

BULOVA

MITCHELL ADLER
MANAGER
Technical Services



Dear Watchmaker/Jeweler:

We are pleased to provide you with your copy of the Series 221 Accutron Service Manual. We have also included our Technical Letters #23 through #34, three of which are on L.E.D. watches.

The Series 221 Accutron watch has been designed so that coil assemblies can be easily removed without the need to disassemble any other components. The phasing adjustment is identical to the Series 218 Accutron model and can be accomplished with a minimum of effort. With the removal of seven screws, the watch is ready for ultrasonic cleaning and re-assembly. No effort has been spared to make this as simple a watch as possible to service.

Diagnostic charts, meter interpretations, exploded views and recommended repair procedures are provided to enable you to undertake quick and profitable servicing.

Additional information and assistance on a specific problem is available from this office. Please do not hesitate to contact us at the address below.

Cordially,

Mitch Adler

MA:dg
Enclosures

MEMO TO ALL ACCUTRON SERVICE KIT OWNERS

Subject: Accutron Test Set Conversion to Model 700

The Model 600 Test Set which you now own as part of your Accutron Service Kit was designed to test Bulova Series 214 and 218 Accutron electronic timepieces. As you may know we have now expanded the Accutron line for ladies with our Series 221 and 230.

The design changes in the 221 and 230 Accutrons are such that your present Model 600 Accutron Test Set cannot be used. However, there is a conversion available through Watchmaster Products, which will allow testing of these two models. The conversion consists of test lead replacement, meter dial change, recalibration and all tools required for the 230 Series as follows:

Movement Holder #9982	Locking Ring Wrench #9918
Regulator Key #9922	Adj. Support Block-second hand E-31 #9919
Hack Post Wrench #9924	Adj. Support Block-minute and hour hand E-32 #9921
Index and Pawl Post Wrench #9923	Power Cell Lead #9985

Because of the diversity of the changes, this conversion must be performed by Watchmaster Products. Mail your present Model 600 Test Set to Watchmaster Products, 62-10 Woodside Avenue, Woodside, New York 11377, together with your check or money order for \$32.50 and we will make the necessary modifications and return your Test Set postpaid. *When mailing your Test Set to us, please pack carefully and insure for \$130.00. Do not include the gray box or any accessories.

PLEASE COMPLETE THE FORM BELOW AND DETACH
(Please Print)

Individual's Name _____

Store Name _____

Address _____

City State Zip

Please check the following:

I have enclosed my Accutron Test Set together with my check money order for \$32.50. Please convert my Test Set to check the Accutron Series 221 and 230 timepieces. I understand my Test Set will be returned to me postpaid. The conversion will be performed within five (5) working days after receipt. This excludes any delay in transit.

Test Set Serial # _____ Do not include the gray box or any accessories.
Turn meter switch to OFF position before packing.

*We cannot bill you for this conversion.

PLEASE MAKE CHECK OR MONEY ORDER PAYABLE TO WATCHMASTER PRODUCTS

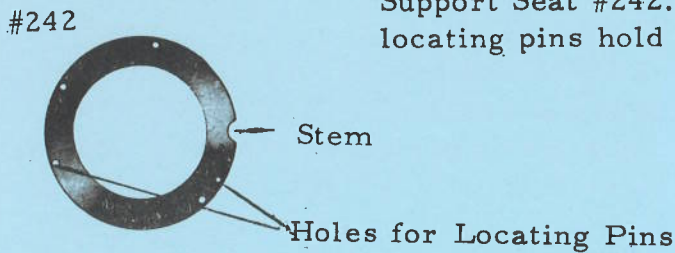
TECHNICAL LETTER

BENCH TIPS ON THE DIGITAL READ-OUT

CARAVELLE MODEL II OWU

Note: New digital part numbers

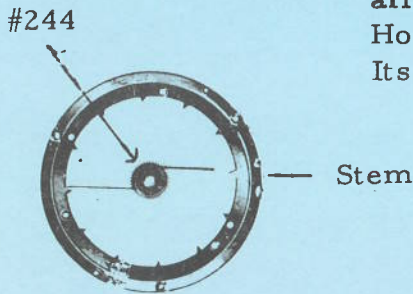
1. After fitting the Cannon Pinion, position the Hour Indicator Support Seat #242. Its cut-out aligns with the stem and two locating pins hold it in position.



2. Replace the Minute Wheel Bridge #9, the Hour Indicator Drive Wheel #244 and the Hour Indicator Drive Wheel Cover #243 and fasten them all into place with Minute Wheel Bridge Screws #44A.



3. Replace the Toothed Hour Indicator Support #240, carefully avoiding damage to the Hour Drive Wheel Spring, (see #244). As a guide in repositioning, note the two struck dots on ring #240, which are aligned with the stem; the same two locating pins used for the Hour Indicator Support Seat #242, hold the Support #240 in position. Its screws #245 fasten both the Support and its Seat.

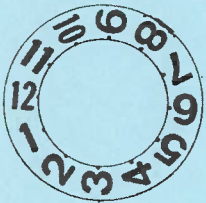


#240 Toothed Hour Indicator Support

(Please turn the page.)

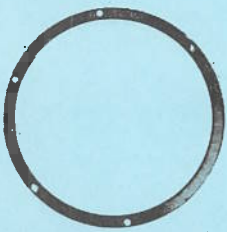
TECHNICAL INFORMATION SERVICES

4. Check the jump action of the Hour Indicator Drive Wheel #244 by turning it with the stem until its longer spring rests against a tooth of the Toothed Hour Indicator Support #240. Then continue turning and observing the Hour Indicator Drive Wheel #244. The Hour Indicator should move freely. The longer spring should be slightly flexed at contact point with a tooth, should arch more sharply as the Hour Drive Wheel turns and then spring briskly to the next tooth at let-off.



#237

5. Look at the underside of the Hour Indicator #237. Observe the V shaped recess that ends in a thin slot, which is located at the underside of the 11 o'clock on the Indicator. (At the opposite side between 3 and 5 there is a wide cut-out to accommodate the short safety spring.) Place the Indicator in position, so that the longer spring enters the thin slot located under 11 o'clock.



#241



#245

6. Position Hour Indicator Support Cover #241 and screw into position with its screws #245. Recheck the functioning of the hour jumping mechanism. Using the crown, turn the Hour Drive Wheel #244. When its spring is freed from a tooth of the Toothed Hour Indicator Support #240, it should propel the Hour Indicator to the next hour. Check that the hour line next to the numeral on the Hour Indicator is aligned with the stem.



#238

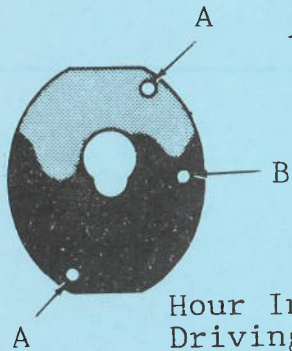
7. Pre-position the Minute Indicator #238. Align the zero mark of the Minute Indicator with the line of any hour numeral. Hold in position and press onto the cannon pinion. Recheck.



#239

8. Align zero mark of the Second Indicator #239 with the zero mark of the Minute Indicator #238 and press into place.

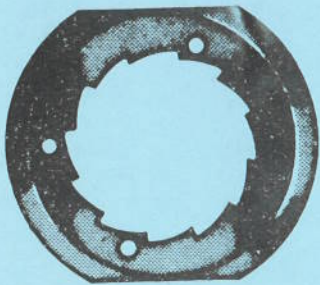
TECHNICAL LETTER



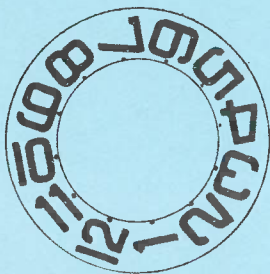
Hour Indicator
Driving Wheel
Cover #243



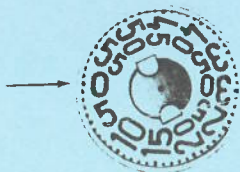
Hour Indicator
Drive Wheel #244



#240 Toothed Hour
Indicator Support



Hour Indicator #237



Minute Indicator #238

BENCH TIPS ON CARAVELLE DIGITAL MODEL 5 UCU

After fitting the cannon pinion, assemble the digital parts in the following order:

1. Form a sub-assembly of the Hour Indicator Drive Wheel Cover #243 and the Hour Indicator Drive Wheel #244. Proceed as follows:
 - 1A Establish the correct position of Cover #243 on the movement. Its two end holes (see A in illustration) are over the threaded bushings in the movement and its third hole is over the winding pinion (see B in illustration). Note that the smaller cut-out in the key-hole opening is over the cannon pinion.
 - 1B Place the Cover #243 on the bench, grasp the head of the Hour Indicator Drive Wheel #244 and drop it into the large opening of the key-hole.
 - 1C To center the Drive Wheel #244, slide it into the smaller cut-out of the key-hole.
2. Place the assembled parts, Cover #243 and Wheel #244, onto the movement.
3. Position the Toothed Hour Indicator Support #240 on the movement with its flat side down and its counter-sunk holes over the threaded bushings in the plate. Be sure that the finger, (C in illustration, Hour Indicator Drive Wheel #244) is free. If it is caught beneath a tooth of the Support #240, nudge it counter-clockwise until it is free.
4. Fasten the Support #240 in place with screws #245.
5. Observe the back of the Hour Indicator #237 and note the slot on its inner edge. Position the Indicator so that the finger (C in illustration, Hour Indicator Drive Wheel #244) enters the slot. Then check jump action by holding the Indicator down with light pressure and rotating the crown.
6. Turn the crown very slowly. At the exact instant when the Indicator jumps to the next hour, push in the crown.
7. (Before replacing the Minute Indicator, #238, please note that its zero line is aligned at the 9 o'clock position of a conventional watch. See illustration.)

Align the zero mark of the Minute Indicator with an hour line on the Hour Indicator. When it is exactly aligned, steady it and press it onto the cannon pinion. Pull the stem into the setting position again and check the synchronization of the two Indicators.

The digital parts are now completely assembled.

TECHNICAL INFORMATION SERVICES

AUGUST 1975

TECHNICAL LETTER

POWER CELL DISCONNECT SYSTEM BULOVA ACCUTRON SERIES 218 G

Important Notice:

Caliber 218, in addition to the regular series, is made with power disconnect systems. These are calibers:

- 218 F- TWO STEM POSITIONS (SEE TECHNICAL LETTER #4)
 - 218 G- THREE STEM POSITIONS (DESCRIBED IN THIS LETTER #24)
- Specifically, these calibers are marked 2181G, 2182G, etc.

I. INSTANT DETECTION OF A "DISCONNECT" CALIBER

To find out, without opening the case, whether or not a Bulova Accutron watch that is running is equipped with a power cell disconnect system, simply pull the crown out to the outermost position, (position 2 for system F, position 3 for system G), and listen carefully: if it does not hum, it is equipped with a disconnect system.

II. SETTING CHARACTERISTICS OF THE 218 G SERIES

STEM POSITION	FUNCTION
1. Normal running position:	instant date setting.
2. Intermediate position:	hand setting, day and date setting.
3. Pulled out position:	opens circuit- disconnects power, movement stops.

III. HOW THE "DISCONNECT" SETTING SYSTEM IS USED IN THE 218 G SERIES

With the stem in the hand setting position, the braking system is the same as in the series 218: pawl jewel is moved away from the index wheel by the pawl lift pin on the hack lever. However, with the stem in the third- "pulled out"- position, circuit is open and the power disconnected. This feature permits the power cell to be installed into the movement at the factory. The watch is shipped with a plastic sleeve in the shape of a tuning fork, wedged between the crown and the case. This maintains the stem in the "disconnect" position and prevents power cell drain during storage.

(Please turn page.)

TECHNICAL INFORMATION SERVICES



Circuit closed
429

Fig. 1

Stem in normal running position.



Circuit closed

Fig. 2

Stem in hand-setting position.



Circuit open

Fig. 3

Stem pulled out to third position.

IV. FUNCTIONING

- Stem in normal running position: The setting lever 205 pushes the switch spring 429 against the contact spring 430. In this way the circuit is closed (fig. 1).
- Stem in hand -setting position: The circuit is still closed (fig. 2), but the pawl lift pin moves the pawl finger away from the index wheel. The hands stand still.
- Stem pulled all the way out: When pivoting, the setting lever frees the switch spring 429, which no longer presses against the contact spring 430. The circuit is open (fig. 3) and the power disconnected.

V. WHEN REASSEMBLING

- a) Pull stem out to third position.
- b) Fasten switch assembly #429 to the pillar plate with switch screw #317.
- c) Replace the tuning fork and the cell coil and component coil assemblies, taking care that the contact spring 430 is located as shown in fig. 3. (The contact assembly 430 is soldered to the component coil assembly.)

VI. PARTS FOR 218 G ONLY - NOT INTERCHANGEABLE WITH 218 F or 218

Important: Please be sure to quote caliber reference number (engraved on the train bridge), when ordering replacement parts.

203	Setting lever spring	404	Train bridge
204	Clutch lever	429	Switch assembly
205	Setting lever	709	Pillar plate
207/8	Clutch wheel	712	Component coil assembly
317	Switch screw	XXX	Contact spring 430 (not available separately) (soldered to 712)

August 1975

TECHNICAL LETTER

**Subject: CARAVELLE CALIBER 6UA
HAIRSPRINGS AND STUDS**

Watches received with the complaint "runs fast" should be examined for:

1. Oil on the hairspring
2. Outer coil hung up on the outside edge of the stud
3. Outer coil hitting the inside edge of the stud

One or all of these conditions could be present.

In the first instance, if coils of the hairspring are not already adhering to each other, carefully push against the side of the spring until two coils come together. If they display a tendency to stick together after pressure is removed, it means there is oil on the spring. Clean the entire movement because oil on the hairspring is usually indicative of excess oil in other areas.

In the second instance, analyze the situation before releasing the coil or removing the balance cock. Determine if the hangup is due to burrs, a rough edge or excess epoxy on the hairspring stud. Scrape or stone the offending condition off, making sure that all outside edges of the stud are smooth.

In the third instance, re-center or re-circle the hairspring so that the body of the spring is moved away from the stud. Put the watch in beat by means of the movable stud holder. Regulate the watch via the separate regulator assembly.

In the 7 jewel Caravelle Model 6UA, the train wheel bushings are made of brass. The amount of oil present in a brass bushing must be closely controlled because there is a tendency for excessive oil to run out of these bushings. Once this occurs, oil spreads throughout the watch and eventually accumulates on the hairspring. Therefore, *oil these brass bushings very sparingly.*

TECHNICAL INFORMATION SERVICES

August 1975

TECHNICAL LETTER

Subject: SETTING ACCUTRON MOVEMENTS: Series 214
Series 218
Series 221
Series 230

Correct setting of the Accutron movement requires that the minute hand be rotated until it is approximately five minutes ahead of the desired time and THEN TURNED *BACKWARD* TO THE DESIRED MINUTE MARKER.

This applies to all four types of Accutron movements and is necessary to compensate for the backlash in the train and dial gearing.

For the Series 214, 218 and 221 styles, TAP THE CASE LIGHTLY at the 3 o'clock or 9 o'clock position to start the tuning fork vibrating.

For the Series 230, TAP THE CASE LIGHTLY on the 12 o'clock or 6 o'clock side to start the tuning fork vibrating.

In the event the watch does not employ a second hand, it should be placed on a timing machine pickup or next to the ear to make sure that the tuning fork hum is heard.

TECHNICAL INFORMATION SERVICES

August 1975

TECHNICAL LETTER

Subject: PROTECTIVE COATING ON NEW WATCHES

Always looking for ways of maintaining an ever higher standard of quality, and to make sure our customers receive Bulova products in the best possible condition, we are employing a protective coating of quick-drying lacquer on selected styles of Accutron, Bulova and Caravelle cases.

This coating of the complete watch case (back and bezel) ensures the utmost protection possible for our finished cases. The coating will either be blue or red in color. The possibility of scratches in the course of manufacture, quality control checks, display and sales is, therefore, eliminated.

Masking tape or cellophane tape, pressed over the protective film, will take all the lacquer off with ease. In rare instances, it may be necessary to give the tape several tugs to start the lacquer peeling off.

TECHNICAL INFORMATION SERVICES

October 1975

Revision 2

TECHNICAL LETTER

Subject: LIGHT EMITTING DIODE WATCHES BATTERY LIFE

With the introduction of battery driven watches, consumers were informed that batteries were replaced on an annual basis. However, this does not apply to L. E. D. watches.

Some owners of L. E. D. watches are greatly surprised by the number of battery changes that are required during the year. This Technical Letter attempts to give you an understanding of the reasons behind the need for frequent battery replacements.

The life of a set of batteries is dependent on five variables:

1. Frequency of display (number of displays per day)
2. Duration of display (length of time the display is illuminated)
3. Number of segments lit (time at which display is illuminated)
4. Function(s) demanded (time, seconds, date—or any combination)
5. Setting time (power consumed while setting to correct time after the batteries have been replaced)

To better understand these principles, consider the flashlight. The life of flashlight batteries depends on the amount of time the bulb is illuminated. While one user will have the same set of batteries for six months to a year, another will exhaust them in two to four months. The more the flashlight is used, the shorter the life of the batteries.

But, unlike the flashlight, which can hold two large batteries, the L. E. D. watch case, with its limited space, can only hold two small-sized batteries. Because the size of batteries must, of necessity, be limited, there is also a limit to the amount of power available.

Experience has shown that the same watch will require frequent battery changes for one customer and fewer for another. Because using habits vary greatly between individuals, it is not possible to state a specific time between battery replacement.

Like other quality watch manufacturers, Bulova has incorporated only the finest components available in the electronics market. The batteries used undergo extensive in-house testing to assure their peak efficiency and freshness.

Experience has shown that by the time the first set of batteries has been changed, the novelty of showing off the new timepiece by the wearer has been decreased. Therefore, the next set of batteries may last two or three times longer. It should also be noted, though, that these same wearers occasionally need to replace the batteries after only two months because they demonstrated the watch to many friends during a short period. Obviously, the more times the display is activated, the sooner the batteries require replacement. Because of the fact that this is a highly unusual product, most consumers are willing to accept the extra cost of battery replacement.

The technology of the light emitting diode watch is a phenomenal engineering achievement. The unusual drain of power on such a piece of equipment has initiated the fact that time is displayed on demand only, rather than a perpetual time display. These are the facts. They apply to all L. E. D. watches—no matter who manufactures them.

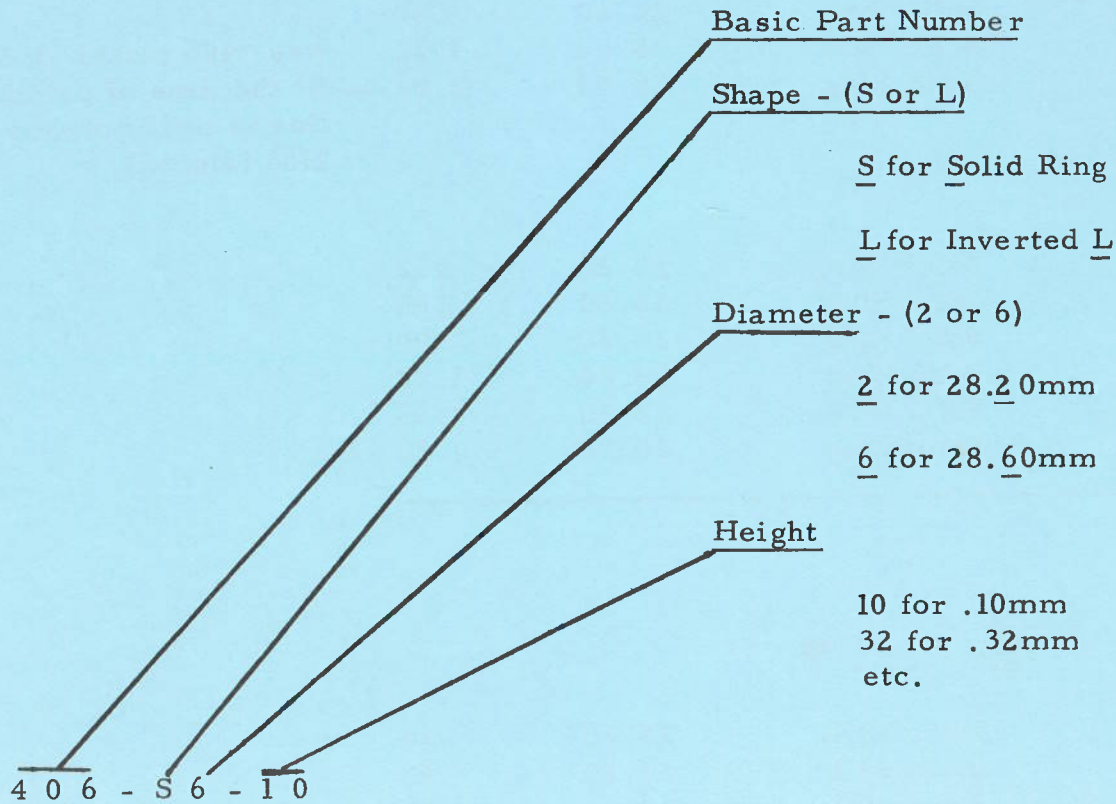
TECHNICAL INFORMATION SERVICES

TECHNICAL LETTER

218 SERIES DIAL SUPPORT # 406

In some instances, dial supports #406, are used in models 2180-2181-2182 * 2185 and 2186. Whether they are used - and which specific dial support is required - is determined by both case and dial - in combination. If replacements are needed, refer to the DIAL SUPPORT CHART on back of page, match the sample dial support with shape, diameter and height shown on the CHART. Then please order by Part Number, which appears in the first column.

An explanation of how the part number is derived follows:

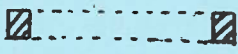


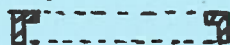
*Dial Supports are not used in model 2183.

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TECHNICAL INFORMATION SERVICES

Chart for 218 Series Dial Supports #406
 (All measurements are in millimeters)

Part#	Shape (Cross Section) 	Diameter	Height	Comments
406-S6-10	Solid Ring	28.60	.10	was *406 brass -.10mm
406-S6-32	Solid Ring	28.60	.32	
406-S6-40	Solid Ring	28.60	.40	was *406 nickel-.40mm
406-S6-49	Solid Ring	28.60	.49	was *406 gold -.49mm
406-S6-54	Solid Ring	28.60	.54	
406-S6-86	Solid Ring	28.60	.86	
406-S6-90	Solid Ring	28.60	.90	
406-S6-122	Solid Ring	28.60	1.22	was *406 nickel -1.22mm
406-S6-227	Solid Ring	28.60	2.27	— At the time of printing, this is used only for 2186 (digital).
<hr/>				
406-S2-32	Solid Ring	28.20	.32	
406-S2-86	Solid Ring	28.20	.86	
406-S2-90	Solid Ring	28.20	.90	
406-S2-122	Solid Ring	28.20	1.22	
406-S2-145	Solid Ring	28.20	1.45	
406-S2-183	Solid Ring	28.20	1.83	

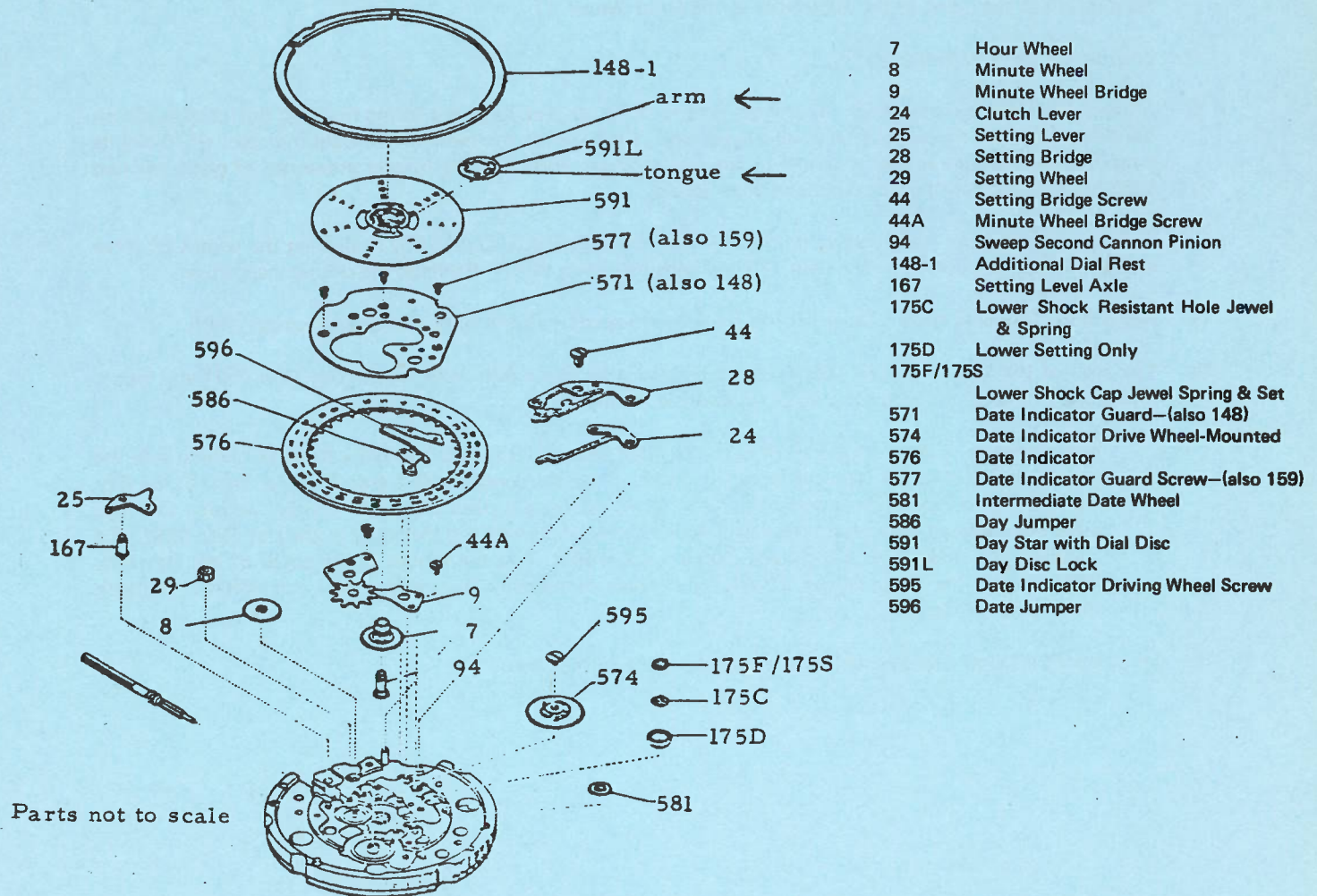


406-L2-40	Inverted L	28.20	.40	
406-L2-50	Inverted L	28.20	.50	
406-L2-58	Inverted L	28.20	.58	
406-L2-90	Inverted L	28.20	.90	
406-L2-104	Inverted L	28.20	1.04	
406-L2-140	Inverted L	28.20	1.40	

* Former Description

TECHNICAL LETTER

BENCH TIPS ON CARAVELLE MODEL 11 OTCB



ASSEMBLING CALENDAR MECHANISM

1. After positioning the cannon pinion, replace the Date Indicator Drive Wheel #574 and its screw #595.
2. Replace the double toothed Intermediate Date Wheel #581, with its smaller wheel facing down. It rides on a post in the plate between the Hour Wheel #7 and the Date Indicator Drive Wheel #574.
3. Replace the Hour Wheel #7. Its teeth should mesh with the Minute Wheel #8 and the Intermediate Date Wheel #581.

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TECHNICAL INFORMATION SERVICES

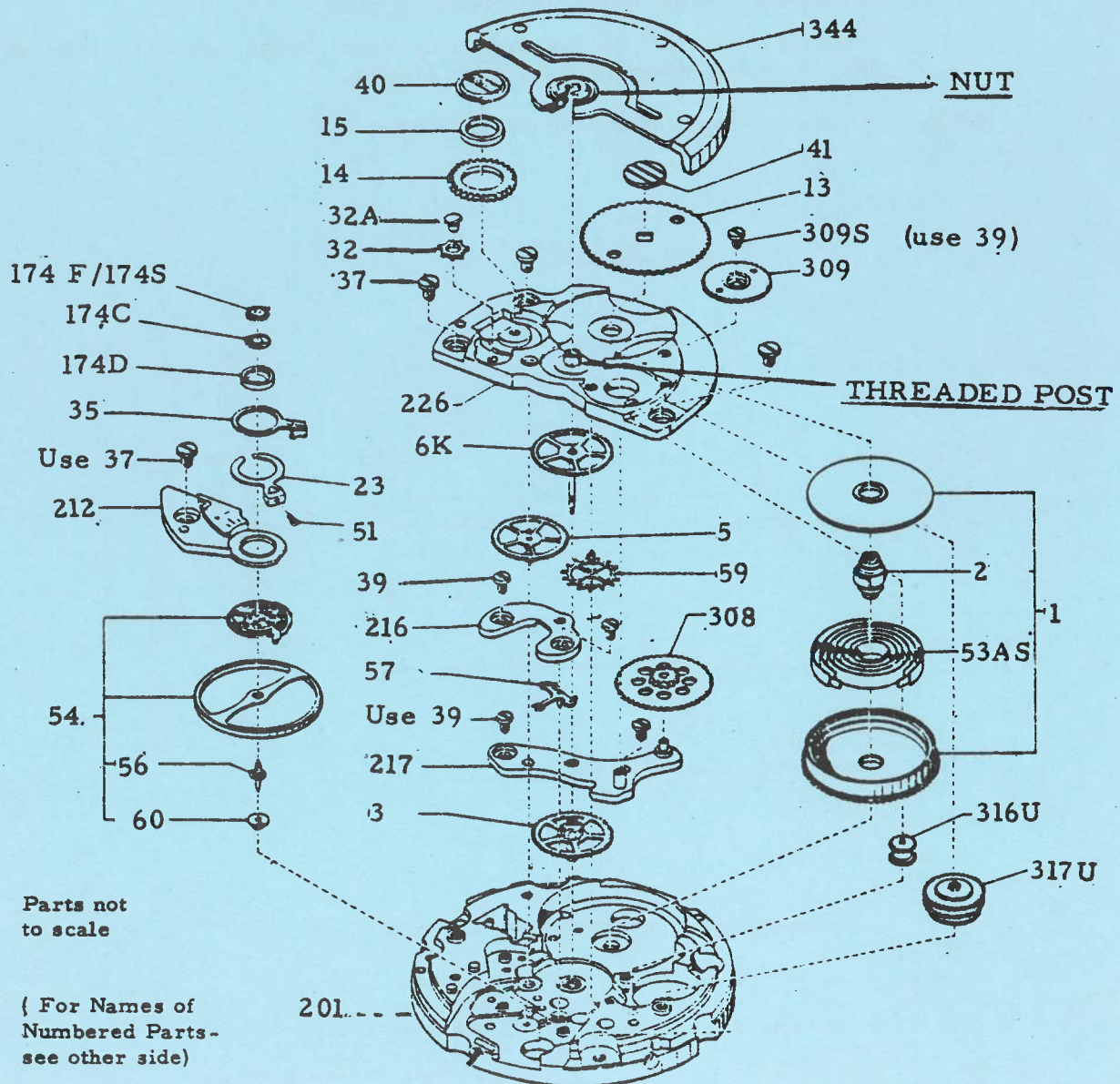
4. To replace the Minute Wheel Bridge #9, position the movement and the Bridge as shown in the illustration. The hole in Bridge #9, at its lower left corner, fits onto the locating pin near the Setting Wheel #29 and the hole at the right, upper corner fits onto a pin near the Intermediate Date Wheel #581.
5. Fasten the Bridge #9, with its Minute Wheel Bridge Screws #44A.
6. With the stem, check the setting mechanism.
7. Replace the Day Jumper #586, with its step facing up. The hole in the lower level, (third portion) fits onto a locating pin in the recess in the plate close to the Hour Wheel #7.
8. Position the Date Indicator #576.
9. Replace the Date Jumper #596. The larger hole in the wide section of the spring fits onto the locating pin on the plate. Its "V" shaped end, with its smaller hole, fits between the teeth of the Date Indicator #576 and its long, thin arm presses against the beak of the Day Jumper #586. If the Jumper moves out of place, use two tweezers to reposition the Day Jumper and its spring.
10. With its counter-sunk holes facing up, replace the Date Indicator Guard #571, aligning the widest of three crescent-shaped cut-outs with the stem. Fasten with its screws #577. Recheck the setting mechanism.
11. Replace the Day Disc #591. Check that its teeth are in mesh with the beak of the Day Jumper #586.
12. The arms of the Day Disc Lock #591L (see illustration) fit into a thin collar on the Day Disc #591 and lock it into place. To fasten the Day Disc #591, proceed as follows:

With tweezers, grasp the Lock #591L, by its small hole, at its tongue and place its large opening over the cannon pinion. Drop it onto the Day Disc #591. Align the tongue with a groove in the collar of the Day Disc #591 and hold lock in position. Then, at its opposite slotted end, insert another pointed tool into a cut-out. Spread and release—one at a time—fitting the arms into the collar in the Day Disc #591. To complete the lock, push the tongue of the Lock #591L into the groove in the collar of the Day Disc #591 toward the Hour Wheel. Check for flatness of the Day Disc, #591 and Lock #591L. Recheck the setting mechanism.

13. Using the Additional Dial Rest, #148-1, complete the dialing process.

TECHNICAL LETTER

BENCH TIPS ON CARAVELLE MODEL 11 OTAC



DESCRIPTION OF AUTOMATIC SYSTEM

Incorporated into the design of the 11 OTAC automatic mechanism is an unusual locking arrangement for the oscillating weight. Some features are:

1. The weight revolves around the ball bearing unit. In the center of the unit is a NUT (not separable) with two flat edges for grippage. (see NUT—in center of 344 illustration)
2. The NUT of the oscillating weight screws onto a THREADED POST, which is an integral part of the combined bridge. (see THREADED POST on bridge 226 in illustration)

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TECHNICAL INFORMATION SERVICES

ASSEMBLY AND DISASSEMBLY OF OSCILLATING WEIGHT #344

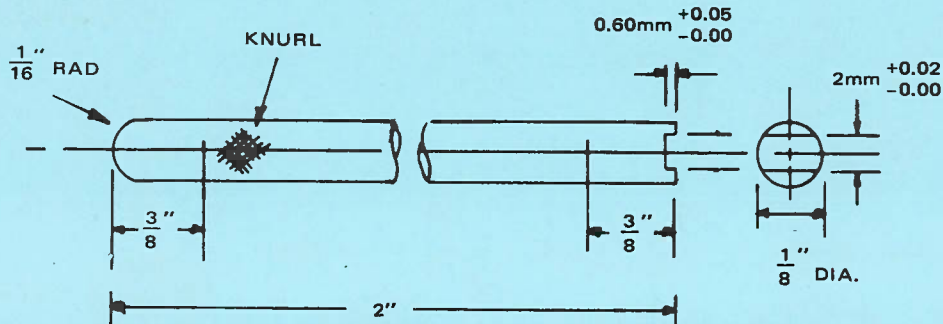
1. Use a sturdy, flat tweezer—such as a #8—or a small flat nosed pliers with smooth jaws. To disassemble, grip the flat edges of the nut with the tool and turn the nut COUNTER-CLOCKWISE. *The nut turns independently of the weight.*

Hint A In assembling and disassembling the oscillating weight, first determine the direction of the turn—clockwise to tighten, counter-clockwise to loosen.

Then grip the nut with the tool, without turning it. Instead, turn the movement holder (with its mounted movement) in the desired direction.

Hint B A special tool can be made from the sketch shown below.

NUT WRENCH



MAT: Drill Rod
Harden & Temper Black Oxide Finish

11 OTAC PARTS ILLUSTRATED ON THE FRONT PAGE

- | | |
|---------------------------------|--|
| 1. Barrel & Cover | 56. Balance Staff |
| 2. Barrel Arbor | 57. Pallet s/s Pivot |
| 3. S.S. Center Wheel | 59. Escape Wheel s/s Pivot |
| 5. Third Wheel | 60. Roller |
| 6K. S.S. Wheel & Pinion | 174C. Upper Shock Hole Jewel & Spring |
| 13. Ratchet Wheel | 174D. Upper Setting Only |
| 14. Crown Wheel | 174F. Upper Shock Cap Jewel Spring & Set |
| 15. Crown Wheel Ring | 174S. |
| 23. Stud Holder | 201. Lower Plate |
| 32. Click | 212. Balance Bridge—Flat |
| 32A. Ratchet Click Pin | 216. Pallet Bridge |
| 35. Regulator—Flat | 217. Center Wheel Bridge |
| 37. Barrel & Train Bridge Screw | 226. Combined Bridge |
| 39. Pallet Bridge Screw | 308. Reduction Gear |
| 40. Crown Wheel Screw | 309. Ratchet Wheel Driving Gear |
| 41. Ratchet Wheel Screw | 309S. Screw for Ratchet Wheel Driving Gear |
| 51. Hairspring Stud Screw | 316U. Additional Pawl Winding Wheel |
| 53AS. Mainspring w/Bridle Alloy | 317U. Pawl Winding Wheel Complete |
| 54. Balance Complete | 344. Oscillating Weight |

December 1975

Revision 1

TECHNICAL LETTER

**Subject: LIGHT EMITTING DIODE WATCHES
DAYLIGHT USE**

The design of the Bulova Accuquartz Digital incorporates a feature which keeps the display screen illuminated for approximately two seconds after the command button is released. The wearer can take advantage of this feature in bright sunlight by using this two-second display period to shade the display screen.

Experience has shown that many owners use their bodies as shields between the display screen and the direct rays of the sun. Additionally, cupping the hand over the display screen blocks out the surrounding light and improves readability.

Although there is a limit to the legibility of any L. E. D. watch display in bright sunshine, the Bulova Accuquartz Digital, with its two-second illumination period, allows sufficient time for the wearer to shade the screen for optimum viewing.

TECHNICAL INFORMATION SERVICES

APRIL 1976

TECHNICAL LETTER

SUBJECT: Testing L.E.D. Power Cells With The ACCUTRON Power Cell Tester

When L.E.D. batteries begin to fail, any number of symptoms may occur:

- 1) Display may fail to light
- 2) Display may become dim
- 3) One digit may not light
- 4) Watch may fail to display the correct function when the Command Button is pressed

Remove both Power Cells and check with the ACCUTRON Power Cell Tester.

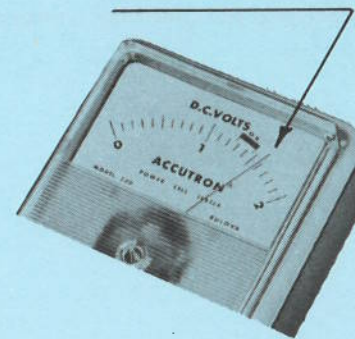
Silver Oxide Power Cells (L.E.D. Cells) **MUST** have a minimum of 1.5 volts when checked.

If **EITHER** of the two old cells check below 1.5 volts, replace **BOTH** cells. (See other side for explanation of why **BOTH** Power Cells must be replaced.)



Disregard "OK" area when checking L.E.D. cells. This area is for checking ACCUTRON Power Cells rated at 1.35 volts.

Voltage **MUST** be above 1.5 volts for L.E.D. Power Cells.



REMEMBER — When in doubt, exchange both Power Cells with fresh cells and find out if this procedure remedies the problem. If so, then the batteries which were in the watch were bad.

(Please turn page)

TECHNICAL INFORMATION SERVICES

APRIL 1976

TECHNICAL LETTER

**SUBJECT: L.E.D. Watches
Power Cell Replacement**

There are two main elements of the light emitting diode module that draw power from the batteries:

- 1) The timekeeping element (quartz crystal and its accompanying divider circuit)
- 2) Display circuit and display element

Like other electronic watches, the timekeeping elements are designed to draw a minimal amount of current from the batteries. If an L.E.D. watch was not displayed, the watch would continue to keep time for well over one year. It is, however, the second part of the circuit which we must concern ourselves with.

The display circuits vary, but even the most efficient L.E.D. display currently on the market draws over 3000 times more power than the timekeeping element! Each time the Command Button is depressed, a surge of power is demanded from the batteries.

The Power Cells may be able to deliver the necessary current to maintain the quartz crystal circuit (timekeeping portion) but may not be able to deliver the **ADDITIONAL SURGE** of current required to activate the diodes on the display screen. When this occurs, the display will become dim or fail to light and **BOTH POWER CELLS MUST ALWAYS BE REPLACED.**

The two Power Cells are in the same circuit and in series connection. Both are subject to essentially the same power drain. Consequently, when one cell tests "bad" the **OTHER** cannot be far behind. So, if both cells are not changed at the same time, a second failure of the display can be expected within a matter of days.

TECHNICAL INFORMATION SERVICES

TECHNICAL LETTER

LIST OF VIBRATIONS & ANGLES OF LIFT

BULOVA

MODEL	ANGLE OF LIFT (DEGREES)	BEATS PER HOUR
3AK - 3AE	51	21,600
5AN	48	21,600
5BA - 5BC - 5BD	48	21,600
6CD - 6CN	48	21,600
6CF - 6CL - 6CT	50	18,000
6CMA - 6CMAC	50	18,000
7BCAC	51	21,600
7BEAC - 7BEACD	53	18,000
7BKACD	52	21,600
7BLACD	52	28,800
7BPC - 7BPP	51	21,600
7EDA - 7EDAD	50	21,600
7EFAD - 7EFACD	48	19,800
8EA	49	21,600
10 CK	52	21,600
11AERC	53	18,000
11AL - 11ALACD - 11ALC	50	18,000
11AN - 11ANAC	46	21,600
11ANACB - 11ANACD	46	21,600
11ANC - 11ANCD	46	21,600
11AO - 11AOAC	46	21,600
11AOACB - 11AOACD	46	21,600
11AOCD	46	21,600
11ATRCD	53	18,000
11AURCD	52	21,600
11BKACB	54	21,600
11BL - 11BLACD - 11BLC	50	18,000
11BSACB	52	21,600
11COAUD	52	21,600
12EBA-12EBAC-12EBACD	48	19,800
12ECA-12ECAC-12ECACD	48	19,800
14EB - 14EBD	48	18,000
14EC	48	18,000
14EFAD	50	21,600
16AB	44	18,000
16AC	44	18,000

TECHNICAL INFORMATION SERVICES (Please turn over)

LIST OF VIBRATIONS & ANGLES OF LIFT

CARAVELLE

MODEL	ANGLE OF LIFT (DEGREES)	BEATS PER HOUR
5AW	51	18,000
5BW	48	21,600
5 OE	52	21,600
5 OF	52	18,000
5 OX - 5 OXX	52	21,600
5UCU	52	21,600
6 OB	52	21,600
6 OF	54	18,000
6RJ	50	18,000
6RK	50	18,000
6RO	50	18,000
6RP	50	18,000
6RR	50	18,000
6UA	52	21,600
6UDC	N/A	28,800
7 OBACD	51	21,600
7 OHAC - 7 OHACD	53	21,600
7 OT	N/A	21,600
10 OAD	52	21,600
10 OCD	52	18,000
10 OL	52	21,600
11DO - 11DOD	52	18,000
11DP - 11DPD	52	18,000
11 ODC	50	18,000
11 OKAC	54	21,600

MODEL	ANGLE OF LIFT (DEGREES)	BEATS PER HOUR
11 OKACB - 11 OKACD	54	21,600
11 OPAC - 11 OPACD	54	18,000
11 ORAC - 11 ORACD	57	18,000
11 OTAC	51	21,600
11 OTCB	51	21,600
11 OWACD	52	21,600
11 OWU	52	21,600
11 OXAC	57	18,000
11 OXACB - 11 OXACD	57	18,000
11 OZAC	54	18,000
11 OZACB - 11 OZACD	54	18,000
11UAC - 11UACD	52	21,600
11UBCB	52	21,600
11UEC	52	18,000
11UKACB - 11UKACD	52	21,600
11ULAC	52	21,600
11ULACB - 11ULACD	52	21,600
11UOACB - 11UOACD	52	21,600
11UOACP	52	21,600
11UPAC	52	18,000
11UTC - 11UTCD	52	21,600
12 OTC	50	18,000
12 OUC - 12 OUCD	50	21,600
12UECD	N/A	28,800
13UKCD	N/A	28,800
16 OA - 16 OC	44	18,000