BULOVA WATCH COMPANY, Inc.

TECHNICAL BULLETIN

Accuquartz® Series 224

INTRODUCTION

The Series 224 Accuquartz is basically an Accutron® Series 218 with some modifications. The most significant difference is the addition of a Quartz Crystal Oscillator to an already proven and established timepiece. Although some parts, regulation and minor adjustments may differ, the Series 224 and Series 218 are very similar to each other in basic servicing procedures.

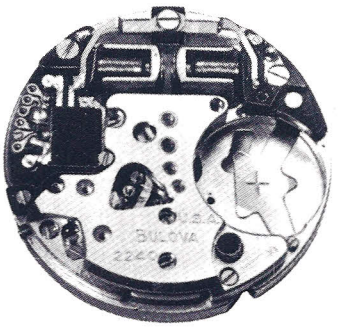

FIGURE 1.
Series 224 Movement, train side.

Tools

The basic tools and equipment necessary for servicing the Accutron Series 218 are also employed in servicing the Accuquartz 224. In addition, a Quartz Crystal Deviation Counter with 32,768 Hz pickup is required. When phasing, an I.C. (integrated circuit) Phasing Attachment (Accuquartz Service Kit #224/6601) is used in conjunction with the basic 218 movement holder. Also, an abbreviated meter scale is necessary. (Accuquartz Service Kit #224/6602).

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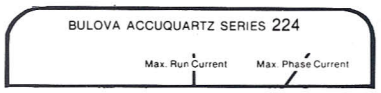
FIGURE 2.



Service Kit #224/6602,
Abbreviated Meter Scale.

Service Kit #224/6601,
I.C. Phasing Attachment

Servicing

Disassembly, cleaning, lubrication and reassembly including calendar, INDEX ADJUSTMENT and PHASING (with a minor variation) is done in exactly the same manner as the Series 218. When necessary, please refer to the 218 manual for servicing the Accuquartz 224.

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SPECIFICATIONS

Quartz Frequency
32,768 Hz (cycles per second)

Tuning Fork Frequency
341 1/3 Hz (cycles per second)

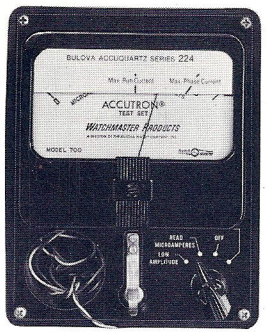
Jewels
15

Dimensions
25.75mm x 4.4mm (6.1mm height with calendar)

Ligne Size
12 3/4

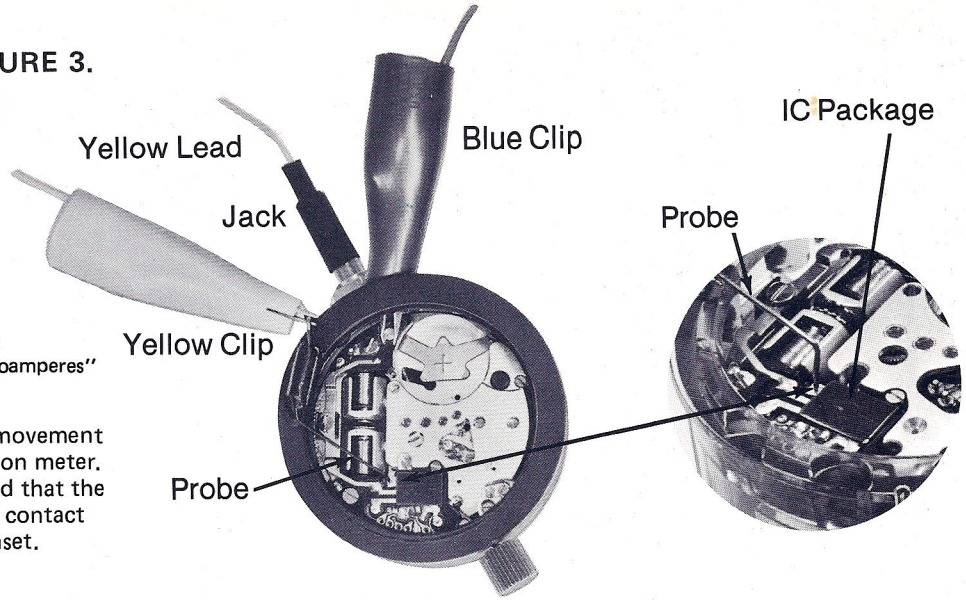
Power Source
"Bulova 218," or "Accutron 218"

Displays
Model 2240—Hour, Minute and Sweep Second
Model 2241—Hour, Minute, Sweep Second and Date
Model 2242—Hour, Minute, Sweep Second, Day and Date



NOTE:
Meter set at
"Read Microamperes"

FIGURE 3.



I.C. Phasing Attachment in place on movement holder and Abbreviated Meter Scale on meter. Note connection points for leads and that the probe of the attachment must be in contact with the I.C. Package as shown on inset.

PHASING

NOTE: The Series 224 and Series 218 are phased the same way: by turning the phasing cam and creating the *run-stop-run* action of the Index Wheel. However, the meter is *NOT* set at Low Amplitude, but in fact, at *READ MICROAMPERES.* (The I.C. Phasing Attachment compensates for this change in procedure.)

A. The indexing mechanism should be properly adjusted and positioned for phasing as described in the 218 manual.

B. With movement seated properly in 218 movement holder, slip I.C. Phasing Attachment over movement and on holder. Center movement stem in wall of attachment slot. Set meter at *Read Microamperes* setting.

C. Connect meter leads. Blue lead to cell strap pin, yellow lead (jack) to ground (movement holder) Fig. 3.

NOTE: On occasion, the meter pointer will "peg." When this occurs, wait about 15 seconds for pointer to recover. If it does not recover, lightly tap meter dial and the pointer should return to a lower reading. If it fails to recover, replace the Component Coil #712 because it has a short circuit.

D. Clip yellow alligator lead to I.C. attachment. Do *not* remove yellow plug in movement holder (Fig. 3). Place abbreviated meter scale (224/6602) on meter as pictured.

E. Check meter reading to confirm proper contact between I.C. Attachment and movement. Meter pointer should indicate a reading *between* the two drawn lines on the abbreviated meter scale. This is normal for this watch.

NOTE: If below, check I.C. attachment for proper contact with watch movement (see Fig. 3). Also check for proper contact of yellow alligator clip.

If above, first check for mechanical blockage. If there is no mechanical blockage, replace Component Coil #712.

F. Movement is ready for phasing. Check that the meter selector is at the Read Microamperes position. Phase as Series 218. Rotate the cam slowly until the Index Wheel starts. Continue turning the cam until the Index Wheel stops and restarts. Do not turn cam any further. Tighten lock screw. The watch is now in phase.

"REGULATOR" ADJUSTMENT

Unlike previous Accutron watches, the Tuning Fork "Regulators" of a Series 224 Accuquartz, do *NOT* function as "Regulators." The "Regulators" in fact, function as "Balancers." When the "Balancers" are positioned properly, the fork will vibrate in close harmony with the frequency of the Quartz Crystal, and will require a minimum of current.

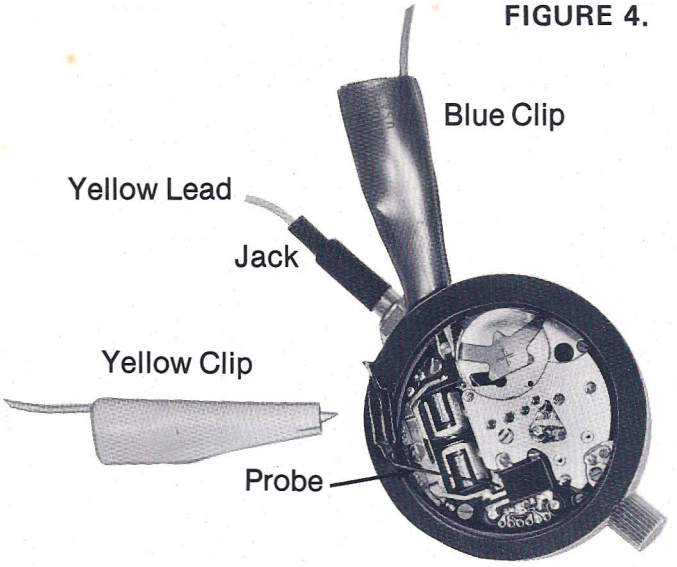
A. To check Balancers (Regulators), remove the yellow alligator clip from the I.C. Phasing Attachment. Meter Selector Switch should be in the "Read Microamperes" position.

B. With watch *phased* and *running,* hold the watch (in the movement holder with Phasing Attachment in place) in the tuning fork cups "Up" position. Take careful note of the pointer position. Turn the watch to the tuning fork cups "Down" position and again note the pointer position. The difference between pointer position cups "up" and cups "down" should not exceed *two pointer widths.* This corresponds to approximately 0.2 microamperes.

C. If the needle moves more than twice its width, the microampere reading is excessively unequal. The objective is to reduce the higher of the two readings until the difference is no greater than two needle widths, corresponding to 0.2 microamperes. To do this, determine which position produces the higher reading, and lower it. For instance, if the "tuning fork cups up" is higher in reading than "tuning fork cups down," move both "Balancers" towards the center of the movement. If the "tuning fork cups down" reading is the higher reading, then move the "Balancers" towards the outside of the movement.

NOTE: It is good practice to divide the amount of adjustment equally between the 2 "Balancers" so that they remain opposite each other at all times.

FIGURE 4.



NOTE:
Meter set at
"Read Microamperes"

Current Drain Check. Note that the connections differ from those shown in Figure 3 in that the yellow alligator clip is NOT connected to the I.C. Phasing Attachment.

CURRENT DRAIN CHECK

A. After adjusting the Balancers with the selector switch still set at "Read Microamperes," check that the reading does NOT exceed "Max. Run Current." Leads are connected as in Fig. 4; that is, yellow alligator clip is NOT attached to I.C. Phasing Attachment.

B. If current drain is above "Max. Run Current," then check for possible causes as in Series 218. See "Hints" on back page.

FREQUENCY CHECK

Set the frequency counter selector at 32,768 Hz.

Checking the frequency of the Quartz Crystal (32,768 Hz) is done by pulling the stem to the setting (out) position and placing the movement on the frequency counter pick-up. The rate is adjusted solely by changing the number and/or position of Tuning Capacitor Screws (#352) located on the Component Coil (#712). The AMOUNT and LOCATION of screws adjust the frequency (Table 1).

A. *If frequency too fast*—Increase the capacitance of the tuning capacitor, thereby decreasing the frequency, by *adding* or *relocating* one or several capacitor screws. This reduces the frequency. See Table 1.

B. *If frequency too slow*—Reduce the capacitance of the tuning capacitor, thereby increasing the frequency, by *removing* or *relocating* one or several tuning capacitor screws. This increases the frequency. See Table 1.

NOTE: After making a frequency adjustment, allow the watch to lie flat for a few minutes before placing it on the frequency counter once more: this allows the Quartz Crystal to stabilize. The design of the watch is such that accuracy within three minutes a year is not unusual.

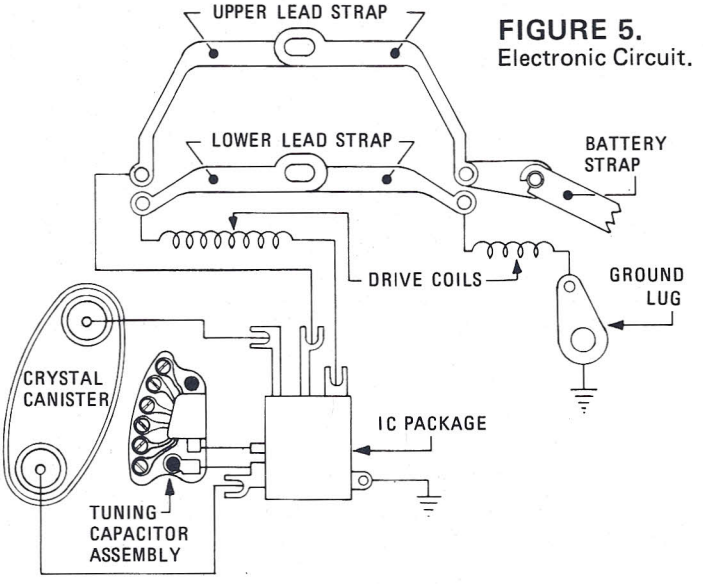
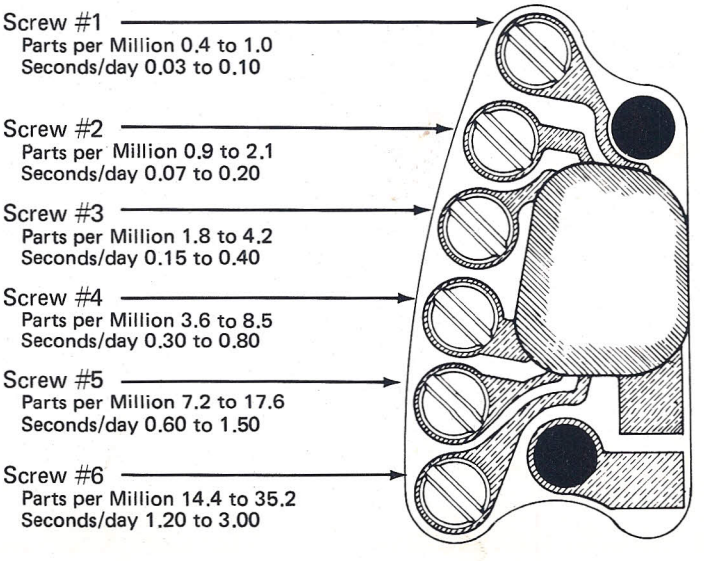


FIGURE 5.
Electronic Circuit.

TABLE I
NOMINAL VALUES
FOR THE 6 TUNING CAPACITOR SCREWS

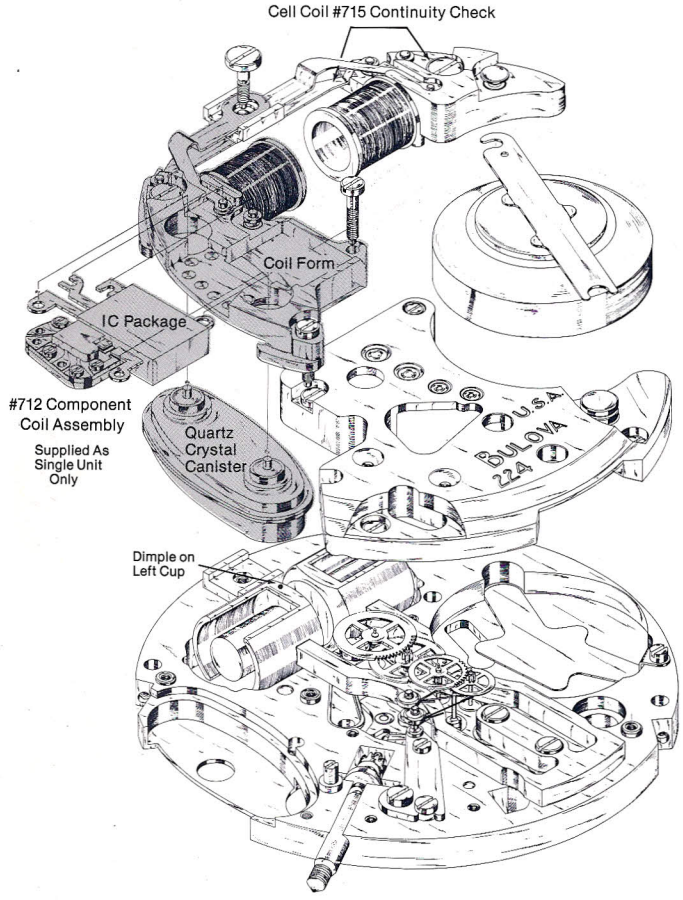


LIST OF PARTS FOR SERIES 224
ADDITIONAL TO OR VARYING FROM SERIES 218

103	Second Wheel	205	Setting Lever	609	Lead Strap Separator
105	Third Wheel	209	Setting Lever Screw	709	Pillar Plate
112	Index Wheel	315	I.C. Ground Screw	712	Component Coil Assembly
141	Cell Strap	352	Tuning Capacitor Screw	715	Cell Coil Assembly
151	Cell Coil Screw	404	Train Bridge	*716	Tuning Fork
151	Component Coil Screw	606A	Lead Strap stand-off	814	Cell Strap Stand-off tube
151	Lead Strap Screw				

*The Series 224 Tuning Fork, being of different frequency is *not* interchangeable with the Series 218. To distinguish one from the other, examine the left cup. The Series 224 has a countersunk indent (dimple); The Series 218 does not.

FIGURE 6.



Components of Series 224. Shaded components are only available as a single unit specified as Part No. 712 (Component Coil Assembly).

HINTS

1. To determine whether a "Zero" meter reading is due to an open Component Coil #712 or an open Cell Coil #715, set meter selector at "low amplitude" and carefully place yellow lead to *lower* #715 lead strap, blue lead to ground lug, Fig. 6. If meter pegs, #715 is o.k. and #712 is open and must be replaced. If meter needle remains at zero then the #715 is open and must be replaced.
2. Check Quartz Crystal Canister and I. C. Board. They must be cemented tightly in place. If loose, cement in place with Aron Alpha epoxy or equivalent. USE SPARINGLY! As with all Quartz Crystal Watches, care should be taken not to subject the Quartz Crystal to abuse when movement is uncased.
3. It is imperative that the Tuning Fork be positioned properly between the shoulders on the underside of the train bridge and the pillar plate. Space between fork tines and train bridge should be approximately twice the distance as that between tines and pillar plate.
4. The tuning fork in an Accuquartz is a slave, whose accuracy is controlled by the Quartz Crystal. Therefore, if a problem exists within the accuracy of the watch, which cannot be adjusted by regulating, and there is no mechanical problem, it is the Component Coil (#712), which contains the Quartz Crystal, that needs to be replaced. On the other hand, if the meter current drain is excessive, and there is no mechanical problem, it is usually a demagnetized fork that is causing the high current reading. The Tuning Fork must be replaced.
5. Check frequency, electronic circuit, and current drain before assembling gear train to eliminate unnecessary assembly and disassembly if problem exists.

All information contained in this booklet is based on the latest product information available at the time of printing.

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