



*LBI-38776B*

*Mobile Communications*

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**TALK-AROUND KIT  
OPTION DXTA1A/PMTA1B**

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**Installation Manual**

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## INTRODUCTION

*This manual contains installation instructions and maintenance information for Talk-Around Kit used in the MDR Mobile Radio. These instructions cover the mounting and cabling of this kit within the radio; assembly, interconnection, outline and schematic diagrams are provided at the back of the manual for reference. Installation of this kit involves the replacement of the Duplexer Interface Board, originally installed in the MDR, with Talk-Around Board 19D903507G1 or G7. Before mobile installation, the radio should be programmed using an IBM compatible personal computer and the following items:*

<i>Serial Programming Interface Module Kit</i>	<i>TQ3370</i>
<i>Programming Cable</i>	<i>TQ3361 or TQ3371</i>
<i>MDR Programming Software</i>	<i>TQ3355 or TQ3373</i>

*Refer to Programming Manual TQ3355 or TQ3373 for programming instructions.*

### CAUTION

*Never program the MDR Mobile Radio for talk-around frequencies unless the Talk-Around Kit is properly installed! Operation on talk-around frequencies without the Talk-Around Board installed will damage the radio!*

## UNPACKING AND CHECKING EQUIPMENT

*When ready for installation, carefully unpack the kit contents and identify each item listed below. If damage has occurred to the equipment during shipment, file a claim with the carrier immediately.*

- |  |                          |
|--|--------------------------|
| <input type="checkbox"/> <i>Talk-Around Board</i>                  | <i>19D903507G1 or G2</i> |
| <input type="checkbox"/> <i>Interconnection cables W25 and W26</i> | <i>19B801454P33</i>      |
| <input type="checkbox"/> <i>Installation Manual</i>                | <i>LBI-38776</i>         |

## INSTALLATION

*Install the talk-around kit using the steps shown below. These steps describe the proper installation of the Talk-Around Board and the necessary power readjustment to the radio. Reference the assembly, interconnection, outline and schematic diagrams at the back of the manual as needed during the installation.*

- 1. *Remove the top and bottom covers of the radio using the following procedures:*

### **Top Cover**

- *Insert a small flat blade screwdriver under one side of the cover and gently pry it away from the radio casting to release the side locking tab.*
- *Press in on the locking tabs at the rear of the cover using the screw driver which will release the rear edge of the cover.*
- *Insert the screwdriver under the other side of the cover to release the remaining locking tab and lift the cover from the casting.*

### **Bottom Cover**

- *Remove the two screws securing the bottom cover to the radio and lift the cover from the casting.*

- 2. *Locate the Duplexer Interface Board. With the radio top side facing up, front panel towards the installer and heat sink fins pointing away, the Duplexer Interface Board will be on the right side of radio casting. The RF Board (component side) will be visible in the left center and left rear compartments of the casting. The Audio Board will be visible in the left front compartment of the casting. The duplexer is mounted to a support plate on the underside of the radio. The System Board is accessed from the radio bottom and is beneath the Duplexer Interface Board.*
- 3. *Disconnect all of the cable plugs from the Duplexer Interface Board jacks as follows: P1 of W1 from J6 (external antenna cable connection), P6 of W24 from J7 (connection from the duplexer antenna port), and P5 of W21 from J5*

and P151 of W6 from J151 (connections from the RF Board).

- ❑ 4. *Disconnect the indicated cable plugs from the RF Board jacks as follows: P401 of W22 from J401 (connection from the duplexer receive port to the RX IN line on the RF Board) and P103 of W23 from J103 (connection from the duplexer transmit port to the PA OUT line on the RF Board).*
- ❑ 5. *Remove the four M3.5-0.6 TORX screws (#15 drive) securing the Duplexer Interface Board to the casting. Carefully work the board out of the radio, unplugging it from the feedthrough assembly Z903. Feedthrough assembly Z903 interconnects J903 on the Duplexer Interface Board with J903 on the System Board.*
- ❑ 6. *Install the Talk-Around Board component side up in the compartment vacated by the Duplexer Interface Board. Match the holes in the board with those in the radio casting, reconnect the feedthrough assembly Z903 and secure the board in place using the same four TORX screws that were removed in the previous step. Make sure that the grounding tab on the bottom of the Talk-Around Board makes contact with the bottom surface of the casting compartment.*
- ❑ 7. *Connect plug P1 of external antenna cable W1 to J6 on the Talk-Around Board.*
- ❑ 8. *Connect plug P6 of duplexer antenna port cable W24 to J7 on the Talk-Around Board.*
- ❑ 9. *Connect plug P401 of duplexer receive port cable W22 to J3 on the Talk-Around Board.*
- ❑ 10. *Connect plug P103 of duplexer transmit port cable W23 to J4 on the Talk-Around Board.*
- ❑ 11. *Re-route the extra receive (W22) and transmit (W23) cable lengths to the underside of the radio and run these cables around the duplexer to take up any slack.*
- ❑ 12. *Connect either one of the interconnection cables included with the Talk-Around Kit between J2 on the Talk-Around Board and J103 on the RF Board (PA OUT).*

- ❑ 13. Connect the second interconnection cable included with the Talk-Around Kit between J1 on the Talk-Around Board and J401 on the RF Board (RX IN).
- ❑ 14. Connect plug P5 of cable W21 to J5 on the Talk-Around Board (connections from the RF Board).
- ❑ 15. Connect plug P151 of cable W6 to J151 on the Talk-Around Board (connections from the RF Board).
- ❑ 16. Arrange the cables so the cover will fit back on the top of the radio without any pinching or binding.
- ❑ 17. Reset the transmitter output power to the correct level using the following procedure:
  - Place the radio in test mode while on channel 649.
  - Use an accurate and calibrated 800 MHz wattmeter or power meter with necessary attenuators to reset the transmitter output power to 11.00 watts. This is done by keying the transmitter (**FCN 01**) and adjusting R111 in the power control circuit. R111 is located on the component side of the RF Board and is shown below in figure 1. This value ensures that the radio will meet the rated power specification of 10.00 watts across the entire transmit range.

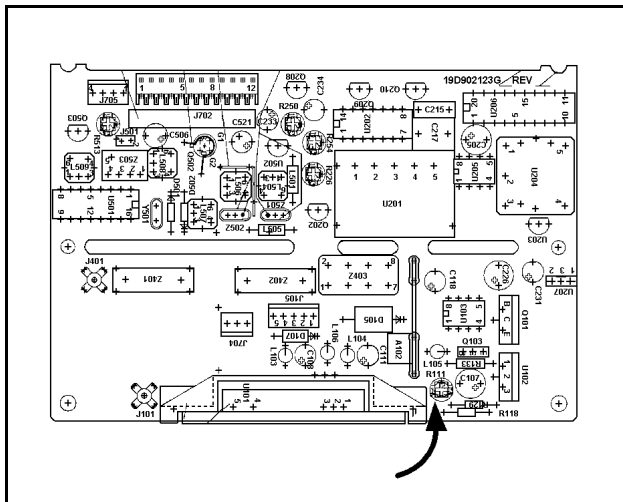


Figure 1 - Location of R111 on the RF Board

### CAUTION

*Do not exceed the value of 11.00 watts for the transmitter output power! The radio may be capable of more power but a value greater than 11.00 watts will overheat the power amplifier in full duplex mode. This undue stress could lead to possible failure of the power amplifier!*

- *Place the radio in talk-around mode (FCN 2 1).*
  - *Select channel 4400 (center of talk-around band).*
  - *Key the transmitter (FCN 0 1) and verify that at least 8.00 watts of transmitter power is emitted in the talk-around band using the same wattmeter from above.*
18. *Replace the top and bottom covers of the radio.*
19. *Verify proper operation of the radio by testing the receiver sensitivity in duplex test mode and recheck the power output.*

Table 1 - Interconnection Summary

<b>FROM:</b>	<b>(STANDARD) TO:</b>	<b>(TALK-AROUND) TO:</b>
<i>External antenna cable (P1 of W1)</i>	<i>Duplexer Int. Board TO ANTENNA (J6)</i>	<i>Talk-Around Board TO ANTENNA (J6)</i>
<i>Duplexer antenna port (J10)</i>	<i>Duplexer Int. Board DUPLEXER ANT (J7)</i>	<i>Talk-Around Board DUPLEXER ANT (J7)</i>
<i>Duplexer RX port (J11)</i>	<i>RF Board RX IN (J401)</i>	<i>Talk-Around Board (J3)</i>
<i>Duplexer TX port (J12)</i>	<i>RF Board PA OUT (J103)</i>	<i>Talk-Around Board (J4)</i>
<i>RF Board PA OUT (J103)</i>	<i>Duplexer TX port (J12)</i>	<i>Talk-Around Board (J2)</i>
<i>RF Board RX IN (J401)</i>	<i>Duplexer RX port (J11)</i>	<i>Talk-Around Board (J1)</i>
<i>RF Board (J105)</i>	<i>Duplexer Int. Board (J5)</i>	<i>Talk-Around Board (J5)</i>
<i>RF Board (J704 &amp; J705)</i>	<i>Duplexer Int. Board (J151)</i>	<i>Talk-Around Board (J151)</i>
<i>System Board (J903 via Z903)</i>	<i>Duplexer Int. Board (J903)</i>	<i>Talk-Around Board (J903)</i>



## DESCRIPTION

*The transmit half of the duplexer used in the MDR Mobile Radio does not allow for signal transmission in the receive or talk-around portion of the 800 MHz band. Talk-Around Board 19D903507G1/2 permits talk-around operation by switching the transmit (TX) half of the duplexer out of the transmit path while the radio is in the talk-around mode. RF relays perform this switching operation and route the transmit signal through the receive (RX) half of the duplexer. The RX half of the duplexer passes and filters the transmitter power. The relays and associated PIN diode activate only when the transmitter is keyed in the talk-around mode. At all other times, including receive, repeater, and trunked operation the switching circuits are inactive and pass transmit power directly to the TX half of the duplexer while passing receive signals from the duplexer to the input of the receiver.*

## CIRCUIT ANALYSIS

### POWER DISTRIBUTION

*A+ power is supplied to the board via the six pin Molex connector J903 and the feedthrough capacitor assembly bolted to the casting. Diode D3 provides reverse polarity protection. If the A+ power polarity is accidentally reversed, D3 will conduct causing the A+ fuse located in the power cable to blow which prevents serious damage to the radio. Capacitors C11 and C10 filter the A+ supply bus of the radio. Connector J151 distributes the DC power to the RF board through the power harness.*

### RF POWER DETECTOR

*A microstrip directional coupler is used to sample the RF output of the duplexer just before the antenna connector. The DC voltage developed from this sampling is sent to the power control circuit located on the RF board. By sampling the RF power just before the antenna connector, the power control loop encloses the duplexer within the loop and thereby eliminates fluctuations in RF power. These fluctuations are caused by the ripple in the bandpass response of the duplexer as well as gain ripple in the power amplifier module both as a function of frequency.*

*The coupler is made of two 50 ohm microstrip lines mounted very close to one another to induce coupling between the lines. The coupling is a directive process having about 15dB of directivity as well as 15dB of coupling.*

*Resistors R3, R4, and R5 comprise a 50 ohm pi type attenuator pad that matches one port of the coupler as well as attenuates the forward coupled power before it is fed to detector diode D4. The other coupled port is terminated in 50 ohms by the combination of R2 and R7. The main RF input to the coupler is J7 while the main output is J6.*

NOTE

Do not attempt to reverse the main input and output ports of the coupler as all power control will be lost in the radio! Operation of the radio in this mode will cause serious damage to the radio!

*Capacitor C5 acts as a DC block between D4 and the resistive attenuator. The DC voltage developed by D4 is feed through R6 to limit the current and then filtered and bypassed by C3 and C4 before exiting the board via J5.*

## **TALK-AROUND**

*Received signals passed by the duplexer are sent to relay K1 through J3. Except during talk-around transmit time, the signals at J3 are routed through the normally closed contacts of K1 and are delivered to J1. J1 connects to the receiver input on the main RF board.*

*Transmit signals from the PA are sent to K2 via J2. Except during talk-around transmit time, signals at J2 are routed through the normally closed contacts of K2 and are delivered to J4. J4 connects to the TX half of the duplexer.*

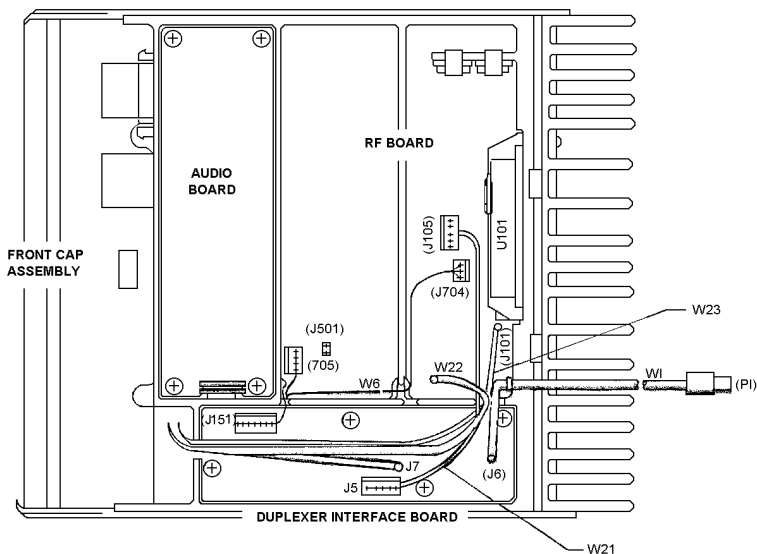
*During non-talk-around transmit time, no DC bias is applied to pin 3 of J5. With no DC bias, relays K1 and K2 and PIN diode D1 are not active and are in an off state.*

*When bias is applied during the transmit period of talk-around operation, K1 and K2 energize and reroute the transmitter output at J2 to the RX half of the duplexer through J3. The same bias that keys the relays also turns on PIN diode D1. D1 provides additional isolation between the two relays during non-talk-around transmit times.*

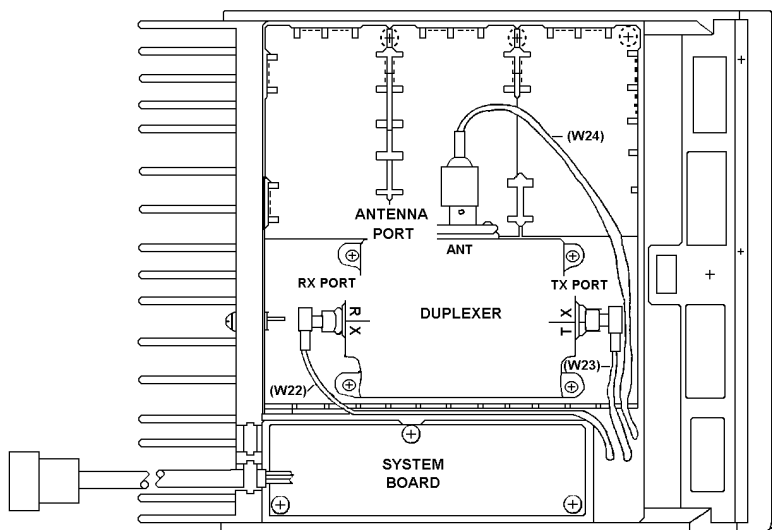
*Capacitors C1 and C2 bypass RF from the talk-around bias line. Resistor R1 limits the bias current on D1. Inductors L1 and L2 decouple the RF from the bias path of the PIN diode. Spike protection diode D2 clamps the negative voltage spikes of the relay coils.*

# ASSEMBLY DIAGRAM

## TOP VIEW (COVER REMOVED)



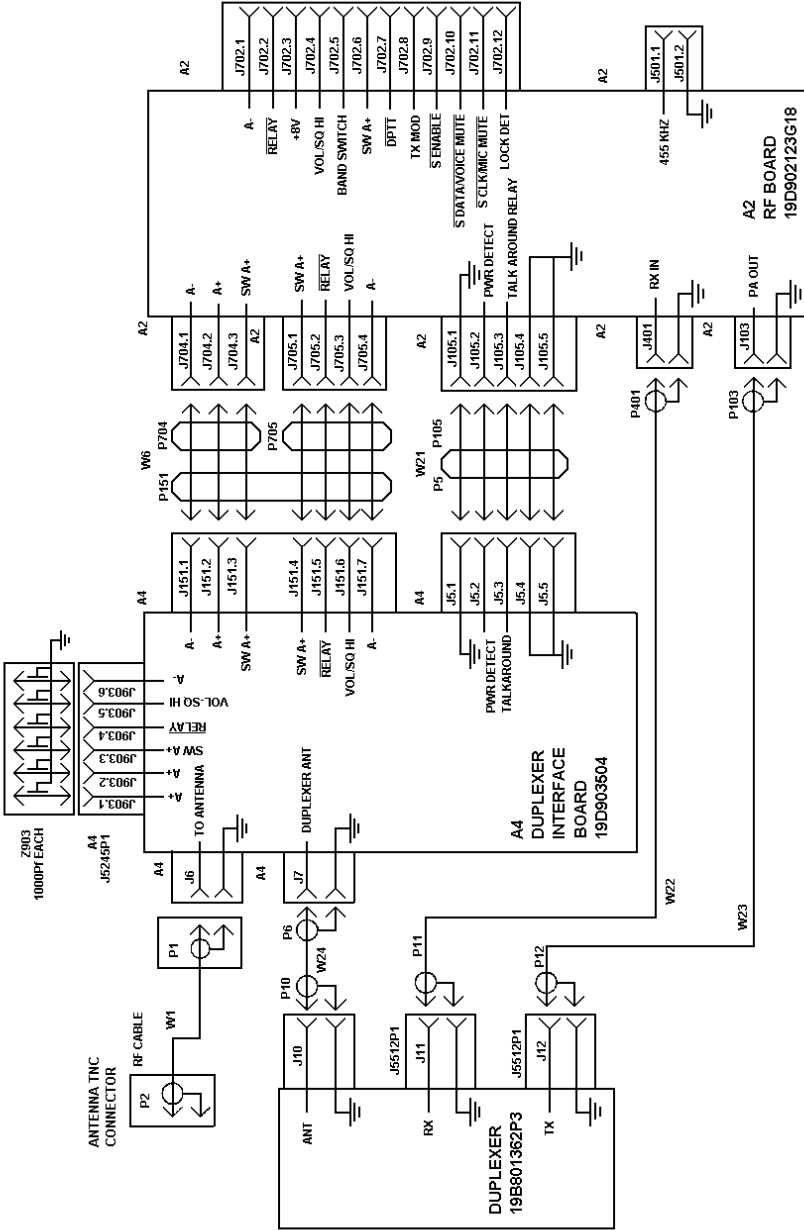
## BOTTOM VIEW (COVER REMOVED)



## REAR ASSEMBLY 19D901916G22

Made from (19D901916, Sh. 4, Rev. 0)

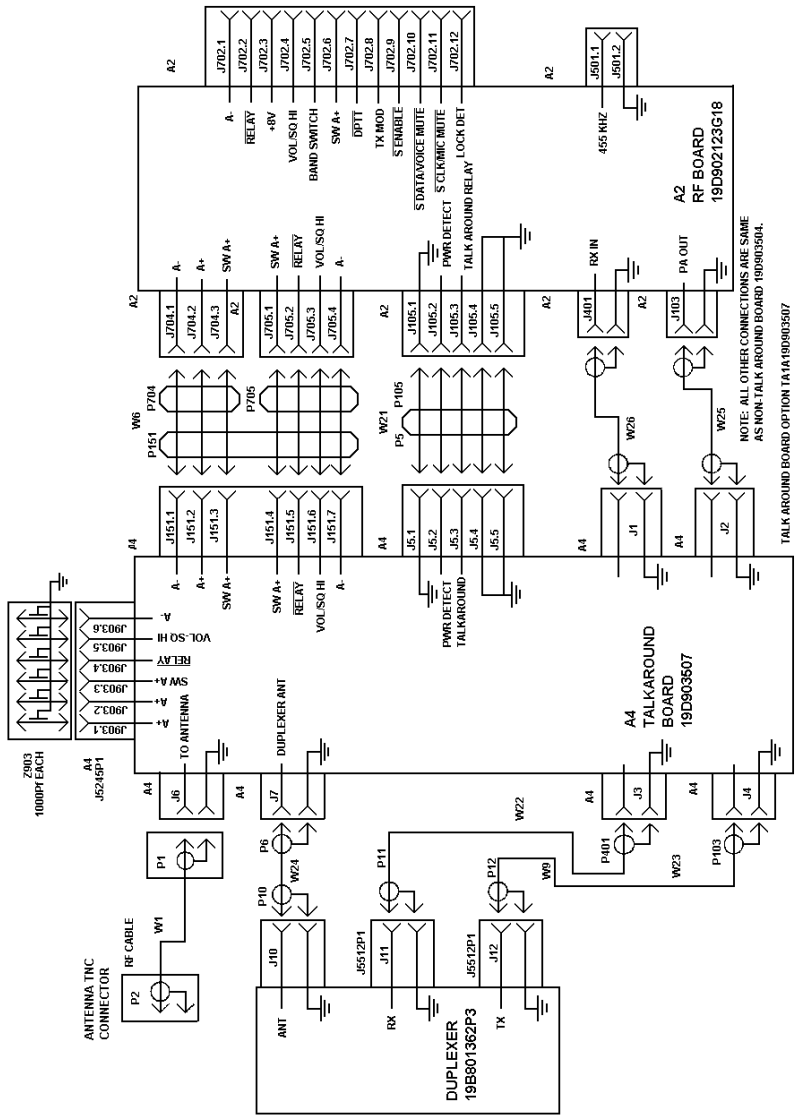
# INTERCONNECTION DIAGRAM



## MDR MOBILE RADIO (STANDARD)

Made from (19D903561, Sh. 2, Rev. 4)

# INTERCONNECTION DIAGRAM

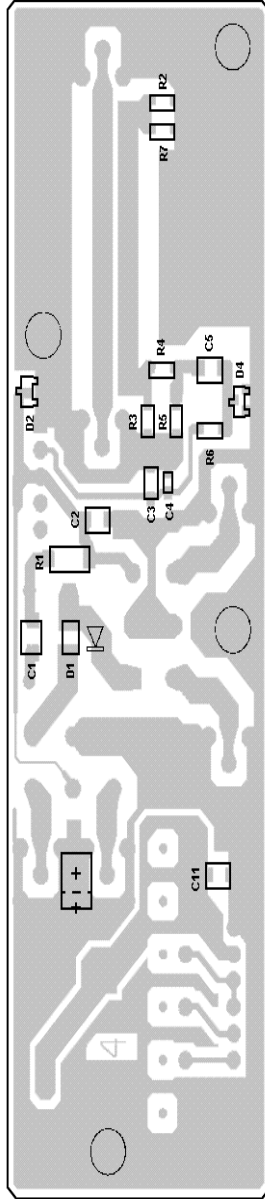
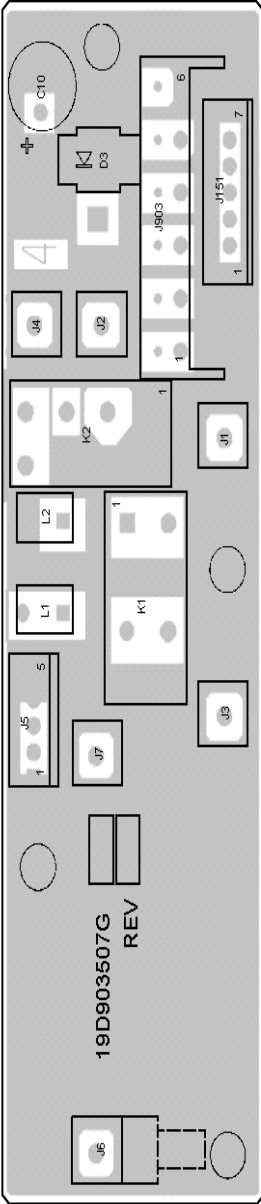


TALK AROUND BOARD OPTION TA1A 19D903567  
 NOTE: ALL OTHER CONNECTIONS ARE SAME  
 AS NON-TALK AROUND BOARD 19D903567.

## MDR MOBILE RADIO (TALK-AROUND)

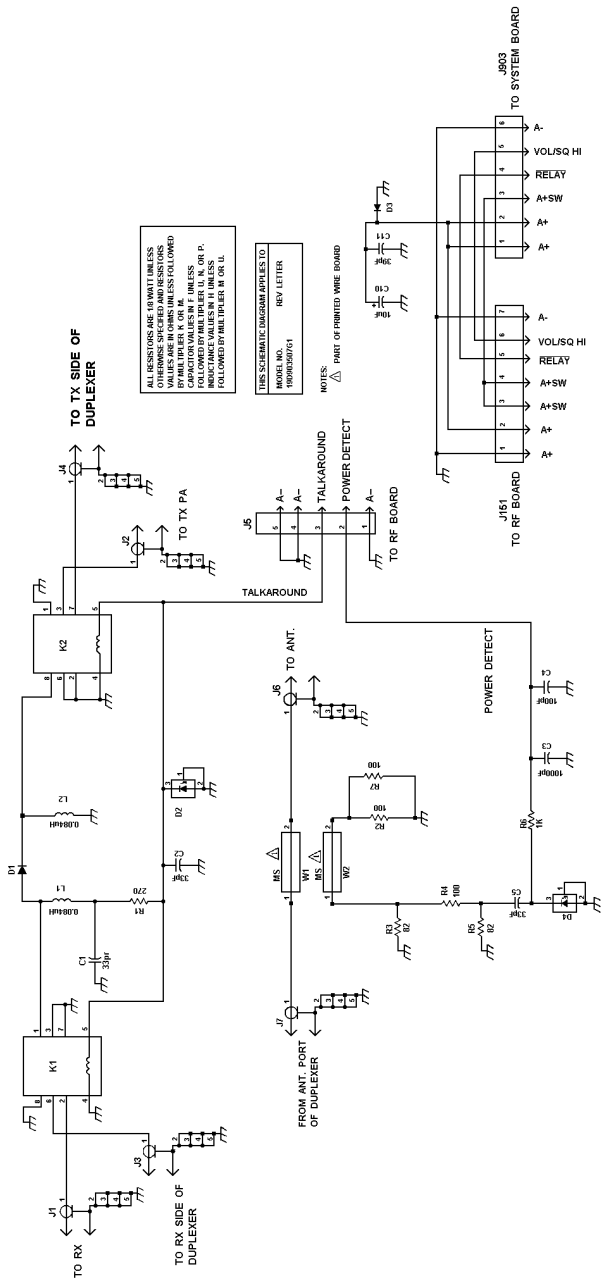
Made from (19D903561, Sh. 3, Rev. 4)

# OUTLINE DIAGRAM



## TALK-AROUND BOARD 19D903507G1 & G2

(19D903507 Rev. 5)



ALL RESISTORS ARE 10WATT UNLESS OTHERWISE SPECIFIED AND RESISTORS ARE 1% TOLERANCE UNLESS FOLLOWED BY MULTIPLIER M, OR K, CAPACITOR VALUES IN P. UNLESS OTHERWISE SPECIFIED ARE IN P. INDUCTANCE VALUES IN H, UNLESS FOLLOWED BY MULTIPLIER M, OR U.

THIS SCHEMATIC DIAGRAM APPLIES TO MODEL NO. 19D903507G1 REV. LETTER

NOTES:  $\Delta$  PART OF PRINTED WIRE BOARD

# TALK-AROUND BOARD 19D903507G1&G2

(19D903506, Rev. 3)

# PARTS LIST

TALK-AROUND KIT

344A3803G1& G2

ISSUE 2

SYMBOL	PART NO.	DESCRIPTION
A4		TALK-AROUND BOARD 19D903507G1 & G2
		----- CAPACITORS -----
C1 and C2	19A705108P25	Mica Chip: 33 pF -5%, 500 VDCW, temp coef 0 + 50 PPM/°C.
C3	19A702061P99	Ceramic: 1000 pF -5%, 50 VDCW, temp coef 0 -30 PPM/°C.
C4	19A702236P50	Ceramic: 100 pF -5%, 50 VDCW, temp coef 0 -30 PPM/°C.
C5	19A705108P25	Mica Chip: 33 pF -5%, 500 VDCW, temp coef 0 + 50 PPM/°C.
C10	19A703314P10	Electrolytic: 10 uF -10+50%, 50 VDCW; sim to Panasonic LS Series.
C11	19A705108P27	Mica Chip: 39 pF -5%, 500 VDCW, temp coef 0 + 50 PPM/°C.
		----- DIODES -----
D1	344A3316P1	Silicon, PIN: sim to MA4P1250.
D2	19A702525P2	Silicon, PIN: sim to MMBV3401.
D3	19A700082P1	Rectifier, silicon; sim to MR751 (Group 1).
D4	19A705377P1	Silicon, Hot Carrier: sim to MMB0201.
		----- JACKS -----
J1 thru J4	19A705512P7	Connector, RF SMB Series: sim to Sealectro 51-351-0000-226.
J5	19A704852P31	Connector: 5 contacts; sim to Molex 22-29-2051.
J6	19A705512P6	Connector, RF SMB Series, Right Angle: sim to AMP 228435-1 (Group 2).
J7	19A705512P7	Connector, RF SMB Series: sim to Sealectro 51-351-0000-226 (Group 2).
J6 & J7	19A705512P7	Connector: RF SMB Series; sim to Sealectro 51-351-0000-226 (Group 1).
J151	19A700072P33	Printed wire: 7 contacts rated @ 2.5 amps; sim to Molex 22-27-2071.
J903	19A705245P1	Printed wire: 6 contacts, sim to Molex 10-02-1062.
		----- RELAYS -----
K1 and K2	19A700061P1	Hermetic sealed: 180 to 341 ohms coil res, 8-16.3 VDC; sim to GE 3SAV1760A2, CP Clare HFW-1201558, or Potter-Brumfield HCM6160.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



SYMBOL	PART NO.	DESCRIPTION
L1 and L2	19B800891P6	<p style="text-align: center;">----- INDUCTORS -----</p> Coil, RF: .084 uH; sim to Paul Smith SK-890-1.
R1	19B801486P271	Metal film: 270 ohm -5%, 100 VDCW.
R2	19A702931P101	Metal film: 100 ohms -1%, 200 VDCW, 1/8 w.
R3	19B800607P820	Metal film: 82 ohms -5%, 1/8 w.
R4	19B800607P101	Metal film: 100 ohms -5%, 1/8 w.
R5	19B800607P820	Metal film: 82 ohms -5%, 1/8 w.
R6	19B800607P102	Metal film: 1K ohms -5%, 1/8 w.
R7	19A702931P101	Metal film: 100 ohms -1%, 200 VDCW, 1/8 w.
W1 and W2		<p style="text-align: center;">----- CABLES -----</p> Part of printed wire board.
W25 and W26	19B801454P33	<p style="text-align: center;">----- CABLES -----</p> Cable.

## *NOTES*

## *NOTES*



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