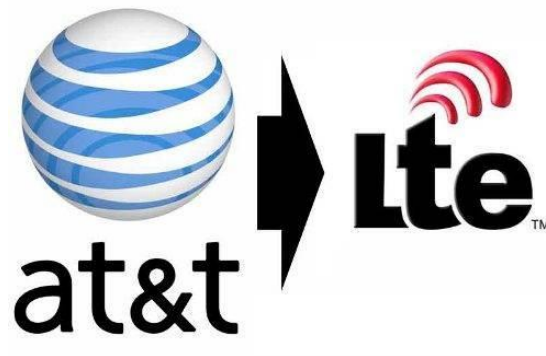


# Moto X Field Service Trouble Shooting Guide



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## 1.0 Revision History

Ver	Date	Author	Notes
1.0	07/23/2013	Suresh Sethuraman	Initial document created.
1.1	08/20/2013	Manjeet Bhalla	Updated missing blocks
1.2	10/02/2013	Manjeet Bhalla	Updated Table of Contents and filled in missing sections.

## 2.0 EE Hardware Profile Overview

	Moto X (XT1058)
Bands/modes	GSM 850/900/1800/1900, GPRS, WCDMA850/900/1900/2100, HSPA+(CAT14) CDMA 850/1900 + Diversity LTE band 13 + Diversity
RF	RTR8600(GSM/UMTS/LTE RX/TX function integrated) RTR8605(CDMA RX/TX function integrated)
	MMPA including WCDMA 850/2100 and Quad-band GSM PA Module WCDMA900 PA Module WCDMA1900 PA Module CDMA850 PA Module CDMA1900 PA Module LTE B13 PA module
Baseband Chipsets	MSM8960Pro (Baseband processor) PM8921 (power management) WCN9310 (Audio Codec)
Application Chipsets	MSM8960 (dual core 2, 1.5GHz application processor)
Memory (eMMC)	8GB eMMC
Memory (RAM)	2GB LPDDR2 SDRAM
Display	4.3" qHD 540*960 AMOLED
Camera	8 MP w/ flash (rear), VGA (front)
Bluetooth/WiFi	WCN3680
Connectivity	Micro USB
Other	3.5mm headset jack

EE Hardware Profile Overview

o RF Band Support

RF Technology	Band	BLOCK	CIRCUIT	Americas	TMO	Europe	Verizon	Sprint	USC		
GSM	850	RF - GSM	G850 Tx	1	1	1	1	1	1	ANTENNA 1	2G/3G MAIN
GSM	850	RF - GSM	G850 Rx	1	1	1	1	1	1	ANTENNA 2	4G MAIN
GSM	900	RF - GSM	G900 Tx	1	1	1	1	1	1	ANTENNA 3	3G/4G DIV
GSM	900	RF - GSM	G900 Rx	1	1	1	1	1	1	ANTENNA 4	B7 & GPS
GSM	1800	RF - GSM	G1800 Tx	1	1	1	1	1	1	ANTENNA 5	BT/WIFI
GSM	1800	RF - GSM	G1800 Rx	1	1	1	1	1	1		
GSM	1900	RF - GSM	G1900 Tx	1	1	1	1	1	1		
GSM	1900	RF - GSM	G1900 Rx	1	1	1	1	1	1		
CDMA	800	RF - CDMA	CDMA BC0 Tx	HWPPath	HWPPath	HWPPath	1	1	1		
CDMA	800	RF - CDMA	CDMA BC0 Rx	HWPPath	HWPPath	HWPPath	1	1	1		
CDMA	800	RF - CDMA	CDMA BC0 RxD	HWPPath	HWPPath	HWPPath	3	3	3		
CDMA	1900	RF - CDMA	CDMA BC1 Tx	HWPPath	HWPPath	HWPPath	1	1	1		
CDMA	1900	RF - CDMA	CDMA BC1 Rx	HWPPath	HWPPath	HWPPath	1	1	1		
CDMA	1900	RF - CDMA	CDMA BC1 RxD	HWPPath	HWPPath	HWPPath	3	3	3		
CDMA	Secondary 800	RF - CDMA	CDMA BC10 Tx	N/A	N/A	N/A	N/A	1	N/A		
CDMA	Secondary 800	RF - CDMA	CDMA BC10 Rx	N/A	N/A	N/A	N/A	1	N/A		
CDMA	Secondary 800	RF - CDMA	CDMA BC10 RxD	N/A	N/A	N/A	N/A	3	N/A		
LTE	2100	RF - LTE	LTE B1 Tx	HWPPath	HWPPath	1	HWPPath	HWPPath	HWPPath		
LTE	2100	RF - LTE	LTE B1 Rx	HWPPath	HWPPath	1	HWPPath	HWPPath	HWPPath		
LTE	2100	RF - LTE	LTE B1 RxD	HWPPath	HWPPath	3	HWPPath	HWPPath	HWPPath		
LTE	1900	RF - LTE	LTE B2 Tx	1	1	N/A	HWPPath	HWPPath	1		
LTE	1900	RF - LTE	LTE B2 Rx	1	1	N/A	HWPPath	HWPPath	1		
LTE	1900	RF - LTE	LTE B2 RxD	3	3	N/A	HWPPath	HWPPath	3		
LTE	1800	RF - LTE	LTE B3 Tx	N/A	N/A	1	N/A	N/A	N/A		
LTE	1800	RF - LTE	LTE B3 Rx	N/A	N/A	1	N/A	N/A	N/A		
LTE	1800	RF - LTE	LTE B3 RxD	N/A	N/A	3	N/A	N/A	N/A		
LTE	1700	RF - LTE	LTE B4 Tx	1	1	N/A	2	N/A	1		
LTE	1700	RF - LTE	LTE B4 Rx	1	1	N/A	1	N/A	1		
LTE	1700	RF - LTE	LTE B4 RxD	3	3	N/A	3	N/A	3		
LTE	850	RF - LTE	LTE B5 Tx	1	1	1	HWPPath	HWPPath	1		
LTE	850	RF - LTE	LTE B5 Rx	1	1	1	HWPPath	HWPPath	1		
LTE	850	RF - LTE	LTE B5 RxD	3	3	3	HWPPath	HWPPath	3		
LTE	2600	RF - LTE	LTE B7 Tx	2	HWPPath	2	N/A	N/A	2		
LTE	2600	RF - LTE	LTE B7 Rx	2	HWPPath	2	N/A	N/A	2		
LTE	2600	RF - LTE	LTE B7 RxD	4	HWPPath	4	N/A	N/A	4		
LTE	900	RF - LTE	LTE B8 Tx	HWPPath	HWPPath	1	HWPPath	HWPPath	HWPPath		
LTE	900	RF - LTE	LTE B8 Rx	HWPPath	HWPPath	1	HWPPath	HWPPath	HWPPath		
LTE	900	RF - LTE	LTE B8 RxD	HWPPath	HWPPath	3	HWPPath	HWPPath	HWPPath		
LTE	upper 700	RF - LTE	LTE B13 Tx	N/A	N/A	N/A	2	N/A	N/A		
LTE	upper 700	RF - LTE	LTE B13 Rx	N/A	N/A	N/A	2	N/A	N/A		
LTE	upper 700	RF - LTE	LTE B13 RxD	N/A	N/A	N/A	3	N/A	N/A		
LTE	lower 700	RF - LTE	LTE B12 Tx	N/A	N/A	N/A	N/A	N/A	N/A		
LTE	lower 700	RF - LTE	LTE B12 Rx	N/A	N/A	N/A	N/A	N/A	N/A		
LTE	lower 700	RF - LTE	LTE B12 RxD	N/A	N/A	N/A	N/A	N/A	N/A		
LTE	700	RF - LTE	LTE B17 Tx	2	2	N/A	N/A	N/A	2		
LTE	700	RF - LTE	LTE B17 Rx	2	2	N/A	N/A	N/A	2		
LTE	700	RF - LTE	LTE B17 RxD	3	3	N/A	N/A	N/A	3		
LTE	EU 800	RF - LTE	LTE B20 Tx	N/A	N/A	2	N/A	N/A	N/A		
LTE	EU 800	RF - LTE	LTE B20 Rx	N/A	N/A	2	N/A	N/A	N/A		
LTE	EU 800	RF - LTE	LTE B20 RxD	N/A	N/A	3	N/A	N/A	N/A		
LTE		RF - LTE	LTE B25 Tx	N/A	N/A	N/A	N/A	2	N/A		
LTE		RF - LTE	LTE B25 Rx	N/A	N/A	N/A	N/A	2	N/A		
LTE		RF - LTE	LTE B25 RxD	N/A	N/A	N/A	N/A	3	N/A		

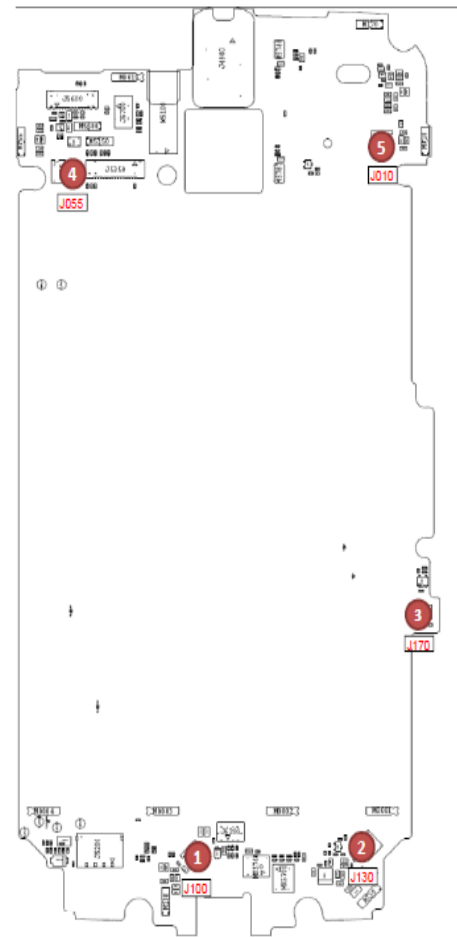
RF Technology	Band	BLOCK	CIRCUIT	Americas	TMO	Europe	Verizon	Sprint	USC		
WCDMA	2100	RF - WCDMA	WCDMA B1 Tx	1	1	1	1	1	1	ANTENNA 1	2G/3G MAIN
WCDMA	2100	RF - WCDMA	WCDMA B1 Rx	1	1	1	1	1	1	ANTENNA 2	4G MAIN
WCDMA	2100	RF - WCDMA	WCDMA B1 RxD	3	3	3	3	3	3	ANTENNA 3	3G/4G DIV
WCDMA	1900	RF - WCDMA	WCDMA B2 Tx	1	1	1	1	2	1	ANTENNA 4	B7 & GPS
WCDMA	1900	RF - WCDMA	WCDMA B2 Rx	1	1	1	1	2	1	ANTENNA 5	BT/WIFI
WCDMA	1900	RF - WCDMA	WCDMA B2 RxD	3	3	N/A	3	3	3		
WCDMA	1800	RF - WCDMA	WCDMA B3 Tx	N/A	N/A	1	N/A	N/A	N/A		
WCDMA	1800	RF - WCDMA	WCDMA B3 Rx	N/A	N/A	1	N/A	N/A	N/A		
WCDMA	1800	RF - WCDMA	WCDMA B3 RxD	N/A	N/A	3	N/A	N/A	N/A		
WCDMA	1700	RF - WCDMA	WCDMA B4 Tx	1	1	1	2	N/A	1		
WCDMA	1700	RF - WCDMA	WCDMA B4 Rx	1	1	3	1	N/A	1		
WCDMA	1700	RF - WCDMA	WCDMA B4 RxD	3	3	N/A	3	N/A	3		
WCDMA	850	RF - WCDMA	WCDMA B5 Tx	1	1	1	1	1	1		
WCDMA	850	RF - WCDMA	WCDMA B5 Rx	1	1	1	1	1	1		
WCDMA	850	RF - WCDMA	WCDMA B5 RxD	3	3	3	3	3	3		
WCDMA	900	RF - WCDMA	WCDMA B8 Tx	1	1	1	1	1	1		
WCDMA	900	RF - WCDMA	WCDMA B8 Rx	1	1	1	1	1	1		
WCDMA	900	RF - WCDMA	WCDMA B8 RxD	3	3	3	3	3	3		

### 3.0 Snapshots of Antennas

#### 1. ATT/Vow/Sprint/USC/TMO/Europe:

	Band/Mode	XFon Americas	XFon Europe	XFon Sprint	XFon Verizon	XFon TMO	XFon US Cellular	
GSM	G850	G850 Tx	1	1	1	1	1	
	G850	G850 Rx	1	1	1	1	1	
	G900	G900 Tx	1	1	1	1	1	
	G900	G900 Rx	1	1	1	1	1	
	G1800	G1800 Tx	1	1	1	1	1	
	G1800	G1800 Rx	1	1	1	1	1	
GSM	G1900	G1900 Tx	1	1	1	1	1	
	G1900	G1900 Rx	1	1	1	1	1	
	B1	W2100 Tx/Rx	1	1	1	1	1	
		W2100 RxDiv	3	3	3	3	3	
	B2	W1900 Tx/Rx	1	1	2	1	1	
		W1900 RxDiv	3		3	3	3	
B3	W1800 Tx/Rx							
	W1800 RxDiv							
B4	W1700-2100 Tx/Rx					1		
	W1700-2100 RxDiv					3		
B5	W850 Tx/Rx	1	1	1	1	1		
	W850 RxDiv	3	3	3	3	3		
B8	W900 Tx/Rx	1	1		1	1		
	W900 RxDiv	3	3		3	3		
LTE	B1	L2100 Tx/Rx						
		L2100 RxDiv						
	B2	L1900 Tx/Rx	1				1	
		L1900 RxDiv	3				3	
	B3	L1800 Tx/Rx		1				
		L1800 RxDiv		3				
	B4	L1700-2100 Tx	1			2	1	2
		L1700-2100 Rx	1			1	1	1
	B5	L1700-2100 RxDiv	3			3	3	3
		L850 Tx/Rx	1					2
	B7	L850 RxDiv	3					3
		L2600 Tx/Rx	2	2				
B8	L2600 RxDiv	4	4					
	L900 Tx/Rx							
B12	L900 RxDiv						2	
	L700 Tx/Rx						3	
B13	L700 RxDiv				2			
	L700 Tx/Rx				3			
B17	L700 RxDiv	2				2		
	L700 Tx/Rx	3				3		
B20	L800 Tx/Rx		2					
	L800 RxDiv		3					
B25	LE1900 Tx/Rx			2				
	LE1900 RxDiv			3				
GPS	GPS	4	4	4	4	4	4	
BT/WIFI	BT/WIFI	5	5	5	5	5	5	
CDMA	BC0	C850 Tx/Rx (1x)			1	1	1	
		C1900 Tx/Rx (1x)			1	1	1	
		C800 Tx/Rx (1x)			1			
		C1700-2100 Tx/Rx (1x)						
	BC0	C850 Tx/Rx (DO)			1	1	1	
		C850 RxDiv (DO)			3	3	3	
	BC1	C1900 Tx/Rx (DO)			1	1	1	
		C1900 RxDiv (DO)			3	3	3	
	BC10	C800 Tx/Rx (DO)			1			
		C800 RxDiv (DO)			3			
	BC15	C1700-2100 Tx/Rx (DO)						
		C1700-2100 RxDiv (DO)						

## XFON P1B3, P2



Connectors 1, 2, 4, 5 (Qty 4) are 09014615001 which is the new Murata 2-way connector. Plan is to use this connector during design and change to 0988612M01 connector for production. Factory probes for this connector are Murata PN-MM126055. Development/Analyzer probes for this connector are Murata PN-MXH383QE3000

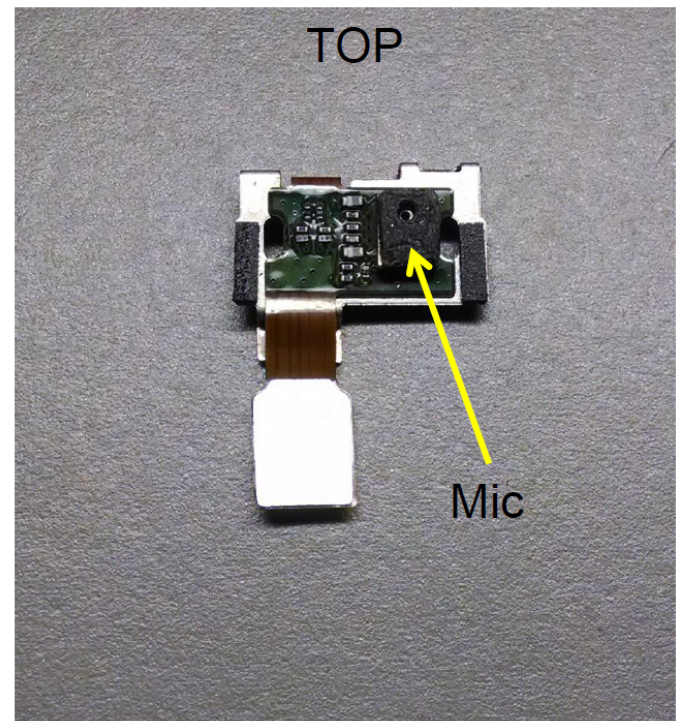
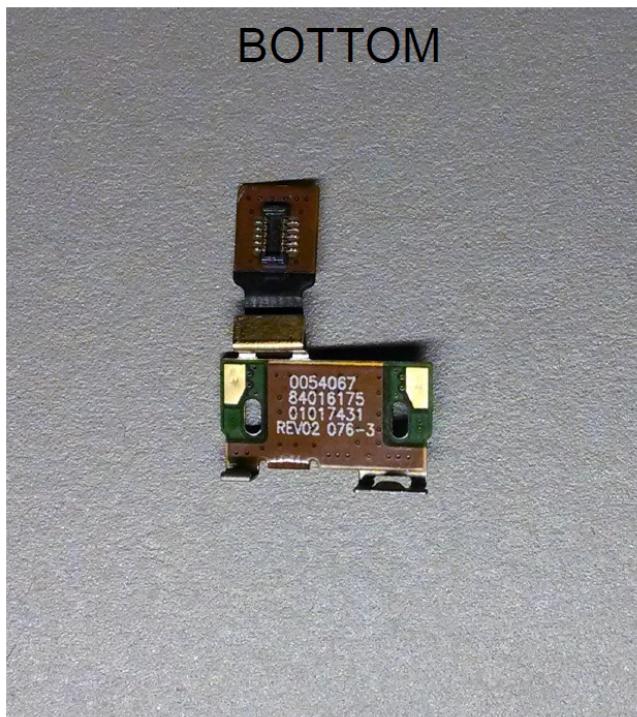
Connector	Ref Des	PIN
1	J100	09014615001
2	J130	09014615001
3	J170	09014068001
4	J055	09014615001
5	J010	09014615001





#### 4.0 Schematic and Component Overlays

- **Main PCB Overlays and schematics - see service portal for files**
- **Snapshots of Flex Assemblies**



Audio Flex

TOP



BOTTOM



Battery/Battery Flex

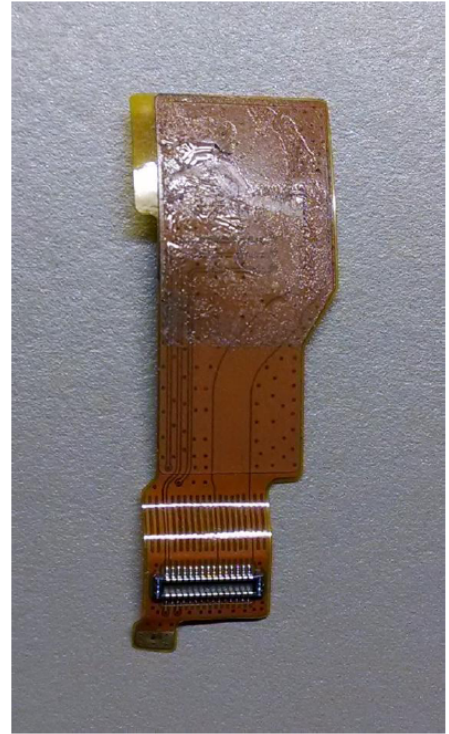
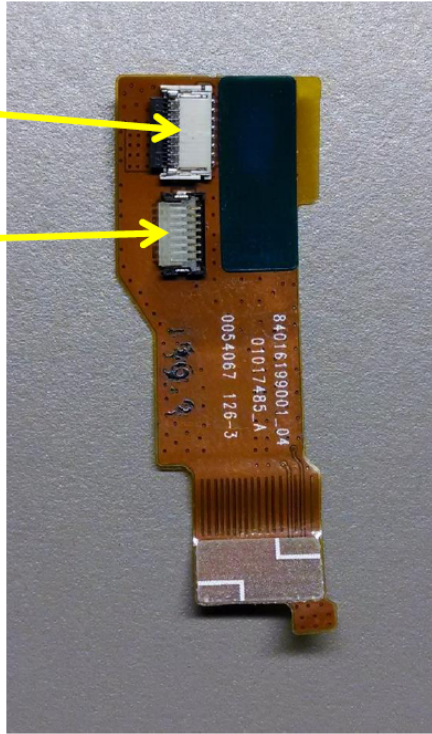


TOP

BOTTOM

Flash Flex  
Connector

Side Key Flex  
Connector



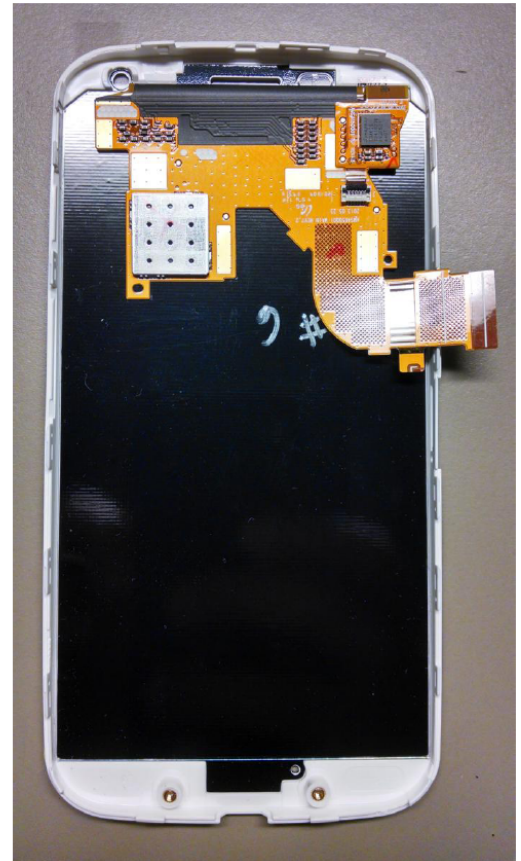
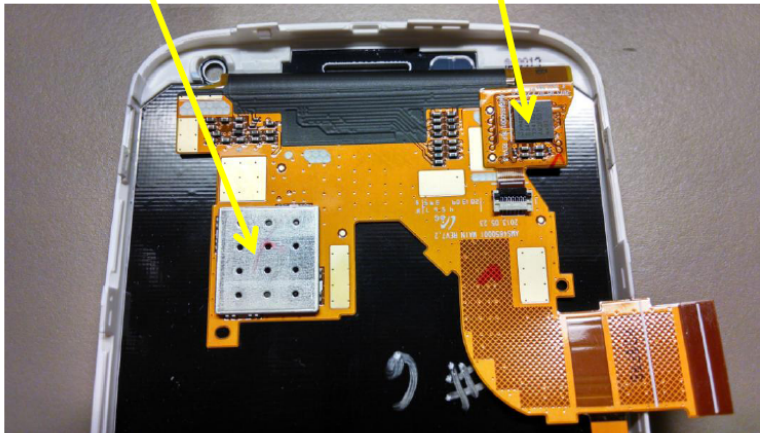
Bridge Flex



## Display Flex

Display IC/Circuitry

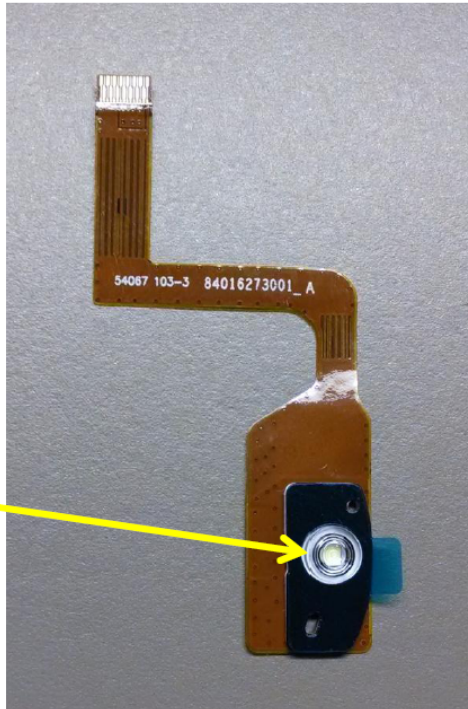
Touch IC/Circuitry



Display Flex

# Flash LED Flex

TOP



Flash LED

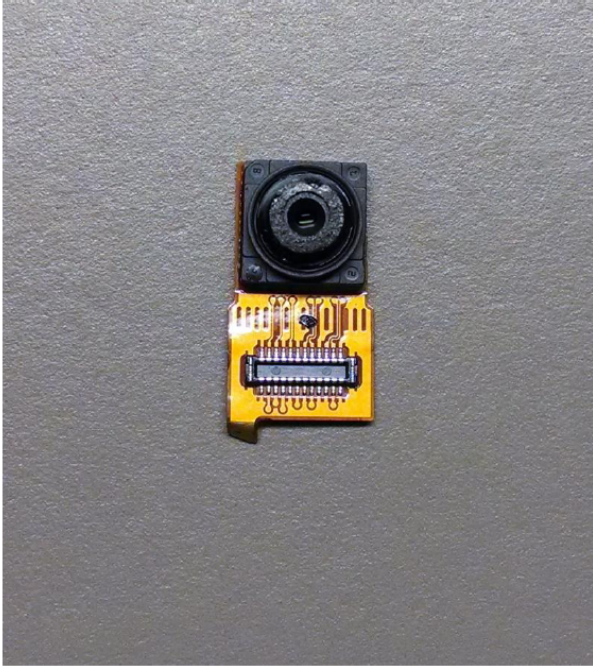
BOTTOM



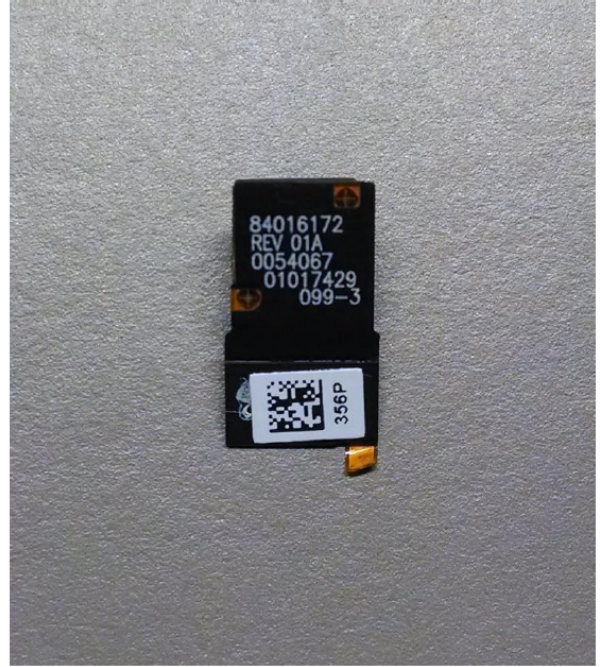
Flash LED Flex

# Front Facing Imager Flex

## TOP



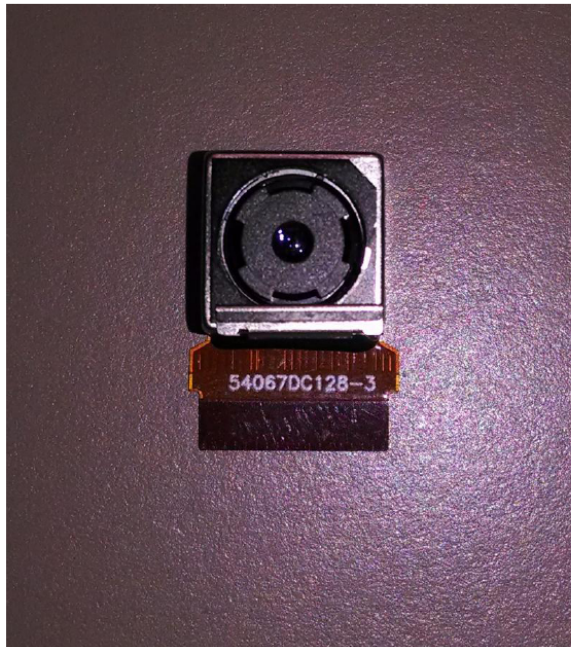
## BOTTOM



Front Facing Imager Flex



Main/Rear Imager Flex  
TOP

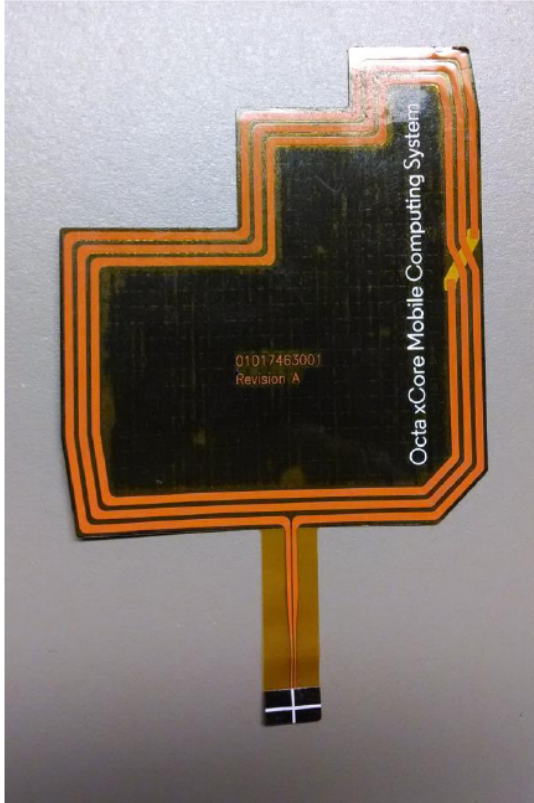


BOTTOM

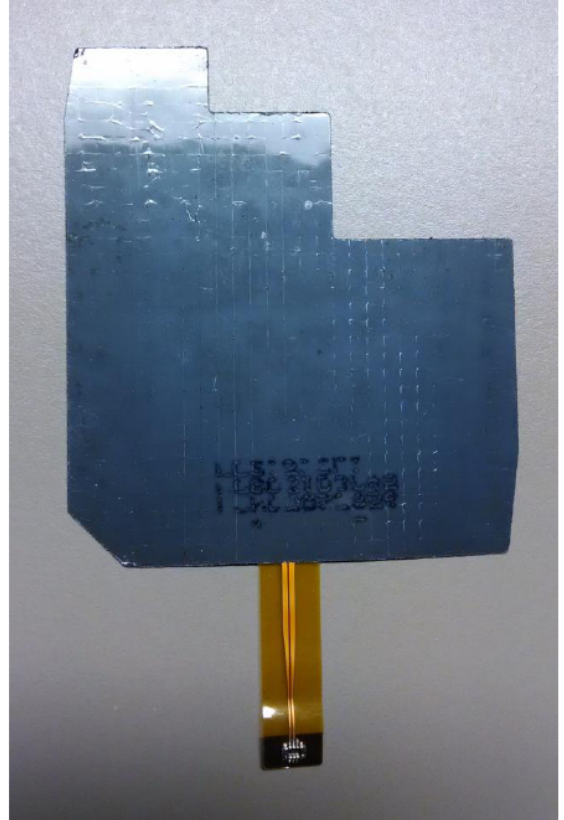


Main/Rear Imager Flex

TOP



BOTTOM



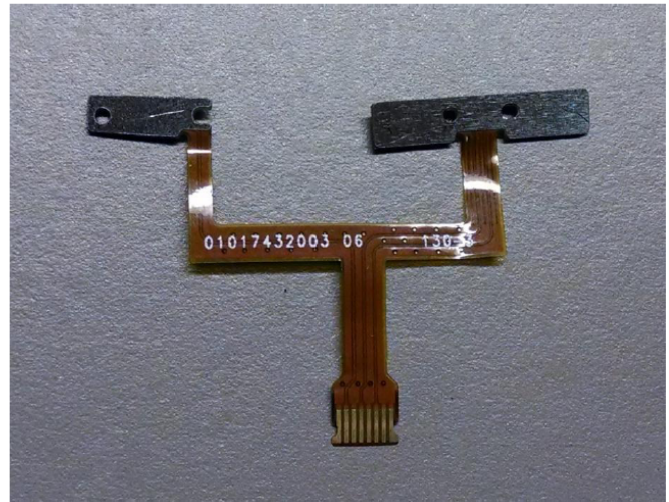
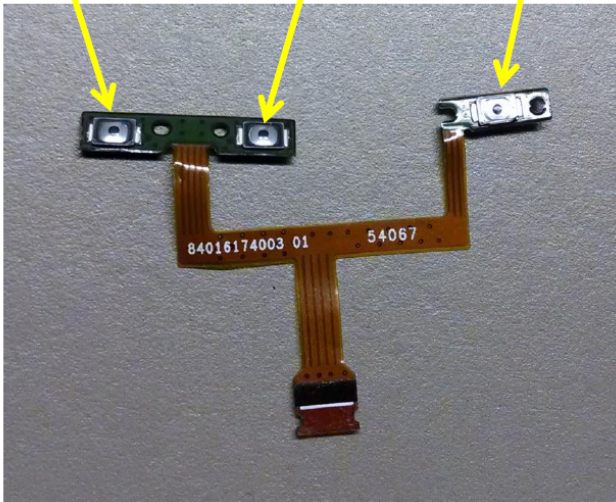
NFC Flex

# Side Key Flex

TOP

BOTTOM

Vol Down      Vol Up      Power



Side Key Flex

## 5.0 RF Troubleshooting

### 5.1.1 CDMA RF Troubleshooting

#### **Objective / Purpose:**

- Studying CDMA failures and providing procedure for debugging the failures
- The following tests from RADTEST section of the NTF\_Pareto document will be discussed

Here are the various test cases:

For the Verizon SKU Failure List (Primary, C0/C2): [Verizon Primary](#)

Test Area	Test Code	Test Description
RadTest	C192P00P	QC_CDMA_1900_C2_TX_RAD_POW_25
RadTest	C192P0W/N	QC_CDMA_1900_C2_TX_RAD_POW_1175
RadTest	C2SMLCCW	QC_CDMA_800_C2_RSSI_LCH
RadTest	C2TMHCCW	QC_CDMA_1900_C2_RSSI_HCH
RadTest	C2TMLCCW	QC_CDMA_1900_C2_RSSI_LCH
RadTest	C802POLL	QC_CDMA_800_C2_TX_RAD_POW_777
RadTest	C802POS5	QC_CDMA_800_C2_TX_RAD_POW_1013

For the Verizon SKU Failure List (Secondary, C3): [Verizon Secondary](#)

- QC\_CDMA\_800\_C3\_RSSI\_LCH
- QC\_CDMA\_1900\_C3\_RSSI\_LCH
- QC\_CDMA\_1900\_C3\_RSSI\_HCH

For the Sprint CDMA Failure List (Primary, C0/C2): [Sprint](#) Primary

Test Area	Test Code	Test Description
RadTest	C2SMLCCW	QC_CDMA_800_C2_RSSI_LCH
RadTest	C2TMHCCW	QC_CDMA_1900_C2_RSSI_HCH
RadTest	C2TMLCCW	QC_CDMA_1900_C2_RSSI_LCH
RadTest	C802POLL	QC_CDMA_800_C2_TX_RAD_POW_777
RadTest	CCPMLCCW	QC_CDMA_800_C0_RSSI_LCH

For the USC SKU Failure List (Primary, C0): [US Cellular](#)

Test Area	Test Code	Test Description
RadTest	C192P00P	QC_CDMA_1900_C2_TX_RAD_POW_25
RadTest	C192P0wN	QC_CDMA_1900_C2_TX_RAD_POW_1175
RadTest	C2SMLCCW	QC_CDMA_800_C2_RSSI_LCH
RadTest	C2TMHCCW	QC_CDMA_1900_C2_RSSI_HCH
RadTest	C2TMLCCW	QC_CDMA_1900_C2_RSSI_LCH
RadTest	C802POLL	QC_CDMA_800_C2_TX_RAD_POW_777
RadTest	C802P0S5	QC_CDMA_800_C2_TX_RAD_POW_1013



### Verizon CDMA Primary:

Please follow the detection scheme shown below to resolve the issue related to VERIZON CDMA bands. If one step is not working then go to the next step.

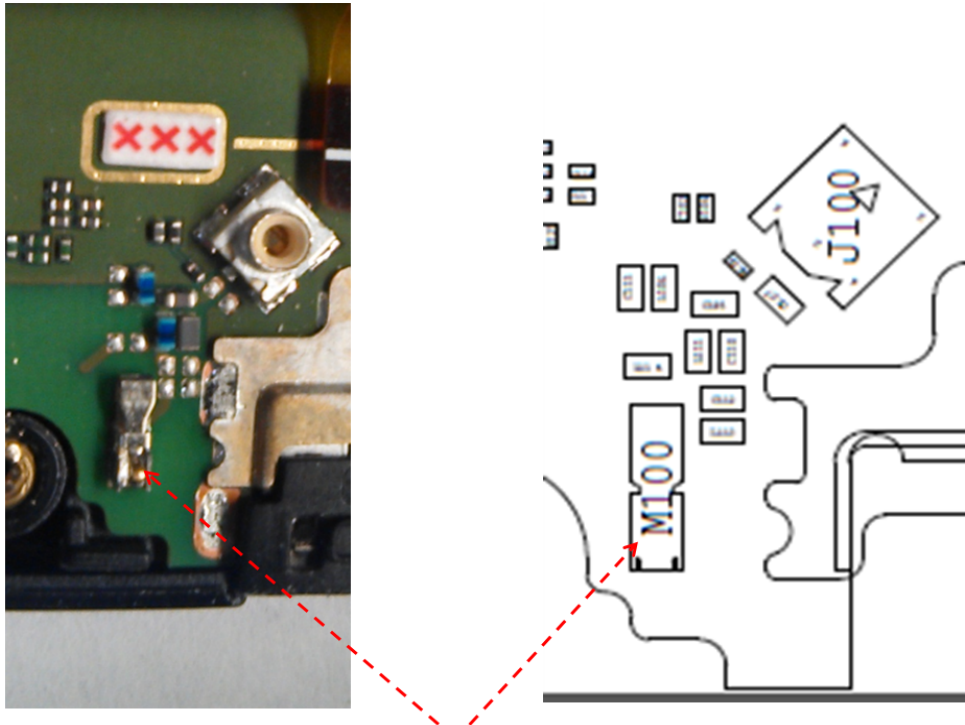
Step 1: Repeat the test. If problem exists, go to the next step.

Step 2: Check if the bottom antenna carrier is for the Verizon or not. If it is Verizon, 003 is printed on the Antenna carrier as shown below:



Figure: Antenna Carrier

Step 3: if Step 2 does not resolve issue, check if universal contact on the PCB is damaged. Is it touching the antenna pad? If the contact is twisted or not making contact, this is a problem. The contact should look like this picture below:



This is the clip to check

Figure: Antenna clip for CDMA Antenna

Step 4: If step 3 does not resolve the problem check if components C110 is placed in the circuit

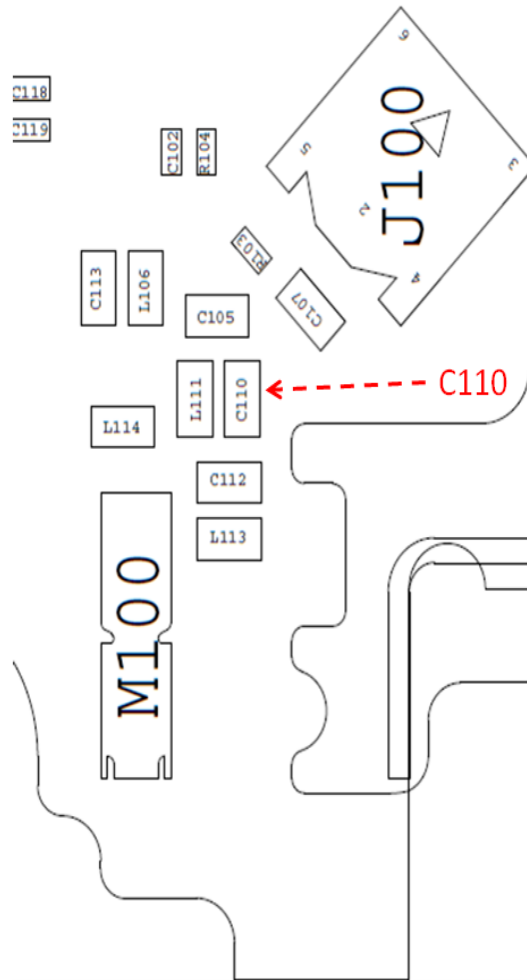
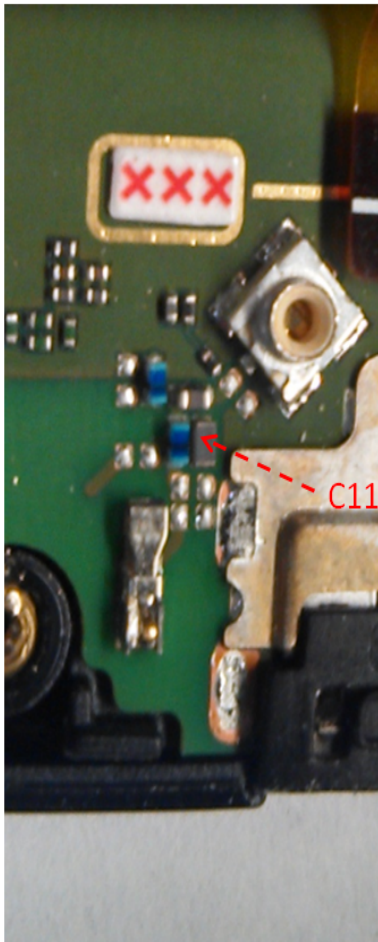


Figure: Component C110

Step 5: If Step 4 does not resolve the problem check if components L111 is placed in the circuit. In addition, you may have to check the component under a microscope to ensure that the body of the part is not cracked.

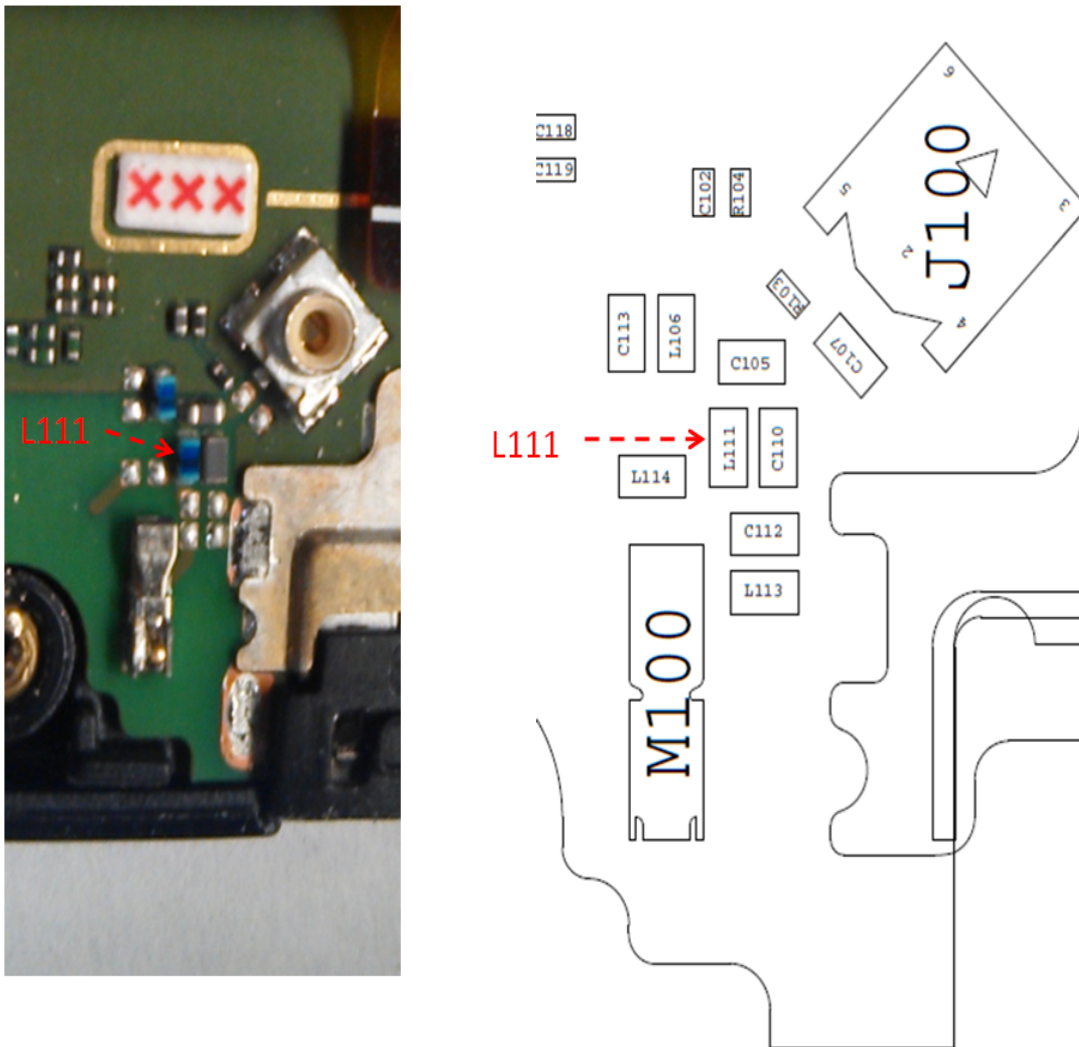


Figure: Component L111

Step 6: If Step 5 does not resolve the problem check if components L106 is placed in the circuit

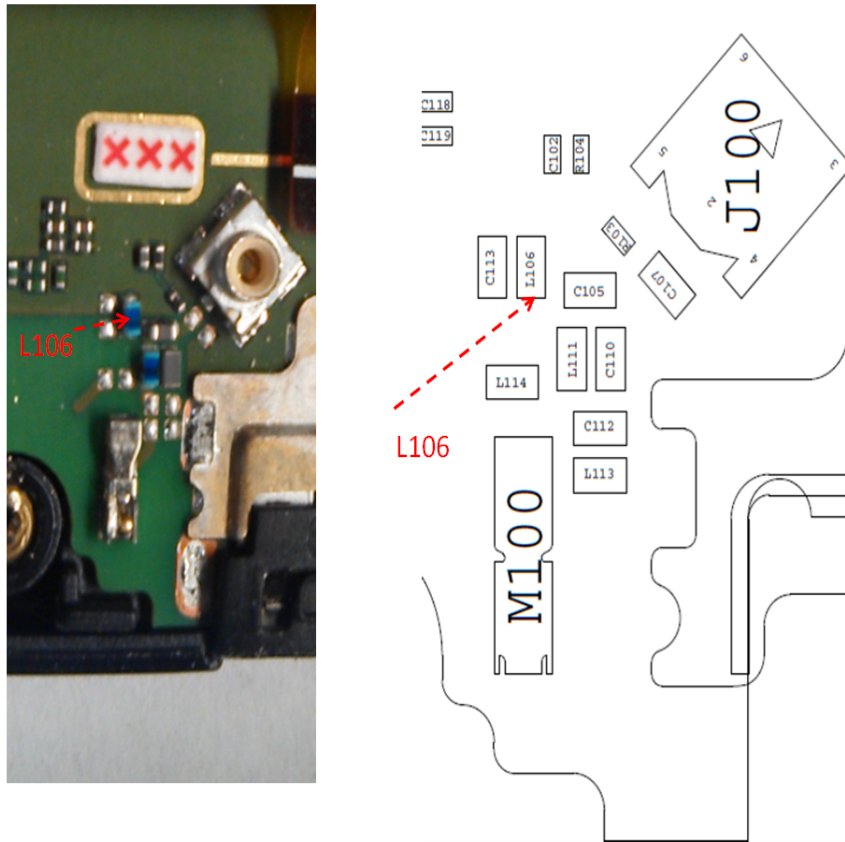
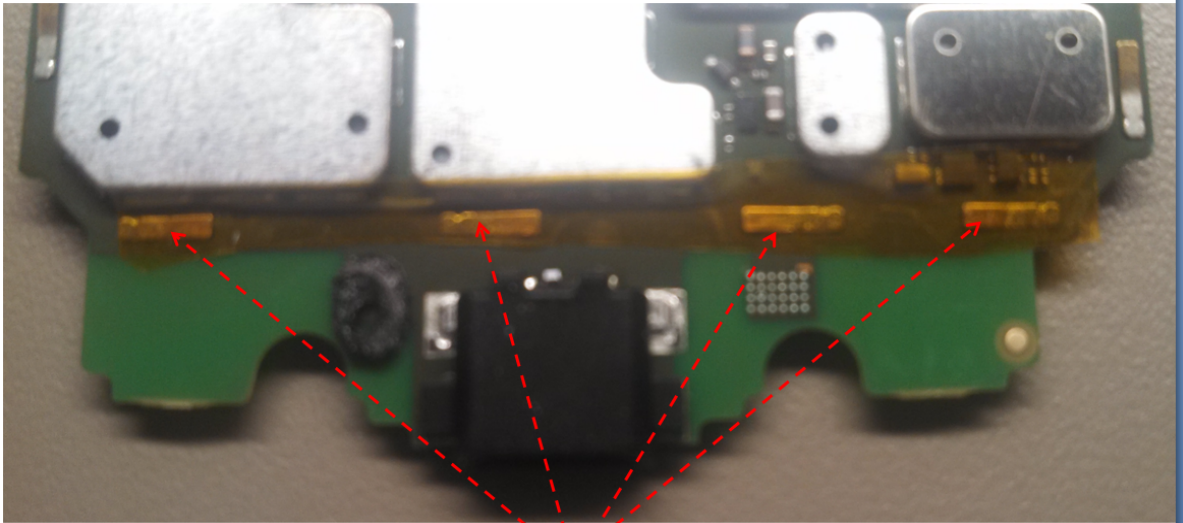


Figure: Component L106

Step 7: If Step 6 does not resolve the problem check if the ground clips are placed on the board



Ground Clips on display side

Figure: Moto X PCB board with ground clips



## Verizon CDMA Secondary

For factory radiated test failures on the Verizon SKU, for CDMA Secondary Bands 800 and 1900, please do the following:

Step 1: Retest the unit.

Step 2: If the failure persists, check the Antenna 3 universal contact, M170. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 3 on the diversity antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M170 and retest.

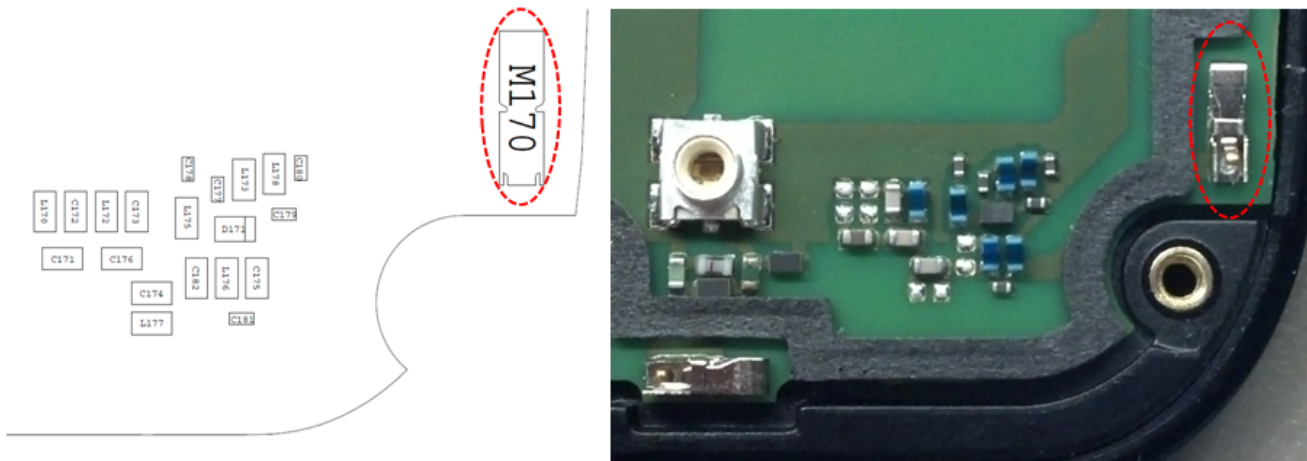


Figure: Antenna 3 Universal Contact

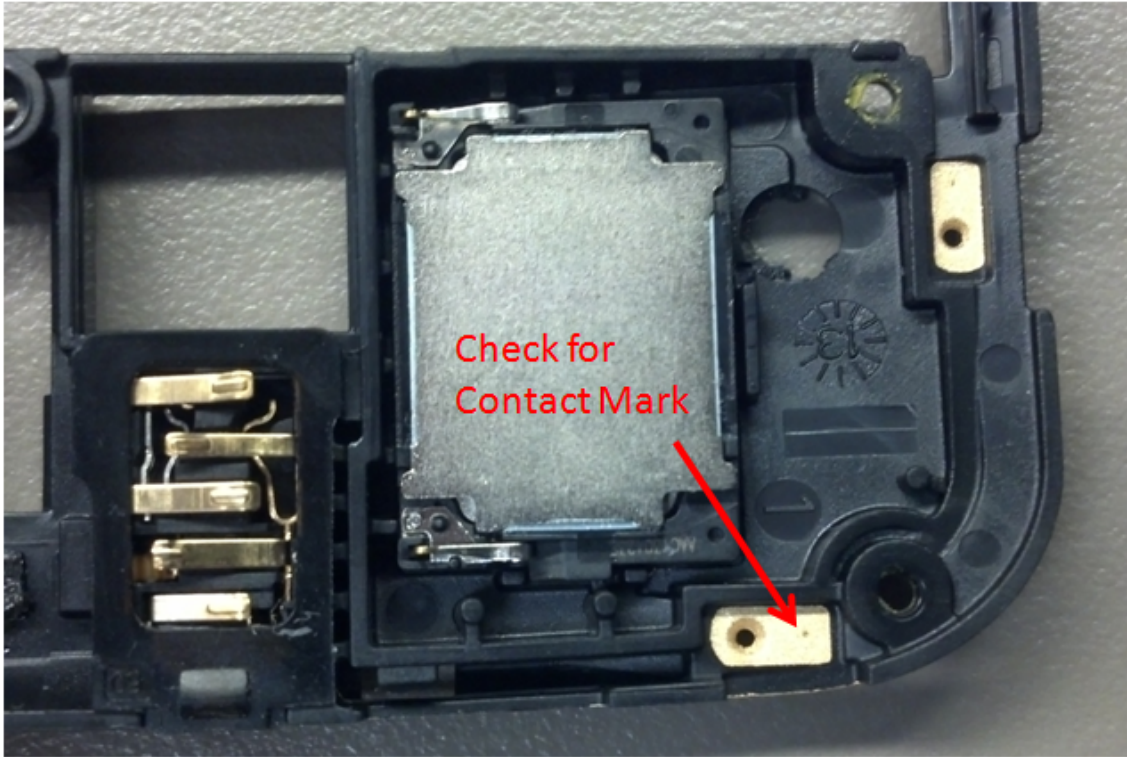


Figure: Contact Pad of Antenna 3



Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, C175, L176, L173, C177, D171, L175, L178, and C179. If any component is missing, misplaced, or damaged, place/replace the part and retest.

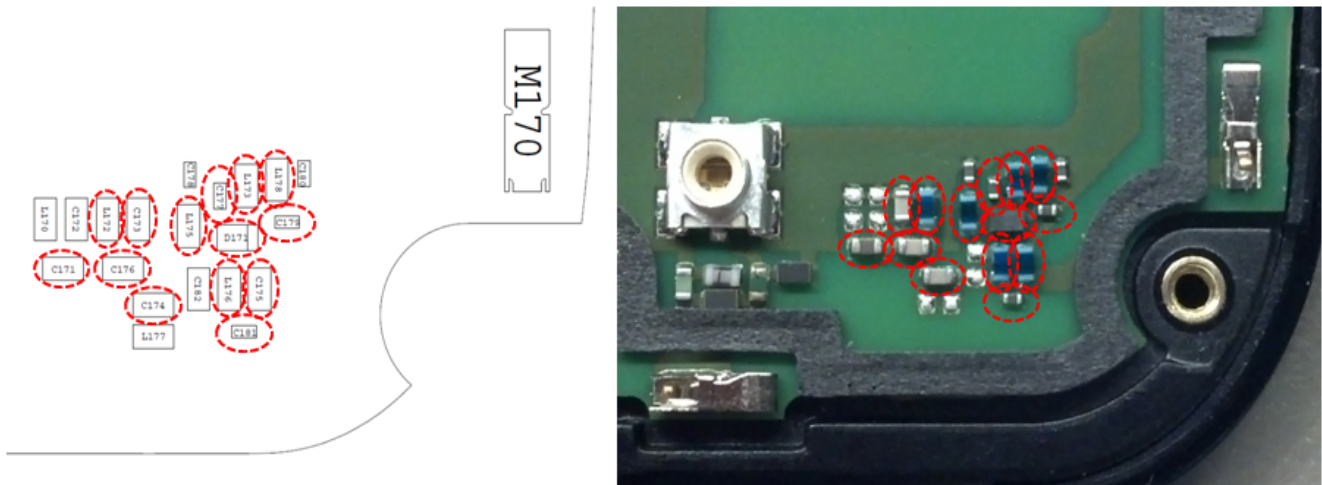


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

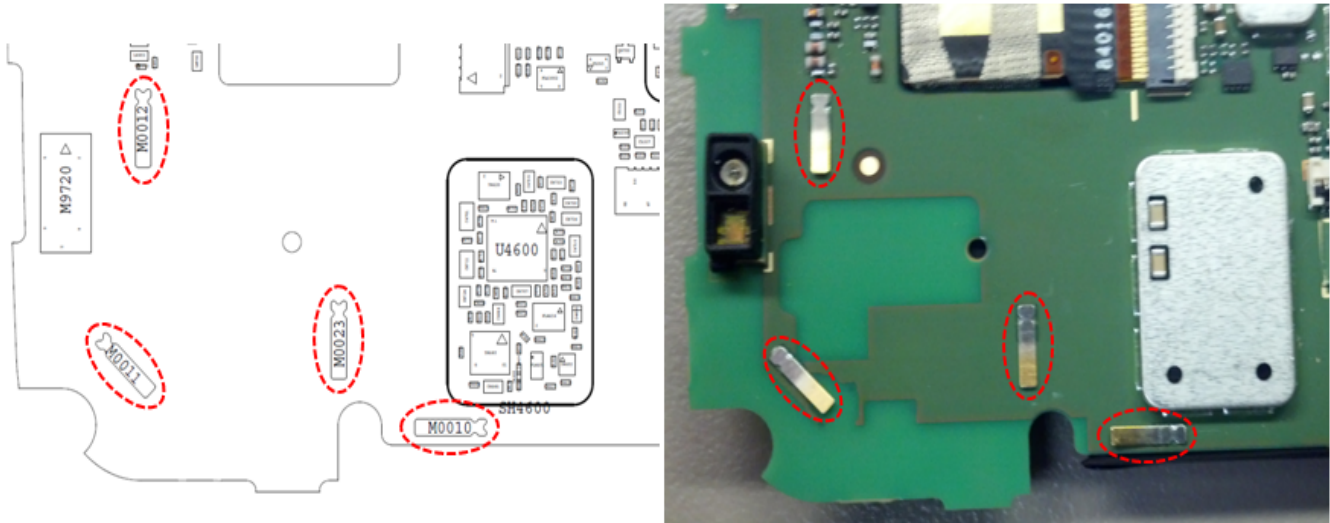


Figure: PCB Grounding Clips Near Antenna 3 Matching

Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

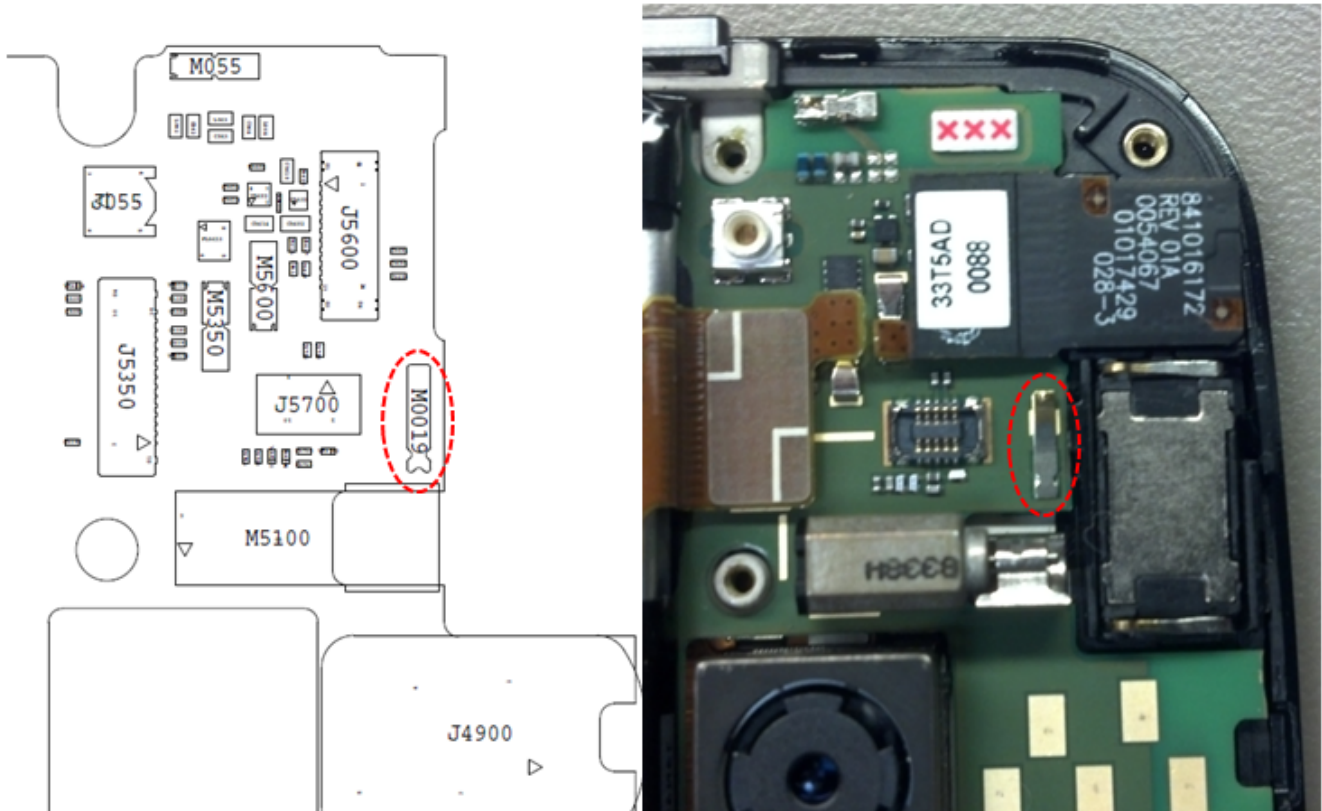


Figure: Grounding Clip Between PCB and Audio Flex Bracket

Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

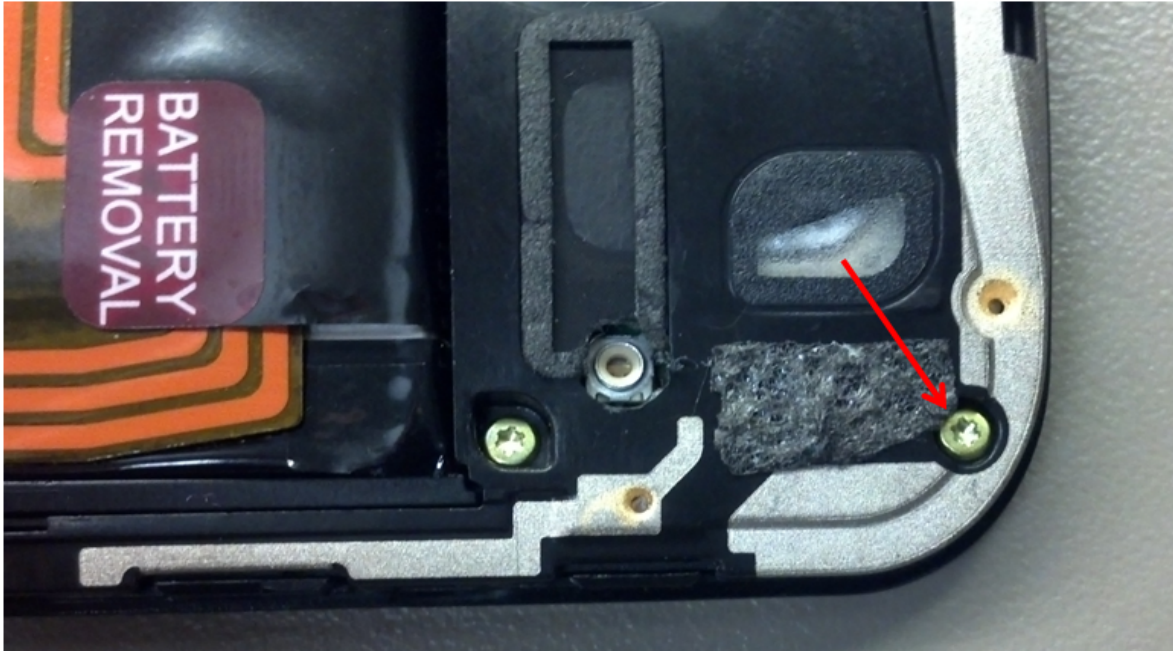


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed

Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

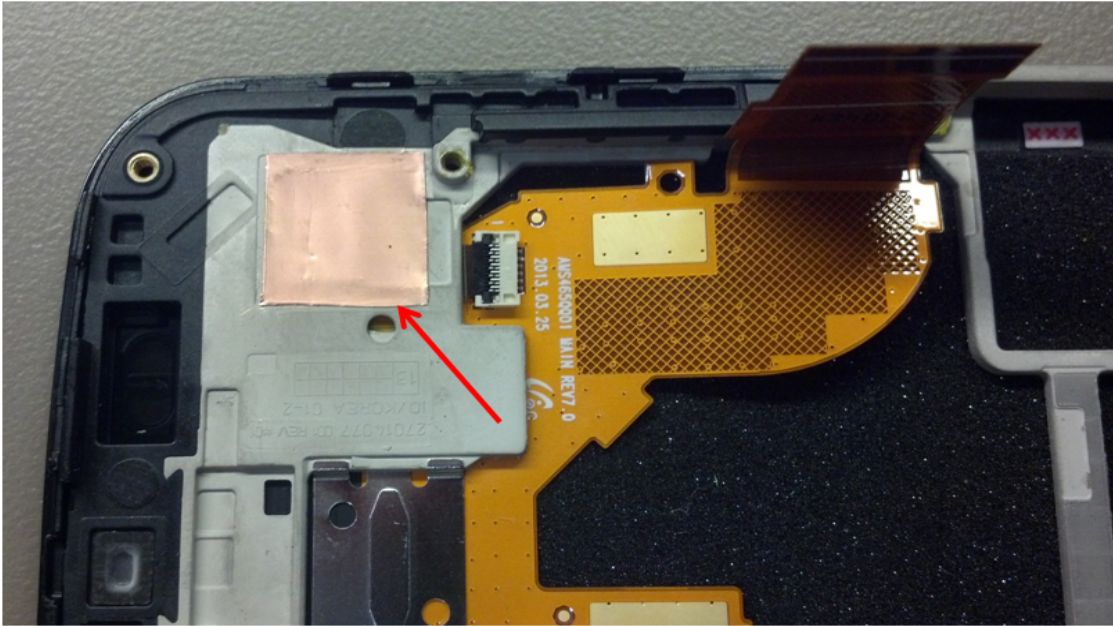


Figure: Copper Tape over Touch IC on Chassis

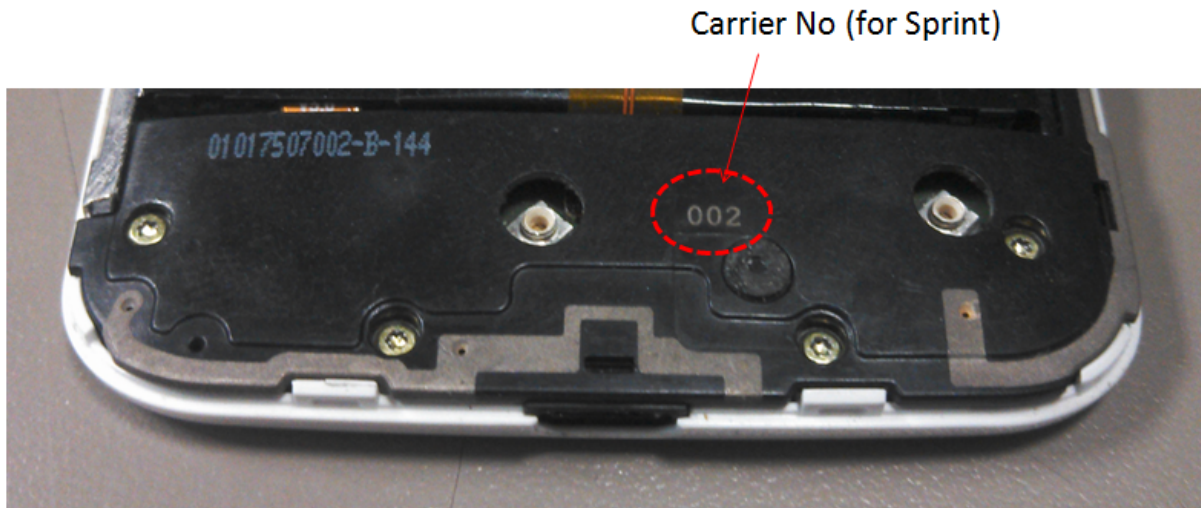


### SPRINT CDMA:

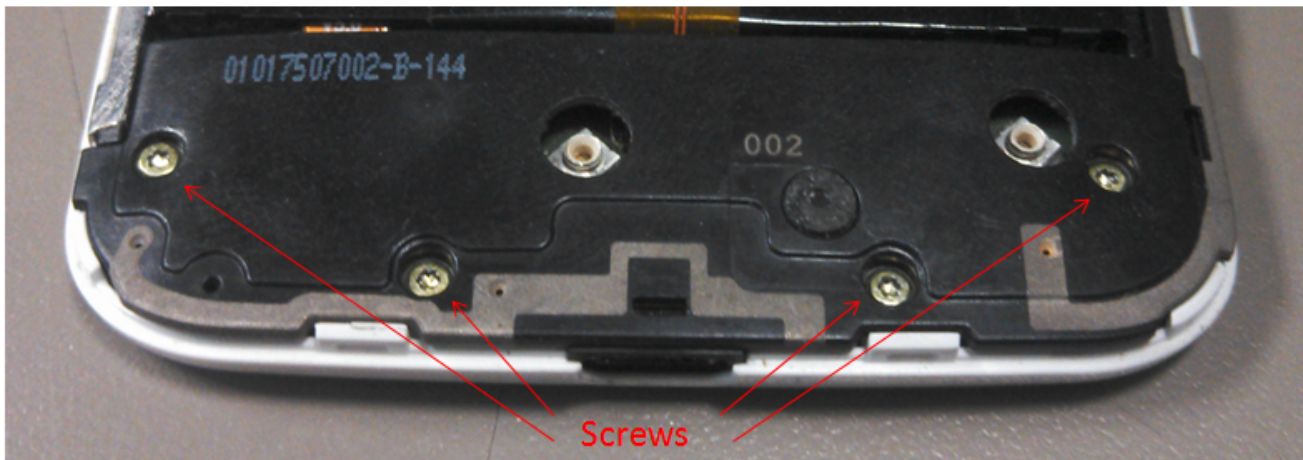
Please follow the detection scheme shown below to resolve the issue related to SPRINT CDMA bands. If one step is not working then go to the next step.

Step 1: Repeat the test. If problem exists, go to the next step.

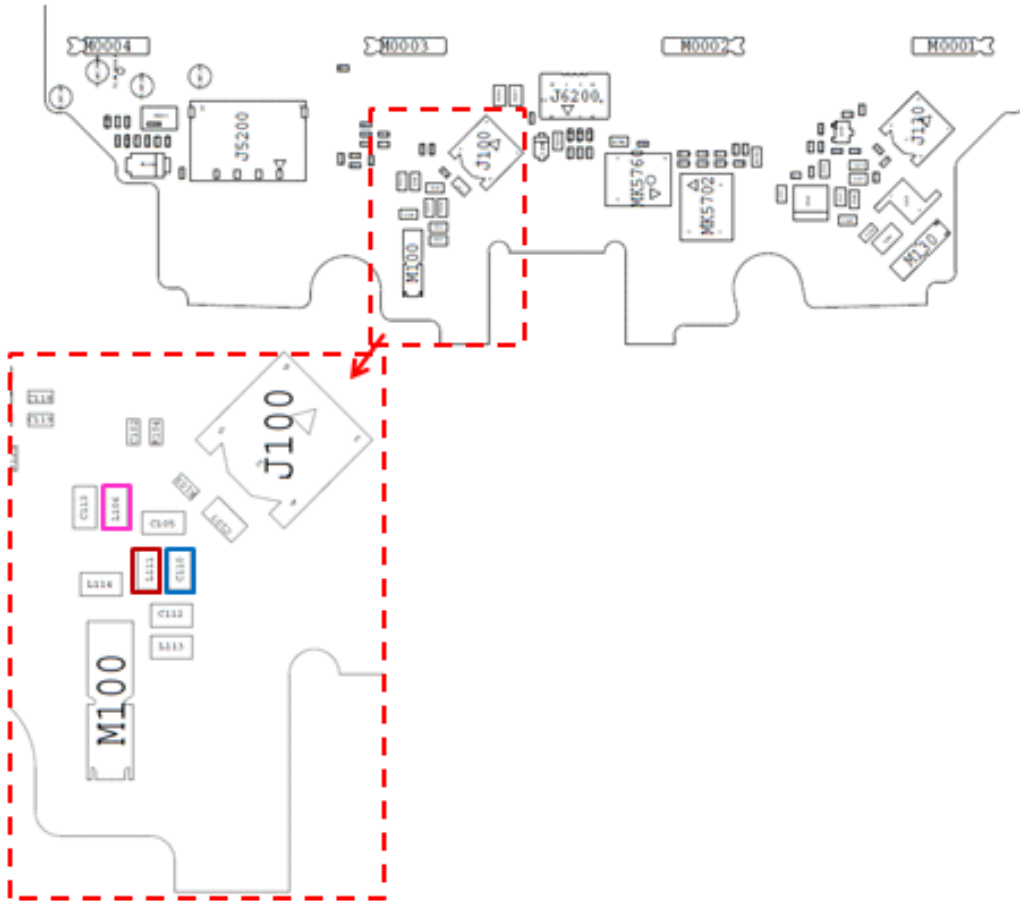
Step 2: Check if the bottom antenna carrier is for the Sprint or not. If it is Sprint, 002 is printed on the Antenna carrier as shown below:



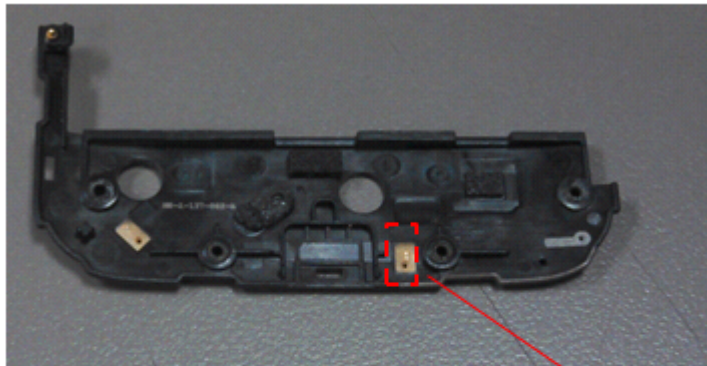
Step 3: Check if all the screws are present or not (see the picture below)



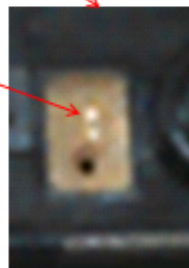
Step 4: Check if the antenna contact (M100) is present there or not. The location of the contact is shown in the PCB layout below:



Step 5: Check if the antenna feed for ANT1 is touching the antenna contact or not. The photograph of the antenna feed area is shown below. You cannot see whether it is touching or not, but if the carrier is touching you would see touch mark on the feed of the antenna as shown below:

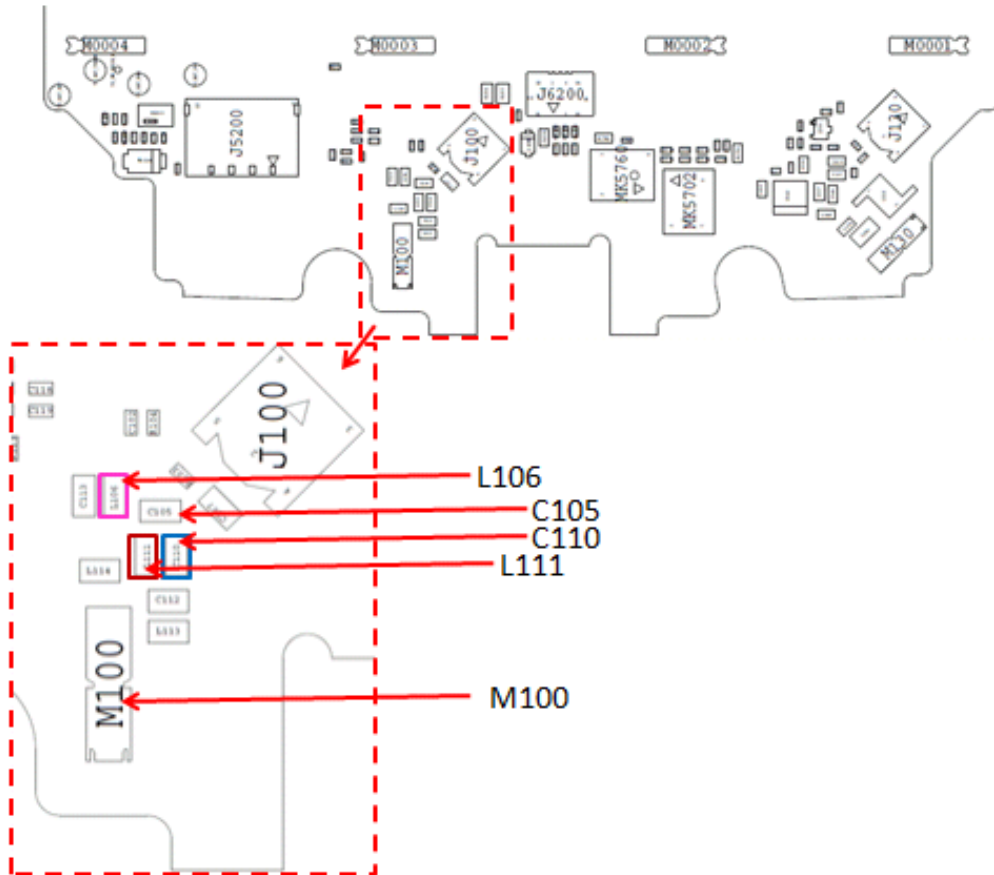


Contact mark

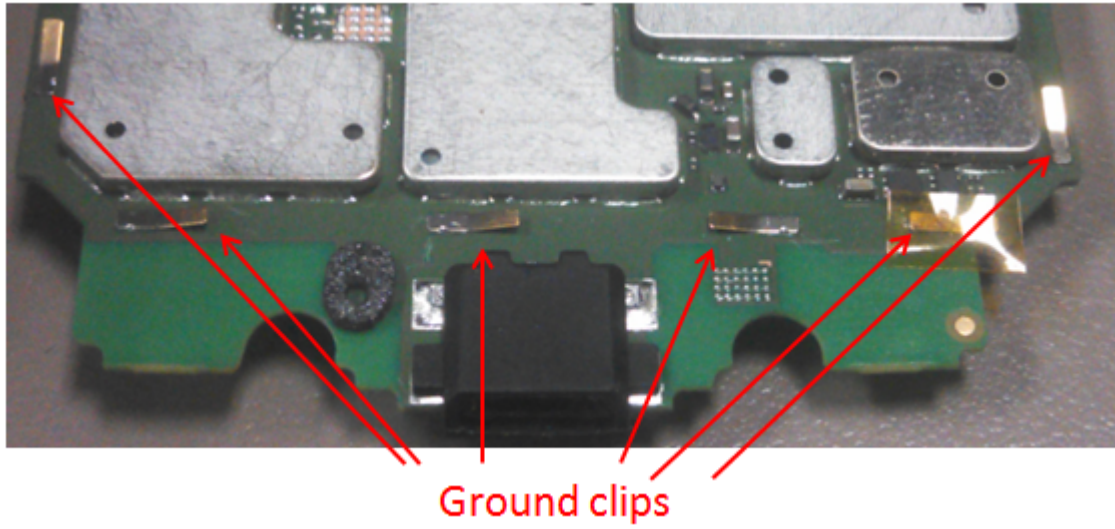




Step 6: Check for the missing, misplaced, crashed parts for the following matching components:



Step 7: Check for the ground clips connecting display bezel to the PCB



### US Cellular CDMA Primary:

Please follow the detection scheme shown below to resolve the issue related to USC CDMA bands. If one step is not working then go to the next step.

Step 1: Repeat the test. If problem exists, go to the next step.

Step 2: Check if the bottom antenna carrier is for the USC or not. If it is USC, 001 is printed on the Antenna carrier as shown below:



Figure: Antenna Carrier

Step 3: if Step 2 does not resolve issue. Check if the antenna feed for ANT1 is touching the antenna contact or not. The photograph of the antenna feed area is shown below. You cannot see whether it is touching or not, but if the carrier is touching you would see touch mark on the feed of the antenna as shown below:

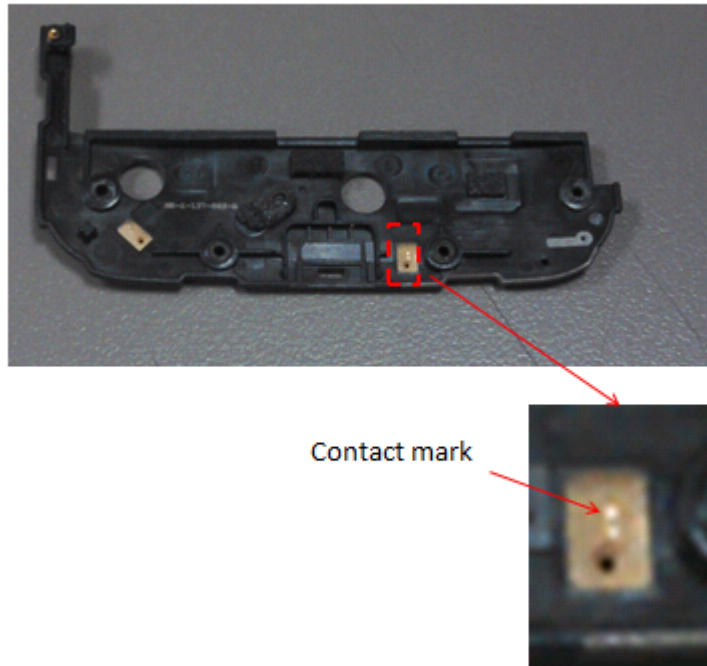
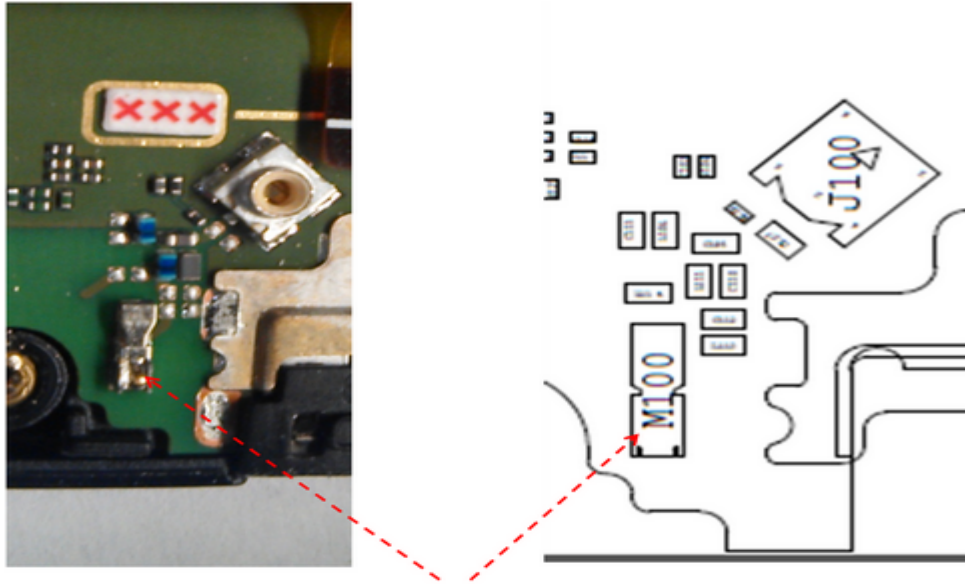


Figure: Antenna contact pad

Step 4: If Step 3 fails, check if universal contact on the PCB is damaged. Is it touching the antenna pad? If the contact is twisted or not making contact, this is a problem. The contact should look like this picture below:



This is the clip to check

Figure: Antenna contact



Step 5: If step 4 does not resolve the problem check if components L111, C110, C107 and L106 are placed in the circuit.

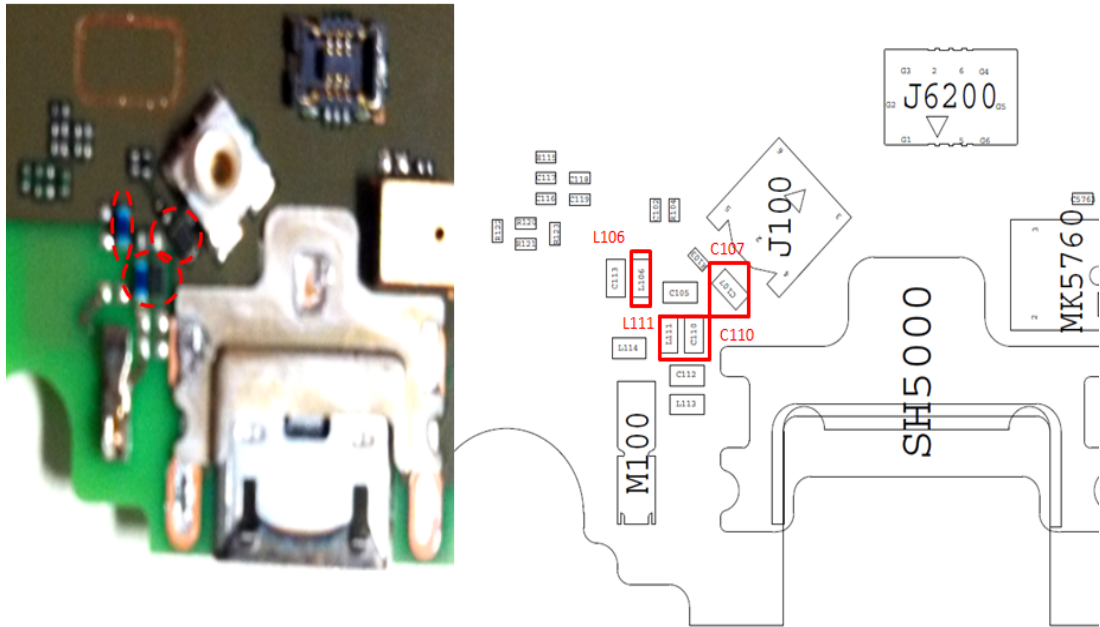
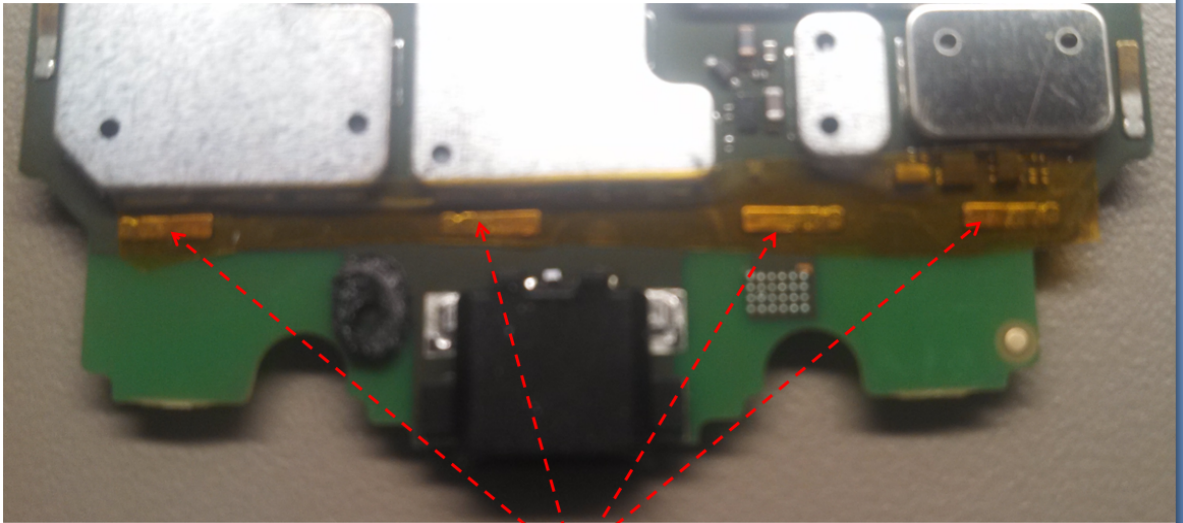


Figure: Matching components

Step 6: If Step 5 does not resolve the problem check if the ground clips are placed on the board



Ground Clips on display side

Figure: Moto X PCB board with ground clips

## 5.1.2 WCDMA/GSM RF Troubleshooting

### **Objective / Purpose:**

- Studying WCDMA/GSM failures and providing procedure for debugging the failures
- The following tests from RADTEST section of the NTF\_Pareto document will be discussed

Here are the various test cases :

For the AT&T SKU Failure List (Primary, C0): [ATT Primary](#)

- QC\_WCDMA\_2100C0\_TX\_RAD\_POW\_9888
- QC\_WCDMA\_1900\_C0\_TX\_RAD\_POW\_9671
- QC\_WCDMA\_900\_C0\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_1900\_C0\_TX\_RAD\_POW\_9938

For the AT&T SKU Failure List (Secondary, C1): [AT&T Secondary](#)

- QC\_WCDMA\_850\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_850\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_900\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_900\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_1900\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_1900\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_2100\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_2100\_C1\_RAD\_RX\_RSSI\_HCH

For the Verizon SKU Failure List (Primary, C0): [Verizon Primary](#)

- QC\_WCDMA\_1900\_C0\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_1900\_C0\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_2100C0\_TX\_RAD\_POW\_9612

- QC\_WCDMA\_2100C0\_TX\_RAD\_POW\_9888
- QC\_WCDMA\_2100\_C0\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_2100\_C0\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_850C0\_TX\_RAD\_POW\_4133
- QC\_WCDMA\_850C0\_TX\_RAD\_POW\_4233
- QC\_WCDMA\_850\_C0\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_850\_C0\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_900C0\_TX\_RAD\_POW\_2712
- QC\_WCDMA\_900C0\_TX\_RAD\_POW\_2863
- QC\_WCDMA\_900\_C0\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_900\_C0\_RAD\_RX\_RSSI\_LCH

For the Verizon SKU Failure List (Secondary, C1): [Verizon Secondary](#)

- QC\_WCDMA\_850\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_850\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_900\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_900\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_1900\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_1900\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_2100\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_2100\_C1\_RAD\_RX\_RSSI\_HCH

For the Sprint WCDMA Failure List (Primary, C0): [Sprint Primary](#)

- W19HHCCW: QC\_WCDMA\_1900\_C0\_RAD\_RX\_RSSI\_HCH
- W19LHCCW: QC\_WCDMA\_1900\_C0\_RAD\_RX\_RSSI\_LCH
- W21MHCCW: QC\_WCDMA\_2100\_C0\_RAD\_RX\_RSSI\_HCH
- W21MLCCW: QC\_WCDMA\_2100\_C0\_RAD\_RX\_RSSI\_LCH

For the Sprint SKU Failure List (Secondary, C1): [Sprint Secondary](#)



- QC\_WCDMA\_1900\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_1900\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_2100\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_2100\_C1\_RAD\_RX\_RSSI\_HCH

For the USC SKU Failure List (Primary, C0): [US Cellular Primary](#)

- QC\_LTE\_BC5\_C0\_RX\_RAD\_RSSI\_LCH2450

For the T-Mobile SKU Failure List (Secondary, C1): [T-Mobile Secondary](#)

- QC\_WCDMA\_850\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_850\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_900\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_900\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_1700\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_1700\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_1900\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_1900\_C1\_RAD\_RX\_RSSI\_HCH
- QC\_WCDMA\_2100\_C1\_RAD\_RX\_RSSI\_LCH
- QC\_WCDMA\_2100\_C1\_RAD\_RX\_RSSI\_HCH



### **AT&T GSM / WCDMA Primary**

For factory radiated test failure on AT&T SKU at GSM / WCDMA bands, please do the following:

Step 1: Retest

Step 2: If retest does not pass, check if the unit has correct bottom antenna carrier. The AT&T bottom antenna carrier should look like following:

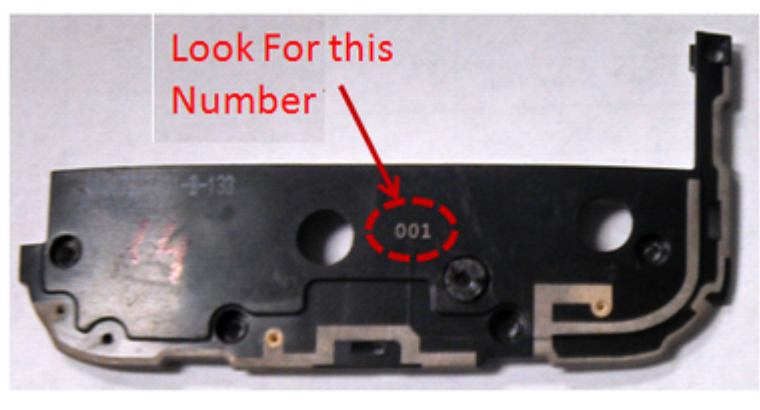


Fig: Moto X Americas Bottom Antenna Carrier

Step 3: if Step 2 does not resolve issue, check if universal contact (RefDes = M100) on the PCB is damaged. Is it touching the antenna pad? If the universal clip is twisted or not making contact, this needs to be replaced :

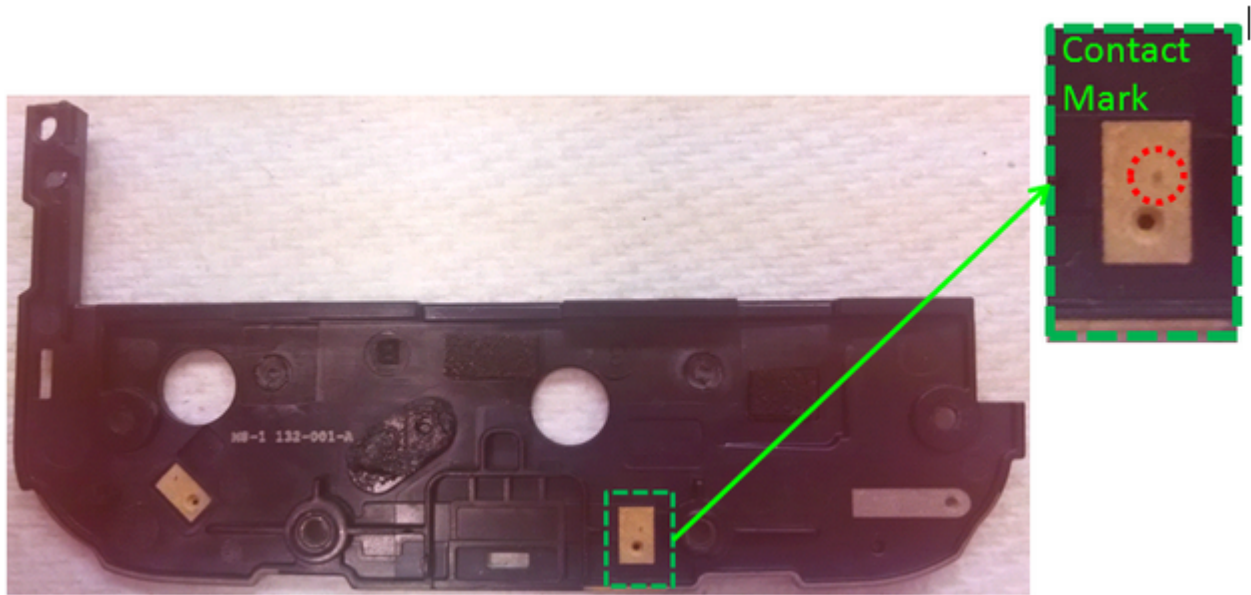


Figure: Contact marks visible on feeding pad from universal clip for WCDMA Antenna

Step 4: If Step 3 does not resolve the problem check if components RefDes = L106, L111, C107 and C110 are placed correctly on PCB as shown below:

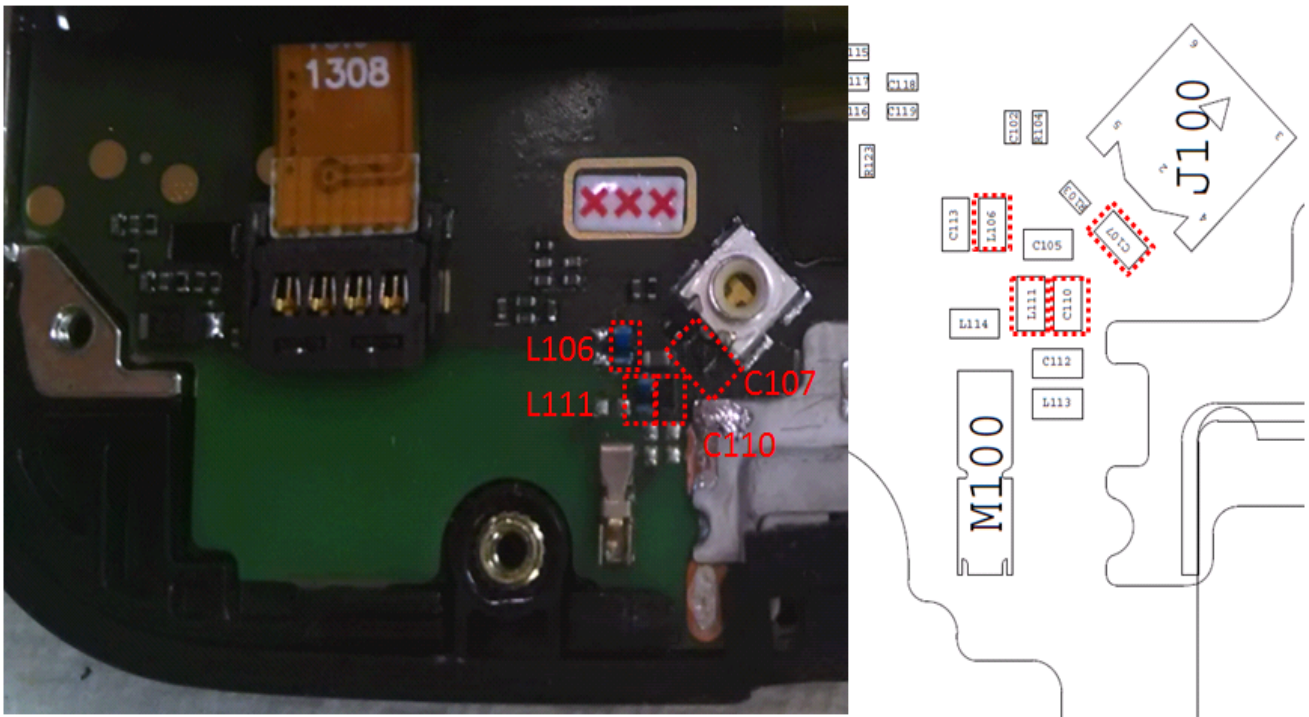


Figure: Antenna matching components and universal clip for WCDMA Antenna

### AT&T WCDMA Secondary

For factory radiated test failures on the AT&T SKU, for WCDMA Secondary Rx Bands 850, 900, 1900, and 2100, please do the following:

Step 1: Retest the unit.

Step 2: If the failure persists, check the Antenna 3 universal contact, M170. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 3 on the diversity antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M170 and retest.

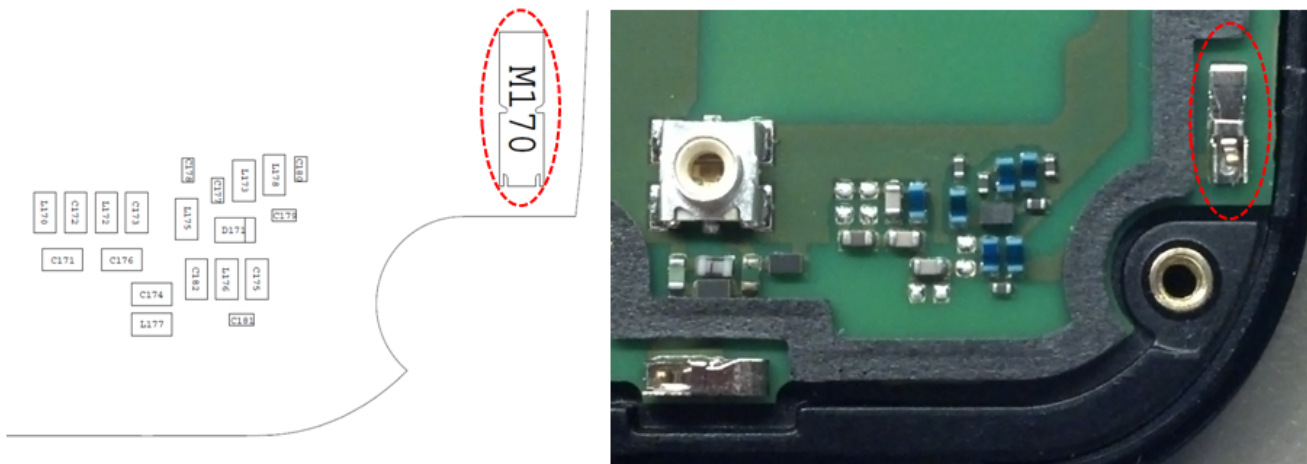


Figure: Antenna 3 Universal Contact

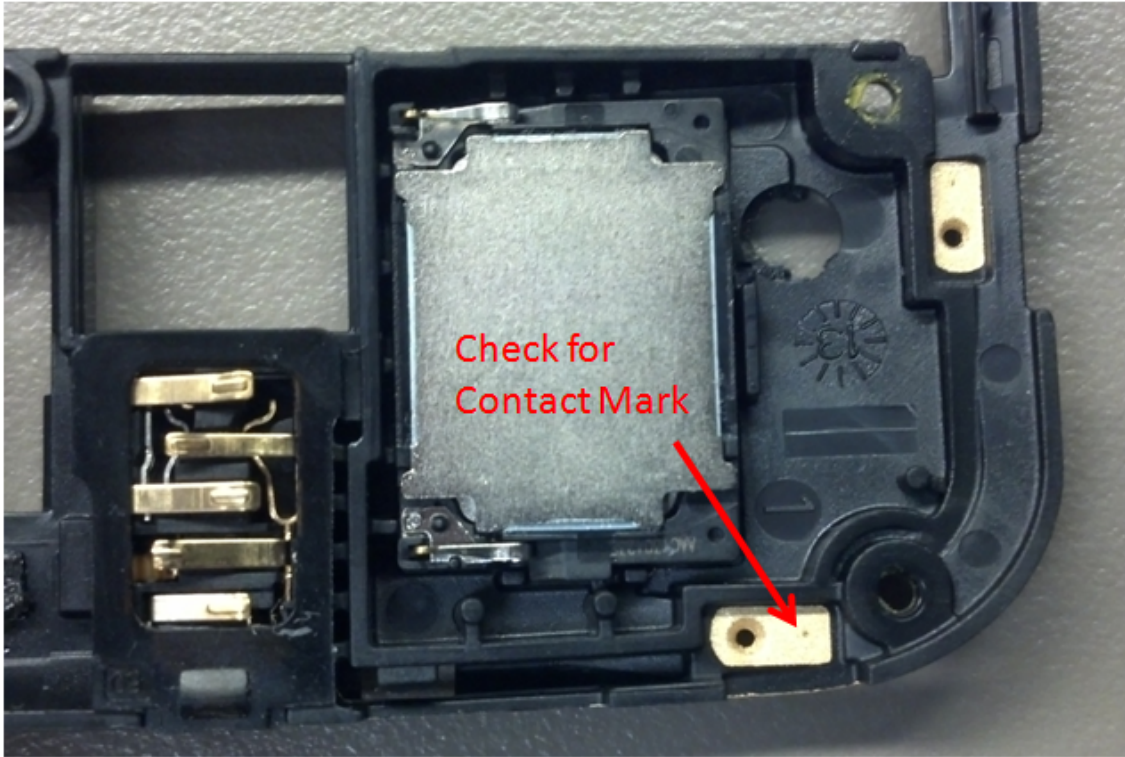


Figure: Contact Pad of Antenna 3



Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, C175, L176, L173, C177, D171, L175, L178, and C179. If any component is missing, misplaced, or damaged, place/replace the part and retest.

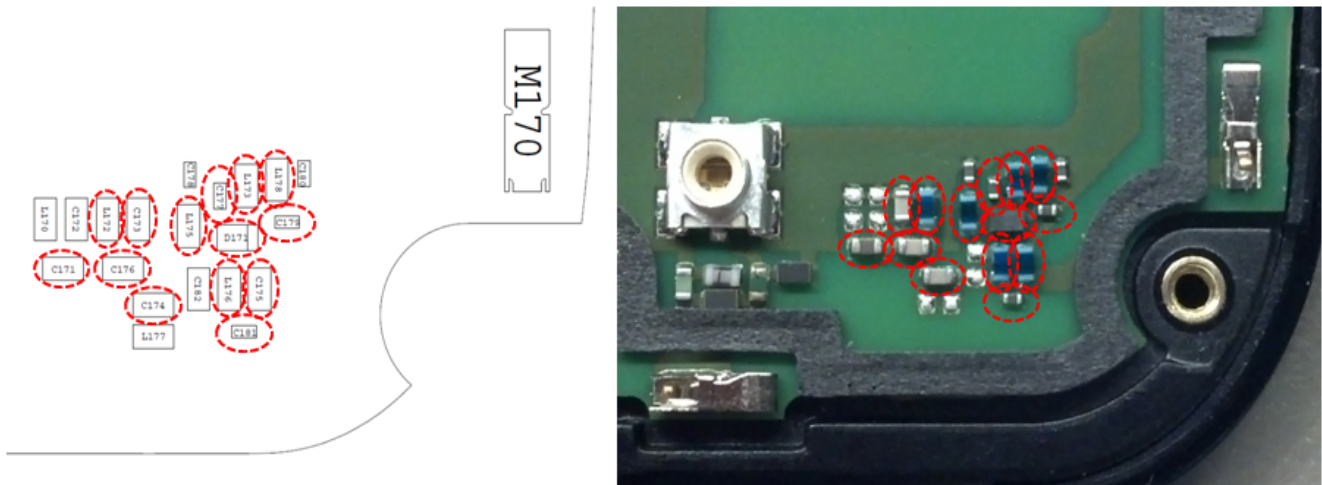


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

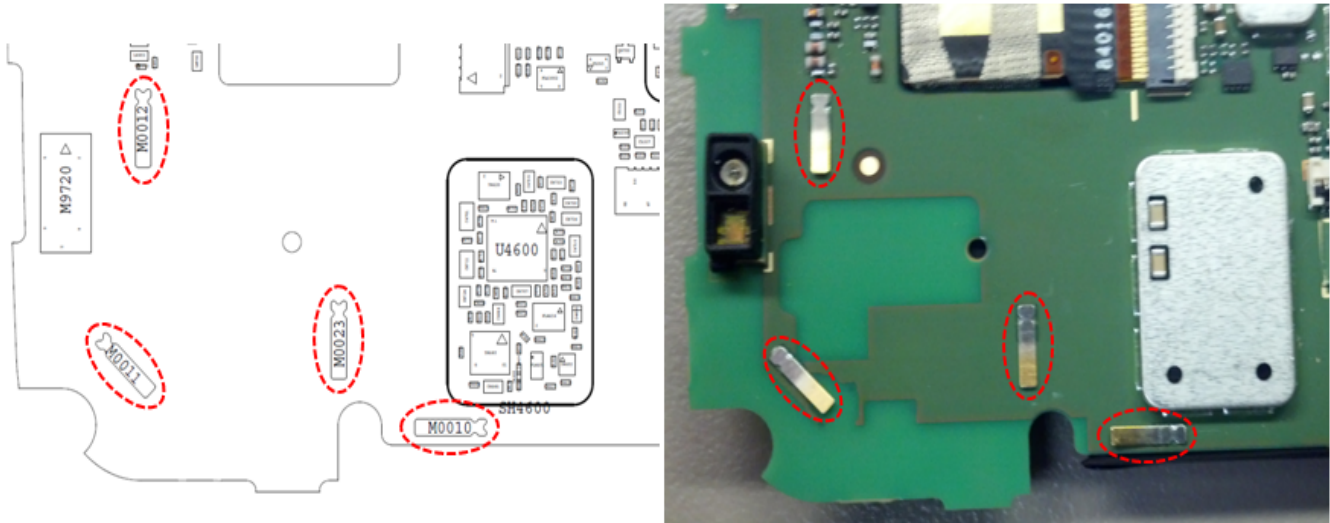


Figure: PCB Grounding Clips Near Antenna 3 Matching

Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

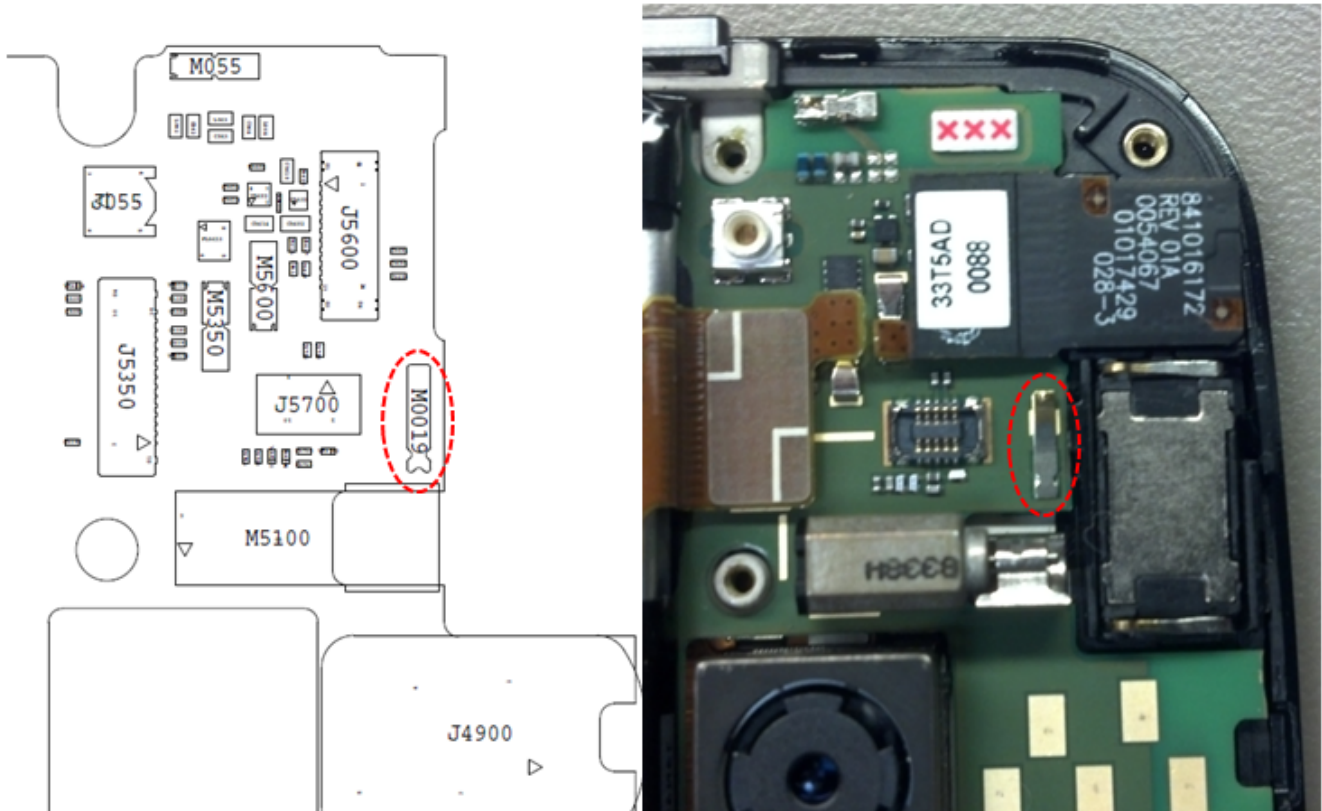


Figure: Grounding Clip Between PCB and Audio Flex Bracket

Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

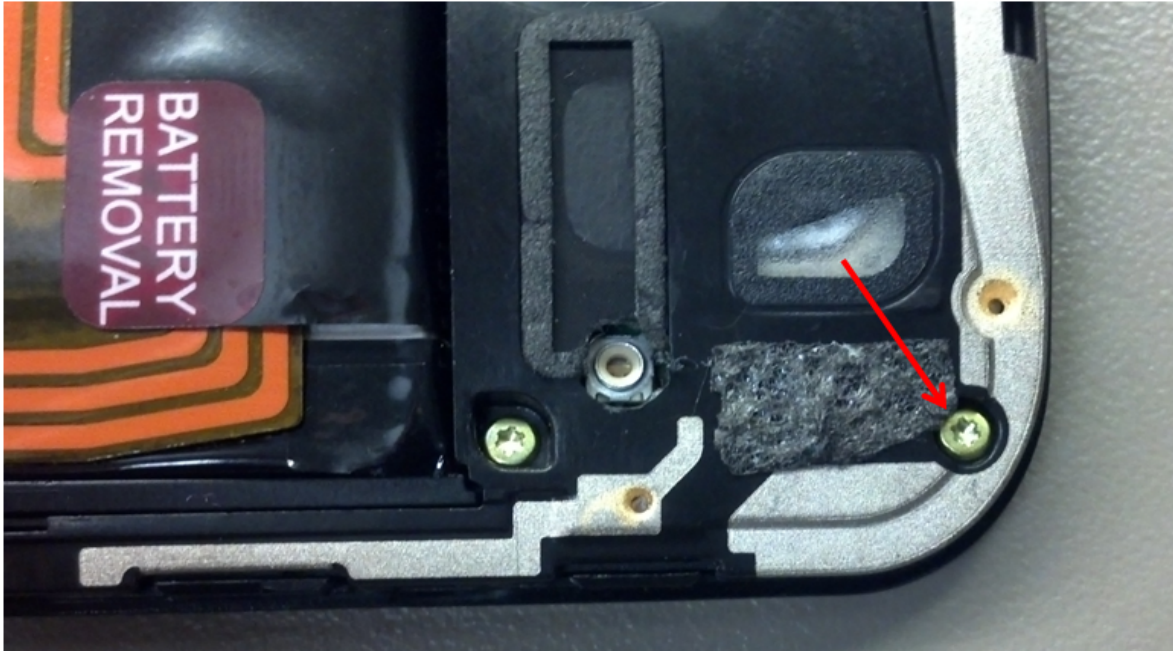


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed

Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

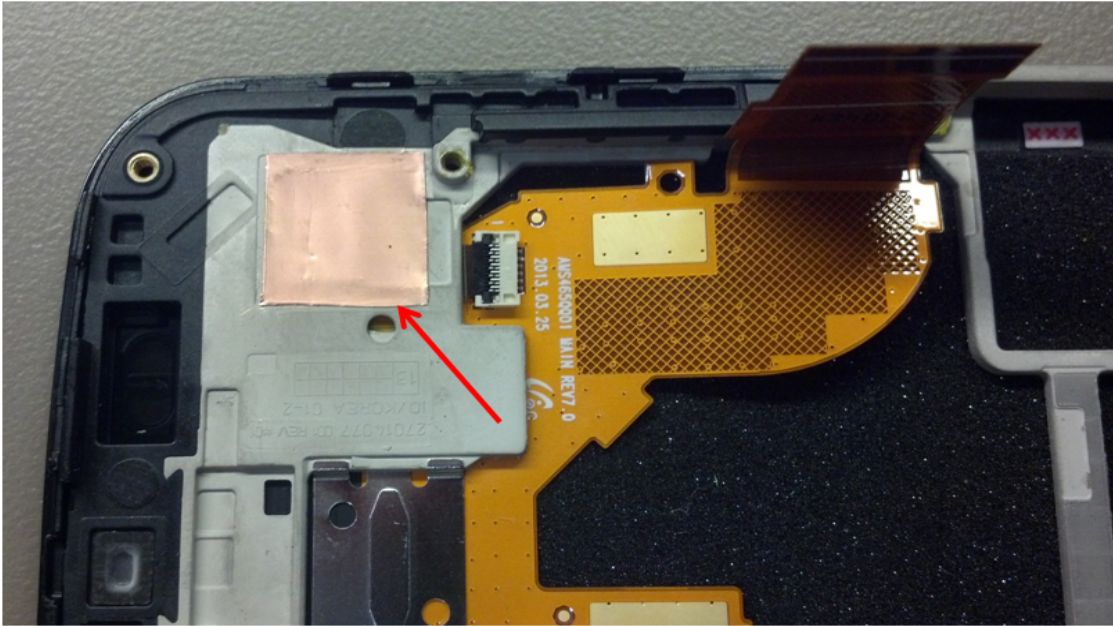


Figure: Copper Tape over Touch IC on Chassis



### **VZW GSM / WCDMA Primary**

If this test fails in factory these are the steps to take

Step 1: Please retest the unit again

Step 2: If failure persists, check if we have the right carrier. The carrier is as shown in figure below

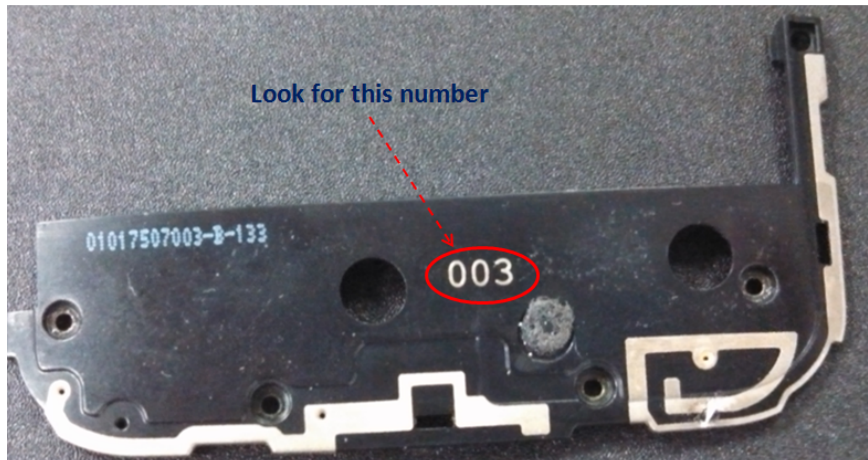
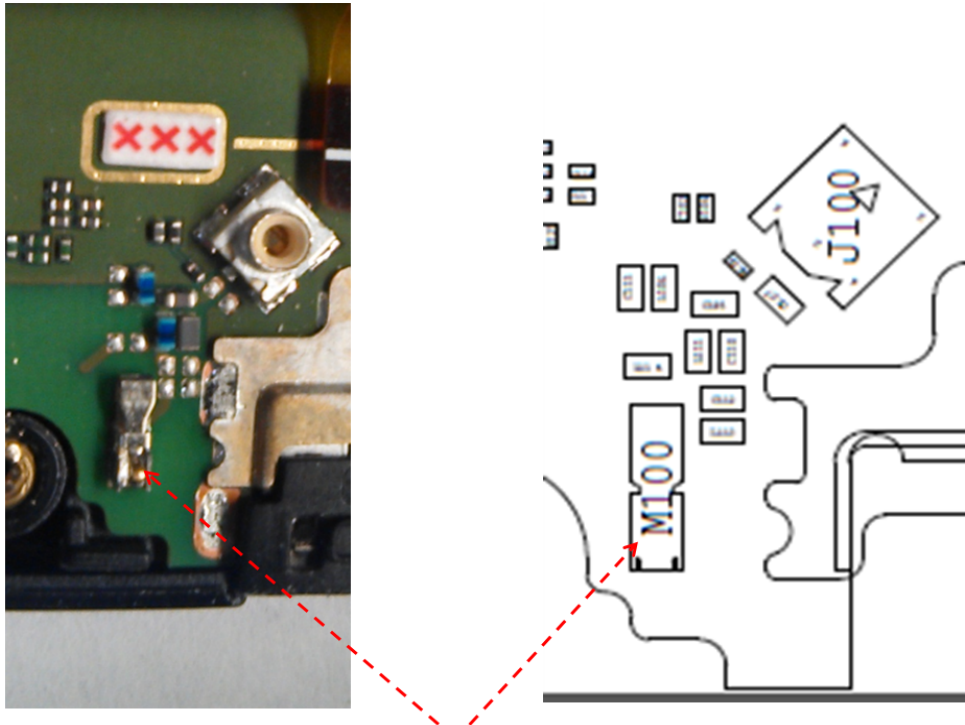


Fig: Carrier

Step 3: if Step 2 does not resolve issue, check if universal contact on the PCB is damaged. Is it touching the antenna pad? If the contact is twisted or not making contact, this is a problem. The contact should look like this picture below:



This is the clip to check

Figure: Antenna clip for WCDMA Antenna

Step 4: If step 3 does not resolve the problem check if components C110 is placed in the circuit

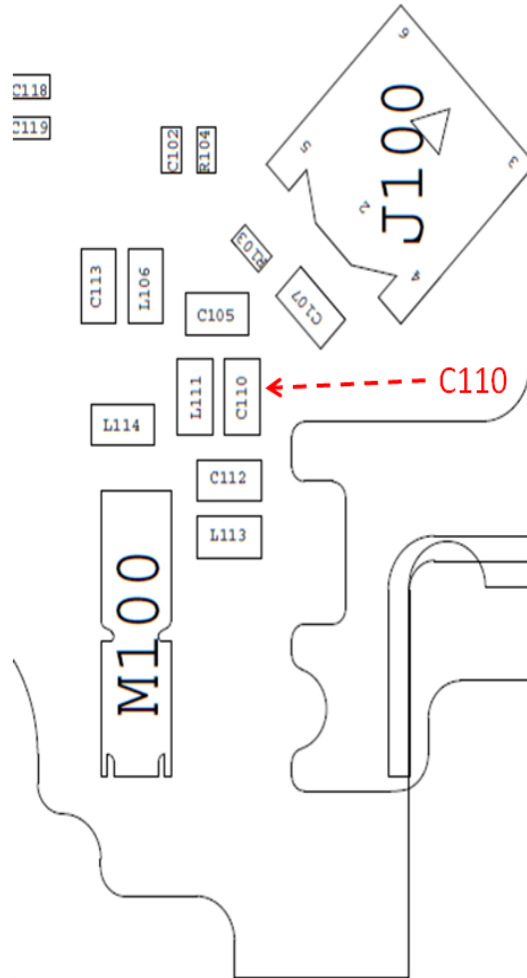
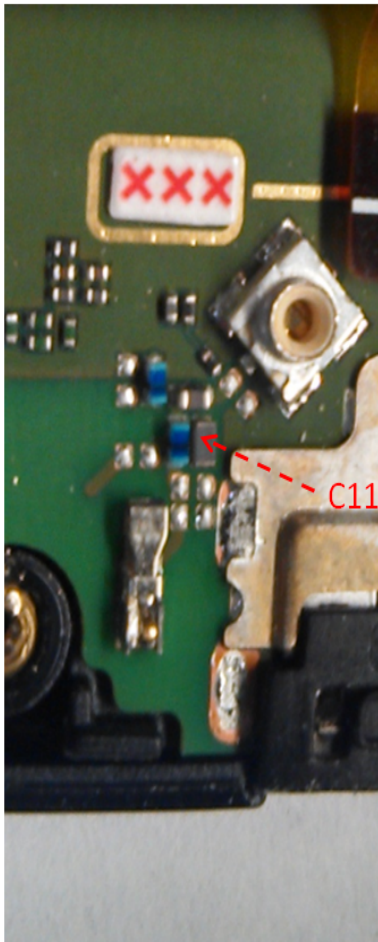


Figure: Component C110

Step 5: If Step 4 does not resolve the problem check if components L111

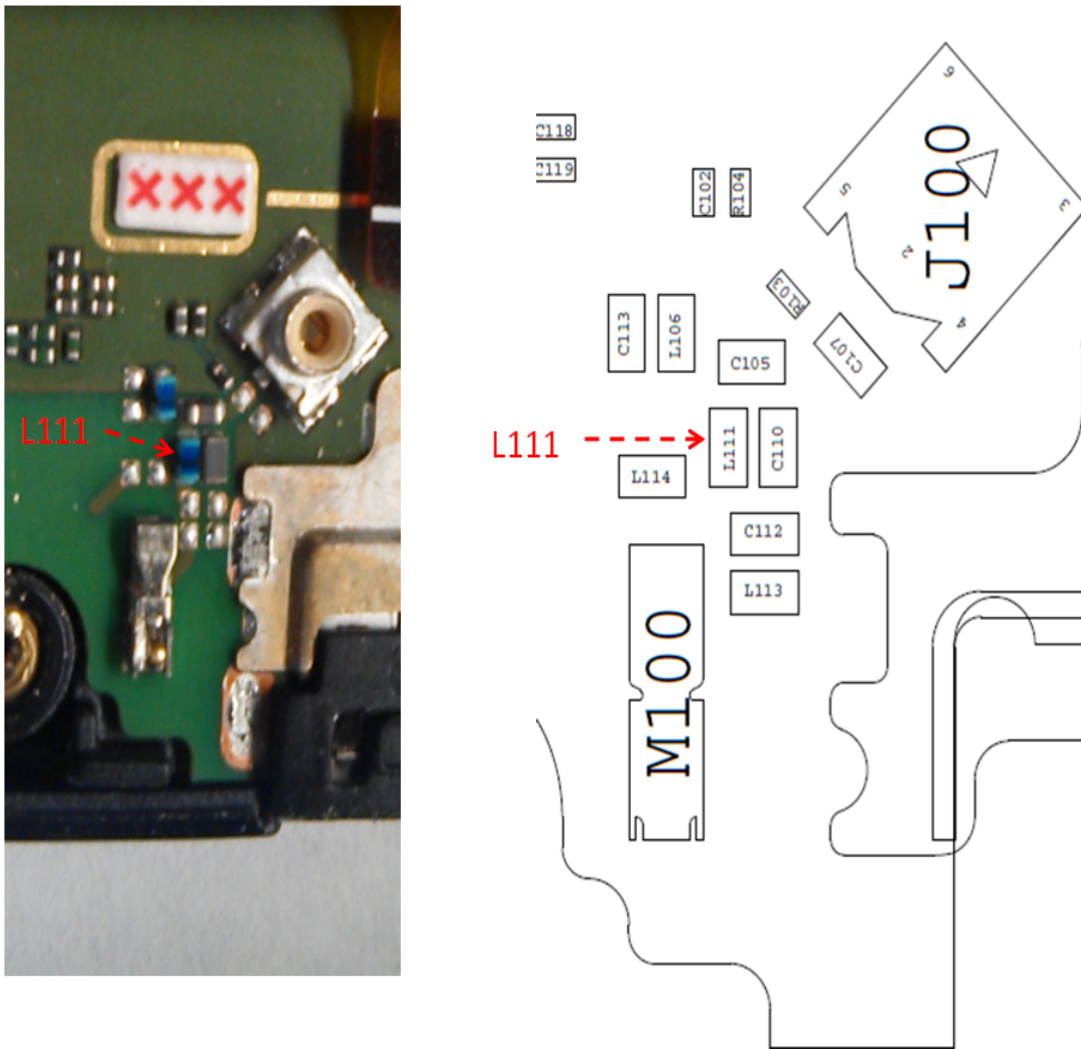


Figure: Component L111

Step 6: If Step 5 does not resolve the problem check if components L106 is placed in the circuit

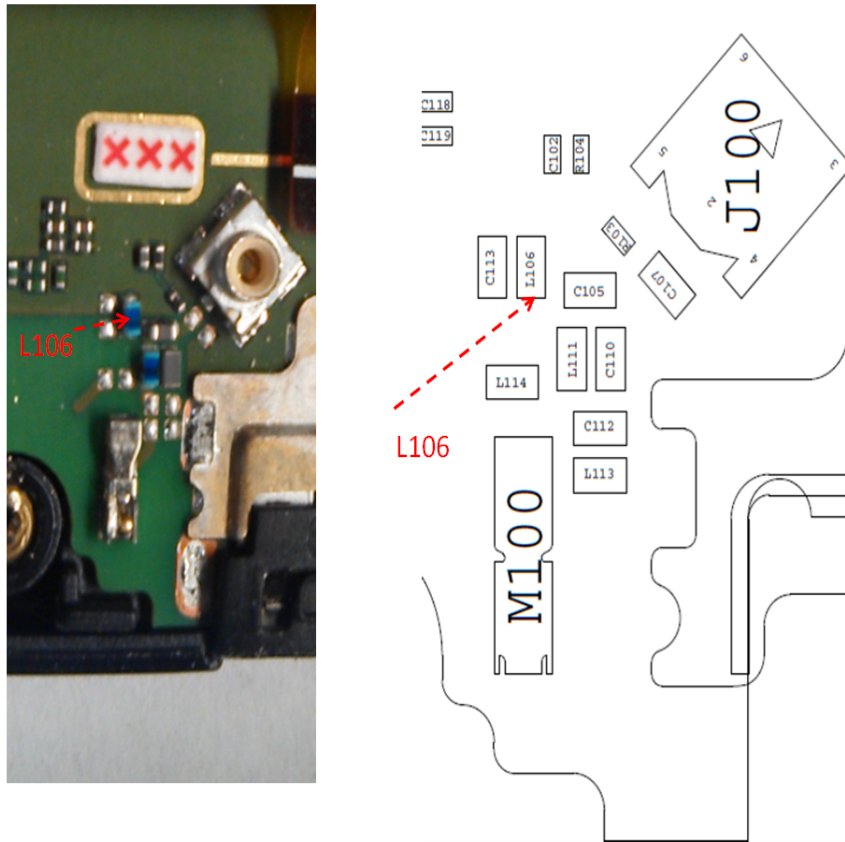
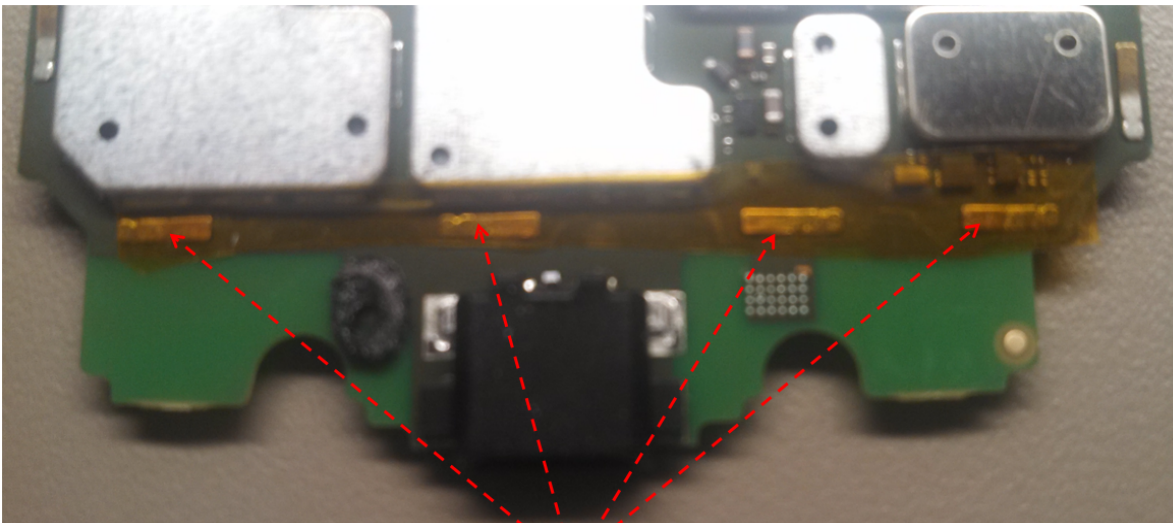


Figure: Component L106



Step 7: If Step 6 does not resolve the problem check if the ground clips are placed on the board



Ground Clips on display side

Figure: Moto X PCB board with ground clips

## Verizon WCDMA Secondary

For factory radiated test failures on the Verizon SKU, for WCDMA Secondary Rx Bands 850, 900, 1900, and 2100, please do the following:

Step 1: Retest the unit.

Step 2: If the failure persists, check the Antenna 3 universal contact, M170. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 3 on the diversity antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M170 and retest.

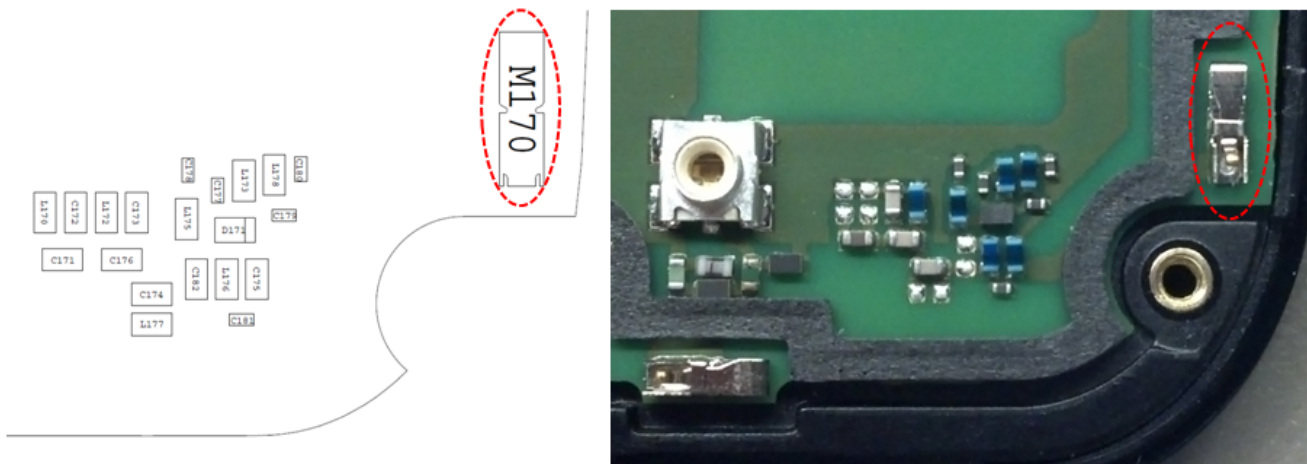


Figure: Antenna 3 Universal Contact

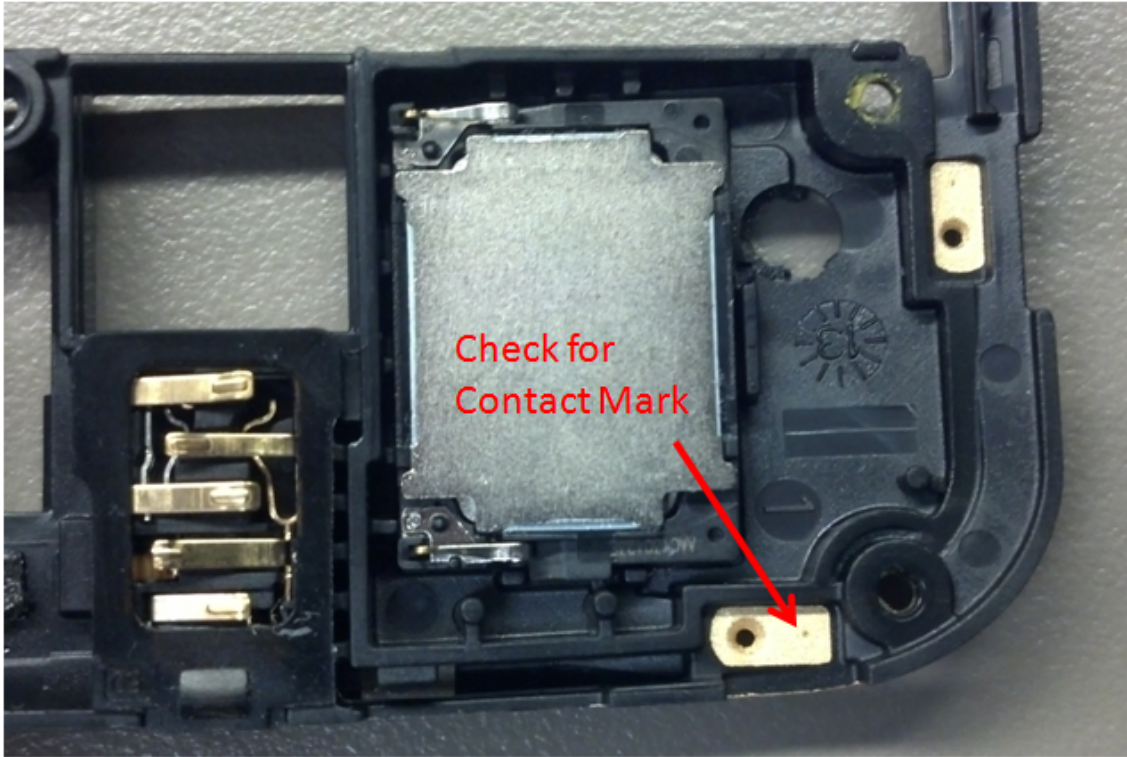


Figure: Contact Pad of Antenna 3

Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, C175, L176, L173, C177, D171, L175, L178, and C179. If any component is missing, misplaced, or damaged, place/replace the part and retest.

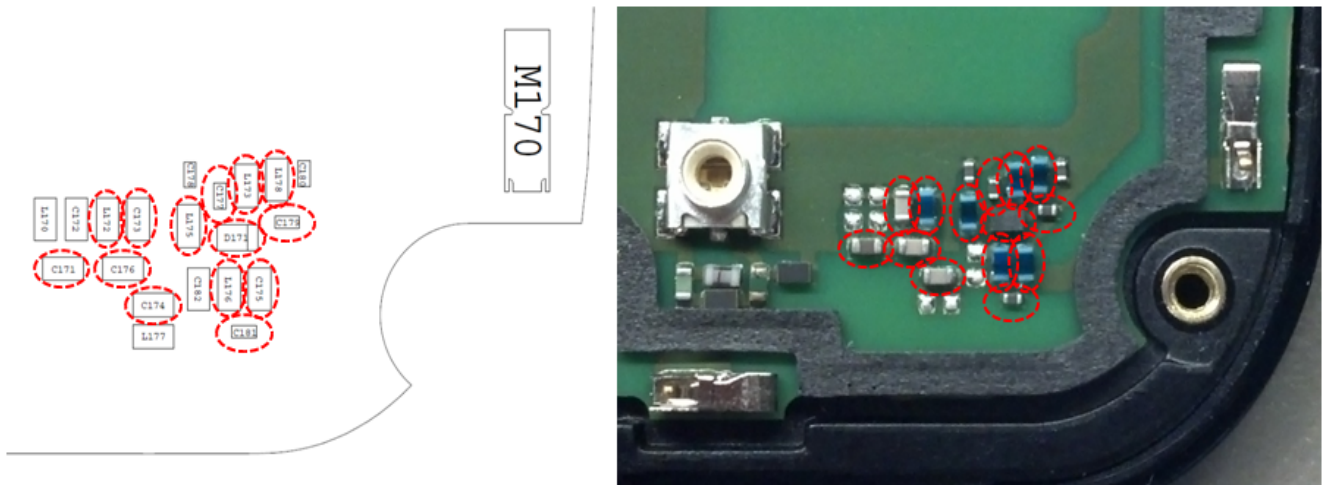


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

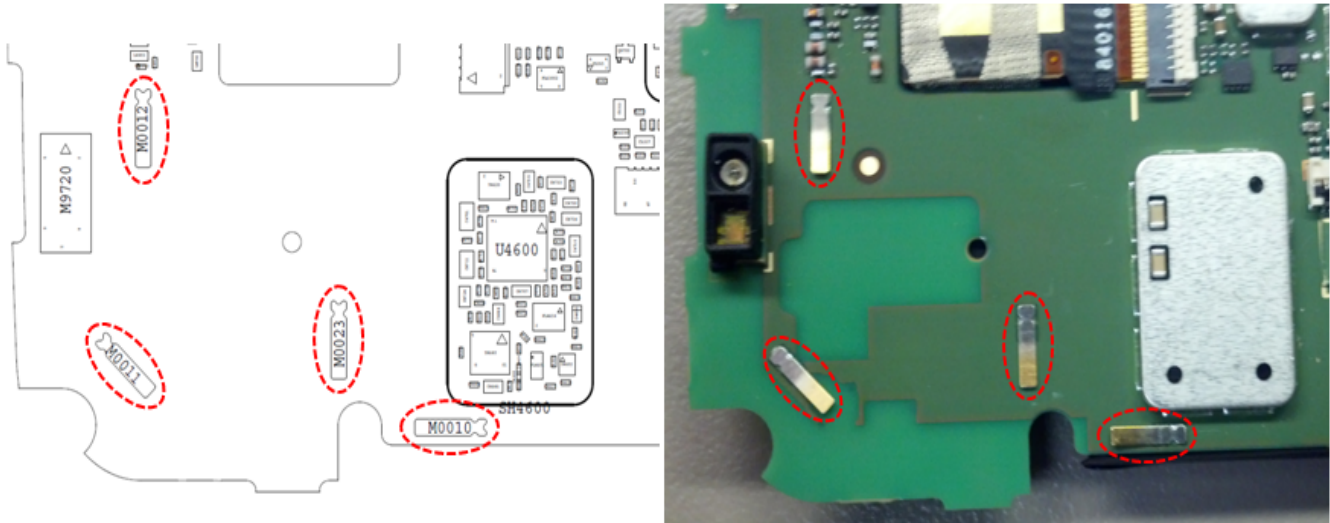


Figure: PCB Grounding Clips Near Antenna 3 Matching



Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

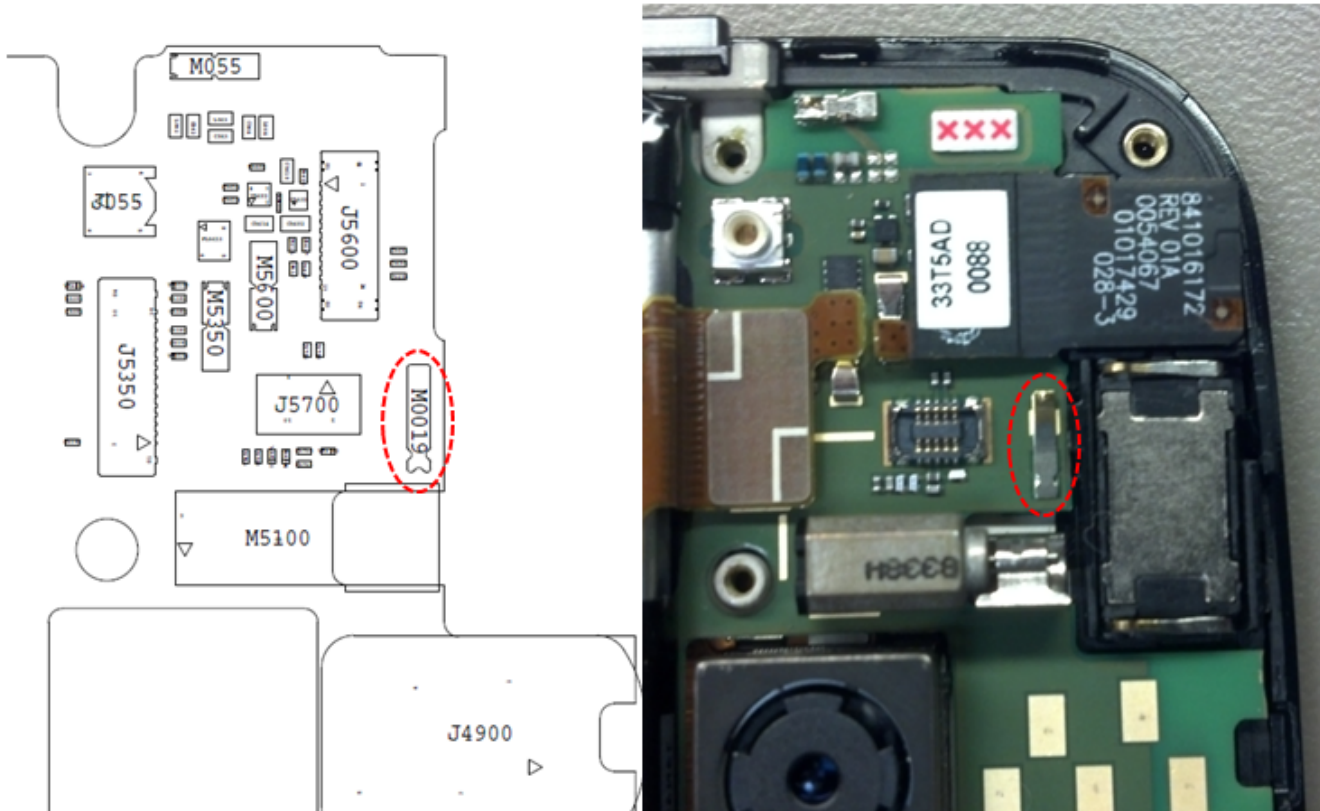


Figure: Grounding Clip Between PCB and Audio Flex Bracket

Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

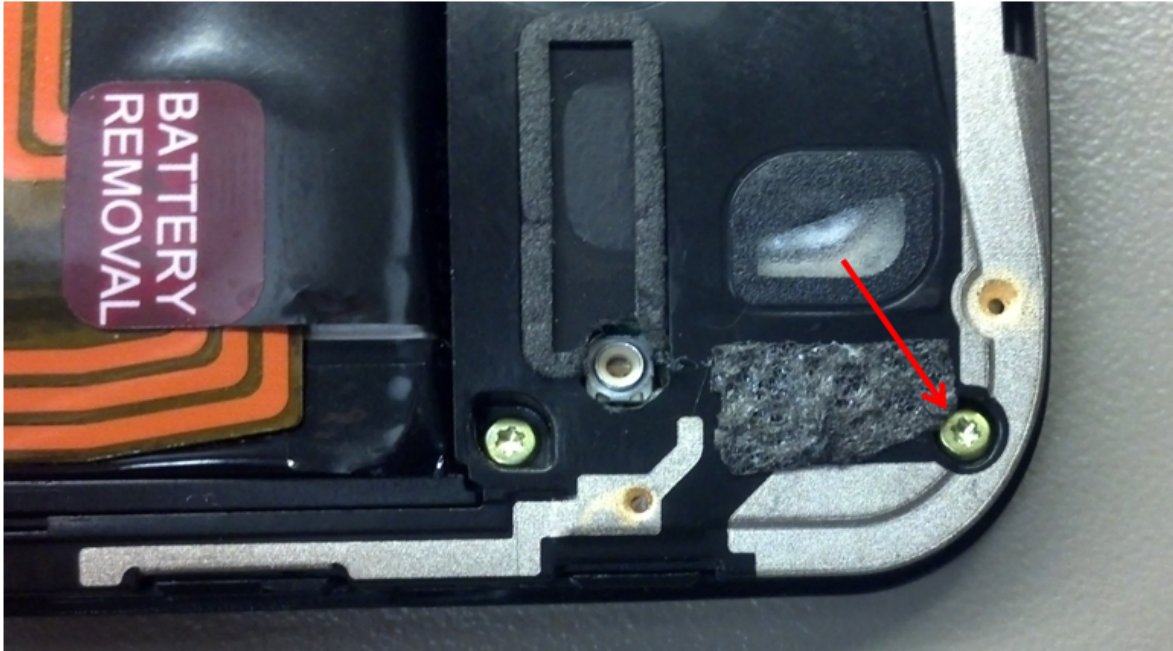


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed

Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

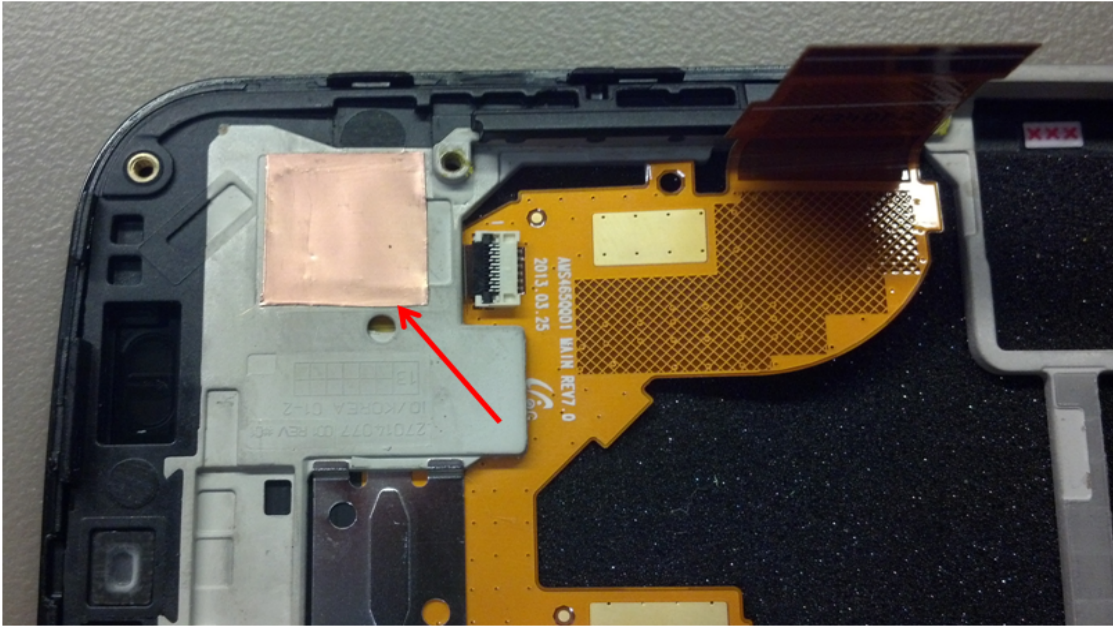


Figure: Copper Tape over Touch IC on Chassis

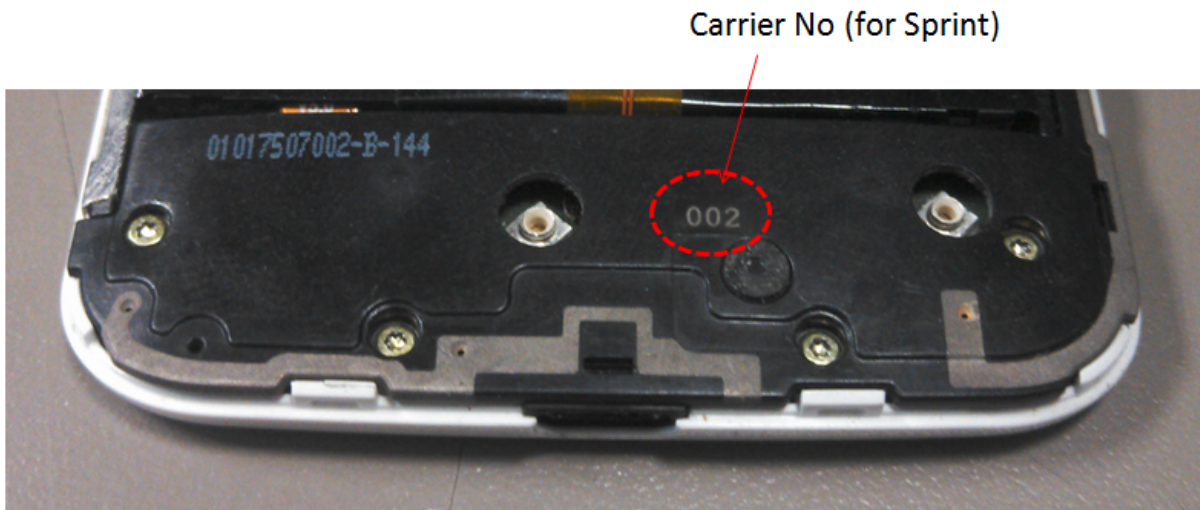
**USC WCDMA Primary:**

**SPRINT WCDMA Primary:**

Please follow the detection scheme shown below to resolve the issue related to SPRINT WCDMA/GSM bands. If one step is not working then go to the next step

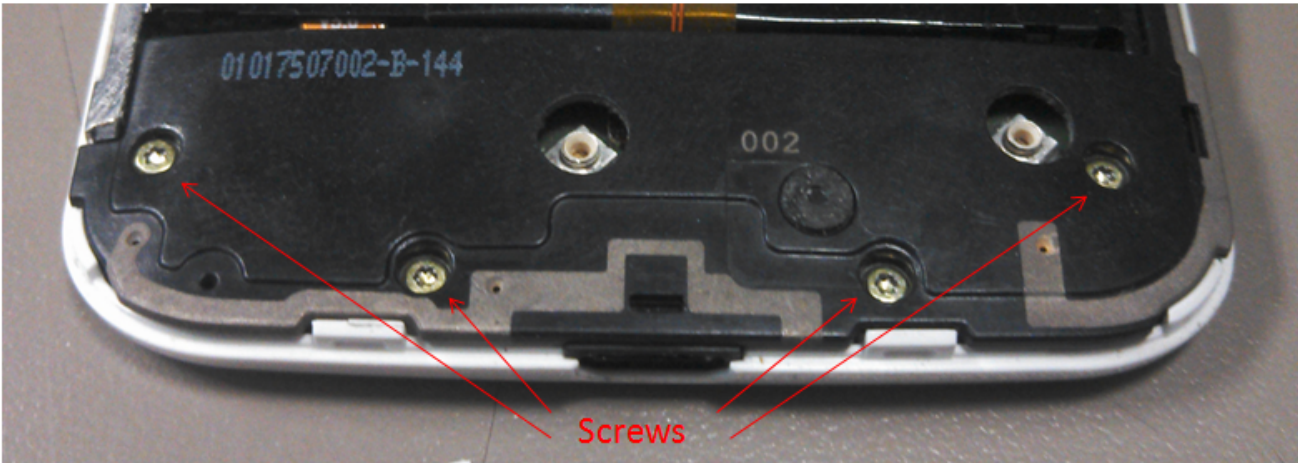
Step 1: Repeat the test. If problem exists, go to the next step.

Step 2: Check if the bottom antenna carrier is for the Sprint or not. If it is Sprint, 002 is printed on the Antenna carrier as shown below:





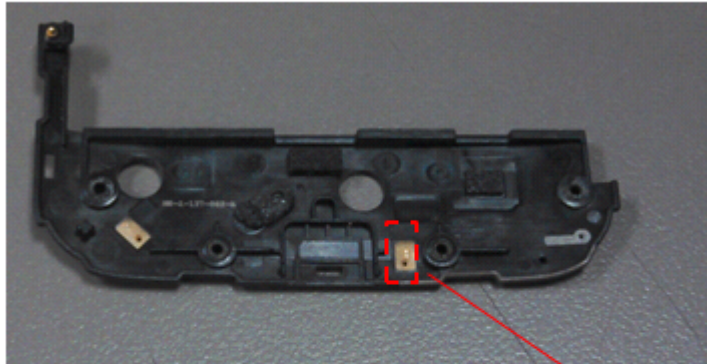
Step 3: Check if all the screws are present or not (see the picture below)



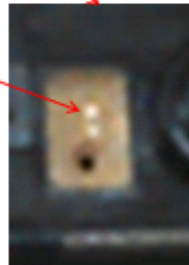




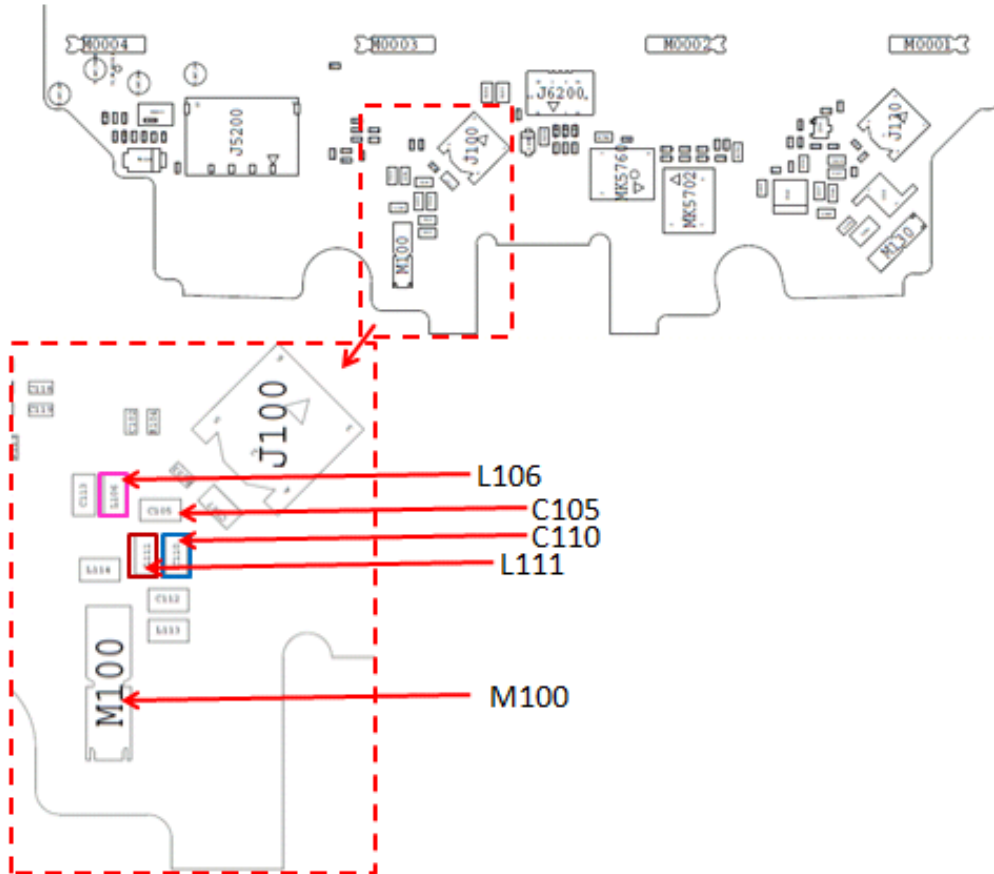
Step 5: Check if the antenna feed for ANT1 is touching the antenna contact or not. The photograph of the antenna feed area is shown below. You cannot see whether it is touching or not, but if the carrier is touching you would see touch mark on the feed of the antenna as shown below:



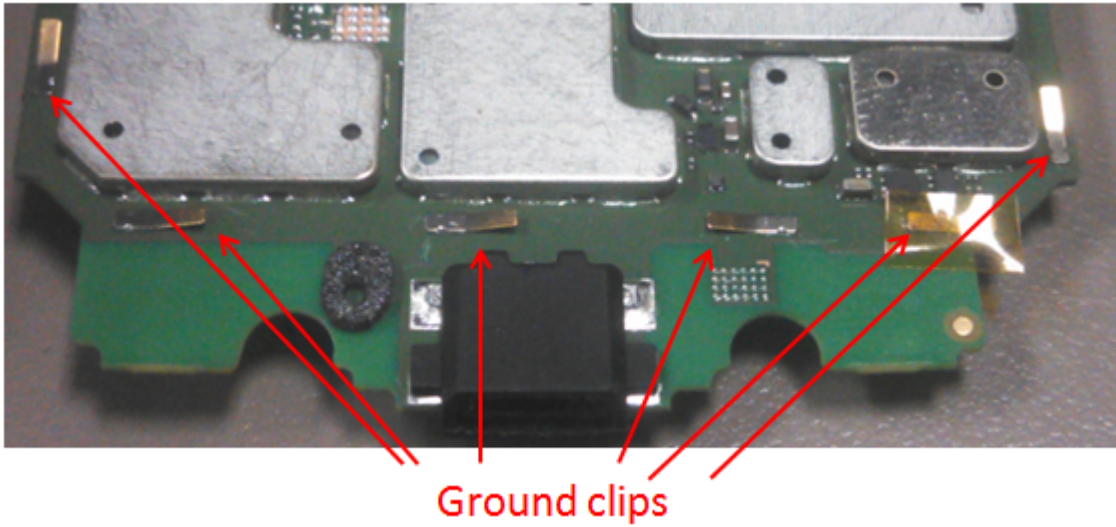
Contact mark



Step 6: Check for the missing, misplaced, crashed parts for the following matching components:



Step 7: Check for the ground clips connecting display bezel to the PCB



## Sprint WCDMA Secondary

For factory radiated test failures on the Sprint SKU, for WCDMA Secondary Rx Bands 1900 and 2100, please do the following:

Step 1: Retest the unit.

Step 2: If the failure persists, check the Antenna 3 universal contact, M170. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 3 on the diversity antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M170 and retest.

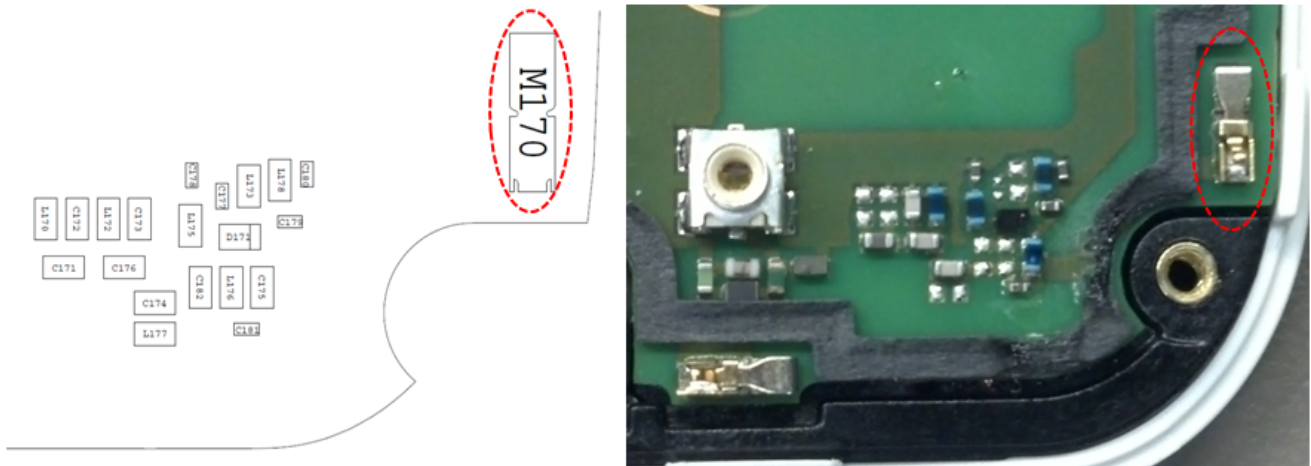


Figure: Antenna 3 Universal Contact



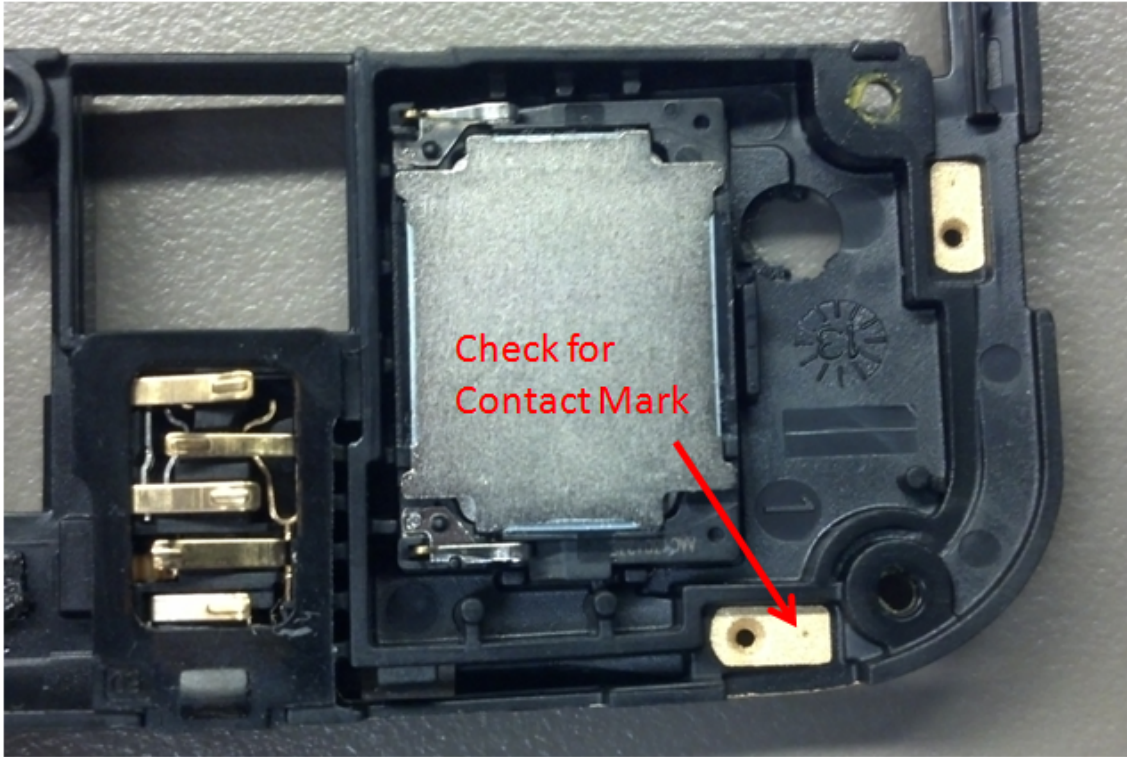


Figure: Contact Pad of Antenna 3

Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, and C175. If any component is missing, misplaced, or damaged, place/replace the part and retest.

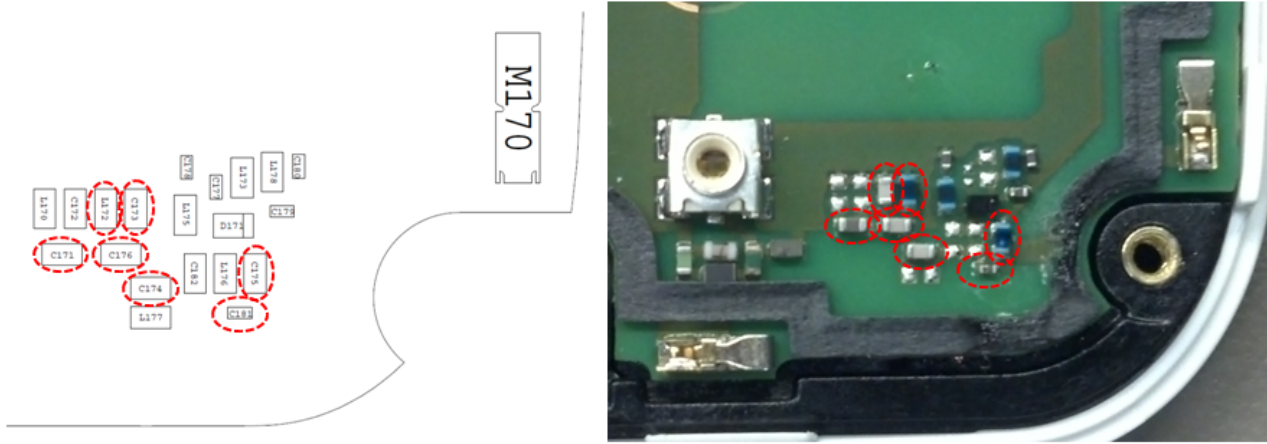


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

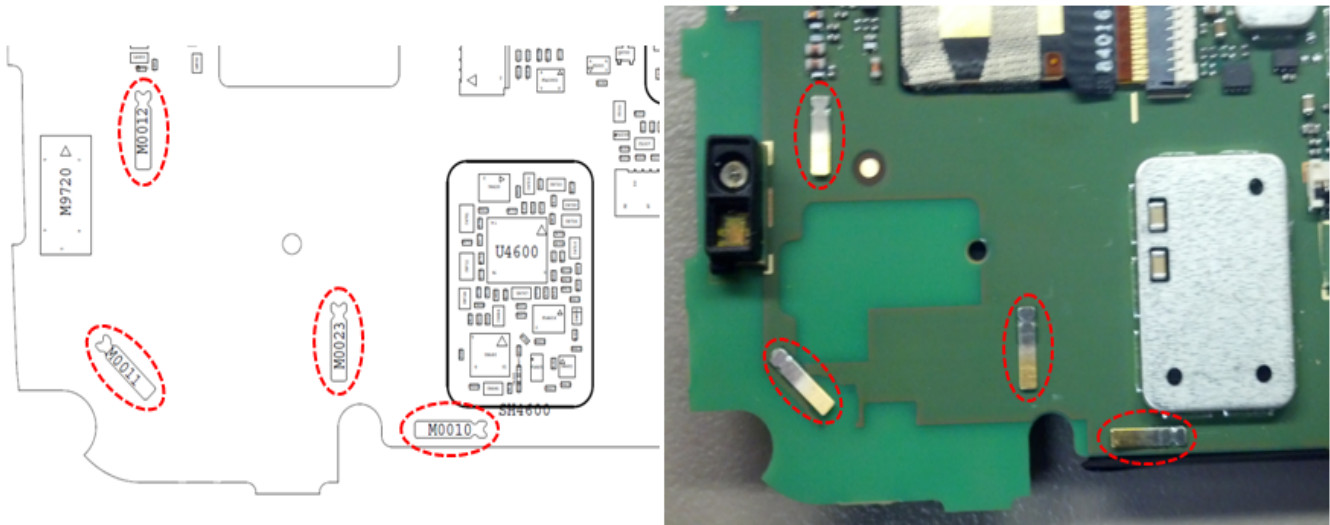


Figure: PCB Grounding Clips Near Antenna 3 Matching

Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

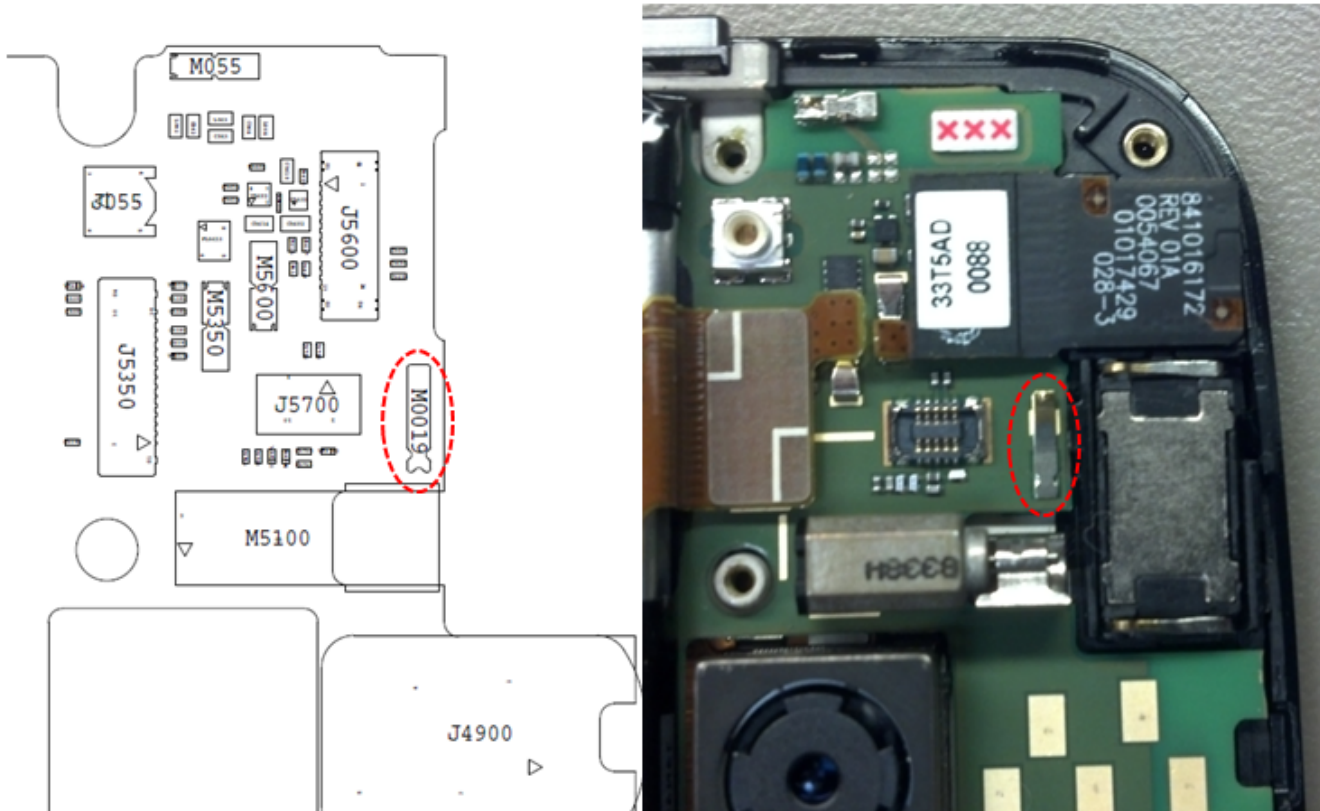


Figure: Grounding Clip Between PCB and Audio Flex Bracket

Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

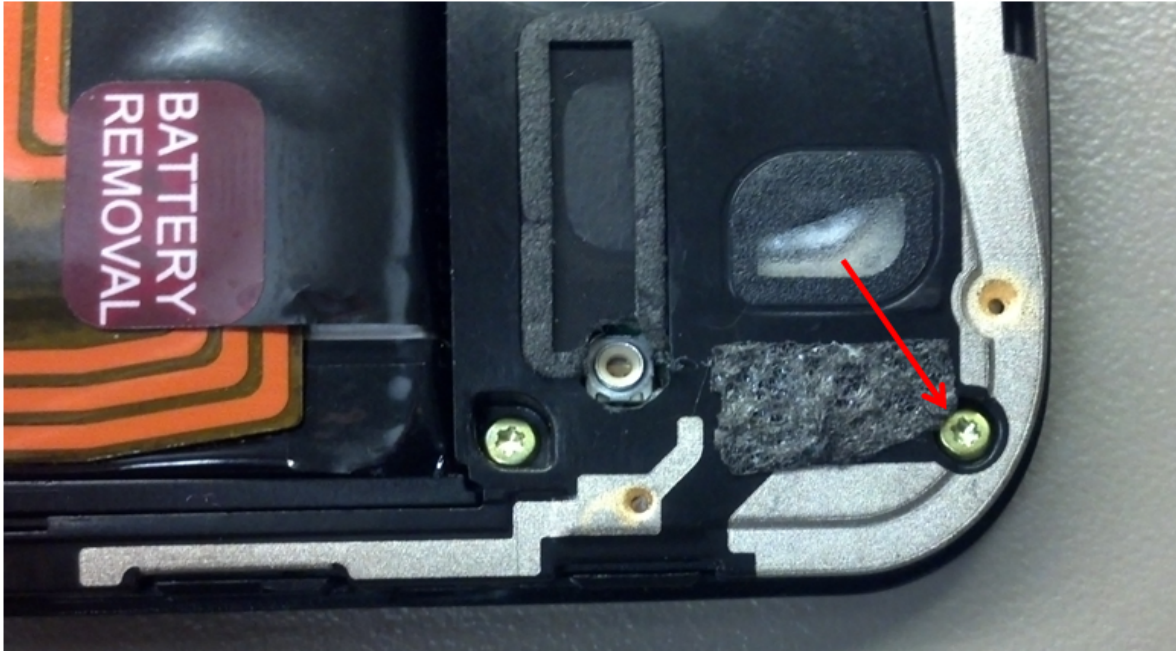


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed



Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

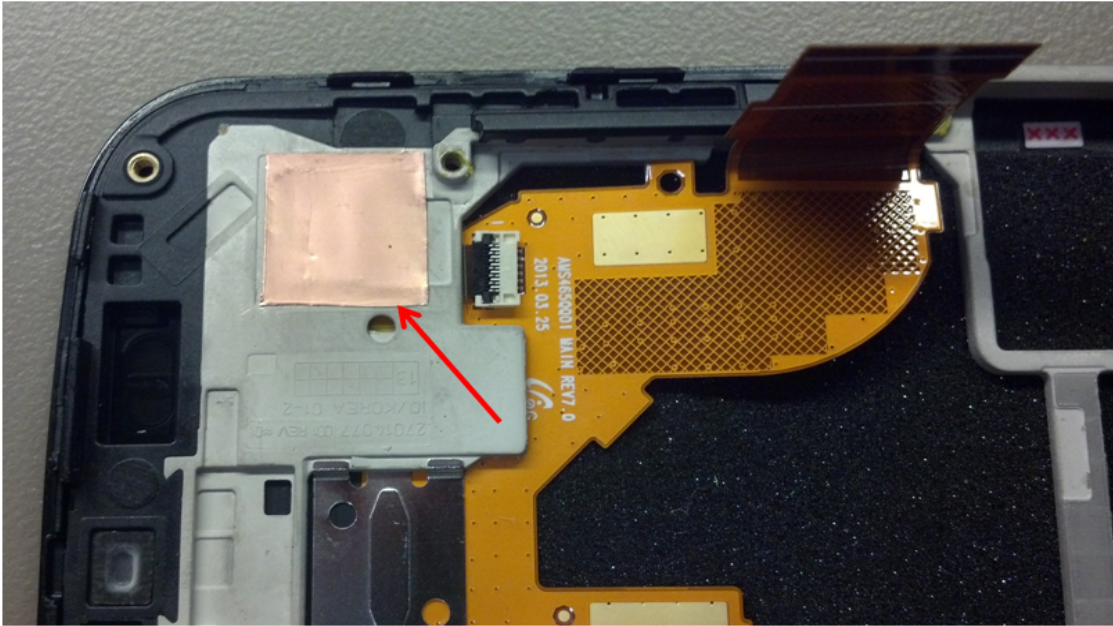


Figure: Copper Tape over Touch IC on Chassis

### **T-Mobile WCDMA Primary**

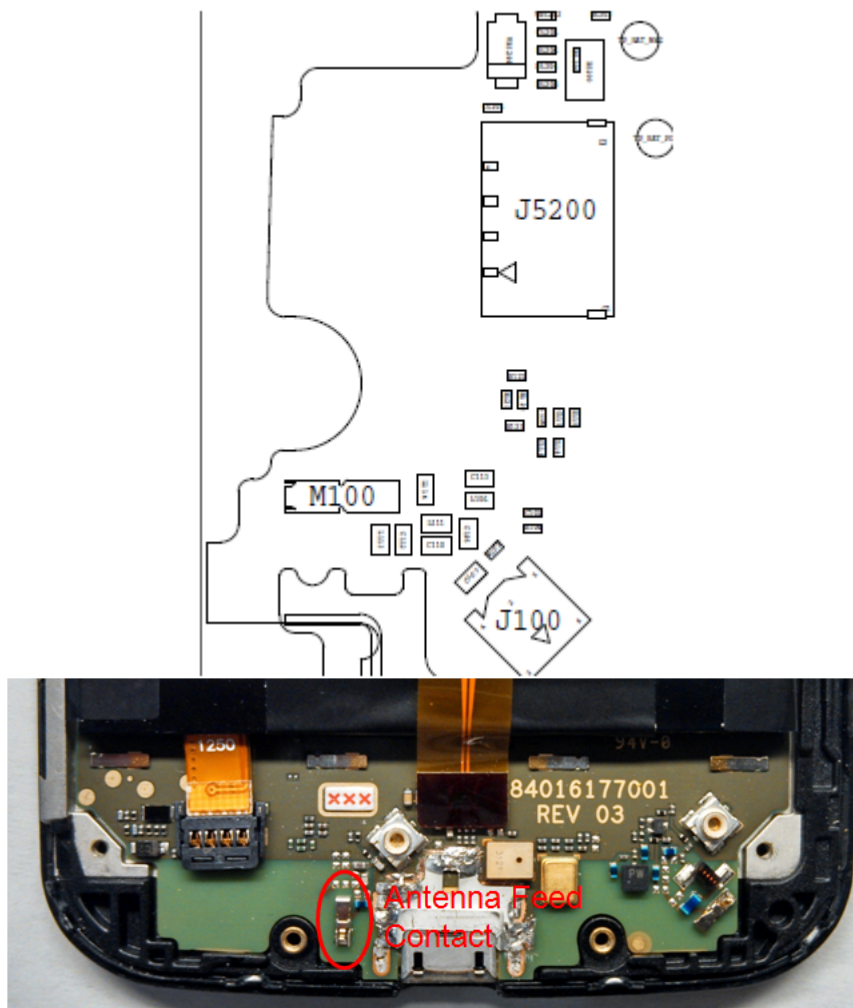
For factory radiated test failures on the T-Mobile SKU, for WCDMA Primary Bands 2, 4, and 5. please do the following:

Step 1: Retest the unit.

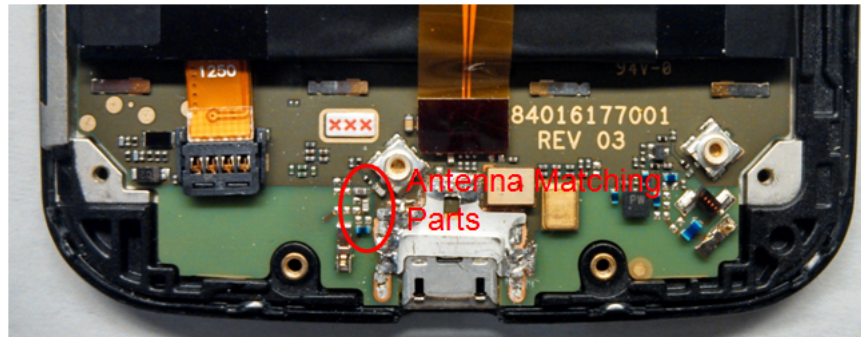
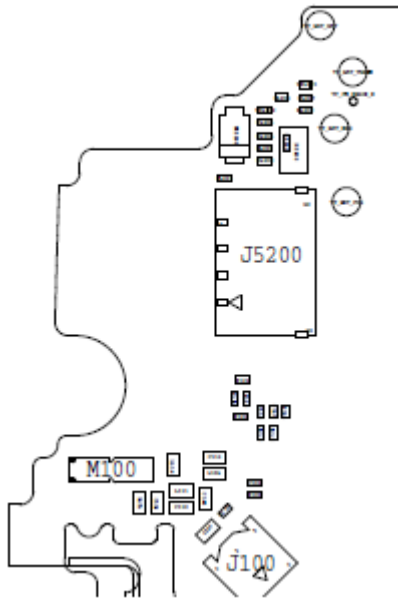
Step 2: Check if the bottom antenna carrier is the correct carrier for TMO. TMO antenna has marking '004' as shown below



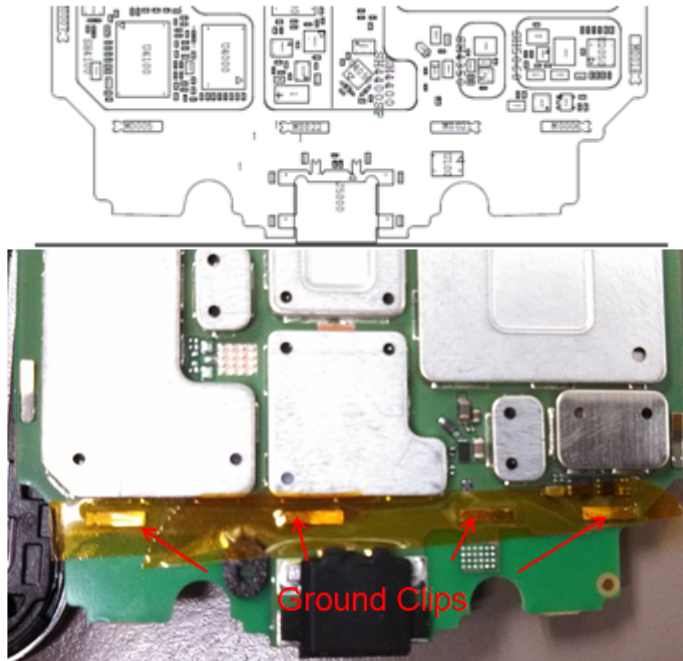
Step 3: If the failure persists, check the Antenna 1 universal contact, M100. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 2 on the main antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M100 and retest.



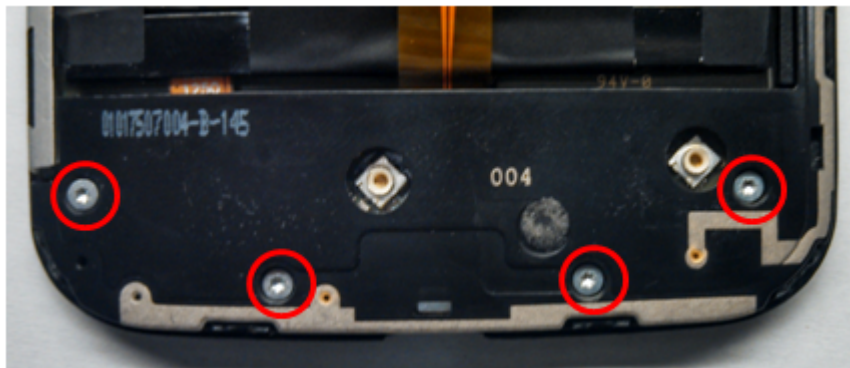
Step 4: If Step 3 does not resolve the issue, check all Antenna 1 matching components L113, C110, C107 and C105. If any component is missing, misplaced, or damaged, place/replace the part and retest.



Step 5: If Step 4 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0005, M0022, M0021, and M0006. If any clip is missing, misplaced, or damaged, place/replace the part and retest.



Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 1 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.





## T-Mobile WCDMA Secondary

For factory radiated test failures on the T-Mobile SKU, for WCDMA Secondary Rx Bands 850, 900, 1700, 1900, and 2100, please do the following:

Step 1: Retest the unit.

Step 2: If the failure persists, check the Antenna 3 universal contact, M170. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 3 on the diversity antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M170 and retest.

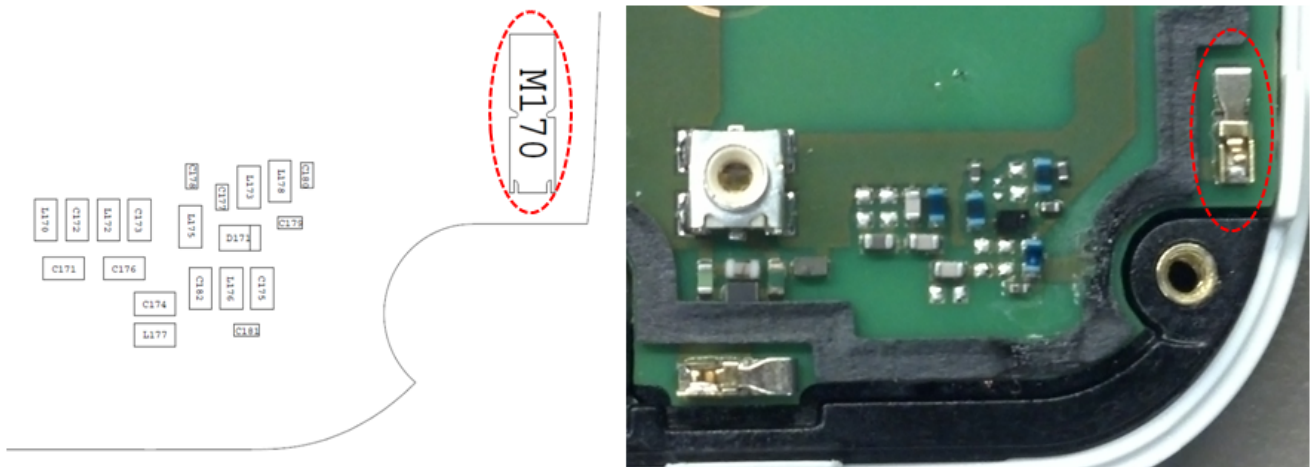


Figure: Antenna 3 Universal Contact

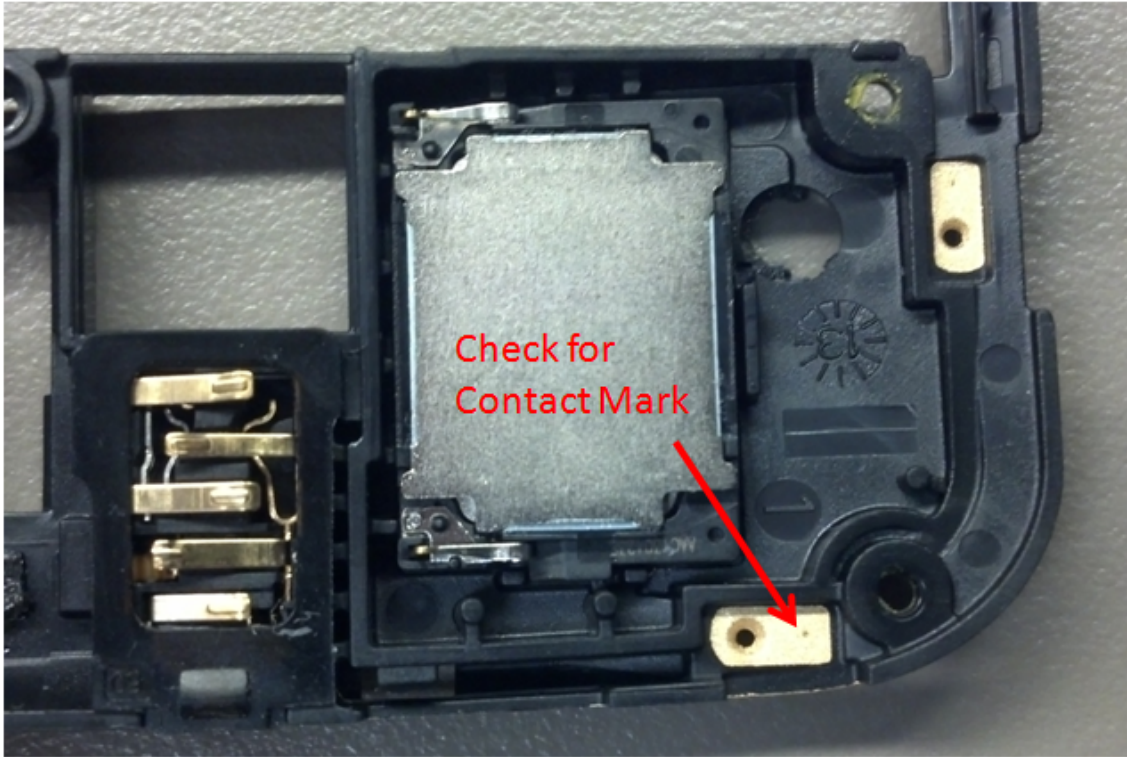


Figure: Contact Pad of Antenna 3

Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, and C175. If any component is missing, misplaced, or damaged, place/replace the part and retest.

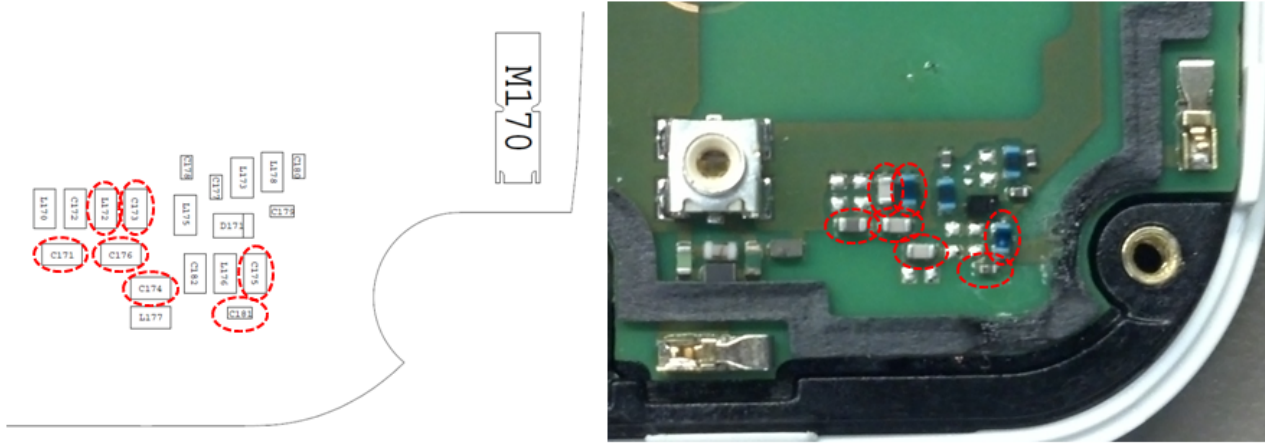


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

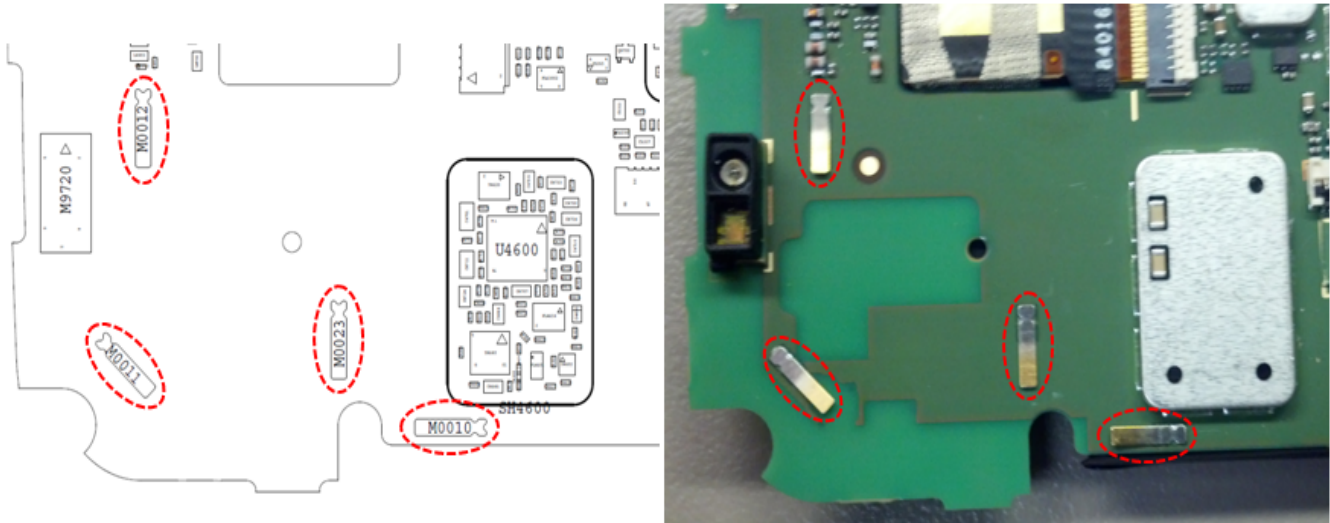


Figure: PCB Grounding Clips Near Antenna 3 Matching

Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

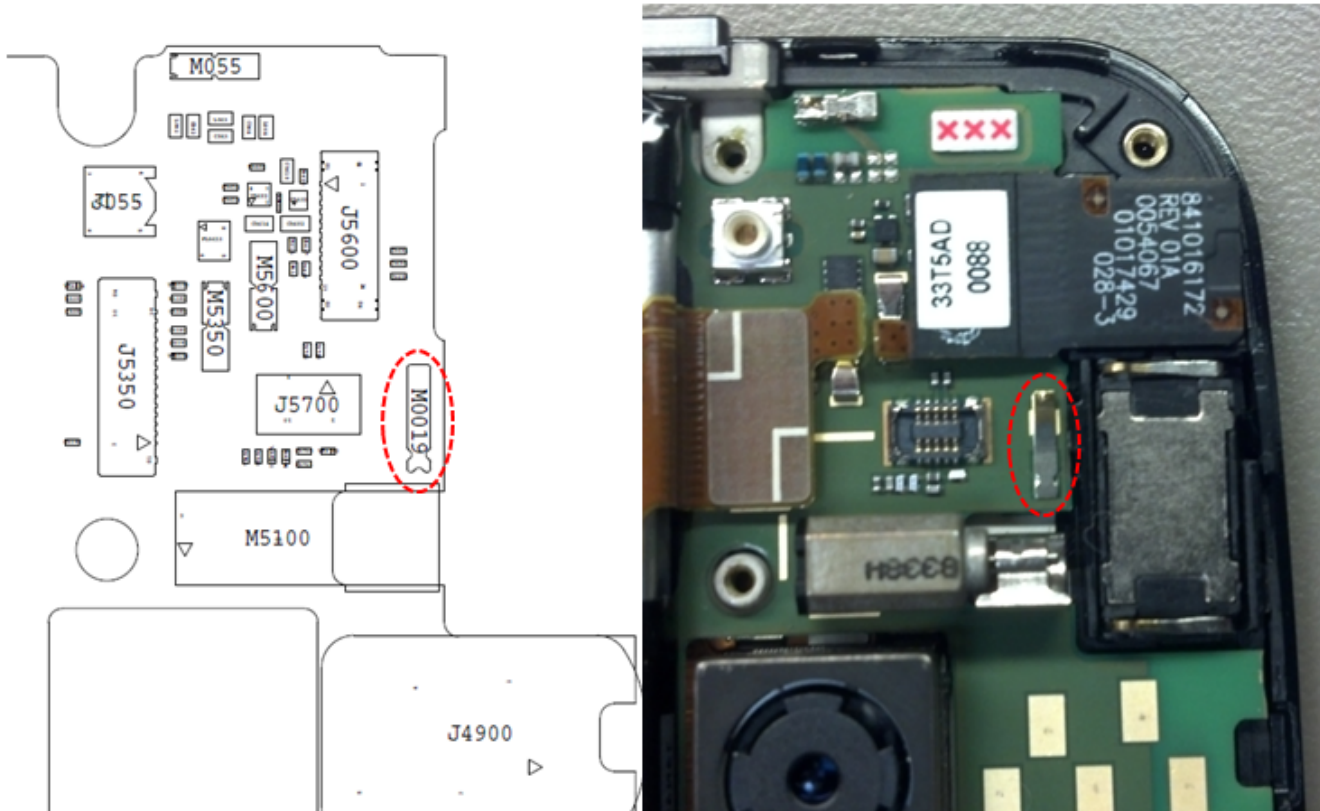


Figure: Grounding Clip Between PCB and Audio Flex Bracket



Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

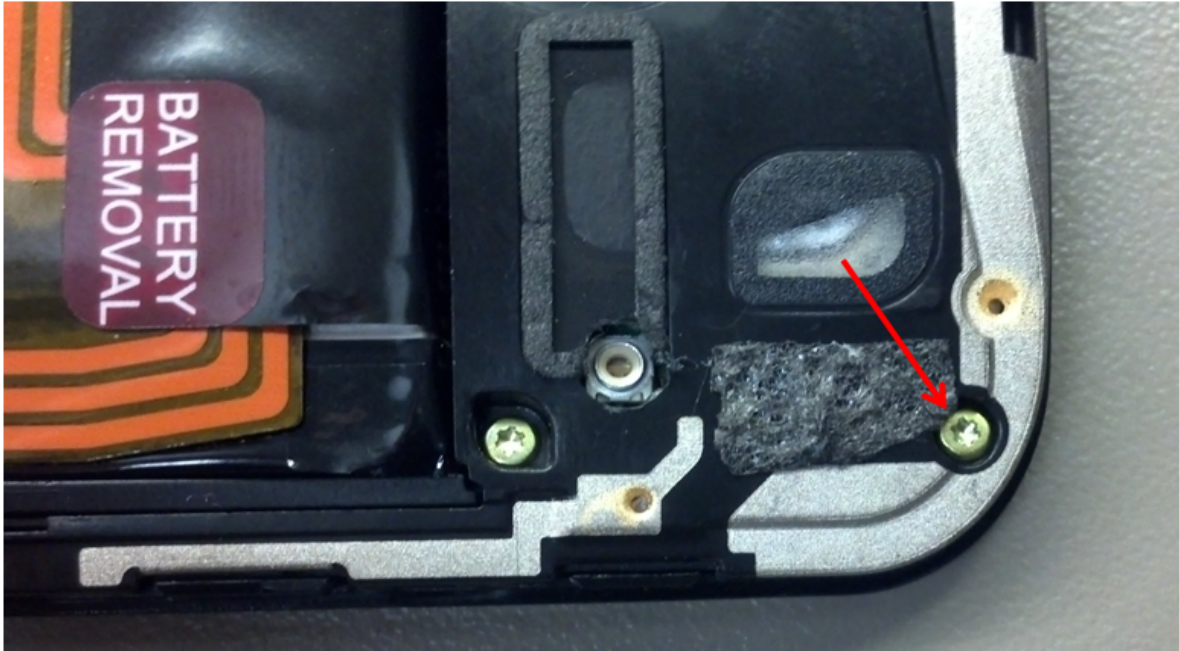


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed

Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

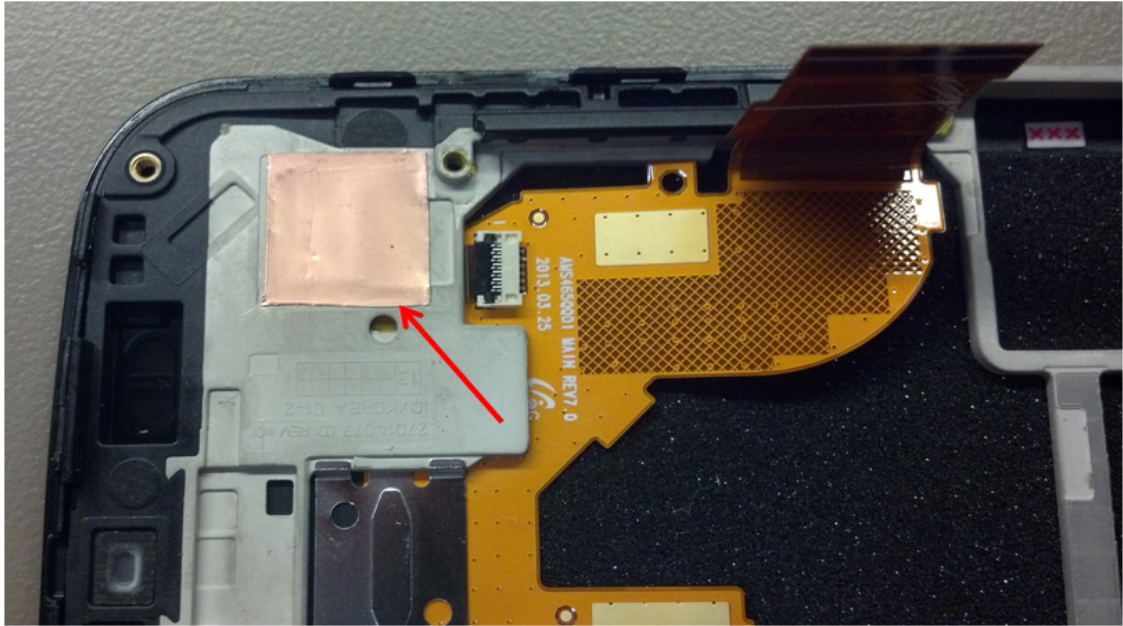


Figure: Copper Tape over Touch IC on Chassis

### 5.1.3 LTE RF Troubleshooting

#### **Objective / Purpose:**

- Studying LTE Band failures and providing procedure for debugging the failures
- The following tests from RADTEST section of the NTF\_Pareto document will be discussed

Here are the various test cases :

For the AT&T SKU Failure List (Primary, C0): [AT&T Primary](#)

- QC\_LTE\_BC17\_C0\_TX\_RAD\_POW\_23780
- QC\_LTE\_BC7\_C0\_RX\_RAD\_RSSI\_HCH3400

For the AT&T SKU Failure List (Secondary, C1): [AT&T Secondary](#)

- QC\_LTE\_BC2\_C1\_RX\_RAD\_RSSI\_LCH650
- QC\_LTE\_BC2\_C1\_RX\_RAD\_RSSI\_HCH1150 SW see
- QC\_LTE\_BC4\_C1\_RX\_RAD\_RSSI\_LCH2000
- QC\_LTE\_BC4\_C1\_RX\_RAD\_RSSI\_HCH2350
- QC\_LTE\_BC5\_C1\_RX\_RAD\_RSSI\_LCH2450
- QC\_LTE\_BC5\_C1\_RX\_RAD\_RSSI\_HCH2600
- QC\_LTE\_BC7\_C1\_RX\_RAD\_RSSI\_LCH2800
- QC\_LTE\_BC7\_C1\_RX\_RAD\_RSSI\_HCH3400
- QC\_LTE\_BC17\_C1\_RX\_RAD\_RSSI\_LCH5780
- QC\_LTE\_BC17\_C1\_RX\_RAD\_RSSI\_HCH5800

For the Verizon SKU Failure List (Primary, C0): [Verizon Primary](#)

- QC\_LTE\_BC13\_C0\_Rx\_RAD\_RSSI\_LCH5184
- QC\_LTE\_BC13\_C0\_RX\_RAD\_RSSI\_HCH5268
- QC\_LTE\_BC13\_C0\_TX\_RAD\_POW\_23230

- QC\_LTE\_BC04\_C0\_TX\_RAD\_POW\_20350
- QC\_LTE\_BC04\_C0\_TX\_RAD\_POW\_20000

For the Verizon SKU Failure List (Secondary, C1): [Verizon Secondary](#)

- QC\_LTE\_BC4\_C1\_RX\_RAD\_RSSI\_LCH2000
- QC\_LTE\_BC4\_C1\_RX\_RAD\_RSSI\_HCH2350
- QC\_LTE\_BC13\_C1\_RX\_RAD\_RSSI\_LCH5184
- QC\_LTE\_BC13\_C1\_RX\_RAD\_RSSI\_HCH5268

For the USC SKU Failure List (Primary, C0): [US Cellular Primary](#)

- QC\_LTE\_BC04\_C0\_TX\_RAD\_POW\_20000
- QC\_LTE\_BC04\_C0\_TX\_RAD\_POW\_20350
- QC\_LTE\_BC05\_C0\_TX\_RAD\_POW\_20450
- QC\_LTE\_BC05\_C0\_TX\_RAD\_POW\_20600
- QC\_LTE\_BC05\_C0\_TX\_RAD\_POW\_23060
- QC\_LTE\_BC12\_C0\_TX\_RAD\_POW\_23130
- QC\_LTE\_BC12\_C0\_RX\_RAD\_RSSI\_HCH5130
- QC\_LTE\_BC12\_C0\_RX\_RAD\_RSSI\_LCH5060
- QC\_LTE\_BC5\_C0\_RX\_RAD\_RSSI\_HCH2600
- QC\_LTE\_BC5\_C0\_RX\_RAD\_RSSI\_LCH2450

For the USC SKU Failure List (Secondary, C1): [US Cellular Secondary](#)

- QC\_LTE\_BC4\_C1\_RX\_RAD\_RSSI\_LCH2000
- QC\_LTE\_BC4\_C1\_RX\_RAD\_RSSI\_HCH2350
- QC\_LTE\_BC5\_C1\_RX\_RAD\_RSSI\_LCH2450
- QC\_LTE\_BC5\_C1\_RX\_RAD\_RSSI\_HCH2600
- QC\_LTE\_BC12\_C1\_RX\_RAD\_RSSI\_LCH5060
- QC\_LTE\_BC12\_C1\_RX\_RAD\_RSSI\_HCH5130



For the Sprint SKU Failure List (Primary, C0): [SPRINT Primary](#)

L250PCFC QC\_LTE\_BC25\_C0\_TX\_RAD\_POW\_26090  
L250PDAG QC\_LTE\_BC25\_C0\_TX\_RAD\_POW\_26090  
LP0RMBP4 QC\_LTE\_BC25\_C0\_RX\_RAD\_RSSI\_LCH\_8090  
LP0RMCK8 QC\_LTE\_BC25\_C0\_RX\_RAD\_RSSI\_HCH\_8640

For the T-Mobile SKU Failure List (Secondary, C1): [T-Mobile Secondary](#)

- QC\_LTE\_BC2\_C1\_RX\_RAD\_RSSI\_LCH650
- QC\_LTE\_BC2\_C1\_RX\_RAD\_RSSI\_HCH1150
- QC\_LTE\_BC4\_C1\_RX\_RAD\_RSSI\_LCH2000
- QC\_LTE\_BC4\_C1\_RX\_RAD\_RSSI\_HCH2350
- QC\_LTE\_BC17\_C1\_RX\_RAD\_RSSI\_LCH5780
- QC\_LTE\_BC17\_C1\_RX\_RAD\_RSSI\_HCH5800



### **ATT LTE Primary**

For factory radiated test failure on AT&T SKU at LTE bands B17 and B7, please do the following:

Step 1: Retest

Step 2: If retest does not pass, check if the unit has correct bottom antenna carrier. The AT&T bottom antenna carrier should look like following:



Fig: Moto X Americas Bottom Antenna Carrier

Step 3: if Step 2 does not resolve issue, check if universal contact (RefDes = M130) on the PCB is damaged. Is it touching the antenna pad? If the universal clip is twisted or not making contact, this needs to be replaced :

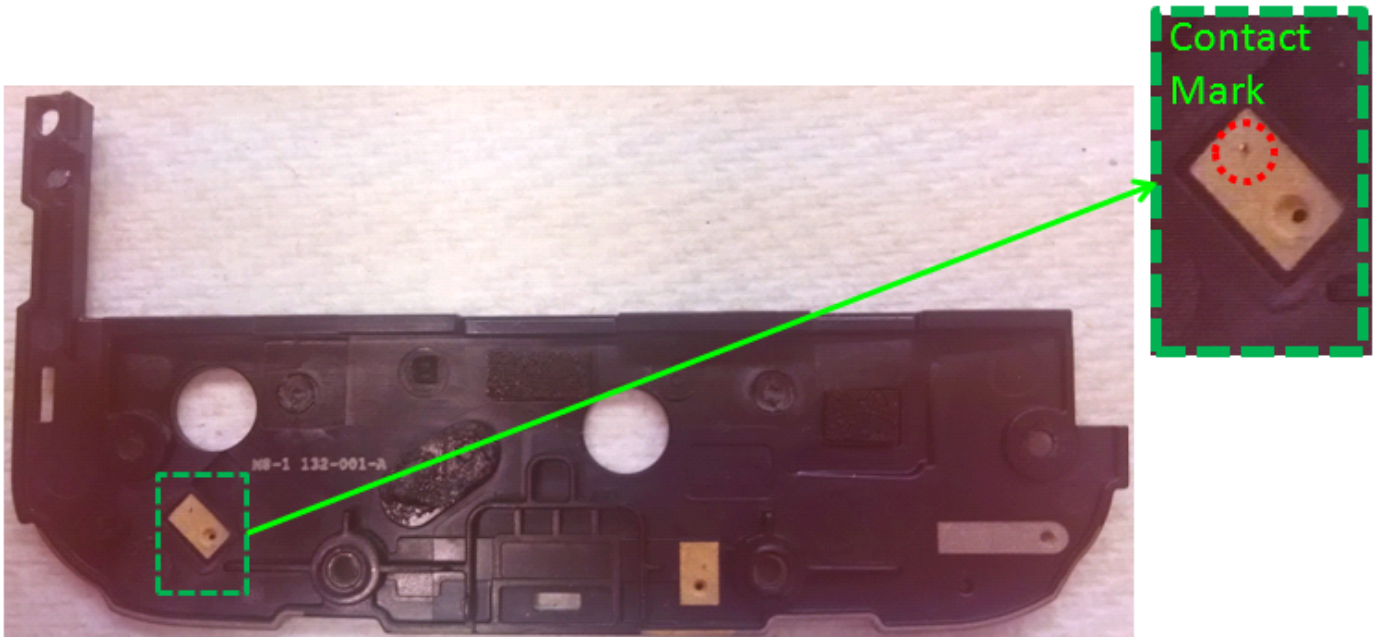


Figure: Contact marks visible on feeding pad from universal clip for LTE B17 Antenna

Step 4: If Step 3 does not resolve the problem check if components RefDes = L140, L150 and L138 are placed correctly on PCB

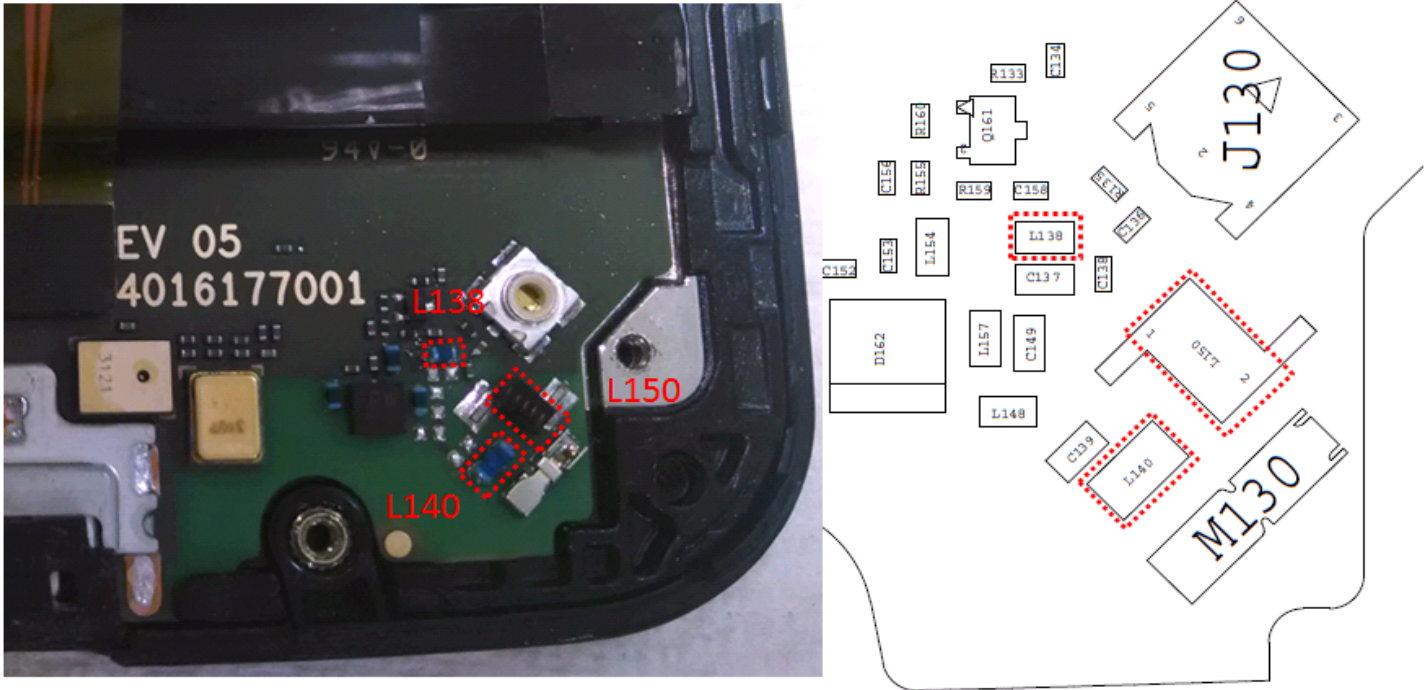


Figure: Antenna matching components and universal clip for LTE B17 Antenna

## AT&T LTE Secondary

For factory radiated test failures on the AT&T SKU, for LTE Secondary Rx Bands 2, 4, 5, and 17, please do the following:

Step 1: Retest the unit.

Step 2: If the failure persists, check the Antenna 3 universal contact, M170. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 3 on the diversity antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M170 and retest.

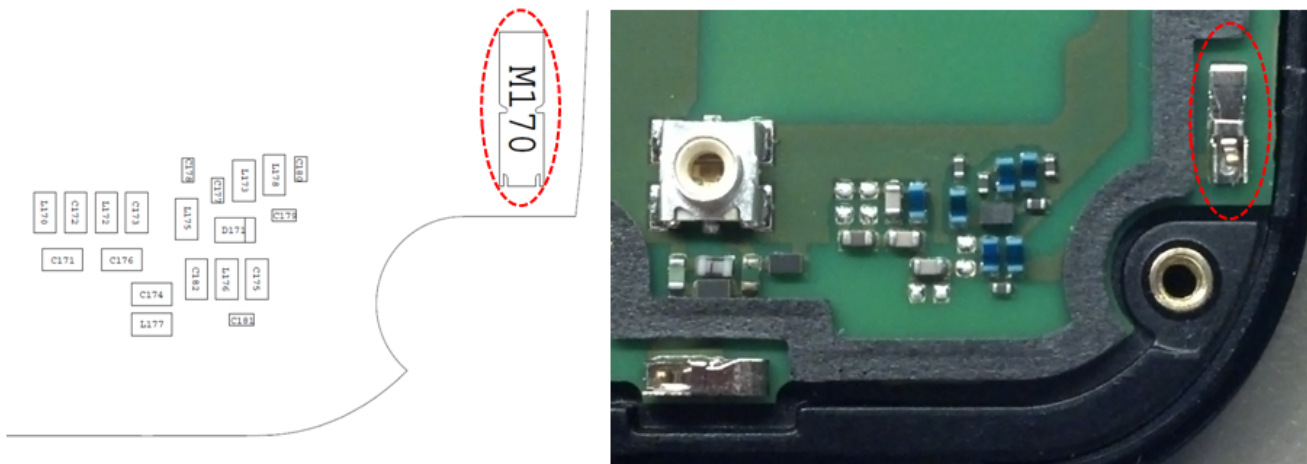


Figure: Antenna 3 Universal Contact



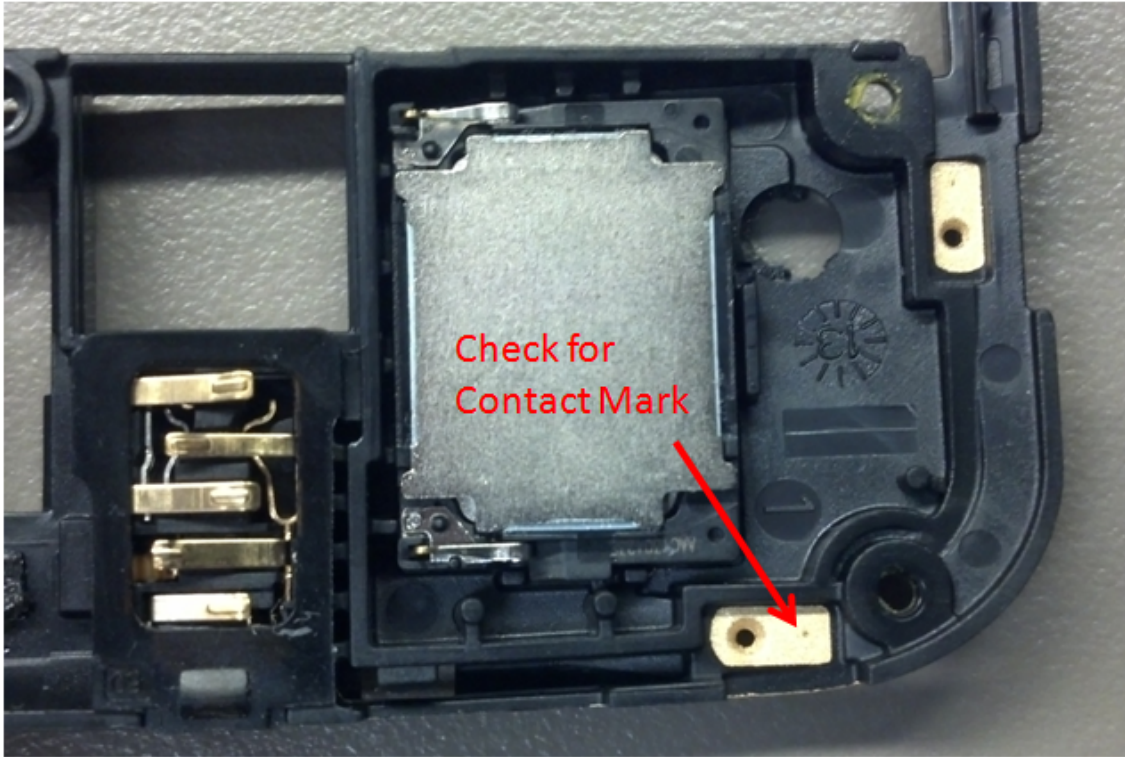


Figure: Contact Pad of Antenna 3



Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, C175, L176, L173, C177, D171, L175, L178, and C179. If any component is missing, misplaced, or damaged, place/replace the part and retest.

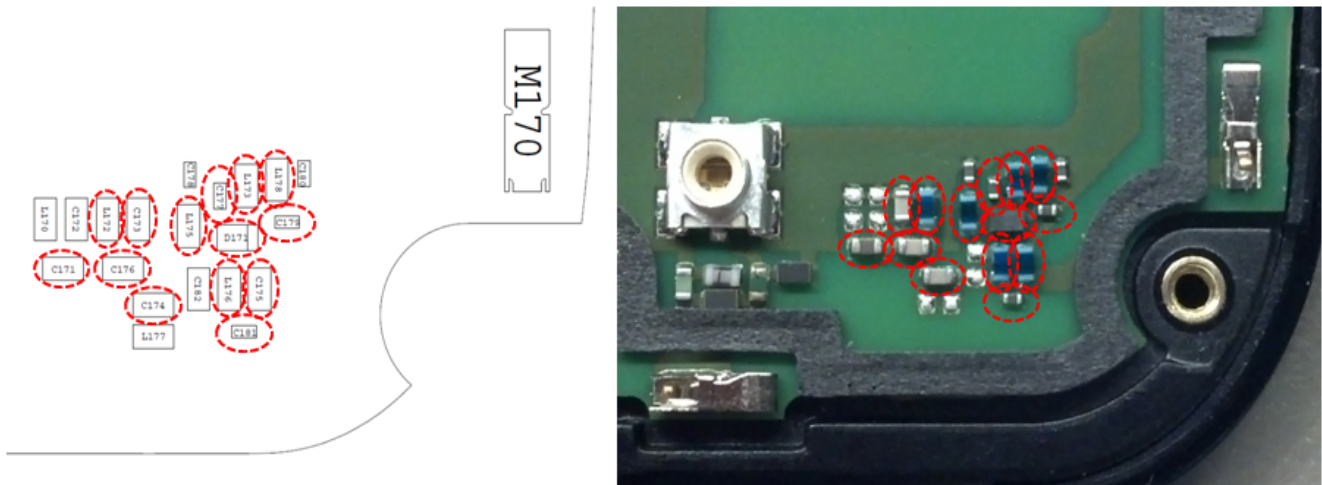


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

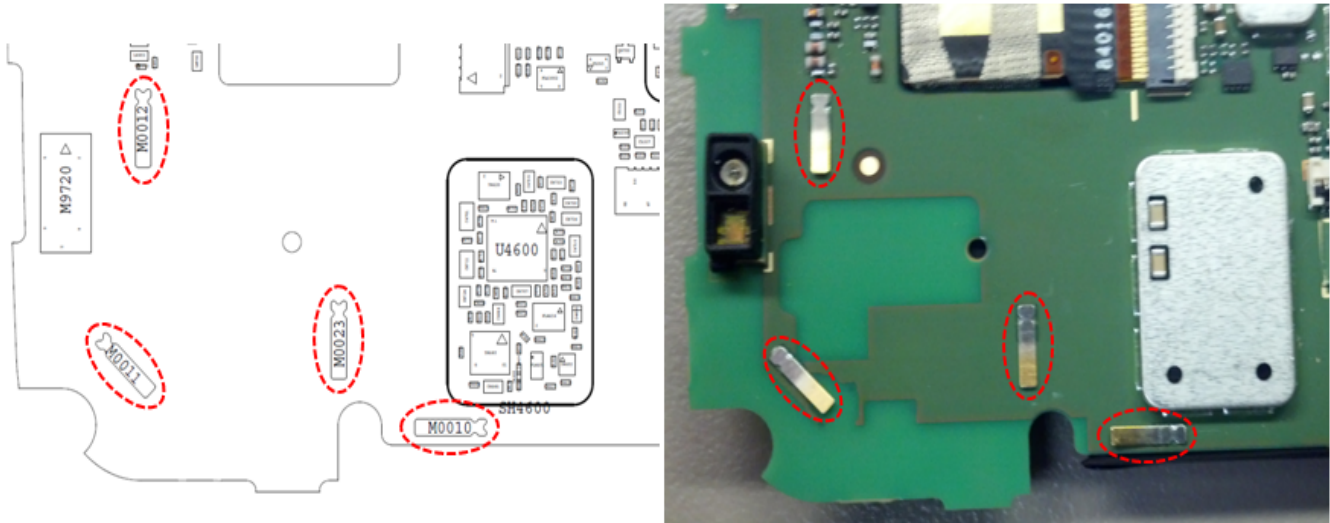


Figure: PCB Grounding Clips Near Antenna 3 Matching

Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

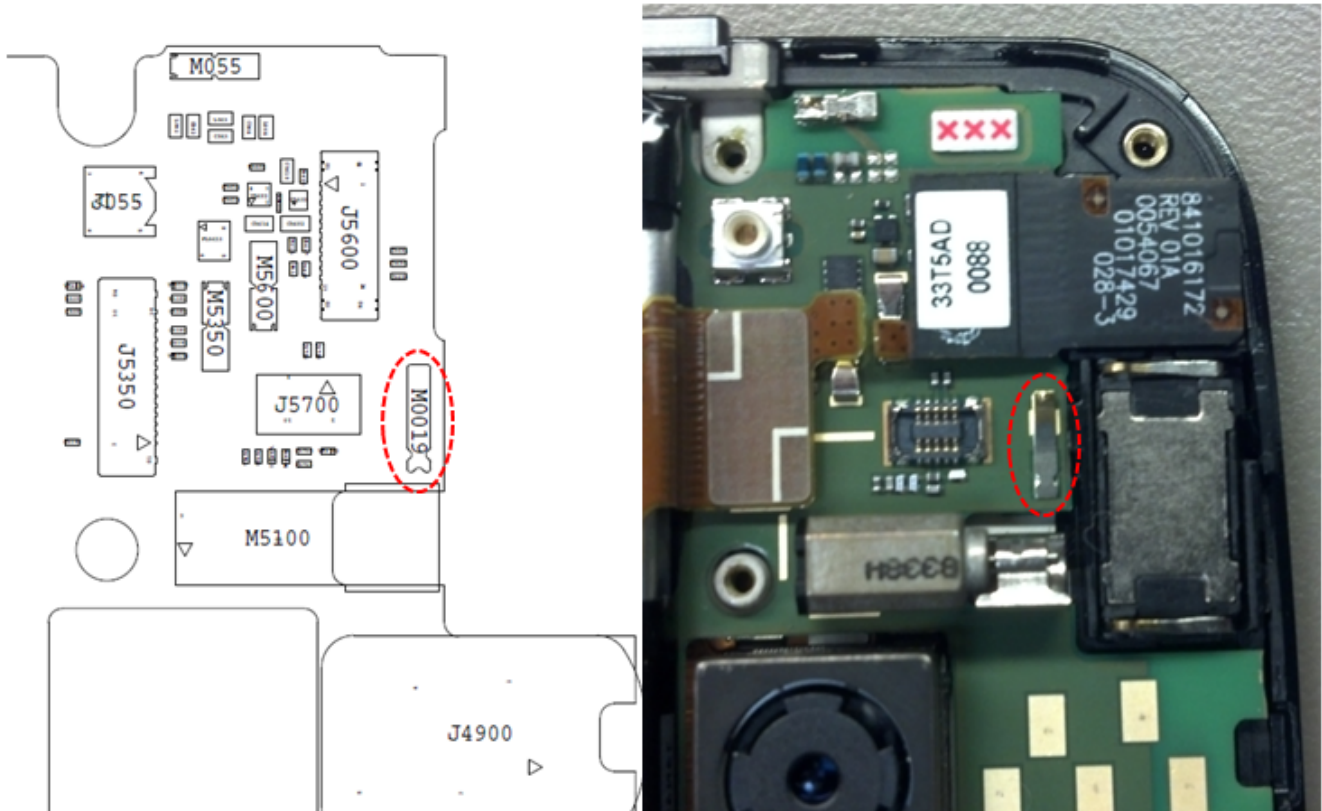


Figure: Grounding Clip Between PCB and Audio Flex Bracket

Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

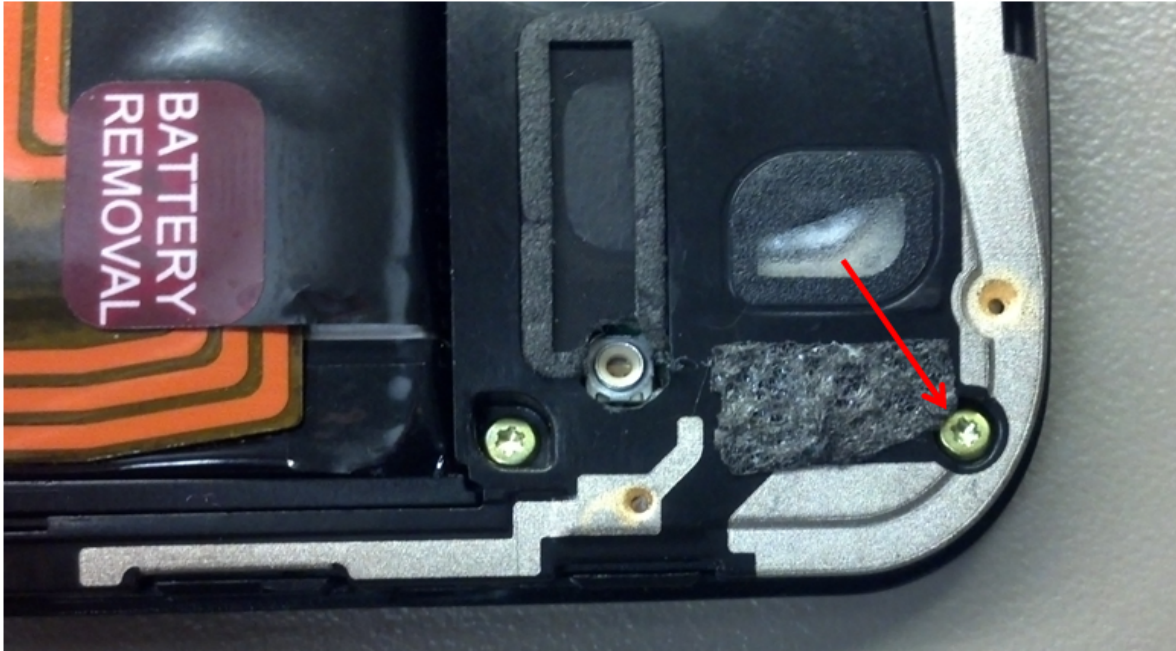


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed

Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

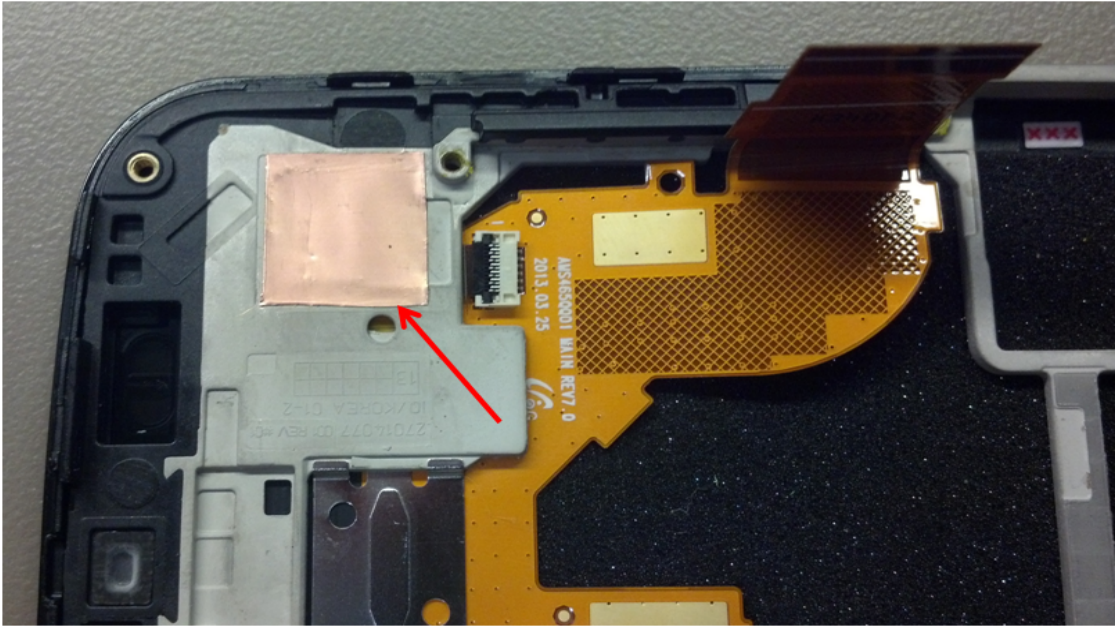


Figure: Copper Tape over Touch IC on Chassis



For factory radiated test failures on the AT&T SKU, for LTE Secondary Rx Bands 7, please do the following:

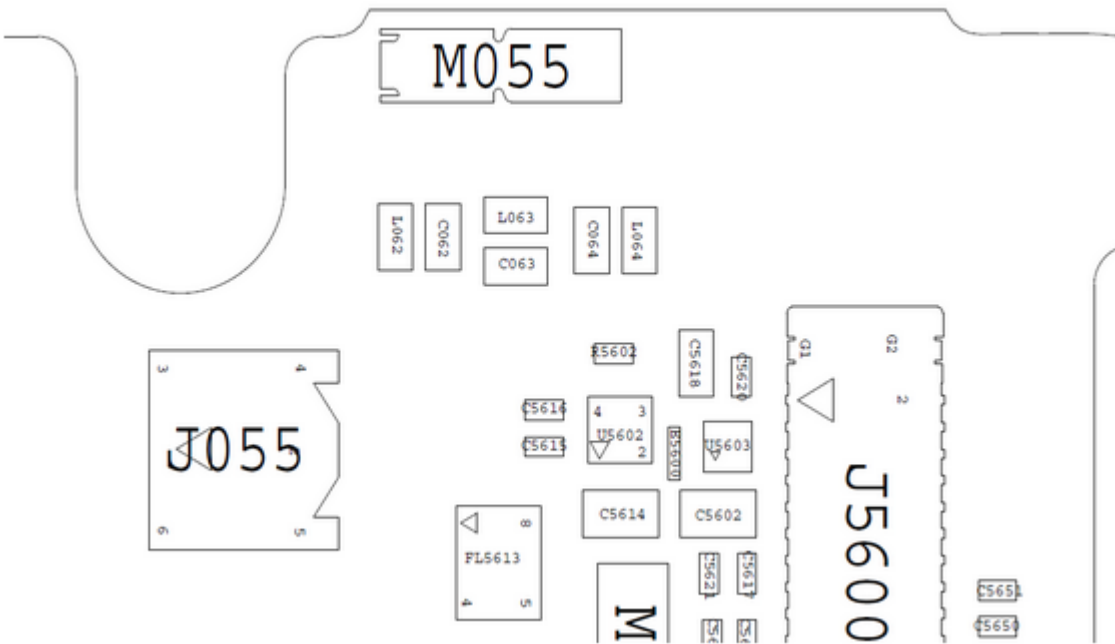


Figure: Ant 5 Overlays

Step 1: Please retest the unit again

Step 2: If failure persists, check if the antenna feed contact (M055, see figure above) is in good condition.

Step 3: If failure persists, check if the antenna made a contact with antenna feed contact (contact mark). There should be a dot next to via on the antenna carrier (see figure below).

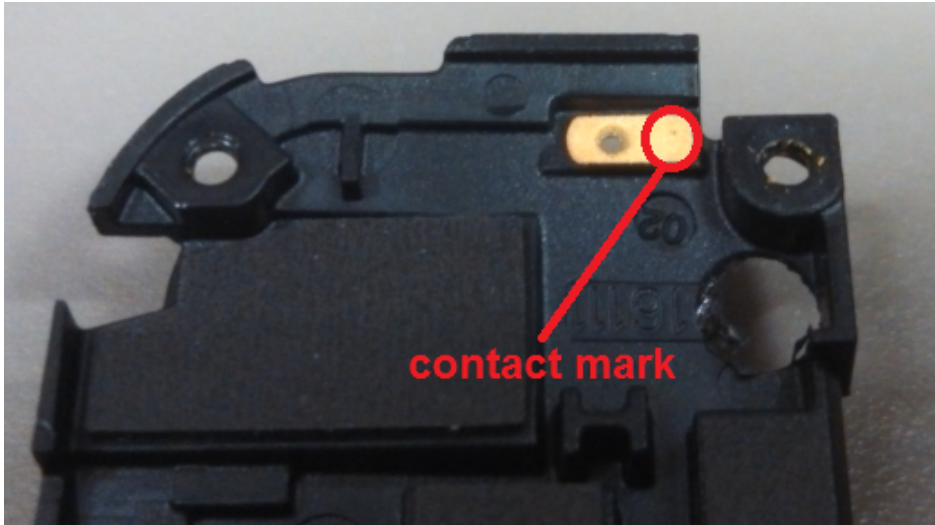


Figure: contact mark

Step 4: If failure persists, check if matching components are soldered properly (L064, L063, C062, see figure overlays above).

Step 5: If failure persists, check if there is any crack in the antenna, especially in the snap location area.

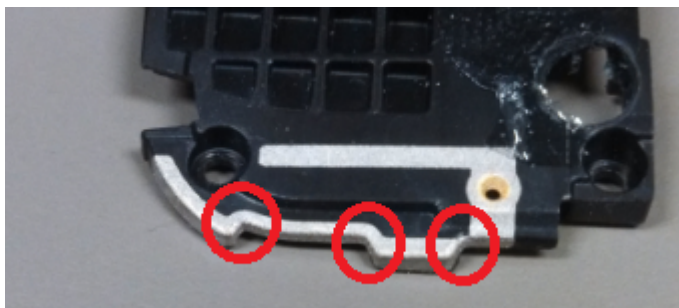


Figure: Antenna 5

### **VZW LTE Primary**

If this test fails in factory these are the steps to take

Step 1: Please retest the unit again

Step 2: If failure persists, check if we have the right carrier. The carrier is as shown in figure below



Fig: Carrier

Step 3: if Step 2 does not resolve issue, check if universal contact on the PCB is damaged. Is it touching the antenna pad? If the contact is twisted or not making contact, this is a problem. The contact should look like this picture below:

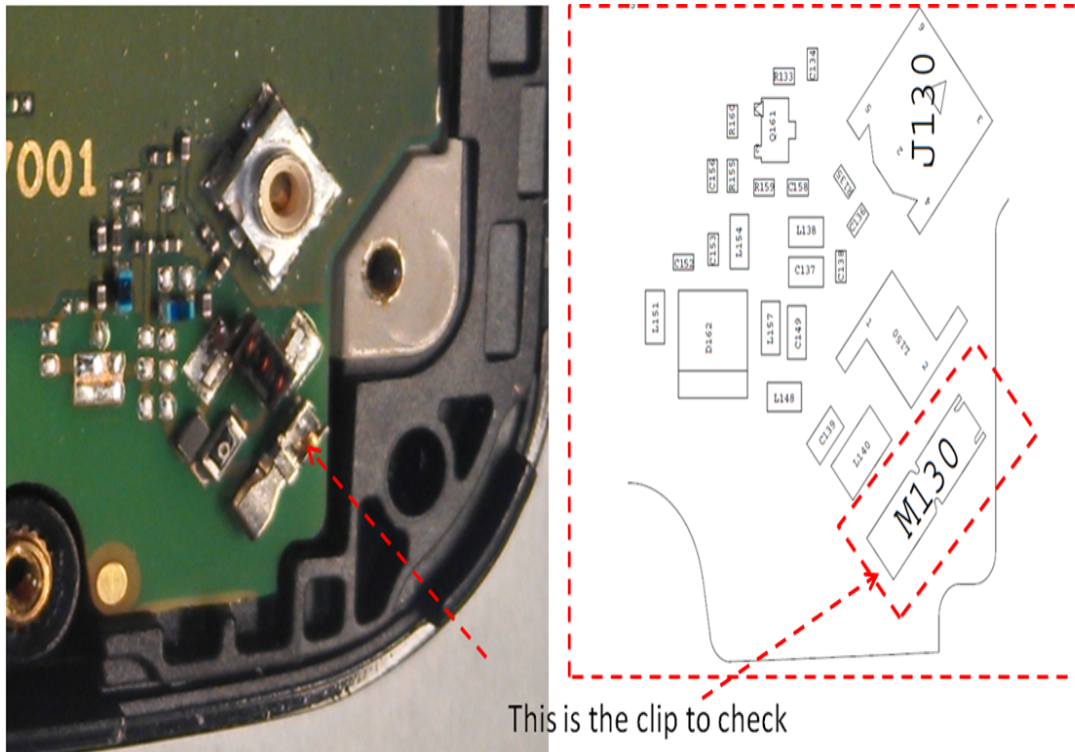


Figure: Antenna clip

Step 4: If step 3 does not resolve the problem check if components C139 is placed in the circuit

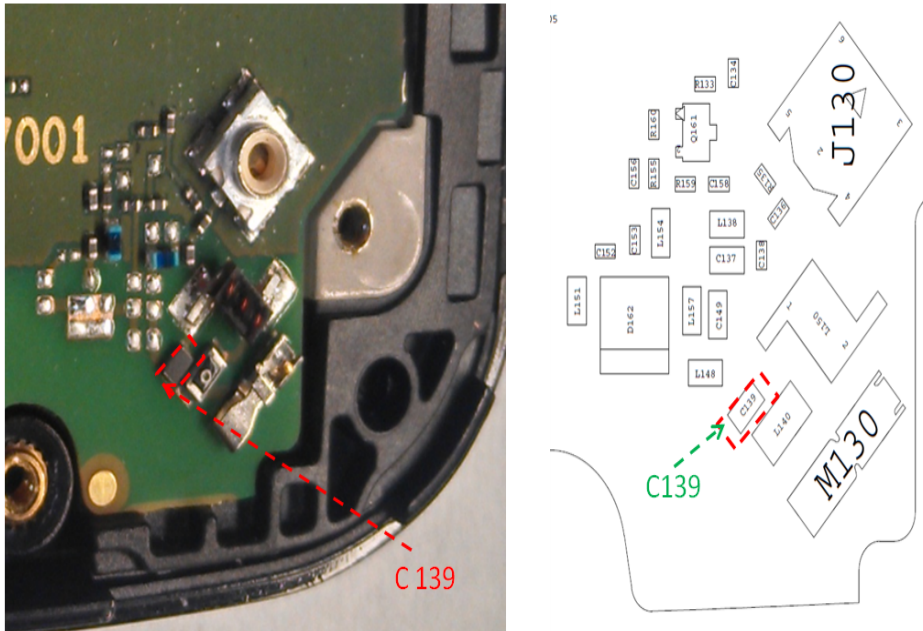
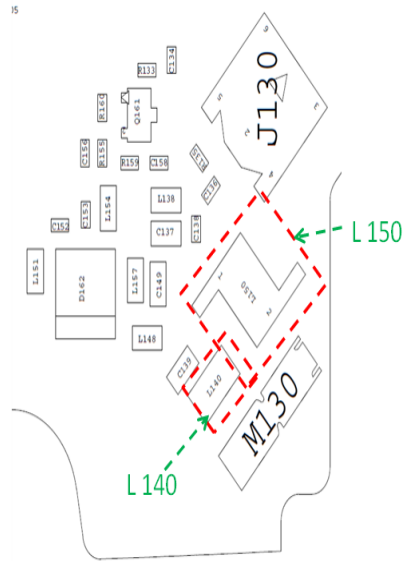
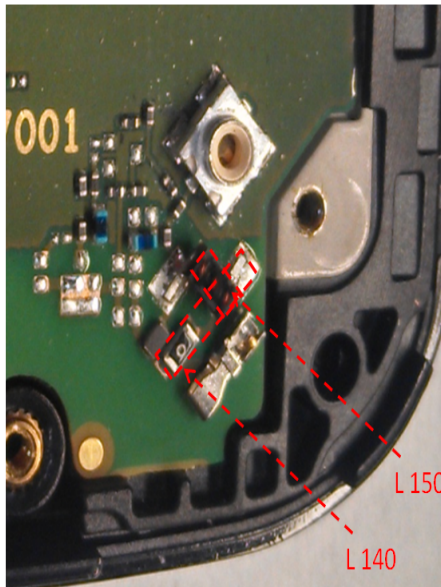


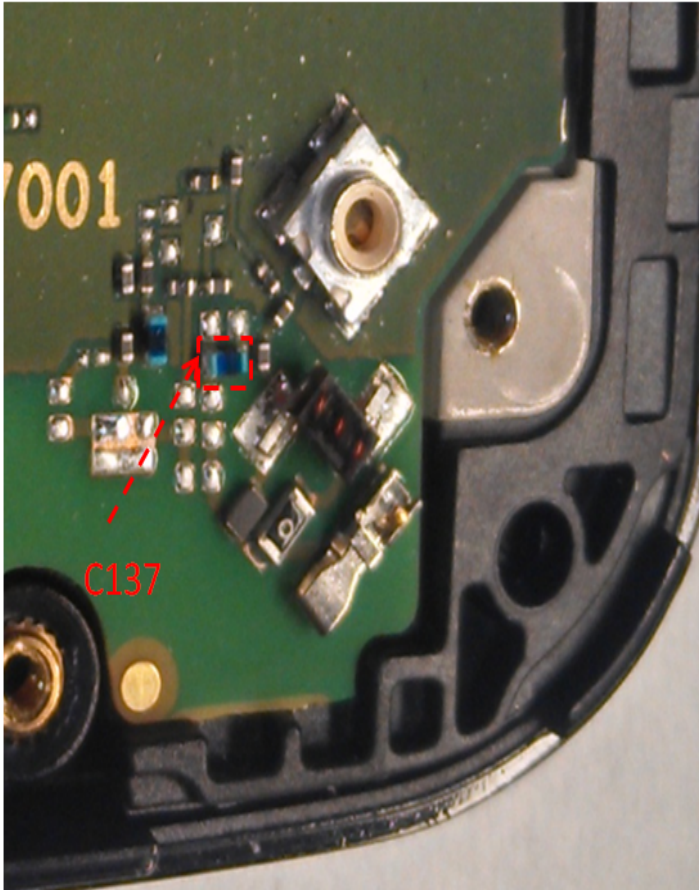
Figure: Component C139



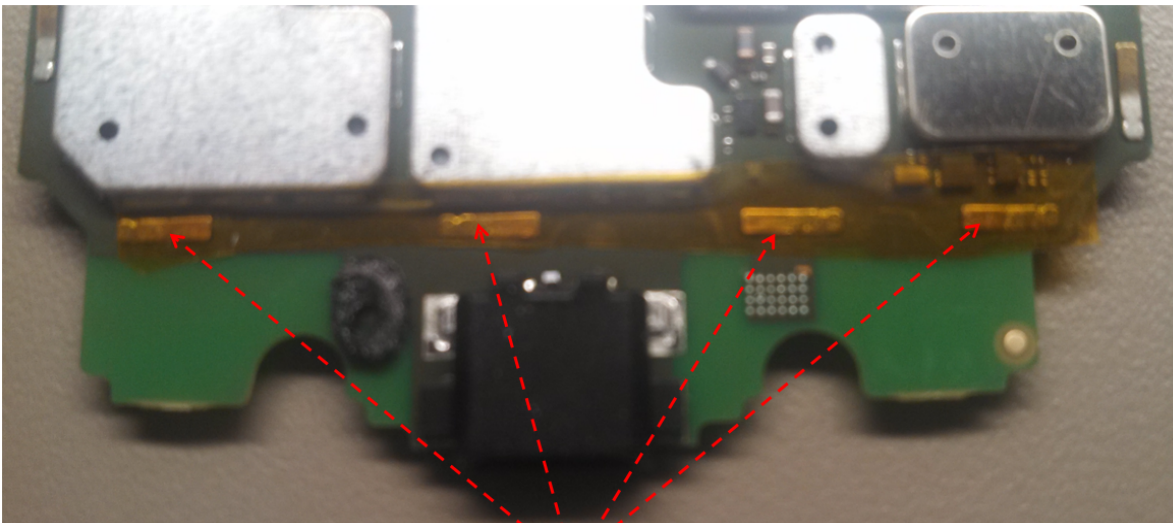
Step 5: If Step 4 does not resolve the problem check if components L140 and L150 is placed in the circuit



Step 6: If Step 5 does not resolve the problem check if components C137 is placed in the circuit



Step 7: If Step 6 does not resolve the problem check if the ground clips are placed on the board



Ground Clips on display side

Figure: Moto X PCB board with ground clips

## Verizon LTE Secondary

For factory radiated test failures on the Verizon SKU, for LTE Secondary Rx Bands 4 and 13, please do the following:

Step 1: Retest the unit.

Step 2: If the failure persists, check the Antenna 3 universal contact, M170. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 3 on the diversity antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M170 and retest.

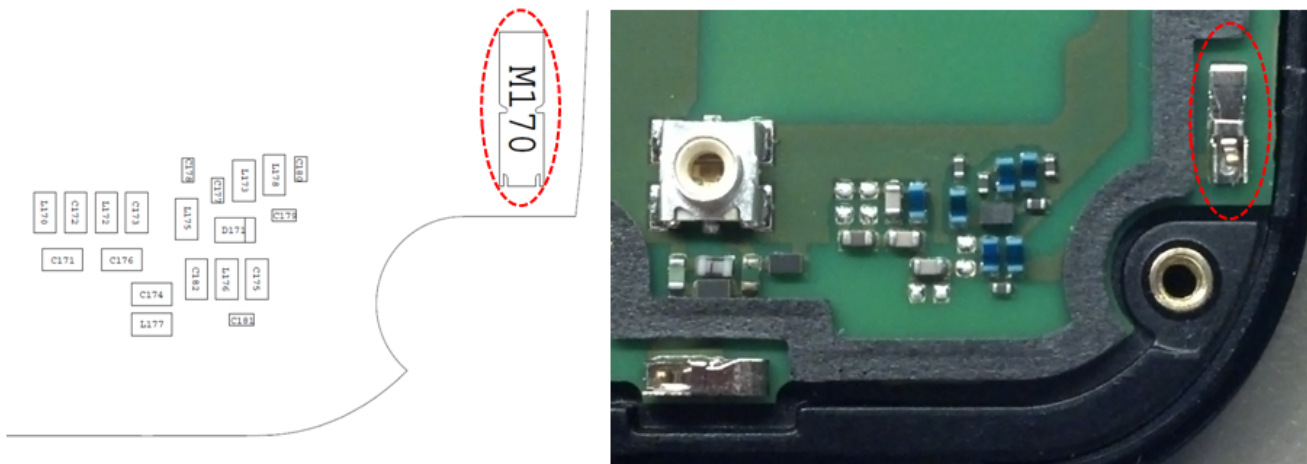


Figure: Antenna 3 Universal Contact

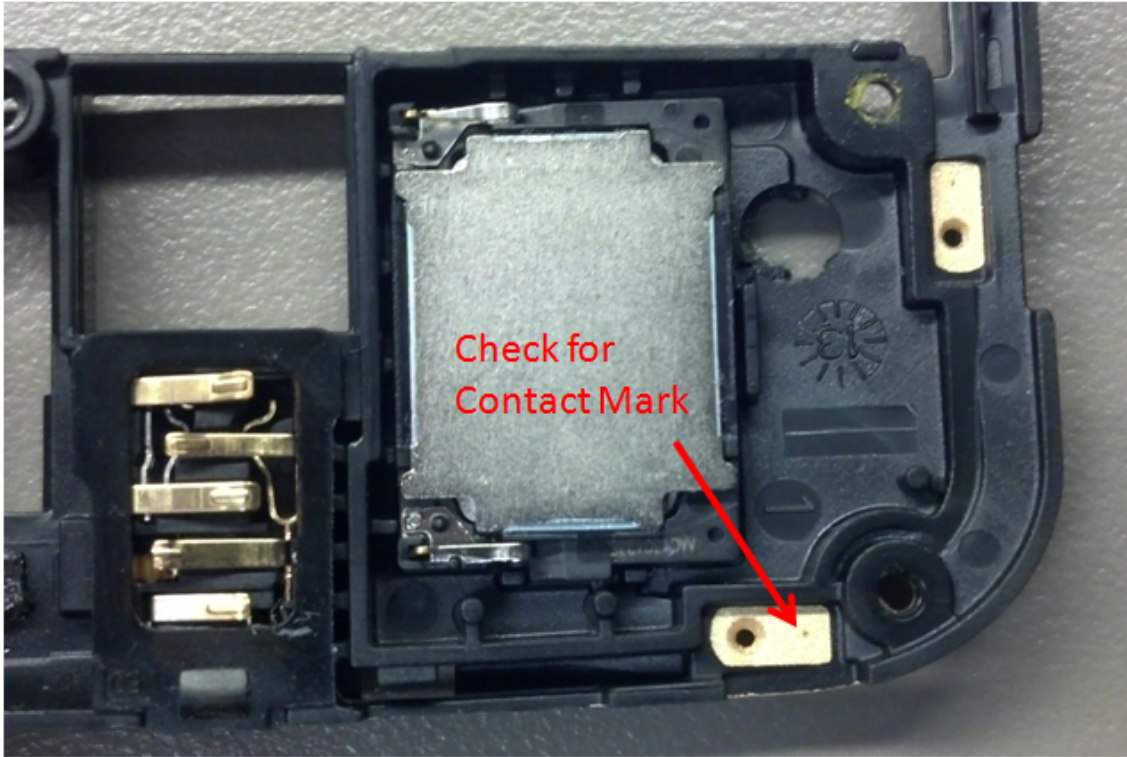


Figure: Contact Pad of Antenna 3



Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, C175, L176, L173, C177, D171, L175, L178, and C179. If any component is missing, misplaced, or damaged, place/replace the part and retest.

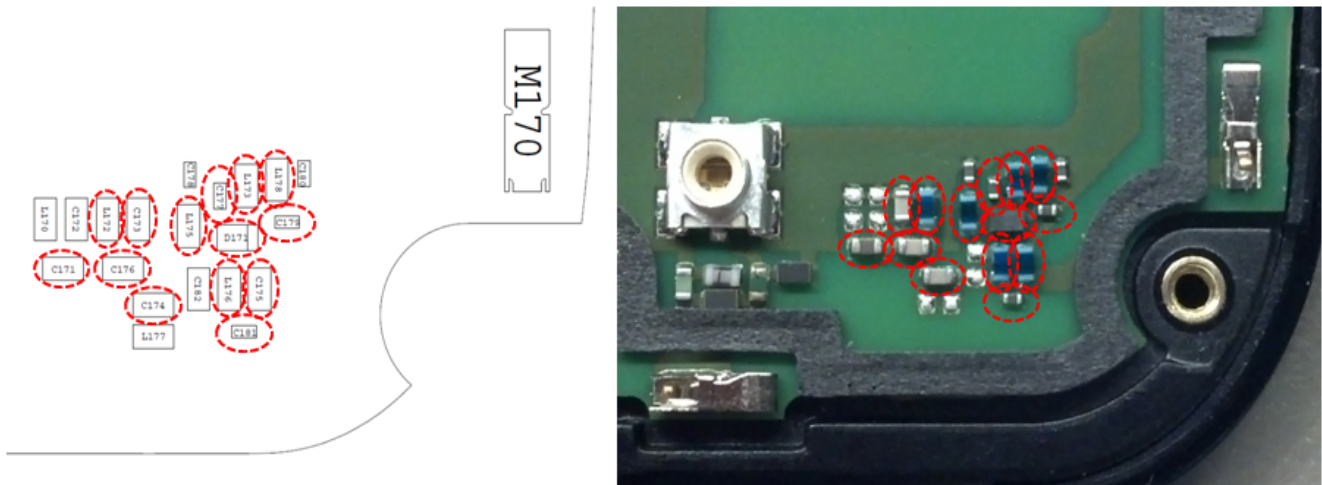


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

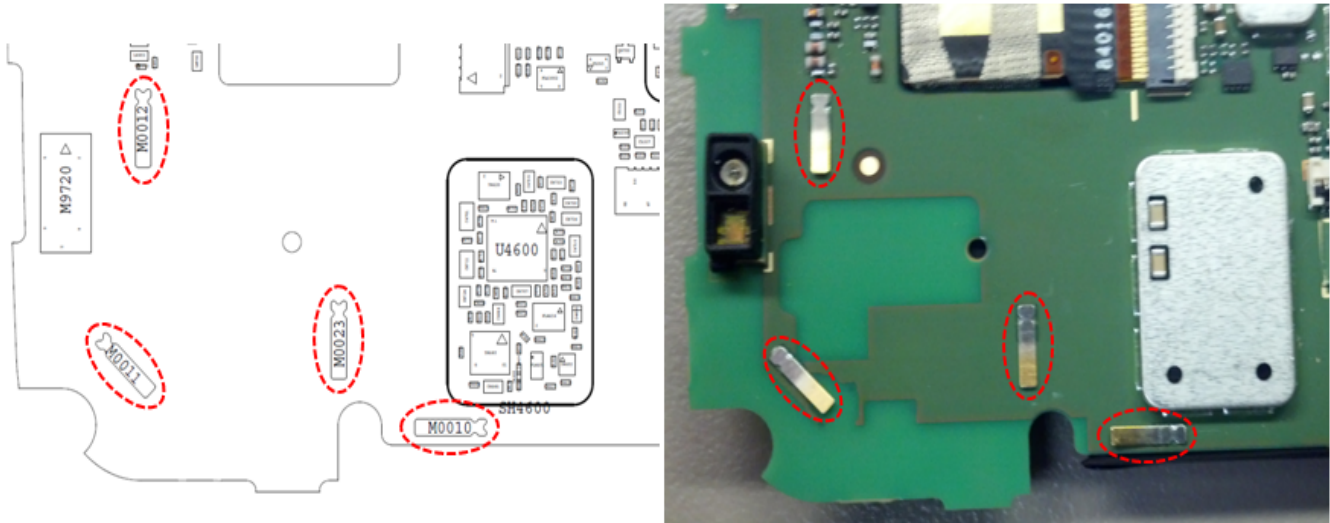


Figure: PCB Grounding Clips Near Antenna 3 Matching

Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

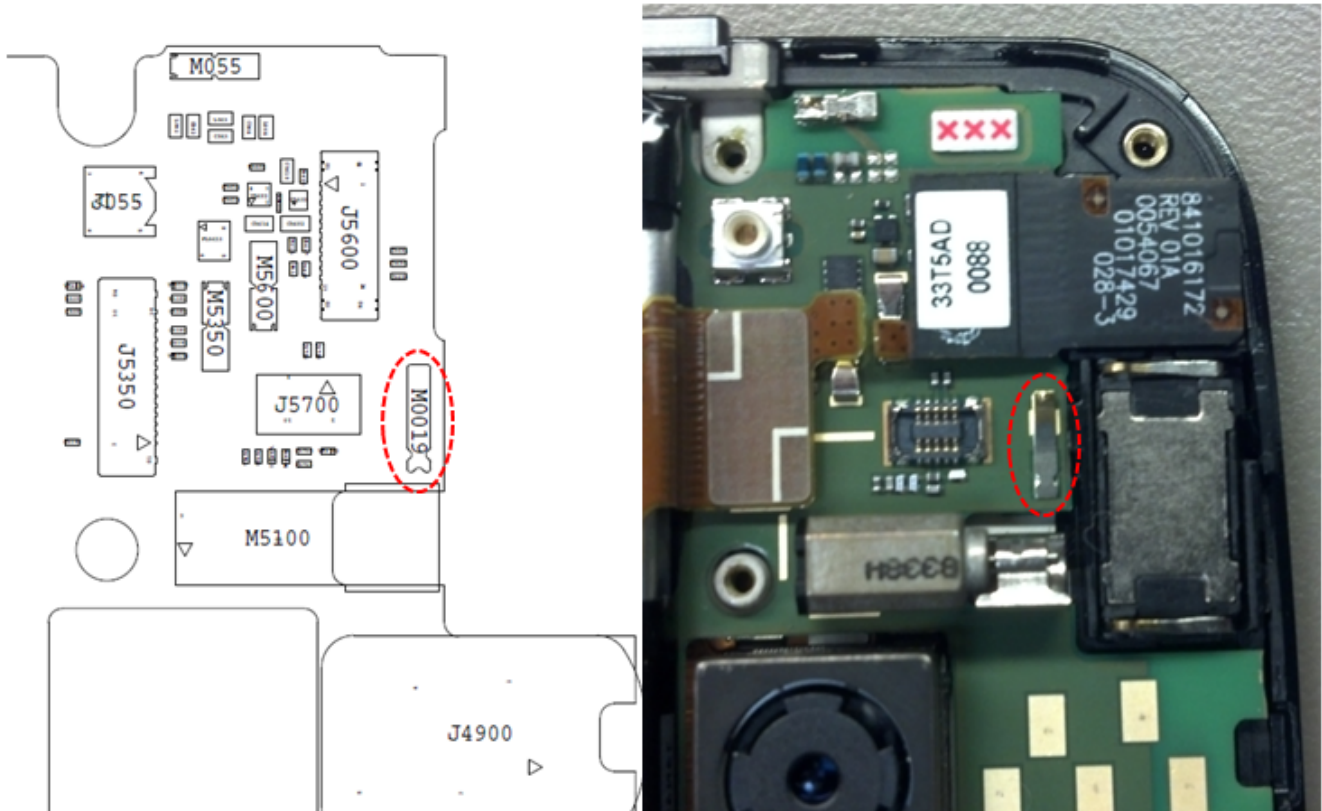


Figure: Grounding Clip Between PCB and Audio Flex Bracket

Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

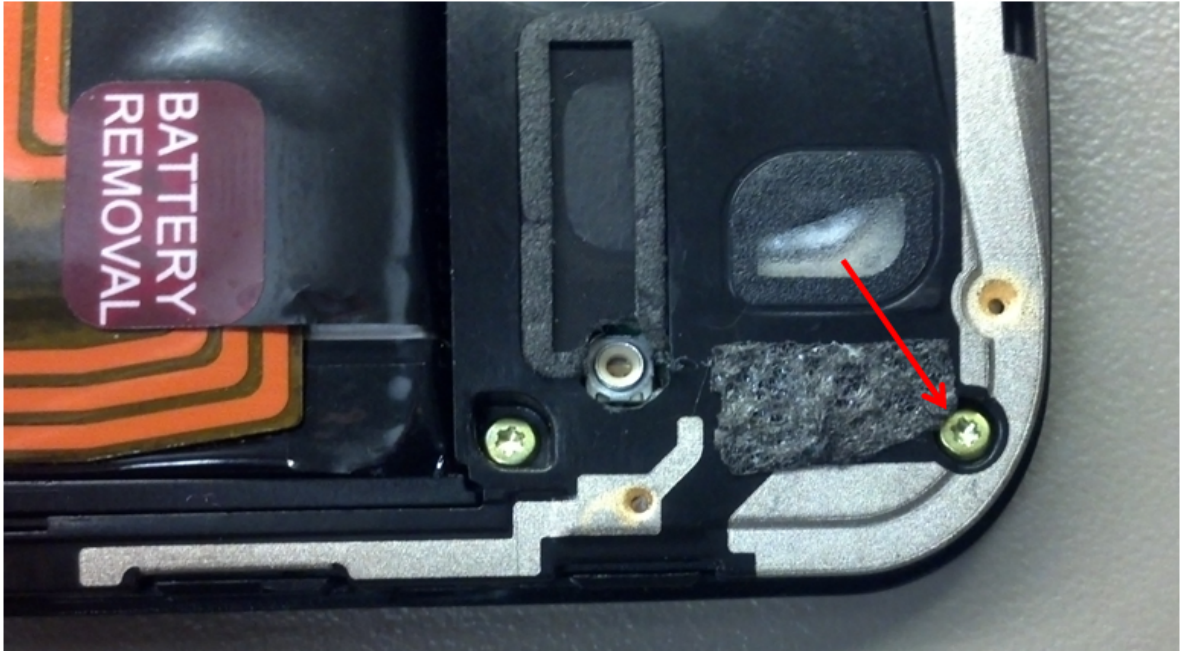


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed

Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

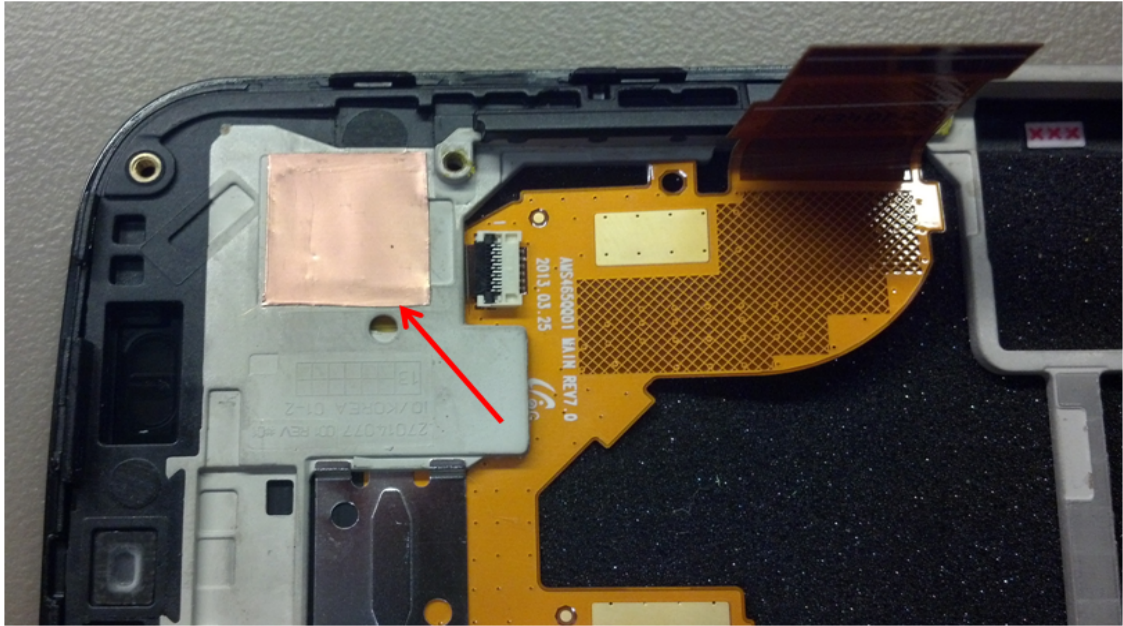


Figure: Copper Tape over Touch IC on Chassis



**USC LTE Primary:**

For factory radiated test failure on USC SKU at LTE bands B12,B5 and B4 please do the following:

Step 1: Retest

Step 2: If retest does not pass, check if the unit has correct bottom antenna carrier. The USC bottom antenna carrier should look like following:



Figure: Antenna carrier

Step 3: if Step 2 does not resolve issue, check if universal contact on the PCB is damaged. Is it touching the antenna pad? If the contact is twisted or not making contact, this is a problem. The contact should look like this picture below:

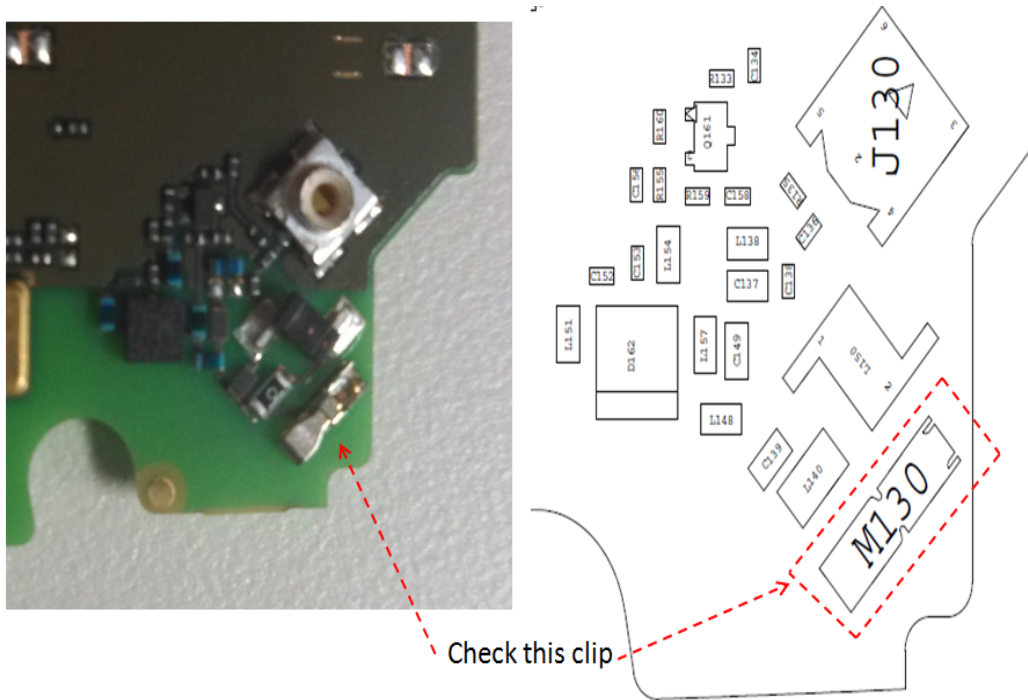
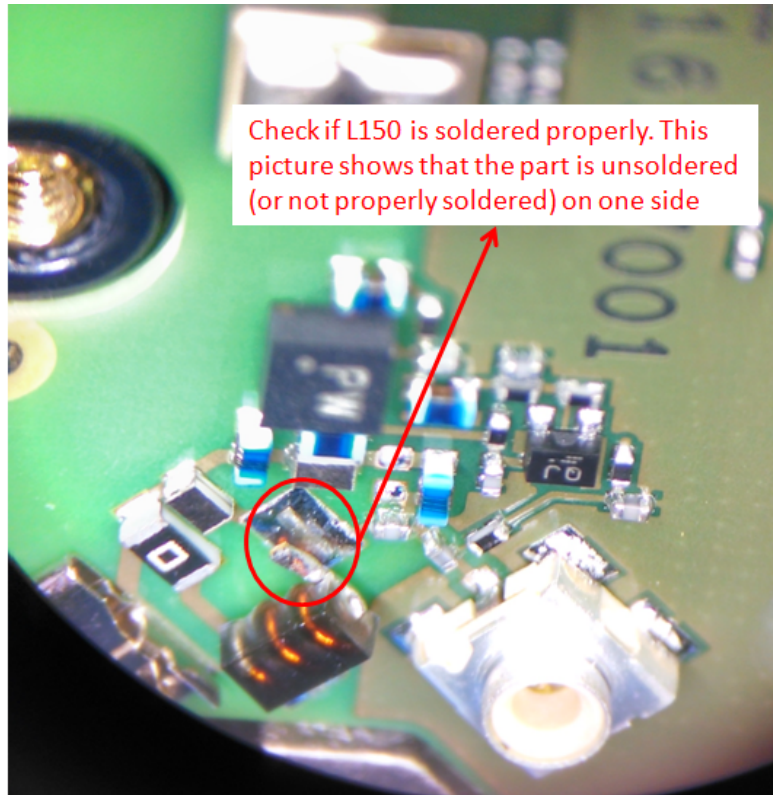


Figure: Antenna clip





Step 5: If step 4 does not resolve the problem check if components with Ref Des = L148, C139, C149, L138, L151, L154 and L157 are all placed in the PCB

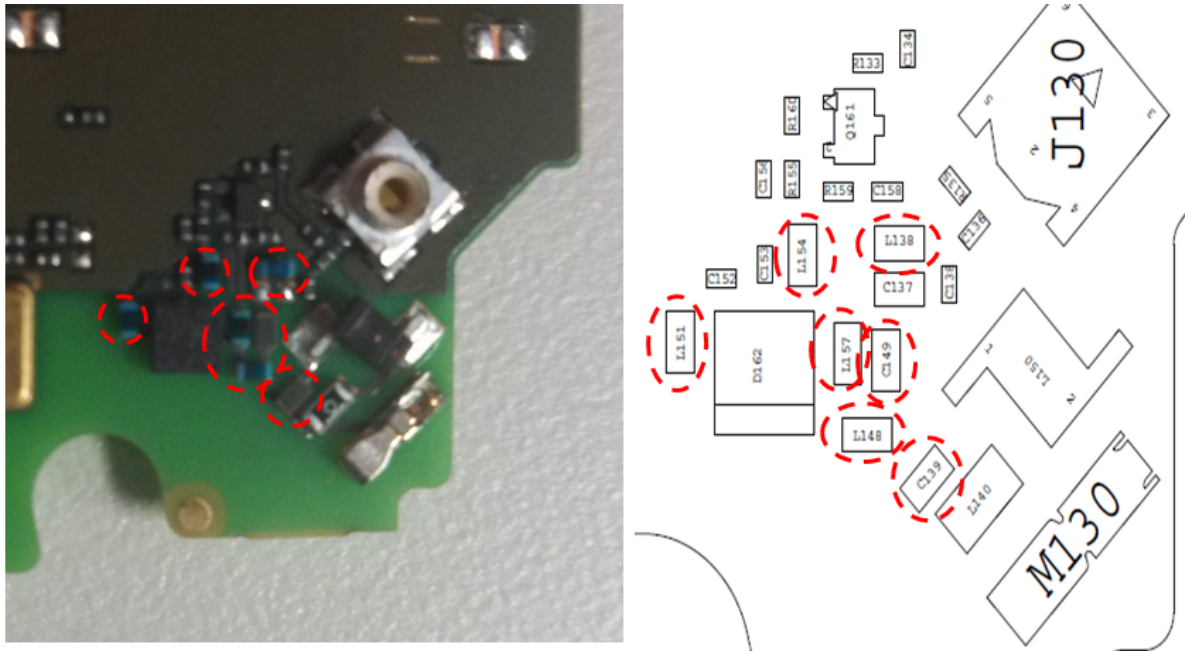
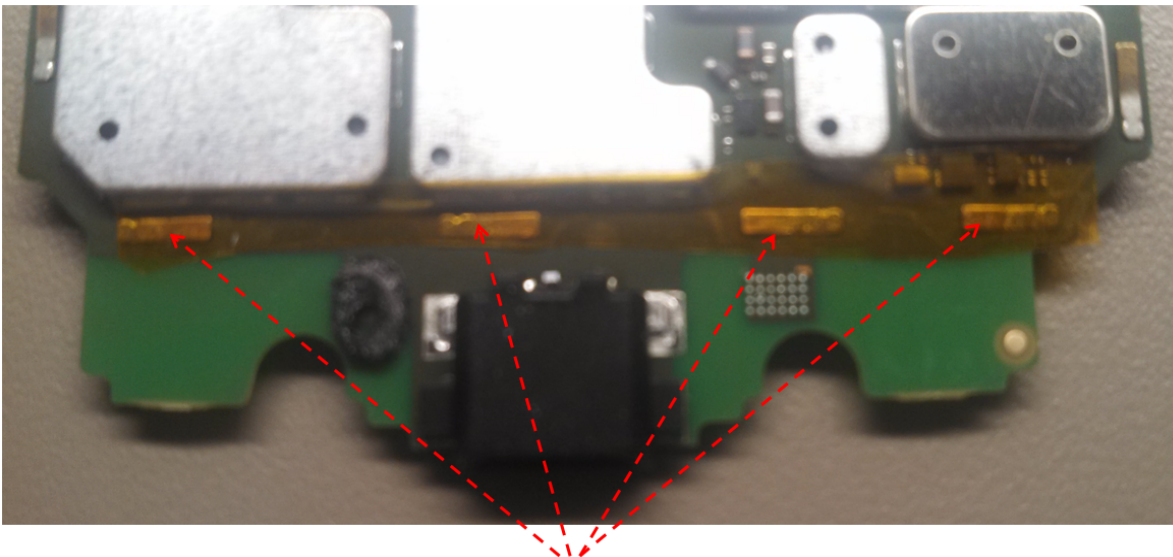


Figure: Matching components



Step 6: If Step 5 does not resolve the problem check if the ground clips are placed on the board



Ground Clips on display side

Figure: Moto X PCB board with ground clips

Step 7: If the unit still fails, change the bottom antenna carrier with a new one and retest.

## USC LTE Secondary

For factory radiated test failures on the US Cellular SKU, for LTE Secondary Rx Bands 4, 5, and 12, please do the following:

Step 1: Retest the unit.

Step 2: If the failure persists, check the Antenna 3 universal contact, M170. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 3 on the diversity antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M170 and retest.

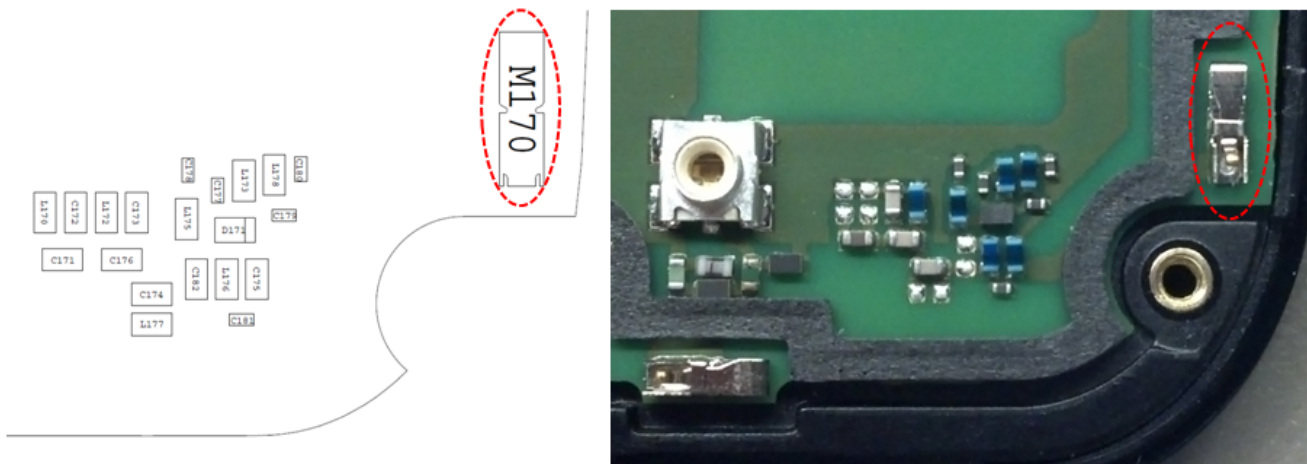


Figure: Antenna 3 Universal Contact

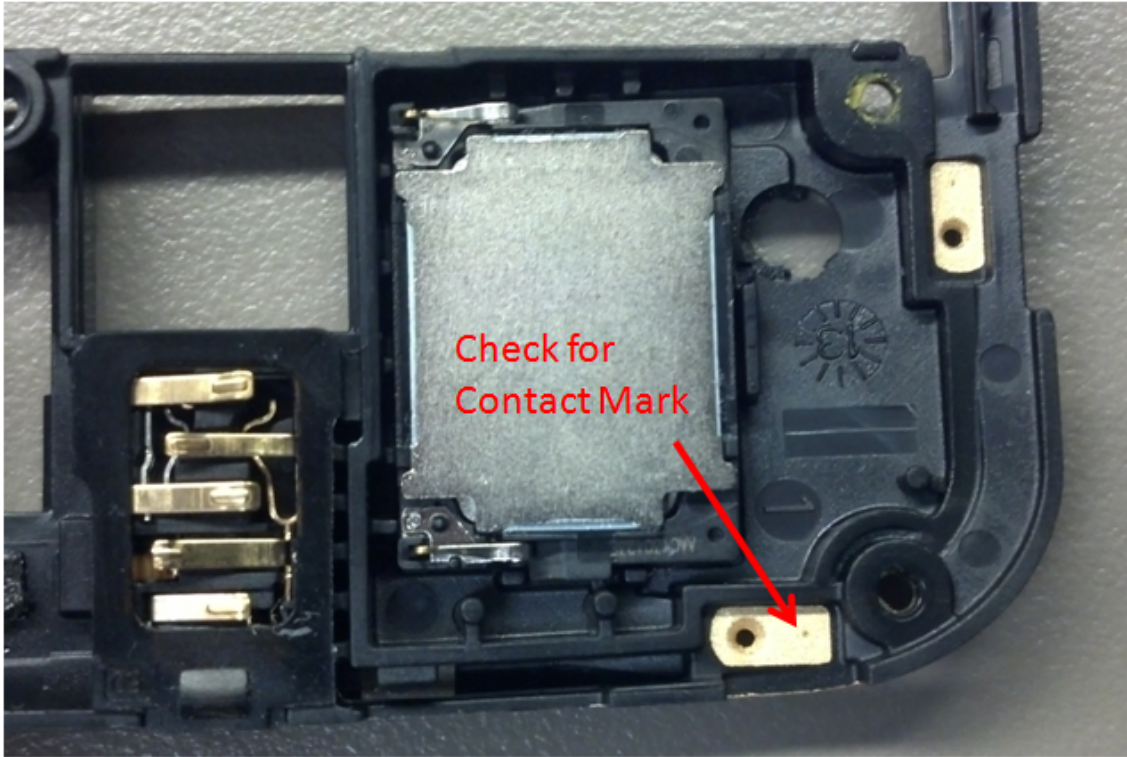


Figure: Contact Pad of Antenna 3

Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, C175, L176, L173, C177, D171, L175, L178, and C179. If any component is missing, misplaced, or damaged, place/replace the part and retest.

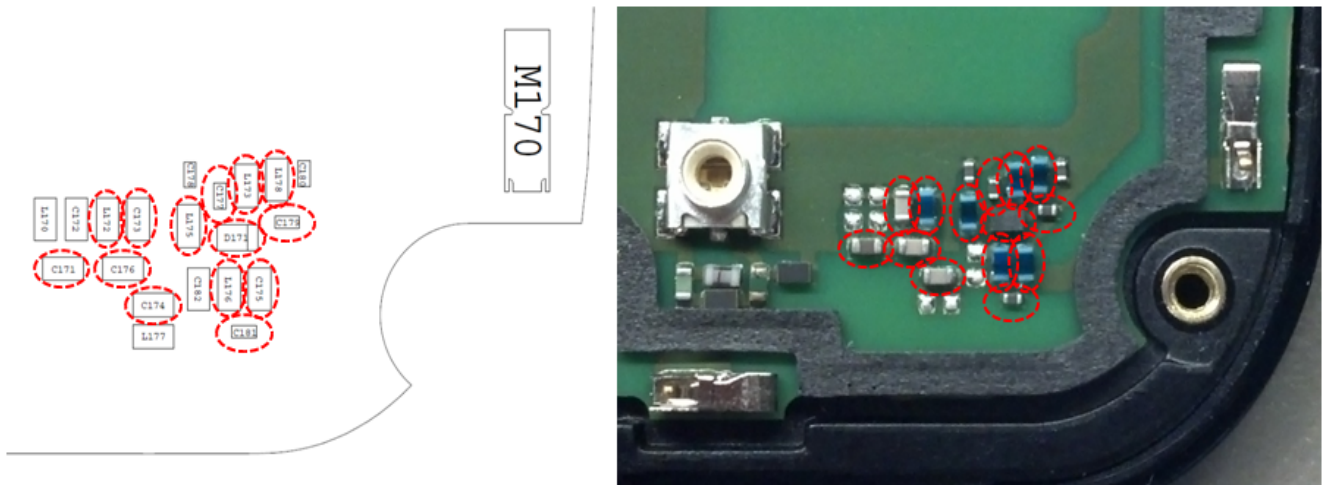


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

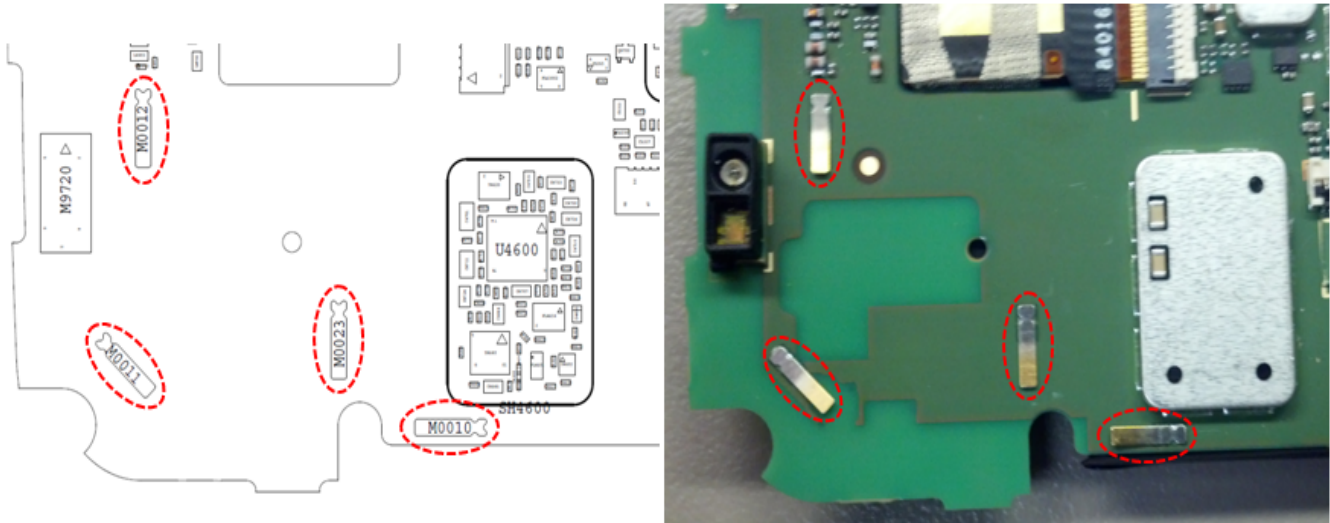


Figure: PCB Grounding Clips Near Antenna 3 Matching



Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

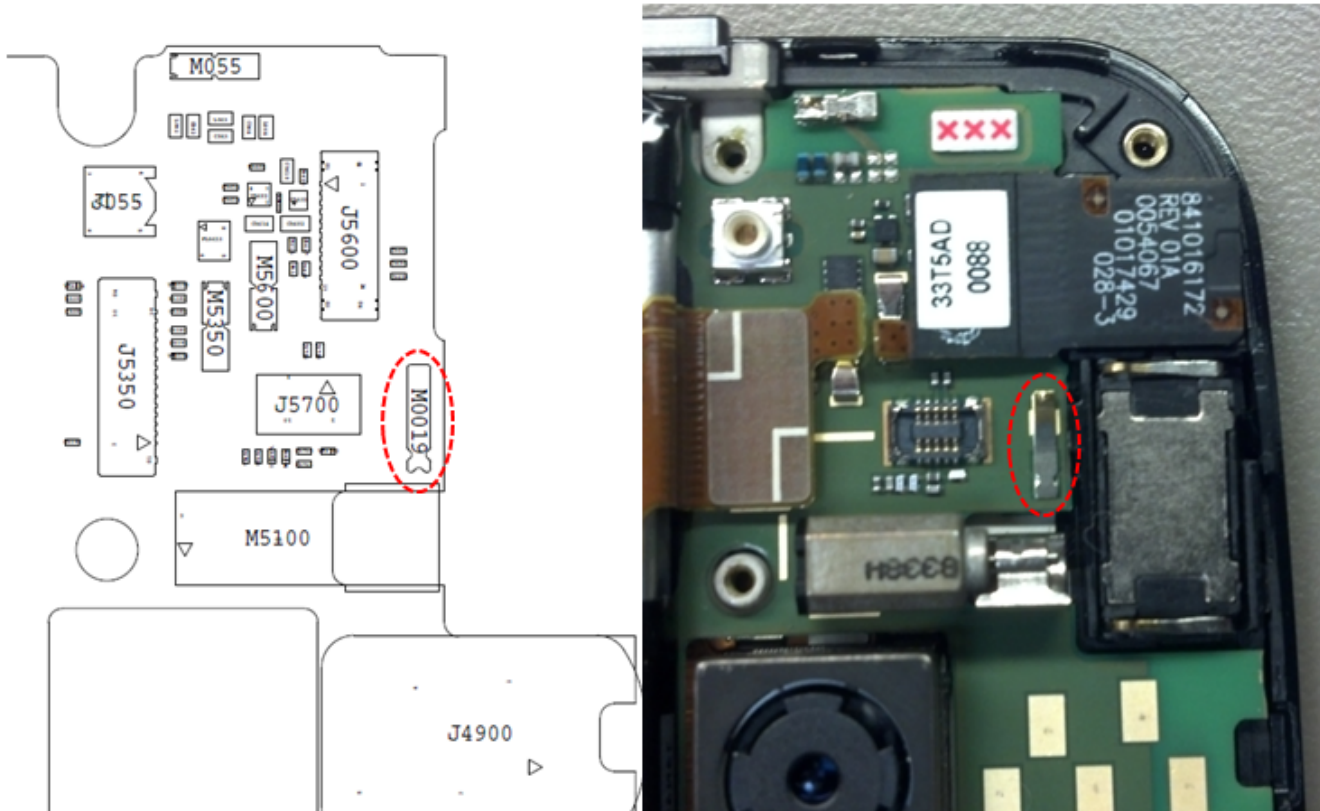


Figure: Grounding Clip Between PCB and Audio Flex Bracket

Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

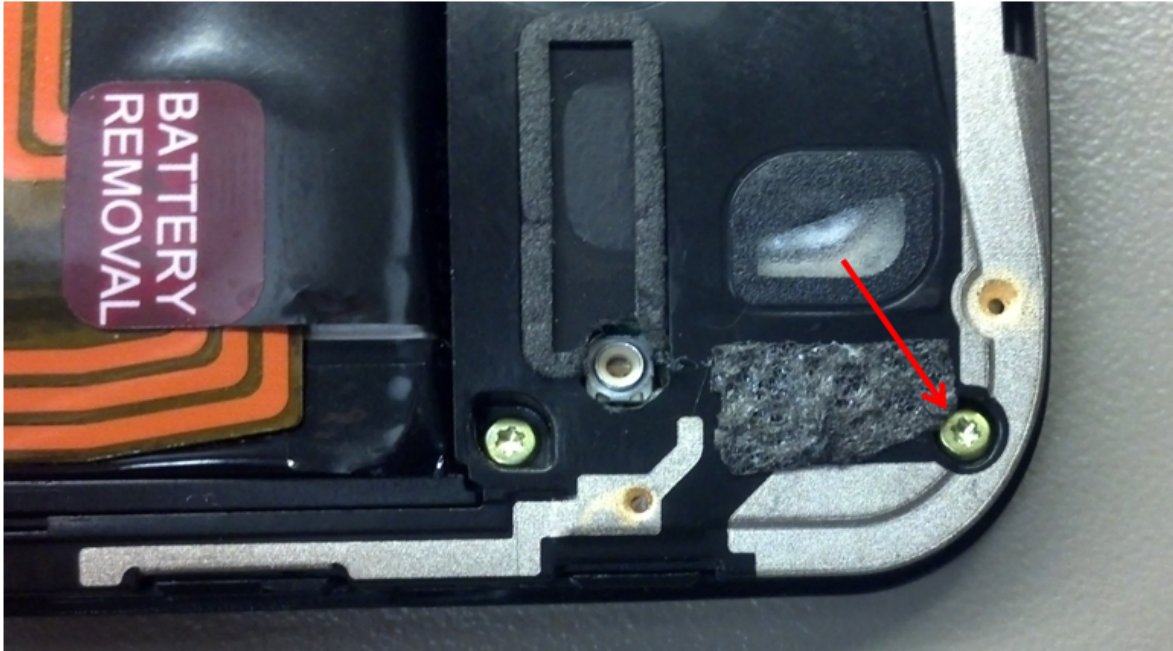


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed

Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

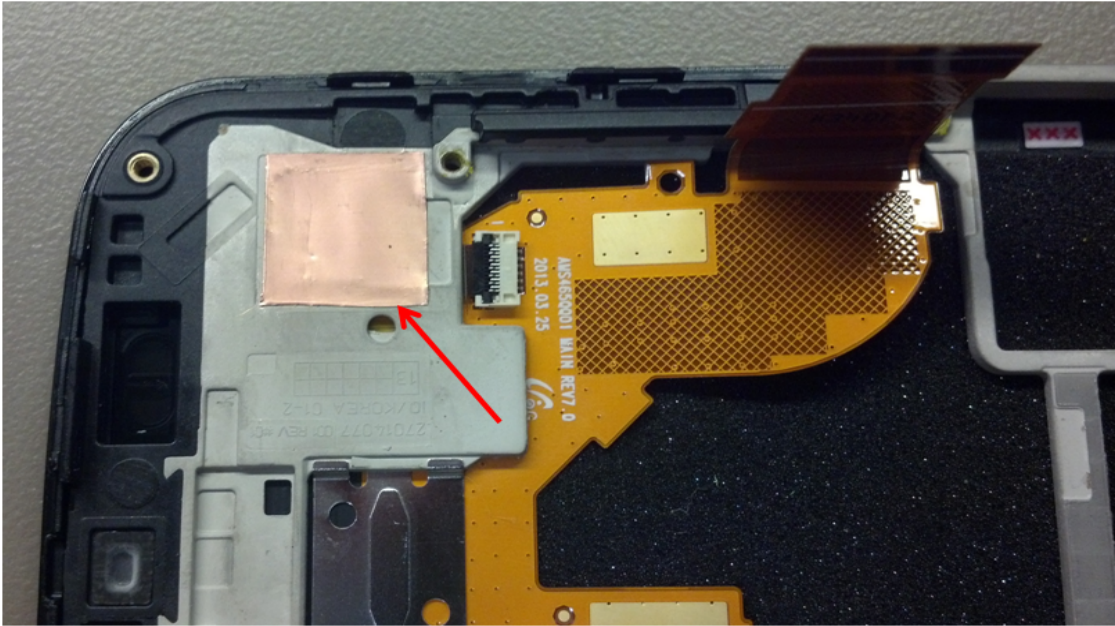


Figure: Copper Tape over Touch IC on Chassis



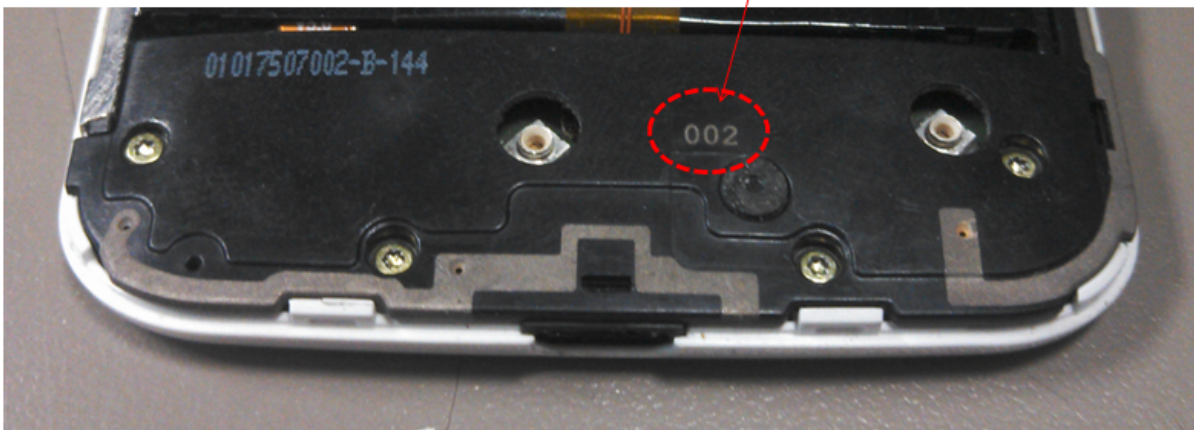
**SPRINT Primary:**

Please follow the detection scheme shown below to resolve the issue related to SPRINT LTE B25. If one step is not working then go to the next step

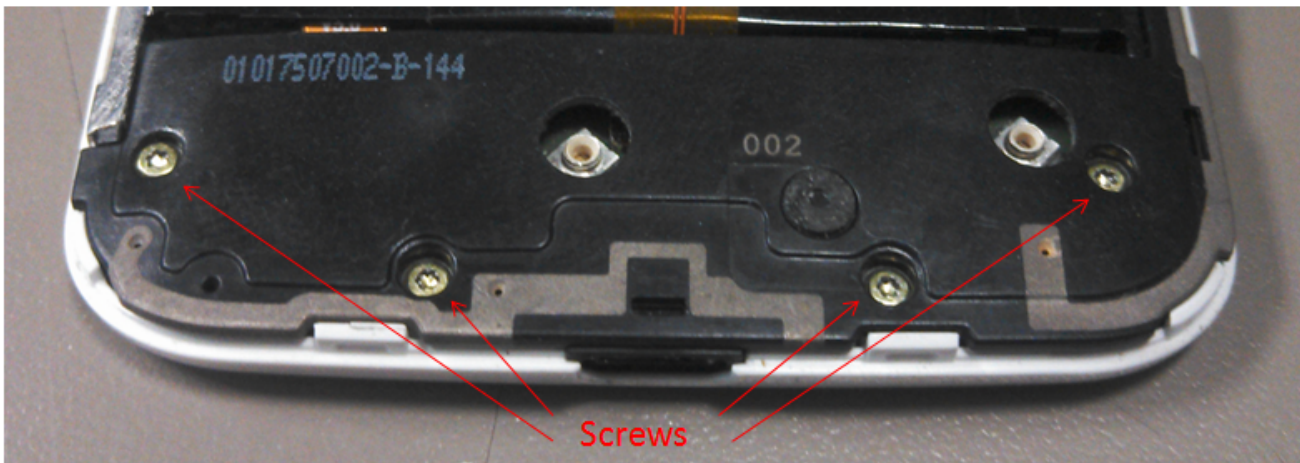
Step 1: Repeat the test

Step 2: Check if the bottom antenna carrier is for the Sprint or not. If it is Sprint, 002 is printed on the Antenna carrier as shown below:

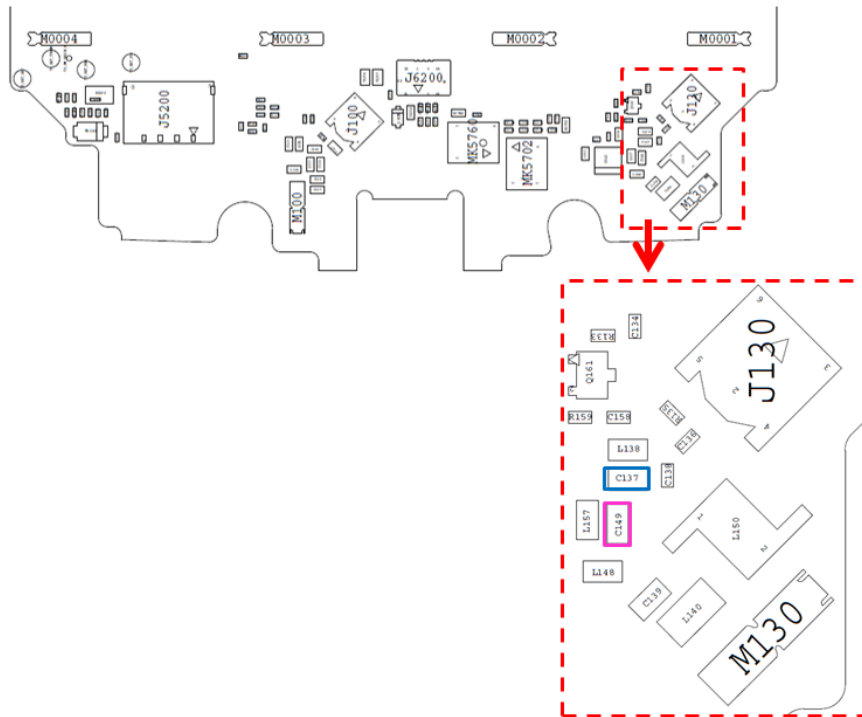
Carrier No (for Sprint)



Step 3: Check if all the screws are present or not (see the picture below)

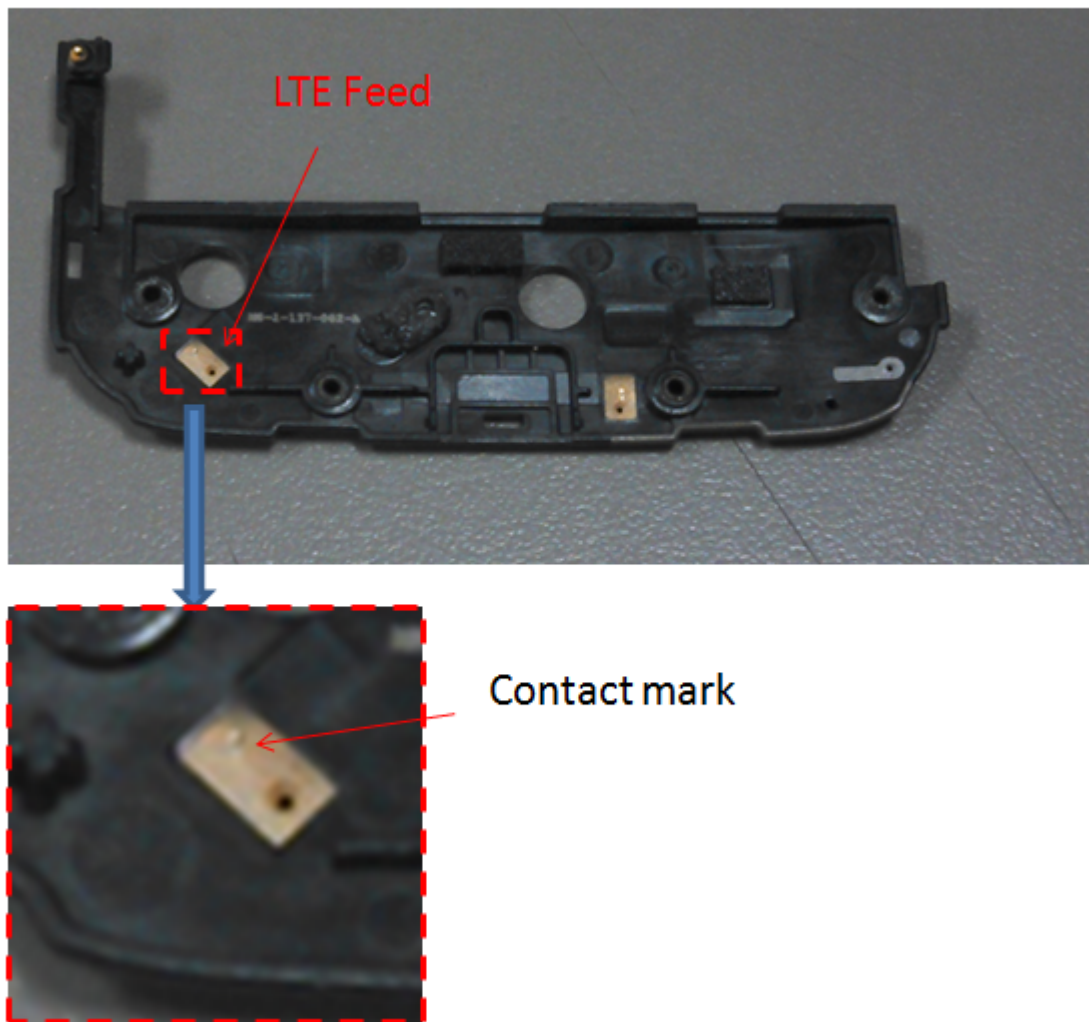


Step 4: Check if the antenna contact (M130) is present there or not. The location of the contact is shown in the PCB layout below:

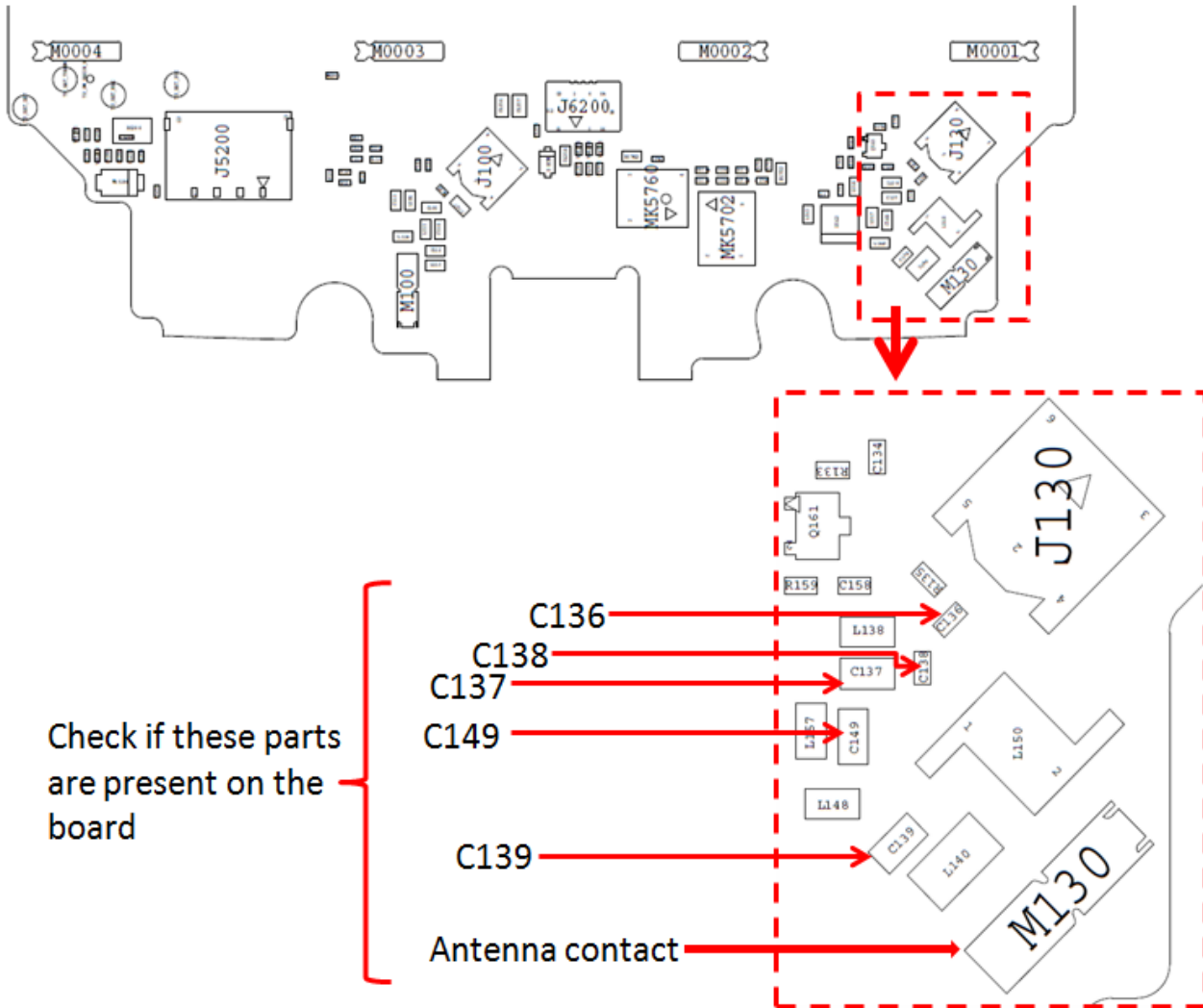




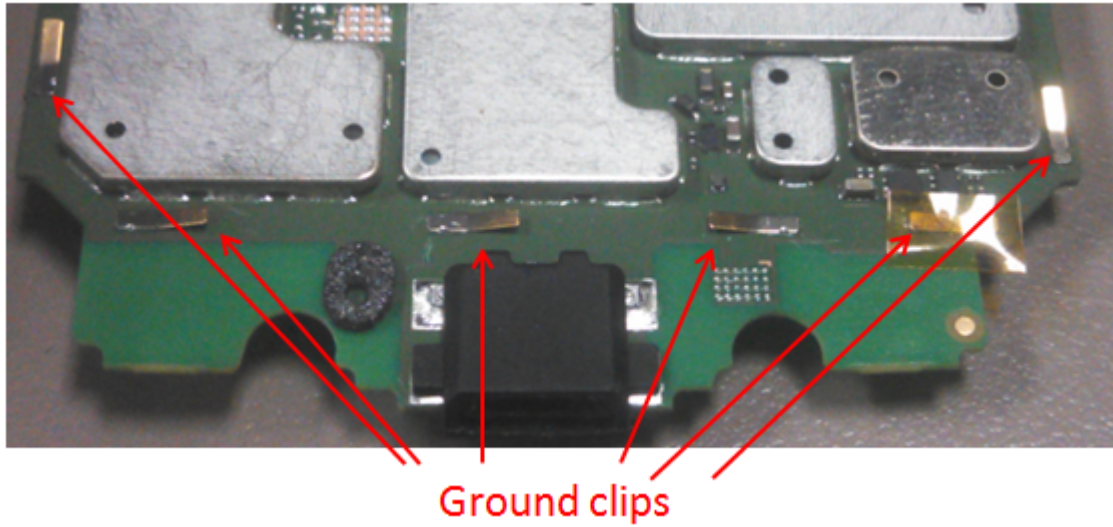
Step 5: Check if the antenna feed for ANT2 is touching the antenna contact or not. The photograph of the antenna feed area is shown below. You cannot see whether it is touching or not, but if the carrier is touching you would see touch mark on the feed of the antenna as shown below:



Step 6: Check for the missing, misplaced, crashed parts for the following matching components:



Step 7: Check for the ground clips connecting display bezel to the PCB



### **T-Mobile Primary**

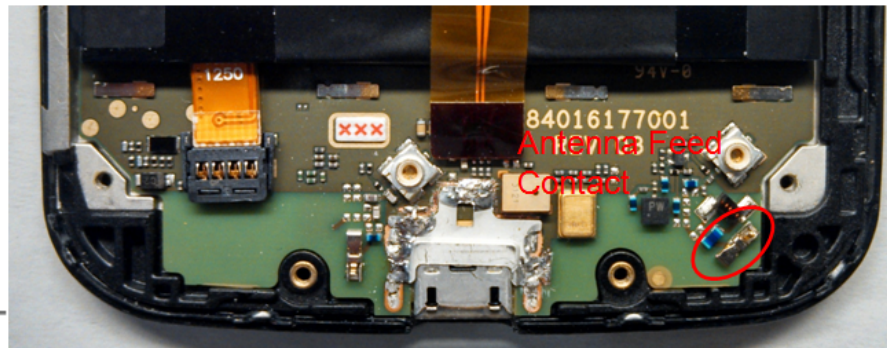
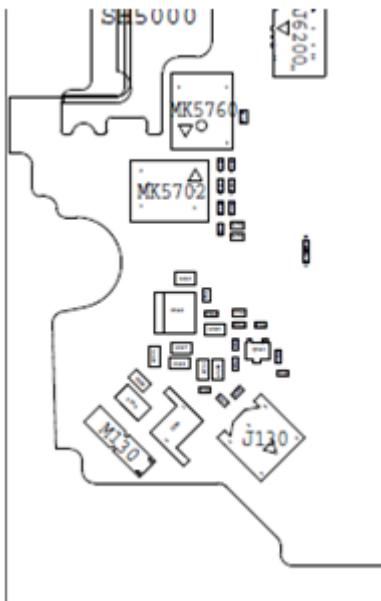
For factory radiated test failures on the T-Mobile SKU, for LTE Primary Bands 17, please do the following:

Step 1: Retest the unit.

Step 2: Check if the bottom antenna carrier is the correct carrier for TMO. TMO antenna has marking '004' as shown below

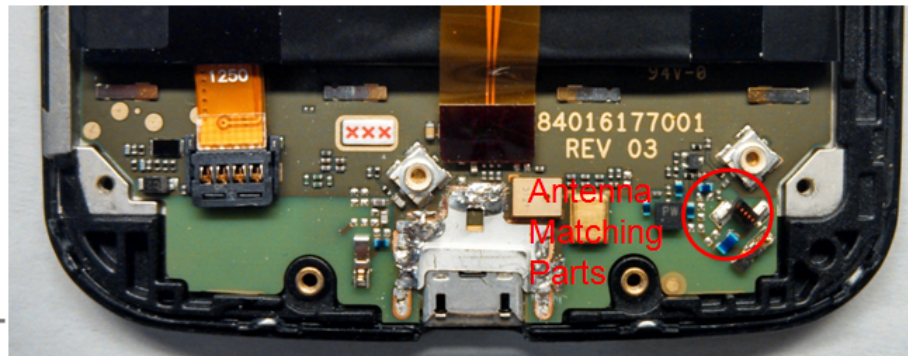
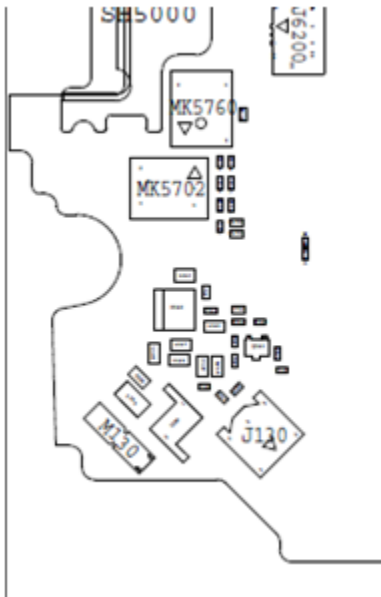


Step 3: If the failure persists, check the Antenna 1 universal contact, M100. If it is missing, misplaced, or damaged, place/replace the part and retest. Also check the contact pad of Antenna 2 on the main antenna carrier for a visible mark where the contact was touching the pad. If no mark is present, replace the universal contact M100 and retest.

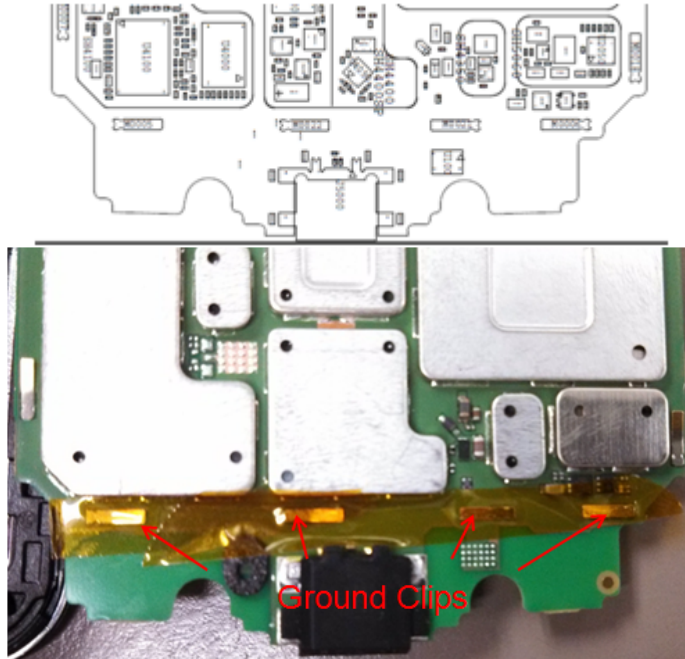




Step 4: If Step 3 does not resolve the issue, check all Antenna 1 matching components L113, C110, C107 and C105. If any component is missing, misplaced, or damaged, place/replace the part and retest.



Step 5: If Step 4 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0005, M0022, M0021, and M0006. If any clip is missing, misplaced, or damaged, place/replace the part and retest.



Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 1 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.





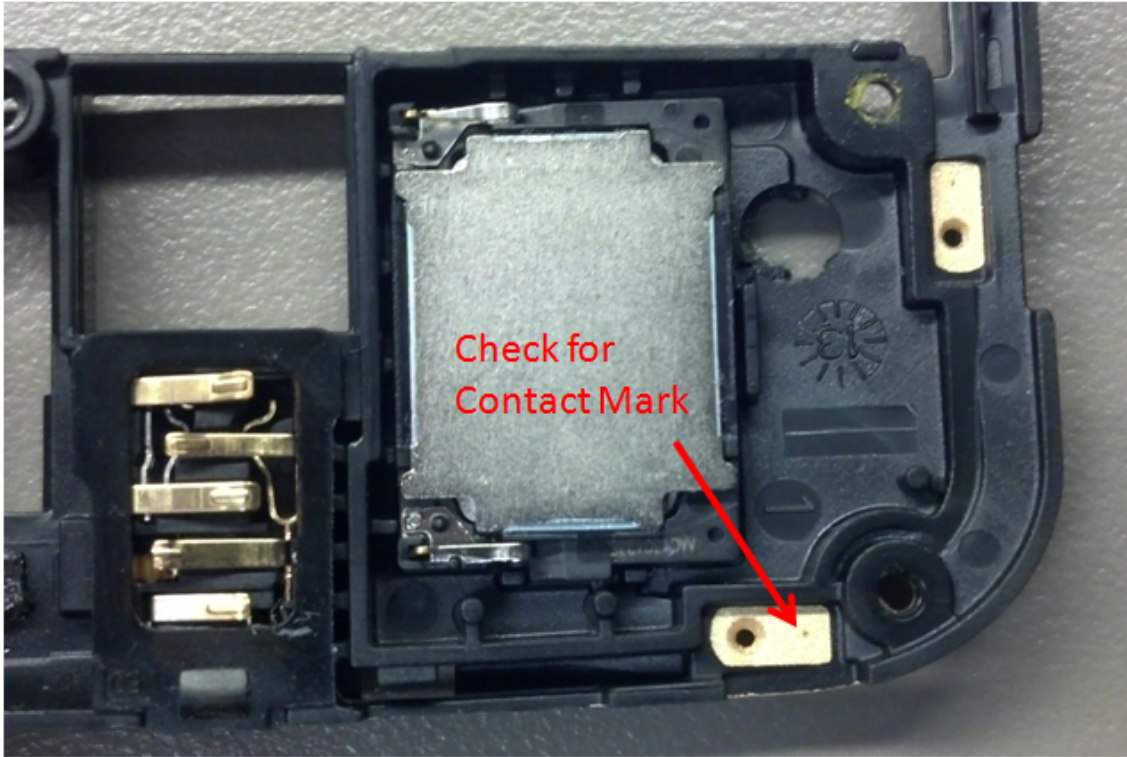


Figure: Contact Pad of Antenna 3



Step 3: If Step 2 does not resolve the issue, check all Antenna 3 matching components and PIN diode biasing components: C171, L172, C176, C173, C174, C181, and C175. If any component is missing, misplaced, or damaged, place/replace the part and retest.

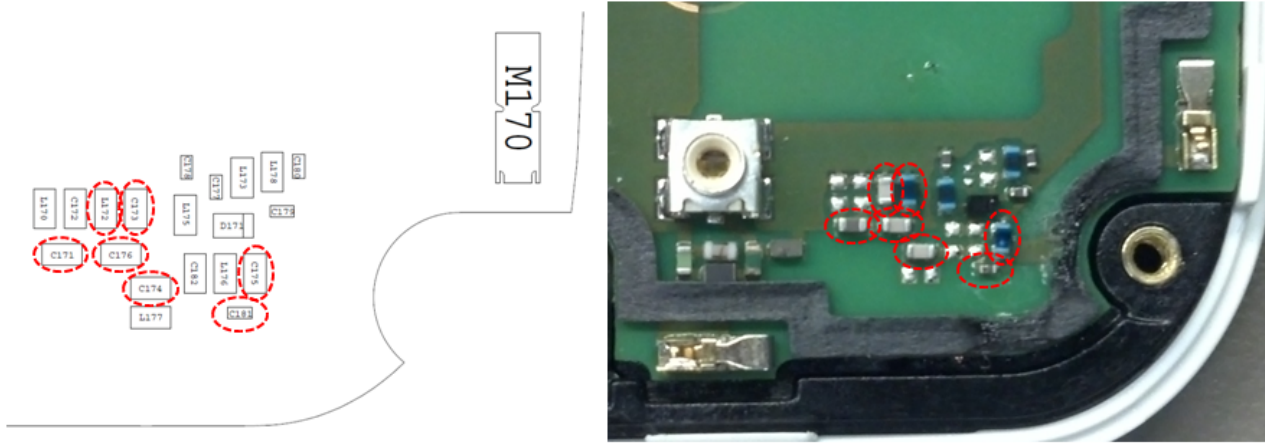
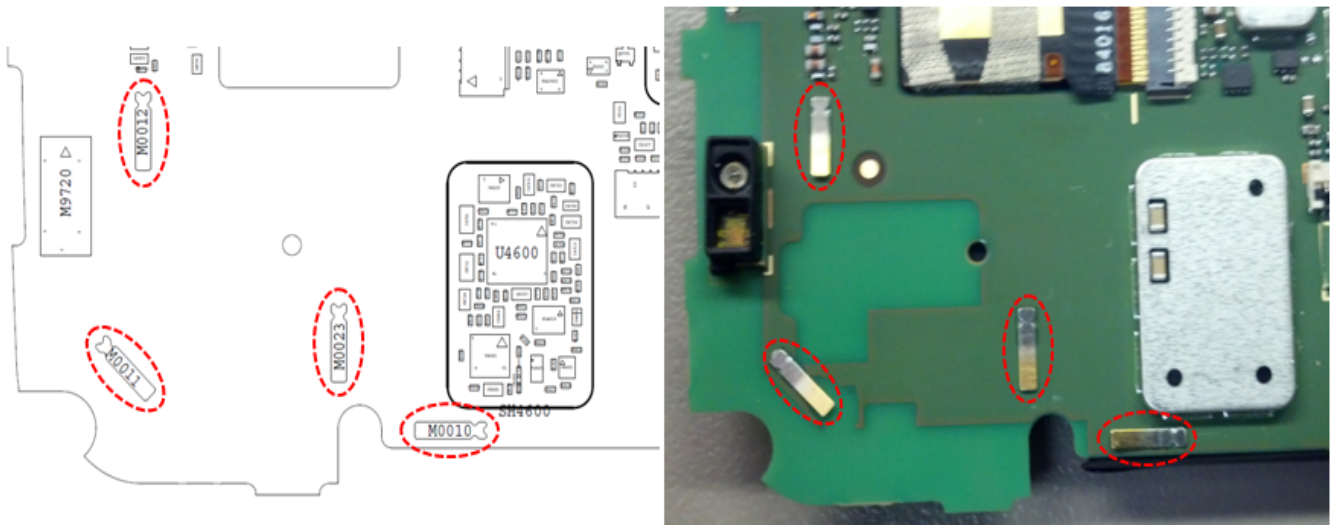


Figure: Antenna 3 Matching Components and PIN Diode Biasing Components

Step 4: If Step 3 does not resolve the issue, check the PCB grounding clips on the display side of the PCB: M0010, M0011, M0012, and M0023. If any clip is missing, misplaced, or damaged, place/replace the part and retest.

Figure: PCB



Grounding Clips Near Antenna 3 Matching

Step 5: If Step 4 does not resolve the issue, check the grounding clip between the PCB and the audio flex bracket, M0019. If the clip is missing, misplaced, or damaged, place/replace the part and retest.

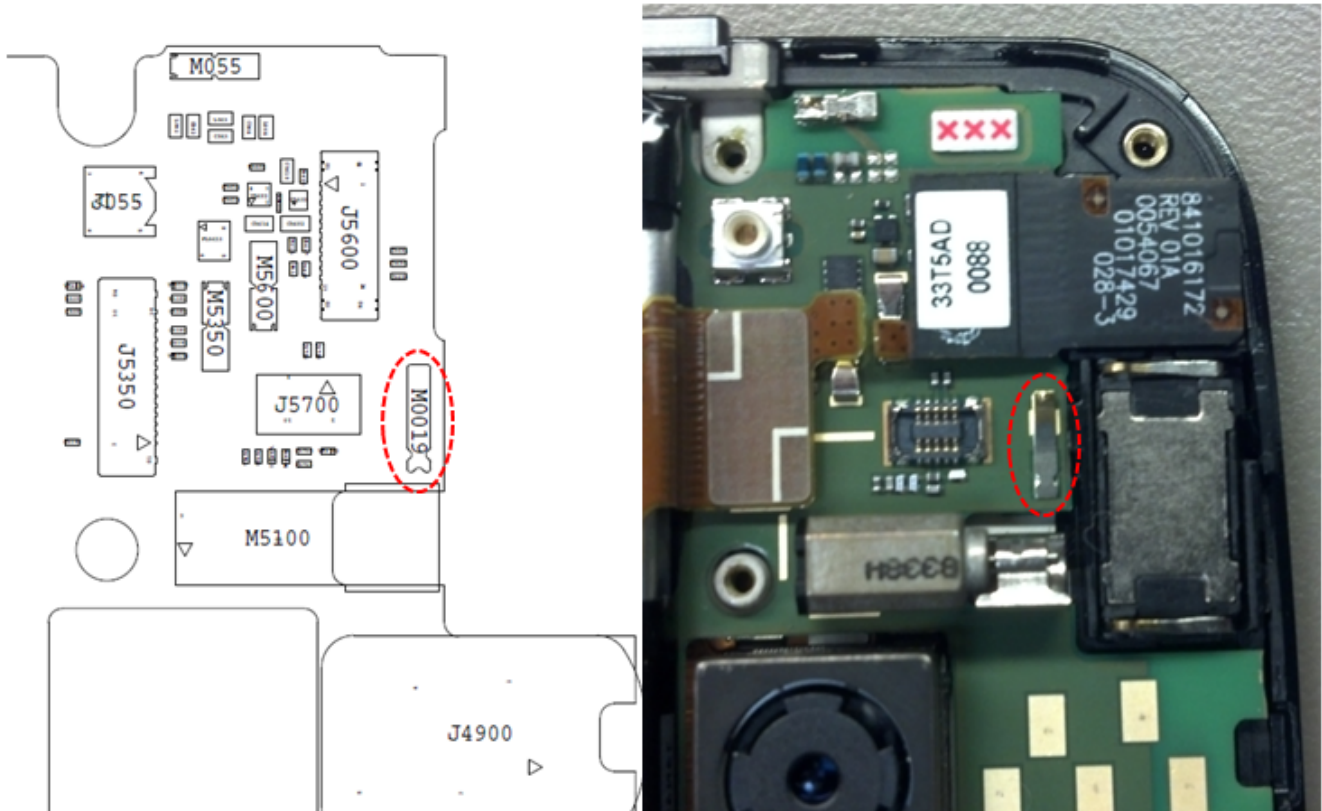


Figure: Grounding Clip Between PCB and Audio Flex Bracket

Step 6: If Step 5 does not resolve the issue, check the screw holding the antenna carrier to the front housing near the Antenna 3 feed. If the screw is missing or not fully inserted, place/replace the screw and retest.

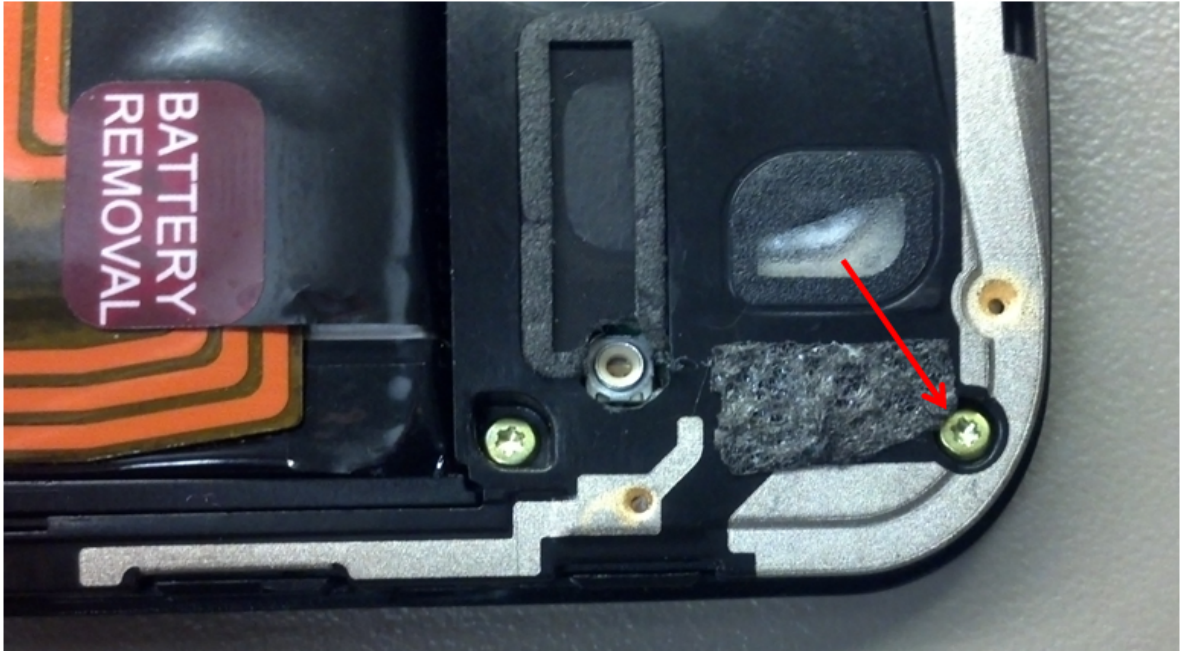


Figure: Screw Holding Diversity Carrier near Antenna 3 Feed

Step 7: If Step 6 does not resolve the issue, check the square piece of copper taped placed over the touch IC on the chassis. If the copper tape is missing, misplaced, or not fully adhered, place/replace the copper tape and retest.

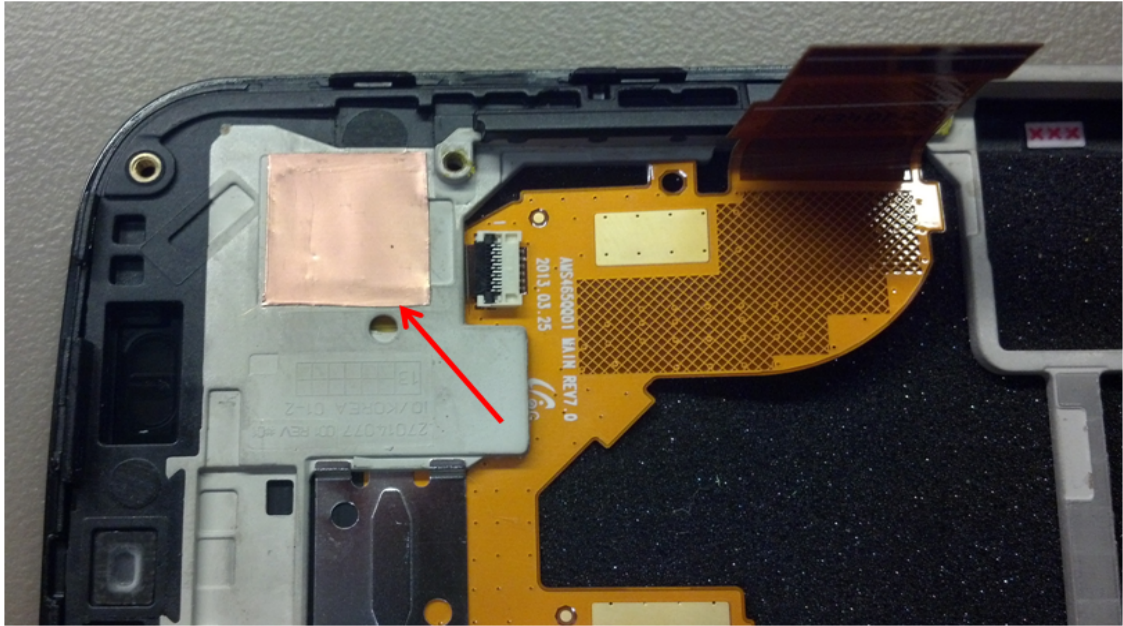


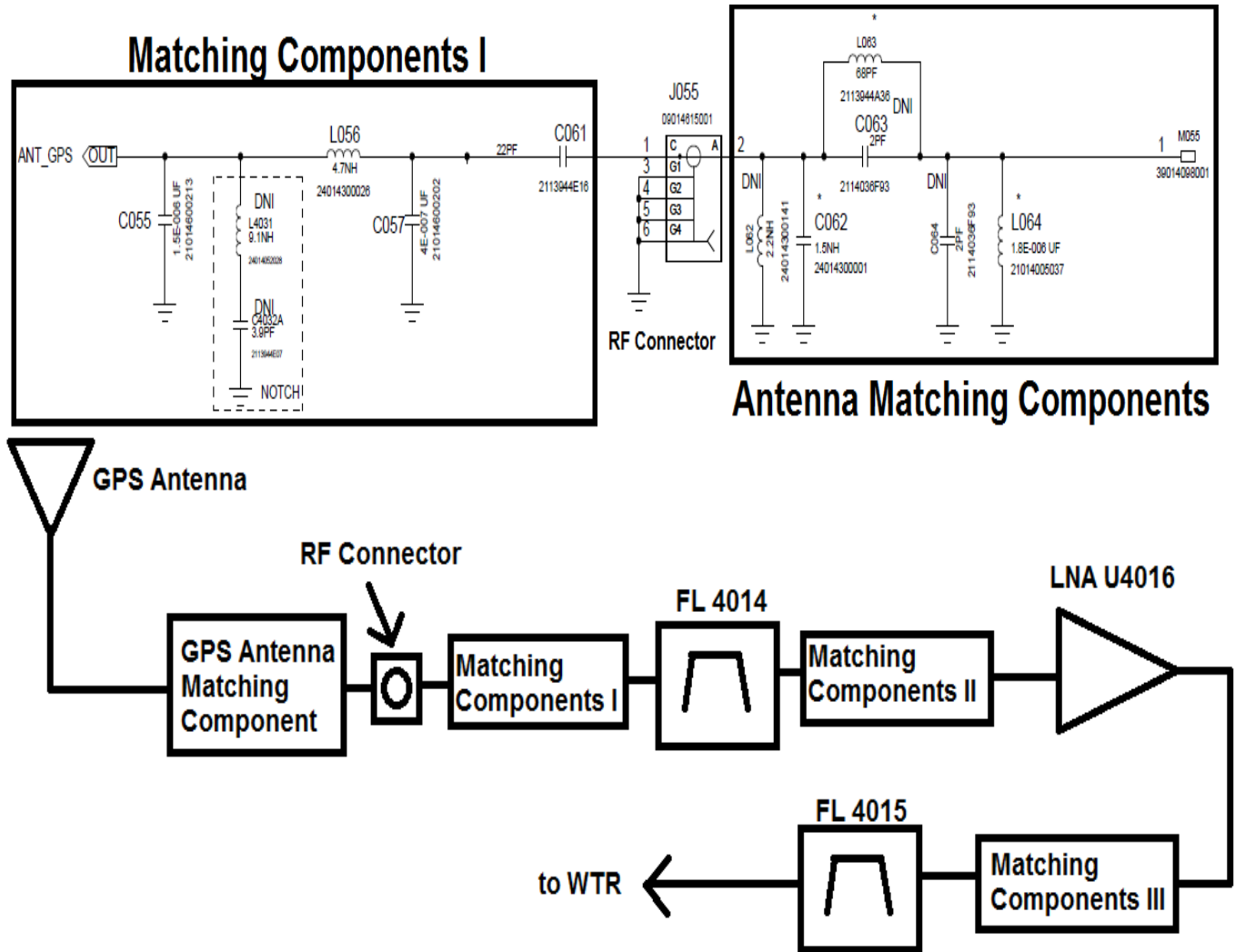
Figure: Copper Tape over Touch IC on Chassis



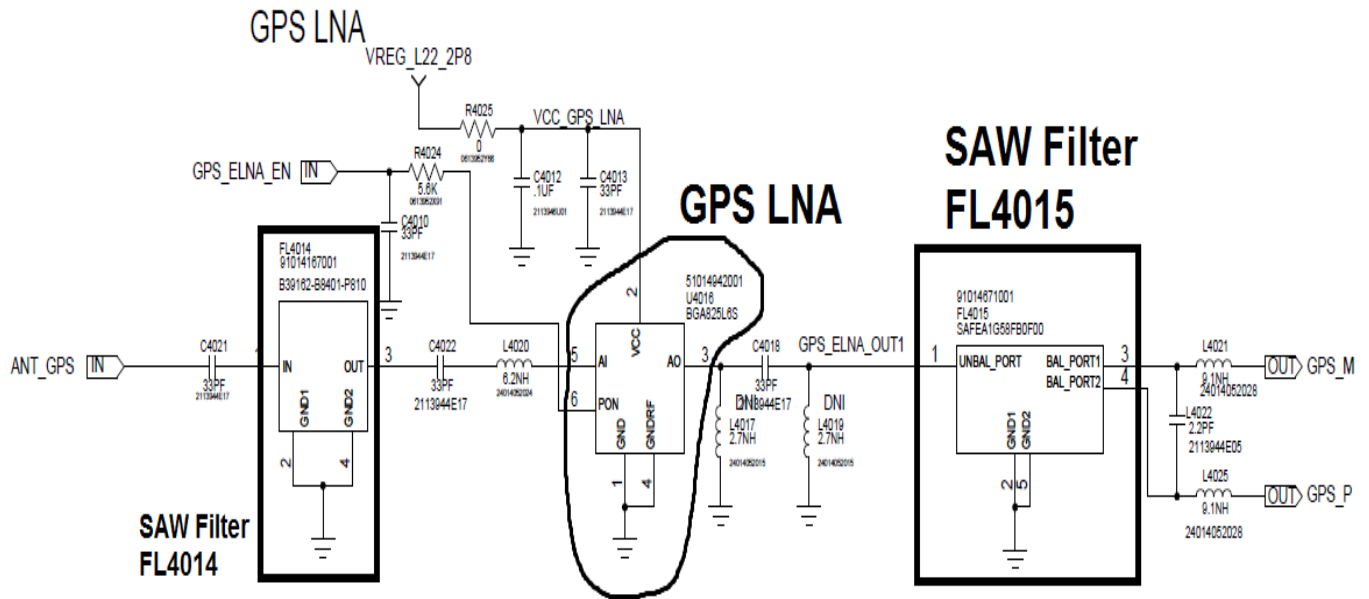
## 5.2 GPS Subsystem Troubleshooting

### Setup:

- GPS RF lineup block diagram:



- GPS antenna matching components and Matching Components I layout:
- GPS Conducted lineup layout (Saw Filter, Matching Components II, GPS LNA, Matching Components III, Saw Filter):



- Tianjin should take care of the conducted lineup (phasing, etc). The components (from Matching Components I to FL4015) are in SH4000 shield.

**Data/Analysis:**

- There is 2 tests for GPS lineup:
  - GPS\_Freq\_Offset.
  - GPS\_CTON. In GNPO, the window of C/No is from 51.5 to 61.5 dB

If GPS\_CTON fails, these are the steps you can follow to debug the issue:

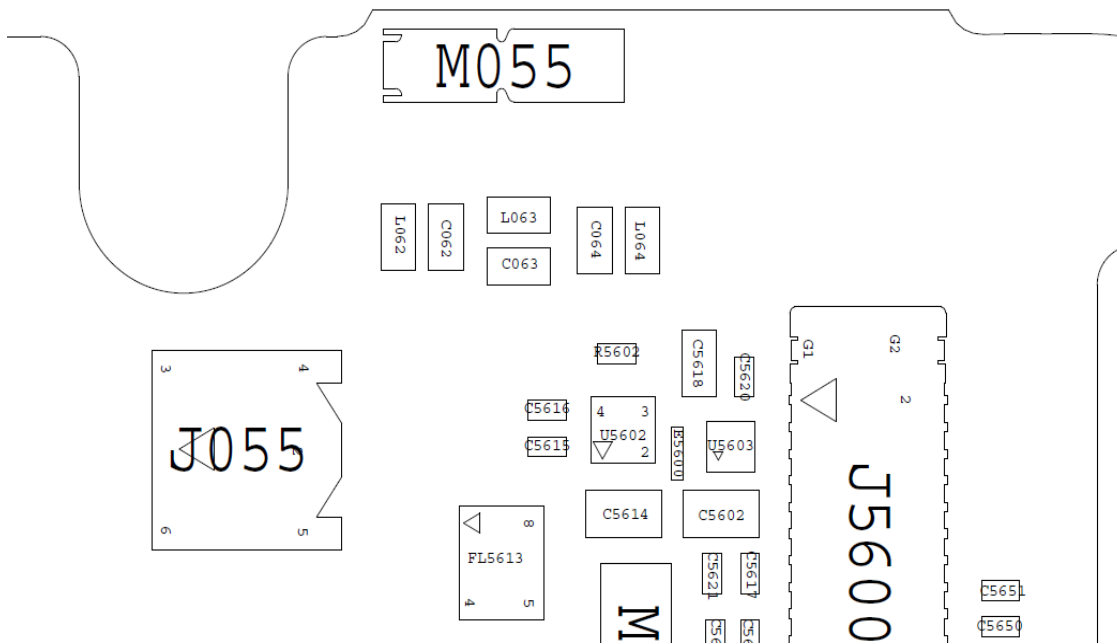


Figure: Overlays close to Ant 5

- **Americas version:**

Step 1: please retest the unit again

Step 2: If failure persists, please check whether antenna feed contact is in good condition or not (M055, see figure overlays above).

Step 3: If failure persists, check whether the antenna made a contact (contact mark, see figure below)



Figure: Contact Mark in Antenna 5, near Front Facing Imager side

Step 4: If failure persists, check if matching components are soldered properly (L064, L063, C062, see figure overlays above).

Step 5: If failure persists, check if there is any crack in the antenna, especially in the snap location area.

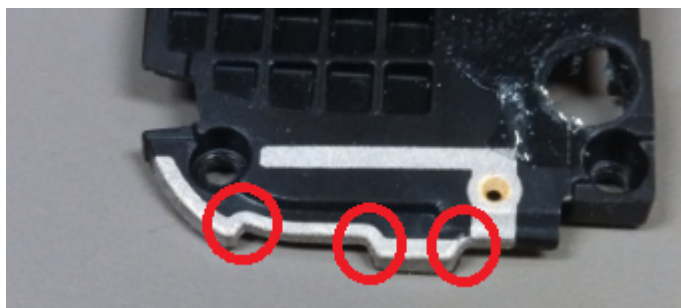


Figure: Antenna 5

- **Other versions:**

Step 1: please retest the unit again.

Step 2: If failure persists, please check whether antenna feed contact is in good condition or not (M055, see figure overlays above).

Step 3: If failure persists, check whether the antenna made a contact with the antenna feed contact (contact mark, see figure below).

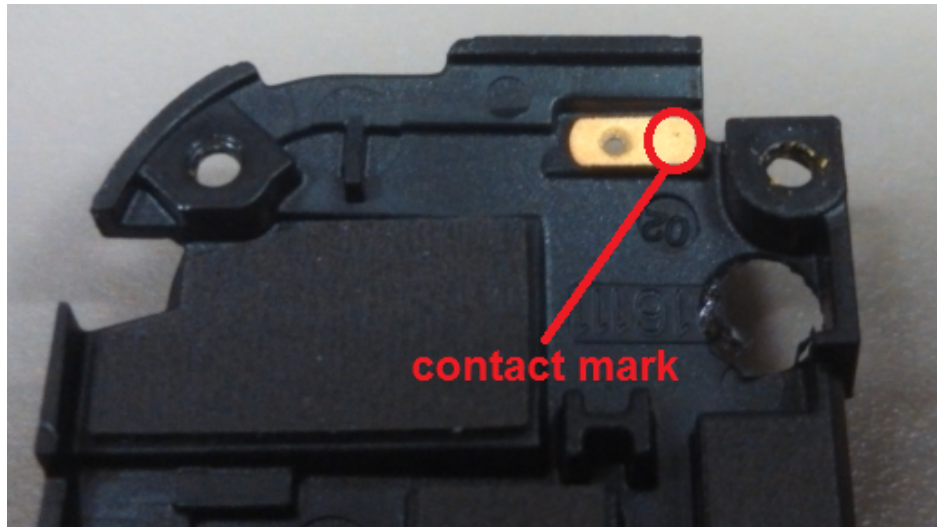


Figure: contact mark

Step 4: if failure persists, check whether matching component L063 is soldered properly or not (see figure overlays above).

Step 5: If failure persists, check whether matching components L062, C062 is soldered properly or not. (impact will be less)

Step 6: If failure persists, check if there is any crack on the antenna



If GPS\_Freq\_Offset fails,

Step 1: re-phase TC\_XO

Step 2: see if Y2010 XTAL19.2MHz is soldered properly

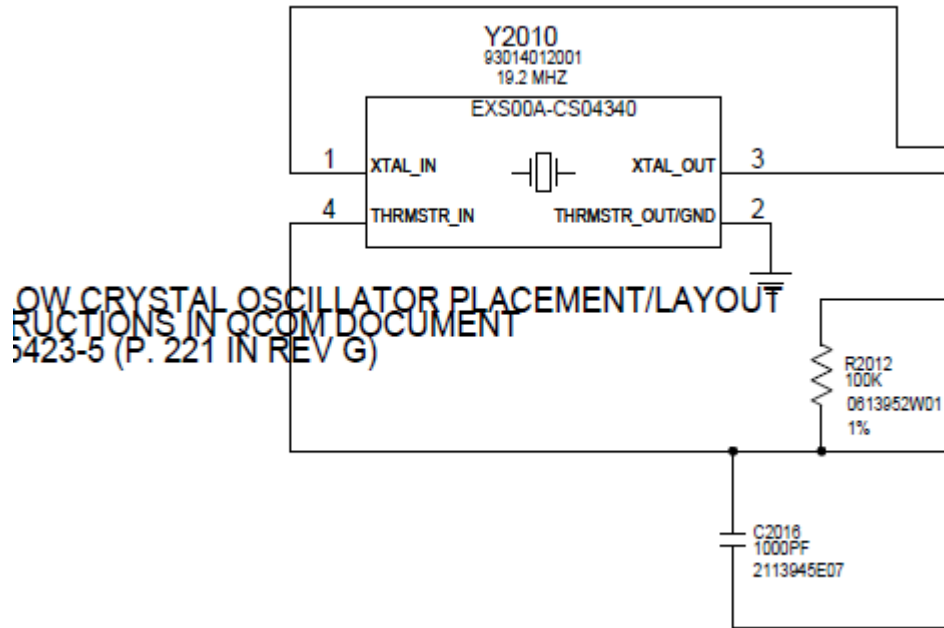
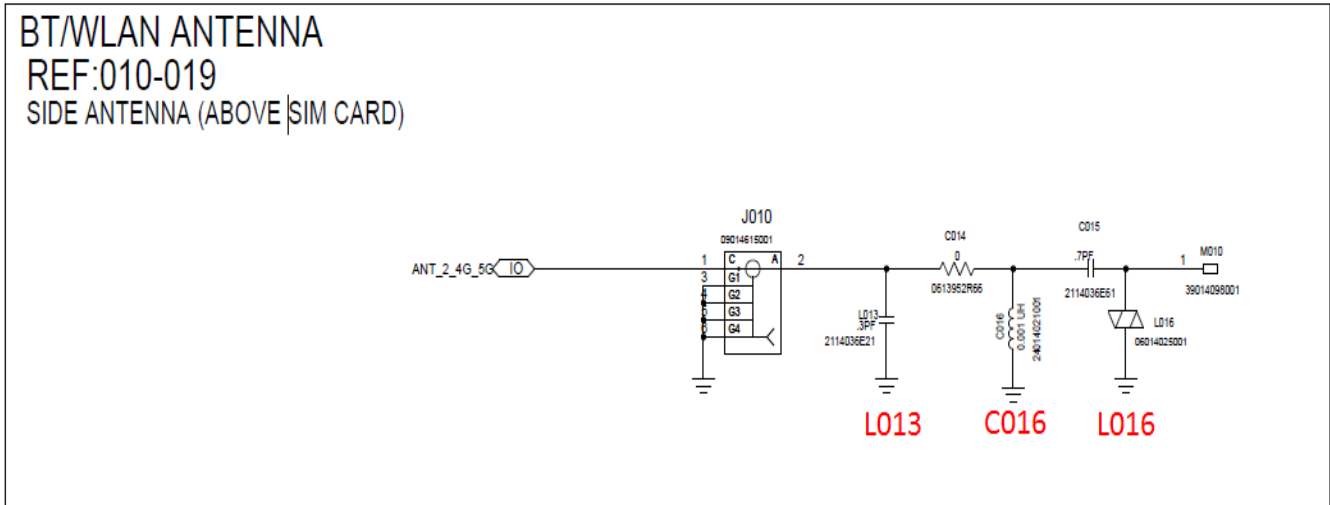


Figure: Y2010 XTAL

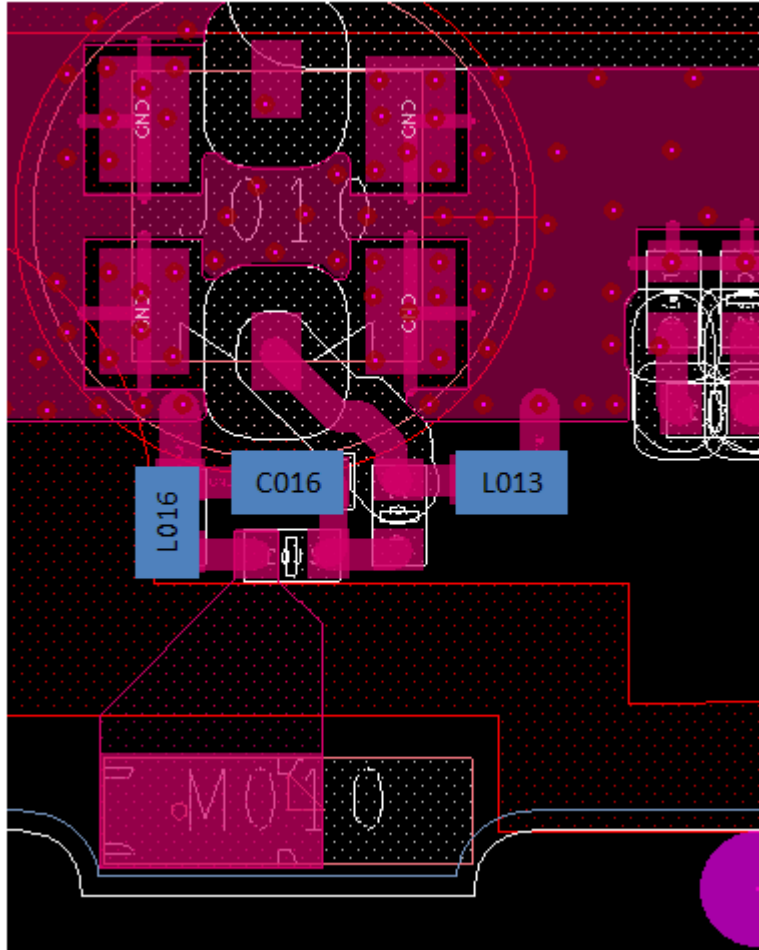
### 5.3 BT/WiFi Subsystem Troubleshooting

**Setup:**

- Schematic

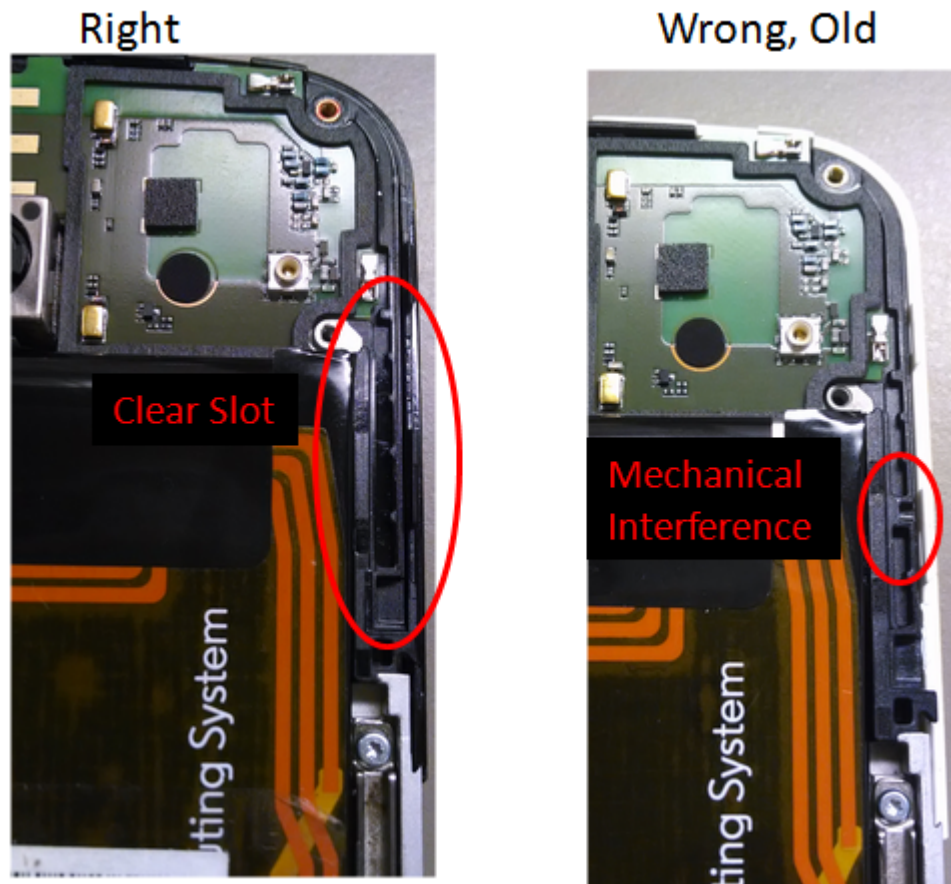


- PCB Layout

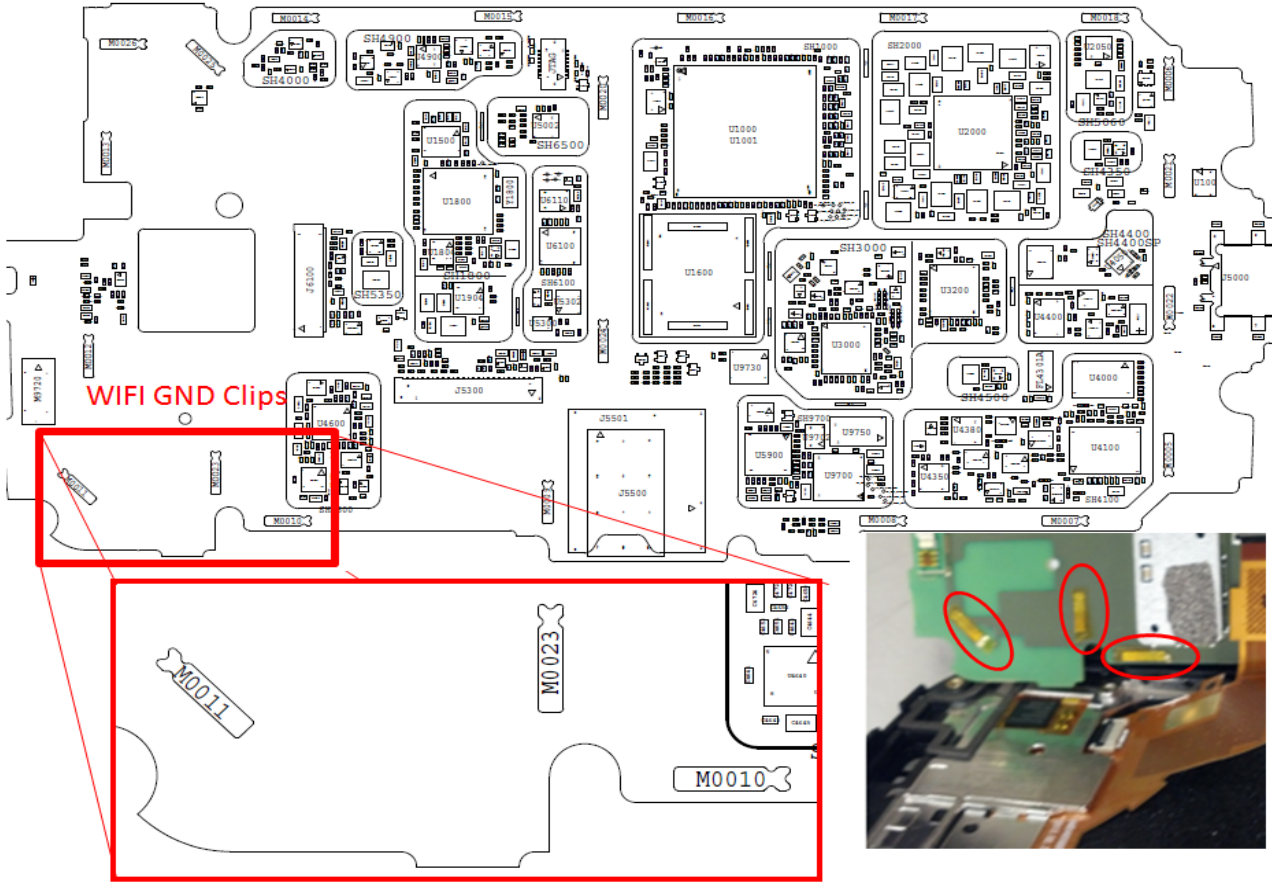


**Assumptions:**

- Begin by retesting to ensure true failure, then
- Check that correct chassis was used in build (wrong chassis will cause top carrier not to sit correctly due to mechanical interference)



- Start off with 2.4 GHz Bluetooth failures
- Then 2.4 GHz conducted WIFI failures
- Move to 5 GHz WIFI failures
- Then 5 GHz conducted WIFI failures
- If none of the following troubleshooting tips help, then look at the grounding clips on the opposite side of the board. They should be intact and making contact with the chassis.





**Analysis:**

- **5 GHz WiFi Failures**

If unit fails 5 GHz WiFi for low current or high current

For Ch 36 or 165 (marginally outside of limits +/- 20 mA)

Disassemble the phone, reassemble, retest

For Ch 36 (drastically outside of limits)

For Ch 165 (drastically outside of limits)

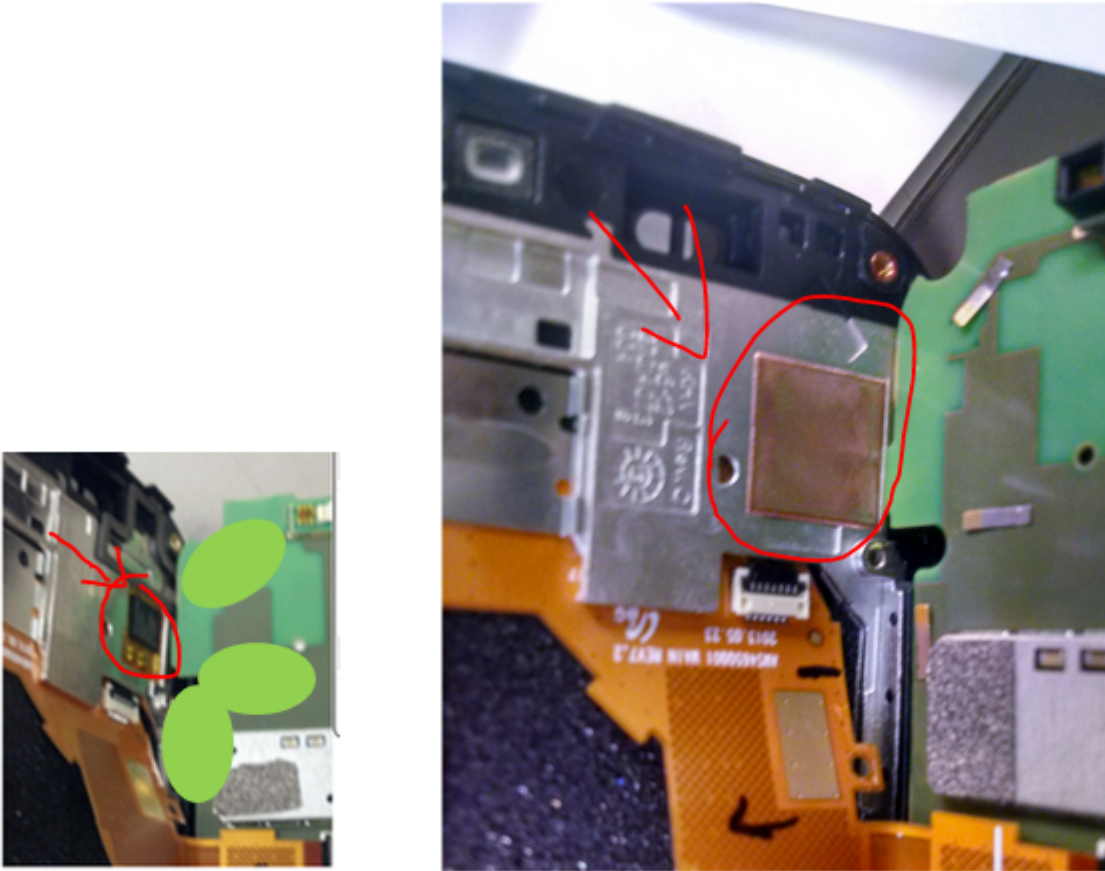
Replace the board.

If unit fails 5 GHz WiFi for low power or high power (marginally outside of limits)

Disassemble the phone, reassemble, retest

If unit fails 5 GHz WiFi for high power (drastically outside of limits)

Disassemble the phone, check the copper tape on opposite side of PCB.



Make sure tape is covering hole. Reassemble, retest.

- **Bluetooth Failures**

If unit fails Bluetooth, then it is likely crack in the antenna leg.

Step 1: If Bluetooth (2.4 GHz) fails low (**less than -5, usually -8 or lower**), check for cracks in the WIFI leg.



This leg can bend easily and crack if mishandled during placement or removal of top antenna carrier. There is a post at the end of the leg that snaps into the plastic of the chassis that must be inserted and removed with great care in order not to stress and crack the antenna. See post below



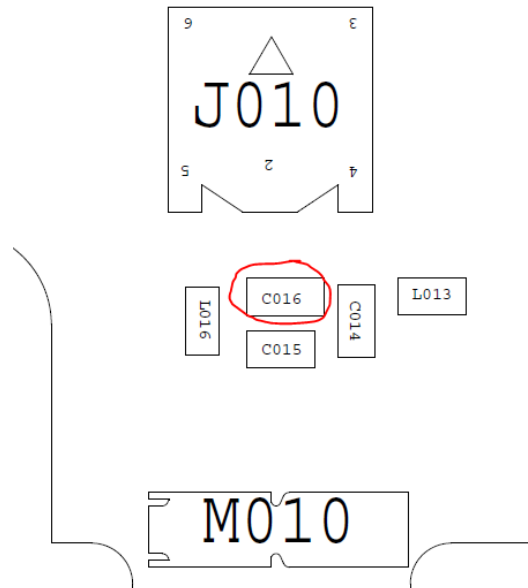
Cracks will only be visible under a microscope. A known “good” top carrier should be placed and the phone re-tested. This should fix the failure.

If no crack is found, continue by checking the following:

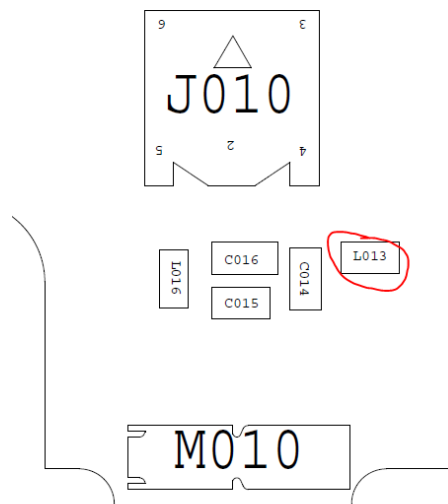
Step 2: Check if universal contact on the PCB is damaged. Is it touching the antenna pad? If the contact is twisted or not making contact, this is a problem. The contact should look like this picture below:



Step 3: Check RefDes C016. Make sure it is soldered down on each side, and not damaged.



Step 4: Check RefDes L013 as shown. Make sure it is soldered down on each side, and not damaged.



Step 5: Check grounding clips on opposite side of board as shown in picture. Note, the contacts should touch the chassis.



The contacts should be able to touch the board (not completely smashed).



- **Conducted Analysis**

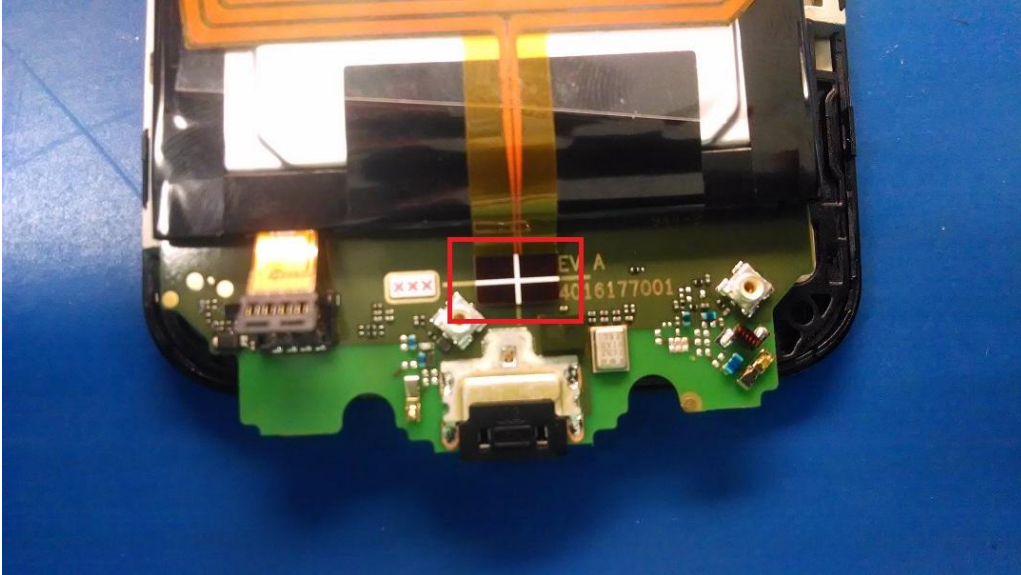
- Components to look into

- If it fails the 2.4 GHz test, please check the components in the red region of the following graph
    - If it fails the 5 GHz test for a low value, please check the components in the green region of the following graph
    - If it fails the 5 GHz test for too high a value, please check the components in the light blue region of the following graph

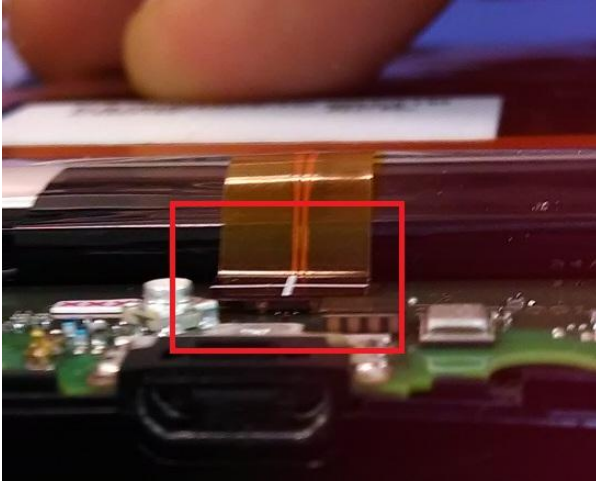


## 5.4 NFC Troubleshooting

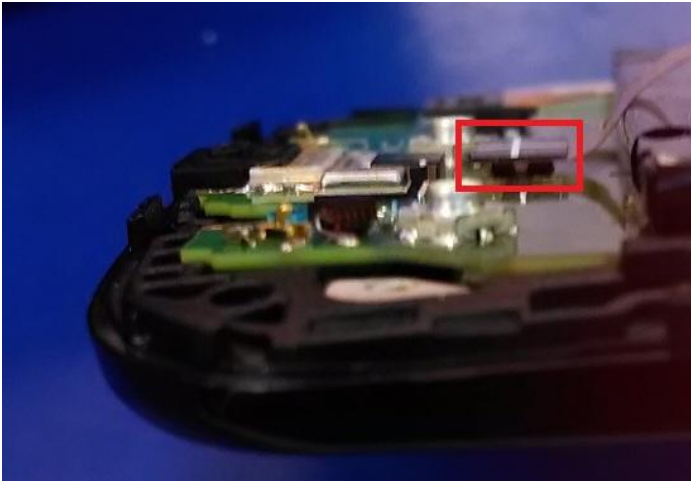
1. Verify NFC antenna exists, is connected, and verify it is properly seated.



- 2.



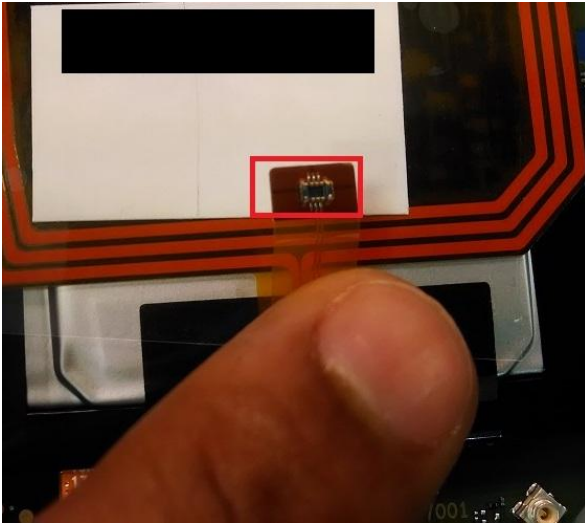
3.



4. Verify NFC antenna connector is not damaged on flex or on PCB. There may be soldering defects, such as shorts, broken pads. There may also be broken pins within the connector. Often broken pins can occur through improper insertion of connector.

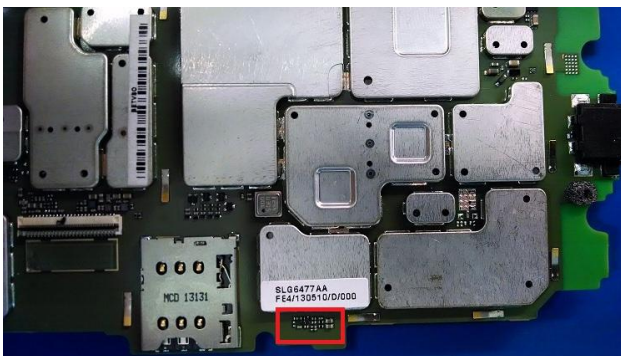


5.



6. Replace NFC antenna to see if it follows antenna itself.

7. Ensure NFC antenna matching components are not damaged.







## **6.0 No Turn On Troubleshooting**

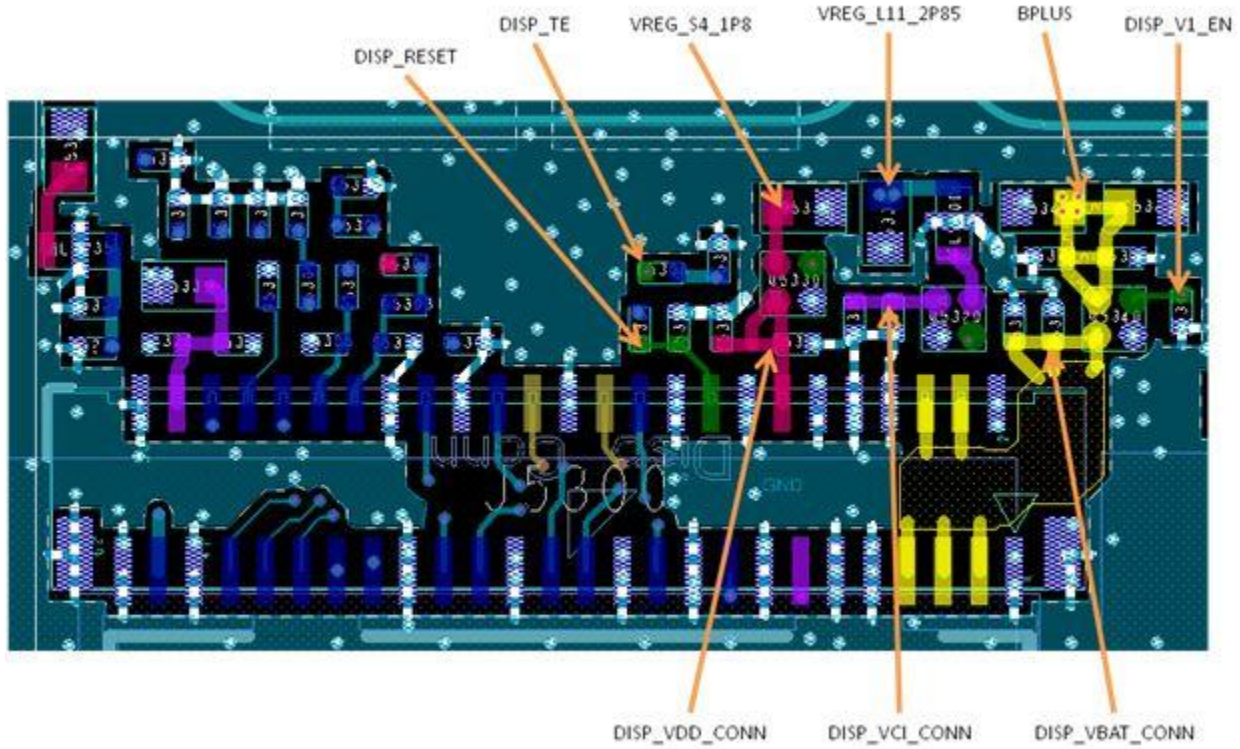
**See separate, dedicated troubleshooting guide “L3 Moto X No Turn On Troubleshooting Guide” on the service portal**

## 7.0 Display Subsystem Troubleshooting

### Purpose:

- The purpose of this test is to verify that the source of the display related failure.
- Ref Des of for measurement when display is attach and active (this included the no image on the display but the driver IC is still active :

Ref Des	NET NAME	Expected Voltage
R5340	DISP_V1_EN	1.8V
C5345	B_PLUS	3.2V - 4.2V
C5341	VBAT_DISP_CONN	3.2V - 4.2V
C5334	VREG_S4_1P8	1.8V
C5333	VDD_DISP_CONN	1.8V
C5332	VREG_L11_2P85	3.1V
C5320	VCI_DISP_CONN	3.1V
C5315	DISP_RST_N_FL	1.8V
E5308	DISP_TE	1.8V, 60 HZ pulse
J5300	(ZIFF TO TOUCH FLEX)	NA





**Assumptions:**

- Display module still attach with the PCB.
- Failure mode recovered.

**Debug Procedure:**

- Visual inspection
  - look for potential issue with display flex inspection, observe if the display connector door is not sit properly, or not fully closed, or one side not fully closed. Observed if the display flex is fully sit into the connector, any skew of offset to one side on the flex connection. Take photo if abnormal result observed.
  - Apply some force on the display flex and verify if the connection could be move easier than a known good unit. If the flex could be move by lower than the desired force, the connection is bad and need to re-do the flex to connector assembly.
  - Otherwise, NTF.



**Assumptions:**

- Display module still attach with the PCB.
- Failure mode could be reproduce.

**Debug Procedure:**

- Visual inspection
  - look for potential issue with display flex inspection, observe if the display connector door is not sit properly, or not fully closed, or one side not fully closed. Observed if the display flex is fully sit into the connector, any skew of offset to one side on the flex connection. Take photo if abnormal result observed.
  - physical remove the display flex from the connector, re-insert the flex to the connector in the desired position and door closed at desired position. retest the unit and verify (without in close phone condition, ensure the display flex connection not moving during test) and determine if failure mode had been recovered.
  - If failure mode recovered, failure is display flex connection related. Otherwise, move on to next section by swap display module (front housing) and XCRV to determine which component cased failure.

**Assumptions:**

- Swapped display module and concluded failure following Main PCB.
- Display flex attached. Display is in active state.
- DMM should be used to verify signal levels. If O-scope is available, can do further investigation. See debug procedure.

**Debug Procedure:**

- Failure Reason
  - Processor failure.
    - Take voltage measurement per the above table. If the power rail is present but the TE signal is missing, display failed to receive command from microprocessor.
  - Load switch failure.
    - Take voltage measurement per the above table. If the power rail of input side is normal but no power rail abnormal at display connector side, failed with load switch.

**Assumptions:**

- Swapped display module and concluded failure following display.
- Display flex attached. Display is in active state.
- DMM should be used to verify signal levels. If O-scope is available, can do further investigation. See debug procedure.

**Debug Procedure:**

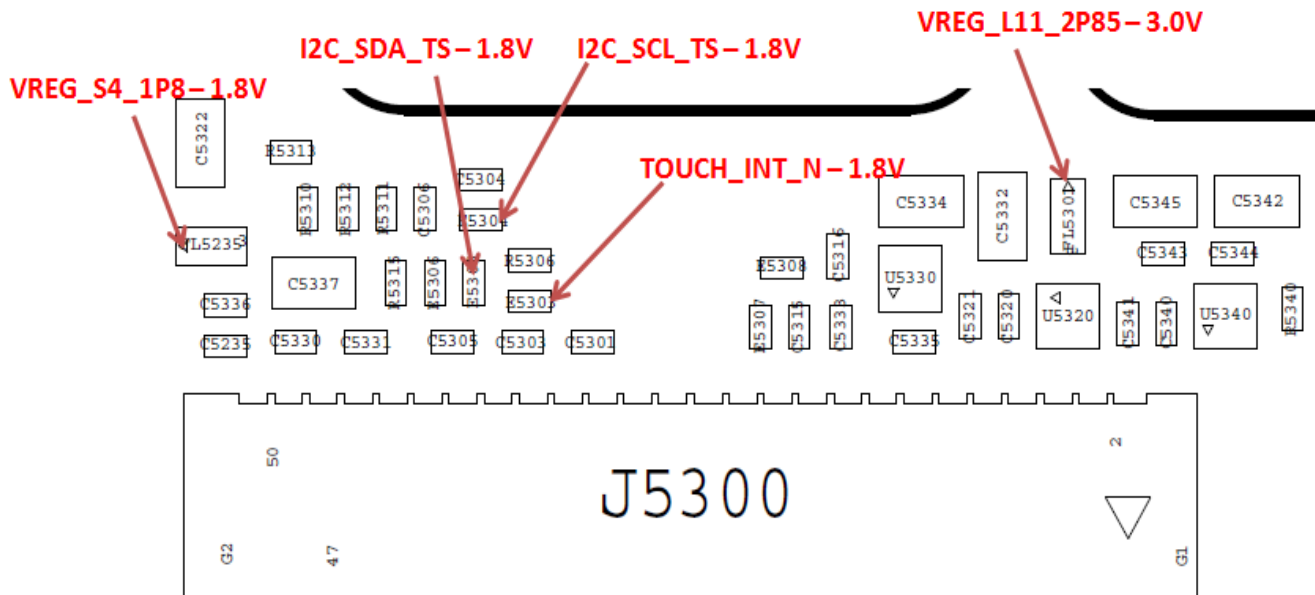
- Failure Reason
  - Display module failure.
  - Snow display image: (could be intermittent). Remove the metal chassis. If the failure still occur but become intermittent, inspect bending area for flex pinch damage caused by assembly. If no visible pinch damage, display module failure.
  - Dark Bubble: panel mechanical damaged. Display will become full dark in 1-2 days
  - Grayscale test failed test limit marginally: Consult Motorola test engineer
  - Display image flickering: Incoming material issue
  - Display intermittent on/off: Incoming material issue

## 8.0 Touch Subsystem Troubleshooting

### **Purpose:**

- The purpose of this test is to verify that the connectivity from the main touch controller to the other connections (J5300) to U9700 and U1000.
- Ref Des of Importance:

Ref Des	NET NAME	Expected Voltage
E5303	TOUCH_INT_N	1.8V
E5304	I2C_SCL_TS	1.8V
E5305	I2C_SDA_TS	1.8V
FL5301	VREG_L11_2P85	3.0V
FL5235	VREG_S4_1P8	1.8V
U1000	(MAIN PROCESSOR)	NA
U9700	(LOW POWER IC)	NA
J5300	(ZIFF TO TOUCH FLEX)	NA



### **Debug Procedure:**

- Failure Reason
  - Trace disconnect between Touch controller and low power system of phone. If there are no previous failures for touch screen, chances are this is a failure in U9700.
- Procedure
  - Carefully open device and ensure display flex is properly connected
  - Verify voltages of I2C lines, Interrupt, and 2 power rails at the Ref Des shown above. (Use overlay to locate components - All near J5300)
  - If voltages are correct, and other touch tests pass before this, it indicates failure at U9700 or trace disconnect between U9700 and J5300. Most likely indicates a board level failure, TJ will have to replace U9700 and retest.
  - Analyzer should also verify board failure by doing 1 last swap of a known working display assembly on the bad board and retest before sending the PCB for repair.



**Purpose:**

- The purpose of this test is to verify the functionality of the main touch controller (attached at J5300) and the physical connection in the PCB to the main processor (U1000)
- Ref Des of Importance:

Ref Des	NET NAME	Expected Voltage
E5303	TOUCH_INT_N	1.8V
E5304	I2C_SCL_TS	1.8V
E5305	I2C_SDA_TS	1.8V
FL5301	VREG_L11_2P85	3.0V
FL5235	VREG_S4_1P8	1.8V
U1000	(MAIN PROCESSOR)	NA
J5300	(ZIFF TO TOUCH FLEX)	NA
R5306	(INTERRUPT PULL UP)	1.8V
R1109	I2C PU - Under Shield	1.8V
R1110	I2C PU - Under Shield	1.8V

**Debug Procedure:**

- Failure Reason
  - Trace disconnect between Touch controller (J5300) and Main Processor (U1000)
  - Physical manufacturing defect on main touch panel
- Debug Procedure
  - Before opening device, turn on device to see if touch works. This validates power is good, interrupts, and I2C connectivity is present.



- If touch is not functional, carefully open device and validate Ziff connection to J5300
- Check reference designators in table above to see if they are present, damaged and voltages levels are acceptable. If I2C voltages are not correct, check Pull Up resistors. I2C pull up's are under a shield and will not be able to be debugged at Spectre.
- If root cause is pointing towards board defect that is not obvious or not able to be debugged, do swap analysis with known working PCB and Touch Panel to isolate the exact failing component.

## 9.0 Camera Flash Driver Troubleshooting

### Test Names:

- CAMERA\_EXT\_FLASH\_OFF\_ILLUMINATION
- ANDRIOD\_CAMERA\_EXT\_TAKE\_PICTURE\_FLASH\_OFF
- CAMERA\_EXT\_FLASH\_TORCH\_ILLUMINATION
- ANDRIOD\_CAMERA\_EXT\_TAKE\_PICTURE\_FLASH\_TORCH
- CAMERA\_EXT\_FLASH\_STROBE\_ILLUMINATION
- ANDRIOD\_CAMERA\_EXT\_TAKE\_PICTURE\_FLASH\_STROBE

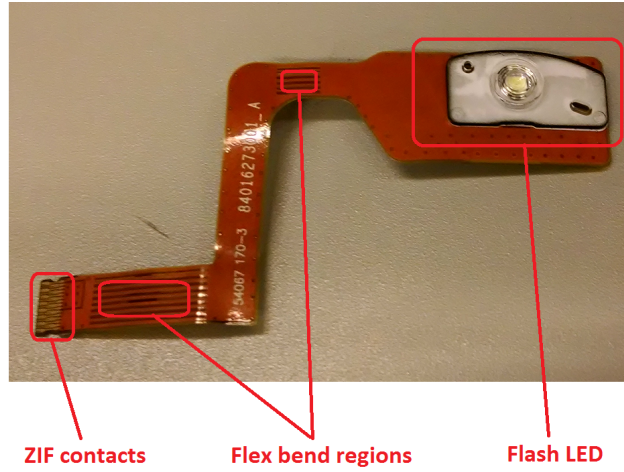
### Test Purpose:

To verify the flash LED is placed correctly, the flash LED flex is connected, the camera flash driver and its passive components are placed correctly. To verify the camera flash LED and camera flash driver are operating within specifications.

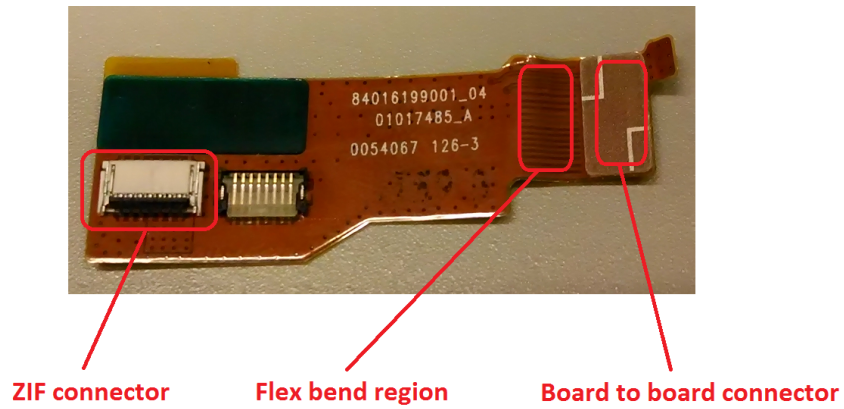
### Debug Procedure:

- There are three main components for the Camera Flash. The LED flex, attached to the rear housing. The Bridge flex, attached to the battery. The Main PCB.
- Follows LED flex
  - Refer to the following figure: “Flash LED Flex”
  - Inspect the ZIF contacts for shorts or foreign material.
  - Inspect the flex for cracked traces, especially in the bend regions.
  - Inspect the Flash LED for damage.
- Follows Bridge flex
  - Refer to the following figure: “Flash and Power Key Bridge Flex”
  - Inspect the ZIF connector for damage.
  - Inspect the board to board connector for damage.
  - Inspect the flex for cracked traces, especially in the bend regions.
- Follows Main PCB
  - Refer to the following figures: “Flash Driver Circuit Locations”, “Flash Driver Circuitry”, and “Additional Flash Driver Circuitry”
  - Remove the appropriate shields without using heat.
  - Inspect the highlighted components for correct placement and proper solder joints.

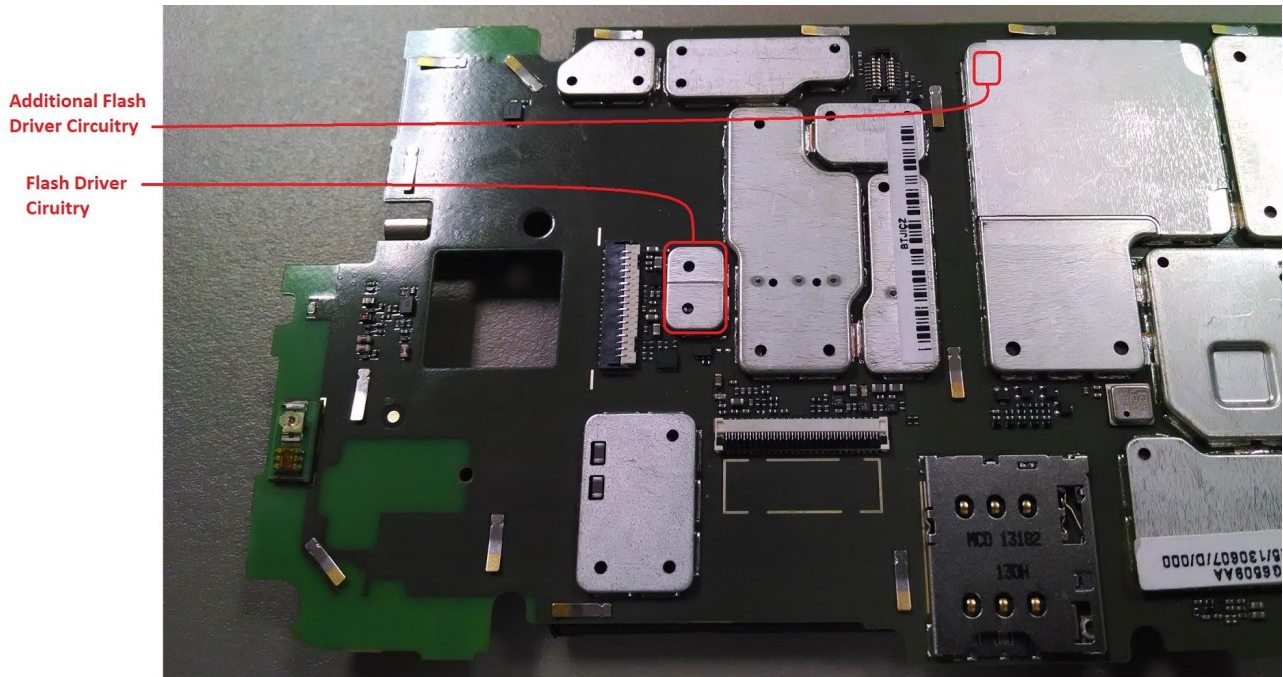
### Flash LED Flex



### Flash and Power Key Bridge Flex

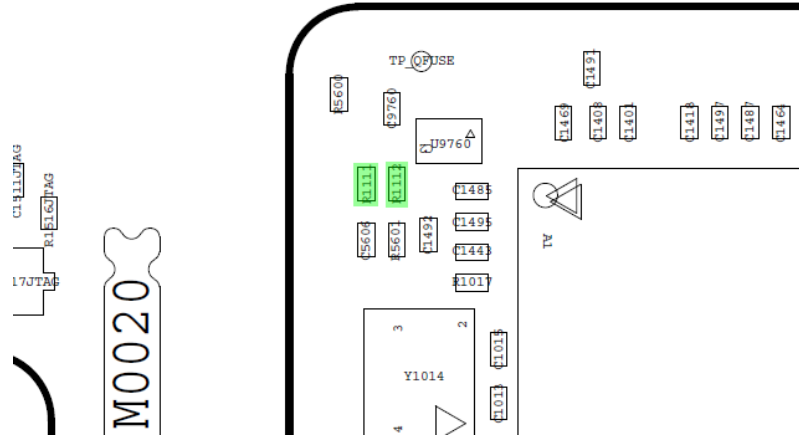


### Flash Driver Circuit Locations









## 10.0 Audio Subsystem Troubleshooting

**Purpose:** This test checks the headset jack state to see if a valid accessory has been inserted.

**Assumptions:**

1. Analyzer checked MQS Failure Code with spec limits

**Debug Procedure:**

If this test is failing, the headset detection portions must be checked.

At built level:

1. Check the pins on the headset jack for any bent pins or missing pins.
2. Ensure the boot of the headset jack is not resting between the contact and the PCB.

On the PCB:

3. Series components L4900, L4901, L4903, and L4904 must be physically placed and measure under a couple ohms using a DMM. Replace if any are found to be open circuit.
4. ESD Diodes VR4900, VR4901, VR4902, VR4903 must be open circuit. Measure these with a DMM to ground. If any short circuit is found, replace the ESD diode.
5. Capacitors C4915, C4916, C4917, and C4918 must be placed and not damaged. These are series components of the audio path.
6. Capacitors C4910, C4911, and C4912 must be placed and not damaged. These are charge pump capacitors.
7. U4900 must have voltage on the VDD line, and can be probed on either C4913 or C4919. This should measure 1.8V.
8. U4900 must have voltage on the MICVDD line. This can be probed at C4914. This should measure 2.85V.

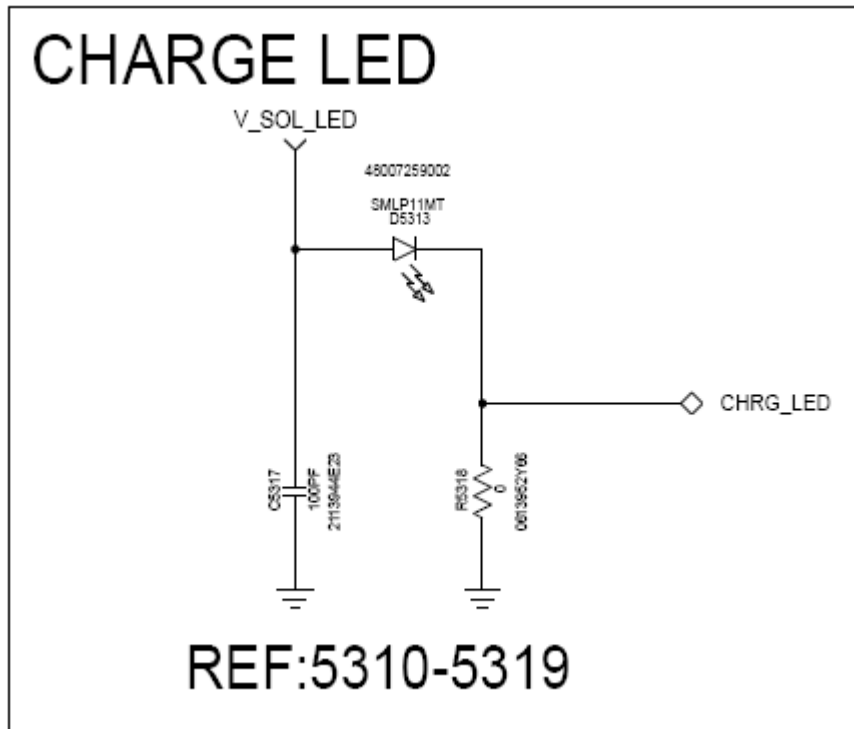
## 11.0 Miscellaneous Baseband Troubleshooting

### Purpose:

- Verify that Green LED (D5313) is lit and shines properly through earpiece speaker Mesh.

### Assumptions:

- Analyzer has checked MQS Failure Code with spec limits.



### Debug Procedure:

- Use raw test command (003E2001) to enable the LED.
- Check for part visibility through front housing.
  - If visible, and measured value at Vision is high, check that front housing assembly has metal mesh installed and rubber diffuser is installed.



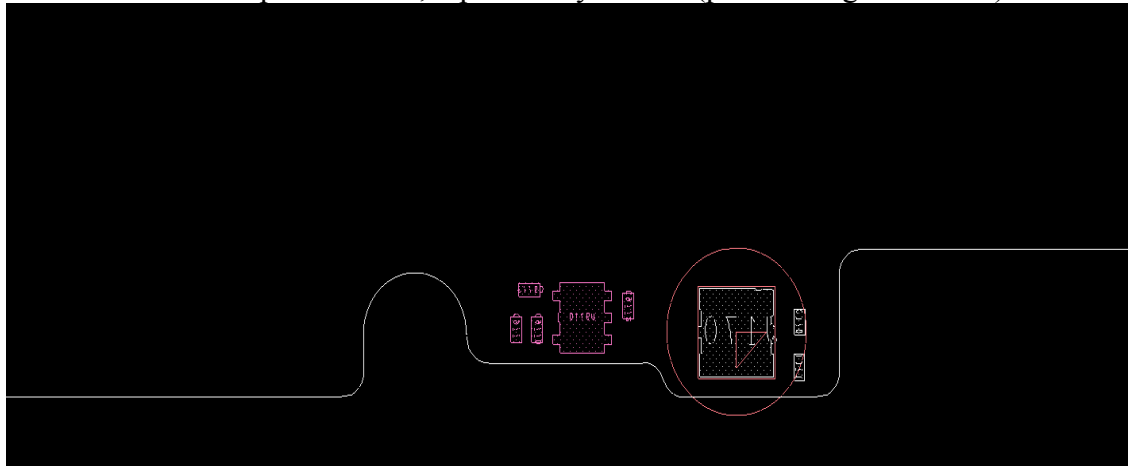
- If not visible, check that front metal mesh has small holes for the light to pass. Check that rubber diffuser is present on back. If FH looks OK, remove PCB from Front Housing assembly.
  - Verify that LED is lit at PCB level. If not lit, check part (D5313) placement and orientation.



- If no magnetometer data can be read, verify that accelerometer data can be read. If both sensors fail to report any data, inspect purple parts in diagram, and then replace U9700. If accelerometer does provide data, replace only U9740 (red in diagram).
- Digital Temp Sensor
  - If temperature reading is inaccurate. Inspect and replace U9760 (yellow in diagram).
- Proximity Sensor
  - If proximity readings are high, or it reports covered when no object is present:
    - Visually inspect through the lens artwork opening. There should be a grommet present that covers most of the IR LED portion of M9720 (blue in diagram). Only the middle circle should be visible when looking through the lens. If the body of the part is also visible the grommet is missing.
    - If grommet is present, verify that it is not skewed, torn, or upside-down.
  - If proximity readings are low, or it reports uncovered when a reflective object is present:
    - Visually inspect through the lens artwork opening. Under bright light, you should be able to see both the LED and detector portions of M9720. If one is not visible or partially obscured, then the grommet is misaligned and should be replaced.
  - If no proximity events are reported:
    - Follow the steps above, events are reported on transitions from covered to uncovered and uncovered to covered, if the part does not see a transition, it may not report any state information.
    - If no prox data can be read, verify that accelerometer data can be read. If both sensors fail to report any data, inspect purple parts in diagram, and then replace U9700. If accelerometer does provide data, replace only M9720 (blue in diagram).
- Ambient Light Sensor
  - If ambient light readings are low, verify that the grommet over M9720 is not partially blocking the sensor, due to improper assembly.
  - If ambient light readings are too high, replace M9720.
  - If no lux data is reported, verify that accelerometer data can be read. If both sensors fail to report any data, inspect purple parts in diagram, and then replace U9700. If accelerometer does provide data, replace only M9720 (blue in diagram).
- Barometer
  - If barometer provides readings, but they are inaccurate, inspect and replace U9730 (green in diagram).
  - If no pressure data is reported, verify that accelerometer data can be read. If both sensors fail to report any data, inspect purple parts in diagram, and then replace U9700. If accelerometer does provide data, replace only U9730 (green in diagram).
- Dock-detection Hall-Effect Sensor
  - Placing the north-pole of a magnet to back of the phone, under the hall effect sensor, should simulate a desk dock accessory.
  - Placing the south-pole of a magnet to back of the phone, under the hall effect sensor, should simulate a car dock accessory.
  - Removing the magnet should simulate removing the phone from a dock.

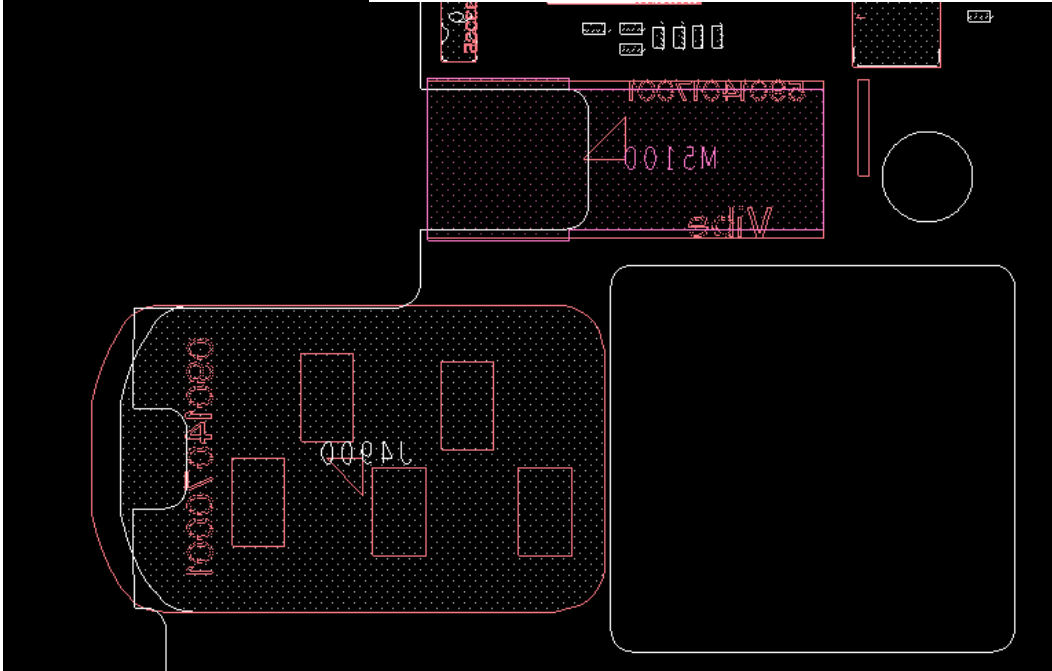


- Therefore there are three states to verify. They should be tested by applying and removing each pole and looking for a dock transition on each of the four actions.
- If no transitions occur, verify that accelerometer data can be read. If both sensors fail to report any data, inspect purple parts in diagram, and then replace U9700. If accelerometer does provide data, replace only U9770 (pink in diagram below).



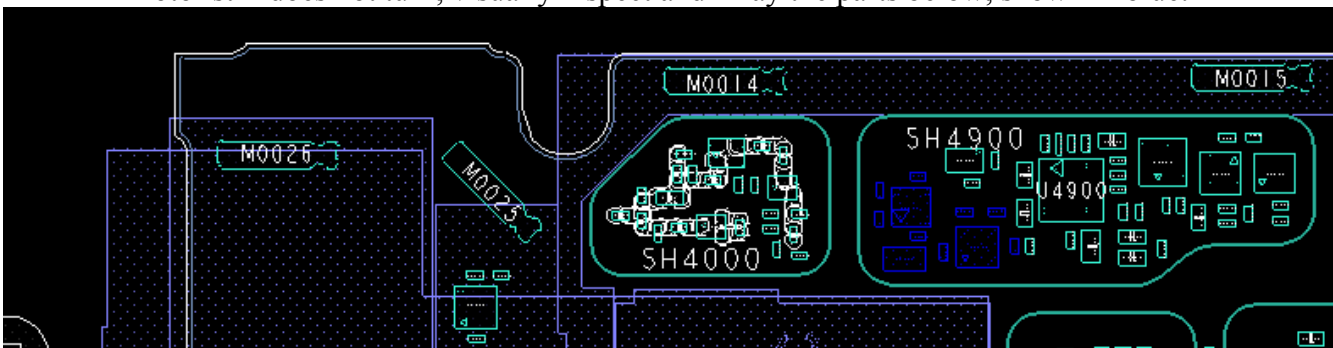
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### Vibrator Troubleshooting:



Motor shown above in pink.

- Enable vibration and observe motor. If motor starts to turn and stop. Replace M5100 (pink in diagram).
- With vibration enabled, try turning the motor shaft slowly by hand, if it starts turning and then stops, or if starts turning and continues turning. Replace M5100 (pink in diagram).
- If motor does not try to turn at all, try to apply pressure to the top of the vibrator to see if it starts turning (bad solder joint).
- If motor still does not turn, visually inspect and x-ray the parts below, shown in blue:



- At this point it could be either the motor or the parts shown in blue. Start by replacing the motor M5100, then try U5101, then try U5102.
- If motor runs perfectly, but phone fails due to high current when vibrator is running, start by replacing U5101, then try replacing the motor.