

Fischer
Made in Germany



Barograph User's Manual



presented by *STARPATH*

English Edition

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BAROGRAPH USER'S MANUAL

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1. General Information

This manual contains important information about the function, start-up, and maintenance of Fischer Barographs. Please review all of the information before initial use of the barograph. For the barograph to function as intended, all instructions in this manual must be followed in detail. If the instructions are not followed closely, operational malfunctions may occur.

2. About the Barographs

Fischer barographs record changes in atmospheric pressure over time. The measuring element used is a 7-cell aneroid capsule set with a 62-mm diameter. They are constructed from a corrosion-resistant copper-beryllium alloy whose excellent flexibility has made it the best material for measuring atmospheric pressure for the past 70 years. These aneroid capsules are essentially immune to hysteresis and elastic after-effects.

The effect of temperature changes on the measurement is compensated for with bimetal elements over the full range of pressures for temperatures between -30° C (-22° F) and 40° C (104° F).

The elements of the precision movement are made of brass in various finishes, depending on the model. All crucial axles use jeweled bearings for lowest possible residual friction. All materials used are corrosion-resistant. The measuring element is enclosed within the fully ventilated housing and is therefore protected from mechanical damages. Optional lockable housings are also available. Some models employ an enhanced dampening movement for use at sea.

All standard barograph models have optional pressure ranges that are selected before purchase to match the station elevation where they will be used, but the models with enhanced dampening are assumed to be used at sea, so they come with a single fixed pressure range for sea-level applications.

The barographs are equipped with either a mechanical or quartz clockwork that drives the rotation of the recording drum.

For the quartz clockworks, the drum revolution can be easily set to a daily, weekly, or monthly cycle. The corresponding time in hours would be 25.6 hr, 176 hr, and 783 hr respectively.

The mechanical clockworks can be changed between daily or weekly operation.

All models of barographs come with fiber pens and chart paper to last one year. The Captain and Admiral models have a chart storage tray built into them. The Captain model is accessed from the end of the unit; the Admiral model from the side.

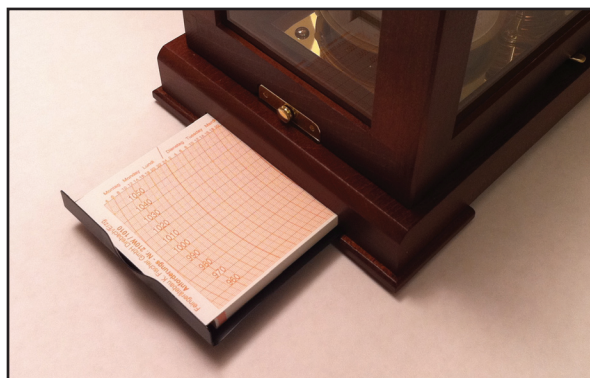
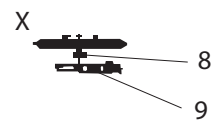
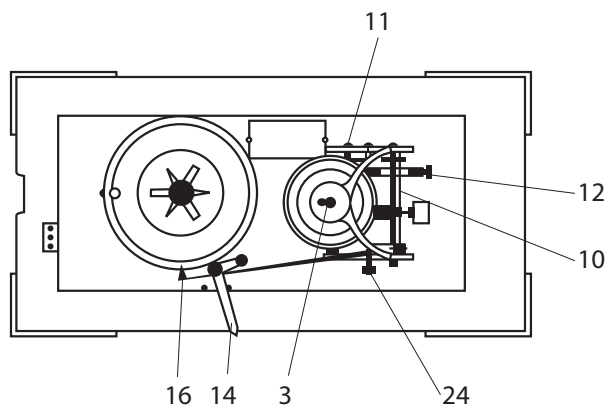
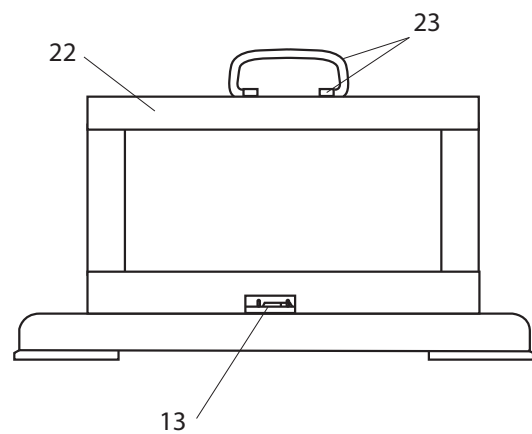
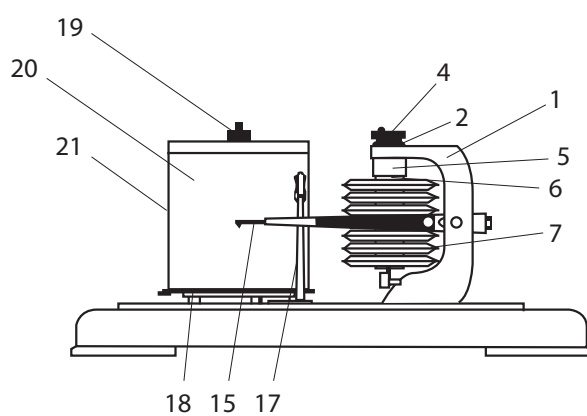


Chart tray on Captain's Choice model

2.1 Mechanical Diagram

- | | |
|------------------------------|------------------------------|
| 1. Precision Movement | 13. Housing lock |
| 2. Socket | 14. Disengaging rod release |
| 3. Grub screw set | 15. Pen-arm |
| 4. Pressure adjustment screw | 16. Fiber pen |
| 5. Upper telescope case | 17. Disengaging rod |
| 6. Lower telescope case | 18. Clockwork |
| 7. Capsule set | 19. Fastening nut |
| 8. Pin | 20. Recording drum |
| 9. Bimetal arm | 21. Diagram retaining strips |
| 10. Axle | 22. Housing |
| 11. Transport mode screw | 23. Handle |
| 12. Null-setting lever | 24. Pen-arm adjustment screw |



2.2 Technical Data

Accuracy of measurement ±0.7 hPa (mb)

Chart graduation 1 hPa (mb)

Measuring range	corresponding altitude
955 to 1055 hPa	0 up to 150 m above sea level (0 to 490 ft)
930 to 1030 hPa	150 up to 350 m above sea level (490 to 1,150 ft)
905 to 1005 hPa	350 up to 600 m above sea level (1,150 to 1,970 ft)
880 to 980 hPa	600 up to 850 m above sea level (1,970 to 2,790 ft)
855 to 955 hPa	850 up to 955 m above sea level (2,790 to 3,140 ft)

Clockwork

Mechanic drum clockwork: International accuracy standard DIN 58658

Revolution cycle day = 25.8 h
 week = 176 h

Running period 1 week (see later notes on clockwork)

Electronic quartz clockwork

Revolution cycle day = 25.8 h
 week = 176 h
 month = 783 h

Running period 12 months (uses two AA 1.5 V batteries)

Recording drum

Drum material: plastic

Drum dimensions: 93.3 mm diameter, 93 mm high

Chart paper clamp material: brass nickel plates

Chart paper write range 80 mm; resolution 1 hPa (inches charts also available)

Materials

Transmission system: brass matte-chromium-plates, axles in chrome-plated steel

Movement stand: aluminium (2S5/267M Brass polishes)

Housing cover part : 225 / 227 aluminium and chrome-plated steel X5CrNi1810, corrosion resistant, other models, polished wooden cases

Accessories

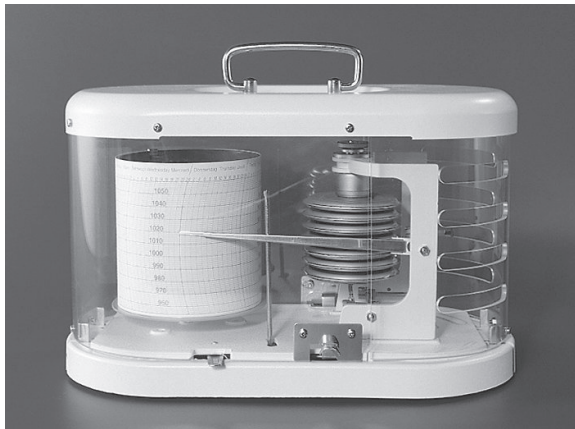
Additional chart paper

Sealed pack of 2 fiber pens

AA Batteries (Quartz Models)

Carrying Case ES-55 (for Models 225/227)

2.3. Model Specifications



“Navigator’s Choice” Models 225, 227

Housing made of cast aluminum and chrome steel, with a white finish. Movement brass and steel, with flat chrome finish. Glazing made of transparent synthetic material.

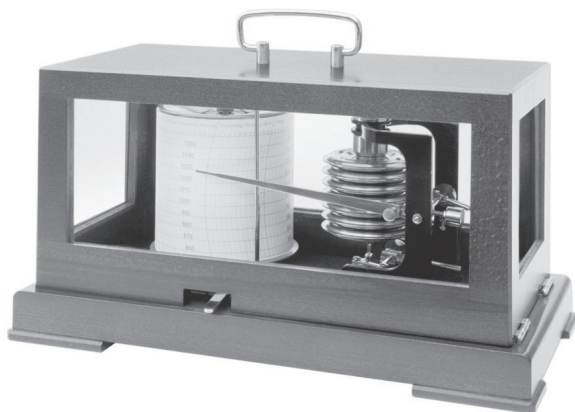
Dimensions 290 x 145 x 190 mm
(11.4” x 5.7” x 7.5”); weight 2.5 kg (5.5 lbs)

Model 225 Mechanical wind-up clockwork. Runs in 2 modes: daily or weekly.

Model 225Q Quartz clockwork. Runs in 3 modes: daily, weekly, and monthly.

Optional pressure ranges selected at time of purchase.

Model 227 and 227Q same as above with vibration-damped movement for use at sea, with a fixed measuring range of 955 - 1055 hPa.



“Captain’s Choice”

Models 205M, 207M and 285M, 287M

Housing made of beech hardwood with a mahogany stain finish. Comes with choice of movement finishes.

Dimensions 345 x 170 x 180 mm
(13.6” x 6.7” x 7.1”); weight 3.4 kg (7.5 lbs)

Model 205M Mechanical wind-up clockwork. Runs in 2 modes: daily or weekly.

Movement brass and steel, with flat chrome finish.

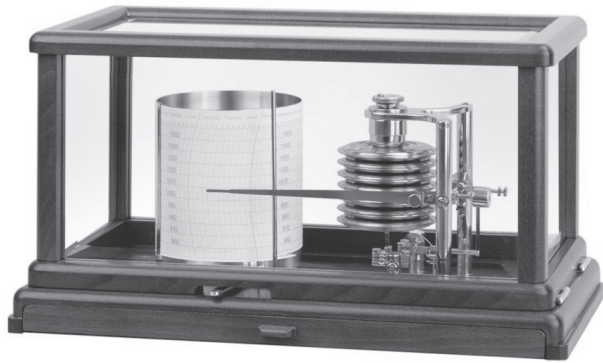
Model 205MQ Quartz clockwork. Runs in 3 modes: daily, weekly, and monthly.

Movement brass and steel, with flat chrome finish.

Model 285M, 285MQ same as above with polished brass movement.

Optional pressure ranges selected at time of purchase.

Model 207M, 207MQ and 287M, 287MQ same as above. With vibration-damped movement for use at sea, with a fixed measuring range of 955 - 1055 hPa.



“Admiral’s Choice” Models 265, 267

Housing made of beech hardwood with a mahogany stain finish. Glazing cut glass with beveled edges. Base plate and movement of polished brass; includes front drawer for charts and pens.

Dimensions 345 x 190 x 185 mm
(13.6” x 6.7” x 7.1”); weight 4.4 kg (9.7 lbs)

Model 265M Mechanical wind-up clockwork. Runs in 2 modes: daily or weekly.

Model 265MQ Quartz clockwork. Runs in 3 modes: daily, weekly, and monthly.

Optional pressure ranges selected at time of purchase.

Model 267M and 267MQ same as above With vibration-damped movement for use at sea with a fixed measuring range of 955 - 1055 hPa.

3. Unpacking the Barograph

After taking the barograph out of its packaging, remove the surrounding paper, including the carrier-handle cardboard wrap.

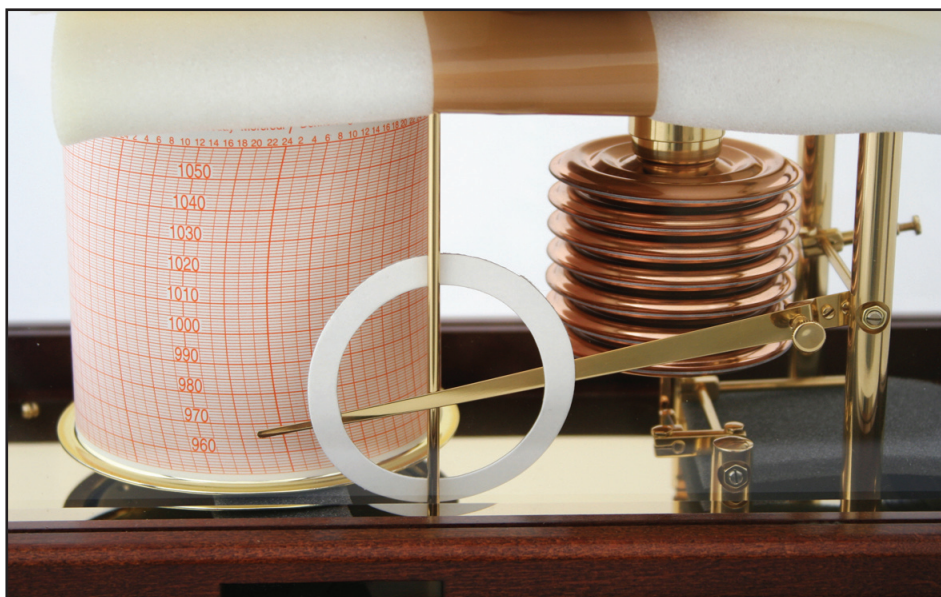
Warning: Be sure to remove all accessories (chart paper, fiber-pens, battery, and clock-work key) from the package before discarding it.

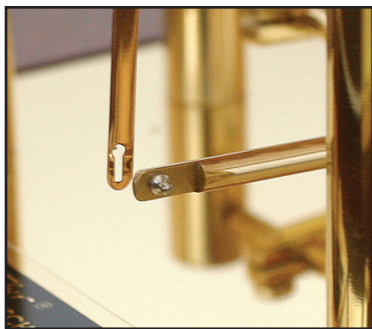
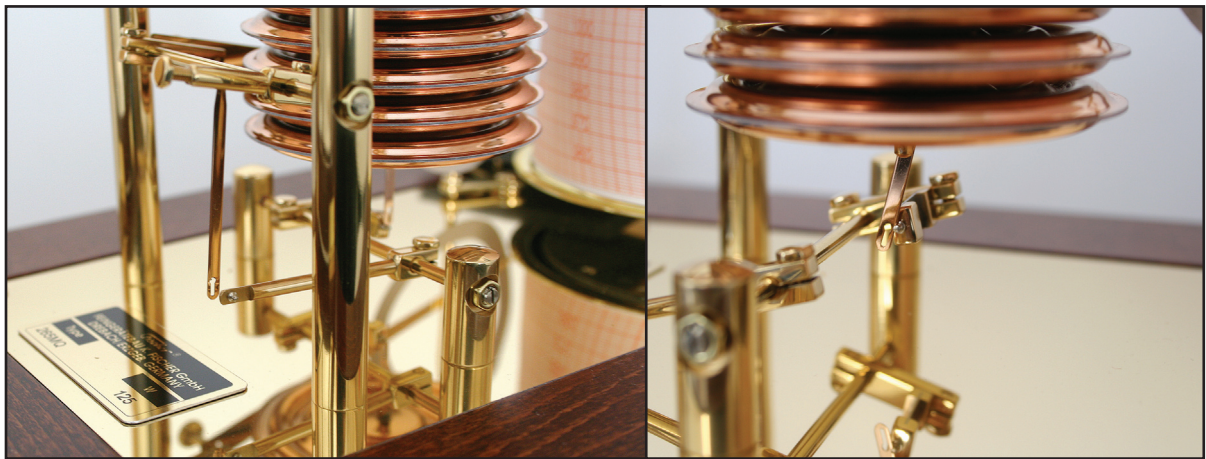
To open the housing, move the housing lock (13) to the left and raise the lid. For models 225/227 move the housing lock to the left and right.

In models 225 and 227 (Navigator's Choice) both sides of the housing can be opened.

The barographs are initially set to transport mode. The housing is locked and the transmission system is decoupled in two places. (This does not apply to the 2X7 series with vibration-damped measuring systems). The pen-arm is also secured to the disengaging rod with a circular cardboard clip.

Before starting the barograph, the transmission system must be reconnected as shown, and the write-arm must be removed from the cardboard clip.





Connect the decoupled pieces by inserting the pins in the slots provided. The weight of the pen-arm will keep it in place.



4. Start Up

The following instructions will prepare you for the initial start up of the barograph including setting the drum revolution cycle, winding the mechanical clockwork or setting the quartz clockwork, and beginning recording.

4.1. Setting the Drum Revolution Cycle

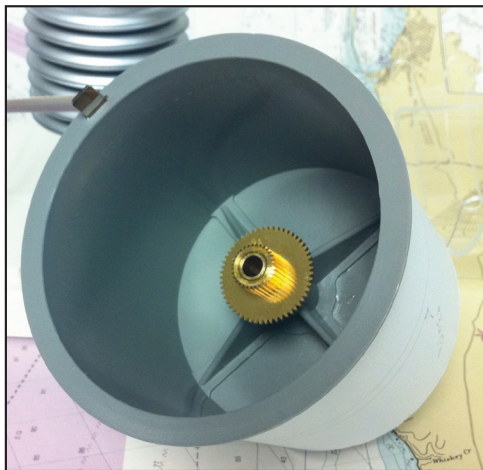
The clockwork is located inside the recording drum, which it rotates in a clockwise direction. The clockwork can be set for 1 day (daily), 7 day (weekly), or 31 day (monthly) revolution cycle.

Warning: The monthly setting is only available with quartz clockwork models. The barographs are initially set to a weekly cycle. To change the setting you must lift the recording drum off of the clockwork as described in the following sections.

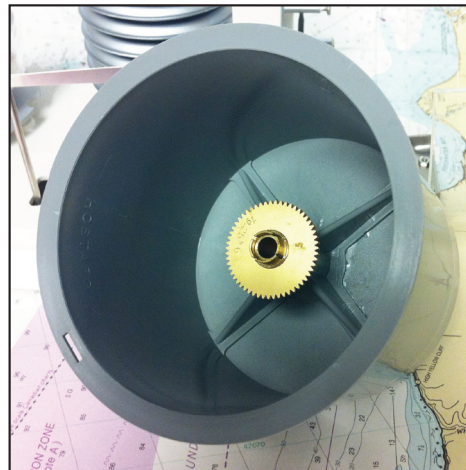
4.2. Mechanical Clockwork

To remove the drum, insert the clockwork key in the drum and turn the key in a clockwise motion. Using both hands, place fingers underneath the edge of the drum and lift it off the clockwork. After that, the revolution cycle can be set by inserting the gear wheel in the desired orientation (daily or weekly). Then replace the drum over the clockwork, and using the key, screw it back down in a counter-clockwise motion.

To start the mechanical clockwork, wind the clockwork key in a counter-clockwise motion until it is fully wound — until it will turn no further. This will be about 9 or 10 full 360° turns of the key.



☞ Orientation



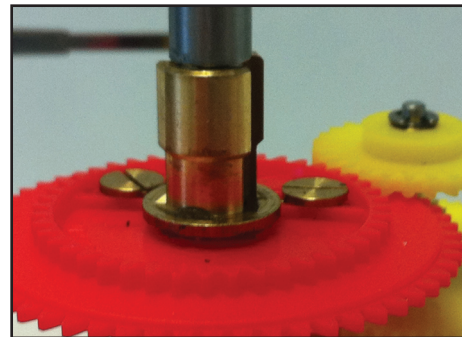
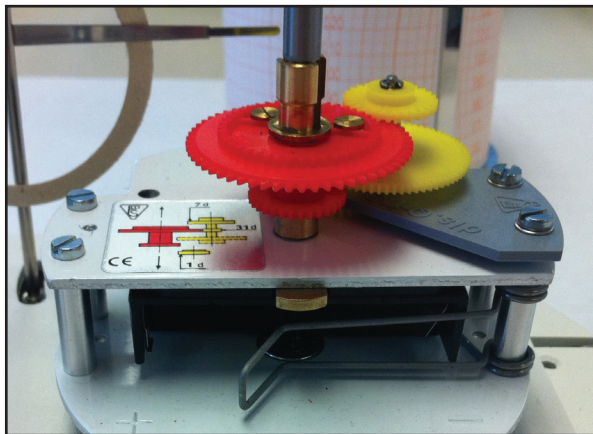
☞ Orientation

4.3. Quartz Clockwork

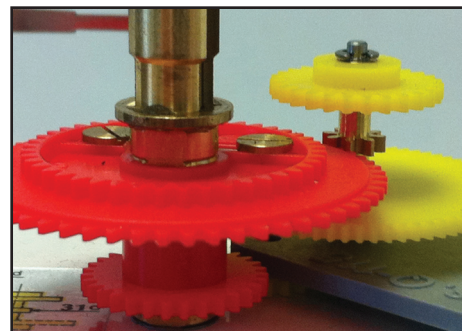
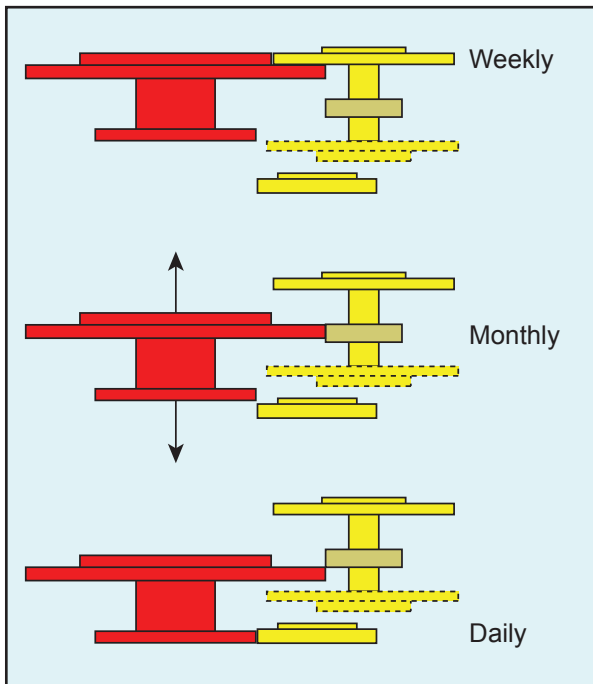
Using both hands, place fingers underneath the edge of the drum and lift it off the clockwork. After that, the revolution cycle can be set by moving the red gear wheel to the desired position (daily, weekly, or monthly). The highest position is 7 day (weekly), the middle position is 31 day (monthly) and the lowest is 1 day (daily).

Warning: After changing the drum revolution cycle you will need to insert the corresponding chart paper. Standard delivery includes weekly charts, but this can be changed at the time of purchase.

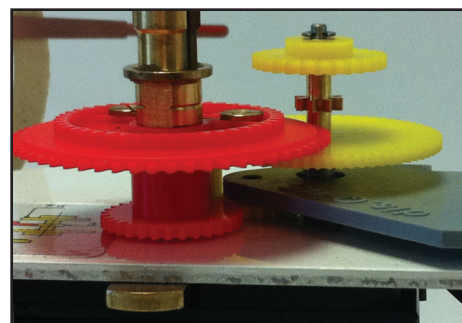
To start the electronic quartz clockwork, simply insert the provided AA battery into the battery holder. Be sure that the positive and negative ends are in their correct positions. After the battery is in place, put the recording drum back on the clockwork.



Weekly Position



Monthly Position



Daily Position

4.4. Starting the Barograph

For instructions on attaching the chart paper see section 5.3 Replacing the Chart Paper.

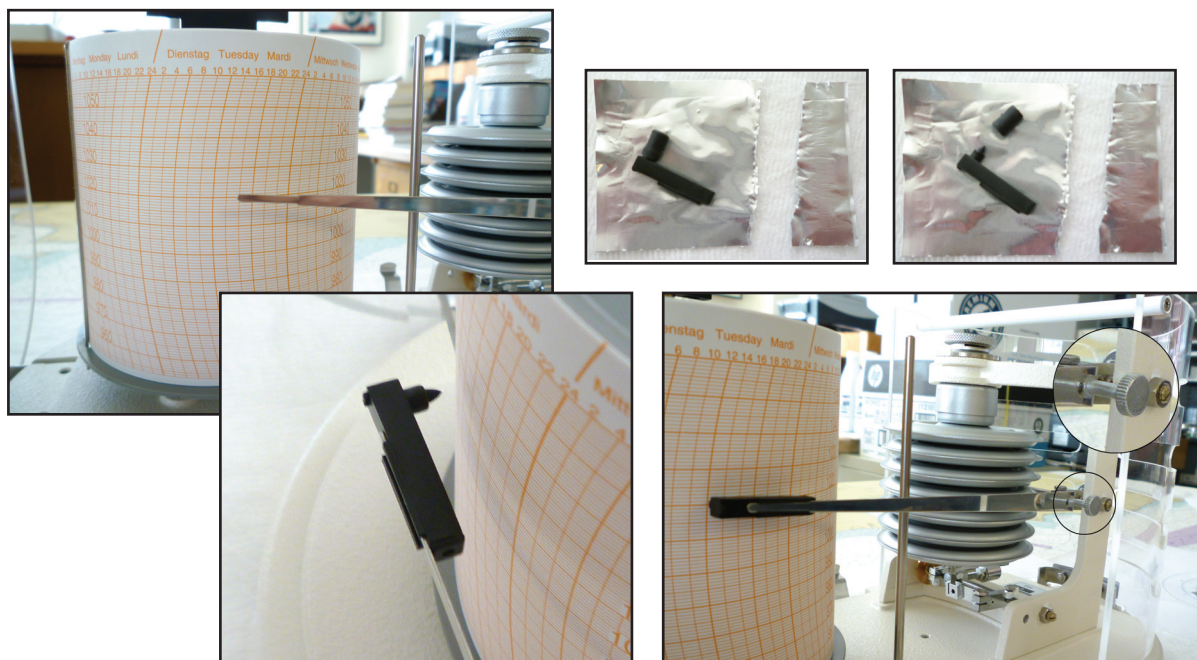
The Barographs are supplied with two fiber pens. Each pen should last 6 to 8 months under normal usage. To insert a new pen, remove the protective tip of the fiber pen and attach it to the pen-arm as shown in the illustrations. Before recording, be sure that the proper chart paper is being used in accordance with the drum revolution cycle. Adjust the pen-arm's position using the Pen-arm Adjustment Screw until the fiber pen touches the chart paper on the recording drum.

Note: This should be set to have the minimum force on the chart that will leave a trace. You can rotate the drum manually to check this. Too much pressure could mask small pressure changes.

Then close and lock the housing and the barograph is ready to begin recording.

If desired, the safety lock on the housing can be engaged to prevent unauthorized access to the barograph.

Be sure the pen-arm is not touching the disengagement rod when recording pressures.



Pen-arm Adjustment Screw (inset)

5. Maintenance

The following instructions will detail the proper maintenance procedures to insure that the barograph functions to its full potential.

5.1. Winding the Mechanical Clockwork

The mechanical clockwork can last on its own for at least 1 week. After that the clockwork must be re-wound in its entirety. From a fully unwound position, this will take *approximately* 10 full 360° turns.

Warning: The clockwork must always be wound in a counter-clockwise motion, otherwise the clockwork could be irreparably damaged.

5.2. Changing the Battery

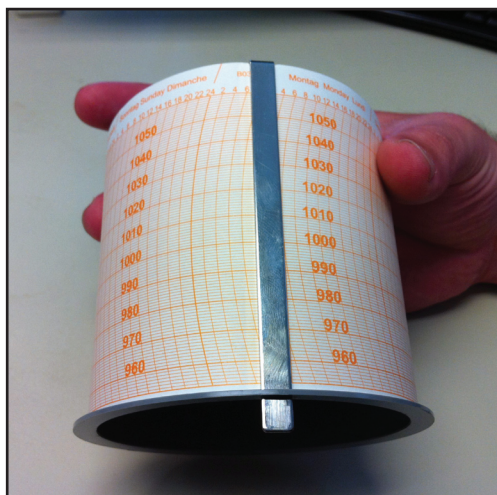
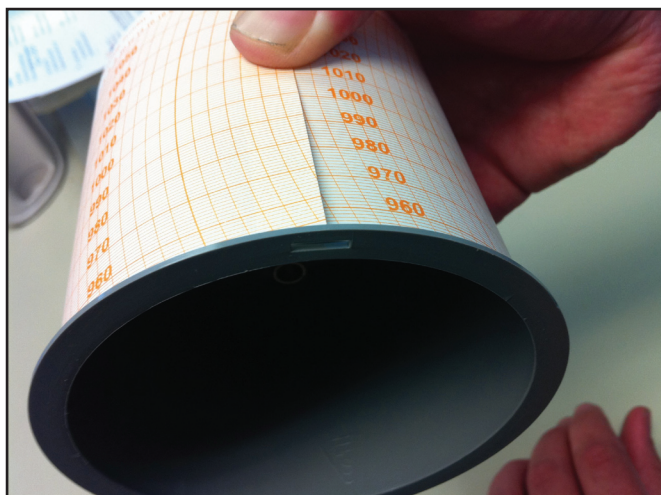
The electronic quartz clockwork runs approximately 12 months. The actual life of the battery will depend upon the chosen drum cycle revolution setting as well as operating conditions. If the clockwork stops replace the battery. Always use AA batteries.

5.3. Replacing the Chart Paper

At the end of the drum revolution cycle, move the pen-arm away from the drum using the lever attached to the Disengaging rod (see section 2.1 Mechanical Diagram). Then remove the recording drum from the clockwork. Remove the clamp holding the chart paper to the recording drum and remove the used chart paper. Wrap a new chart paper around the drum so that the slightly overlapping edges line up with the location of the clamp (see diagram 5.3). Be sure that the bottom (low pressure) side of the chart paper is lined up directly with the lip on the lower edge of the recording drum. Insert the clamp in the slot at the base of the drum and clip it at the top.

After the paper is loaded, replace the drum on the clockwork with the time and date approximately aligned with the pen position. Once the chart is in place and the pen is returned to the chart, make a final manual rotation of the drum to the correct time as needed. This may take a further adjustment after some time has passed to remove slack in the gear.

Warning: If the barograph has a mechanical clockwork, the clockwork key must be unscrewed (in the clockwise direction) before removing the recording drum. Likewise it must be screwed back in (counter-clockwise) after it the drum has been replaced.



5.4 Setting the correct local pressure

Your barograph will provide accurate pressures to within ± 0.7 hPa, but it is best to check the pressure at first installation and adjust the pen position as needed. Local airports or weather services offer pressure values as do some newspapers. There are also numerous convenient online sources of local weather data. See in particular www.starpath.com/barometers which is set up specifically to provide you with accurate local pressure worldwide, as well as elevation corrections.

Recall that most public sources of accurate pressure are corrected to sea level pressure, which will be higher than the actual pressure at your instrument location unless you too are at sea level.

Thus to set your barograph to the correct local pressure, called *station pressure*, you must reduce the reported sea level pressure for your location by an amount determined by the elevation of your location plus the height of the instrument above ground level. See Appendix 1.

The Pressure adjustment screw is located above the measuring elements, as shown in Section 2.2. There is a small lock screw on top of it that must be released before the adjustment and then gently tightened once done.

Warning: The pressure range of the barograph, from top to bottom of the chart, cannot be changed without irreparably damaging the instrument. Therefore the pressure range adjustment screws have been secured with lacquer and should not be adjusted.

5.5 Cleaning the Housing

The outside of the housing can be cleaned with a dampened washcloth and mild soap. Do not under any circumstances use scrubbing agents or solvents.

5.6 Troubleshooting

Error	Possible Cause	Solution
The barograph is not recording	The fiber pen is not touching the recording drum.	Move lever to the right.
	The protective case has not been removed from the fiber pen.	Remove the protective case.
	The fiber pen has dried up.	Dampen the pen with a drop of vinegar.
	The fiber pen is used up.	Change pen.
The recording drum does not rotate	The recording drum is not set on the clockwork axle properly.	Gently rotate the drum until you feel the gears engage.
	The clockwork has not been properly wound.	Fully wind the clockwork.
	Gears are not engaged properly.	Reset the drum revolution cycle, paying close attention to the gears
	Battery is dead.	Change battery.
The barograph records a constant pressure	The pen-arm is touching the Disengaging rod.	Press lever completely to the right.
Time measurements on the chart paper do not correspond with the rotation of the recording drum	The wrong chart paper is being used.	Make sure the chart paper corresponds with the drum revolution cycle.
	The battery is dying.	Change battery.
The barograph is recording the wrong values	The chart paper used does not correspond with the range of the barograph.	Make sure you are using the correct chart paper.
	The chart paper is not correctly aligned.	Reset chart paper making sure the bottom edge is properly aligned with the base of the recording drum.
	Pressure correction not set.	Correct the pressure adjustment.
	Pressure correction drifted.	Correct the pressure adjustment.
The barograph pen-arm hangs down	The precision movement is not connected to the pen-arm.	Reconnect the arm with the movement (see Start up notes).

6. EEC Conformity

We hereby confirm that the barographs series 205/207, 225/227, 215/217, 265/267, 285/287 conform to the following regulations:

EEC guideline on electromagnetic compatibility 89/336/EEG as modified by guideline 92/31/EEG.
Further EU guidelines have not been established for the equipment.

The following standards are met for industrial and residential areas relating to protection from electromagnetic emissions and interferences.

EN50081-1:92/-2:93

EN50082-1:92/-2:95

All units carry the CE approval.

7. Liability Limitations

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Appendix 1. Pressure corrections for Elevation

Elevation		Correction	Elevation		Correction
Feet	Meters	hPa = mb	Feet	Meters	hPa = mb
0	0	0.0	1200	366	43.2
5	2	0.2	1250	381	44.9
10	3	0.4	1300	396	46.7
20	6	0.7	1350	411	48.5
30	9	1.1	1400	427	50.2
40	12	1.5	1450	442	52.0
50	15	1.8	1500	457	53.7
75	23	2.7	1600	488	57.2
100	30	3.7	1700	518	60.7
150	46	5.5	1800	549	64.2
200	61	7.3	1900	579	67.7
250	76	9.1	2000	610	71.1
300	91	10.9	3000	914	105.1
350	107	12.8	4000	1219	138.1
400	122	14.6	5000	1524	170.2
450	137	16.4	6000	1829	201.3
500	152	18.2	7000	2134	231.4
550	168	20.0	8000	2438	260.6
600	183	21.8	9000	2743	289.0
650	198	23.6	10000	3048	316.4
700	213	25.4	11000	3353	343.1
750	229	27.2	12000	3658	368.8
800	244	29.0	13000	3962	393.8
850	259	30.7	14000	4267	418.0
900	274	32.5	15000	4572	441.4
950	290	34.3	16000	4877	464.1
1000	305	36.1	17000	5182	486.0
1050	320	37.9	18000	5486	507.3
1100	335	39.6	19000	5791	527.8
1150	351	41.4	20000	6096	547.6

The standard surface pressure is 1013.25 mb and the pressure drops at a rate that can be computed from

$$P_a = P_o [1 - (6.87535 \cdot H / 1,000,000)]^{5.2561},$$

where P_a is the pressure at altitude H (given in feet), and P_o is the base or surface pressure, 1013.25 mb. The notation x^y means x raised to the power of y .

If you live at an elevation of 1100 feet, your pressure will read 39.6 mb lower than reported at sea level if your barometer is properly calibrated. If the barometer in your boat is 10 feet above sea level, your barometer reads 0.4 mb lower than it should if not corrected to sea level.

See The Barometer Handbook by David Burch for more information on atmospheric pressure, barometers, and barographs.