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UHF Wireless System

SERVICE MANUAL CHANGE NOTICE

U1/U1L UHF BODY-PACK TRANSMITTER

Changes and corrections have been made to the Service Manual for the U1/U1L UHF Body-Pack Transmitter. These changes will make it easier to repair the transmitters. To update your Service Manual, remove the pages identified in the tables below and replace them with the pages attached to this Change Notice. Note that there are no changes to pages not specifically identified in the tables below.

U1/U1L SERVICE MANUAL REVISION HISTORY

Release	Part Number	Date Code
Original	25A1021	QE
Revision 1	25B1021	SA
Revision 2	25C1021	TD
Revision 3	25C1021	AG
Revision 4	25C1021	BF
Revision 5	25C1021	BG

CHANGES EFFECTIVE JULY 12, 2002

REMOVE these pages from the U1/U1L Service Manual	INSERT these Revised pages into the U1/U1L Service Manual
21 to 25	21 to 25

SHURE®

Service Manual U1/U1L Body-Pack UHF Transmitter

General

Characteristics

The Shure U1/U1L Body-Pack UHF Transmitter is a microprocessor-controlled body-pack transmitter operating in the UHF frequency range. This product is intended for use in high-end installed sound, rental, and concert sound applications. Different frequency variations are available.

Controls and Indicators

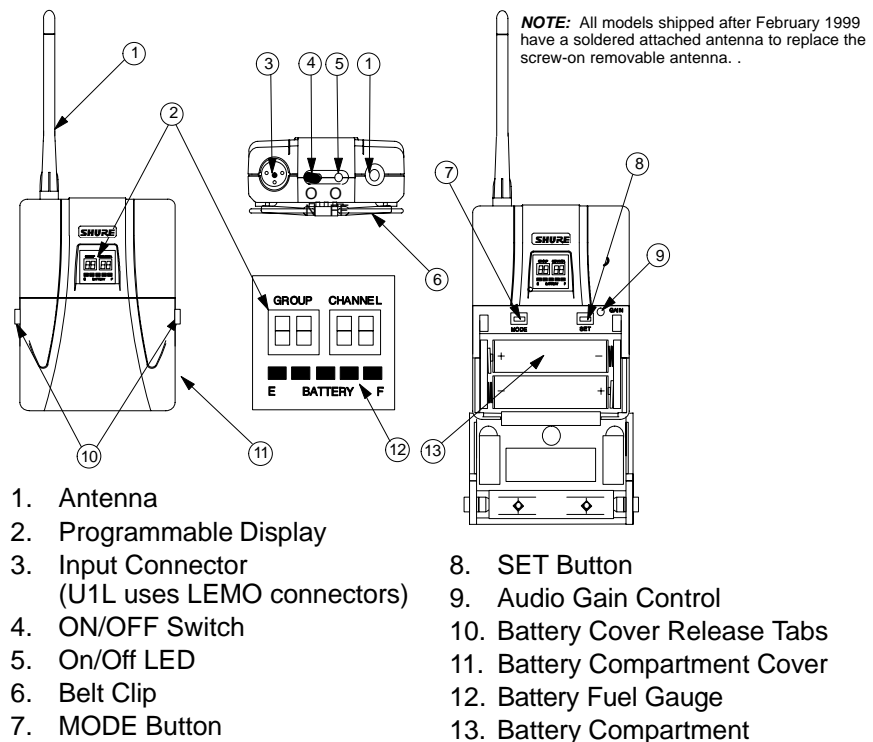


Figure 1. U1/UL Transmitter Controls and Indicators

Service Note: Shure recommends that all service procedures be performed by a Factory-Authorized Service Center or that the product be returned directly to Shure Brothers Inc.

Licensing: Operation may require a user license. Frequency or power-output modifications may violate this product's approvals. Contact your country's communications authorities.

Circuit Description

Audio Section

Audio enters L201, an inductor that is used as an rf choke. The signal enters a 6 dB pad made up of R203, R204, C204, and C206. The signal is ac-coupled through C205 into a 40 dB (30 dB for JB frequencies) user-adjustable gain stage around U201A.

This gain stage is externally accessible to the user. C201, C202, and C207 protect the pre-amplifier and bias circuits from rf interference. R205 and R207 set up a half-supply bias, and R206 sets the ac input impedance.

The amplified audio signal is then passed through a pre-emphasis network before entering the compression stage. R208, R211, and C211 set up two corners for the pre-emphasis network. The pre-emphasis network boosts the high frequencies before transmission and helps set the hinge point (0 dB gain) of the compandor. The network feeds NE575 compandor U203, which utilizes an external amplifier U202B. The compandor performs 2:1 logarithmic compression of the audio signal.

Transistors Q201 and Q202, along with crystal Y202, form the tone key oscillator circuit, which provides a stable, continuous 32.768 kHz sine wave. Transistor Q204 buffers the tone key signal before it is added to the audio signal.

The tone key signal is used in the receiver to provide audio output only when the tone key signal is present in the transmitted signal. Therefore, if the tone key or the transmitter is turned off, the receiver will be muted. Q203 acts as a switch for toggling the tone key on and off. It is controlled via the microprocessor. R224 allows the tone key amplitude level to be set.

The tone key circuit is powered by U208B, which is a dc amplifier that multiplies the 3 V battery voltage to 4.5 V (gain = 1.5). As the battery voltage drops, the tone key supply voltage also drops, which decreases oscillator amplitude. The tone key amplitude is used by the receiver to indicate transmitter battery strength.

The tone key feature indicates battery level at the receiver. It is not available on JB models.

The tone key signal, along with the processed audio signal, is fed to summing amplifier U202A. Resistors R232 and R233 set up a half-supply bias. Resistor R231, located at the output of the summing amplifier, prevents spurious oscillations from the operational amplifier. After passing through ac-coupling capacitor C232, the signal is fed to the rf module.

Rf Section

Processed audio enters R243, an internal potentiometer adjusted for 45 kHz deviation (100% modulation) with a -7.2 dBV, 1 kHz tone, at the output of the front audio stage (pin 1 of U201). On JB models, R243 is adjusted for 5 kHz deviation with -63.2 dBV, 1 kHz tone, at the input to the transmitter.

The audio is then fed to the tuning voltage pin of the voltage controlled oscillator (VCO) and modulates the carrier directly. The use of a phase locked-loop (PLL) frequency synthesized system eliminates the need for multiplier stages, resulting in a much higher degree of spectral purity. The VCO is shielded against interference from external rf fields. Regulated +5 Vdc power from the dc-to-dc converter ensures frequency stability, even if the battery voltage changes.

At the output of VCO U205, the rf signal splits into two paths. The output of the VCO is coupled by C244 to the frequency control pin of synthesizer U204. The synthesizer's internal circuitry divides the signal as necessary to reach the desired reference frequency.

The synthesizer contains a quartz-controlled reference oscillator circuit, including a 4.0 MHz crystal (Y201), that is adjusted by means of trimmer capacitor C239.

The transmitter output frequency is user-selectable. Frequency selection is made via microprocessor U103, which interfaces with the user by means of the mode/select switches. The output of the synthesizer is a series of pulses that are integrated by a passive loop filter (R238, C245, R240, C266, C267, R239, and C247) to produce a control voltage signal. The control voltage signal is then connected to the VCO through amplifier U210A, which is used to isolate the PLL filter from the audio modulation signals.

The VCO output is also coupled to an rf power amplifier through a resistive pad consisting of R254, R255, R256, R257, and an LC matching network containing C261, L209, and C248. The rf power amplifier, dual gate MESFET Q208, is fixed-tuned and configured as a common source device.

Amplifier stability is obtained through resistive loading on the input, R247. The output of Q208 contains a low-pass matching network (L206) and an LC-type low-pass filter (LP206), which provide a high degree of spectral purity. The output of the low-pass filter feeds a microwave isolator that reduces the production of reverse third-order intermodulation products.

The transmitter is capable of delivering a maximum of +10 dBm (10 mW) to the 50Ω antenna. During transmitter power-up and frequency selection, rf power is muted by bringing the base of Q209 high. This provides approximately 45 dB rf attenuation until the PLL has locked. The transmitter rf is then unmuted by bringing the base of Q209 low. During transmitter power off conditions, voltage is first removed from the VCO by bringing the base of Q207 high. In this way, the transmitter carrier signal is not allowed to drift off frequency during power on or power off conditions.

Transmitter Display Board

The display board consists of the following circuitry blocks.

Microcontroller Section

The microcontroller section consists of microcontroller U103 and the liquid crystal display (LCD). The microcontroller has an on-board liquid crystal display (LCD) driver. R111, R113, and R114 supply the microcontroller with the LCD drive voltage for a four-plex drive. The LCD indicates the UHF frequency group and channel. The LCD also has a battery fuel gauge. A 4.000 MHz oscillator, Y101, provides the operating frequency to the microcontroller. The oscillator circuit includes C107, C108, R102, and R103, which along with Y101, U106, R112, and C112, form the reset circuit. U106 is the reset integrated circuit (IC) that resets the U103 microcontroller if the 5 V normal operating voltage falls below 3.5 V. R107 is the pull-up resistor for the U103 programming voltage pin.

Memory Section

The memory section consists of U101, a non-volatile EEPROM, that stores current transmitter settings and the mapping of compatible groups and channels.

Battery Management Section

The battery management section consists of comparator U102. It is used to measure the effective battery voltage, with reference to +5 V, by measuring the time used to charge a capacitor to a reference threshold of $0.1 \text{ Vdc} \pm 0.01 \text{ Vdc}$. The battery is checked approximately every 5 seconds. Comparator U102 alternately charges C106 with +5 V reference voltage, then the battery voltage (PLUS signal, test point I109).

User Interface Section

The user interface section consists of the Power, Mode, and Set switches. The status of each switch function is indicated on the LCD.

Power Supply Section

The U105 dc-to-dc converter provides the transmitter with regulated +5 V derived from two AA batteries. Power MOSFET Q101 provides reverse battery protection. Q103, R118, R286, and C124 control the soft start and reset of dc-to-dc converter following battery voltage drops.

Listening Test

Before completely disassembling the transmitter, operate it to determine whether it is functioning normally and try to duplicate the reported malfunction. Refer to the *User Guide* for operating instructions, troubleshooting, and specifications.

Review any customer complaint or request, and focus the listening test on any reported problem. The following, more extensive, functional tests require partial disassembly.

Functional Tests

Refer to the Disassembly section to partially disassemble the transmitter for the following functional tests.

Use dc blocks at all rf outputs to protect test equipment.

Test Setup

1. Use a U4 receiver for the following functional tests.
2. Dc voltages are present at most rf test points. Use dc blocks to protect the test equipment, if necessary.
3. Connect the (+) power supply terminal through a milliammeter to the (+) contact on the battery nest, and the (–) power supply terminal to (–) the contact on the battery nest.
4. Connect a dc voltmeter across the power supply and set the power supply for +3 Vdc..
5. Connect the audio generator to the mic-jack board either via the TINI QG connector, or the LEMO connector to BNC cable, depending on mic style.

Rf Power

1. Attach a U4 antenna to the spectrum analyzer.
2. Turn the U1 on and hold it very close to the antenna. Move the U1 up and down to maximize power on the spectrum analyzer.
3. Verify that output power is greater than 3 dBm.

Current Drain

1. Apply 3.0 Vdc to the battery terminals.
2. Verify that the current drain is less than 110 mA.

Frequency Response

If the U1 has an attenuator switch on the back of the unit, it should be set to -6 dB for the following tests (versions G or later). Values between board versions may vary slightly; the following values are *typical* values.

1. With the transmitter set to minimum gain, apply 200 mVrms at 1 kHz to its input.
2. Connect the audio analyzer's input to the unbalanced output of the U4 receiver.
3. Make sure the receiver volume control is set to maximum.
4. With respect to the 1 kHz level, measure -8.22 dBu ± 2 dB.
5. Change the frequency to 100 Hz. Verify that the measurement from the U4 unbalanced output is within ± 2 dB with respect to the 1 kHz level.
6. Change the frequency to 10 kHz. Verify that the measurement from the U4 unbalanced output is within ± 2 dB with respect to the 1 kHz level.

Notes

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Disassembly and Assembly



Disassembly

NOTE: All models shipped after February 1999 have a soldered attached antenna to replace the screw-on removable antenna. Do not try to remove and replace the soldered attached antennas.

1. Open the battery compartment cover and remove the batteries.
2. Remove the belt clip.
3. Remove the two screws from the back of the case.
4. Lift the top half of the transmitter case away to expose the printed circuit boards.
5. Remove the two screws securing the battery nest to the chassis.
6. Remove the rf ground screw, located next to the antenna.
7. Lift the printed circuit boards out of the case.

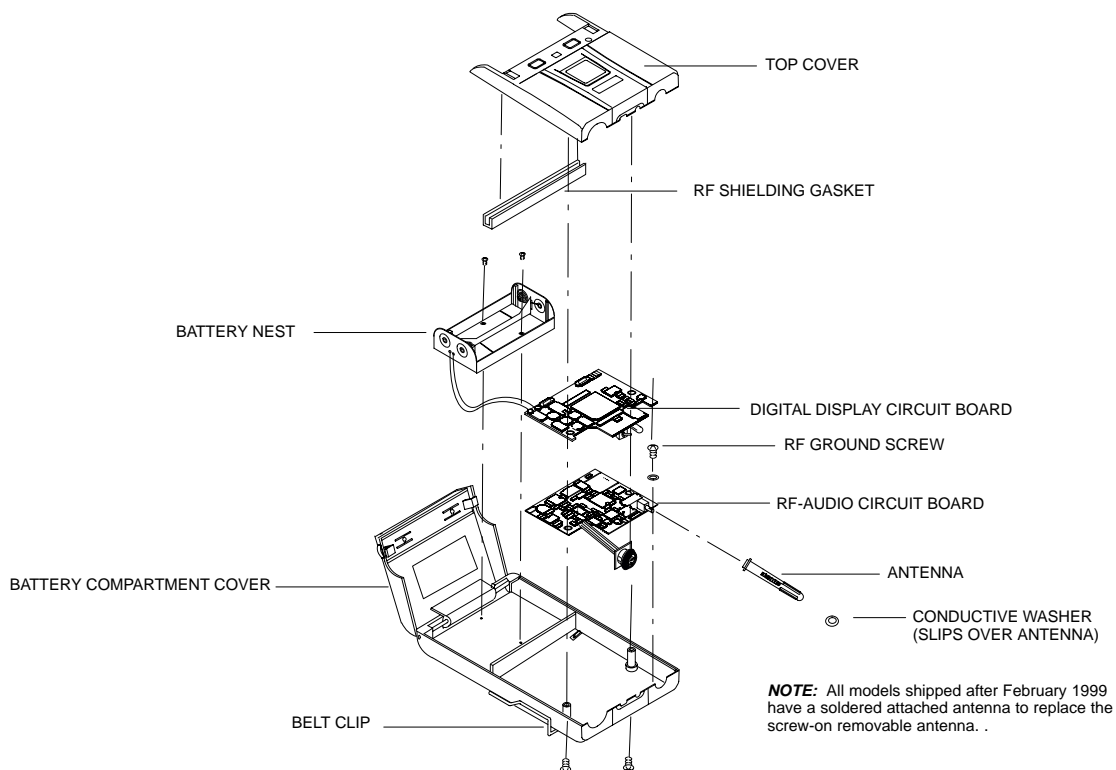


Figure 3. U1/U1L Hand-Held Transmitter Disassembly

Reassembly

After completing all repairs, replace the antenna. Then place the circuit boards back in the case, making sure the multi-pin connectors on the boards mate. Reassemble the transmitter by performing the steps of the disassembly procedure in reverse order.

Service Procedures

Service Notes

Units With Date Codes Earlier Than August 1996

A small number of synthesizer ICs (U204) can experience start-up problems with the 4 MHz crystal reference oscillator. The problem will only occur for certain values of tuning capacitance.

The transmitter displays the correct group and channel information. However, the carrier will have moved to its lowest possible frequency (around 750 MHz). The tuning voltage of the VCO will read 0 Vdc.

Adjusting the crystal's tuning capacitor to its lowest value should cause the 4 MHz crystal oscillator to start up, and the carrier will lock to the proper frequency.

The tuning capacitor can now be readjusted to center the carrier to within ± 1000 kHz. However, once the unit is turned off, the problem may return.

All units with **August 1996** date codes or later have a 10 k Ω resistor from pin 2 of the synthesizer to ground to insure that the internal oscillator will start up for all values of tuning capacitance (C239). Safe values for the resistor are from 16.8 to 33.2 k Ω .

Product Changes

Antenna Changes

All models shipped after **February 1999** have a soldered attached antenna (70A8017) to replace screw-on removable antenna.

Attenuator Switch SW201

Attenuator switch SW201 has been added to the audio section of the rf-audio printed circuit board. All products shipped after **February 1997** (board versions "F" and later) should include this switch.

Inductor L104 Removal

Inductor L104 has been removed for improved electrostatic discharge (ESD) performance. On products shipped after **March 1997**, L104 was replaced with a jumper.

On "F" and later versions of the board, the circuit was redesigned and the jumper was removed. Shure recommends that any product shipped before March 1997 have L104 removed and replaced with a jumper.

Comparator U102

Comparator U102 has been changed to prevent an "88 88" display.

Antenna Replacement

NOTE: All models shipped after February 1999 have a soldered attached antenna to replace the screw-on removable antenna. Do not try to remove and replace the soldered attached antennas.

The top printed circuit board (pcb) is connected to the bottom pcb by a multi-pin connector. Two wires also lead to the battery connector and a three-wire flat cable that connects the pcbs to the microphone jack.

Handle the pcbs with care to avoid damaging these connections.

1. Open the battery compartment cover and remove the batteries.
2. Remove the belt clip.
3. Remove the two screws from the back of the case.
4. Lift the top half of the transmitter case away to expose the pcbs.
5. Remove the single screw visible next to the antenna connector.
6. Use the antenna to gently lift up both pcbs far enough so that the antenna assembly clears the case, or remove the top pcb to gain better access to the bottom pcb.
7. Remove the antenna by unscrewing it from the connector. Make sure that the washer on the antenna clears the case.
8. Install the new antenna by screwing it onto the connector. If necessary, replace the conductive rubber gasket at the base of the antenna.
9. Return the pcbs to their original position.
10. Reinstall the single screw next to the antenna connector.
11. Perform these steps in reverse order to reassemble the unit.

Measurement Reference

dBu is a measure of *voltage*, and dBm is a measure of *power*.

For example, the HP8903 should be labeled dBu instead of dBm because it is a voltage measurement. These two terms are often used interchangeably even though they have different meanings.

Audio levels in dBu are marked as dBm on the HP8903.

dB Conversion Chart	
0 dBV	= 2.2 dBu
0 dBu	= 0 dBm, assuming the load = 600 Ω

Test Equipment

Most test equipment needed is described in the Shure *Wireless Service Equipment Manual*. The following test equipment (or approved equivalent) is also needed.

Table 1
Test Equipment

Equipment Type	Model
Audio analyzer	*Hewlett-Packard 8903B
Digital multimeter	Fluke 87
Interconnect Cable	Shure PT1843
BNC (Male) Cables (2)	Shure PT1838A
DC Blocker	Shure PT1838W
BNC (Female) to 1/4-inch Phone Plug Adapter	Shure PT1838C
20 dB Attenuator	Shure PT1838T
BNC to QG Cable	Shure PT1825
BNC to LEMO Cable	Shure PT1878
BNC (Female) to SMC (Female) Adapter	Shure PT1838S
BNC (Female) to SMC (Female) Adapter	Shure PT1838S
Test Cable, Japan Version	Shure PT1838-AF
Adapter, Japan Version	Shure PT1838-AJ
BNC (Male) to RG-174 Cable, unterminated	Shure PT1824
Frequency counter	Hewlett-Packard 53181A
Rf signal generator	Hewlett-Packard 8656B
Spectrum analyzer	Hewlett-Packard 8590L
Shure U4S receiver	Shure U4S

*Audio levels in dBu are marked as dBm on the HP8903B.

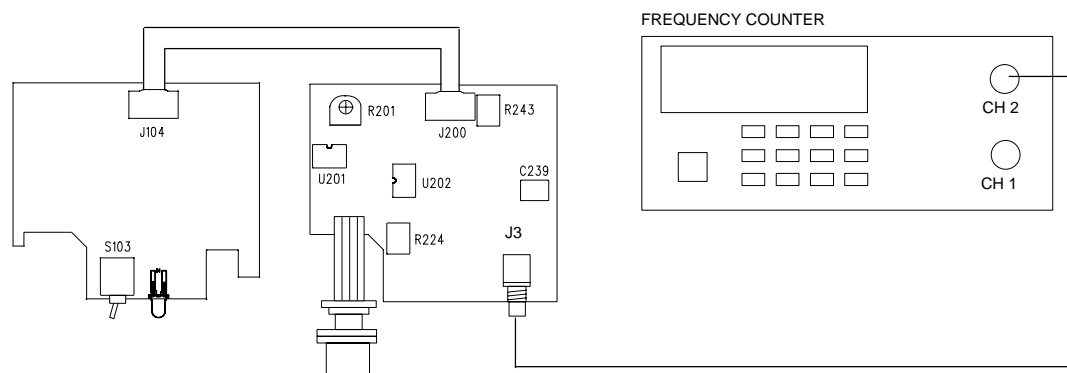
Printed Circuit Board Interconnecting Cable

This cable is provided with the standard test equipment and is used to connect U1 circuit boards that have been removed from the case for servicing. It is made from two custom Shure printed circuit boards, a four-inch, 11-wire ribbon cable, and one male (Shure 170A07) and one female (Shure 170A08) surface-mount connector. Note that the SMC connectors face in opposite directions.



Figure 4. Printed Circuit Board Interconnecting Cable

Rf Alignment



U1 Transmitter		Frequency Counter	
Power (S103):	ON	Connect CH2:	J3
Gain (R201):	For JB models: set to maximum		

Figure 5. Alignment Test Set-Up

Rf Alignment Set-Up

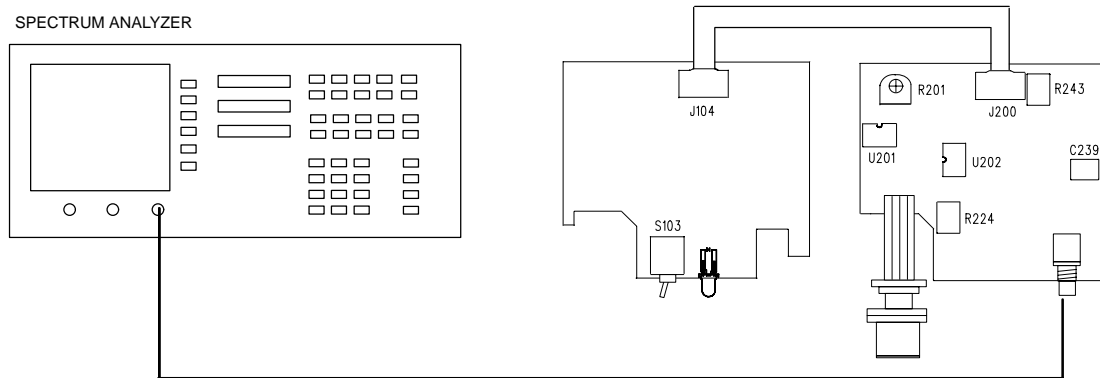
1. Proper adaptors should be used to connect the test equipment.
2. Use RG58 or other low-loss 50 Ω cables for all rf connections.
3. Include the insertion loss of the cables and connectors in rf conductive power measurements.
4. Connect the rf-audio board to the digital board through board interconnects J104 and J200.
5. On all models except JB, audio GAIN potentiometer R201 does not need to be preset to any position. On JB models, R201 GAIN should be set to maximum.
6. All rf measurements should be made from the antenna output connection, the 50 Ω SMC connector on PCB versions "G" and earlier or through the P1824 test cable on PCB versions "H" and later. For JB models with SMT rf test connector, use PT1838-AF with PT1838-AJ.

Rf Alignment

1. Slide the ON/OFF switch (S103) to the ON position.
2. Connect the transmitter to the frequency counter via J3.
3. Determine the transmitter operating frequency by comparing the Group and Channel information on the LCD to the tables in the *User Guide* and *User's Guide Supplements*.
4. Adjust variable capacitor C239 until the frequency counter measurement matches the desired operating frequency, ± 1 kHz.

Power Output Measurement

The output power measurement ensures that the output signal is strong enough for sufficient range when the system is in use. The output power measurement also verifies that the output power is not above the specified maximum level, to ensure compliance with regulatory agencies' standards.



U1 Transmitter		Spectrum Analyzer	
Power:	ON	Peak search:	ON
		Signal track:	ON
		Marker:	ON

Figure 6. U1 Power Output Measurement Test Set-Up

1. Rf output power is not adjustable. Use RG58 or any other low loss 50 Ω cables for all rf connections.
2. Include the insertion loss of the cables and connectors in rf conductive power measurements.
3. Using the spectrum analyzer, verify output power is at least +8 dBm. JB models must be at least +8 dBm and cannot exceed +10 dBm.

Audio Alignment

Deviation Reference Voltage

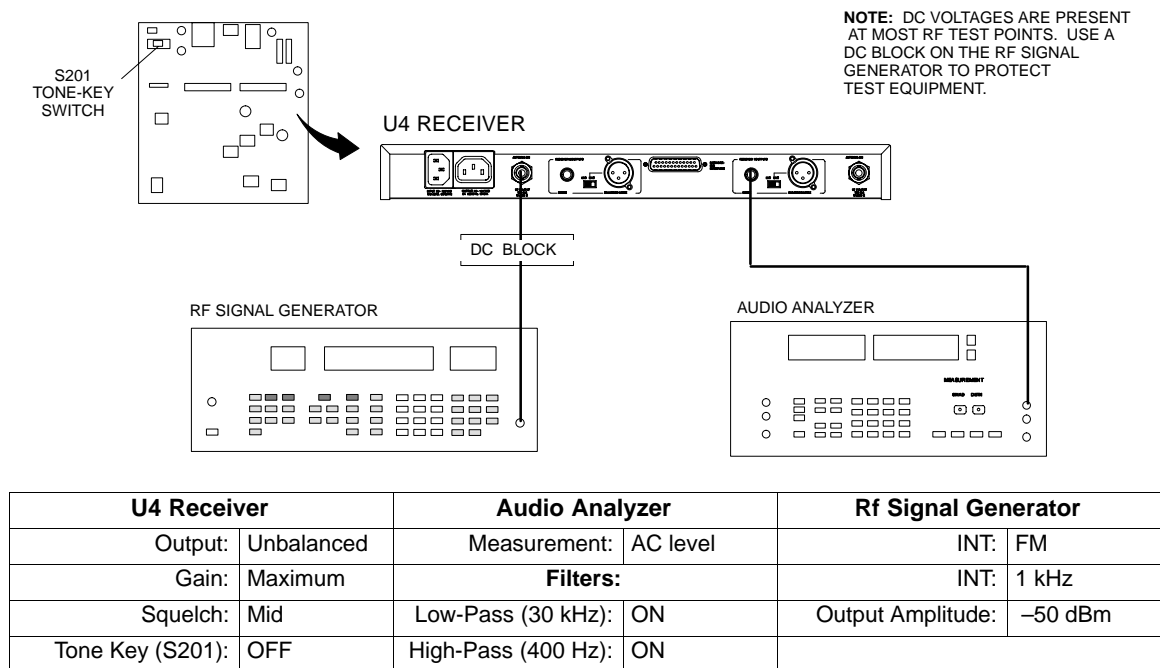


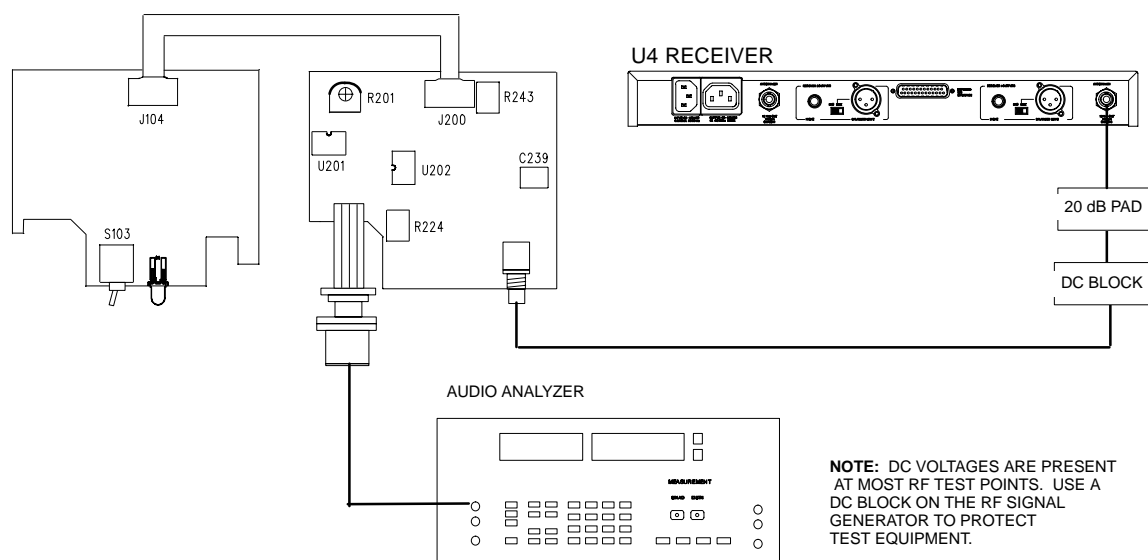
Figure 7. Deviation Reference Voltage Test Set-Up, Using a U4 Receiver

1. The U1 transmitter should be turned OFF for this procedure.
2. Connect the rf signal generator to antenna A or B on a U4 receiver. *Make sure the dc block is on the rf signal generator.*
3. Set the rf signal generator to the same frequency as the U1 transmitter.
4. Set rf signal generator modulation to 1 kHz and set the deviation to 45 kHz for UA, UB, MA, MB, MC, and MD models, 40 kHz for KK models, and 5 kHz for II models.
5. Set the output amplitude of the rf signal generator to -50 dBm.
6. Turn the U4 receiver ON and set the tone key switch (S201) inside the U4 receiver to the OFF position. This will disable the receiver tone key function.
7. Connect the audio analyzer to the unbalanced output of the U4 receiver. The voltage should be 4.2 ± 0.5 dBu (1.26 ± 0.07 V) for UA, MA, MB, MC, MD, and KK models, and -26.2 ± 0.5 dBu for II models.

Note the voltage obtained; it is the *deviation reference voltage*.

8. Disconnect the rf signal generator from the U4 receiver and return the tone key switch (S201) to the ON position.

Deviation Reference Voltage Adjustment

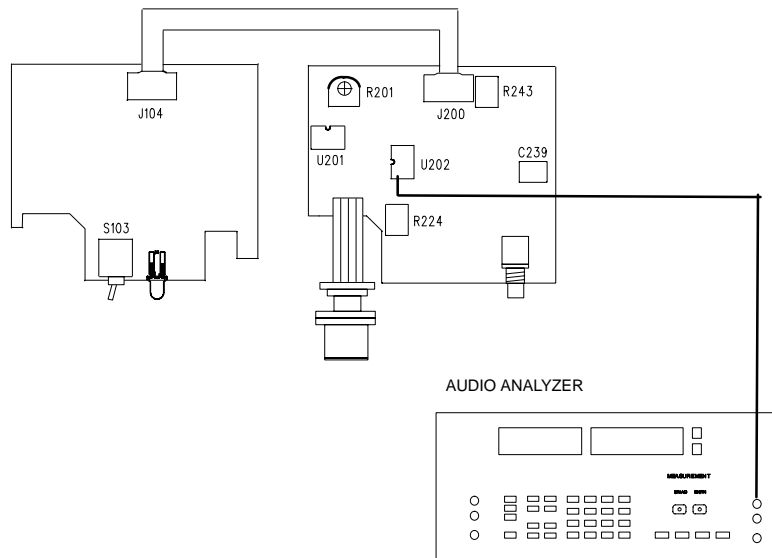


U1 Transmitter		Audio Analyzer	
Power:	+3 Vdc	Measurement:	AC level
Gain:	Minimum; for JB models, set to MAX	Output:	1 kHz
		Filters:	
		Low-Pass (30 kHz):	ON
		High-Pass (400 Hz):	ON

Figure 8. Deviation Reference Voltage Adjustment Test Set-Up

1. The U1 transmitter should be turned ON for this procedure.
2. Turn the rf signal generator OFF for this procedure.
3. For G and later board versions, adjust the audio analyzer for 1 kHz to get a level of -5.0 dBu (436 mV) at pin 7 of U201.
4. For F or earlier board versions, adjust the audio analyzer for 1 kHz to get a level of -5.0 dBu (436 mV) at pin 1 of U201.
5. On JB models, adjust the audio analyzer for 1 kHz to -61.0 dBu at the input connector.
6. Connect the transmitter rf output to a U4 antenna connector through a dc block and a 20 dB pad.
7. Connect the U4 unbalanced output to the audio analyzer's input.
8. Adjust R243 until the audio analyzer reads the deviation reference voltage, measured in the last test, from the unbalanced output of the U4 receiver, ± 0.1 dB.
9. Turn OFF the 30 kHz low-pass filter and the 400 Hz high-pass filter on the audio analyzer.
10. Disconnect the audio analyzer output from the U1 mic input.

Tone Key Level Adjustment



U1 Transmitter		Audio Analyzer	
Power:	+2.5 Vdc	Measurement:	AC level
Gain:	Minimum; for JB models, set to MAX	Output:	None
		Filters:	
		Low-Pass (30 kHz):	OFF
		High-Pass (400 Hz):	OFF

Figure 9. Tone Key Level Adjustment Test Set-Up

1. Use a dc power supply to apply 2.5 ± 0.01 V to the battery terminals, with no audio applied to the audio input.
2. Make sure no filters are used on the measuring instrument.
3. The tone key frequency will be approximately 32.768 kHz. Adjust R224 so that the tone key level of -22.8 ± 0.1 dBu (56 mV) is measured at U202, pin 1. For JB models, this level should be -24.7 dBu ± 0.1 dBu (45 mV).

Bench Checks

Dc Problems

- ✓ Measure the dc voltage at pin 1 of C104. This is the output of the dc to dc converter. It should be $5V \pm 0.2$ Vdc.
- ✓ Measure the dc voltage at C113, pin 1, and C105, pin 1. It should be $5V \pm 0.2$ V.
- ✓ Verify the battery voltage is between 2 V and 3.5 V.
- ✓ Check for proper Vcc and +5 V rf at Q207 (make all dc measurements with respect to rf ground unless otherwise specified). If incorrect voltage is present, check the values of the biasing resistors.
- ✓ Trace the dc back to the dc to dc converter.
- ✓ Check the power switch.
- ✓ Look for open coils, cracked parts, reversed polarity capacitors, solder shorts. If there is a short to ground from 5 V, isolate different parts of the circuit.
- ✓ Verify rf OFF signal changes from +5 V at power on/power off to 0 V during normal operation. Trace the signal to the microprocessor. Q207 should be saturated during normal operation.
- ✓ Verify that the battery voltage appears at U105 pin 1.
- ✓ Verify that the Vds (drain to source voltage) of Q101 is approximately -0.025 V. Q101 should be saturated.
- ✓ Verify that the dc to dc converter output is 5 V at pin 8 on U105.

Rf Problems

- ✓ If the carrier is out of specification by less than 40 kHz and cannot be corrected by adjusting C239, check the values of C239, C238, and Y201. If these values are correct, replace Y201. As a last resort, replace synthesizer U204.
- ✓ If the carrier frequency is not within the allocated UHF bandwidth, or if it is unstable, the loop is unlocked. Check the solder connections at the head board, VCO, microprocessor (traces LE, D, and CK), and synthesizer U204.
- ✓ Check for 4 MHz frequency at pins 1 and 2 of U204. If frequency other than 4 MHz is detected, replace crystal Y201.
- ✓ Check the loop filter: R238, C245, R240, C266, C267, R239, C247 U208, R243, and R285.
- ✓ Check U204, pins 3 and 4, and U208, pin 8.
- ✓ Replace synthesizer U204. The tuning voltage of the VCO should be approximately 3 Vdc when the transmitter is programmed for the center of the frequency range.

Low Rf Output Power

- ✓ Check the VCO power output. If the power output is still low, the VCO is faulty.
- ✓ Verify power across C261. Isolate the rest of the circuit by removing L209.
- ✓ Check R254, R255, R256, R257, C261, L209, and C248.
- ✓ Verify the dc bias of Q208. Verify that the rf mute signal changes from +5 V at power on/off to 0 V during normal operation. If Q209 is not saturated during normal operation, rf power at the antenna will be attenuated by approximately 45 dB.
- ✓ Isolate components, starting from the antenna and working back to the rf power amplifier.
- ✓ Check continuity from U207, pin 1, to the center conductor of J3.
- ✓ Remove microwave isolator U207 and check the low-pass filter power output at LP201, pin 4. It should be approximately 10 dBm.
- ✓ Remove the low-pass filter and check the power output of the amplifier at LP206, pin 1.
- ✓ Check the output matching network: Q208 C258, L206, and C256.
- ✓ Check the bypass capacitors: C254, C253, C252, and C5.
- ✓ Replace Q208.
- ✓ Reinstall L209 and U207.
- ✓ Check continuity between pins 1 and 4 of LP201.

Excessive Current Drain

- ✓ Isolate different sections of the circuit (rf, audio, digital, dc to dc converter).
- ✓ Apply +3 V to the battery terminals and measure the current drain, using a dc milliammeter. It should be less than 110 mA.

Deviation Problems

- ✓ If R243 cannot be adjusted to obtain 45 kHz deviation, isolate the problem to either the audio or rf section.
- ✓ Check R243.
- ✓ Check the rf section by setting the transmitter frequency to 800 MHz and verifying that the tuning voltage of the VCO is approximately 3 Vdc.

Replacement Parts and Drawings

Model Variations

Different frequency versions of the U1 and U1L transmitters are currently available for use in various countries. Each version is identified in the table below by country code, frequency range, and printed circuit board version.

**Some frequency versions have been discontinued. For the new list of frequency variations use the MK2 manual.

Table 2
U1/U1L Model Variations

COUNTRY CODE	FREQUENCY RANGE	COUNTRY DESIGNATION	U1 RF-AUDIO PC BOARD NUMBER	U1L RF-AUDIO PC BOARD NUMBER
UA	782–806 MHz	U.S.A. and Canada	90UA8739J	90UA8740M
MA	782–810 MHz	Germany	90MA8739M (No Longer Available)	*90MA8740M* (No Longer Available)
JB	806–810 MHz	Japan	*90JB8739J* (No Longer Available)	–
KK	838–862 MHz	United Kingdom	90KK8739M	–
MB	800–830 MHz	Europe	90MB8739J	–
MC	774–782 MHz	Netherlands	90MC8739J	–
MD	To create an MD board, order the 90MB8739J PCB's and install the MD EEPROM .			
UB	692–716 MHz	U.S.A.	90UB8739M	90UB8740M

**For PCB's that are no longer available use the U1–MK2 manual for replacements.

Parts Designations

The following comments apply to the parts list and the schematic:

Resistors: Unless otherwise noted, all resistors are surface-mount with $\frac{1}{10}$ W rating and 1% tolerance.

Capacitors: Unless otherwise noted, non-polarized capacitors are surface-mount NPO dielectric types with a 100 V capacity and a 5% tolerance, and polarized capacitors are tantalum types.

Shure U1/U1L Body-Pack UHF Transmitter

*Table 3
U1/U1L Transmitter Replacement Parts*

Reference Designation	Description	Shure Part Number
A1	Belt clip assembly	90A4392
MP1	Antenna (removable); units shipped before 2/99	95A8731
MP2	Antenna (soldered); units shipped after 2/99	70A8019
MP3	Battery nest	95A8751
MP4	Battery nest screw	30K8136A
MP5	Bushing	66A308
MP6	Case back	32A8034A
MP7	Case door	32A8025A
MP8	Case top	32A8021A
MP9	Coil spring	44A8012
MP10	Conductive gasket	80C8198
MP11	Door spring	65A8243
MP12	Foam pad	36A675
MP13	Hinge pin	31A8142
MP14	Lens	65A8236
MP15	LCD (liquid crystal display)	95A8934
MP16	Nameplate	39B8227
MP17	Nameplate battery	39_8411
MP19	Retainer plate	53A8419
MP20	EMI Washer for use with 95A8731 antenna only	36B8066

Shure U1/U1L Body-Pack UHF Transmitter

Table 4
Printed Circuit Board Replacement Parts:
Side 1

Reference Designation	Description	Shure Part Number
<i>Non-SMT Components</i>		
MP21	Mic PCB Ribbon Cable	95A8622
J101,102	Socket strip	56G8069
R201	Potentiometer, 0.1 W, 20%, 100 k	46C8049
S101,102	Switch, pushbutton, SPST	55A187
Y202	Crystal, 32.768 kHz	40A8010
<i>SMT Components</i>		
C239	Capacitor, trim, 7 / 50 pF	152H02
J200	Header, 11 Position	170A07
L101,102,103	Inductor 15%, 33 μ H	162B16
L104	Resistor 1/8 W, 5%, 0	145AJ000
L201,203	Inductor 10%, 0.18 μ H	162R10
L202	Ferrite bead	162A03
L206	Inductor 10%, 0.12 μ H	162A10
LP206	Filter, low pass	162A17
Q101	Transistor, MOS FET, MDT3055EL	183A35
Q201	Transistor, NPN SOT-23, MMBT5089L	183A38
Q203	Transistor, PNP SOT-23, MMBT5087	183A01
R208	Resistor, 1/10 W, 1–5, 249	145BF2490
R224, 243	Trimming pot, 1/4 W, 25%, 1 k	146B02
U104	Diode, switching, 7000L	184A08
U201,202	Integrated Circuit, 33178	188A18
U203	Compander, integrated circuit, NE575	188A126
U204	PLL Frequency Synthesizer	188A134
Y101	Crystal, 4 MHz, for Microcontroller	140A005
Y201	Crystal, 4 MHz, for U204	140A09

Table 5
Printed Circuit Board Replacement Parts:
Side 2

Reference Designation	Description	Shure Part Number
<i>Non-SMT Components</i>		
D102	LED, green	86C8419
J2	Receptacle, TINI QG, 4-pin, male: U1 ONLY	95A8413
J103	Receptacle, LEMO, OS: U1L ONLY	95A8601
S103	Switch, toggle, DPDT	55A189
<i>SMT Components</i>		
D101,103	Rectifier, Schottky, MBRS140	184A16
D201,202	Diode, dual	184A08
J104	Receptacle	170A08
L200,205,208, 211	Inductor 10%, 0.18 μ H	162R10
Q102	Transistor, MOS FET, MDT3055EL	183A35
Q103,202,204	Transistor, NPN SOT-23, MMBT5089L	183A38
Q207,209	Transistor, PNP SOT-23, MMBT5087	183A01
Q208	Transistor, Dual Gate Ga As MESFET, NE25139	183C12
SW201	Switch, 3-position	155A09
U102	Comparator	188A136
U105	Integrated Circuit, 5 V dc/dc converter, MAX751CSA	188A182
U106	Voltage detector	188B210
U208	Dual operational amplifier	188A118

*Variations in part numbers correspond to country codes.

Table 6
U101 EPROM Table

Country Code	Shure Part Number
UA	188T131UA
UB	188T131UB
MA	188T131MA
MB	188T131MB
MC	188T131MC
MD	188T131MD
JB	188T131JB
KK	188T131KK

Shure U1/U1L Body-Pack UHF Transmitter

Table 7
VCO Selection

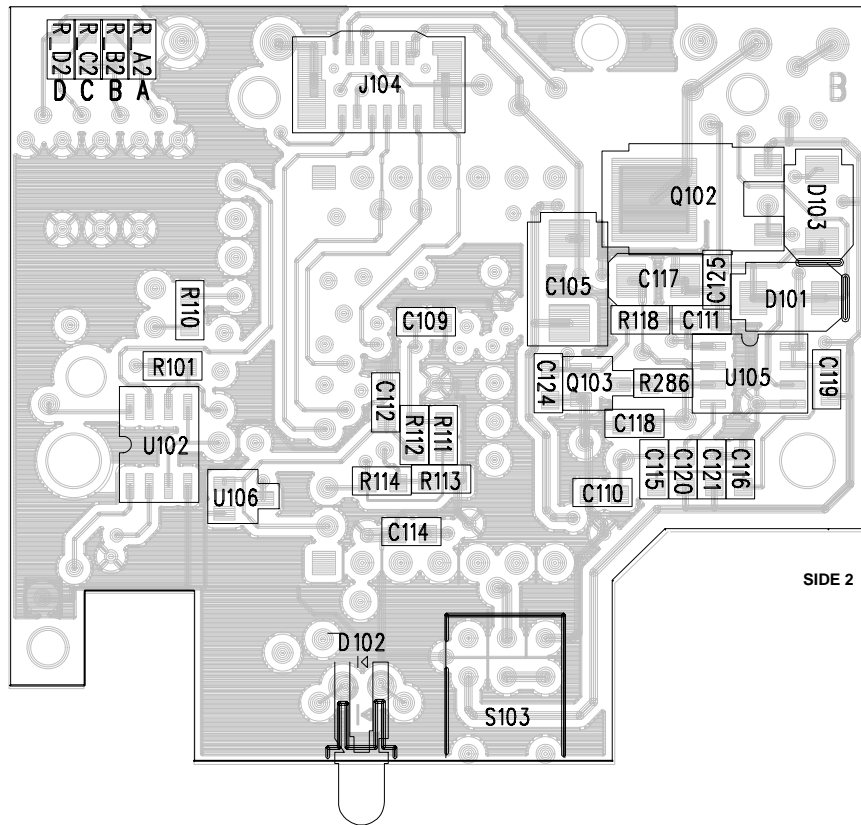
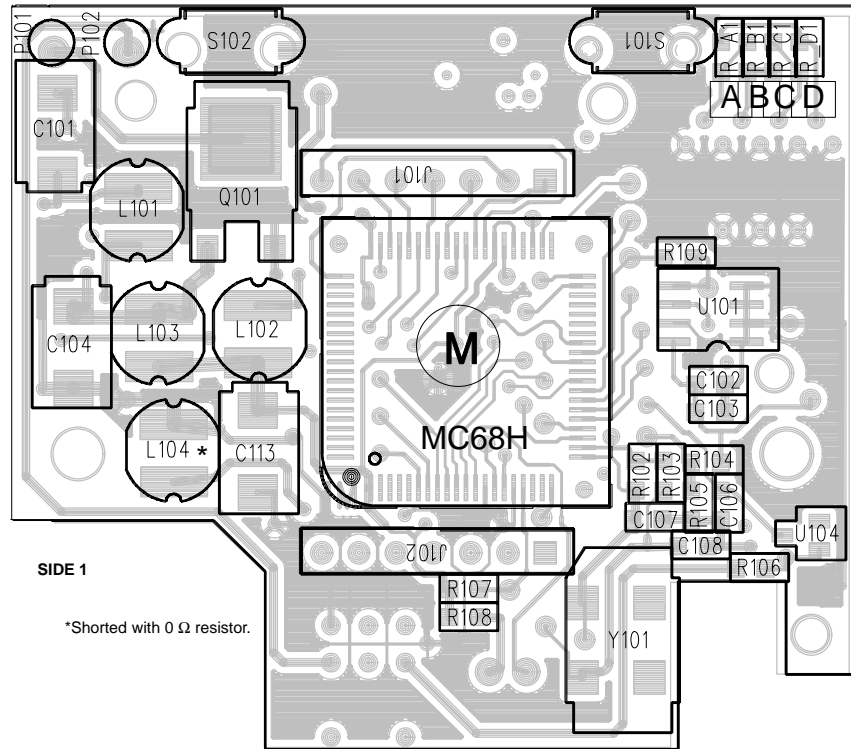
Country Code	UA205 VCO Range	Shure Part Number
UA MA MC JB	782–810 MHz	187A10R
KK	837–863 MHz	187B10R
MB MD	800–830 MHz	187C10R
UB	692–716 MHz	187D10R

Table 8
Microwave Isolator Selection

UA207 Country Code	Shure Part Number
UA MA MB MC MD JB	187A07
KK	187B07
UB	187C07

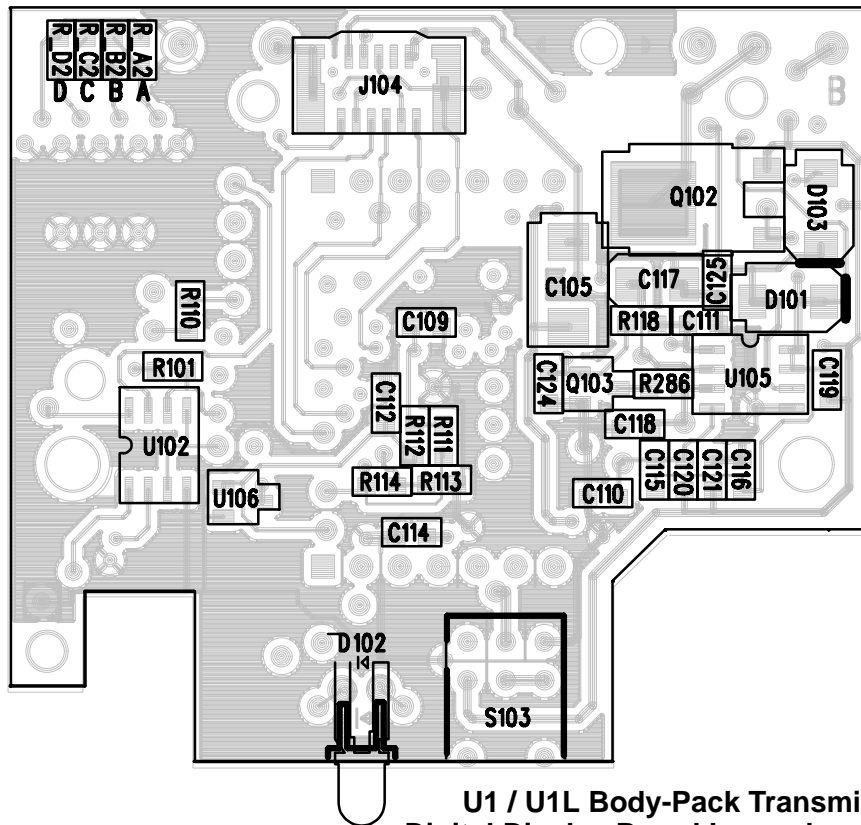
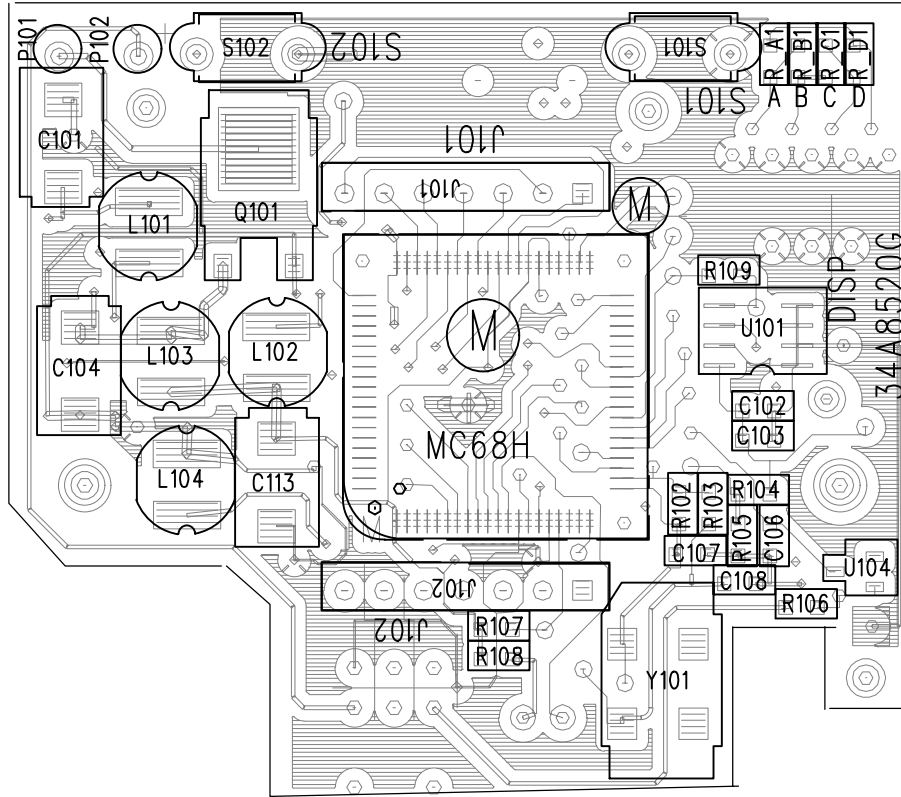
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Shure U1/U1L Body-Pack UHF Transmitter



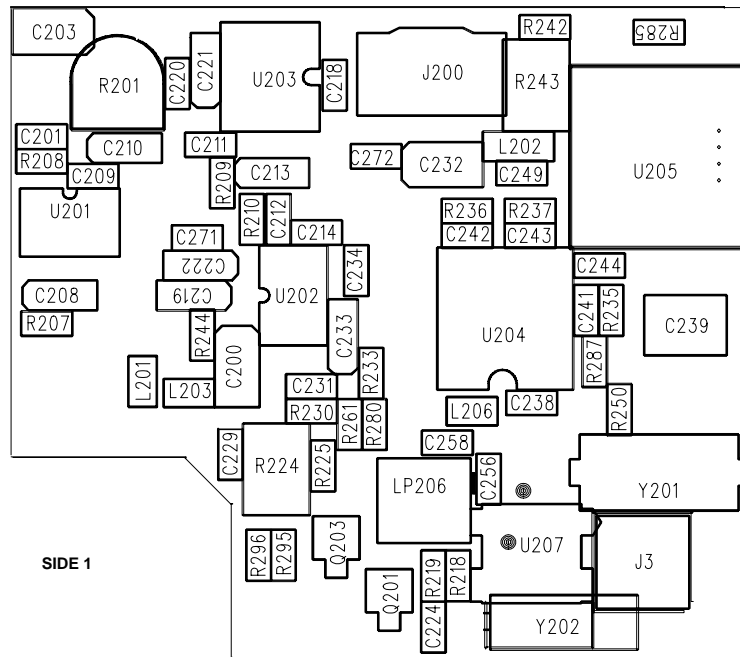
**U1 / U1L Body-Pack Transmitter
Digital Display Board Legends and Foils
“E” and Earlier Board Versions**

Shure U1/U1L Body-Pack UHF Transmitter

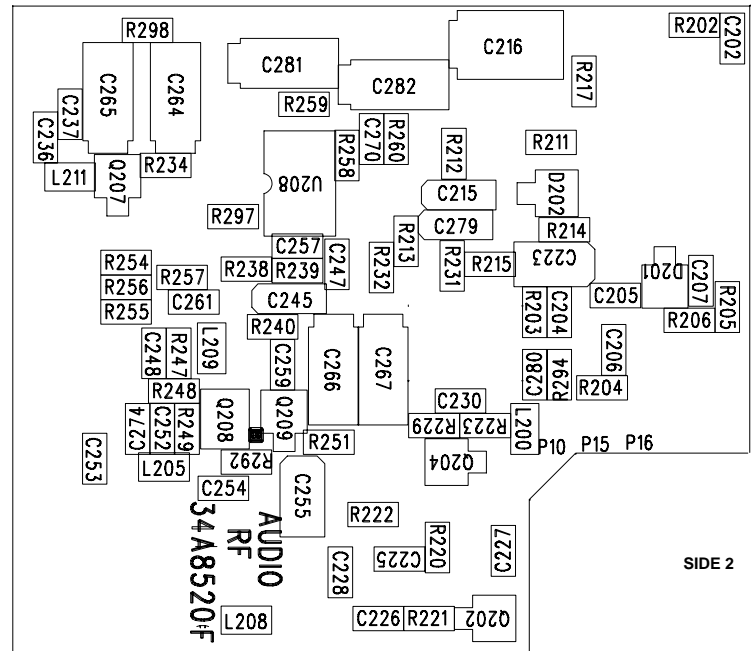


U1 / U1L Body-Pack Transmitter
Digital Display Board Legends and Foils
"F" and Later Board Versions

Shure U1/U1L Body-Pack UHF Transmitter



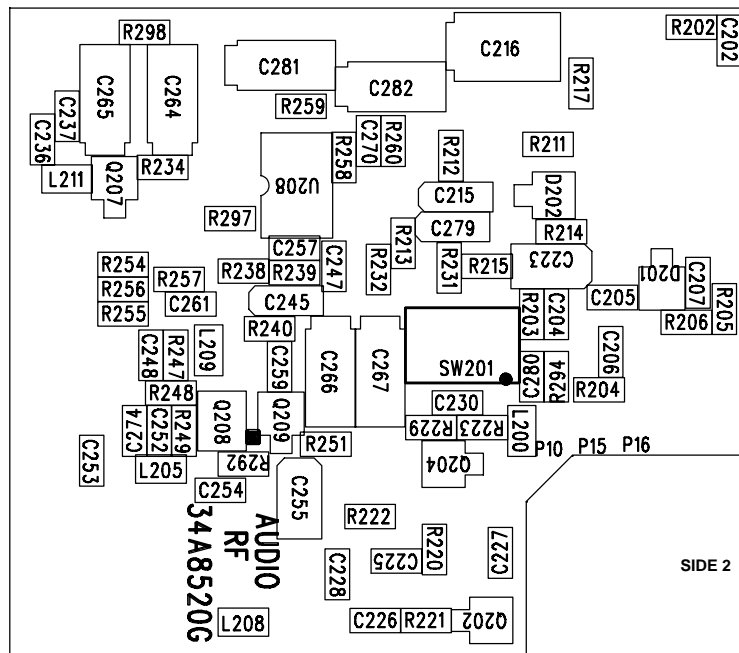
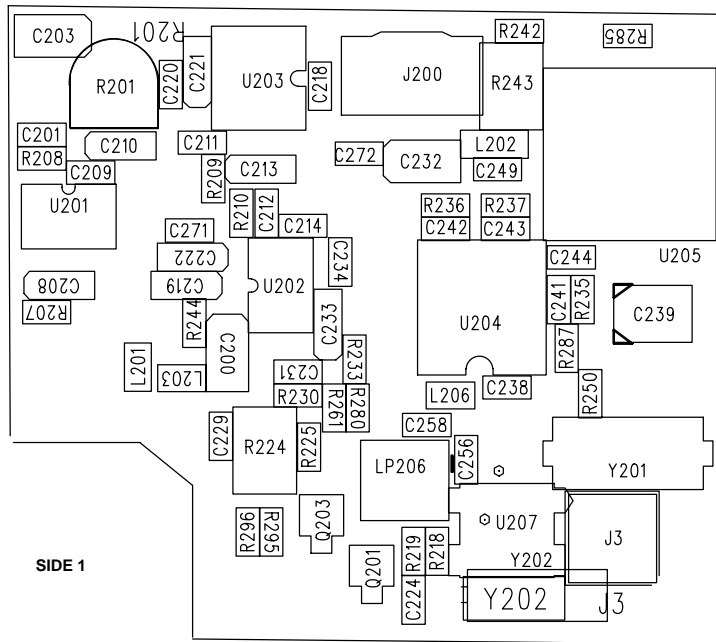
SIDE 1



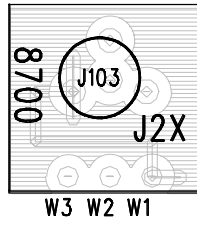
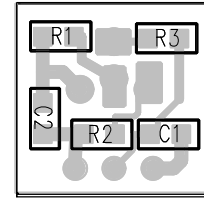
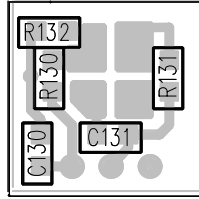
SIDE 2

U1/U1L Body-Pack Transmitter RF–Audio Printed Circuit Board Legends “E” and Earlier Board Versions

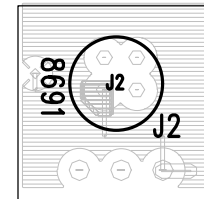
Shure U1/U1L Body-Pack UHF Transmitter



**U1/U1L Body-Pack Transmitter
Rf–Audio Printed Circuit Board Legends
“G” and Later Board Versions**



LEMO, 4-Pin



TINI QG, 4-Pin

**Mic-Jack Printed Circuit Board
Legends and Foils**

Notes

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