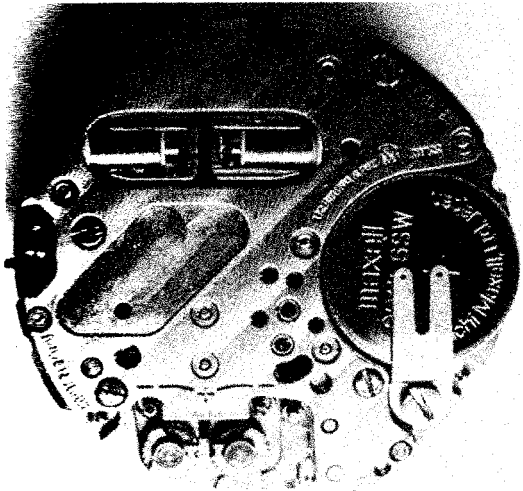


ESA 9162
REPAIR MANUAL

ELECTRONIC

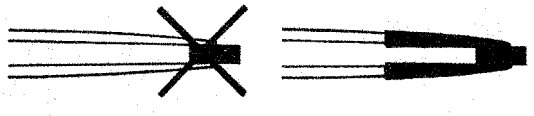
OMEGA

Folder 1-1250

Replacement of the power cell

Important warning!

- **Do not uncase the movement. This would disturb the accurate adjustment of the indexing mechanism. Only persons possessing the necessary qualifications and equipment may carry out this operation.**
- **The watch should in no case be demagnetized.**
- **Handling of the new power cell should only be effected by means of tweezers with insulated tips.** (Fig. 1.1).



1.1

Equipment

Insulated tweezers

Replacement of the power cell

1.1 Remove case-back.

1.2 Unscrew and remove the power cell brace No. 1250.9028 (Fig. 2.1).

1.3 Remove defective power cell by turning the watch over.

1.4 Check condition and cleanliness of the power cell braces. Clean, if necessary.
Should the gilding on the contact points of the cell braces be corroded:
- replace in the case of upper cell brace (positive pole) brace No. 1250.9028.
- in the case of lower cell brace (negative pole) return the watch to the general agent.

If the power cell has leaked inside its seating return the watch to the general agent.

1.5 Lodge the new power cell No. 9900 positive pole (+) uppermost (Fig. 3.1). Check condition of power cell. Only cells in perfect condition are to be utilized.

1.6 Replace and screw on upper cell brace.

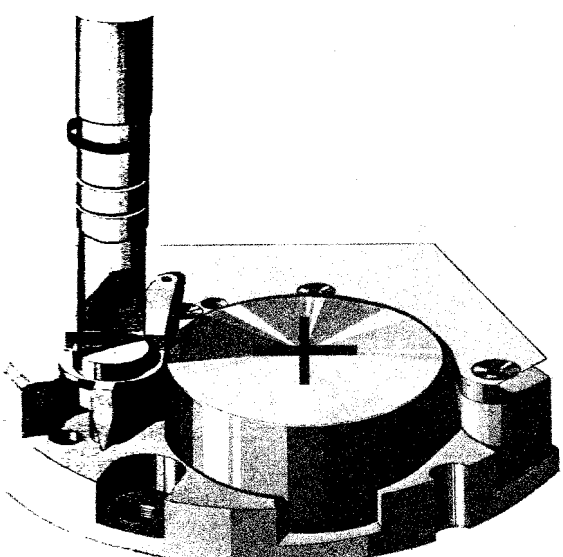
1.7 Tighten case-back.

COMPONENTS:

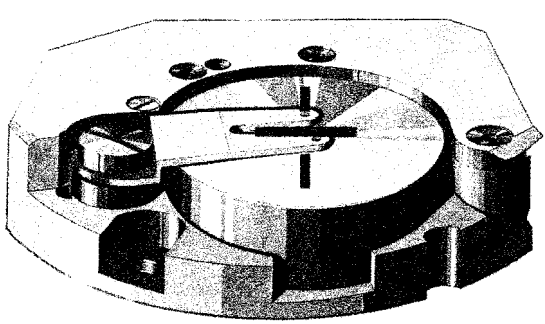
No. 1250.9028 power cell brace with screw mounted

No. 9900 power cell, tension 1.35 V.

2.1



3.1



ELECTRONIC

OMEGA

Folder 2-1250

Adjustment of the rate

Important warning!

- Do not uncase the movement. This would disturb the accurate adjustment of the indexing mechanism. Only persons possessing the necessary qualifications and equipment may carry out this operation.
- The watch should in no case be demagnetized.

Equipment

Key for frequency corrector.

Omega-adapter for normal timing machines, or timing machine with circuit for 300 Hz, or Deltatest.

Adjustment of the rate

Remarks

- An adjustment can only be effected if the daily rate is inferior to the regulating possibilities offered by the frequency correctors.
  If the correctors are centred (Fig. 1.2), the limit for a possible adjustment is ±8 seconds in 24 hours. If the daily rate exceeds this possibility, the watch should be returned to the general agent.

- The tightening of the case-back will cause the watch to lose 1 to 2 seconds in 24 hours.
  A frequency correction might produce a slight temporary modification of the rate. This effect, however, disappears after a few hours.

2.1 Unscrew the case-back.

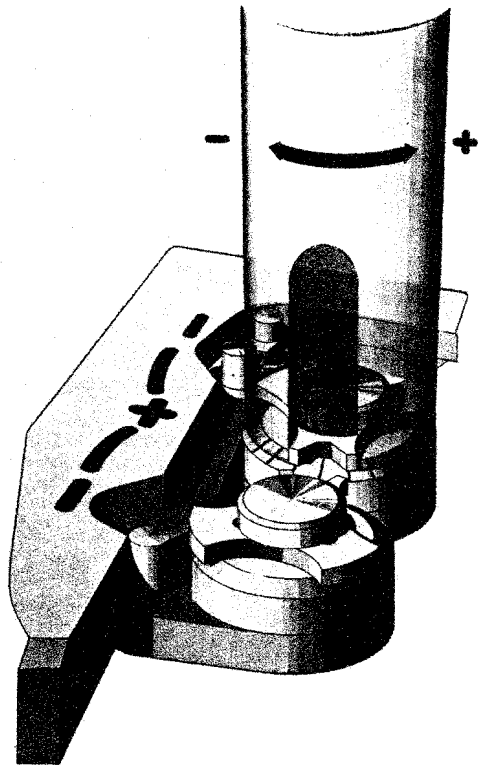
2.2 If an adjustment of the daily rate is possible, a frequency correction can be made by means of the special key created for that purpose (Fig. 1.2). Care should be taken not to deform the resonator during this operation.

By turning the frequency correctors towards the resonator, the watch will be losing. A gaining rate is obtained by turning the frequency correctors away from the resonator (Fig. 1.2). Each division represents one second.

An adjustment can be made independently on one or the other corrector, or on both at the same time, avoiding as much as possible too great a dissymmetry.

2.3 Close the case, tighten the back.

1.2



ELECTRONIC

OMEGA

Folder 3-1250

Standard exchange of the movement or the modules

Important warning !

- Before uncasing the movement, remove the oscillator module.
- Never case up the complete movement; this operation is effected without the oscillator module being in position.
- The wheel train should in no case be turned manually, either in one direction or the other.
- For all handling operations it is advisable to use tweezers with insulated tips.

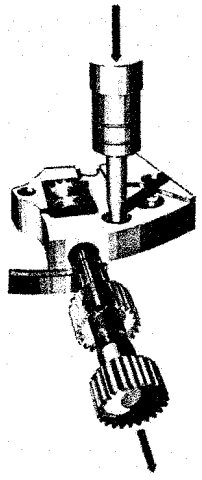
Equipment

Movement holder
Power cell substitute
Key for frequency correctors
Control apparatus ALITEST
Measuring apparatus DELTATEST
Microscope

Standard exchange of the movement or the modules

3.1 After removal of the case-back and power cell, one is obliged to remove the oscillator module No. 1250.9029 by unscrewing its four screws No. 2652 before uncasing the movement. (In order to avoid serious damage to the indexing mechanism, the hands should in no case be moved before this operation).

3.2 Remove the hand-setting stem No. 1250.9006 by pressing the setting lever (Fig. 1.3).



1.3

3.3 Remove the three screws No. 2646 and the casing clamps.

3.4 Extract the movement from the case.

3.5 Replace the hand setting stem by pushing it in completely so that the stud of the setting lever is caught in the groove of the stem.

3.6 After having removed the hands, the dial and the three dial rests, reassemble the two modules of the defective movement.

3.7 On the new movement, separate the two modules by unscrewing the four screws.

3.8 Assemble on the timing module the three dial rests, the dial and the hands.

3.9 Remove the hand setting stem by pressing the setting lever.

3.10 Place the timing module in the case.

3.11 Replace the hand setting stem, lubricate the packing of the crown.

3.12 Place in position the three clamps and the casing clamp screws.

3.13 Place in position, and fix by means of its four screws, the oscillator module.

3.14 Check the indexing mechanism.

It is simply necessary to power-feed the watch on variable tension, using the substitute cell (see application of ALITEST).

- first of all, check that the rotation of the wheel train is normal for the low tension fixed at 1,05 V. This is done by operating the adjusting-screw of the retaining click corrector-plate in either one direction or the other until the wheel train turns continuously.
- the rotation of the wheel train should then be checked with the higher tension fixed at 1,65 V.
- if the wheel train turns continuously with the tensions of 1,05 V, 1,65 V, 1,35 V, the adjustment of the indexing mechanism is completed.

3.15 Measure the current (see application of ALITEST). Consumption must be lower than 9 µA.

3.16 Fit the power cell (see Folder 1–1250 and application of ALITEST).

3.17 Check the instant rate and carry out rate adjustment (see Folder 2–1250 and application of DELTATEST).

3.18 Place washer in position and close the case.

3.19 Check the instant rate and then after 24 hours.

Note:
In order to effect the standard exchange of one or the other module, the following procedure should be adopted:

Exchange of the oscillator module:
follow operations in the order
3.1
3.13 to 3.19

Exchange of the timing module:
follow operations as for standard exchange of the movement.

Components:

Complete movement	1250.9005
Timing module	1250.9004
Oscillator module	1250.9029
Hand setting stem	1250.9006
Clutch wheel	1250.9007
Screw for oscillator module	2652
Screw for casing clamp	2646

ELECTRONIC

OMEGA

Folder 4-1250

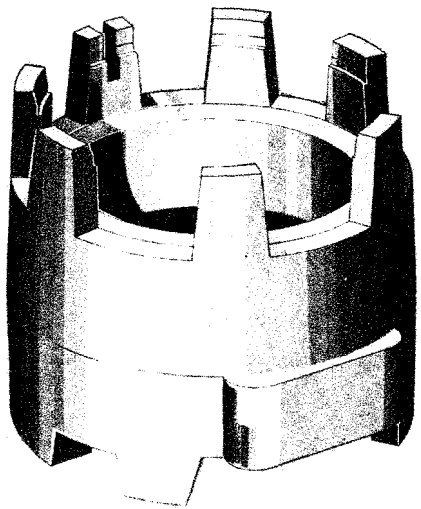
Disassembling, Cleaning, Reassembling and Lubricating of the Movement. Diagnostic

Important — To be observed strictly!

- The watch should in no case be demagnetized.
- Never handle the index wheel with tweezers other than by its pinion.
- The cleaning of the index wheel, resonator and adjuster plate for retaining click must take place when mounted on the upper plate.
- The power cell MUST NOT be handled with metal tweezers.
- The cleanliness of the resonator magnets MUST BE CHECKED very thoroughly.
- DO NOT clean the T unit, RC unit, date indicator and power cell in the usual baths.
- BEFORE uncasing the movement, remove the oscillator module.
- NEVER case-up the complete movement; this operation takes place without the oscillator module being in position.
- The wheel train must IN NO CASE be turned manually, either in one direction or the other.
- For all handling operations, the use of non magnetic tweezers is recommended.

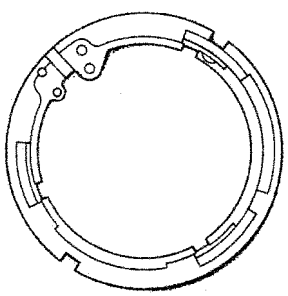
Disassembling, Cleaning, Reassembling and Lubricating of the Movement. Diagnostic

Equipment



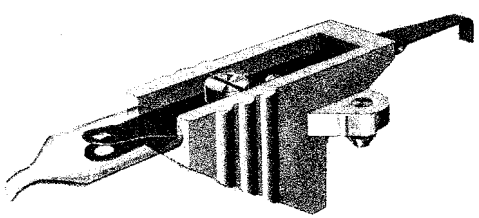
1.4

- **Movement holder**
  The above is construed in such a manner as to allow the oscillator module to be placed on one side and, on the other side, the movement in both positions (fig. 1.4).



2.4

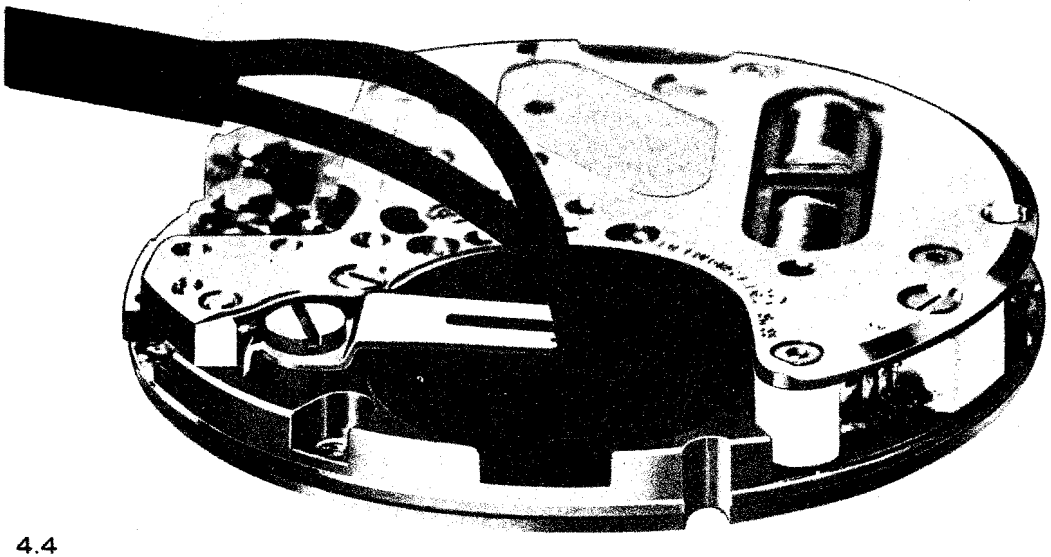
- **Fixing ring for oscillator module**
  This has one purpose only – that of ensuring easier adjustment of the clicks (fig. 2.4).



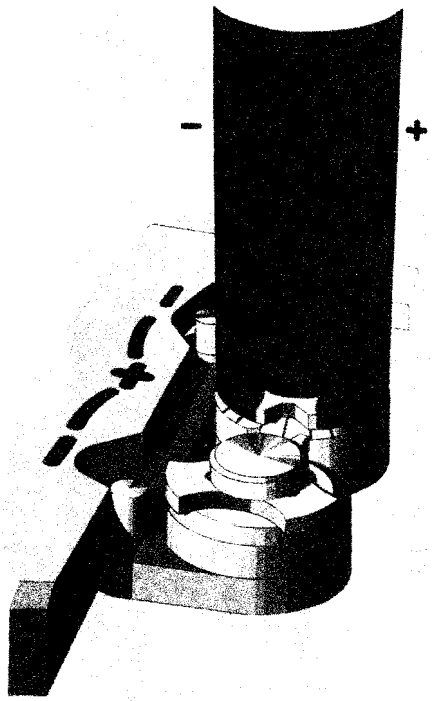
3.4

- **Feeding clip for movement holder**
  The feeding clip is only used for the oscillator module placed on the movement holder. The plug is connected with the ALITEST, whilst the other end is attached to the movement holder (fig. 3.4).

- **Feeding by substitute cell**
  This system allows feeding of the movement placed on the movement holder (fig. 4.4) or cased-up, the plug being connected with the ALITEST.



4.4



5.4

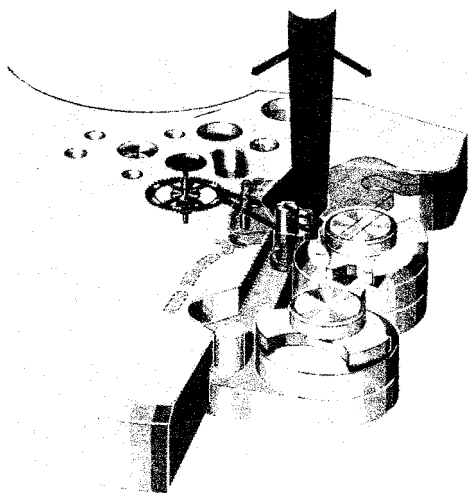
- **Key for adjusting the frequency**
  The above is used for adjusting the rate of the watch by moving the frequency correctors situated at the tip of the resonator (fig. 5.4).

- **Tool for adjusting the indexing mechanism**
  This tool offers two possibilities: either to adjust the passage between clicks and index gauge (fig. 6.4), or to correct the adjustment of the indexing mechanism, movement cased-up, by operating the screw for corrector plate (fig. 7.4).

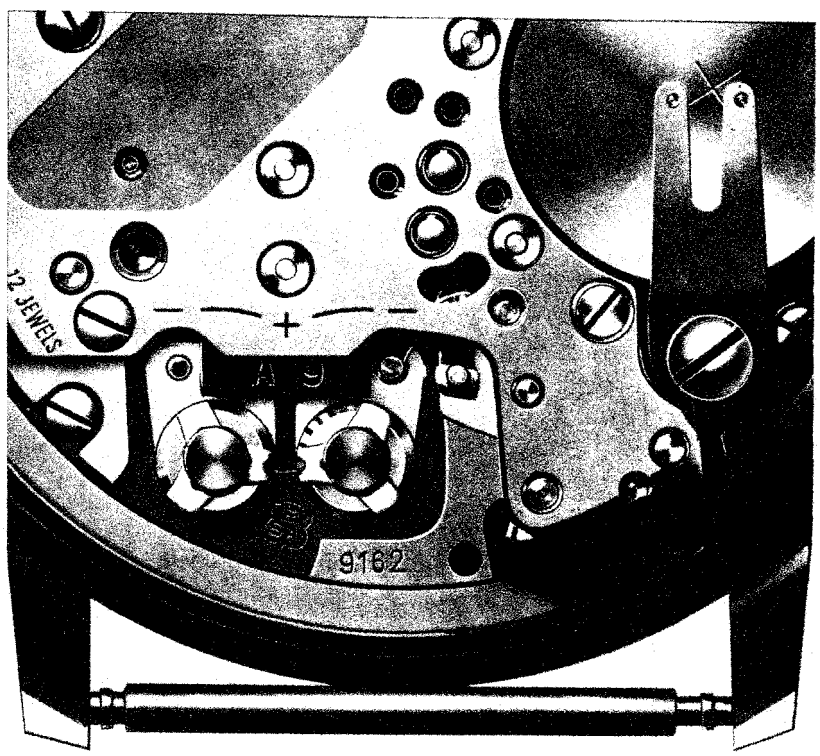
- **ALITEST control apparatus**
  This allows for the provision of a fixed or variable power supply, as well as all necessary tests for diagnostic purposes (see folder 6-1250, application of ALITEST).

- **DELTATEST measuring apparatus**
  The above apparatus enables the instant rate of the watch to be accurately determined (see folder 5-1250, application of DELTATEST).

- **Microscope**
  This is used when adjusting the clicks and checking the indexing mechanism.



6.4



7.4

OPERATIONS

Disassembling

4.1 Open the case.

4.2 Remove the power cell brace No. 1250.9028 by unscrewing its screw, and extract the power cell No. 9900.

4.3 Remove the oscillator module No. 1250.9029 by unscrewing its four screws No. 2652.

4.4 Remove the hand setting stem No. 1250.9006 by pressing the setting lever, and extract the clutch wheel No. 1250.9007.

4.5 Uncase the timing module No. 1250.9004 by removing the three casing clamp screws No. 2646 and the casing clamps.

4.6 Fix the timing module on the movement holder.

4.7 Remove the hands, loosen with a screwdriver the two locking bolts for dial (fig. 8.4), extract the dial and the hour wheel No. 1250.9014, remove the three dial rests.

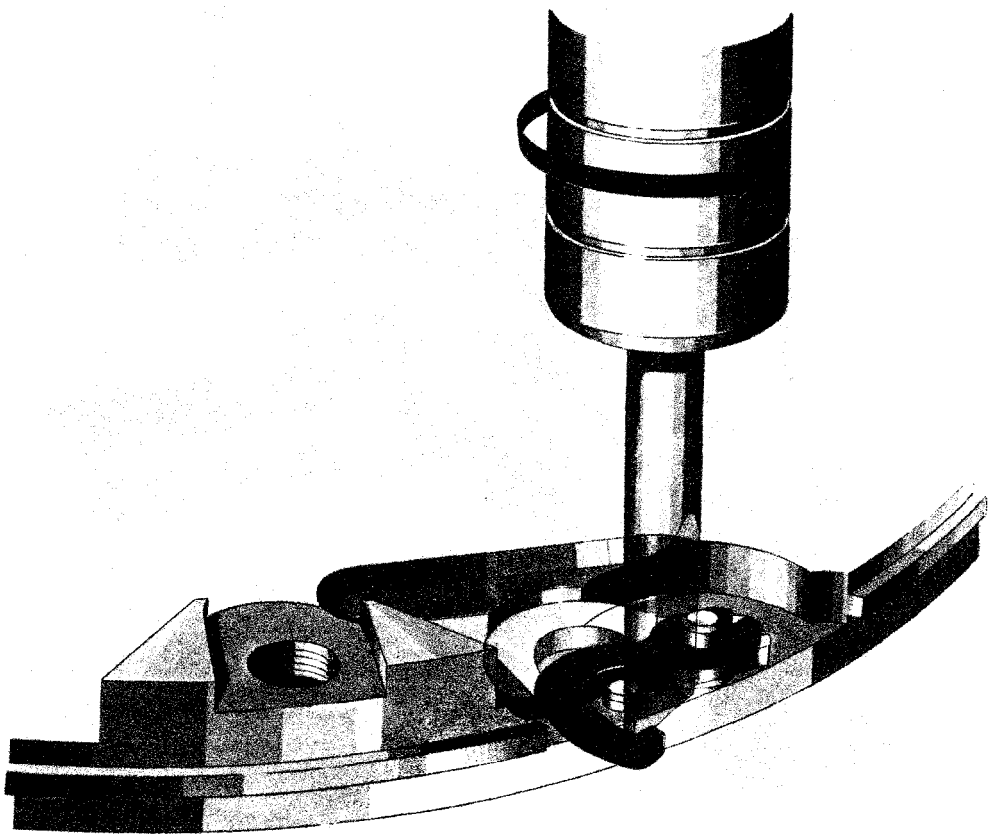
4.8 Remove the date indicator guard No. 1250.9022 by unscrewing its three screws No. 2647, and extract the date jumper No. 1250.9021, the date indicator No. 1250.9025 or 9026, the date connecting wheel No. 1250.9023 and the date indicator driving wheel No. 1250.9024.

4.9 Remove the minute wheel No. 1250.9016 and the center wheel with pinion No. 1250.9013.

4.10 Remove the setting lever spring No. 1250.9009 by unscrewing its two screws No. 2647, and extract the yoke spring No. 1250.9011, the yoke No. 1250.9010 and the setting lever No. 1250.9008.

4.11 Turn over the timing module and once again fix it on the movement holder.

8.4



4.12 Loosen the friction spring for center second wheel No. 1250.9017 by making it turn 1/8th revolution clockwise (fig. 9.4).

4.13 Remove the wheel train bridge No. 1250.9002 by unscrewing its three screws No. 2669, and loosen the center second wheel No. 1250.9019 and the friction wheel No. 1250.9015.

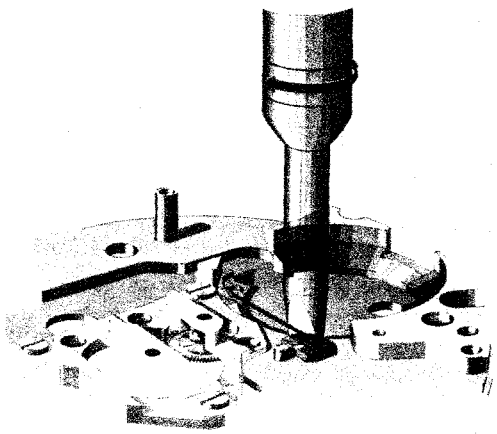
4.14 Remove the insulator blade for contact bridle No. 1250.9027.

4.15 Remove the lower plate No. 1250.9000 from the movement holder.

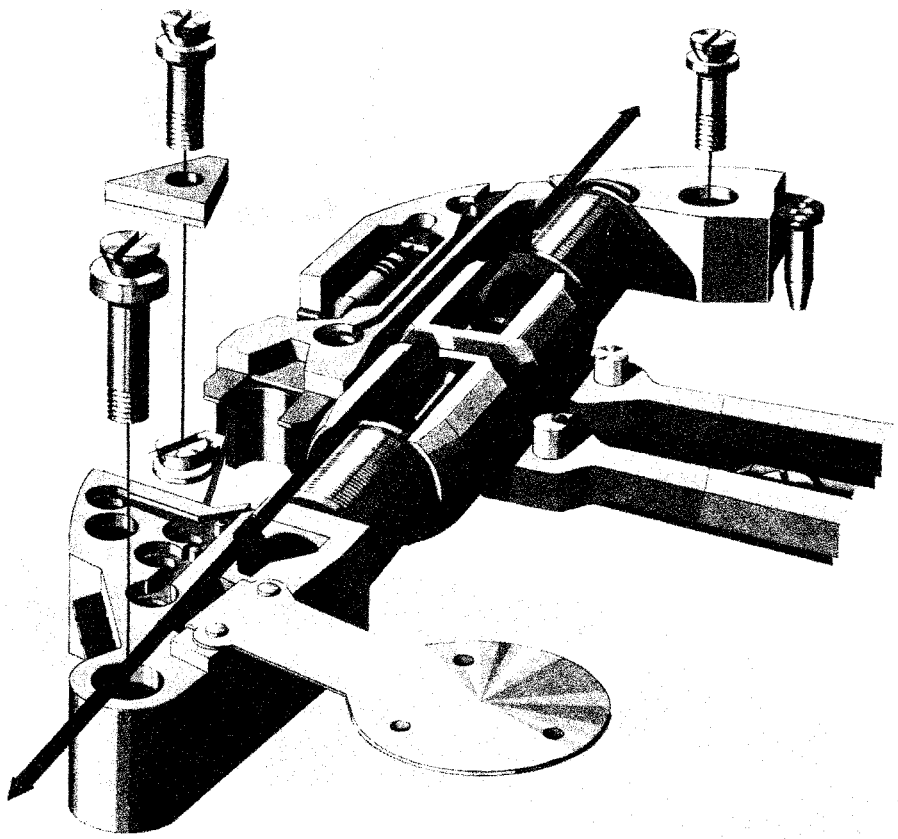
4.16 Fix the oscillator module on the movement holder.

4.17 Remove the connecting plate No. 1250.9030 and its insulator by unscrewing the relevant screw No. 2650.

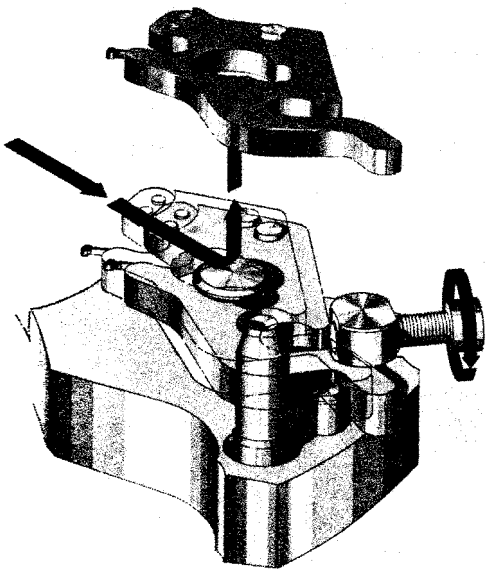
4.18 Remove very carefully, in order to avoid any possible damage to the coils, the RC unit No. 1250.9032 and the T unit No. 1250.9031 by unscrewing their screws No. 2650 (fig. 10.4).



9.4



10.4



11.4

4.19 Remove the adjuster plate for retaining click No. 1250.9034 by partly unscrewing its screw No. 2651 (fig. 11.4).

4.20 Remove the index wheel bridge No. 1250.9003 by unscrewing its two screws No. 2669. Extract the transmission wheel No. 1250.9012 and the index wheel No. 1250.9035, taking care to handle it by its pinion.

4.21 Remove the resonator No. 1250.9033 by unscrewing its two screws No. 2669.

IMPORTANT: If resonator foils No. 1250. 9037, 9038 or 9039 have been used, they should be removed without being mixed together.

4.22 Replace the index wheel, the index wheel bridge and its two screws.

4.23 Remove the upper plate No. 1250. 9001 from the movement holder.

Cleaning

Recommendations:
It is essential to use an efficient cleaning machine; the baths must be very clean.

IMPORTANT – to be observed **strictly!**

- The following are not to be cleaned in the cleaning machine:

– the two electronic units,
– the date indicator,
– the power cell.

- These components may be dry-cleaned (brush, selvyt, air jet).

- In order to avoid damaging of the index wheel teeth, cleaning should be effected with the wheel mounted on the upper plate.

- The clicks may be cleaned by using elder-pith dipped in one of the usual cleaning products. A microscope should be used for this operation.

- If the state of the resonator and the adjuster plate for retaining click is such that the baths of the cleaning machine are necessary, these two components must be mounted on the upper plate in order not to damage the clicks.

- The cleaning baths must be very clean and contain no particles of metal whatsoever, as these would obviously be drawn to the resonator magnets.

- The cleaning of the resonator magnets should be carried out with the utmost care, and a check on their cleanliness made after they have passed through the baths. Particles remaining on the magnets may be removed either with sticky paper or by means of a jet of compressed air applied in such a manner as not to damage the driving click.

Note: Particles of metal present in the baths can be removed easily by means of a permanent magnet placed in the baths prior to cleaning operations.

Lubricating

Oil 1.03

- Wheel train.
- Hand setting mechanism.
- Date mechanism.

Lubricant Molybdene 2.06

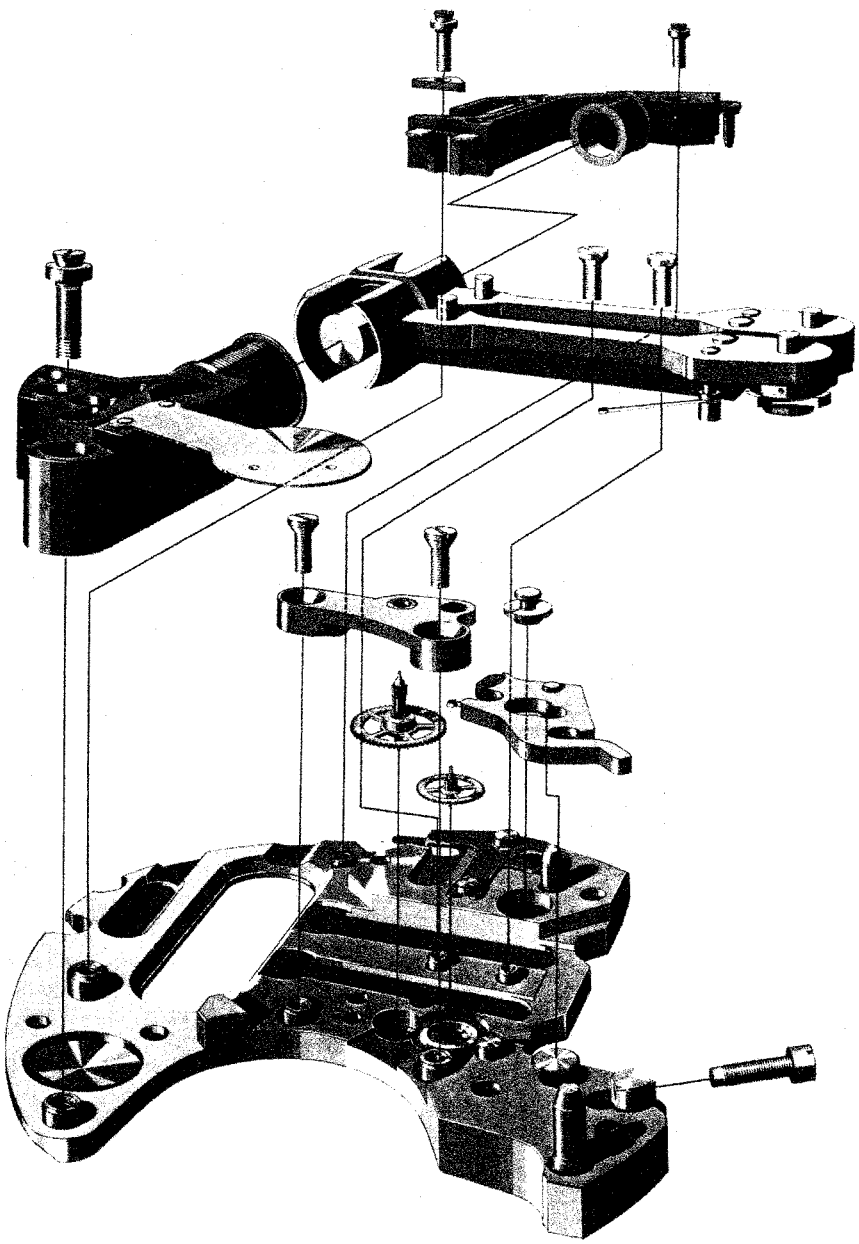
- Friction wheel (op. 4.42).
- Date jumper (op. 4.53).

Assembling

The assembling is carried out in two parts:

Assembling of the oscillator module
(fig. 12.4)

4.24 Fix the upper plate on the movement holder.



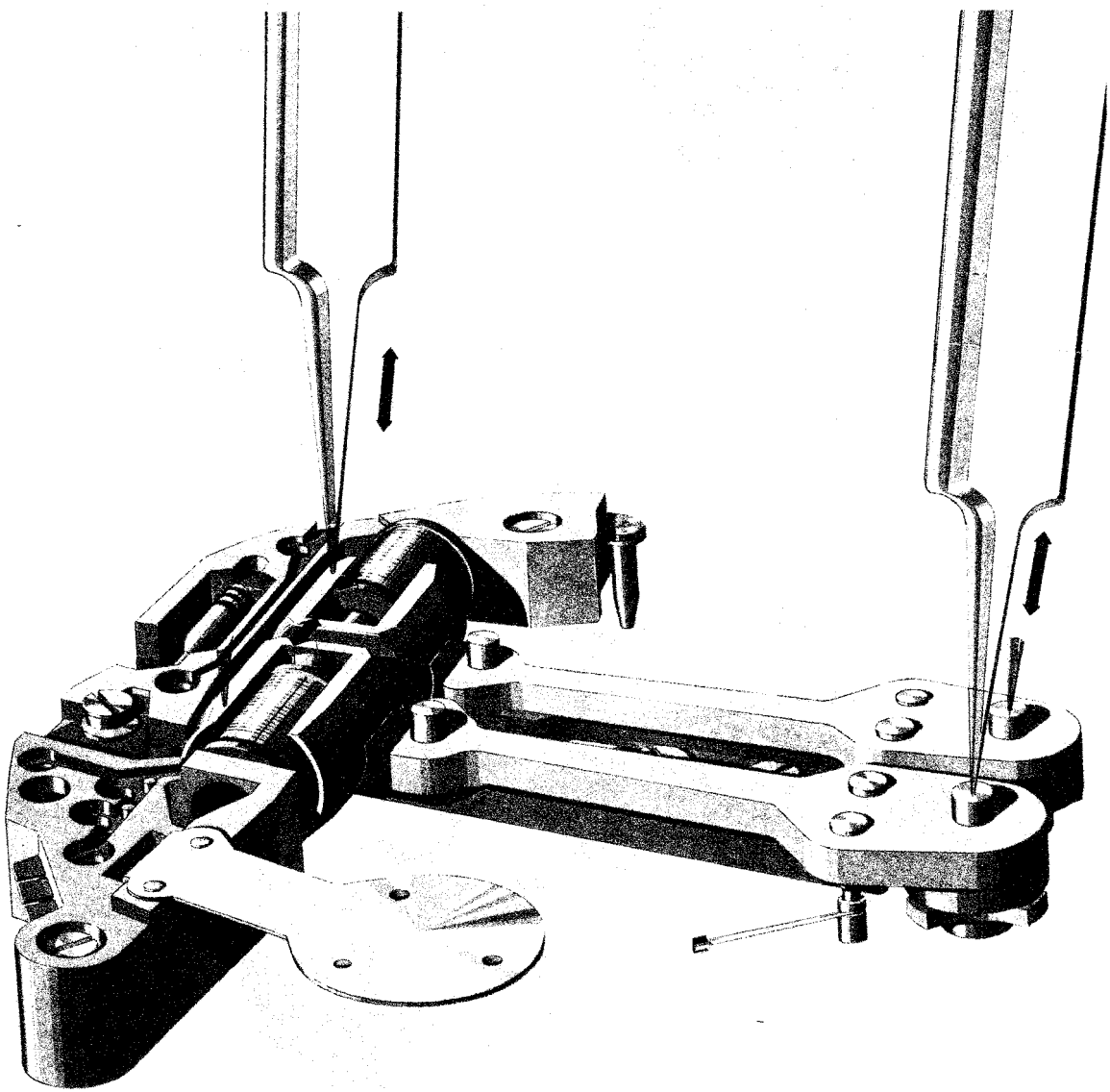
4.25 Check the endshake of the index wheel (0.03 to 0.04 mm); this latter must only be manipulated by its pinion. When this operation is completed, remove the bridge and wheel.

4.26 After having checked the cleanliness of the magnets and driving click, place in position, if required, the foil for centering the resonator, fix the resonator on the plate by means of its two screws, well-tightened (the outer screw first).

4.27 Place in position and screw the T unit, carefully inserting the coil in the cup of the resonator.
Place in position and screw the RC unit, carefully inserting the coil in the cup of the resonator.

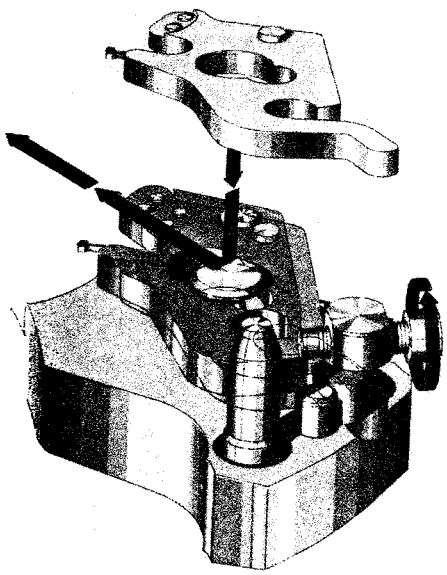
4.28 Fix, by means of its screw, the connecting plate and insulator.

4.29 Check if the resonator is free (fig. 13.4); in no case must its arms enter into contact with any part whatsoever of the movement. If necessary, center the resonator by using the foil specially devised for this purpose.



13.4

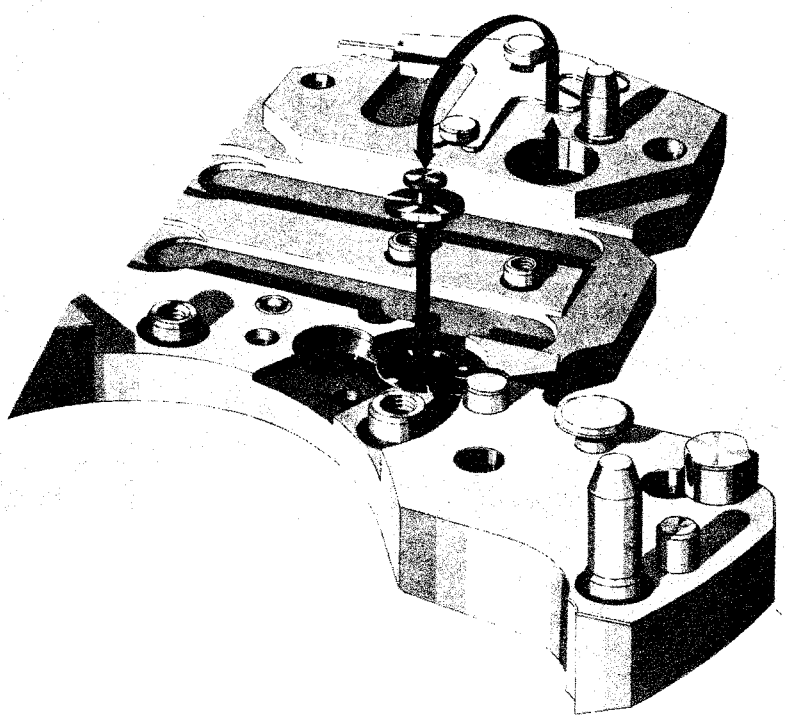
4.30 Place in position, by sliding it carefully, the adjuster plate for retaining click (fig. 14.4). Tighten the screw in order to eliminate sideshake of the adjuster plate. Then give the screw another turn.



14.4

4.31 Measure the current by means of the feeding clip for movement holder (fig. 3.4) (see folder 6-1250, application of ALITEST); the consumption must be lower than 6.5 μA.

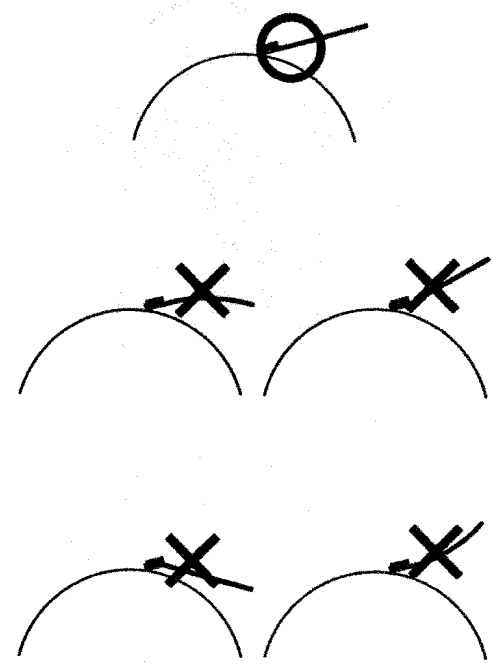
4.32 Place in position the checking gauge for clicks No. 1250.9036 (fig. 15.4).



15.4

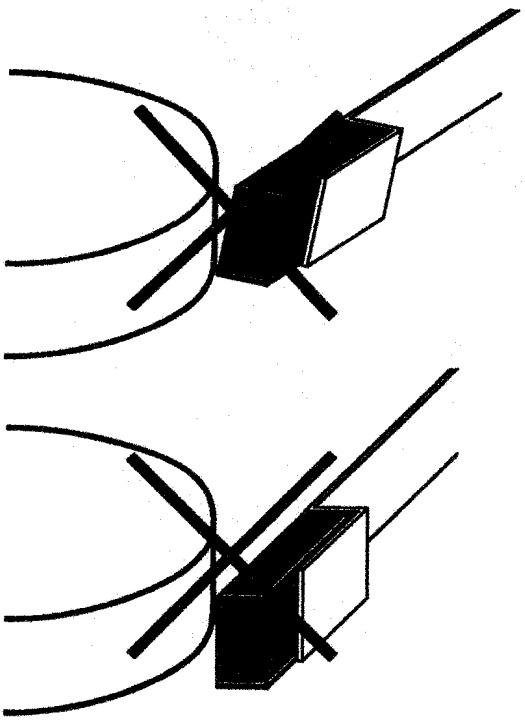
4.33 Adjustment of the position and level of the clicks. This adjustment is effected by means of the special gauge created for such purpose.

– The blades of the two clicks must be as straight as possible, and must in no case touch the studs. The clicks must be in extension of the blades. Correct, if necessary, by means of tweezers (fig. 16.4).



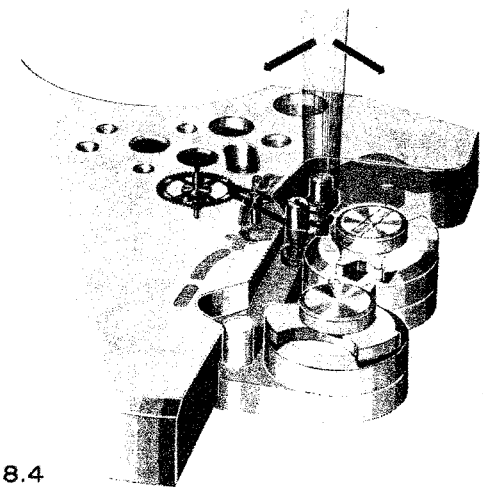
16.4

– The click jewels must be perpendicular to the plan of the gauge. If this is not the case, modify the position by manipulating the click-bearing blades as near as possible to the fixing pin (fig. 17.4).



17.4

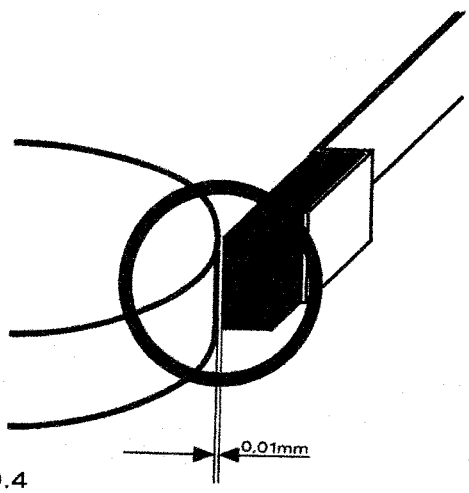
– The height of the outer crown of the gauge has been calculated to take the jewel completely within this distance. In the event of correction being necessary (fig. 17.4), proceed by means of the special tool and manipulate the click pins (fig. 18.4).



18.4

– The diameter of the gauge has been calculated to determine the optimum spring tension of the clicks. These latter must in no case rest against the gauge; a maximum space of 0.01 millimeter must exist (fig. 19.4).

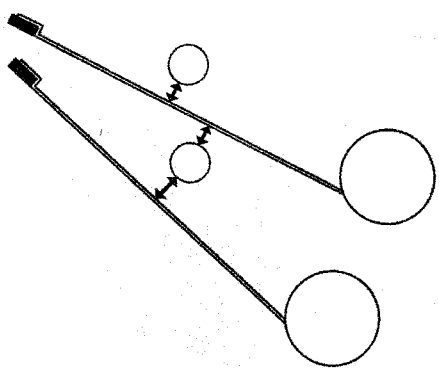
IMPORTANT: The last correction given to the click blades must be of a tension-reducing character. In this way, the subsequent effect of relaxation is avoided.



19.4

– Ensure that the click blades do not touch the studs (fig. 20.4).

– All corrections are carried out by manipulating the click blades with tweezers, as near as possible to the fixing pin.



20.4

Note: Special care must be taken when placing the index wheel in position so that, on the one hand, the above adjustment is not impaired and, on the other hand, damage to teeth is avoided.

4.34 Remove the checking gauge and lubricate the pivoting points of the index wheel and transmission wheel.

4.35 Place in position the index wheel, taking care not to damage the adjustment of the clicks. Also place in position the transmission wheel.

4.36 Fix the index wheel bridge by means of its two screws.

4.37 Check the working limits of the indexing mechanism.
It is simply necessary to use the variable tension (see folder 6-1250, application of ALITEST).

- one checks first of all that the rotation of the wheel train is normal for the lower tension fixed at 1.05 V. In order to do this, one manipulates the adjusting screw of the corrector plate for retaining click in either one direction or the other until the wheel train turns continuously.
- one should then check the rotation of the wheel train when power-fed on the higher tension fixed at 1.65 V.
- if the wheel train turns continuously on the tensions 1.05 V, 1.65 V, 1.35 V, the adjustment of the working limits of the indexing mechanism is completed.

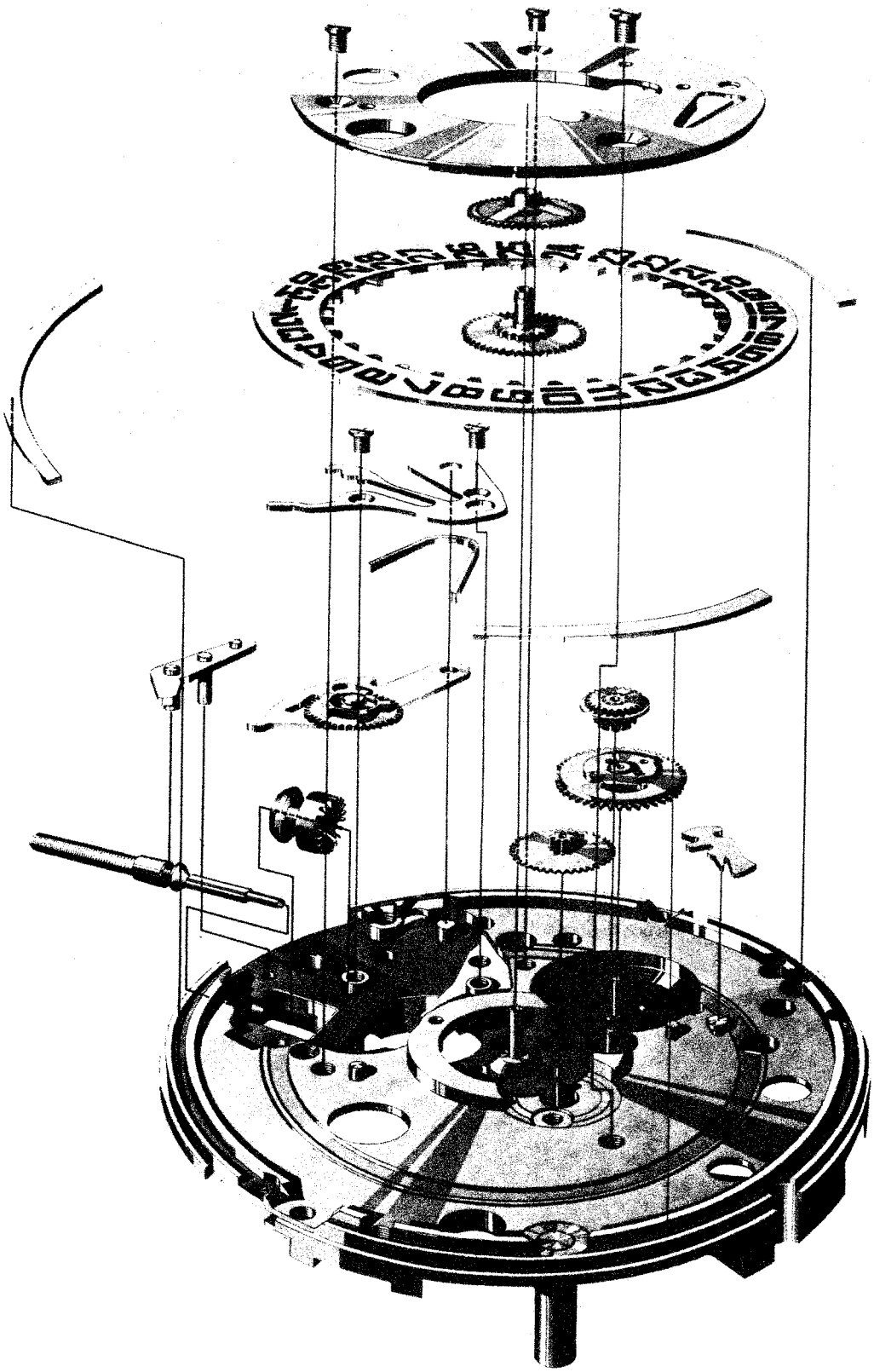
Assembling of the timing module
(fig. 21.4)

4.38 Fix the lower plate on the movement holder.

4.39 Fix the insulator of the contact bridle.

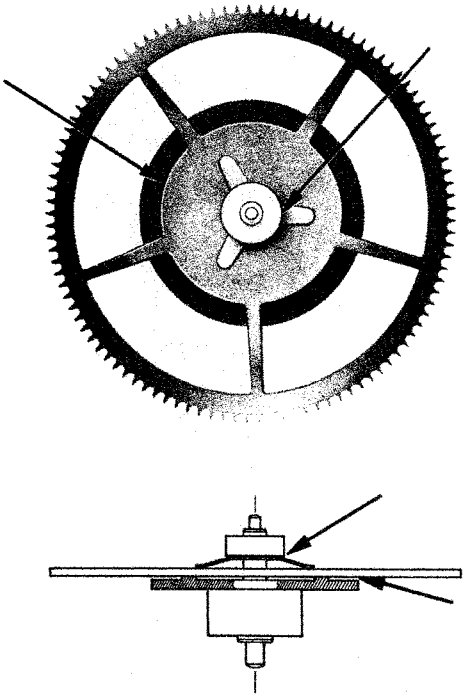
4.40 Oil the cap jewel (dial side) of the transmission wheel.

4.41 Check the tension of the friction spring for center second wheel by turning its screw as far as the stop pin. The spring must be parallel to the plate and lie directly over the hole of the center tube; it should then be disengaged before assembling the wheel train.



4.42 Place in position the friction wheel, having taken care to oil it with Molybdene lubricant (fig. 22.4); the tension of this friction must in no case be modified. Place in position the center second wheel.

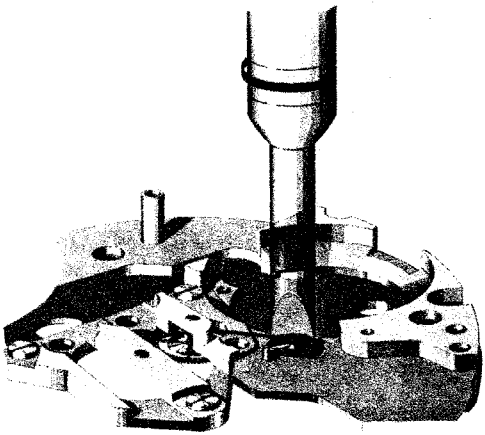
4.43 Fix, by means of its three screws, the wheel train bridge, and check the endshake of the two mobiles.



22.4

4.44 Lubricate the two jewels of the wheel train bridge.

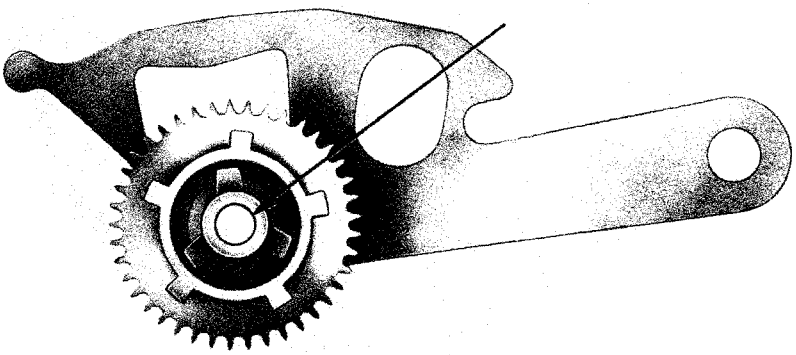
4.45 Fit the friction spring of the center second wheel by turning its screw as far as the stop pin. Check that the spring is in the groove of the wheel (fig. 23.4).



23.4

4.46 Turn the plate over. Lubricate the pivoting points of the center second wheel and friction wheel, as well as the axles of the setting lever and yoke.

4.47 Lubricate the setting wheel for hand-setting mechanism mounted on the yoke (fig. 24.4), and the functional parts of the hand-setting stem.



24.4

4.48 Place in position the clutch wheel, hand-setting stem, setting lever, yoke and yoke spring. Fix the setting lever spring by means of its two screws.

4.49 Lubricate the setting lever pin, groove of the yoke for clutch wheel and active point of yoke spring.

4.50 Lubricate the center tube, minute wheel post, stud for date connecting wheel, stud for date indicator driving wheel, stud for date jumper.

4.51 Lubricate the date indicator driving wheel (fig. 25.4).

4.52 Place in position the center wheel with cannon pinion, minute wheel, date indicator driving wheel, date connecting wheel, date indicator, date jumper; fix the date indicator guard by means of its three screws and place the date jumper spring in position (before the date indicator guard is in position, this spring must be parallel to the outer edge of the clearance). Lubricate the active point for date jumper spring.

4.53 Lubricate very slightly the active part of the date jumper (Molybdene lubricant).

4.54 Check, by means of the hand-setting stem, that the date mechanism is working correctly. Place the hand-setting stem in its intermediate position. Make the indicator turn one complete revolution. The date must change without hesitation.

4.55 Fit the hour wheel and dial rests (see their positions in fig. 26.4).

25.4

26.4

4.56 Fix the dial by pushing the two locking bolts as far as the casing diameter.

4.57 Place the hands in position.

4.58 Check the jump of the date indicator when the hands are at midnight.

4.59 Remove the hand-setting stem.

4.60 Case-up the timing module.

4.61 Replace the hand-setting stem, pushing it in completely.

4.62 Fix the timing module by means of the three fixing clamps, tighten the screws well.

4.63 Fix the oscillator module with its four screws, taking care to insert, beforehand, the pivot of the transmission wheel in the hole of the jewel.

4.64 Check the endshake of the transmission wheel AVOIDING AT ALL COSTS to make the wheel turn.

4.65 Check the working limits of the indexing mechanism (see op. 4.37). For this operation use feed by substitute power cell.

4.66 Place the power cell in position, as well as the power cell brace; fix the latter by means of its screw (see folder 1-1250).

4.67 Check the functioning of the switch (when the stem is in its final position, the watch should stop).

4.68 Close the case.

4.69 Check the instant rate.

4.70 If necessary, proceed with adjustment of the rate (see folder 2-1250).

4.71 Check the rate during a few days.

Note: If the center second hand moves while the hand-setting operation is in progress, check the following points and correct if necessary:

- Insufficient lubrication of the friction wheel (see op. 4.42 and fig. 22.4).
- Faulty friction wheel (friction too great).
- Insufficient tension of the clicks (see op. 4.33 and fig. 19.4).
- Faulty index wheel (teeth).

ELECTRONIC

OMEGA

Folder 5-1250

Application of Deltatest

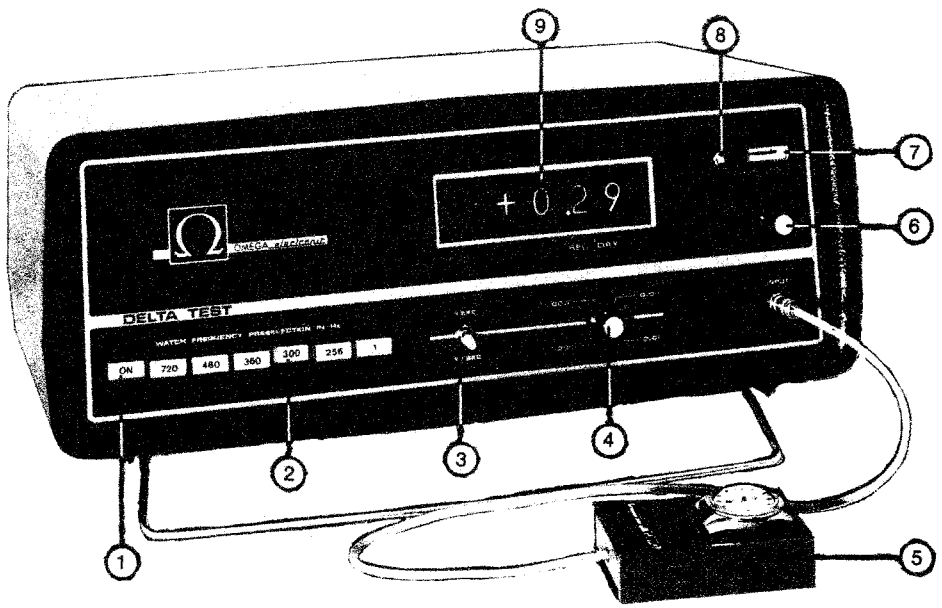
5.1 Generalities

The apparatus (fig. 1.5) is intended for the checking of the instant rate of electronic watches.

The frequency of the watch, ascertained by means of a magnetic captor, is compared to the reference frequency of a quartz.

The difference is converted in order to give the rate error in seconds and fractions of seconds per day.

The result is screened digitally (9), with its sign (+) or (–) and indication in the case of capacity (overflow). It is also possible to measure and screen the frequency of the watch.



5.2 Measurement of the rate

Remark: The apparatus must remain constantly connected (plug 110 V or 220 V) in order that the quartz may be thermostatic. If this were not the case, it would be necessary to wait 30 minutes after connecting with the power so as to secure sufficient stability.

The switch on the back of the apparatus must be on "off".

- Press button "on" (1).
- Place the watch on the captor (5).
- Press the button of the keyboard "300 Hz" (2) relating to the watch.
- Move the watch in order to obtain the maximum signal.
- Adjust the amplification (6) taking into account the level control provided by the hand of the voltmeter (7) and the lamp (8). The optimum adjustment is obtained when the hand is at the beginning of the green zone.
- Select the measuring time 1 or 10 seconds (3).
- Select the accuracy of measurement desired (4).

Remark:

As a general rule, one will use:
1 second, reading to 1/10th
or possibly:
10 seconds, reading to 1/100th

5.3 Measurement of the frequency

Put the switch on the back of the apparatus in the "on" position. The frequency is given with its three significant figures in full.

5.4 Measurement of the rate or frequency by power-feed

See folder 6-1250, application of ALITEST.

ELECTRONIC

OMEGA

Folder 6-1250

Application of Alitest

6.1 Generalities

The apparatus (fig. 1.6) fulfils 2 functions:
1) power-feed
2) measuring instrument

Power-feed function

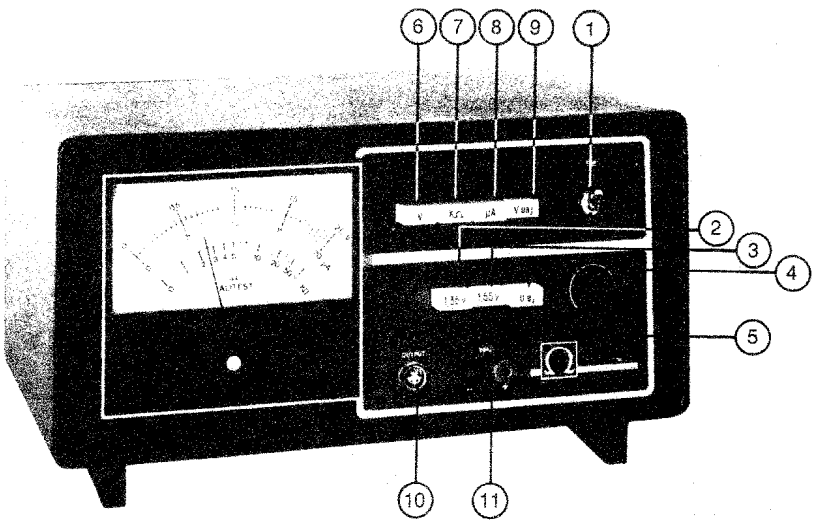
Allows the movement to be fed by an auxiliary source. The apparatus comprises a fixed tension equivalent to the power cell (1.35 V) and an adjustable feed of 0 to 2 V for the purpose of observing the working of the indexing mechanism.

Measuring instrument function

For measuring tensions of 0 to 2 volts (V) with a precision of 2 hundredths of a volt (checking of power cells).

Measuring of current consumed by the watch. Scale of 0 to 20 micro-amperes (μA).

Measuring of resistances of the electronic circuit, enabling possible faults to be detected. Measuring from 0 to 50 kiloohms (KΩ).



6.2 Measuring the tension of the power cell

- Press button V (6).
- Plug the cables with pointed probes into INPUT (11) (black: –; red: +).
- The power cell being placed on the table, connect the black pointed probe with the top of the power cell (–) and the red pointed probe with its case (+).
- The tension must be around 1.35 V; if lower than 1.25 V, the power cell must be replaced.

6.3 Measuring of the current

- This measuring can be effected either with the substitute power cell on the complete movement, or with the feeding clip for movement holder on the oscillator module only.
- The apparatus is put under tension. Press the switch (1).
- Connect the substitute cell or feeding clip for movement holder with OUTPUT (10).
- Press button 1.35 V (2), representing the feed-tension of the watch.
- Press button µA (8) in order that the instrument shows the amount of current consumed by the watch. This current must not exceed 9 µA.
- To start off the movement, it may be necessary to give it a slight shake.

6.4 Variable tension feed for checking of the indexing mechanism

- This measuring can be effected either with the substitute power cell on the complete movement, or with the feeding clip for movement holder on the oscillator module only.
- The apparatus is put under tension. Press the switch (1).
- Connect the substitute cell or feeding clip for movement holder with OUTPUT (10).
- Press button Uaj (4) representing the variable tension feed.
- Press button Vuaj (9) in order that the instrument shows the amount of variable tension applied to the watch.
- The required variable tension is obtained by turning the knob (5).

6.5 Measuring of the rate or frequency on the DELTATEST with feed from ALITEST

- Connect by means of the special cable the outlet on the back of ALITEST with INPUT of DELTATEST.
- Proceed in identical manner to "6.3 Measuring of the current".
- Place the switch on the back of ALITEST in position 1.
- Adjust the level on DELTATEST if necessary.

6.6 Analysis of circuit - Measuring of resistance

Note: This measuring is carried out on the oscillator module only.

- The apparatus is put under tension; press the switch (1).
- Press button KΩ (7).
- Plug the cables with pointed probes into INPUT (11) (black: –; red: +).

Measuring of resistance R between points 1 and 4 (fig. 2.6)

Connect black probe (–) with point 1 and red probe (+) with point 4:

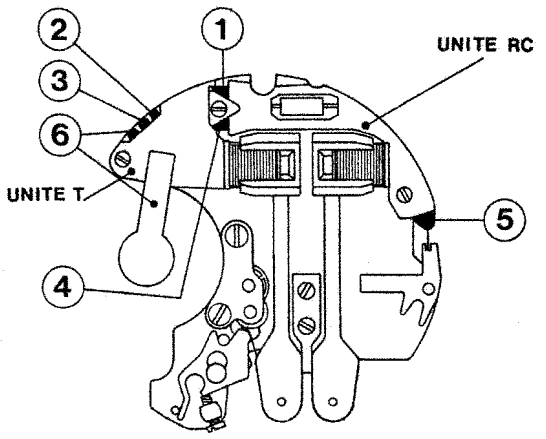
– If ∞ → insulation in order.

– If short-circuit → remove the connecting plate and insulator.

Repeat the measuring between points 1 and 4 while pressing with the probes in order to ensure contact between the ends of the two electronic units:

– If ∞ → replace the connecting plate and insulator.

– If short-circuit → replace T unit.



2.6

Note:
For measuring operations Nos. 4–5–6–7, polarities must be taken into consideration.

ANALYSIS OF CIRCUIT

	Resistance measurements between points Nos.	Limits for a correct circuit	Components to be replaced if value not within limits
1	4 and 5	between 5 and 10 KΩ	RC unit
2	3 and 4	between 5 and 10 KΩ	T unit
3	1 and 2	between 1 and 2 KΩ	T unit
4	+2 and –3	between 2 and 10 KΩ	T unit
5	+2 and –6	between 2 and 10 KΩ	T unit
6	–2 and +3	∞	T unit
7	–2 and +6	∞	T unit
8	If the abovementioned measurements fall within the required limits and the watch does not function, the defect lies between points 1 and 5 of fig. 2.6.		RC unit

ESA 9162

The Swiss tuning fork watch is a creation of Ebauches, S.A., and its official designation is ESA 9162.

Using a tuning fork as its frequency standard, like Bulova's Accutron (from which it is licensed), it claims guaranteed second-a-day accuracy. Its tuning fork differs from Accutron in that it is balanced, claiming a minimization of the position error. Those familiar with servicing the Accutron should find this watch easy to service.

- Resonator (tuning fork) frequency is 300 HZ.
- Battery diameter is 11.60 x 3.60mm . . . 1.35 volts.
- Service capacity to 1.05 V; 110 milliamperehours (rated capacity at 100 microamperes).
- Acceptable batteries: Eveready No. 342 (Union Carbide); Mallory WH 12 NM; Leclanche MR NM.
- This watch has three stem positions:
- The wearing one, with the crown pushed flush towards the case;
- The halfway, second position for setting the calendar mechanism in either direction rapidly (without interrupting the remainder of the movement functions). During the hours of 11:45 p.m. and 2:00 a.m. the calendar mechanism should not be manipulated;
- The third and last position is with the crown pulled out as far as it will go. This position breaks the electrical circuit and lets you set the hands to the exact time. This outermost position also is used to disconnect the battery current in order to store the watch. Regulation can be done with the movement in the case but the case back must be removed.

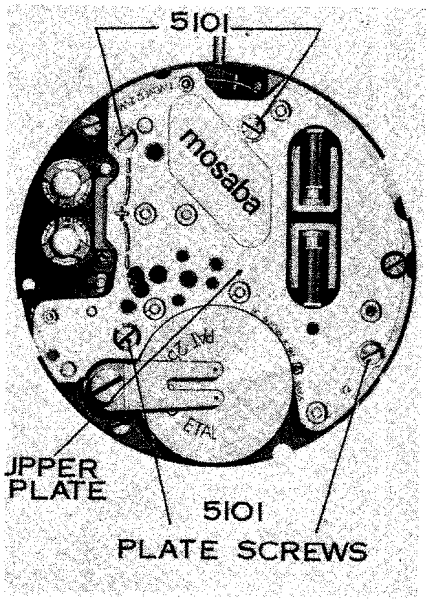


FIGURE 1

Since, for the time being, three companies will be using this calibre, it would be best to study the cases of each make to determine the safest and best method for opening each watch case.

Figure 1 shows the movement side of this calibre. In the place occupied by the name "mosaba" (movements sans balance), the name of the distributor will appear, such as Omega, Longines, Eterna, International, etc.

pushed in, the interrupter spring will press against the interrupter bridle and will shift it slightly, thus insuring good contact.

Checking the Balance Amplitude

Owing to the higher frequency and the peculiar shape of the balance used in this calibre, it is difficult to check its amplitude. Nevertheless, the amplitude should be between the higher limit of 270° in the Dial-Up position and the lower limit of 200° in the Pendant down position.

Casing the Movement

Depending on the type of case, be careful of the mechanical stresses due to the casing-up process.

Adjusting of the Daily Rate

This is the same as ESA 9150. As the mechanical beat has a negligible influence in this calibre, a distance up to 5mm between the strokes forming the timing machine traces can be tolerated.

Checking the Coils

1. Take out the three coil-support screws, Figure 3.
2. The coils are defective if, when they are measured on the ohmmeter and according to Figure 3,

Between No. 1 and 2 R = ∞
No. 1 and 2 R = 0
Between 2 and 3 R = ∞
2 and 3 R = 0

In all these cases, the support with the coils fitted must be replaced.

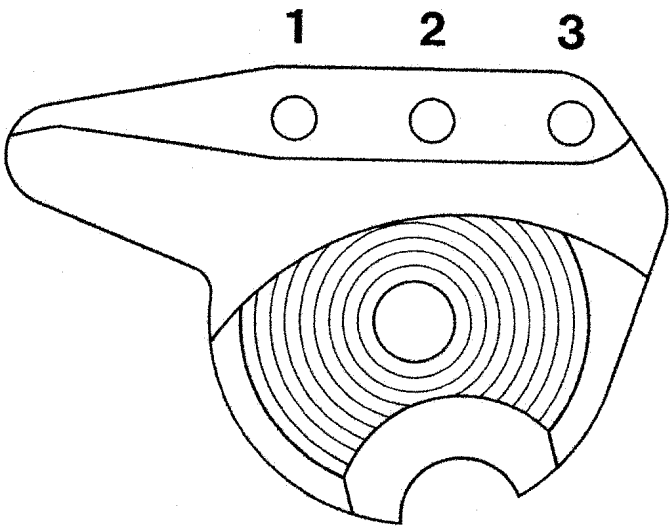


FIGURE 3

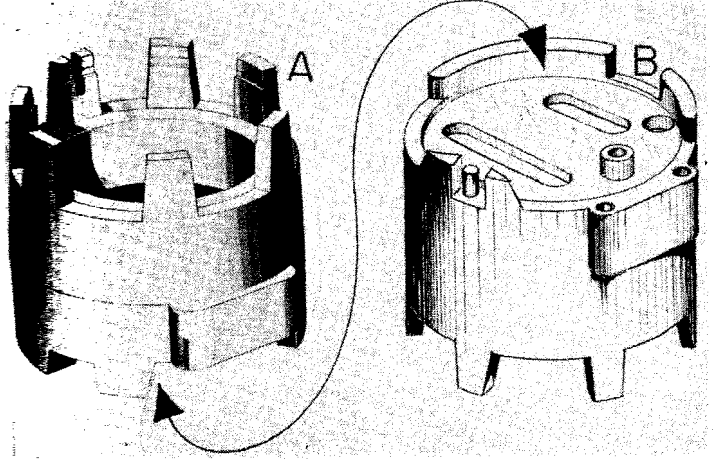


FIGURE 2

To service and check this movement, you will need certain tools. These are: a special holder (Figure 2A), a plastic ring to hold the module when adjusting the click system (Figure 3), a current supply connector (Figure 4) for the movement holder that fits into the holder in Figure 2B.

There is a key for regulating the frequency of the tuning fork (Figure 5). This key fits over the triangular, affixes on the fork's ends and shifts these pieces clockwise or counterclockwise.

To align the pawls in correct conjunction with the click wheel (indexing wheel), you can use another tool with a hollow tip. It is shown in Figure 6, shifting the indexing jewel. The tip fits equally well over the locking pawl post and also should be used to shift the locking pawl into correct conjunction with the click wheel.

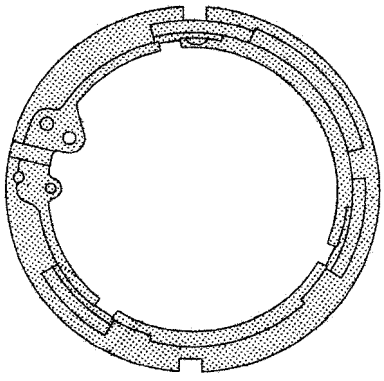


FIGURE 3

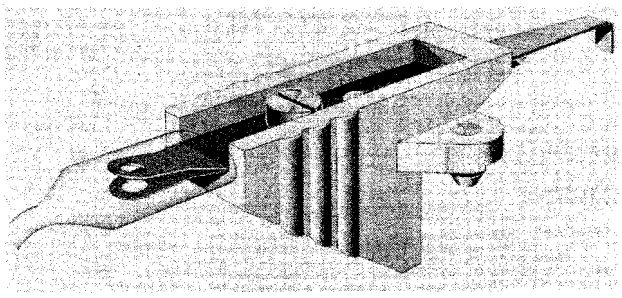


FIGURE 4

(DO NOT use a screwdriver in the slot of the locking jewel post; it is fixed solidly to the plate.)

You will also need an outside power source, and a reliable volt, ohm and ammeter. For production repairs, the Esametre 2 meets all of these requirements.

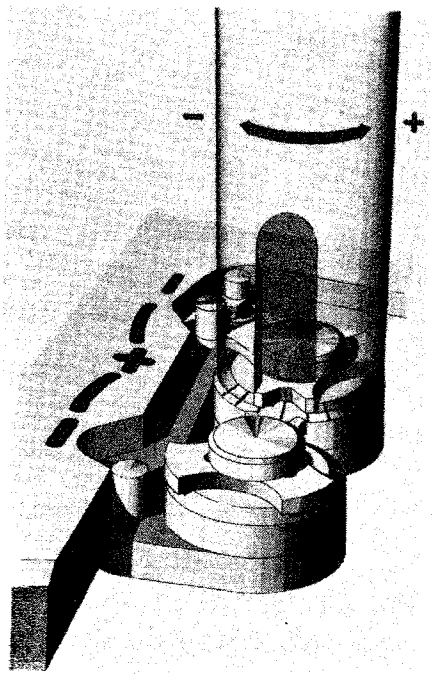


FIGURE 5

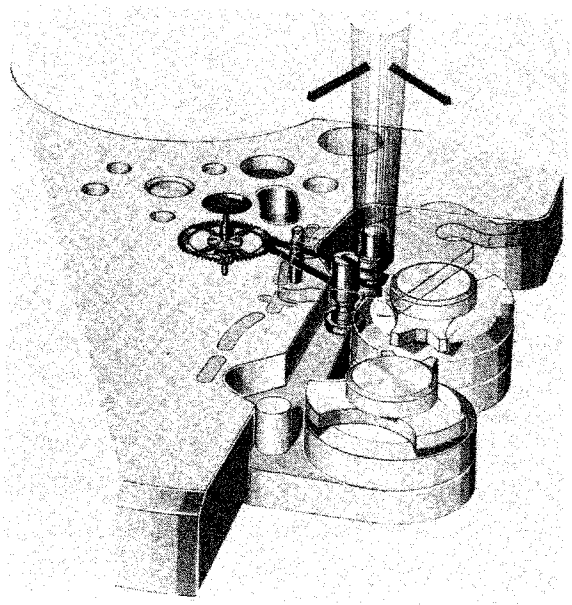


FIGURE 6

Figure 7 shows the other end of the hollow-tip tool shown in Figure 6. At this end, there is a right-angled screwdriver, which can be fitted into the screw of the corrector support and can be lever-turned to advance or retract the locking pawl.

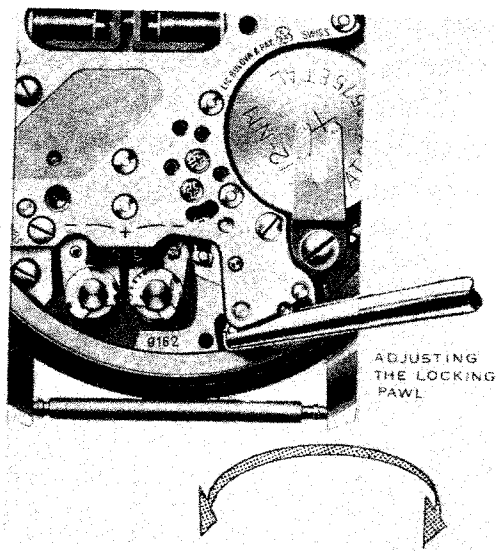


FIGURE 7

Servicing

1. Never put the movement in a demagnetizer.
2. Never pick up the click wheel with tweezers; its pinion, however, may be carefully held with tweezers.
3. When cleaning the click wheel, you must mount it on the upper plate (Figure 1).
4. Do not handle the battery with metallic tweezers.
5. Carefully check the resonator magnets to be sure they are absolutely clean.
6. Do not use liquids or solutions to clean the transistor, resistance and condenser units, or the date indicator.

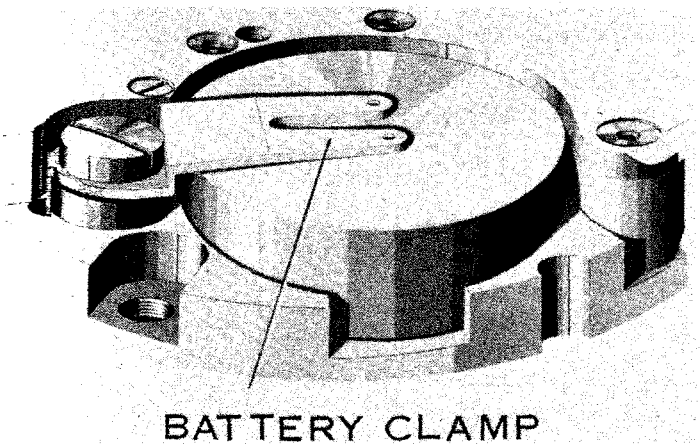


FIGURE 8

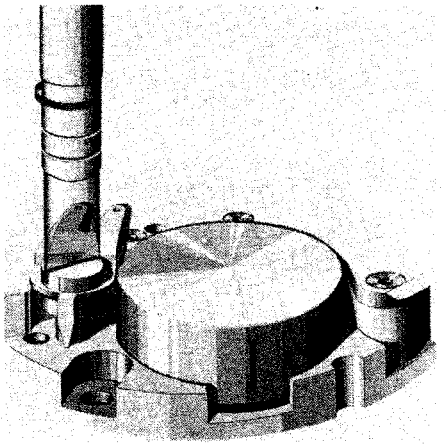


FIGURE 8

7. Before taking the movement out of its case, remove the complete module.

8. Never fit the completely assembled movement to the case. This MUST be done with the module removed.

9. DO NOT for any reason, force or move the train in either direction with a tweezer or other tool.

Changing Batteries

Loosen the battery clamp screw (Figure 8A) enough to disengage the battery clamp, by shifting it towards the inside of the plate as shown in Figure 8B. Remove the battery and check its voltage. (If you are dismantling, remove the clamp.)

You must insert the new battery with the positive (+) part facing upward. DO NOT handle the battery with metal tweezers. Return the battery clamp to position and secure it tightly.

Adjusting Daily Rate

You may adjust the daily rate when it is less than 8 seconds plus or minus (+ or -). If the watch exceeds these limits, it is an indication that cleaning or repairs are needed. (These operations will be covered later in the chapter.

If the daily rate is within 8 seconds, you may adjust it using the key shown in Figure 5. Each division below the triangular pieces corresponds to one second a day. Shifting the indexes outward (clockwise on the right tine, and counterclockwise on the left tine) slows down the rate. Shifting the indexes inward speeds

up the rate. It makes no difference whether you use one or both correctors for regulation. However, to prevent an imbalance, it is advisable to avoid using one corrector more than the other.

Movement Removal

Before taking the movement out of the case, you must:

1. Remove the case back.
2. Remove the battery clamp (Figure 8A).
3. Remove the four upper plate screws (5101), and remove the upper plate (101) as shown in Figure 1.
4. Turn the watch dial side up so that the upper plate (module) will drop out. **DO NOT touch the hands until this has been done.**
5. Remove the hand setting stem (405) by pressing on the setting lever axle, as shown in Figure 9.
6. Loosen the three case-clamp screws (5166). Slide the clamps inward and then tighten these screws again.

You can now remove the movement from the case. Place it on the special movement holder (Figure 2A). Replace the stem and crown in the movement. Push it all the way so the setting lever stud enters the stem slot. Make certain, when seating the movement in the movement holder, to press it and seat it firmly with the stem between the two posts of the movement holder.

Movement Replacement

As shown in Figure 9, remove the stem and crown. Replace the movement in the case (without the module-upper plate). Replace the stem and crown, and be sure to grease the crown joint. Loosen the clamp screws; slide the clamps outward and secure their screws tightly. Each of these clamps has two "dimples" to facilitate its manipulations with tweezers. Place the upper plate (module) in position, and fix it in position by means of its four screws.

Insert the battery and tighten its clamp. Place the waterproofing gasket in position, and close the case. Check the rate of the watch on the timing machine.

Click Mechanism

You do not have to dismantle the movement to check the (indexing) click mechanism. You need only supply the movement

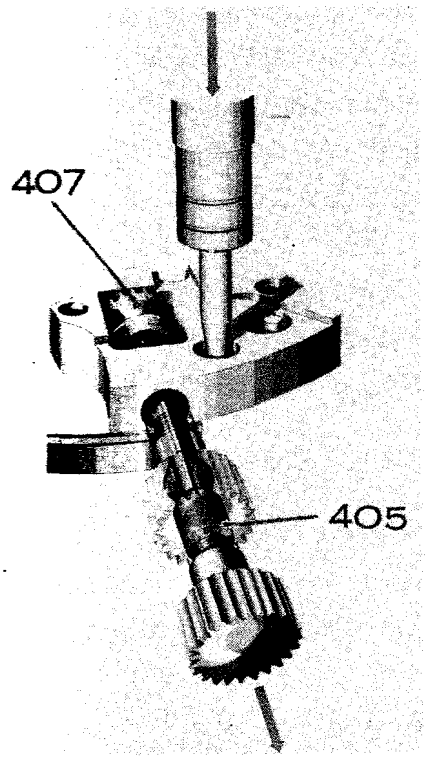


FIGURE 9

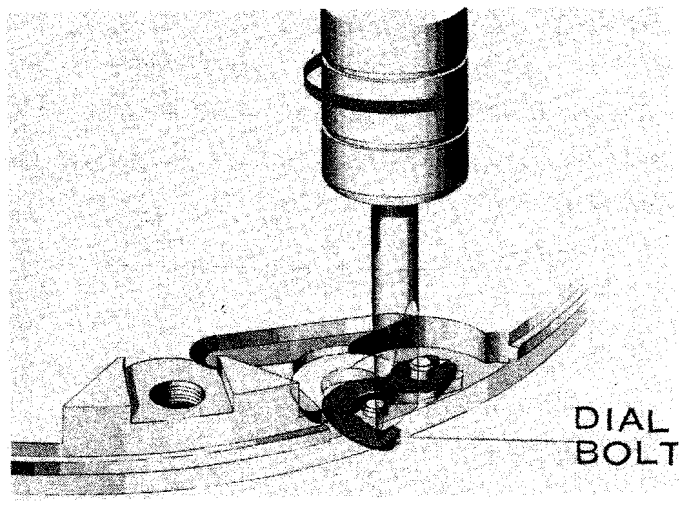


FIGURE 10

with a voltage between 1 and 1.35 volts. Methods of checking the click mechanism and some other checks of the electronic circuit will be discussed later.

Dismantling Procedures

Non-magnetic tweezers are strongly recommended for use with such watches or their components.

After removing the back, the battery clamp's screw and the battery clamp, remove the four upper plate screws (5101) and the upper plate (101), as shown in Figure 1. Turn the watch dial side up to allow the loose upper plate-module to drop out of its own accord.

Press on the set lever axle, withdraw the stem and crown, and remove the clutch wheel (407, Figure 9).

Loosen the case-clamps screws, and slide the three clamps inward. Secure the screws again. Now, remove the movement. Position it firmly into the top portion of the movement holder (Figure 2A). Now, you may remove the hands.

To remove the dial, release the two dial bolts with a screwdriver, as shown in Figure 10. Remove the dial and the hour wheel (255).

Now turn to Figure 11. Remove the date indicator by removing its three screws. Remove the date indicator guard (2535), then the date jumper (2576), the date indicator, the date indicator driving wheel (2556), and the intermediate date wheel (2543). Remove the minute wheel and then the center wheel combination cannon pinion (200).

After removing its two screws (5445), remove the setting lever spring (445), and then the yoke (435), the yoke spring and the setting lever. Next, turn the movement over and secure it in the movement holder.

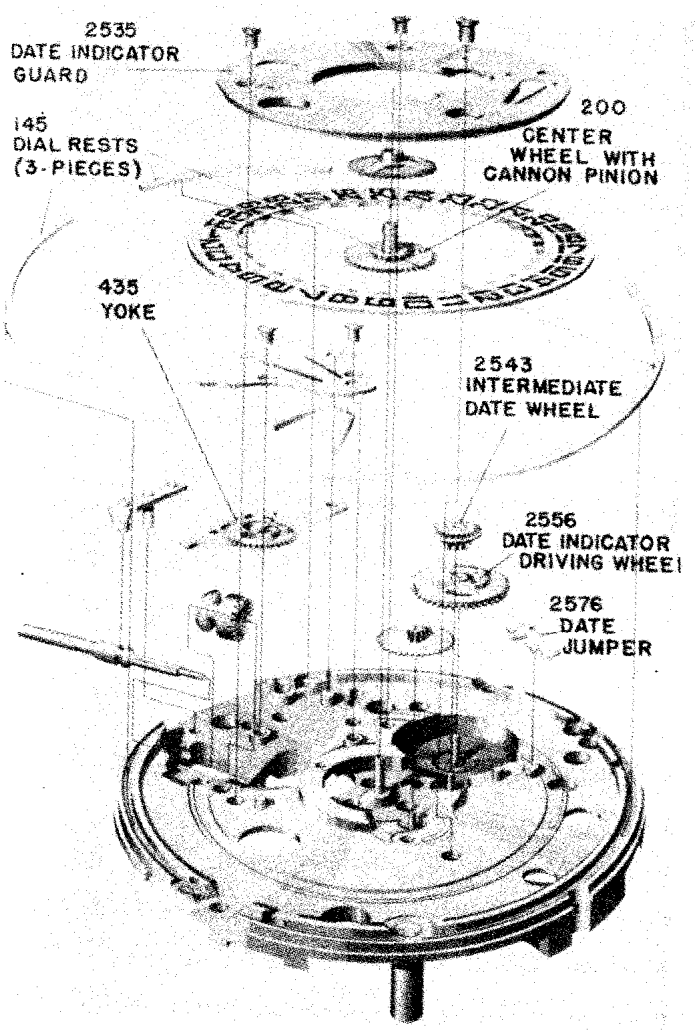


FIGURE 11

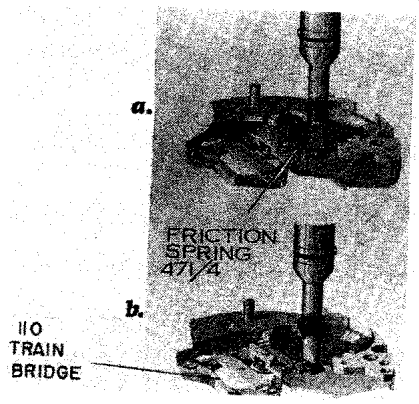


FIGURE 12

Figure 12A shows a friction spring (471/4), which is tensioned against the fourth wheel arbor. Release this spring by placing a screwdriver in the slot of the spring's collet and twisting it 45 degrees (1/8 turn) clockwise, as shown in Figure 12B.

Now remove the three train bridge screws, securing the train bridge (110), Figure 12B; and disengage the third and fourth wheels. **Never immerse the third wheel in any solution.** It may be dry-cleaned. The colored plastic, feed-bridle insulator (4045) may be left in place, since most cleaning solutions and mild heat will not affect this.

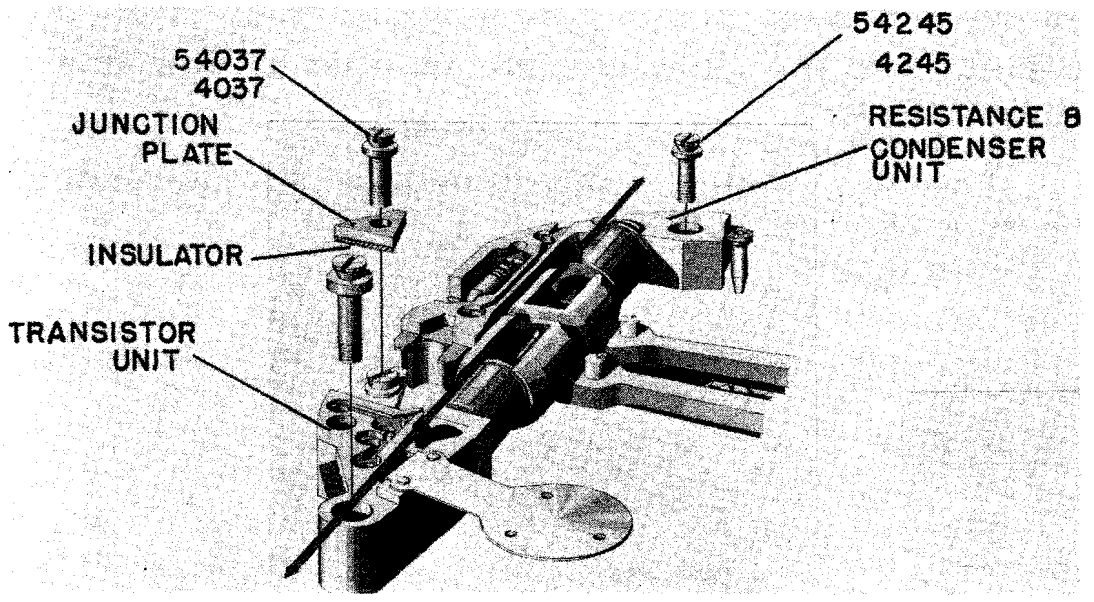


FIGURE 13

Place the module onto the movement holder (Figure 2B), so that its positioning notch (Figure 15) is fitted against the cylindrical post at the edge of the movement holder, shown in Figure 2B. Position the module securely into the holder by pressing on the steady pins of the module.

After removing the screws (54037, 54245), remove the junction plate and its insulator underneath, as shown in Figure 13.

Making certain not to damage the coils, remove the Resistance and Condenser Unit (4245) first, sliding it out in the direction of the arrow. Next remove the Transistor Unit (4240), sliding that out, too.

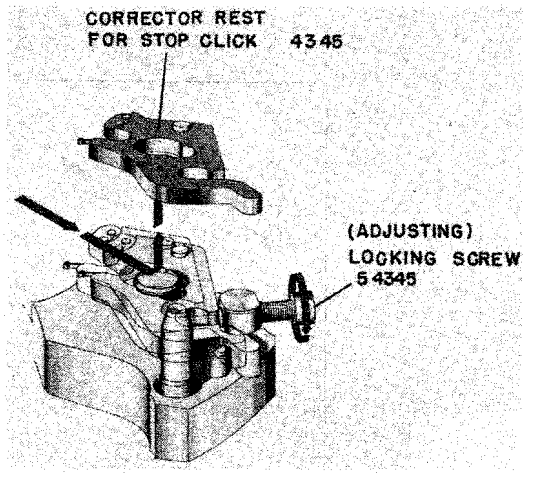


FIGURE 14

Remove the corrector rest for the stop click (4345), as in Figure 14. To do so, loosen the lock screw (54345) just enough to allow the corrector rest to slide out in the direction of the arrow. Then lift the corrector rest upward and out.

Refer to Figure 15 (exploded view). Remove the two screws (5118) and remove the combined bridge (118).

Next remove the two resonator screws (54600), and then carefully lift out the resonator (4600). This is best done by using a screwdriver as a wedge in the notch especially provided for this purpose.

Cleaning

IMPORTANT: The following parts **must not** be cleaned in the cleaning machine:

a) the date indicator;

b) the two electronic units (Transistor and Resistance and Condenser Units 4240, 4245);

c) the battery.

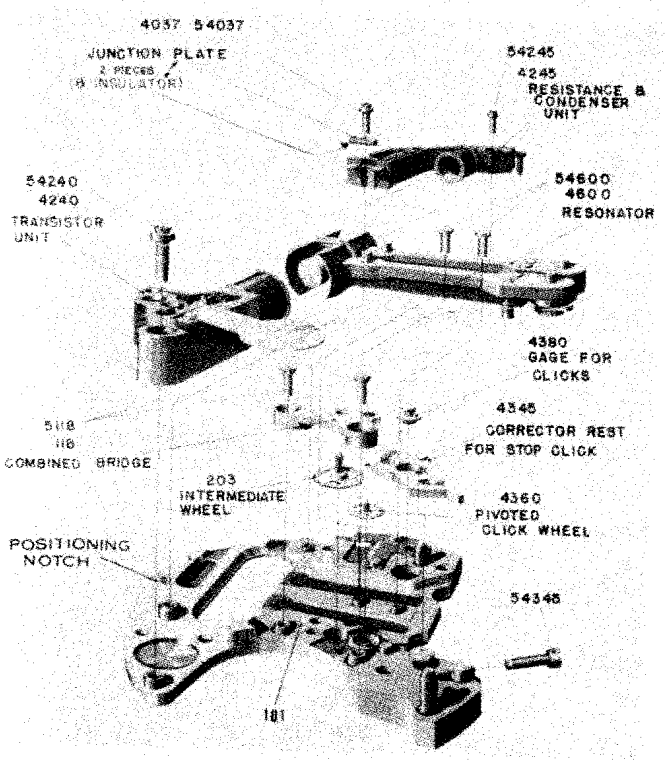


FIGURE 15

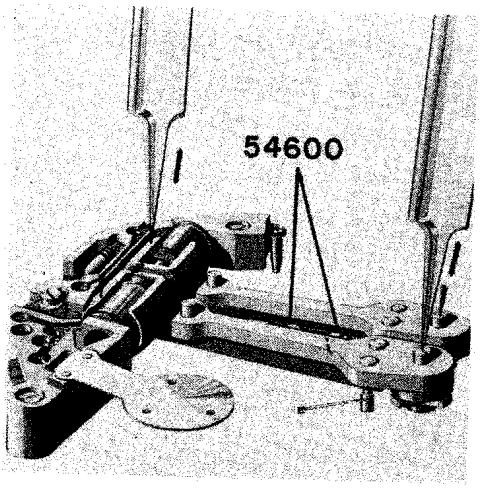


FIGURE 16

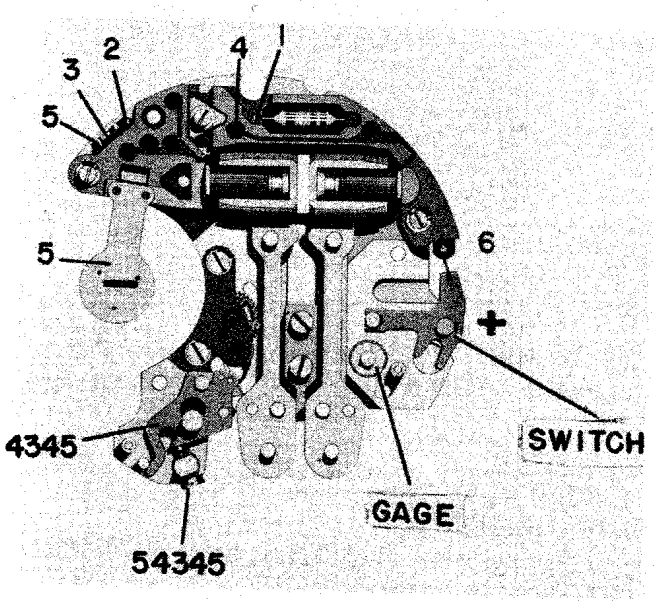


FIGURE 17

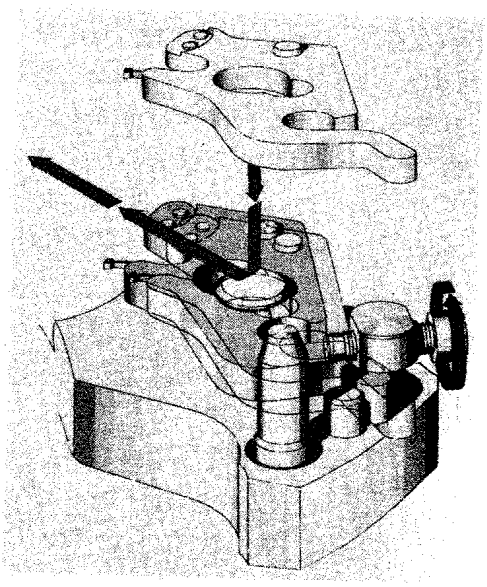


FIGURE 18

These parts may be dry brushed or gently wiped with a Selvyt cloth or air blower.

The cleaning solutions must be fresh, uncontaminated with metallic particles which would inevitably become attached to the resonator magnets.

Cleaning should be done with the (indexing) click wheel and mechanism assembled. Exercise extreme caution to avoid damaging its delicate teeth. The resonator magnets also should be cleaned with the same delicate care. After cleaning, inspect them to be sure they are perfectly clean. Remove any particles clinging to the magnets using adhesive tape or Rodico. Be very careful not to damage the driving pawl. It is a good idea to first clear the cleansing solutions in the ultrasonic machine's liquid jars of metallic particles by placing a permanent magnet temporarily in the solution before cleaning.

Assembling and Oiling

There are two stages in assembling. One is to assemble the complete upper plate (module). Fit the upper plate into position on the movement holder (Figure 2B). Fit the click-wheel and combined bridge into position in order to check the endshake of this wheel. Handle it only by its pinion; position it with the oiler-needle and check its endshake the same way. When this is done, remove the bridge and wheel.

Place the resonator on the plate and fix it with its two screws. Secure these tightly — the outer screw first. First secure the Transistor Unit by means of its screws; be careful that the coil enters the yoke of the resonator. Put the Resistance and Condenser Unit in place by sliding it into the yoke of the resonator. Then replace the screw securely.

Now fit the junction plate insulator and the triangular junction plate in place by means of its screw (54037). (See Figure 13.) Check the resonator to make sure it is free, as shown in Figure 16. To do so, place the non-magnetic tweezer lightly on the cups of the resonator and "feel" whether they are free. Or place the point of a tweezer on the pin of the lower end of the fork-resonator as shown. Also, with the point of tweezer at the side of the pin at the lower end of the resonator, flip the point of the tweezer aside. This will set the resonator into sonic action and will enable you to observe its freedom. On no account must its tines come into contact with any part of this movement. Also be sure that the contact point (6) in Figure 17 is not fouled with the contact table of the switch.

Next refer to Figure 14 and 18. Carefully slide the pawl adjusting support (corrector rest for stop click, 4335) into position as shown in Figure 18. Tighten the screw to eliminate endshake of this part; then give this screw one more turn to tighten it.

Notice that in Figure 17, there is a reference to a "gage". This is a stud-shaped piece that is supplied with every movement and rests in a reserve well or counterbore. This gage has no functional purpose in this watch except as a stand-in for the click wheel for

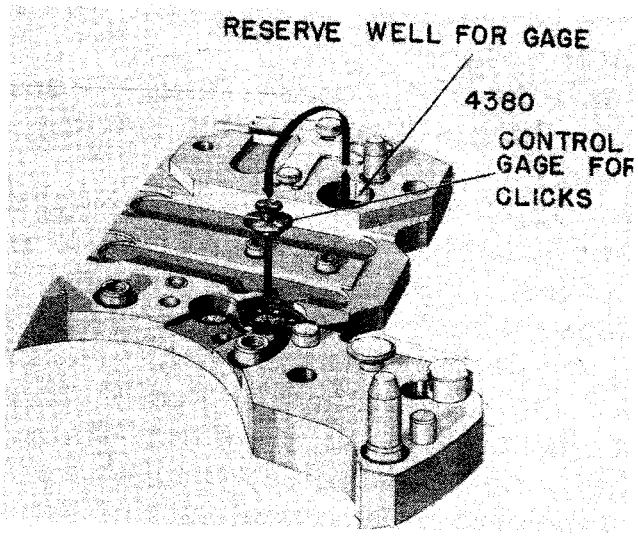


FIGURE 19

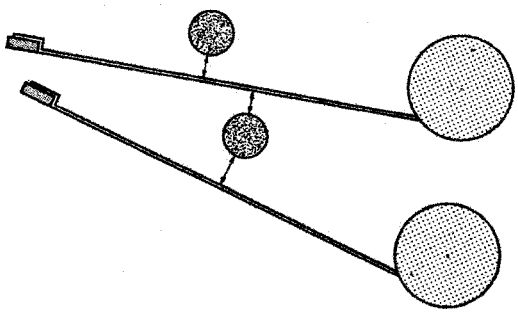


FIGURE 20

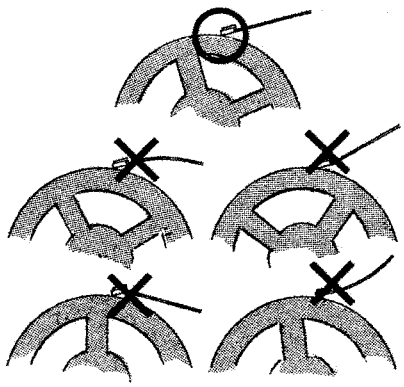


FIGURE 21

the adjusting phase, after which it is returned to its well. The gage is kept in its reserve well by light friction, and it can be easily removed and replaced for the testing and alignment phasing.

Lift out the control gage for clicks (4380), Figure 19, and place it into the space normally occupied by the click wheel. (Remember that earlier the click wheel was removed after its end-shake was satisfactory.)

Adjusting the Click Mechanism

The blades of the two pawls should be as straight as possible and should on no account touch the pins. (See Figure 20.)

Figure 21 shows some common index blade faults which may be corrected with the tweezers. Check the tension of the pawls and their setting in relation to each other with the gage. The pawl jewels should be perfectly aligned with the plane of the gage as shown in the top view, Figure 22. They must be perpendicular to the plane of the gage. If not, they may be altered to correct alignment with a pair of tweezers, working on the pawl blades as close to the studs as possible. The height of the outer crown of the gage has been calculated so that the jewel should be entirely included in that distance. If correction is necessary, work on the

pawl's studs with the special tool shown in Figure 6. (Do not use a screwdriver in the slot of the locking pawl support. This cannot be twisted.)

The outside diameter of the gage has been calculated for determining the optimum pawl tension. The pawls, however, must on no account press against the gage; a space of about 1/100mm should remain between the tips of the blades and the rim of the gage as shown in the top view, Figure 22. For all corrections use tweezers on the blades at their junction with the studs and the tool, shown in Figure 6. Using any good oil, lubricate the two click-wheel bearings on the upper plate side.

NOTE: Take special care, when placing the click wheel in position, not to upset the preceding adjustment or damage the very fine click wheel teeth.

Place the click wheel (4360) in position (Figure 15). Take care not to upset the adjustment of the click mechanism. Now place the intermediate wheel (203) in position (Figure 15).

Next, place the combined bridge (118) in position (Figure 15). Make certain the click wheel pivots are in place, but **do not touch this wheel with the positioning tweezers.** Secure the bridge by means of its two screws.

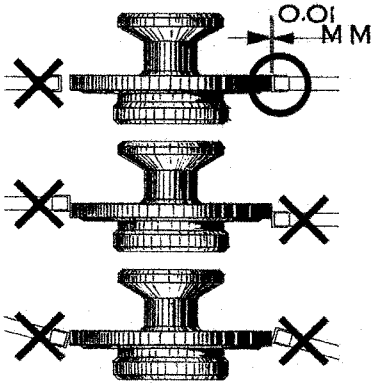


FIGURE 22

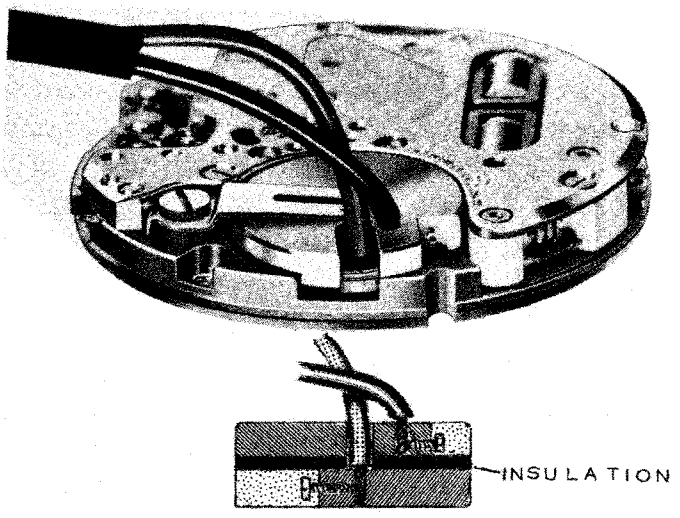


FIGURE 23

The click mechanism can be adjusted either with the movement assembled or with the module alone (upper plate). For this adjustment, you will need an outside battery current supply system. This can be obtained in a number of forms. One is shown in Figure 4.

The clip is attached to the movement holder and makes contact with the movement plate, supplying circuits from the source. The other cable ends of this clip may be attached to a correct current source. Figure 23 shows two lead wires attached to a dummy battery. It is fitted to the movement if testing is required when the movement is fully assembled and in its case. The other

ends of these cables are attached to the power source outside the watch — a battery of the correct voltage or a variable power source such as the Esametre, which contains such a section. The dummy battery consists of two layers of disked brass separated by glued insulation and its terminals, held by set screws.

For measuring the resistance of the Transistor-Resistance-Condenser Units or insulations, etc., as well as power consumption, any reliable 20,000-ohm-per-volt multimeter will do.

With the module set into the movement rest (Figure 2B), check the clicking mechanism. Use the minimum voltage of 1 volt. Shift the adjusting screw of the corrector rest for stop click (4345) in either direction, until the train runs continuously. Watching the click wheel and the intermediate wheel under magnification should quickly show whether these are running satisfactorily. Next, check the train action at higher voltages up to 1.7, and especially at the normal running supply voltage of 1.35 volts.

Since a variable power source will be needed to test this watch, a simple form might be described.

Two 1.5 cells can be fitted in series to obtain a 3.0 volt supply. These cells are then placed in a clip from which current can be drawn. However, since for this watch voltages from 0.9 to 1.7 will be needed, a variable resistance (rheostat) is placed in series with this set-up. Suitable leads are then attached and placed at the terminals of a reliable voltmeter. The resistance is then adjusted slowly until the desired voltage is obtained. The leads may then be connected to the module by the clip shown in Figure 4 (available from the watch importer) or the type shown in Figure 23.

If the train runs continuously at normal speed 1.0, 1.7 and then at 1.35 volts, the click mechanism is in proper adjustment. If the train doesn't run continuously, refer to the troubleshooting section.

Assembling the Movement

Fit the movement on the special movement holder (Figure 2A). If you had removed the red plastic feed-bridle insulator, assemble it by inserting the longest of its tabs in place first.

Oil the dial side of the intermediate wheel jewel. Check the tension of the friction spring (Figures 12A, 12B) of the fourth wheel. Turn its maintaining screw, as far as the stop pin, against the flat side of the screw. The spring should be tangential to the center pipe and parallel to the plane of the plate. If the tension is insufficient, examine the spring and adjust the tension. Then, disengage the spring before assembling the train.

Now fit the fourth wheel in position. After greasing the friction spring of the third wheel with light grease, fit this wheel. If the third wheel needs separate cleaning, clean it with cold isopropylic alcohol for no longer than 20 seconds. When it is dry, add a drop of oil between the wheel plate and the steel disk. Then check its friction washer.

To test for correct friction of the third wheel, place the stem in the hand-setting position. Then "twirl" the crown and observe

the wheels from the train side. If both the third and fourth wheels move, the friction is correct. If the fourth wheel doesn't move, friction is insufficient and the third wheel must be replaced.

Replace the train bridge and tighten its three screws. Check the endshake of the wheels. Oil both wheels' hole jewels in this bridge. Now re-engage the friction spring of the fourth wheel. Turn its screw as far as it will go. The banking pin controls the amount you can turn this screw. Make certain the spring is engaged properly in the groove of the friction pulley.

Now turn the plate over on the movement rest. Grease the spindles of the yoke (435) and the setting lever. Replace the hand setting stem, clutch wheel, setting lever, yoke and yoke spring. Replace the setting lever spring with its two screws (Figure 11).

Grease the pivot of the stem and its square, the stud of the setting lever, the groove of the yoke and the axle of the setting wheel.

With any good watch oil, lubricate the center pipe, the pivot shank of the minute wheel, the spindle of the intermediate date wheel and the spindle of the date-indicator driving wheel. (All are shown in Figure 11.)

Next, replace the combination center wheel and cannon pinion, the minute wheel, the intermediate date wheel, the date-indicator driving wheel, the date indicator and date jumper and remainder of calendar mechanism.

Remove the stem and fit the movement. Remember that the module containing the resonator and electronic circuit has not yet been assembled to the main movement. Fit the movement (without the module) into the case. Replace the stem; push it in all the way. Secure the movement to the case by the three casing clamps and tighten these screws securely.

Now, you may fit the complete upper plate (module) by means of its four screws. Before you tighten the screws, be sure the intermediate wheel pivot is in place in its jewel hole. Check the endshake of this wheel. *Do not turn the intermediate wheel for any reason.*

Replace the battery and its clamp and tighten its screw. Check the operation of the click mechanism by observing the click wheel and the action of the intermediate wheel, while the stem is pushed in all the way and a current is supplied by its own battery.

Using a timing machine, adjust the instantaneous rate. Close the case and recheck the instantaneous rate. Often, you will find there is a one-second difference (slower) when the case is closed. Therefore, when adjusting the instantaneous rate with the case open, allow for this difference. Altitude also affects the rate at one second fast for every 1500 feet above sea level.

Electronic Circuit Check

To check the watch's circuit and electrical efficiency, you need a volt, ohm, ammeter with an outside power source (range up to 2 volts). Ebauches S.A. sells an elaborate device (the Esametre-2) that meets all these requirements. It converts ordinary house

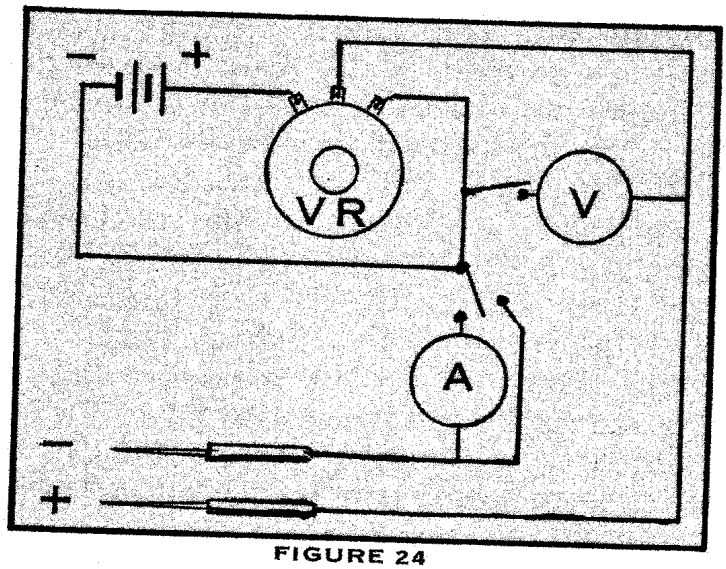


FIGURE 24

current to its needs. However, any reliable volt, ohm and ammeter combination with a 20K Ω per volt range can be used for most of these functions.

The schematic in Figure 24 shows a 3-volt source which is led into a variable resistor (rheostat). By manipulating this resistor in connection with the voltmeter, you can obtain the desired voltage. Simple switches, when turned, will feed this reduced, desired current directly to the leads or through the ammeter.

You can easily adapt a set-up such as this one to your available meter. The variable resistor is inexpensive and easy to hook up.

Radio supply stores also sell power suppliers that convert house current into DC current from 0 to 30 volts (such as the Eico 1020). This unit has its own built-in voltmeter that indicates the drain. With such an instrument, however, it is best to first connect the leads to a reliable voltmeter to arrive at the desired and true voltage.

1. Testing the Battery

You should test the battery while it is out of the watch. If it rates 1.35 volts, it is acceptable. If it tests less than 1.25 volts, replace it.

2. Measuring the Movement's Current Consumption

Remove the battery from the movement. To read the power consumption in microamperes (μA), connect the set-up so the ammeter's negative (-) lead (set to read microamps) is connected to the negative (-) lead of the energy source (1.35 volts). The ammeter's positive (+) lead should be connected to *Point 5*, shown in Figure 17. Then, connect the lead from the positive (+) terminal of the energy source to the movement plate — *Point 6* in Figure 17.

The needle will move suddenly to the far end of the meter, but will quickly settle back to a point on the meter which should not exceed 8.5 μA, regardless of the movement's position. With this set-up, the module resonators should become activated and the ammeter should register.

If this does not happen, try flipping the lower pin of the right fork tine. If the unit does not function, check the resonator for freedom. If the power consumption is more than 8.5 μA, also check the resonators and pawls for interference.

3. Resistance Check Between Points 1 and 4 in Figure 17.

This test is only applied when the Resistance and Condenser Unit 4245 is dismantled from the module. Its purpose is to see if there is a short circuit within this unit.

With the multimeter switched to read in the 20K Ω per volt range, contact the meter's black (-) lead to *Point 1*, Figure 17, and the red (+) lead to *Point 4*, Figure 17. If the meter's needle remains stationary at ∞, the insulation is good. If the needle moves even slightly, there is a partial or total short circuit between these points, and this unit must be changed.

4. Break Switch and Insulation Check

With the stem pulled out all the way, the contact between *Point 6*, Figure 17, and the break switch (movement plate) should be open. To test it, touch the red (+) lead of the meter (ohms) to the plate, and touch the black (-) lead to *Point 5*. If all is well, the needle should remain at ∞.

To test the insulation, when the module is separate from the movement, place a thin plastic shim between *Point 6* and the contact plate. If the meter prods are placed at the plate and at *Point 6*, the needle should remain motionless.

5. Checking the Break Switch

Place one lead of the ohmmeter at *Point 6*, Figure 17, and the other lead on the movement plate with the stem pushed in all the way. The needle should jump to the end of the scale if the contacts are good. If not, clean or adjust the contact blades of the breakswitch.

6. Checking the Complete Circuit (module alone)

With the meter reading 20K Ω or more per volt, place one prod of the meter at *Point 4*, Figure 17, and the other at *Point 6*. The result should be a reading of approximately 7K Ω. If it is below 5K Ω, or more than 10K Ω, the Resistance and Condenser Unit 4245 should be changed.

7. Checking the Resonator Circuit

Remove the battery. With the meter set to read microamperes, place the red (+) prod at *Point 6* and the black (-) prod at *Point 5*, Figure 17. Then, hold the tweezer or your fingernail at the pin on the lower end of the right resonator tine. Flip this to set the resonator vibrating. The meter's needle should move up to a reading of approximately 0.5 on the 0 to 20 μA scale. Excessive movement, or none at all, indicates a need to change the transistor unit 4240.

The main criterion of normal behavior is the oscillation of the resonator.

8. Testing the Efficiency of the Circuitry

Remove the battery. Using the outside power source, regulate the voltage to 1.35 volts. The movement battery current supply system shown in Figure 4 can be used here.

With the module in the movement holder shown in Figure 2B, attach the clip so its points make proper electrical contact. The other ends of the clip have lead wires to be attached to the variable voltage source.

Another method is to place the power source (+) prods at *Point 6*, Figure 17 (the plate), and the (-) prod at *Point 5*. The movement should start to resonate and the click wheel and intermediate wheel should begin to turn.

Observe this under magnification of a pivot loupe. Then you can lower the voltage. The movement should continue to run, even when the voltage reduced to 1.0 volt. Continue to watch the click wheel and intermediate wheel, and raise the voltage slowly until it reads 1.7 volts. The speed of the click and intermediate wheels should remain the same

Trouble Shooting

Numbers in parentheses refer to headings under the previous section, "Checking the electrical circuit." Follow the instructions in these paragraphs.

A-Complete Stoppage

1. Test battery (1). If the battery is below 1.25 volts, replace it.

2. When the battery is good, test the power consumption (2).

3. If the power consumption is abnormal, remove the module and conduct checks, following instruction (3). If the tests under (3) show abnormal behavior (∞), the resonator may not be free. Clean it and remove obstructions. Examine the resonator thoroughly.

4. If tests under (3) show normal function and the resonator is free, conduct the tests under (6).

5. If check under (3) suggests a short circuit, replace the unit.

B-Resonator Works/Hands Stop

1. Check the fitting of the hands. If hands appear to be at fault, open the case and remove the module. Take the movement from the case and adjust the hands. Replace movement and then the module.

2. When the hands are in order, check the battery (1). If it is acceptable, check (2).

3. If the reading is less than 4 μA in check (2), remove the module, check contacts, switch and junction plate and its insulator 4037 in Figure 17. Replace the faulty parts.

If checks (1) and (2) are good, examine the click pawl jewels under magnification. There may be a jewel missing from one of the click pawls. Replace the faulty parts.

4. If the test under (2) shows a reading of more than 9 μA, examine the clickwork. If it is dirty, remove both circuits and clean the module completely; dismantle the combined bridge 118, in Figure 15. Check and correct the tension of the clickwork with gage 4380. Oil and reassemble the parts to make final adjustments to the clickwork.

5. When the click jewels are good, check the tension of the clicks as shown in Figures 20 and 21. Adjust the tension.

Or the clicks may be out of engagement with the click wheel — they may have slipped above or below it.

6. Adjust the clickwork. This can be done when the module is separate from or assembled to the rest of the movement. To do this, apply an outside variable voltage. First, use the minimum 1.0 volt. Shift the adjusting screw (Figure 7) in either direction until the train runs continuously at normal speed. Then, raise the voltage to 1.7 volts. Finally, lower it to the normal 1.35 volts.

C-Only Second Hand Turns

1. Open the case, remove battery and module. Extract the movement from the case. Remove the dial and hands. Check the calendar mechanism. If it is faulty, correct or replace the parts at fault.

2. When the calendar is in order, clean the regulator part of the movement and reassemble it.

3. If the movement itself is clean, replace the third wheel. Its friction is insufficient to carry the dial train. **Do not try to adjust this friction — replace the wheel.**

D-Error of Rate

This watch can be timed directly on most modern timing machines, such as the Vibrograf 200, the Tickoprint TP46 or the Greiner.

1. If the instantaneous rate is good, but you find an error under actual wearing conditions: open the case, check the clickwork according to checks in B (4, 5, 6) above.

2. If the clickwork is satisfactory, remove the module. Clean and reassemble it, and adjust the rate.

3. If the instantaneous rate is more than 10 seconds slow a day: open the case, remove the battery, module and both units. Check the module and both units. Clean and oil them. Reassemble and check the rate.

4. If the rate is still poor after check in B-3, replace the resonator. After replacement, if the rate is still unchanged, replace the click wheel.

E-Faulty Calendar Works

1. Open the case, remove the module and then the movement.

2. If the hour wheel and the hour hand endshake are in order, check the calendar mechanism and replace the faulty parts.

F-Intermittent Stoppage

1. Open the case, remove the module and replace both units.

EBAUCHES S.A. NEUCHATEL

SUISSE

13‴ 9162

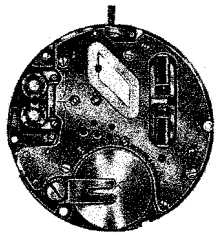
29.00 mm

Mouvement électronique à résonateur acoustique, seconde au centre, quantième à guichet, noyé dans la platine, avec correcteur par la tige de mise à l'heure

Electronic movement with acoustical resonator, sweep second, date showing through aperture in dial, countersunk in the plate, with corrector through hand-setting stem

Elektronisches Werk mit akustichem Resonator, Zentralsekunde, Datum sichtbar durch Fenster im Zifferblatt, im Werkboden versenkt, mit Korrektor durch Zeigerstellwelle

Cal. 9162



Caractéristiques techniques

Dimensions en mm

Cage:

Diamètre d'encageage	29.00
Diamètre total	29.40
Hauteur totale avec quantième	4.80
Hauteur du filet	1.30
Hauteur axe de tige	1.90

Résonateur:

Fréquence	300 Hz

Pile:

Diamètre	max.	11.60
Hauteur	max.	3.60
Force électro-motrice		1.35 V

Non magnétique

Aiguillage:

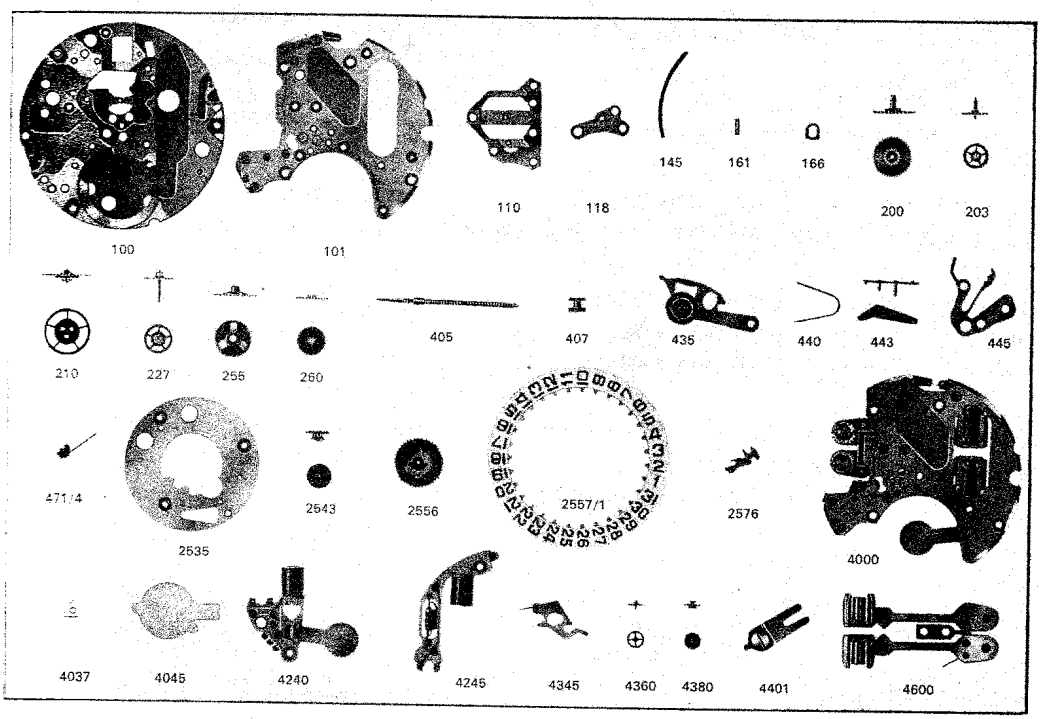
Diamètre ajustement d'aiguille de minute	0.90
Diamètre ajustement d'aiguille d'heure	1.50
Diamètre ajustement d'aiguille de seconde	0.25

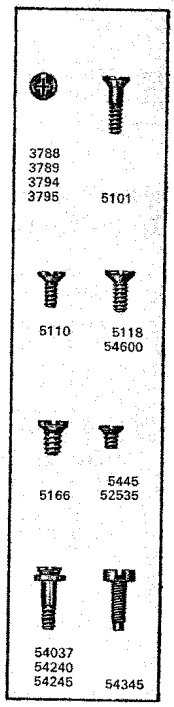
Tige de mise à l'heure:

Diamètre du filetage	1.00

Cadran:

Diamètre trous de pieds dans la platine	1.00





LISTE DES FOURNITURES	No.	LIST OF MATERIALS	Nr.	BESTANDTEILE
Platine	100	Plate	100	Werkplatte
Platine supérieure	101	Upper plate	101	Obere Werkplatte
Pont de rouage	110	Train wheel bridge	110	Räderwerkbrücke
Pont combiné	118	Combined bridge	118	Kombinierte Brücke
Support de cadran	145	Dial rest	145	Zifferblatt-Stütze
Tube de centre	161	Center pipe	161	Zentrumlagerrohr
Bride de fixation	166	Casing clamp	166	Werkbefestigungsbügel
Roue de centre, avec chaussée	200	Center wheel with cannon pinion	200	Minutenrad mit Minutenrohr
Roue intermédiaire	203	Intermediate wheel	203	Zwischenrad
Roue moyenne	210	Third wheel	210	Kleinbodenrad
Roue de seconde au centre	227	Sweep second wheel	227	Zentrumsekundenrad
Roue des heures	255	Hour wheel	255	Stundenrad
Roue de minuterie	260	Minute wheel	260	Wechselrad
Tige de mise à l'heure	405	Hand-setting stem	405	Zeigerstellwelle
Pignon coulant	407	Clutch wheel	407	Schiebetrieb
Bascule	435	Yoke	435	Wippe
Ressort de bascule	440	Yoke spring	440	Wippenfeder
Tirette	443	Setting lever	443	Stellhebel
Ressort de tirette	445	Setting lever spring	445	Stellhebelfeder
Ressort-friction de roue de seconde	471/4	Friction spring for sweep second wheel	471/4	Friktionsfeder für Sekundenrad
Plaque de maintien de l'indicateur de quantième	2535	Date indicator guard	2535	Halteplatte für Datumanzeiger
Roue intermédiaire de quantième	2543	Intermediate date wheel	2543	Datum-Zwischenrad
Roue entraineuse de l'indicateur de quantième	2556	Date indicator driving wheel	2556	Datumanzeiger-Mitnehmerrad
Indicateur de quantième, décalqué	2557/1	Date indicator, transferred	2557/1	Datumanzeiger mit Druckbild
Sautoir de quantième	2576	Date jumper	2576	Datumsperre
Chaton combiné, pour roue intermédiaire, dessus	3788	Combined in-setting, for intermediate wheel, upper	3788	Kombiniertes Steinfutter, für Zwischenrad, oben
Chaton combiné, pour roue intermédiaire, dessous	3789	Combined in-setting, for intermediate wheel, lower	3789	Kombiniertes Steinfutter, für Zwischenrad, unten
Chaton combiné, pour roue d'encliquetage, dessus	3794	Combined in-setting, for click wheel, upper	3794	Kombiniertes Steinfutter, für Schaltrad, oben
Chaton combiné, pour roue d'encliquetage, dessous	3795	Combined in-setting, for click wheel, lower	3795	Kombiniertes Steinfutter, für Schaltrad, unten
Module électronique	4000	Electronic module	4000	Elektronisches Modul
Plaquette de liaison, en 2 pièces	4037	Junction plate, in 2 pieces	4037	Verbindungsplättchen, in 2 Teilen
Isolateur de bride d'alimentation	4045	Insulator for power connection	4045	Isolator für Stromversorgungsbügel
Unité transistor	4240	Transistor unit	4240	Transistor Einheit
Unité résistance-condensateur	4245	Resistance and condenser unit	4245	Widerstand- und Kondensator Einheit
Support-correcteur du cliquet de retenue	4345	Corrector rest for stop click	4345	Korrektorträger für Rückhalte-Sperrkegel
Roue d'encliquetage, pivotée	4360	Click wheel, pivoted	4360	Schaltrad mit Trieb
Jauge de contrôle pour cliquets	4380	Control gauge for clicks	4380	Kontrollehre für Sperrkegeln
Bride-maintien de pile	4401	Fixing clamp for battery	4401	Befestigungsbügel für Batterie
Résonateur	4600	Resonator	4600	Resonator
Vis de platine supérieure	5101	Upper plate screw	5101	Schraube für obere Werkplatte
Vis de pont de rouage	5110	Train wheel bridge screw	5110	Räderwerkbrücken-Schraube
Vis de pont combiné	5118	Combined bridge screw	5118	Schraube für kombinierte Brücke
Vis de bride de fixation	5166	Casing clamp screw	5166	Werkbefestigungsbügel-Schraube
Vis de ressort de tirette	5445	Setting lever spring screw	5445	Stellhebelfeder-Schraube
Vis de plaque de maintien de l'indicateur de quantième	52535	Screw for date indicator guard	52535	Halteplatte-Schraube für Datumanzeiger
Vis de plaquette de liaison	54037	Junction plate screw	54037	Verbindungsplättchen-Schaube
Vis d'unité transistor	54240	Transistor unit screw	54240	Schraube für Transistor Einheit
Vis d'unité résistance-condensateur	54245	Screw for resistance and condenser unit	54245	Schraube für Widerstand- und Kondensator Einheit
Vis de support-correcteur du cliquet de retenue	54345	Screw for corrector rest for stop click	54345	Korrektorträger-Schraube für Rückhalte-Sperrkegel
Vis de résonateur	54600	Resonator screw	54600	Schraube für Resonator

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EBAUCHES S.A. NEUCHATEL

SUISSE

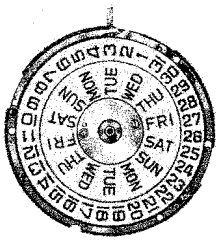
13‴ 9164

29.00 mm

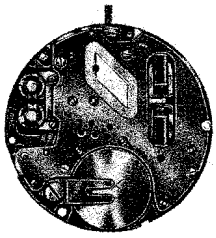
Mouvement électronique à résonateur acoustique, seconde au centre, quantième et jour à guichet, corrections par la tige de mise à l'heure

Electronic movement with acoustical resonator, sweep second, date and name of day showing through aperture in dial, corrections through hand-setting stem

Elektronisches Werk mit akustichem Resonator, Zentralsekunde, Datum und Tag sichtbar durch Fenster im Zifferblatt, Korrekturen durch Zeigerstellwelle



Cal. 9164



Caractéristiques techniques

Dimensions en mm

Cage:

Diamètre d'encageage		29.00
Diamètre total		29.40
Hauteur totale		5.55
Hauteur du filet avec calendrier		2.05
Hauteur axe de tige avec calendrier		2.65

Résonateur:

Fréquence		300 Hz

Pile:

Diamètre	max.	11.60
Hauteur	max.	3.60
Force électro-motrice		1.35 V
Non magnétique		

Aiguillage:

Diamètre ajustement d'aiguille de minute	0.90
Diamètre ajustement d'aiguille d'heure	1.50
Diamètre ajustement d'aiguille de seconde	0.25

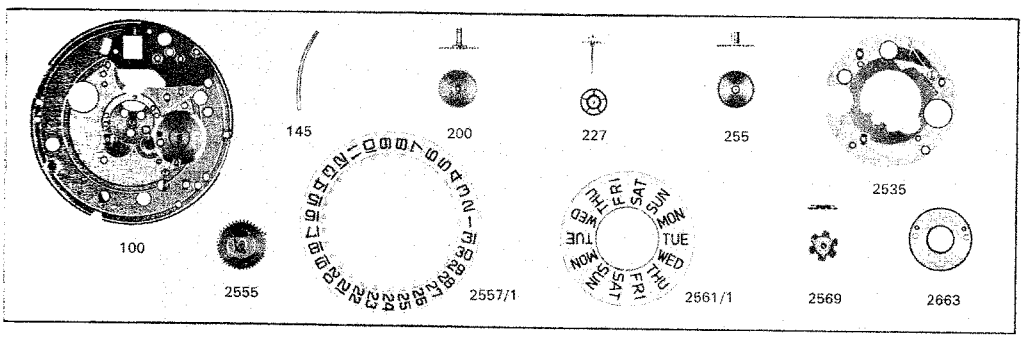
Tige de mise à l'heure:

Diamètre du filetage	1.00

Cadran:

Diamètre trous de pieds dans la platine	1.00

Fournitures particulières au mécanisme quantième et jour à guichet cal. 9164



Nr.	LISTE DES FOURNITURES	No.	LIST OF MATERIALS	Nr.	BESTANDTEILE
100	Platine	100	Plate	100	Werkplatte
145	Support de cadran	145	Dial rest	145	Zifferblatt-Stütze
200	Roue de centre, avec chaussée	200	Center wheel with cannon pinion	200	Minutenrad mit Minutenrohr
227	Roue de seconde au centre	227	Sweep second wheel	227	Zentrumsekundenrad
255	Roue des heures	255	Hour wheel	255	Stundenrad
2535	Plaque de maintien de l'indicateur de quantième	2535	Date indicator guard	2535	Halteplatte für Datumanzeiger
2555	Roue entraineuse du calendrier	2555	Calendar driving wheel	2555	Kalender-Mitnehmerrad
2557/1	Indicateur de quantième, décalqué	2557/1	Date indicator, transferred	2557/1	Datumanzeiger mit Druckbild
2561/1	Indicateur des jours, décalqué	2561/1	Day indicator, transferred	2561/1	Tagesanzeiger mit Druckbild
2569	Correcteur double	2569	Double corrector	2569	Doppelkorrektor
2663	Plaque de maintien de l'indicateur des jours	2663	Day indicator guard	2663	Halteplatte für Tagesanzeiger
52663	Vis de plaque de maintien de l'indicateur des jours	52663	Screw for date indicator guard	52663	Halteplatte-Schraube für Tagesanzeiger

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