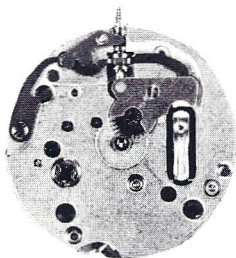


BULOVA WATCH COMPANY, Inc.

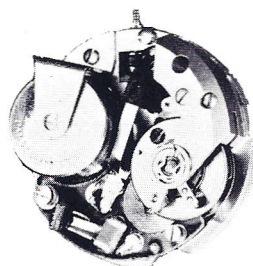
TECHNICAL BULLETIN



Dial Side



Train Side



Actual
Movement Size



CARAVELLE transistorized

MODEL 7 OT

SPECIFICATIONS

- 7¾ Ligne Round
- 21,600 Beats Per Hour
- Transistorized Circuit —
(No Make-Break Contacts)
- Amplitude Regulator
- Crown Controlled Shutoff Switch.
- Self Starting
starts instantly when crown
is pushed in

INTRODUCTION

About Service, Tools and Equipment

The electronic transistorized Caravelle Model 7 OT needs no special service knowledge, no understanding of electronics and, with the exception of the small Caravelle case opener #7037, no special tools. The watch is serviced with the equipment that today's watch repairer considers as standard necessities. Among these is a multimeter with an internal resistance of 20,000 ohms per volt for measuring D.C. volts, ohms and microamperes. It is used for all battery-driven balance wheel watches.

Since cells are by far the units most frequently checked, many watch repairers have found the ACCU-TRON® Power Cell Tester #320, manufactured and designed solely for cell checking, a simple, quick and inexpensive aid.

Before beginning the step-by-step service explanations, it should be noted that the Caravelle 7 OT movement, like most electronic timepieces, should not be put through a demagnetizer. The lower plate and balance wheel contain permanent magnets that would be impaired by demagnetization.

SPECIAL POINTS

Power Cell Replacement

1. Pull stem into setting position (this is to insure that the clutch lever's insulated shoe will remain under the curved end of the power connector #1086).
2. Open case (See Uncasing, Step 1).
3. With stem in setting position, remove power cell strap screw #1083, power cell strap #1056 and cell #1027.
4. Install new power cell with imprinted side "up."
5. **Position the gasket on the case back #7037 (not in the recess in the bezel).**
 - a. Position the case back on the case with the notch at the 12 o'clock position.
 - b. Snap the back into place with finger pressure.
6. Push stem into running position.

Cleaning and Replacement Hints

- Be sure that the solutions are free of magnetic particles. To remove particles, immerse a magnet into the solution, sweep through it and withdraw magnet.
- Do not subject circuit and coil assembly #1001 to cleaning solutions. If cleaning is necessary, follow instructions in Step 11, ASSEMBLY.
- Index wheel lower jewel setting (Rubifix) #122 cannot be disassembled since both the cap jewel and hole jewel are friction fit into the same mounting. Three oblong openings around the perimeter of the hole jewel enable thorough cleaning, removal of dried oil and rinsing.
- Ultrasonic cleaning is recommended. The Watchmaster® Ultrasonic Watch Cleaner gives excellent results.
- If either balance wheel #54 or circuit and coil assembly #1001 is defective, replace with new complete units.

Replacement of Power Cell Insulator

- Remove old insulator. (If it is the old style, the one piece type which included power connector insulator #1087, remove the entire piece.)
- If necessary, clean the power cell seat in the lower plate #201.
- Using a light application, cement the insulator to the power cell seat in the lower plate.

Demagnetizing

- Never demagnetize balance wheel #54 or lower plate #201.
- It is permissible but unnecessary to demagnetize the other parts.

LUBRICATION CHART

Part	Lubricant
Balance Jewels	
Index Wheel Pivots	Synt-A-Lube OL 216
Train Wheel Pivots	
Center Wheel Pivots	
Cannon Pinion	Synt-A-Visco Lube OL 219
Setting Mechanism	

DISASSEMBLY

UNCASING

(The following explanation applies to the snap-back case used when this Bulletin was written. However, the instructions could change if other cases should be used in the future.)

1. Open case with Caravelle case opener #7037.

NOTE: Since the case back's opening lip does not extend beyond the bezel, an ordinary case opener will not engage it.

If a Caravelle case opener is not available, proceed as follows: Remove the spring bar at the 12 o'clock end of the case where the opening slot is located. Select a screwdriver with a blade between 2 mm. and 3 mm. wide. Push it against underside of lip and pry the back up.

2. Remove power cell strap #1056, its screw #1083, and cell #1027.
3. Loosen set lever screw #48 and remove stem #142A.
4. Remove movement from case, reinsert stem #142A into movement, and tighten set lever screw #48.
5. Remove hands and dial.

NOTE: Dial screws #47 must be completely removed because they thread into the hollow dial feet. The dial feet are located at the 1:30 and 6:30 dial positions.

6. Remove hour wheel.

THE ELECTRICAL SYSTEM (Circuit and Coil Assembly #1001)

CAUTION: First read ALL of Step 7 (below). Then proceed.

7. Move stud holder #23 clockwise 90°. This moves the balance wheel magnets away from and clear of the coil (see Fig. 1).
To prevent damage to the hairspring when moving stud holder #23, be sure that regulator #35 follows stud holder #23 and does not lag behind it.
8. Remove large headed circuit and coil assembly screw, long, #1017A (See Fig. 2).
9. Remove the two brass circuit and coil assembly screws #1017.
10. Remove circuit assembly #1001 in the following manner:

The coil lies between the rims of the balance wheel #54. To avoid damaging the coil, first swing circuit and coil assembly #1001 out and away from balance. When circuit assembly #1001 is completely free, grasp it by its outer edge and carefully lift it from movement.

11. Remove bushing #1088 (See Fig. 2) which insulates circuit assembly screw, long #1017A and power connector #1086.

FIG. 1

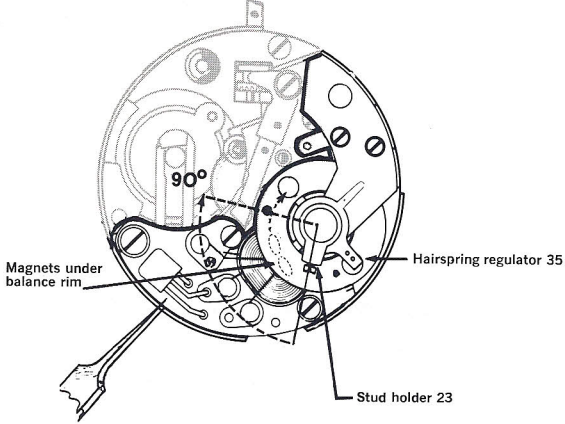


FIG. 2

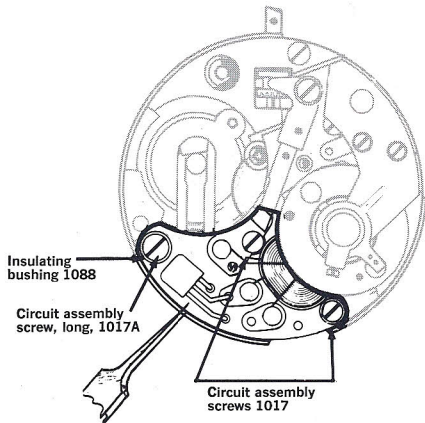
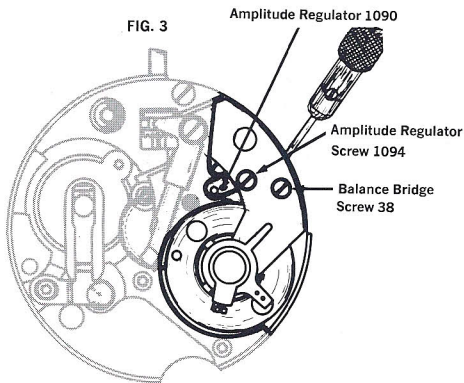
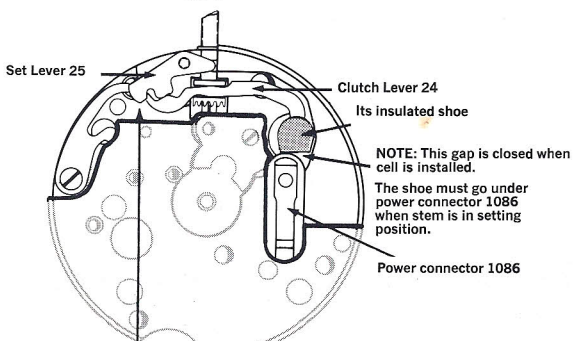


FIG. 3



STEM "IN"—RUNNING POSITION (CELL NOT YET INSTALLED)

FIG. 4



NOTE: Clutch Lever 24 is under set lever 25

THE MECHANICAL SYSTEM

12. Remove balance bridge #212. Insert screwdriver into slot beneath bridge to pry it up. This will minimize the possibility of disturbing amplitude regulator #1090. (See Fig. 3.)
13. The balance wheel #54 can be separated from its bridge #212 in the usual manner.
14. Remove stop lever #1091 and its screw #1096.
15. Remove cannon pinion #11.
16. Remove train bridge #205, its screw #37G and the entire train (center wheel #4, third wheel #5, fourth wheel #6B, and index wheel #1011).
17. Remove minute wheel bridge #1092 and dial train in conventional manner. Then remove clutch lever #24 with care so as not to deform it.

ASSEMBLY

1. Assemble the setting mechanism. (See Lubrication Chart, Page 2.) In replacing the clutch lever #24, hold it at its screw end and slide it under the tail of the setting lever #25. (See Fig. 4.)
2. Replace set wheel #29 (bevel side down), minute wheel #8, minute wheel bridge #1092 and its screw #1100.
 - a. Check freedom and endshake of all setting wheels.
 - b. Check proper functioning of clutch lever #24.
3. Replacing the train:
 - a. Check the index wheel #1011 for cleanliness.
 - b. Oil index wheel jewel setting #1046. (See Lubrication Chart, Page 2.)
 - c. Replace the train in the following sequence: center wheel #4, fourth wheel #6B, index wheel #1011, and lastly, the third wheel #5.
4. Replace train bridge #205 and its screw #37. Check train wheel endshake. Lubricate center wheel arbor in preparation for step 5. (See Lubrication Chart, Page 2.)
5. Replace the cannon pinion #11.

CAUTION: Be sure to support the center wheel pinion from the train side.

6. Check "rest position" of index wheel #1011. Turn the train by pushing at the center wheel. Make sure that the train always comes to rest with a tooth of the index wheel centered over the permanent stud magnet in the lower plate #201. Then, nudge the wheel one half the distance of the space between teeth. Under the influence of the magnet, it should jump to its next position — its tooth over the magnet. If it does not, recheck train for cleanliness and freedom. If necessary, reclean. Repeat checks. If index wheel still does not respond, the stud magnet is defective and lower plate #201 should be replaced.

ELECTRICAL AND FUNCTIONAL CHECKS

EQUIPMENT

Use a multimeter with specifications described in INTRODUCTION. Needle point probes are necessary to prevent damage to the fine wires of the coil.

If your meter is not equipped with needle probes, replace the test leads with ones that have threaded collars. These collared ends can accept all types of probes, including needle points.

CHECKING THE COILS

Actually, there are two coils which appear as one. Refer to Fig. 5. To check the coils, set the meter to OHMS. If there is more than one setting, use R10 or R100 ($\Omega \times 10$ or $\times 100$). To test one coil, place the test probes on terminals 1 and 2. (Terminal 2 is covered by a rectangular capacitor. The test probe should be held against the soldered joint at the edge of the capacitor.) To test the other, place the probes on terminals 1 and 3. If the needle does not move, or swings to zero, the coil(s) is defective and the electronic circuit #1001 must be changed.

7. Oil and assemble the balance jewels. (See Lubrication Chart, Page 2.)
8. Examine balance wheel #54. The four balance wheel magnets and the pivots must be free of magnetic particles. To remove foreign particles, use masking tape or Radico. Make sure both disks are "true in the flat."

9. Reassemble balance wheel #54 to bridge #212.
10. Replace the balance bridge #212 with its attached balance wheel #54 and secure with screw #38.

Check balance wheel #54 endshake. As an aid in adjusting endshake, use balance bridge shim #1093 — available in .02 - .03 - .05 mm. thicknesses.

Check distance between amplitude regulator #1090 (small brass lever situated on base of balance bridge) and the upper and lower balance magnets. The amplitude regulator should be approximately centered between the magnets. If not, it is caused by an unusual condition, such as a bent balance wheel or a bent amplitude regulator.

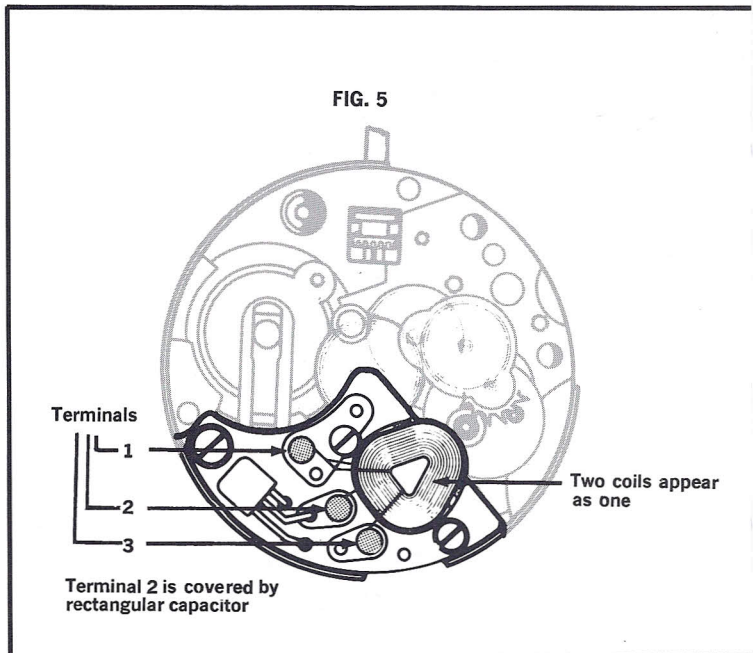
11. Check coil and circuit #1001 for cleanliness. Make sure that the contact surfaces on underside of circuit assembly #1001 are clean. If necessary, clean coil with bellows and very soft brush. Clean other metallic parts of circuit assembly #1001 with pith.

CAUTION: Cleaning solutions will damage circuit assembly #1001.

12. Replace circuit assembly #1001.
 - a. Check position of balance magnets to make sure that they are away from and clear of the coil position. (See Fig. 1.)
 - b. Assemble insulated bushing #1088 to circuit assembly #1001.
 - c. Before installing the circuit assembly #1001, be aware that the coil can be damaged by contact with the rims of balance wheel assembly. Pick up the circuit assembly #1001, keep the coil section well away from the balance wheel and insert the bushing #1088 into lower plate #201. (See Fig. 2.) Then, carefully swivel the circuit assembly #1001 around bushing #1088 until the coil is positioned between the upper and lower rims of the balance wheel #54.
 - d. Replace the two identical circuit assembly screws #1017 (See Fig. 2) but tighten them only after the coil is correctly positioned. See step 13.

13. Check coil in relation to magnets. The coil should have a minimum clearance of .05 mm. If clearance is not correct, first, remove the balance assembly. Then, use a staking or jewelers set to lower or raise the two threaded supports on which the circuit assembly #1001 rests. These supports are friction fit into the lower plate #201. To lower, press on the heads of the screws #1017 (See Fig. 2). To raise, push against the supports from the dial side.

14. Replace the balance stop lever #1091 and its screw #1096. Check for proper functioning.



CHECKING THE POWER CELL

IMPORTANT NOTE: Make sure you use only genuine Caravelle 7 OT Power Cell #1027. DO NOT USE A SUBSTITUTE POWER CELL. Hearing aid cells, having a similar external appearance, use a different electrolyte and sealing technique. This may cause leakage of corrosive materials that can damage the Caravelle movement. Bulova will not be responsible for any damage caused by the use of substitute material.

Use either the multimeter or the ACCUTRON Power Cell Tester.

If the multimeter is used, select the lowest voltage range on the meter that will indicate 1.5 volts D.C. Place black (negative terminal) test probe at the center of the gasket side of the cell and red (positive terminal) test probe against the wall of the cell. If a cell reads less than 1.4 volts, it should be replaced.

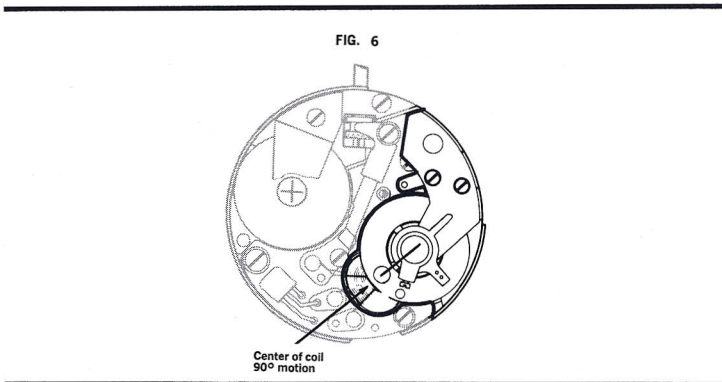
If the ACCUTRON Power Cell Tester is used, follow the instructions provided with the instrument but disregard the "OK" mark on the dial of the meter. If voltage reads less than 1.4, the power cell should be replaced.

DAMPING (FREENESS) OF BALANCE MOTION

This check should be done with the cell outside the movement. Freeness of balance wheel motion is judged by the time required for motion (amplitude) to die down from 315° to 90°. To check:

1. Rotate the balance wheel 315° from its position of rest. [$\frac{3}{4}$ turn (270°) plus an additional $\frac{1}{8}$ turn (45°).]
2. Release and observe how long it takes for the amplitude to drop to 90° (when the two holes of the balance wheel appear to be superimposed over the center of the coil, Fig. 6).

If the time is less than 10 seconds, it reveals a faulty condition. The movement should be thoroughly rechecked, the balance reexamined, parts inspected for cleanliness, and the train tested for freedom.



INSTALL POWER CELL AND CHECK SHUT-OFF SWITCH

Make sure the stem is "in." With a pointed tool, depress the spring-like power connector #1086 until its tongue is below the clutch lever's insulated shoe. Then, pull the stem "out" into setting position. This will align the power connector and shoe in correct relation to each other.

Install cell #1027 and secure with cell strap #1056 and screw #1083. Push stem "in." Check that balance wheel is running.

Check operation of shut-off switch (clutch lever #24) by pulling stem into set position. The balance should stop running. Then, lift up balance wheel stop lever #1091. If switch #24 is functioning properly, the circuit will be open, no current will flow and balance wheel #54 will **not** resume running.

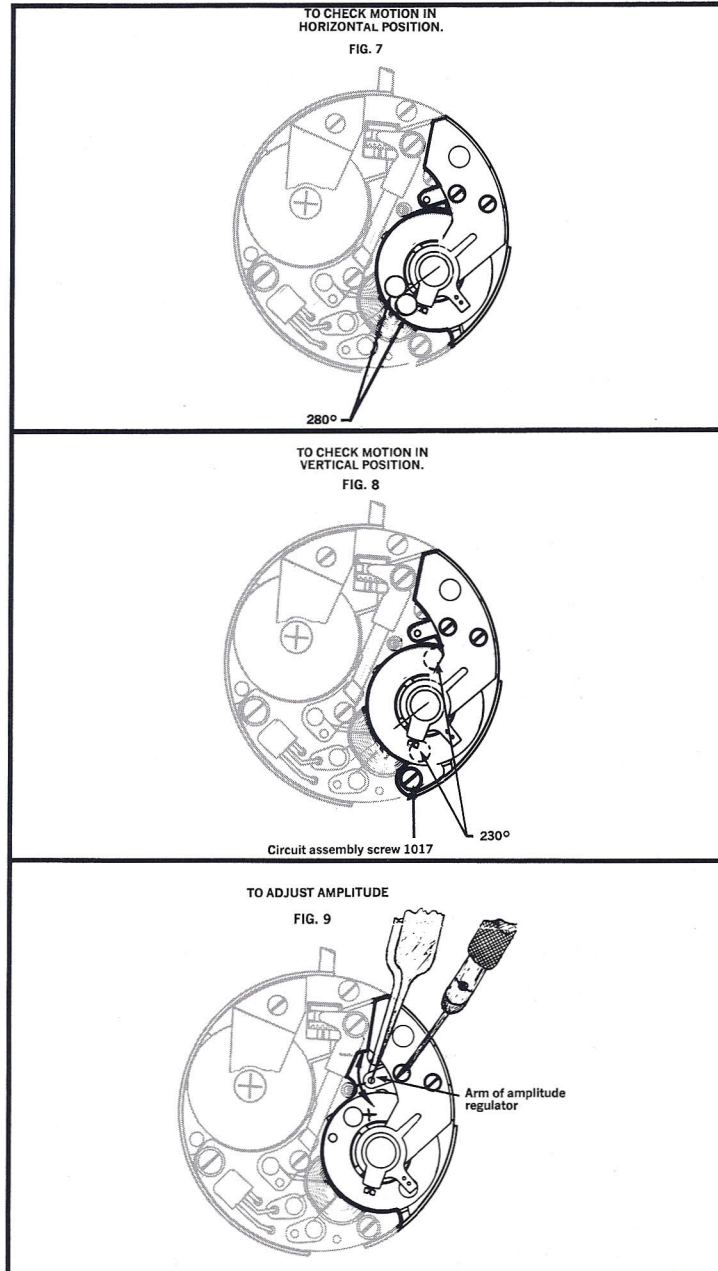
CHECK BALANCE WHEEL AMPLITUDE

Preparation

Check beat, correct if necessary, by means of stud holder #23.

NOTE: On a timing machine, this type of watch can produce beat lines relatively far apart and still be in tolerance. In some machines, acceptable lines can have as much as a 5 mm. spread.

The amplitude of the balance should be no more than 280° in the horizontal position and no less than 230° in the vertical position.



How to Check

1. The motion is 280° when the images of the holes in the balance wheel cross and are tangent to each other as shown in Fig. 7.
2. At 230°, the image of the hole in the balance seems to stop in line with circuit assembly screw

#1017 and the opposite hole seems to stop partially under the balance bridge. (See Fig. 8.)

3. If balance motions are too high or too low, adjust to correct amplitude by means of the amplitude regulator #1090 as follows:

- a. Loosen screw #1094. Insert a tool into the hole of the regulator #1090 as shown in Fig. 9.
- b. Move arm of amplitude regulator **toward** balance wheel to **increase** motion and **away** from balance wheel to **decrease** motion.

c. After proper motion has been achieved, secure amplitude regulator #1090 in position by means of screw #1094. When tightening screw, hold regulator #1090 with tweezers to prevent shifting.

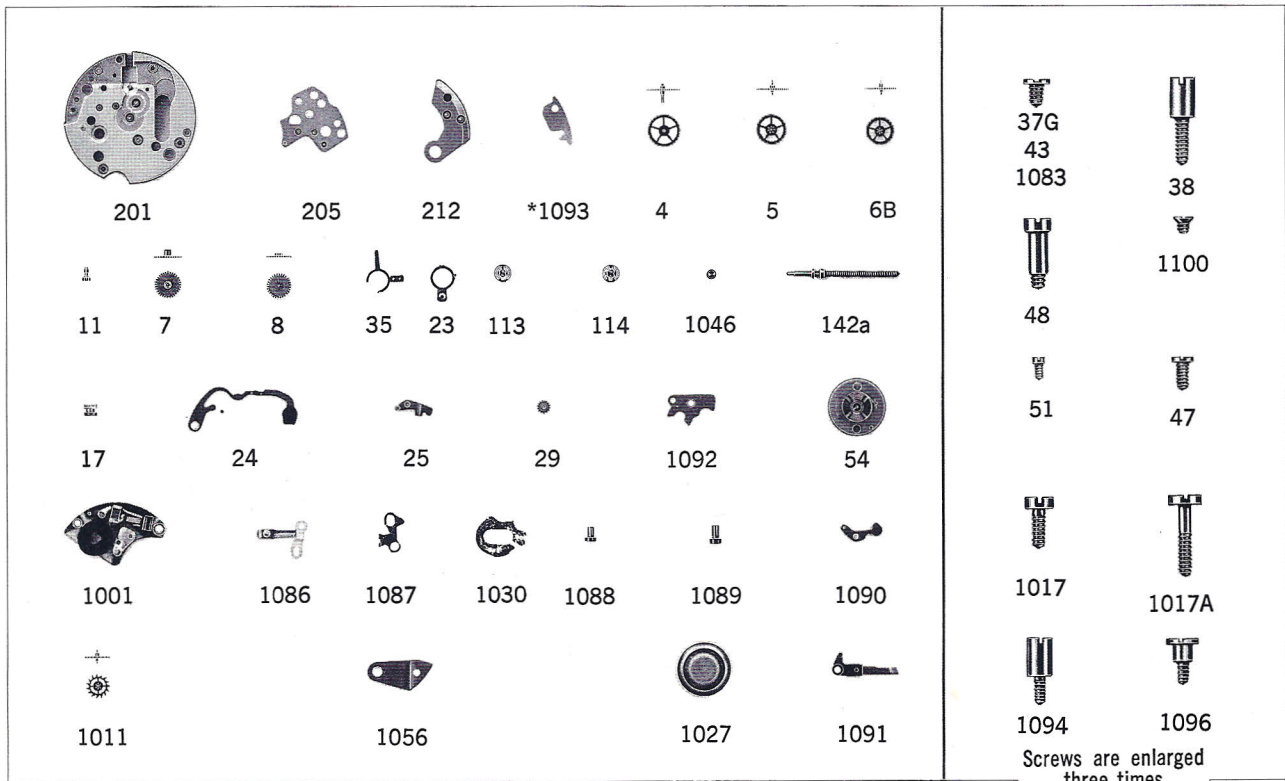
ADJUST DAILY RATE

Check the daily rates. If adjustment is necessary, correct with the hairspring regulator.

CLOSE THE CASE

See: POWER CELL REPLACEMENT — Page 2 step 5.

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
4	Center Wheel	48	Set Lever Screw	1046	Lower Index Wheel Jewel setting complete
5	Third Wheel	51	Hairspring Stud Screw	1056	Power Cell Strap
6B	Fourth Wheel w/o Bit	54	Balance Complete—flat	1083	Power Cell Strap Screw
7	Hour Wheel	63-64	Minute and hour hand (not shown)	1086	Power Connector
8	Minute Wheel	113	Upper Incabloc unit complete	1087	Flat insulator for power connector
11	Cannon Pinion	114	Lower Incabloc unit complete	1088	Insulating bushing for power connector
17	Clutch Wheel	142a	Hand setting Stem	1089	Fastener for Power Connector
23	Stud Holder	201	Lower Plate	1090	Amplitude Regulator
24	Clutch Lever	205	Train Wheel Bridge	1091	Stop lever
25	Set Lever	212	Balance Bridge	1092	Minute Wheel Bridge
29	Set Wheel	1001	Circuit and Coil Assembly	1093*	Balance Bridge Shim—Available in thicknesses .02 — .03 — .05 mm
35	Regulator—flat	1011	Index Wheel s/c pivots	1094	Amplitude Regulator Screw
37G	Train bridge screw	1017	Circuit & Coil Assembly Screw	1096	Stop lever screw
38	Balance bridge screw	1017A	Circuit & Coil Assembly Screw, long	1100	Minute Wheel Bridge Screw
43	Clutch Lever Screw	1027	Power Cell		
47	Dial Screw	1030	Power Cell Insulator		



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

Printed 1971 Reprinted 1974

Printed in U.S.A. Technical Information Services, Bulova Watch Company, Inc., 62-10 Woodside Avenue, Woodside, N. Y. 11377.