TECHNICAL COMMUNICATION 35

Electronic movement with quartz-crystal resonator, frequency 32'768 Hz (2^{15} Hz).
Analog display of hours and minutes.
Digital display of seconds and date or hours and minutes by means of liquid crystals with field effect (4 digits).
Display of month in the « correction » mode.
Device for independent correction of month, date, hours and minutes with stop and resetting of seconds to zero.

Cal. 900.231 : Chronograph with digital display of minutes and seconds up to 59 min 59 s and then of hours and minutes up to 23 h 59 min.
Possibility of reading seconds and date or hours and minutes while the counter is in operation.

Cal. 900.911 : Electronic alarm device with rhythmical signal.
Device for correcting the alarm time and verifying the functions.

EEM

			
	4.50 on battery clamp	4.50 on battery clamp 5.30 on buzzer	H mm
	900.231	**900.911**	

EBAUCHES SA
CH - 2001 NEUCHATEL SWITZERLAND

1.1. Funtions : reading and corrections ESA 900.231

= no point : seconds and date

= one flashing point :
second time zone display

= two non-flashing points :
chrono stopped

= two flashing points :
chrono started

READING

By pressing button **A**, we pass from the indications of the seconds and the date to the indications of the hours and the minutes (Home Time, i.e. : second Time Zone and vice versa up to 23 h 59 min.

By pressing **B**, the stopwatch indication appears on the display. If the chrono is counting press **A** and **B** once to reset 00.00.

By pressing **A**, the counting operation starts from the right side of the screen and the seconds add up ; the 2 points flash.

The minutes add up on the left side of the screen.

From 59 minutes 59 secs onwards, the stop watch will indicate hours and minutes, up to 23 h 59 min.

By pressing button **B** you can change over from reading the stop watch Time to reading the watch Time (Home Time i.e.: second Time Zone) without losing either. This operation can be repeated both ways without any limitation.

By pressing **A** again, the counting operation is stopped, the 2 points stop flashing.

By pressing **B**, the counter is reset to 00.00 and by pressing **B** again, it is possible to return to either the seconds and the date or the hours and the minutes (Home Time) and vice versa.

CORRECTION OF THE INDICATIONS

Correction of the Time (Hands)

By pulling out the setting-crown, it is possible to change the position of the hands either in one or in the other direction.

This operation does not affect the functions of the LCD cell.

Correction of the month

By pressing **A** + **B** simultaneously, the indication of the month flashes on the screen.

Corrections can be made by pressing **A**.

Automatic return to the initial display after a waiting time of approximately 12 seconds.

Correction of the date

By pressing **B** again, the indication of the date flashes on the right side of the screen.

By pressing button **A**, the date can be advanced.

Automatic return to the initial display after a waiting time of approximately 12 seconds.

Your watch is provided with a memory and the date has to be corrected only every 4 years in February (leap years).

Correction of the hour

(Home Time i.e.: second Time Zone)

By pressing **B** again, the indication of the hour will flash on the left side of the screen.

The hours can be advanced by pressing **A**.

Automatic return to the initial display after a waiting time of approximately 12 seconds.

Correction of the minutes

(Home Time i.e.: second Time Zone)

By pressing **B** again, indication of the minutes will flash on the right side of the screen.

The minutes can be advanced by pressing button **A**.

Synchronization of the watch

A correction of the minutes (LCD) stops the watch and resets the seconds to 00.

The point remains fixed ; it is then possible to correct the position of the hands.

The corrected minute indication flashes on the screen.

Press **B** simultaneously with the transmission of a precise time-signal and your watch will be perfectly synchronized.

NOTE :

After having changed the battery make sure that all settings are cycled through zero and one. This operation reprograms your watch. Correct the settings.

1.2. Functions : reading and corrections ESA 900.911

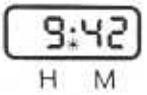
READING YOUR WATCH

Permanent display of H-M by hands and dial.

DIGITAL DISPLAY

Seconds-Date :

upper dot activated : alarm set
upper dot deactivated : alarm unset



Hours-Minutes :

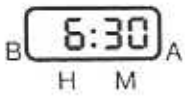
Second Time Zone, or Home Time
upper dot activated ; alarm set.

Hours-Minutes of the alarm time.

CHECKING THE ALARM TIME

PRESS B ONCE.

THE DISPLAY STARTS FLASHING :
The alarm is set.



THE DISPLAY REMAINS IN FIXED MODE :
The alarm is unset.

PRESS A ONCE
to set or unset the alarm.

TO CHECK THE ACOUSTIC TRANSDUCER :
Press A for more than 2 seconds.

NOTE :
The alarm time is synchronized with the digital display only.

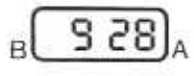
CORRECTION OF THE ANALOG DISPLAY

PULL STEM TO CORRECT THE HANDS SETTING.

NOTE :
The watch will not stop and the digital display will not be affected.

CORRECTION OF THE DIGITAL DISPLAY

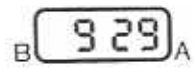
Correction of month settings



Pressing **A** + **B** simultaneously, puts the modul into the correction mode. The months display starts flashing.
Use **A** to correct the setting.

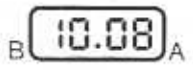
NOTE :
The modul will return to its initial mode after about 12 seconds.

Correction of date setting



Pressing **B** will start flashing of the date display.
Use **A** to correct the setting.

NOTE :
The modul will return to its initial mode after about 12 seconds.
Your watch features a programmed memory. The date therefore needs to be corrected once only every 4 years (leap year).



CORRECTION OF THE SECOND TIME ZONE (OR HOME TIME)

Hours Setting
Pressing **B** again will start flashing of the hours display.
Press **A** to advance the setting.

NOTE :
The modul will return into its initial mode after about 12 seconds.

Minutes Setting

A third pressure on **B** will start flashing of the minutes display.
Press **A** to advance the setting.

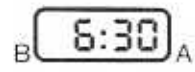
SYNCHRONIZATION OF YOUR WATCH

NOTE :
When correcting the minutes the watch will stop and the seconds will reset (00). The lower dot is activated.

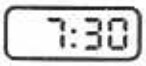
Provide an accurate time source and set the hands to the upcoming minute. When setting and signal coincide press **B**. This will put your watch on time.

SETTING OF ALARM TIME

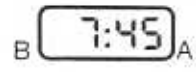
Press B once.
The last alarm time registered appears on the display and starts flashing.
Press **A** + **B** simultaneously for more than 2 seconds. This will put the modul into correction mode. An acoustical signal tells you that you are setting the alarm time.
Use **A** to advance the setting.



NOTE :
The module will return to its initial mode after about 12 seconds. The alarm is unset.

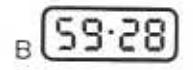


Press **B** twice to select the minutes setting of the alarm time. The minutes display will start flashing.
Use **A** to set the minutes.



NOTE :
The module will return to its initial mode after about 12 seconds. The alarm is unset.

Press A to set the alarm.



B is used to put the modul in one of the watch modes :
seconds-date / hours-minutes / second time zone.

Alarm Cut-Off

The alarm signal stops automatically after 60 seconds, or immediately if **A** or **B** is pressed. Reset the alarm.

To Check the Acoustic Signal

Press **A** more than 2 seconds.
The alarm check does not affect the alarm settings.

NOTE :
After having changed the battery make sure that all settings are cycled through zero and one. This operation reprograms your watch. Correct the settings.

2. Power supply

NOTE : We cannot accept responsibility for damage or extra work due to faulty batteries.

If the battery is run down, it is advisable to remove it from the watch.

2.1. Suitable batteries

	Brand	Cal. 900.231 LOW-DRAIN battery		Cal. 900.911 HIGH-DRAIN battery	
		Type	Capacity in mAh	Type	Capacity in mAh
One 1.55-volt battery	UNION CARBIDE	344	100	—	—
total diameter 11.60 mm	RAY — O — VAC	RW 36	120	—	—
total height 3.60 mm	RENATA	12	90	14	92
	VARTAchron	529	90	549	100
or any other battery of similar type					

2.2. Changing the battery

Press inside the disengagement hole of the bridle +, close to the coil, and turn the bridle towards the inside of the movement. Disengage the bridle and take out the battery.

CHECK the contact points of the bridles to make sure that they are clean.

Using a pair of plastic tweezers, insert a fresh and tested battery into its recess, with the + sign facing upwards. Slip the notched side parallel to the axis of the bridle onto the shoulder of the screw on the side facing the electronic module.

Hold the bridle in position and turn it outwards on the coil side until it catches on the shoulder of the bridle screw.

IMPORTANT : When the battery is being replaced, it is necessary to make the counters pass through **0** or **1**, so that the logic of the integrated circuit can resume a correct working state.

3. Regulation of the instantaneous rate

Recommended apparatus :

with an inductive pick-up or a special microphone for 32 kHz and with a guaranteed precision of .02 s/d.

Regulation

The instantaneous rate must be corrected within the narrowest possible limits, between ± .5 s/d, by turning the frequency-corrector with an insulated screwdriver.

The temperature of the room in which the measurement is made should be between 20 and 25° C.

IMPORTANT : During the process of regulation, the axial pressure exerted on the frequency-corrector should not exceed .3 kp (3 N).

4. Measurement of power consumption Fig. 1

This measurement is upset by the fact that the current impulse takes place every 5 seconds.

Between the impulses, the power consumption of the module should be $\leq$ 3 µA.

The power consumption of the motor is known and invariable, $\leq$ 1 µA.

It is sufficient to add this to the power consumption of the module to obtain the total consumption, $\leq$ 4 µA.

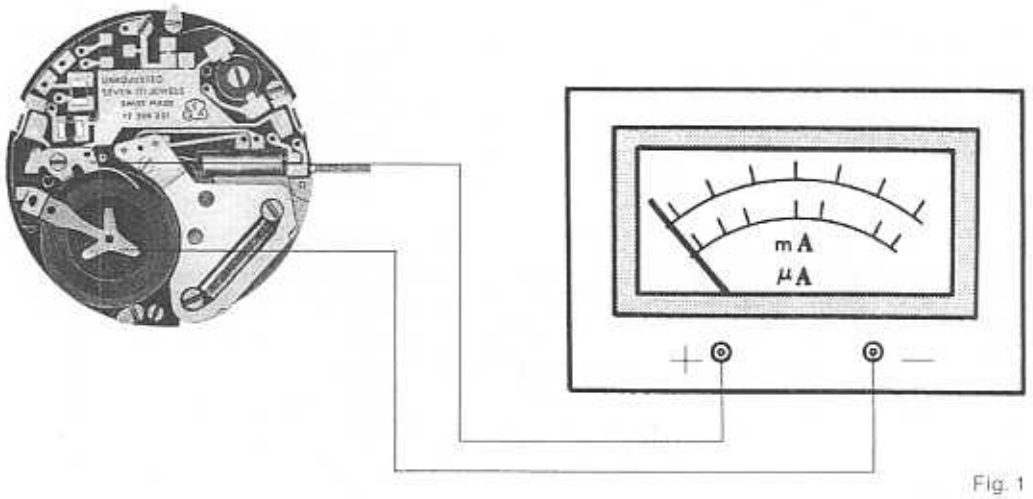


Fig. 1

5. Electrical tests Fig. 2

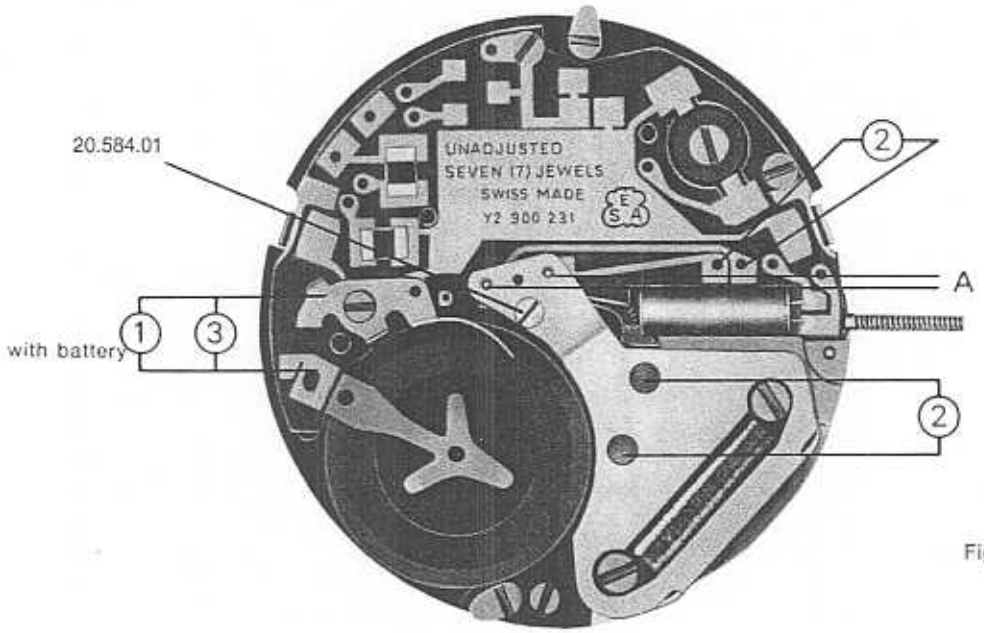


Fig. 2

Position	Multimeter scale	Measurement	Test	Remarks
1	2 V	1.55 V	Voltage of battery	Measurement with battery
2	1 V	The needle is given + and — impulses successively, every 5 sec.	Impulses on coil terminals	Measurement with battery
2	10 kΩ	1.7 to 2.1 kΩ	Resistance of coil	Measurement without battery
3	10 μA	$\leq$ 3 μA	Power consumed by electronic module	Measurement without battery, with external 1.55-volt supply. IMPORTANT : Loosen the screw of the upper magnetic screen 20.584.01 and slip an insulator between the coil circuit and the electronic module, at points A
3	10 μA	$\leq$ 4 μA	Total power consumption of the movement	Measurement without battery, with external 1.55-volt supply. Duration of measurement $\geq$ 5 sec. Measurement inaccurate owing to instability of multimeter needle.
3	2 V	$\leq$ 1,35 V	Lower limit of working voltage	Measurement without battery, with variable external supply.

2. Power supply

NOTE : We cannot accept responsibility for damage or extra work due to faulty batteries.

If the battery is run down, it is advisable to remove it from the watch.

2.1. Suitable batteries

	Brand	Cal. 900.231 LOW-DRAIN battery		Cal. 900.911 HIGH-DRAIN battery	
		Type	Capacity in mAh	Type	Capacity in mAh
One 1.55-volt battery	UNION CARBIDE	344	100	—	—
total diameter 11.60 mm	RAY — O — VAC	RW 36	120	—	—
total height 3.60 mm	RENATA	12	90	14	92
	VARTAchron	529	90	549	100
or any other battery of similar type					

2.2. Changing the battery

Press inside the disengagement hole of the bridle +, close to the coil, and turn the bridle towards the inside of the movement. Disengage the bridle and take out the battery.

CHECK the contact points of the bridles to make sure that they are clean.

Using a pair of plastic tweezers, insert a fresh and tested battery into its recess, with the + sign facing upwards. Slip the notched side parallel to the axis of the bridle onto the shoulder of the screw on the side facing the electronic module.

Hold the bridle in position and turn it outwards on the coil side until it catches on the shoulder of the bridle screw.

IMPORTANT : When the battery is being replaced, it is necessary to make the counters pass through **0** or **1**, so that the logic of the integrated circuit can resume a correct working state.

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The power consumption of the motor is known and invariable, $\leq$ 1 µA.

It is sufficient to add this to the power consumption of the module to obtain the total consumption, $\leq$ 4 µA.

6. Work with solders

6.1. Soldering operation

Soldering iron

Characteristics : Power 6 to 12 W, or greater in the case of temperature-controlled irons.

Supply voltage : Low voltage, 6 to 12 V. It is not advisable to use an iron that is directly connected to the mains supply : this is dangerous both for the operator and for the electronic elements.

Solder with incorporated flux

Recommended alloy : 60/40 tin/lead. Commencement of fusion at 180° C, complete fusion at 190° C.

Recommended alloy for ceramic soldering : 60/38 + 2 % silver.

Ø .5 to .7 mm. Veins of flux 2 to 5.

Proportion of flux : 1.5 to 3 %.

Procedure :

The soldering iron should be used for heating, and not for carrying solder. The flux should come into contact with the workpieces that are to be soldered at the precise instant when the added metal starts to melt. The best method consists in pressing the end of the peen upon the part that is to be soldered, and then bringing the wire of pickling solder into contact with the peen and the workpiece simultaneously. The heat transmission from the peen to the workpiece is at once improved, thanks to the presence of the molten solder. The workpiece is quickly brought to the appropriate temperature. Soldering is done in the least possible time. Use a wig for unsoldering.

Soldering operations can be carried out directly upon the assembled movement, provided that the battery has been removed beforehand.

Perfect cleanliness is indispensable.

6.2. Replacing the frequency-corrector 40.660

— Remove the battery (see § 2).

— Unsolder the lugs of the faulty corrector and take out the remaining solder by means of a wig.

CAUTION : The temperature of the soldering iron should be between 340 and 380° C.

— Fit the new frequency-corrector in position and solder the lugs (the + lug on the side further away from the resonator, see fig. 3).

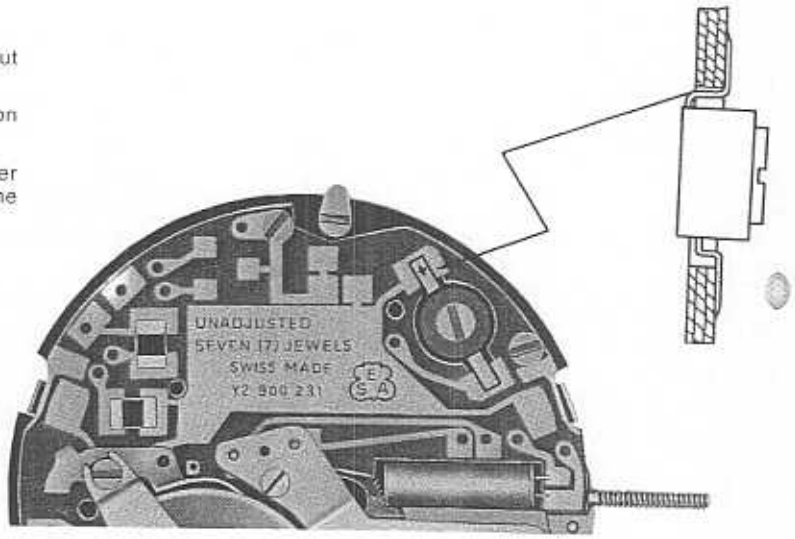


Fig. 3

6.3. Replacing the resonator 40.510

— Remove the battery (see § 2).

— Unsolder and unglue the resonator ; remove any excess glue.

— Solder and glue on the new resonator, using a two-component glue of the epoxy type (Scotch Cast N° 9 of 3M, RTW 3145).

7. Lubrication

Moebius 9010

ETA G 25
Moebius 8200

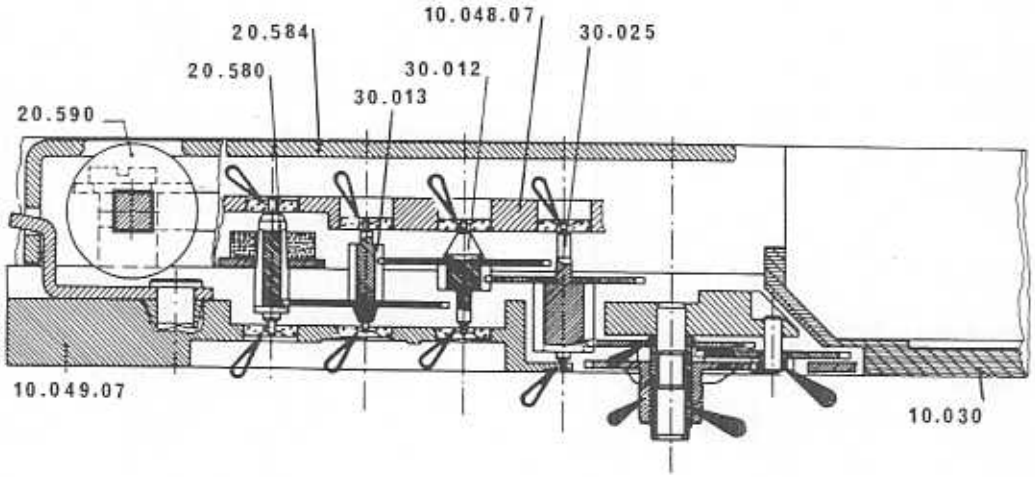


Fig. 4

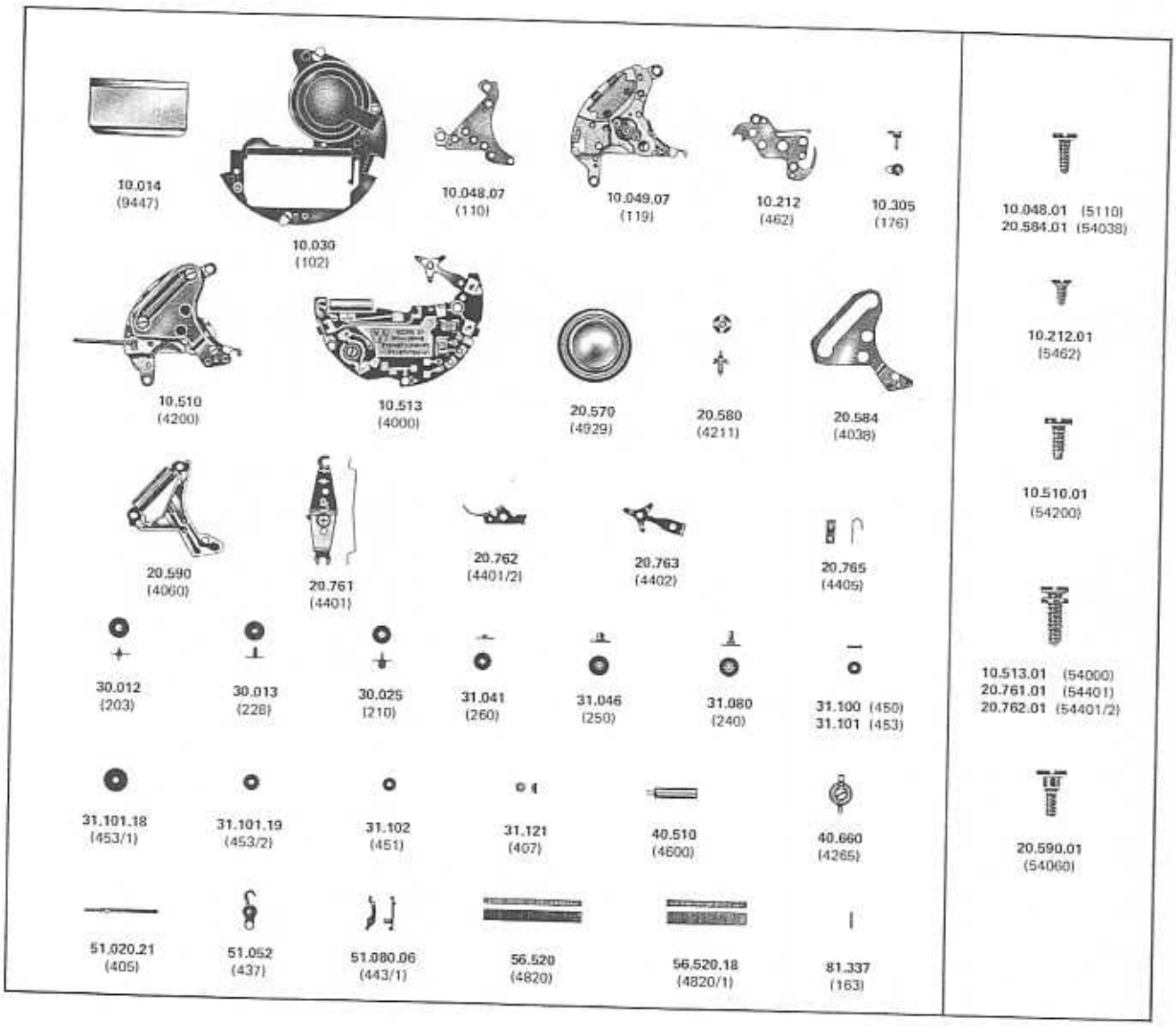
8. Sequence of dismantling operations (component Nos : see § 10)

No	Operation	Remarks
1	**Recommendations** — Always remove the battery before working on the movement. — The screws must be taken out of the movement framework 10.030 with particular care and only with a hand screwdriver. — When the coil 20.590 is removed, avoid turning the hand-setting stem, otherwise the motion work may be damaged. — When using a universal movement-holder, avoid clamping the movement too tightly, otherwise the plastic framework may be damaged.	
2	**Removing the case and the hand-setting stem** **Set the stem to the hand-setting position,** press the setting-lever stud and extract the stem.	
3	**Electronic module**	
3.1	Remove the bridle + 20.761 and the battery 20.570.	
3.2	Remove the upper magnetic screen 20.584 and its screw 20.584.01.	§ 2.2
3.3	Remove the coil 20.590 carefully, as well as its two screws 20.590.01.	•
3.4	Remove the special bridle + 20.762 and its screw 20.762.01.	
3.5	Remove the electronic module 10.513 and its two screws 10.513.01. Remove the connector 20.780 and its screw 20.780.01, the electronic module 10.513 and one screw 10.513.01.	Cal. 900.231 Cal. 900.911
3.6	Remove the two connectors 56.520 and 56.520.18.	
3.7	Remove the display module 10.014 ; disengage it on the spring side of the framework with plastic tweezers.	
4	**Motor module**	
4.1	On the bridge side, remove the train-wheel bridge 10.048.07 and its two screws 10.048.01, remove the rotor 20.580 from the train-wheel bridge 10.048.07.	
4.2	Remove the intermediate wheel 30.012, the transmission-wheel for intermediate wheel 30.013 and the third wheel 30.025.	
4.3	On the dial side, remove the minute-train cover 10.212 and its two screws 10.212.01.	
4.4	Remove the minute wheel 31.041 and the cannon pinion 31.080.	
4.5	Remove the intermediate setting wheels Nos 2 and 3, 31.101.18 and 31.101.19, and the motionwork setting wheel 31.102.	
4.6	Remove the setting wheel 31.100 and the intermediate setting wheel 31.101 from the rocking bar 51.052.	
4.7	Remove the rocking bar 51.052 and the setting lever 51.080.06.	
4.8	Remove the hand-setting stem 51.020.21 and the sliding pinion 31.121.	
5	**Separating the motor and electronic modules, 10.510 and 10.513**	
5.1	Take out the three motor-module screws 10.510.01 and separate the movement framework 10.030 from the lower train-wheel bridge 10.049.07.	
•	**Note :** The motor module 10.510 and the electronic module 10.513 may be separated after operation 3.2, if desired.	
6	**Cleaning** — Only the motor module 10.510 may be cleaned is an ordinary ultrasonic bath, and then **only if the coil 20.590 has been removed.** — Clean the pivots of the rotor 20.580 with elder-pith soaked in alcohol. — With cleaning paste, remove any particles of metal that may be adhering to the permanent magnet of the rotor. — If necessary, dry-clean the other components with a fine brush or an air-jet.	

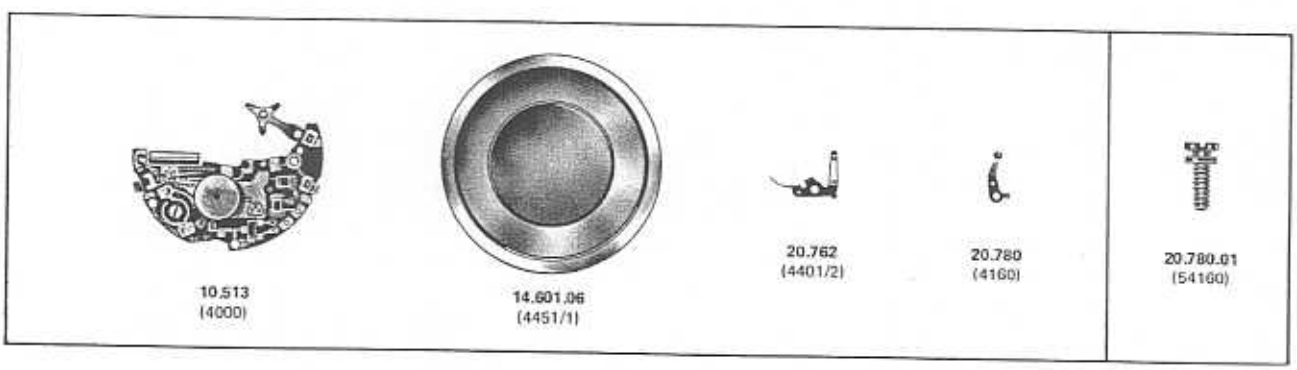
9. Sequence of assembly operations (component N°s : see § 10)

No	Operation	Remarks
1	**Recommendations** — The screws must be driven perfectly straight into the movement framework 10.030 with particular care and with a hand screwdriver only. They should not be driven too tight. — When the coil 20.590 is removed, avoid turning the hand-setting stem, otherwise the motion work may be damaged. — When using a universal movement-holder, avoid clamping the movement too tightly, otherwise the plastic framework may be damaged.	
3	**Motor module**	
2.1	Assemble the lower train-wheel bridge 10.049.07 and the movement framework 10.030 by means of the three motor-module screws 10.510.01 (see point 1).	
2.2	Clean the permanent magnet of the rotor and place the rotor 20.580 in the stator on the train-wheel bridge 10.048.07.	§ 8.6
2.3	On the lower train-wheel bridge 10.049.07, fit the transmission-wheel for intermediate wheel 30.013 (pinion upwards), the third wheel 30.025 and the intermediate wheel 30.012 (pinions downwards).	Fig. 4
2.4	Fit the train-wheel bridge 10.048.07 and its two screws 10.048.01.	Fig. 4
2.5	CHECK : verify the endshake of the arbors.	Fig. 4
2.6	LUBRICATION : top and bottom pivots of the train and rotor.	
2.7	On the dial side, fit the hand-setting stem 51.020.21 and the sliding pinion 31.121, with the boss of the pinion turned towards the center of the movement.	§ 7
2.8	Fit the setting lever 51.080.06, the rocking bar 51.052, engaged on the setting lever.	
2.9	LUBRICATION : pivots of the five setting wheels, the minute wheel, the cannon pinion and the functional points of the hand-setting mechanism.	
2.10	Fit the setting wheel 31.100 and then, in order of gearing, intermediate setting wheels N°s 1, 2 and 3, 31.101, 31.101.18, 31.101.19, the motion-work setting wheel 31.102, the cannon pinion 31.080 and the minute wheel 31.041.	§ 7
2.11	Fit the minute-train cover 10.212 and its two screws 10.212.01.	
2.12	LUBRICATION : setting-lever jumper. CAUTION : Do not turn the hand-setting stem.	§ 7
3	**Electronic module**	
3.1	Fit the display module 10.014 with the metallized part on the side further away from the maintaining spring ; make sure that it is engaged sideways by the maintaining spring.	
3.2	Fit the connectors 56.520 and 56.520.18, the short connector on the beveled side of the case. CAUTION : Replace the connectors if they are bent.	
3.3	Fit the electronic module 10.513, its two screws 10.513.01, the special bridle + 20.762 and its screw 20.762.01.	Cal. 900.231
	Fit the electronic module 10.513 and one screw 10.513.01, the special bridle + 20.762 and its screw 20.762.01, the connector 20.780 and its screw 20.780.01.	Cal. 900.911
3.4	Fit the coil 20.590 and its two screws 20.590.01. CAUTION : Take care not to damage the wires of the coil.	
3.5	Fit the upper magnetic screen 20.584 and its screw 20.584.01.	
3.6	CHECK : working of hand-setting mechanism and free action of the train of setting wheels.	
4	**Checking the movement and fitting the battery**	
4.1	Check the coil resistance : 1.75 to 2.1 kΩ.	§ 5
4.2	Check the power consumption of the electronic module : $\leq$ 3 µA.	§ 4 - 5
4.3	Check the total power consumption of the movement : $\leq$ 4 µA.	§ 4 - 5
4.4	Check the lower limit of working voltage : $\leq$ 1.35 V.	§ 5
4.5	Check the appearance and voltage of the battery : 1.55 V.	§ 2 - 5
4.6	Fit the battery 20.570 and the bridle + 20.761.	§ 2.2
4.7	Check the lighting of all the segments and the functions of the display module.	§ 1
4.8	Regulate the instantaneous rate : ± .5 s/d.	§ 3
5	**Casing**	
5.1	Fit the hour wheel 31.046.	
5.2	Press the dial in position ; its feet are held by clamping tubes. CHECK : endshake of hour wheel : .02 to .06 mm. A light spacing washer, N° 2 ½, .02 mm thick, may be used. It should not be doubled on any account.	
5.3	Fit the hands by means of broaches, resting the movement upon a movement-holder.	
5.4	Case up the movement, holding it by the mainplate fasteners or by the casing ring. CAUTION : avoid allowing chips or filings to drop into the movement.	
5.5	CHECK : hand-setting and push-piece functions.	§ 1
6	**Final checking of instantaneous rate with the case back closed.**	§ 3

Parts of caliber 900.231



Particular parts for caliber 900.911



No	Old numero	LIST OF COMPONENTS
10.014	9447	Display module
10.030	102	Movement framework
10.048.07	110	Train-wheel bridge, jewelled
10.049.07	119	Lower train-wheel bridge, jewelled
10.212	462	Minute-train cover
10.305	176	Main-plate fastener
10.510	4200	Motor module
10.513	4000	Electronic module
14.601.06	4451/1	Buzzer, assembled
20.570	4929	Battery
20.580	4211	Rotor
20.584	4038	Upper magnetic screen
20.590	4060	Coil
20.761	4401	Bridle +
20.762	4401/2	Special bridle +
20.763	4402	Bridle —
20.765	4405	Contact bridle, for push-piece
20.780	4160	Connection
30.012	203	Intermediate wheel
30.013	228	Transmission-wheel for intermediate wheel
30.025	210	Third wheel
31.041	260	Minute wheel
31.046	250	Hour wheel
31.080	240	Driver cannon pinion
31.100	450	Setting wheel
31.101	453	Intermediate setting wheel
31.101.18	453/1	Intermediate setting wheel Nº 2
31.101.19	453/2	Intermediate setting wheel Nº 3
31.102	451	Motion-work setting wheel
31.121	407	Sliding pinion
40.510	4600	Resonator
40.660	4265	Frequency-corrector
51.020.21	405	Hand-setting stem, thread diameter .90 mm
51.052	437	Rocking bar
51.080.06	443/1	Setting lever, assembled
56.520	4820	Connector, long
56.520.18	4820/1	Connector, short
81.337	163	Cannon-pinion stud
10.048.01	5110	Screw for train-wheel bridge
10.212.01	5462	Screw for minute-train cover
10.510.01	54200	Screw for motor module
10.513.01	54000	Screw for electronic module
20.584.01	54038	Screw for upper magnetic screen
20.590.01	54060	Coil screw
20.761.01	54401	Screw for bridle +
20.762.01	54401/2	Screw for special bridle +
20.780.01	54160	Screw for connection

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