

Metal Detector

Model 43149

Assembly and Operating Instructions

Visit Our Web Site
<http://www.harborfreight.com>



3491 Mission Oaks Blvd., Camarillo, CA 93011

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For technical questions and replacement parts, please call 1-800-444-3353.

Specifications

Stem Length:	15" - 27-1/2"
Coil:	8" Diameter
Power Supply:	Qty 3, 9 Volt Batteries
Battery Tester:	Yes, built-in
Audio:	3 distinctive sounds for different metals
Weight:	3.25 Lbs.

Save This Manual

You will need the manual for the safety warnings and precautions, assembly instructions, operating and maintenance procedures, parts list and diagram. Keep your invoice with this manual. Write the invoice number on the inside of the front cover. Keep the manual and invoice in a safe and dry place for future reference.

Safety Warnings and Precautions

WARNING: When using tool, basic safety precautions should always be followed to reduce the risk of personal injury and damage to equipment.

Read all instructions before using this product!

1. **Handle the Metal Detector carefully at all times.** Dropping the Metal Detector can cause damage to circuit boards and the case, which can cause the product to work improperly.
2. **Only use and store the Metal Detector in normal temperature environments.** Extremes in temperature can shorten the effectiveness of electronic devices and melt or damage plastic parts.
3. **Avoid electrical shock.** Any metal detector may discover underground power lines, explosives or other items which when struck could cause personal injury. Do not use this product in areas where there might be underground electric lines or pipes buried at shallow depths. Never search in military zones where bombs or other explosives may be buried. Avoid striking any line known or suspected to be carrying electric power. Do not search any pipeline, particularly if it could contain a flammable gas or liquid. In areas of uncertain conditions, use reasonable caution before using the Metal Detector. If there is any question about a condition being safe or unsafe, do not operate the Metal Detector.
4. **Keep the Metal Detector clean.** Wipe the housing after each use. The search coil is washable and can be fully submerged. Never submerge the control housing. Protect the control housing from rain, blowing surf and heavy mist. Disassemble the stem and wipe it clean after use in sandy areas.
5. **Dress properly.** Do not wear loose clothing or jewelry as they can be caught in moving parts. Protective, electrically nonconductive clothes and nonskid footwear are recommended when working. Wear restrictive hair covering to contain long hair.
6. **Use the right tool for the job.** Do not attempt to force a small tool or attachment to do the work of a larger industrial tool. There are certain applications for which this tool was designed. Do not modify this tool and do not use this tool for a purpose for which it was not intended.
7. **Stay alert.** Watch what you are doing, use common sense. Do not operate any tool when you are tired.

Safety Warnings and Precautions (continued)

8. **Check for damaged parts.** Before using any tool, any part that appears damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment and binding of moving parts; any broken parts or mounting fixtures; and any other condition that may affect proper operation. Any part that is damaged should be properly repaired or replaced by a qualified technician. Do not use the tool if any switch does not turn On and Off properly.
9. **Replacement parts and accessories.** When servicing, use only identical replacement parts. Use of any other parts will void the warranty. Only use accessories intended for use with this tool. Approved accessories are available from Harbor Freight Tools.
10. **Do not operate tool if under the influence of alcohol or drugs.** Read warning labels on prescriptions to determine if your judgment or reflexes are impaired while taking drugs. If there is any doubt, do not operate the tool.
11. **Maintenance.** For your safety, maintenance should be performed regularly by a qualified technician.

Warning: The warnings, cautions, and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

Unpacking

When unpacking, check to make sure all parts shown on the Parts Diagram and Parts Lists are present. If any parts are missing or broken, please call Harbor Freight Tools at the number on the cover of this manual.

Preparing to Operate

To Assemble the Metal Detector:

1. Turn the lock nut on the stem clockwise to loosen (see Figure 1).
2. Adjust the length of the stem so that when you stand upright with the metal detector held in your hand, the search coil is level with and about 1/2 to 2 inches above the ground (see Figure 2).
3. Turn the stem's lock nut counterclockwise to lock it in place.
4. Unscrew the knob on the search coil and take off the knobs and connector. Insert the stem and align the holes on the search coil bracket and the stem. Push the connector through the holes and tighten the knob.

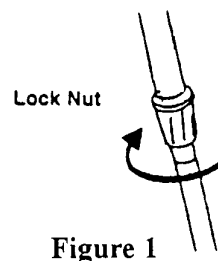


Figure 1

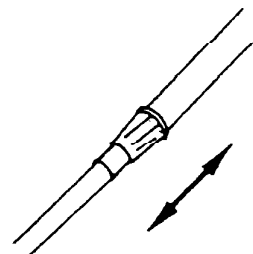


Figure 2

5. Wind the search coil cable around the stem. Make sure you leave enough slack in the cable to allow for adjustment when you are using the Metal Detector on uneven ground (see Figure 3).

6. Plug in the search coil's plug into the search coil jack on the Metal Detector's control panel. Make sure that the pins on the plug align with the holes in the jack (see Figure 4).

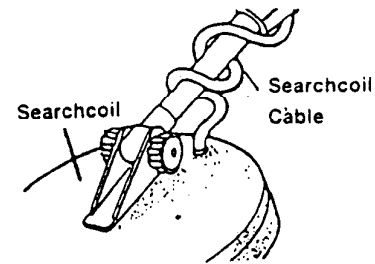


Figure 3

Note: The search coil's plug fits into the connector only one way. Never force the plug; the plug could become damaged.

To disconnect the plug, never pull on the cable; always take hold of the plug and pull it out of the connector.

7. Loosen the knob at the search coil's end, then adjust the search coil's end, then adjust the search coil to the desired angle. The search coil should be parallel with the ground. Tighten the knob enough to keep the search coil from rotating or wobbling.

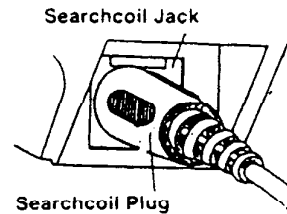


Figure 4

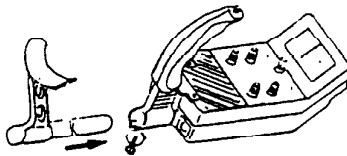


Figure 5

8. To insert the arm support (see Figure 5), loosen the knob at the base of the handle. Insert the arm support and tighten the knob to hold the arm support in place.

To Install Batteries:

The Metal Detector is powered by a quantity of three, 9 Volt batteries. Battery installation is described below:

1. If the Metal Detector is on, turn MODE to OFF (see Figure 6).

2. Press the right battery compartment cover's tab and slide the cover in the direction of the arrow (see Figure 7).

3. Place one 9 Volt battery into the battery compartment on top of the ribbon. Make sure the battery is placed so that it matches the polarity symbols (+ and -) that are marked inside the compartment.

4. Replace the right battery compartment cover.

5. Press the left battery compartment cover's tab and slide the cover off in the direction of the arrow (see Figure 8).

6. Place two 9 Volt batteries into the battery compartment on top of the ribbons, matching the polarity symbols (+ and -) marked. Replace the left battery compartment cover.

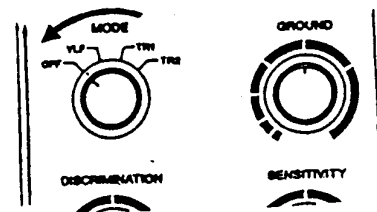


Figure 6

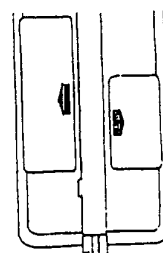


Figure 7

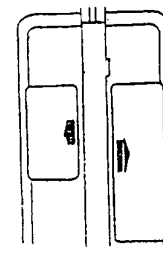


Figure 8

Installing Batteries (continued).

The life of the batteries can be extended by using headphones (not included), which require less power than the built-in speaker. See the section on headphones below.

Caution: Always remove old or weak batteries; old batteries can leak chemicals that can damage electronic parts. If you do not plan to use the Metal Detector for a week or more, always remove the batteries. Use only fresh batteries of the required size. Never mix old and new batteries or different types of batteries.

Testing Batteries:

Test the battery power when the Metal Detector does not turn on, or has weak volume, or will not tune properly or operates erratically.

Set the **MODE** to **VLF** (very low frequency). To test the batteries in the left battery compartment, set **BATT TEST** to **B1**. To test the battery in the right battery compartment, set **BATT TEST** to **B2** (see Figure 9).

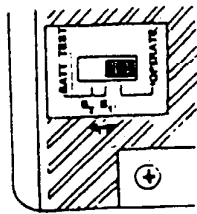


Figure 9

If the pointer on the viewmeter is within the **BATT** scale's green area, the batteries have enough power. If the pointer is not within the green area, the batteries need to be replaced (see Figure 10).

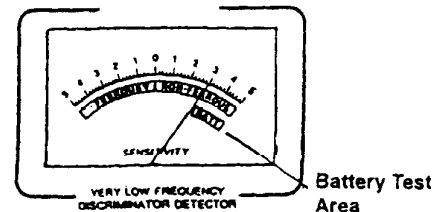


Figure 10

To Adjust the Meter:

Set **MODE** to **OFF**. Using a screwdriver, adjust the alignment control until the pointer lines up with **O** on the scale (see Figure 11).

Using Earphones:

Stereo earphones (not included) can be connected to the Metal Detector. Using earphones saves battery power and makes it easier to identify changes in the sound patterns. Earphones are connected to the ear jack on the side of the Control Housing (see Figure 12).

When using earphones, protect your hearing by:

- Set the volume to the lowest setting before you begin listening. Adjust the volume to a comfortable level.
- Never listen at extremely high volume levels; permanent hearing loss can result.
- Once the volume is set, do not increase it. Over time, your ears adapt to the volume level, so a volume level that does not cause discomfort might still damage your hearing.

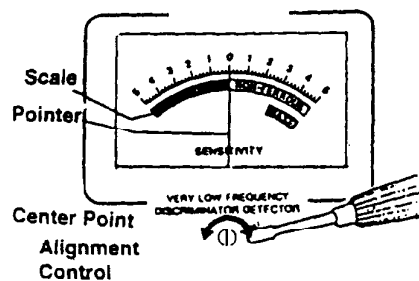


Figure 11

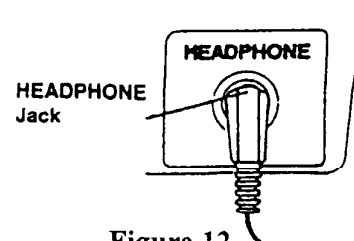


Figure 12

Operation

This metal detector distinguishes between ferrous and non-ferrous metals. Ferrous metals contain iron. Non-ferrous metals do not (examples: gold, silver, copper, platinum, aluminum, lead, and zinc). When the Metal Detector senses a metallic object, the meter reading changes and the detector might sound a tone. The reaction depends on what metal is detected.

Turning On The Metal Detector:

1. Set the **BATT TEST** to **OPERATE**.
2. Hold the detector comfortably, then as shown in Figure 13, rotate **MODE** to the desired position.

Set it to **VLF** to test the battery power and adjust **TUNE** and **GROUND** (see directions below and on page 8).

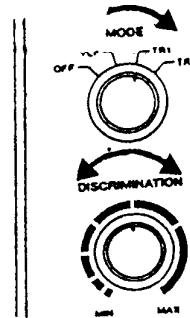


Figure 13

Set it to **TR1** to detect extreme differences in metals, such as between gold and iron. The difference shows on the meter (iron as a ferrous metal, gold as a non-ferrous metal).

Set it to **TR2** to detect finer distinctions between metals. For example, between aluminum and gold.

Tuning the Metal Detector:

TUNE fine tunes the balance between the metal detector's receiver and the transmitter circuitry, to provide consistent pointer and tone indications.

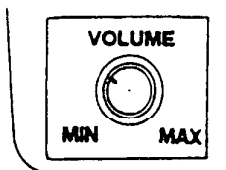


Figure 14

To set the **TUNE**, please do the following and see Figure 14 and 15:

1. Rotate **VOLUME** to the 10 o'clock position.
2. Set **MODE** to **VLF**.
3. Set **GROUND**, **DISCRIMINATION**, and **SENSITIVITY** to mid-range.
4. Hold the search coil at least 1 foot away from the ground and any metal object. Hold down the red button on the handle and slowly rotate **TUNE** until the viewmeter pointer rests at or near 0 (see Figure 16).

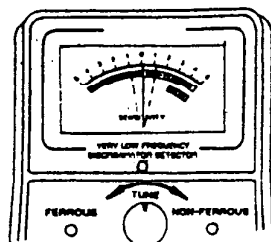


Figure 16

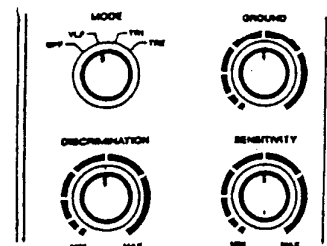


Figure 15

Tuning the Metal Detector (continued)

As you use the Metal Detector to search for items, you can fine tune by using the other control (see Fine Tuning the Metal Detector on page 8).

Note: To return the pointer to the center of the viewmeter at any time, simply press the red button on the handle.

Testing and Using the Metal Detector:

You must first test the detector to find out how it reacts to different metals. It can be tested indoors or outdoors.

Indoor Testing

1. After removing watches, rings or any other metal jewelry, place the detector on a wooden or plastic table. Adjust the search coil's angle so that the flat part faces upward (see Figure 17).

Note: Never test on a floor inside a building, as it may have a type of metal present.

2. Set **MODE** to **TR1**. Move a sample of the material being tested (example: coin or gold ring) about 2 inches above the search coil.

Note: the Metal Detector will not detect without motion. You must move the object since you are not sweeping the Metal Detector.

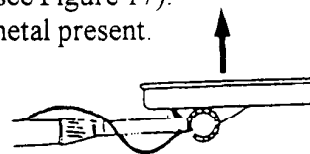


Figure 17

3. If the Metal Detector detects the material, the NON-FERROUS and FERROUS indicators flash and the pointer moves to FERROUS or NON-FERROUS while the detector determines the type of metal it is detecting. If it detects non-ferrous metal, it also sounds a tone.

4. If the Metal Detector does not detect the material, check the battery power and verify that the search coil is properly connected. Also, you might need to fine tune the detector (see next page).

Outdoor Testing

1. Locate an area outdoors where there is no metal present. Place a sample of the material to be tested (coin or gold ring) on the ground.

2. Set **MODE** to **TR1**.

3. With the search coil being held approximately 1 to 2 inches above the ground, slowly move the search coil over the area where you placed the sample. Sweep in a side to side motion as follows:

Sweep slowly to avoid missing targets. Never raise the sweep coil while sweeping; sweep back and forth as if it was a pendulum (see Figure 18).

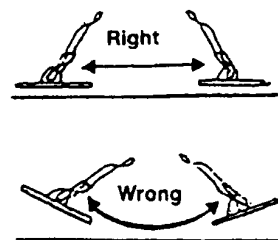


Figure 18

If the Metal Detector detects the item, it sounds a tone and the pointer moves to the type of metal it found. After detecting metal, switch **MODE TR1** to **TR2** to determine the quality of the metal. If nothing was detected, try again (make sure the search coil is being moved properly).

Outdoor Testing (continued)

The detector will respond strongly when it detects most valuable metal objects. If the signal does not repeat after being swept over the target a few times, the target is probably junk metal.

False signals can occur from electrical interference, large, irregular pieces of junk metal, or finding trash on the ground. False signals usually occur broken or are non-repeatable.

After finding a metal item, wait a few seconds after the tone stops before continuing; this allows the detector time to reset. You can also press the red button on the handle to return the pointer to the center of the viewmeter.

Fine Tuning The Metal Detector:

Once you practice with the unit, you can fine tune it to make it more selective in what is found.

Adjusting SENSITIVITY

To adjust the search coil's ability to detect objects at different depths in the ground, rotate **SENSITIVITY** between **MIN** and **MAX**. For maximum detection depth, leave **SENSITIVITY** set as high as possible. If the Metal Detector begins to "chatter", decrease **SENSITIVITY** until the noise stops.

Adjusting GROUND

For accurate operation, it is critical that you take the time to correctly set **GROUND**. **GROUND** tunes out false signals from mineralized soil.

To set **GROUND**:

1. Set **MODE** to **VLF** and lower the search coil to 1/2 to 2 inches above the ground.
2. If the pointer swings to the right, turn **GROUND** to the left. If the pointer swings to the left, turn **GROUND** to the right.

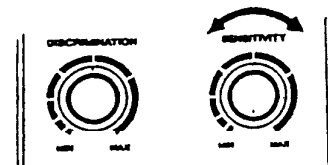


Figure 19

3. Lift the search coil about 12 inches from the ground and press the red button on the handle. The pointer will return to the center. Repeat these three steps until the pointer stays close to the center each time you lower the search coil to the ground.

After setting **GROUND** the Metal Detector is ready for the soil type at that particular site. It will not need to be reset until you move to a new location.

Adjusting DISCRIMINATION

Discrimination is the Metal Detector's ability to differentiate between types of metal. This setting determines whether the detector will distinguish between different types of ferrous and non-ferrous metals. If **MODE** is set to **TR2**, start with **DISCRIMINATION** set to mid-range. While the Metal Detector is being used, adjust **DISCRIMINATION** to the best position. As you set it higher, the

Adjusting DISCRIMINATION (continued)

detector becomes more sensitive to the differences between large aluminum and gold pieces, for example, but other valuable items such as coins and small rings, might be overlooked.

As you set **DISCRIMINATION** to higher levels, the detector first does not detect small pieces of silver paper, then thick foil, and finally metal objects like cola pull tabs. Each time you change areas, you must reset **DISCRIMINATION**.

False Signals and Detection Hints

As you sweep the search coil back and forth over the ground surface, you will recognize the difference between signals that occur at random and signals that are stable and repeatable. The key is to dig only for those targets that produce a strong, repeatable signal. This will prevent you from wasting time focusing on trash induced signals.

No metal detector is totally accurate. Many conditions influence the success of metal detection. Among the factors that influence results are the angle at which the object rests in the ground, the depth of object, the amount of iron the object contains and the size of the object.

To accurately pinpoint a target: 1. Once the detector detects a target that is buried, continue to sweep the search coil over the target in a narrowing side-to-side motion. 2. Stop the search coil directly over the spot on the ground. Then move the search coil straight forward away from you and straight back towards you. Make a mental note of the exact spot on the surface where the detector beeps. Repeat these steps in an X pattern. The target should be directly below the X at the area where the loudest response is heard.

Troubleshooting:

Problem

False signals are being displayed

Once a target is found, the display does not show the correct metal type

Suggestion for Cure

Sweeping too fast or at the wrong angle.

Heavily oxidized metals are detected. Pinpoint the target from several different angles. If the detector does not display and sound the same signal each time, the target is probably heavily oxidized metal.

May be more than one target in the area.

If target is heavily oxidized, an incorrect reading may occur. This does not signify a problem with the detector. It may be a type of metal which is not recognizable to the detector.

MECHANICAL PARTS LIST

Ref. No.	Description		Mfr's Part No.
1	Control Box Top		SQC6.116.042.
2	Meter		M3006
3	Loud Speaker		YD-50 16 ohm 0.25 W
4	Board for fixing		SQC8.610.154
5	Screws ST2.9 x 6		GB845-85
6	Lining Board		SQC8.683.031
7	Main PCB		SQC2.908.526
8	Screws ST2.9 x 8		GB845-85
9	Handle		SQC6.465.033
10	Screws ST3.9 x 16		
11	Nut M6 x 0.75		GB808-76
12	Nut M8 x 0.75		GB808-76
13	Control Knob		SQC8.337.334
14	Control Box Button		SQC6.116.044
15	Potentiometer B-10K		R1710N16K
16	Nut M6 x 0.75		GB808-76
17	Control Knob		SQC8.337.330
18	Earphone PCB (with Double Trace Earphone Socket)		SQC5.566.003
19	Nut M6 x 0.5		
20	Aluminum Stem (19 mm)		SQC8.009.002
21	Stem Lock Ring (Threaded)		SQC8.225.012
22	Stem		SQC6.336.001
23	Screw M3 x 10		GB819-85
24	Stem Lock Nut		SQC8.225.011
25	Stem Lock Ring		SQC8.220.081
26	Screws M4 x 28		
27	Cover (stem)		SQC7.852.078
28	Cover (large)		SQC6.170.030
29	Cover (small)		SQC6.170.031
30	Search Head (with Search Head PCB and Coil)		SQC5.939.000
31	Head Fixing Knob (screw side)		SQC6.354.021
32	Head Fixing Knob (nut side)		SQC6.354.022
33	Bracket		SQC6.154.001
34	Socket PCB (with 5 pin socket)		SQC5.566.004
35	Aluminum Stem (22 mm)		SQC8.009.001
36	Board		SQC8.610.157
37	Flat Washer		GB848-85-3
38	Spring Washer		GB859-87-3
39	Nut M3		GB6172-86
PACKING			
	Gift Box		SQC6.876.216
	Slip Box		SQC6.876.215
	Spacer		SQC8.865.019
	Spacer		SQC8.665.020
	Spacer		SQC8.665.021
	Lining		SQC8.866.194
	Lining		SQC8.866.195
	Packing Box		SQC6.876.214
	PE Bag		SQC8.840.051
	Manual		

ELECTRICAL PARTS LIST

Ref. No.	Description		Mfr's Part No.
Capacitors			
C1	*Mylar 0.047 μ F $\pm$ 10% 100 V		CL21
C2	Mylar CYM-13A		CYM-13A
C3	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C4	Mylar 0.47 μ F $\pm$ 10% 50 V		CL21X
C5	Mylar 0.047 μ F $\pm$ 10% 100 V		CL21
C6	Mylar 0.047 μ F $\pm$ 10% 100 V		CL21
C7	Mylar 0.47 μ F $\pm$ 10% 100 V		CL21
C8	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C9	Mylar 1000 pF $\pm$ 10% 63 V		CL11
C10	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C11	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C12	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C13	Mylar 0.047 μ F $\pm$ 10% 100 V		CL21
C14	Ceramic 150 pF $\pm$ 10% 63 V		CC1
C15	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C16	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C17	Ceramic 0.01 μ F 25 V		CT1
C18	Ceramic 150 pF $\pm$ 10% 63 V		CC1
C19	Mylar 0.047 μ F $\pm$ 10% 100 V		CL21
C20	Electric 47 μ F +50% -10% 16 V		CD11
C21	Ceramic 0.01 μ F 25 V		CT1
C22	Mylar 0.047 μ F $\pm$ 10% 100 V		CL21
C23	Electric 47 μ F +50% -10% 16 V		CD11
C24	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C25	Mylar 0.047 μ F $\pm$ 10% 100 V		CL21
C26	Electric 47 μ F +50% -10% 16 V		CT1
C27	Electric 47 μ F +50% -10% 16 V		CT1
C28	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C29	Mylar 0.1 μ F $\pm$ 10% 50 V		CL21X
C30	Mylar 0.01 μ F $\pm$ 10% 63 V		CL11
C31	Electric 220 μ F +50% -10% 16 V		CD11
C32	Electric 220 μ F +50% -10% 17 V		CD12
C33	Ceramic 0.01 μ F 25 V		CT1
C34	Ceramic 47 pF + 10% 63 V		CC1
Diodes			
D1	Switch Diode IN4148		IN4148
D2	Switch Diode IN4002		IN4002
D3	Switch Diode IN4148		IN4148
D4	LED Diode LED ϕ 3 (Red)		LED710
D5	LED Diode LED ϕ 3 (Green)		LED721
D6	Zener Diode BS-62 5.6 V		BS-62 5.6 V
D7	Zener Diode BS-62 12 V		BS-62 12 V
Intergrated Circuits			
IC1	CA3140		CA3140
IC2	CD4007		CD4007

*Mylar is a registered trademark of E.I. DuPont de Nemours and Company.

ELECTRICAL PARTS LIST – CONTINUED

Ref. No.	Description		Mfr's Part No.
RV3 RV4 RV5	B-10K B-50K B-50K		R1710N16K R163MN14K68 R163MN14K68
Switches			
S1 S2 S3	Switch RS-251-3-4K20P Switch PBS-2201-NL Switch SS23E01-G8		RS-251-3-4K20P PBS-2201-NL SS23E01-G8
Miscellaneous and Connection Wire			
CZ3 CZ4 CZ5	Plug, Socket & Wire Length 200 mm Yellow, White, Black, Red (From Earphone to Main PCB) Plug, Socket & Wire Length 250 mm (From Meter to Main PCB) Plug, Socket & Wire Length 170 mm Yellow, Blue, Red (From Potentiometer to Main PCB) Wire Length 190 mm Red from PCB of Earphone to Speaker Wire Length 125 mm Positive and Negative of Battery Yellow Wire Length 170 mm Negative of Battery to Ground of Main PCB Black Wire Length 100 mm Positive of Battery to Main PCB Red Wire Length 240 mm Negative of Battery to Ground of Main PCB Black Wire Length 200 mm Positive of Battery to PCB Red Wire Length 450 mm Push Switch to PCB White Wire Length 45 mm Switch to PCB Black		JT3-4(straight) RV 1 x 7/0.15 JT3-2(straight) RV 1 x 7/0.15 JT3-3(straight) RV 1 x 7/0.15 RV1 x 7/0.15 RV1 x 16/0.15 RV1 x 16/0.15 RV1 x 16/0.15 RV1 x 16/0.15 RV1 x 16/0.15 RV1 x 16/0.15 RV1 x 16/0.15 RV1 x 16/0.15

PLEASE READ THE FOLLOWING CAREFULLY

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Note: Some parts listed on pages 10 through 14 are shown for illustration purposes only and are not available individually as replacement parts.

ELECTRICAL PARTS LIST – CONTINUED

Ref. No.	Description		Mfr's Part No.
R26	Resistor 33 kohm $\pm 1\%$		RJ14-0.25W
R27	Resistor 68 kohm $\pm 1\%$		RJ14-0.25W
R28	Resistor 160 kohm $\pm 1\%$		RJ14-0.25W
R29	Resistor 62 kohm $\pm 1\%$		RJ14-0.25W
R30	Resistor 470 kohm $\pm 5\%$		RT14-0.25W
R31	Resistor 200 kohm $\pm 5\%$		RT14-0.25W
R32	Resistor 1 Mohm $\pm 5\%$		RT14-0.25W
R33	Resistor 1 Mohm $\pm 5\%$		RT14-0.25W
R34	Resistor 10 kohm $\pm 5\%$		RT14-0.25W
R35	Resistor 43 kohm $\pm 1\%$		RJ14-0.25W
R36	Resistor 100 kohm $\pm 5\%$		RT14-0.25W
R37	Resistor 430 ohm $\pm 5\%$		RT14-0.25W
R38	Resistor 240 kohm $\pm 5\%$		RT14-0.25W
R39	Resistor 22 ohm $\pm 5\%$		RT14-0.25W
R40	Resistor 82 kohm $\pm 5\%$		RT14-0.25W
R41	Resistor 39 kohm $\pm 5\%$		RT14-0.25W
R42	Resistor 20 kohm $\pm 1\%$		RJ14-0.25W
R43	Resistor 220 ohm $\pm 5\%$		RT14-0.25W
R44	Resistor 220 ohm $\pm 5\%$		RT14-0.25W
R45	Resistor 15 kohm $\pm 5\%$		RT14-0.25W
R46	Resistor 150 kohm $\pm 1\%$		RJ14-0.25W
R47	Resistor 130 kohm $\pm 1\%$		RJ14-0.25W
R48	Resistor 100 kohm $\pm 5\%$		RT14-0.25W
R49	Resistor 620 kohm $\pm 5\%$		RT14-0.25W
R50	Resistor 470 kohm $\pm 5\%$		RT14-0.25W
R51	Resistor 4.3 kohm $\pm 5\%$		RT14-0.25W
R52	Resistor 150 kohm $\pm 5\%$		RT14-0.25W
R53	Resistor 150 kohm $\pm 5\%$		RT14-0.25W
R54	Resistor 4.7 Mohm $\pm 10\%$		RT14-0.25W
R55	Resistor 750 kohm $\pm 5\%$		RT14-0.25W
R56	Resistor 100 kohm $\pm 5\%$		RT14-0.25W
R57	Resistor 100 kohm $\pm 5\%$		RT14-0.25W
R58	Resistor 1 Mohm $\pm 5\%$		RT14-0.25W
R59	Resistor 22 kohm $\pm 5\%$		RT14-0.25W
R60	Resistor 22 kohm $\pm 5\%$		RT14-0.25W
R61	Resistor 47 kohm $\pm 5\%$		RT14-0.25W
R62	Resistor 47 kohm $\pm 5\%$		RT14-0.25W
R63	Resistor 1 Mohm $\pm 5\%$		RT14-0.25W
R64	Resistor 4.3 kohm $\pm 5\%$		RT14-0.25W
R65	Resistor 30 kohm $\pm 1\%$		RJ14-0.25W
R66	Resistor 10 kohm $\pm 5\%$		RT14-0.25W
R67	Resistor 15 kohm $\pm 5\%$		RT14-0.25W
R68	Resistor 15 kohm $\pm 5\%$		RT14-0.25W
R69	Resistor 51 kohm $\pm 5\%$		RT14-0.25W
R70	Resistor 43 kohm $\pm 5\%$		RT14-0.25W
R71	Resistor 220 kohm $\pm 5\%$		RT14-0.25W
R72	Resistor 15 kohm $\pm 5\%$		RT14-0.25W
Protentionmeter			
RV1	C-10K		R163MN14K68
RV2	B-200K		R163MN14K68

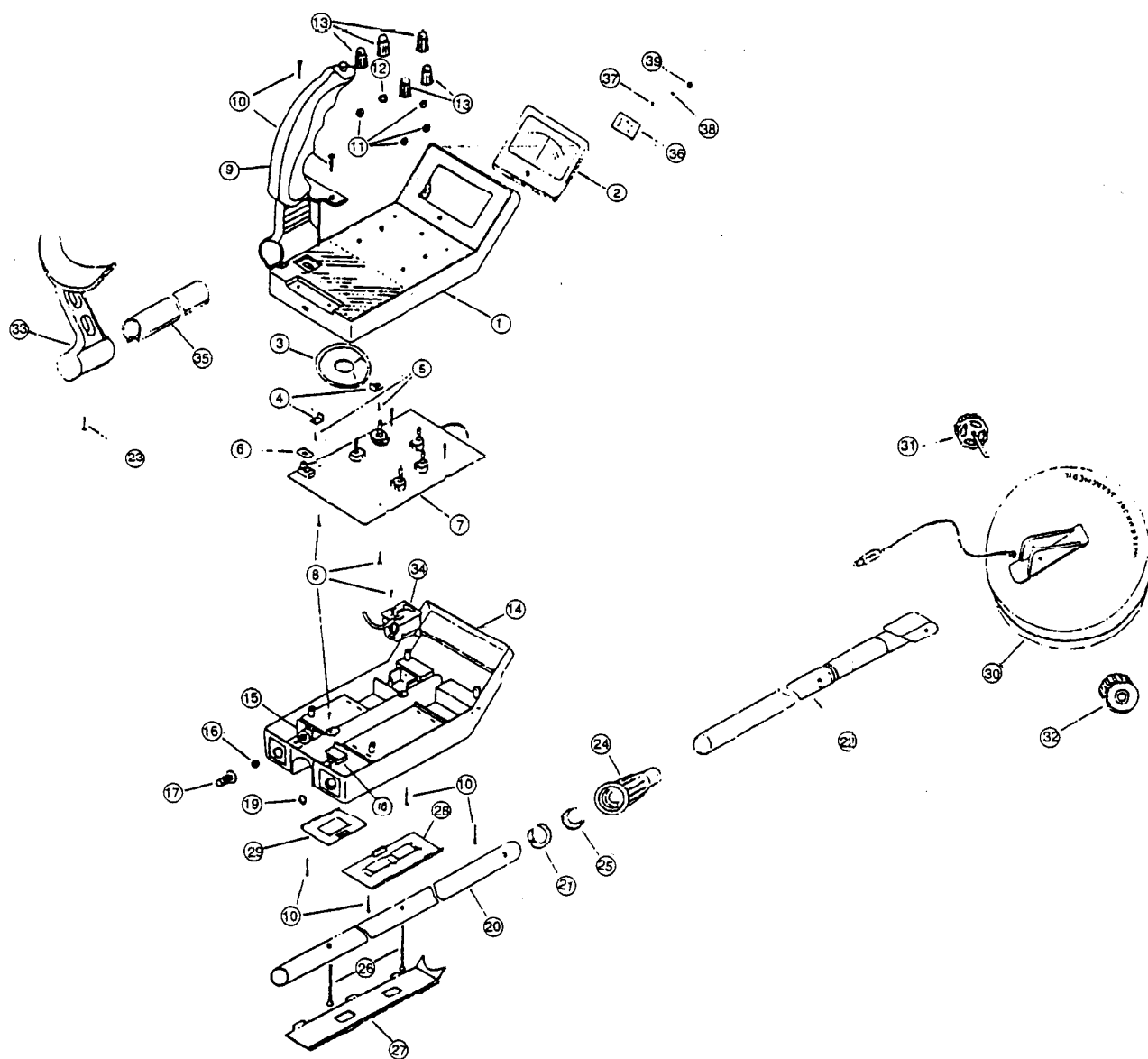
ELECTRICAL PARTS LIST – CONTINUED

Ref. No.	Description		Mfr's Part No.
IC3	CD4069		CD4069
IC4	CD4007		CD4007
IC5	CD4053		CD4053
IC6	LM324		LM324
IC7	LM324		LM324
Inductors			
L1	Transmitter Coil 5.775.018		SQC5.775.018
L2	Receiver Coil 5.760.061		SQC5.760.061
L3	Inductor 15 μ H		LGA0307-R15K
L4	Inductor 15 μ H		LGA0307-R15K
L5	Inductor 15 μ H		LGA0307-R15K
Transistors			
Q1	Transistor 9014C		9014C
Q2	Transistor 9014C		9014C
Q3	Transistor 9015C		9015C
Q4	Transistor 9014C		9014C
Q5	Transistor 9013H		9013H
Q6	Transistor 9014C		9014C
Q7	Transistor 9012H		9012H
Q8	Transistor 9014C		9014C
Q9	Transistor 9014C		9014C
Resistors			
R1	Resistor 150 kohm $\pm$ 5%		RT14-0.25W
R2	Resistor 27 kohm $\pm$ 5%		RT14-0.25W
R3	Resistor 10 kohm $\pm$ 5%		RT14-0.25W
R4	Resistor 15 kohm $\pm$ 5%		RT14-0.25W
R5	Resistor 100 kohm $\pm$ 5%		RT14-0.25W
R6	Resistor 15 kohm $\pm$ 5%		RT14-0.25W
R7	Resistor 220 ohm $\pm$ 5%		RT14-0.25W
R8	Resistor 4.7 kohm $\pm$ 5%		RT14-0.25W
R9	Resistor 1 kohm $\pm$ 5%		RT14-0.25W
R10	Resistor 100 kohm $\pm$ 5%		RT14-0.25W
R11	Resistor 33 kohm $\pm$ 5%		RT14-0.25W
R12	Resistor 470 kohm $\pm$ 5%		RT14-0.25W
R13	Resistor 820 ohm $\pm$ 5%		RT14-0.25W
R14	Resistor 2.2 kohm $\pm$ 5%		RT14-0.25W
R15	Resistor 1 Mohm $\pm$ 5%		RT14-0.25W
R16	Resistor 1 Mohm $\pm$ 5%		RT14-0.25W
R17	Resistor 100 kohm $\pm$ 5%		RT14-0.25W
R18	Resistor 15 kohm $\pm$ 1%		RJ14-0.25W
R19	Resistor 3.3 kohm $\pm$ 5%		RT14-0.25W
R20	Resistor 4.7 kohm $\pm$ 5%		RT14-0.25W
R21	Resistor 27 kohm $\pm$ 1%		RJ14-0.25W
R22	Resistor 100 kohm $\pm$ 5%		RT14-0.25W
R23	Resistor 100 kohm $\pm$ 5%		RT14-0.25W
R24	Resistor 62 kohm $\pm$ 1%		RJ14-0.25W
R25	Resistor 47 kohm $\pm$ 5%		RT14-0.25W

TROUBLESHOOTING

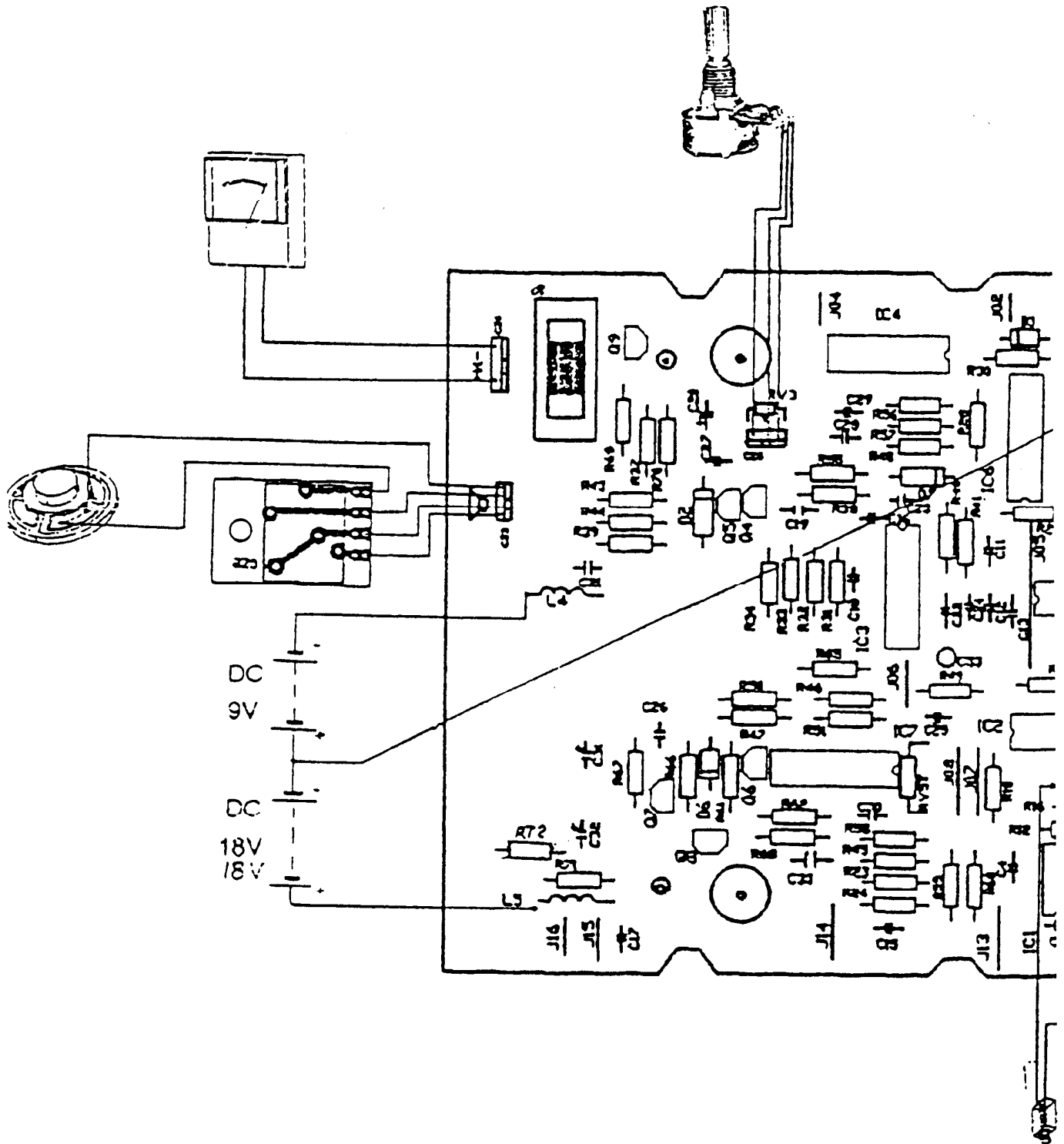
Symptom	Cause	Remedy
1. No (output) sound and meter reading	- Defective battery clip. - Broken Battery wire to PCB - Bad Battery (B1) or (B2) - Defective MODE Control (S1) Switch	- Replace - Replace - Replace - Replace
2. No sound or Noise	- Open speaker. - Broken speaker or earphone jack connections. - Rectifier (D2) is defective. - Defective transistor Q4 and Q5. - Defective headphone jack. - Defective IC4.	- Replace - Repair - Replace - Replace - Replace - Replace
3. No meter indication	- Defective meter connection - Defective meter. - Defective Test control (S3) Switch.	- Repair - Replace - Replace
4. Auto-Tune does not function	+V and 1/2V voltage incorrect check Q6, Q7, Q8 and IC7. - Broken auto-tune switch (S2) connection - Defective auto-tune(s) Switch - IC1, IC2 defective - Tune control RV4 defective	- Repair - Soldering - Replace - Replace IC - Replace
5. No response to any metal	- Defective transistor Q1, Q2, Q3 and D1. - Defective coil L1 or L2. - Defective coil connections and din plug sockets.	- Check and replace - Check and replace - Check and repair
6. Ground control and disc control do not function properly	- Defective IC3, IC5 and IC6. - Defective MODE control (S1) Switch - Coil out of alignment - Defective capacitor C19 and C14. - Ground control RV1 DISCRIMINATION control RV2 defective.	- Check and replace - Check and replace - Search head - Replace - Check and replace
7. Sensitivity too low	- Coil out of alignment - Batteries voltage - Exposure to too high humidity -internal corrosion	- Replace search - Replace - Replace indicated components
8. No Tree tone-Audio but with noise	- IC3 audio oscillator is not oscillating - IC5, IC6 defective	- Replace - Replace

Parts Diagram



Caution: Service and maintenance should only be performed by a qualified technician.

Wiring Diagram (continued on next page)



Wiring Diagram (continued from prior page)

