How to Assemble and Use the Supplement

Double-foliot Japanese Clock

Assembly time: Approx. 1 hour and 30 minutes

Parts in the Kit

- Front plate
- Middle plate
- Back plate
- Pillar for foliots
- Winding knob
- Mainspring case
- Receiver plate for foliots (transparent brown)
- Foliots
- Clock hand
- Mainspring shaft stopper
- Cam
- String guard
- Verge stopper
- String
- Switch contacts (black) (red)
- Pan head screws (3)
- Switch base
- Mainspring shaft
- Second wheel for speed adjustment
- Clock hand
- Click
- Ratchet pawl
- Shaft
- Flat head screws (27)
- Washer head screws (3)
- Shaft spring
- Cam spring

* Any leftover screws are to be used as spares.

* Lubricant oil has been applied to the mainspring. There may be some lubricating oil dripping out of the shaft openings or other places. If so, be sure to wipe it away before proceeding with the assembly of this kit.

Things you will need

- Screwdriver, scissors, and lubricating oil

CAUTION

Take necessary caution when handling parts with pointed edges. There is a risk of injury.

This kit includes screws and other small parts. Be careful not to swallow them. There is a risk of suffocation.

Do not apply too much force when assembling the inner parts of the clock. There is a risk of damage as they are precision devices.

Keep this kit out of the reach of small children when not in use.

* Please read the instructions and cautions thoroughly before use.

* For your safety, be sure to follow the instructions in this manual.

In addition, do not use any parts that have become damaged or deformed during use.

Notes for tightening screws

When tightening screws, firmly press the screwdriver straight against the screw and turn. It is said that 70 percent of the force applied is used for pushing against the screw and 30 percent for turning it. The types of screws used for the supplement are those that carve grooves into the plastic as they are inserted (self-threading). For this reason, the screw hole may be damaged if you exert too much force when tightening the screw. Precision screwdrivers are hard to turn, so use a small screwdriver with a grip diameter of about 2 cm.

Materials used in this kit

- Front plate, middle plate, back plate, pillar for foliots, winding knob, mainspring case, receiver plate for foliots (transparent brown), foliots, clock hand, mainspring shaft stopper, cam, string guard, verge stopper, switch base, and weight frame (black): ABS
- Each of the wheels, click, ratchet pawl, ends of the foliots, verge bearings, and mainspring bearings (black): POM
- Escape wheel (black): PC; String: Polyester; Screws: Iron (colored black); Wires: Copper
- Each type of shaft, springs, mainspring, and switch contacts: Iron (nickel-plated)

* Please dispose of this product in accordance with local regulations.
Assembling the Body

[1] Assemble the mainspring unit
1. Assemble the cam, and attach it to the middle plate
Align the protrusion and hole on the cam receiver up with the hole and protrusion on the cam, and fit them together.

2. Assemble the first wheel
Attach the click to the first wheel. Turn the click to fix it into place.

3. Fit the mainspring and wheels together
Set the first wheel onto the mainspring with the side on which the click was attached in Step 2 facing down.
Attach the second wheel for speed adjustment to the metal shaft on the side of the mainspring. Turn the second wheel to ensure that it is engaged with the first wheel.

How to attach a leaf spring for linking to the Japanino 8-bit microcomputer of Supplement No. 27
* If you are not planning to use the Japanino, proceed to [2].

Assembling the switch
1. Insert screw threads into the switch base using two pan head screws
After screwing the pan head screws in as shown in the picture, unscrew them.

2. Attach the switch contacts
Being careful about the positions of the protrusions of the screw holes on the switch base, arrange the black switch contact and red switch contact as shown in the picture, and affix each one with a pan head screw.

4. Attach the middle plate
Line the middle plate up with the screw holes on the mainspring as shown in the figure below. Set the middle plate onto the mainspring, but do not screw it into place.

CAUTION  If it looks like the ends of the switch contacts may touch each other, adjust the distance between them with your fingers so that they are apart.

3. Attach the switch to the middle plate
Attach the assembled switch to the switch backing on the middle plate with the red switch contact facing up. Line the hole on the protrusion on the switch base up with the screw hole on the switch backing, and affix the switch with one pan head screw.

Pan head screw
Switch contact (red)
Middle plate
Switch contact (black)
2. Attach the second wheel

With the mark on the second wheel facing up, slide the second wheel onto the shaft in the center of the center plate and adjust it so that the mark is facing the cutout on the center wheel.

3. Attach the front plate

With the clock face on the front plate facing down, and affix the mainspring with three flat head screws.

4. Affix the mainspring

Being careful not to pull the mainspring loose, set the front plate with the clock face facing down, and affix the mainspring with two flat head screws.

5. Attach the ratchet pawl

Assemble the ratchet pawl and shaft together, and attach them to the middle plate.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Flat head screws</th>
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6. Assemble the foliot unit

1. Cut screw threads into the pillar for the foliota.

Using two washer head screws, cut screw threads into the pillar for the foliota in advance. After screwing in the screws, unscrew them.

| Washer head screws |

2. Assemble the foliot for the night hours

Line the teeth for the foliot for the night hours up with the keyhole on the receiver plate for the foliot for the night hours (smaller one), and insert the verge into the hole. The top and bottom teeth are placed on the verge at differing angles, so turn the verge where necessary to slide the teeth through the keyhole.

| Foliot for the night hours |

3. Assemble the foliot for the day hours

As in step 2 above, assemble the foliota and the receiver plates, and affix the verge stopper for each with two flat head screws.

| Vige stopper |

4. Apply lubricant to the escape wheel

Apply a small amount of lubricant to the shafts on the escape wheel (on both sides).

| Oil on the shafts with a tissue |

5. Place the wheels on the foliot unit for the day hours

Set the escape wheel and third wheel on the foliot unit with the verge stopper on the foliot for the day hours facing down. Arrange the escape wheel so that the side with the mark is facing down.

| Escape wheel |

Remove the shaft onto which you temporarily placed parts.
6. Put the foliot unit for the day hours and the foliot unit for the night hours together
Place the foliot unit for the night hours on the foliot unit for the day hours on which the escape wheel and third wheel have been set so that the verge stopper of the foliot unit for the night hours is facing up. Secure only the bottom right of the foliot receiver plates with a screw. Do not screw in screws anywhere else.

7. Attach the pillar for the foliots
For both the foliot for the day hours and the foliot for the night hours, adjust the teeth on the ends so that they are resting against the escape wheel. Being careful to not move either foliot, insert the pillar for the foliots so that it is sandwiched between the two foliot units, and screw it down in the places shown in the diagram.

8. Attach the string to the foliots
Cut the string provided in half to get two pieces.
1) Pass the strings through the hole on the side of the top of the foliot, one for the foliot for the day hours and one for the foliot for the night hours.
2) Gather the two ends of each string together, pass them through from the side with the cutout on the protrusion on the string guard, and then pull them through the hole and along the notch in the end of the string guard.
3) Line the wide hole on the screw guard up with the screw hole on the pillar for the foliots for both the foliot for the day hours and the foliot for the night hours. Orient the screw hole so that it is in the center of the wide hole, and fit the wide hole into place with a washer head screw.
4) Tie a knot in each string as to lightly push the foliots downward. Pass the ends of the string around the bottom of the protrusion, and then firmly knot the string on the top side.

9. Adjust the height of the foliots
Loosen the washer head screw and adjust the string guard up or down so that the bottom end of the Verges (for daylight) are suspended about 1 mm above the ratchet pawl when lying sideways.

[Image]

Completed
Adjusting the Japanese Clock

[1] Adjust the mechanism for switching between foliots

Before making adjustments, let’s learn about the relationship between the positions of the foliots and the clock hand. For a double-foliot Japanese clock that’s adjusted correctly, the foliot for the day hours will move when the clock hand is traveling across the top half of the clock face, and the foliot for the night hours will move when the clock hand is traveling across the bottom half of the clock face. When the clock hand is rotating straight up at the 6, the foliots will move automatically through movement of the ratchet pawl at this time. Having learned about these principles, let’s now proceed with trying to adjust the clock.

When the clock hand is traveling across the top half of the clock face, the foliot for the day hours is moving.

When the clock hand is traveling across the bottom half of the clock face, the foliot for the night hours is moving.

The hand on “6 o’clock” side points to the minute.

[2] Set the time

Check information on the previous calendar

Japanese clocks are based on a system of unequal hours that change from day to day and from season to season. The standards for time used for the clock are the times for daybreak and nightfall. The time for daybreak is called Brighter 6 o’clock (6 a.m.), and the time for nightfall is called Darker 6 o’clock (6 p.m.). You can find the times for exercise (for daybreak) and sunset (for nightfall) for the day on a certain region on the Internet or with other resources.

Brighter 6 o’clock 35 minutes after sunrise

Darker 6 o’clock 35 minutes after sunset

The information you can use from the previous calendar system to set the time on the clock is the times for daybreak (Times of sunrise = 8 hrs. 14 minutes, Times of sunset = 3 hrs. 40 minutes). There are 120 thin marks made on the inner circle on the clock face of the Japanese clock. Accordingly, by completing the calculations given below, you can find the times for day and night as well as the time for each mark.

[Finding the times for day and night]

Day times

- Time from daybreak to daylight: Time is measured from 6 a.m. to the length of day time
  - Day time: 14 hrs. 57 min. - 4 hrs. 18 min. = 10 hrs. 39 min.
  - Time at 6 a.m.: 1 - 8 hrs. 14 minutes = 14 hrs. 57 minutes
  - Time in 1 mm = 14 minutes
  - Time in 1 mm = 14 minutes

Night times

- Time remaining from 24 hours minus the day time: 24 hrs. - 14 hrs. 57 min. = 9 hrs. 3 min.

Ex.) August 7, the beginning of fall in Tokyo, daybreak: 4:18, nightfall: 19:15

Next, divide each time found by 60, which will give you how much time each thin mark on the inner circle of the clock face represents. In the above example, the mark for the day time has its length of 10 hrs. 39 min., and each mark for the night time has its length of 9 hrs. 3 min. Use the clock hand to find the current time, subtract the current time from the time for daybreak or nightfall, and then move the clock hand to the number of marks found by dividing by 15 min. for the day time and 9 min. for the night time.

When moving the clock hand forward, follow the steps provided in “How to unwind the mainspring” on the left.

[3] Adjust the weights on the foliots

Check the position of the clock hand after a certain amount of time has passed

Once you’ve set the time, let the clock run for several hours. Using the same calculation method as given above, find the time that should be shown on the Japanese clock at this time, and compare this to the actual position of the clock hand. After checking to see if the clock is running too fast or too slow, change the positions of the weights to adjust how fast or slow the hand moves, depending on how the clock is running.

If the clock runs too fast or the actual time

Check which foliot is moving after the orientation of the clock unit has been returned to its upright position and then remove the clock hand and reattach it as shown in the diagrams.

If the foliot for the day hours is moving, set the clock hand to the hour of the foliot (darker 6 o’clock).

If the foliot for the night hours is moving, set the clock hand to the hour of the foliot (brighter 6 o’clock).

If the foliot is hanging too low, it is best to have the foliots hang about 1 mm from the top surface of the ratchet pawl.

A: It may take several days for the wheels in the clock to “develop a rhythm” (get used to running with each other). Frequent wind up the clock, and wait for a few days to see how things go.

B: If there are problems, check the looseness of the string and up/down position of the foliots. The foliots may be hanging too low. It is best to have the foliots hang about 1 mm from the top surface of the ratchet pawl.

Refer to page 83 for how to adjust the heights.

Ishikawa-style Adjustment Method for the Supplement’s Japanese Clock

Mr. Eiaku Ishikawa, whom we interviewed for a feature article in this magazine, provided us with a method for adjusting the supplement’s clock that is based on experiences he had living the lifestyle of the Edo period using a traditional Japanese clock he made himself. Below, we introduce a part of the “Ishikawa-style” method of adjusting traditional Japanese clocks.

Calculating the “Time it takes for the clock hand to move one hour on the clock face” when the weights on the foliots are placed at the innermost positions and when they are placed at the outermost positions, in order to balance the weights.

When the weights on the foliots for the day hours are placed at the outermost positions, 185 min.

In half a day, 185 min. + 18 hrs. 30 min. = 14 hrs. 57 min. + 3 hrs. 38 min. There are 4 mm for every hour, so you would need to move the weights about 14 mm inward in this case.

This gives us a difference of about 10 hours. The length of the distance that you can move the weights is about 40 mm, which yields 4 mm per hour. Use the same process to make measurements and calculations for the foliots for the night hours, as well. Compare the time for the day hours and the time for when the weights are placed at the outermost position on the foliots for the day hours, and adjust the position of the weights by the amount of the difference. In the example at left, the length of the day is 14 hrs. 57 min., so 18 hrs. 30 min. + 14 hrs. 57 min. + 3 hrs. 38 min. There are 4 mm for every hour, so you would need to move the weights about 14 mm inward in this case.

*: Due to differences in individual clocks because of slight part variations and variations in how the parts are assembled, the results you get for your measurements will not be the same as the values given in the example. Please be sure to actually take measurements for your own clock.

Q: The foliot does not move.

A: Check the looseness of the screws holding down the verge stopper, the orientation of the escape wheel, and the orientation of the escape wheel.

Q: The clock does not change between night and day.

A: Check the assembly of the cam and cam receiver.

Q: The mainspring winding comes undone all at once.

A: The tooth of the relevant foliot may have been shifted upward away from the escape wheel.

Q: The clock runs too fast.

A: There is a tendency for the clock to run fast right after assembly is completed. Wait for about three days. If you still think that the clock runs too fast after this time, add another weight (a nut) to adjust the time.

Q: The clock stops partway through its operation.

A: It may take several days for the wheels in the clock to “develop a rhythm” (get used to running with each other). Frequently wind up the clock, and wait for a few days to see how things go.

Q: The clock runs too slow.

A: Adjust the mechanism for switching between foliots.