19A701006P3	Strap.
L152	19B800891P4	Coil, RF Choke: sim to Paul Smith SK-890-1.
L153 and L154		Part of Printed Wiring Board 19C851821P1.
L155	19B800890P7	Coil, RF: 15.8 nH \pm 5%; sim to Paul Smith SK-891-1.
L156	19A701091G1	Coil.
L157	19A701006P12	Strap.
		----- TRANSISTORS -----
Q151	19A143471P1	Silicon, NPN.
		----- RESISTORS -----
R151	19A700113P15	Composition: 10 ohms \pm 5%, 1/2 w.
		----- FILTER -----
Z151		Part of Printed Wiring Board 19C851821P1.
		----- MISCELLANEOUS -----
2	19A700125P10	Wire Magnet, Plastic Coated.
3	19A700122P1	Torroidal core.

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped in the unit includes all previous revisions. Refer to the Parts List for the descriptions of parts affected by these revisions.

REV. C - POWER AMPLIFIER BOARD 19C851822G1

To improve PA reliability, changed C154 and C155.
C154 and C155 were: 19A705108P21
Mica: 22 pF
 \pm 5%, 500 VDCW.

REV. D - POWER AMPLIFIER BOARD 19C851822G1

Improved thermal capacity to increase transmit current
C151 and C161 were: 19A705108P9
Mica: 6.8 pF
 \pm .25 pF 500 VDCW.

REV. E - POWER AMPLIFIER BOARD 19C851822G1

Improve radio efficiency by reducing current during transmit mode.
C162 was: 19A705108P14
Mica: 11pF.

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*COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

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