BULOVA® ACCUTRON® QUARTZ SMQ® Series 245 & 246 TECHNICAL BULLETIN



All information contained in this booklet and referring to Series 245 includes ser. 246, unless otherwise noted.



Fig. 1. ENLARGED VIEW OF MOVEMENT OF CALIBER 245



Bulova Accutron Quartz Series 245—Electronic movement with quartz resonator, stepping motor, disconnect system, and *Accuset*.®

SPECIFICATIONS

Quartz Frequency 32,768 Hz (Cycles per second)

Electronic Circuit C-MOS Integrated Circuit—one second signal increments

Stepping Motor Bipolar, 2 steps per revolution

Power Cell One Silver Oxide Battery, 1.55 Volt Bulova 247 (Low Drain)

Power Consumption

Max. 2.5 Microamperes (Normal Running) Max. 0.5 Microamperes (Disconnect Position 3)

Disconnect System

When the stem is pulled out as far as it will go (Position 3), the motor and hands stop. The Resonator (Quartz) continues to vibrate, without affecting the synchronization of the electronic ACCUSET circuit, while preserving the life of the battery.

Accuset

A device that corrects the second hand by merely depressing a push button. The second hand is reset automatically to the time standard.

Day Indicator

In two languages: English and Spanish, or English and French.

CALIBER	DISPLAY		HEIGHT	DIAMETER	LIGNE	
2451.10	Hour, Minute, & Second		4.20 mm	26.0 mm	111/2	
2452.10	Hour, Minute, Second & Date		5.05 mm	26.0 mm	111/2	
2453.10	Hour, Minute, Second, Date & Day		5.05 mm	26.0 mm	111/2	
2461.10	Hour, Minute & Second		4.20 mm	20.5 mm	83/4	
2462.10	Hour, Minute, Second & Date	-	4.70 mm	20.5 mm	83/4	

BASIC ELECTRONIC FUNCTION OF ACCUTRON QUARTZ SERIES 245

Refer to Fig. 3

The Accutron Quartz Series 245 is powered by a 1.55 volt Bulova 247 (Low Drain) battery. Voltage from the battery is introduced into the electronic circuit, which then transmits current to the Quartz Crystal circuit causing the crystal to vibrate at 32,768 Hz (cycles per second). The accuracy of the watch is dependent on the frequency of the Quartz Crystal. If the Quartz frequency is incorrect, the TRIMMER capacitor regulator, within the movement, can be turned to make adjustments of up to 8 seconds per day.

This Quartz frequency (rate) must be then converted to one-second impulses before it can be used to mechanically drive the hands of the watch. This is accomplished by means of an electronic divider circuit. The divider circuit, which contains 15 stages, receives the signal generated by the Quartz Crystal and divides this signal by two in each of the 15 stages.

The 15th stage emits one pulse per second. The divider circuit divides the 32,768 Hz to 1Hz (2¹⁵ = 32,768), which drives the stepping motor in the time-keeping mode. The motor in turn drives the gear train which is connected to the dial train causing the hands to turn.

ACCUSET® OPERATION

In addition to the 15 stage divider, and other circuits, there are also two independent counter ACCUSET control logic circuits. These logic circuits perform the resetting function for the ACCUSET feature. Both are set to zero when the crown is in position 3 (Fig. 4) and the ACCUSET button is pushed and released. When the stem is pushed in (Position 1 or 2) both circuits start to count continuously, one count per second up to 60, and then start over again.

USING THE ACCUSET CORRECTOR

Once the ACCUSET feature has been programmed (Page 3) and after a period of time, if the watch is no longer accurate to the exact second, press and release the ACCUSET button the instant the *time standard* used reaches the 60th second (12 o'clock) marker. (Maximum correction is + or - 30 seconds.) The sweep second hand of the watch will temporarily stop if it is fast, or accelerate if it is slow until it is in synchronization with the time standard.

Important: When the crown is "all the way out" (Position 3), motor and all hands stop. The ACCUSET circuit continues to operate and the quartz crystal continues to vibrate, using extremely little current. Store watches with crown in "out" (Position3) to prolong battery life.



Fig. 3. This illustration is a simplified version of the complicated circuit within the Accutron Quartz Series 245. It is not intended to be used as a means of conveying any other thought but a practical way of demonstrating a theory.

CROWN POSITIONS

Position 1

Normal Running

Position 2

Instant Calendar Setting

Position 3

- Stops Second Hand
- Synchronizing ACCUSET circuit
- Minute and Hour Hand setting
- Disconnect Position: Conserves life of power cell when watch is not in use



REPLACING THE POWER CELL

- A) Release cell strap screw sufficiently to allow strap tab to pass over p.c. board.
- B) Swing strap away from movement.
- C) Remove old cell from movement.
- D) Insert new power cell with printed (+) side down.

Recommended power cell: Bulova 247 (Low Drain) (1.55 volt)

If the cell is not replaced before it is exhausted, the watch will simply stop. The movement should not be harmed in any manner.

However, when it becomes exhausted it should be replaced at the earliest opportunity to diminish the possibility of leakage. Never store a watch with an exhausted power cell in it.

SETTING INSTRUCTIONS AND PROGRAMMING ELECTRONIC ACCUSET CIRCUIT

Important: It is necessary to re-synchronize ACCUSET circuit after:

- A. Installing a Power Cell.
- B. Servicing the Movement.
- C. Interruption of Current (e.g. loose contact screw).

SETTING INSTRUCTIONS

Step 1. When sweep second hand of the watch reaches the 60th second mark (12 o'clock marker), pull crown out to Position 3 (See Fig. 4). (All hands will now stop.)

Step 2. Press and release ACCUSET button. (ACCUSET circuit is now synchronized with position of second hand.)

Step 3. Turn hands forward until date changes. (This establishes midnight.)

Step 4. If A.M., advance hands five minutes ahead of a time standard being used. Then gently turn the minute hand back to correct time.

If P.M., advance the hands past 12 o'clock (noon) to 5 minutes ahead of time standard and then gently turn the minute hand back to correct time.

Step 5. When time standard being used reaches the 60th second mark (12 o'clock marker), push crown to the "intermediate" position (Position 2). All hands will start instantly.

Step 6. First set the date, then the day. Crown must remain in Position 2. Slowly turn crown forward to correct date; backward to correct day. Push crown "in" (Position 1).

Note: Day Indicator is printed in English and Spanish, or English and French. Set accordingly.

The Calendar can be manually set at any time during the day or night. The design is such that no damage will occur during instant manual day/date setting.

Once the ACCUSET circuit has been set (Refer to Step 1 and Step 2), there is no need to reset it, unless the power cell has been removed, or there has been an interruption of current.

CHECKING THE ACCUSET FUNCTION

After programming the Accuset feature, check as follows:

1) Press and release button (A) when the watch's second hand reaches the 15 second marker. The second hand should stop for 15 seconds.

2) Press and release button (A) when the *time standard* being used, reaches the 60th second marker. The second hand should then advance twice as fast until the correct second is reached.

Accuset Not Functioning Properly

1) With the movement in the case, press the Accuset Button. The contact strip (Part #20.765) should press against the contact stud riveted to the underside of the electronic circuit. When the button is released, the contact strip should return to rest against the limiting post on the pillar plate.

2) If contact strip is correct, re-synchronize the Accuset circuit.

3) If the Accuset feature continues to malfunction, replace electronic module.

Checking the Frequency (Rate)

Place watch on Frequency Counter pick-up. Quartz frequency should be 32,768 Hz \pm 0.17 seconds per day.

Adjusting the Frequency (Rate)

Use a screwdriver to turn the trimmer in the appropriate direction (+ or -). The maximum rate change is approximately 8 seconds per day. Avoid excessive downward pressure on the trimmer. If rate cannot be corrected, replace the electronic circuit.

REMOVING STEM

On occasion, pressing the lever for setting lever (#51.081) may not release the stem. It will then be necessary to insert the blade of a screwdriver between the setting lever and the stem and by carefully twisting the screwdriver a slight amount, disengage the setting lever retaining pin from the stem slot. The stem can then be removed.

SERVICE

It is NOT necessary to periodically clean the Series 245 movement.

CLEANING AND LUBRICATION

The following components should not be dipped in solvent:

- Dial Support (#10.106)
 - Electronic Circuit (#10.513)
 - Coil Winding (#20.590)
 - Stepping Rotor (#20.580)
 - Stator (#20.582)
 - Date Indicator (#91.440)
 - Day Indicator (#91.441)
 - Circuit Insulator (#20.655)

After removing the above listed components, clean the movement in usual manner. The use of Miracle Plastic, One Step, or equivalent is acceptable. DO NOT OIL TRAIN BUSHINGS. The rotor pivots and pinion can be cleaned with "one dip" or soft (pith) wood. Oil the *rotor* pivots only, using lubricant #OL 216. The setting, dial train and calendar mechanism is lubricated as shown on page 7.

TOOLS & EQUIPMENT

- Quartz Crystal Deviation Counter with 32,768 Hz. capacity
- Bulova Service Meter #700
- Accessory #9920/6603
- Non-magnetic tweezers
- Watchmaker's Loupe
- Watchmaker's Hand Tools



Fig. 6

BASIC TEST PROCEDURE FOR S.M.Q. SERIES





LUBRICANTS:

Setting and Calendar Mechanism	Use (DL 206
Day/Date Jumper	Use	KT-22
Rotor Bushings	Use (DL 216

CHECK THE FOLLOWING MECHANICAL POINTS:

1) Hand adjustment; hands level, not touching dial markers, each other, rubbing on underside of crystal.

2) Calendar mechanism free from binding against dial, etc.

3) Setting mechanism is free.

4) Seconds stop lever must not be bent or distorted, nor touch the second wheel when the setting stem is in the 1st or 2nd position.

CHECKING THE WHEEL TRAIN

Because the rotor is held by its own magnetic field, it does not allow the train wheels to turn freely. Nevertheless, a check should be made that each wheel has sufficient end and side play.

CHECK THE FOLLOWING ELECTRICAL POINTS:

1) Screws holding the electronic circuit are tight.

2) Cell strap insulator is in place.

3) Printed circuit leads properly contact coil contact and cell strap. Contacts must be clean for proper contact.

TRIMMER

Check solder points at trimmer supports. Faulty solder points will cause erratic rate during regulation or stopper.

CHECKING THE COMPONENTS

Note: The following components can be tested and replaced, if necessary, without removing the movement from the case (See Pages 4 and 5 for basic test procedures):

- 1. Power Cell (#20.570)
- 2. Electronic Circuit (#10.513)
- 3. Coil Assembly Winding (#20.590)

Note: The electronic circuit is also referred to as the "P.C. (Printed Circuit) Board."

REMOVING THE COMPONENTS ELECTRONIC CIRCUIT

Using a tweezer, grip the p.c. board by the ceramic portion. Do not touch circuit board with fingers, or scratch the printed circuit with the tweezer.

COIL ASSEMBLY (Winding)

Use a tweezer to grasp the coil core using the bare hole end and not the end containing the connections to the printed circuit.

STEPPING ROTOR

Handle rotor by its pinion and not the magnet.

DIALING

Calendar Mechanism: Turn hands clockwise until *DATE* changes (disregard Day Indicator). Push Crown "in" (Position 1). Assemble Minute and Hour Hands at the 12 o'clock position.

Second Hand: When redialing, wait until motor has indexed a few times, then pull crown to the "out" position (Position 3). While holding in position, align the sweep hand with the 12 o'clock marker, and press hand into place.

The second hand is counterpoised. If replacement is necessary, use only genuine replacements.

HELPFUL HINTS

To Open Case:

Use a piece of plastic sheet between the case opener and case to prevent damage to the case.

Tight Cannon Pinion:

Either lack of lubrication or foreign matter between the cannon pinion and the center wheel post can cause the pinion to bind, causing damage to the minute wheel, hour wheel and minute post. The cannon pinion must be removed during servicing. The center wheel post and cannon pinion must be lubricated to prevent damage to the dial train.

Removing Hands:

The cannon pinion may lift during hand removal. Make certain to lower cannon pinion before advancing to the next operation. If the cannon pinion is not lowered, damage may occur to the dial train during attempts at setting the watch.

Burred Screw Head:

Do not burr the date indicator maintaining plate screw slot. Burrs may cause the day indicator to bind.



Part #	Part Name
10.020	Main Plate Center Wheel Bridge
10.047.01	Contor Wheel Bridge Screw 10.047.02 (Special)
10.047.01	Train Mhool Bridge
10.040	Train Wheel Bridge Scrow
10.046.01	Dial Ourport
10.106	Dial Support
10.513	Electronic Module
10.513.01	Electronic Module Screw
10.513.02	Electronic Module Screw (Long)
13.016	Corrector Mechanism
13.016.01	Corrector Mechanism Screw
13.105	Date Indicator Maintaining Plate
13.105.01	Date Indicator Maintaining Plate Screw
20.570	Power Cell (247)
20.580	Rotor
20.582	Stator
20.582.01	Stator Screw
20.584	Magnetic Screen, Upper
20.584.01	Magnetic Screen, Upper Screw
20.585	Magnetic Screen, Lower
20.585.01	Magnetic Screen, Lower Screw
20.590	Coil Assembly (Winding)
20.655	Circuit Insulator
20.761	Power Cell Strap
20.765	Contact Strip
20 765 01	Contact Strip Screw
30.012	Intermediate Wheel (1st)
00.012	

Part #	Part Name			
30.015	Center Wheel			
30.025	Third Wheel			
30.027	Second Wheel			
31.041	Minute Wheel			
31.080	Cannon Pinion (Hts. 2.88-3.23)			
31.100	Setting Wheel			
31.121	Sliding Pinion (Clutch)			
33.010	Double-Toothed Hour Wheel (Hts. 2.25-2.60)			
33.014	Intermediate Calendar Wheel			
33.028	Calendar Driving Wheel			
33.080	Date Corrector Setting Wheel			
36.052	Corrector Intermediate Setting Wheel			
51.020	Handsetting Stem			
51.050	Yoke (Clutch Lever)			
51.080	Setting Lever			
51.081	Lever For Setting Lever			
51.090	Setting Lever Jumper			
51.090.01	Setting Lever Jumper Screw			
53.080	Date Jumper			
56.071	Stop Lever for Sweep Second			
63.030	Date Jumper Spring			
83.138	Date Indicator Core			
83.171	Day Indicator Spring-Clip			
90.000.01	Dial Screw			
91.440	Date Indicator			
91.441	Day Indicator			
NUTE: 10.020.03 Casing Screw (Cut Head) some models only				

PARTS LI (Additional	ST MODELS 2451.10 & 2461.10 or Varying from 2453.10)	PARTS L (Additiona	IST MODE	EL 2452.10 rom 2453.10)		
Part # 10.020 10.020 10.212 10.212.01 20.585 30.015 20.027	Part Name Main Plate (2461.10) (8 ³ / ₄ ligne) Main Plate (2451.10) (11 ¹ / ₂ ligne) Minute Train Cover Minute Train Cover Screw Magnetic Screen, Lower Center Wheel	Part # 10.020 13.016 13.105 33.028	Part Name Main Plate Corrector I Date Indica Calendar D	Mechanism ator Maintaining I Driving Wheel	Plate	- (
30.027 31.046 31.080 51.090 61.241	Second Wheel Hour Wheel (Hts. 1.40-1.75) Cannon Pinion (Hts. 2.03-2.38) Setting Lever Jumper Dial Washer (FOR POCKET WATCHES ONLY)		Used only 93.230 93.230.01	on some cases Accuset Buttor Accuset Buttor	n Extender n Extender Screw	
PARTS LI (Additional of Part #	ST MODEL 2462.10 or Varying from 2453.10) Part Name	g	03.230.01	93.230	LIMITING POST	
10.020 10.106 13.016 13.105 30.015 30.027 31.080 33.010 33.028 91.440	Main Plate Dial Support Corrector Mechanism Date Indicator Maintaining Plate Center Wheel Second Wheel Cannon Pinion (Hts. 2.53-2.88) Double-Toothed Hour Wheel (Hts. 1.90-2.25) Calendar Driving Wheel Date Indicator					
				-		Fig. 11

NOTES:

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