

The FT-2 Panoramic Camera Guide

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Content

This is a work in progress! Many things are missing and will probably be added later!

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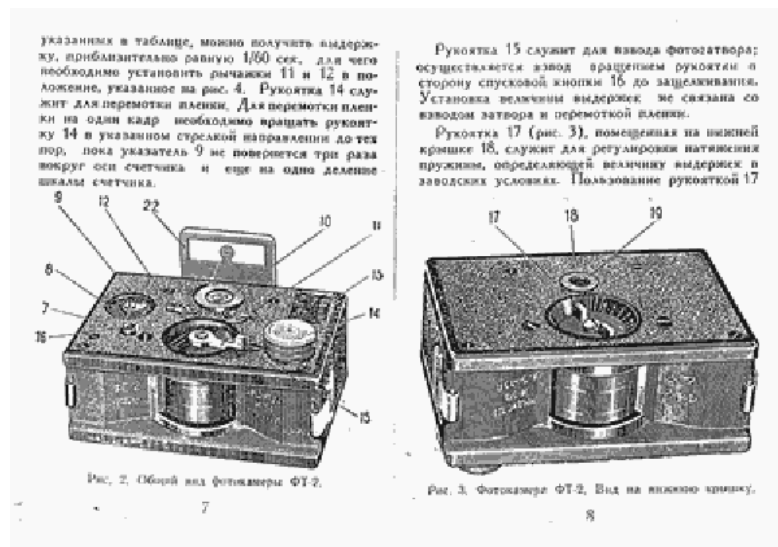


Fig. 1: parts description taken from the original FT-2 manual

FT-2 History and Today's Usage

History

"FT stands for 'Fotoapparat Tokareva', or Tokarev's Camera. It's so named after its designer, Feodor Vasilievich Tokarev, who had gained notoriety as an arms designer, and who carried the informal title "Personal Friend of Stalin".

According to the memoirs of E. V. Soloviev, he around 1950 appeared at the gates of KMZ in a big ZIS limousine, to present his design, that incidentally had already been approved by the "Personal Friend". The camera was already named 'FT-2' when Tokarev presented it. Engineers at the plant were frankly unimpressed by the design, and dismissed it as too difficult to mass-produce. They nevertheless liked the concept of a panoramic camera, so they kept the idea on the shelf till 1958, when the FT-2 (perhaps Tokarev's prototype, perhaps not) was submitted to the World Fair in Brussels.

Directly after that, it was taken into production and exported world-wide under names as Spiratone, Panorama, Spaceview (a hint to the Sputnik probe?) and also plainly FT-2. Somewhere during production (in 1960) an upgraded version with a different spring and aperture design appeared. The camera stayed in production till 1965, with a grand total of 16,662 produced (Princelle)."

The source of this information is an article that appeared in the Russian magazine 'Nedelya', #41, 1997.

The 'Princelle-Authentic-Guide' describes the FT-2 as follows:

FT-2 1958 – 1965 (16,662 produced)

Designer: F. V. Tokarev in 1950

Initially conceived by the celebrated engineer in armaments, Tokarev, to verify the impact of barrage fire (artillery).

The camera finally went into production in 1958 and, to make it's manufacture profitable, it was presented to the general public.

Panoramic, 12 exposures, 24x110mm on perforated 35mm film. The film advance button ensures the correct winding of the film from the cassette to a special cassette. No rewind.

3 rotations of the counter arrow, 12 exposures on 115mm of film.

Cocking of the turret by lever (several forms).

Three speeds: 1/100-1/200-1/400s obtained by rotor friction on 0, 1 or 2 helicoidal brakes . Simple but effective.

Lens: Industar-50 f3.5-50mm, "restricted" to shutter 5,

Angle of field – 120°. Hyperfocal control of focussing.

Viewfinder – Flexible view meter.

Variations:

K2620/ On the first 100 cameras, the name FT2, the KMZ logo and lens details engraved on the facade.

K2621/ The two first years of production, the FT2 had an adjustable brake on the rotor spring under the camera.

K2622/ Characters in latin.

Sold under various distributor's labels:

K2625/ Spiratone or Panorama by F. Spira, USA.

K2626/ Spaceview, Ets Tranchant E. France.

Today's Usage

One of the best well known FT-2 users is probably Czech-born Jaroslav Poncar, Professor at Cologne Technical University for Photo-engineering. He published several books with great photos taken with his FT-2 camera(s). A must-have for every FT-2 user is his Tibet book with very impressive panoramic shots of an impressive vast landscape, Published by 'Edition Panorama'. His website is also worth a visit and can be found at <http://www.poncar.de/>.

Another website devoted to photography using the FT-2 is RHEINBLICKE by Roland Goseberg as <http://www.rheinblicke.de/>.

Maybe it's just my narrow minded search techniques, but I have a feeling that most FT-2 users are located in Europe or maybe even Germany.

Since more and more parts of the real world get ported over to the internet, there is also a FT-2 user group on Flickr: http://www.flickr.com/groups/ft-2_and_horizont/

FT-2 Care and Repair

Due to the age of the camera – and due to its simple construction principles – several problems can occur. That's the reason every FT-2 user should know his camera inside out. After a general description on how to (dis-)assemble the FT-2 the most likely problems will be covered in more detail.

Disassembling the Camera

The construction of the FT-2 is rather simple. Thus, it's fairly easy to take it apart and reassemble again. The following photos show my 'Cyrillic' FT-2 from 1960 but most of it also applies to the newer models.

The first thing when trying to take the camera apart is to remove the cocking lever (15) by removing the screw in its centre. After having removed this screw, the lever can be removed by simply lifting it up. You'll now be able to see a small set-screw which holds the lens in its position and needs to be un-tightened slightly in case you want to adjust the focus (see detailed description below).



Fig. 2: lens turret viewed through camera top with lever removed

To get into the inside of the camera we need to remove the top cover. To do so, remove the six screws marked with red circles on the photo below. These screws hold the top cover of the camera and the body together. The screw heads are rather soft, so make sure your screwdriver has the correct size!



Fig. 3: camera viewed from top

Once these screws and the cocking-lever are removed the whole top cover can be removed from the camera body. Please do this very carefully as the 'brakes' that are sitting on the underside of the cover might fall off. Don't lose them!

Now, the camera looks as shown on the picture below.

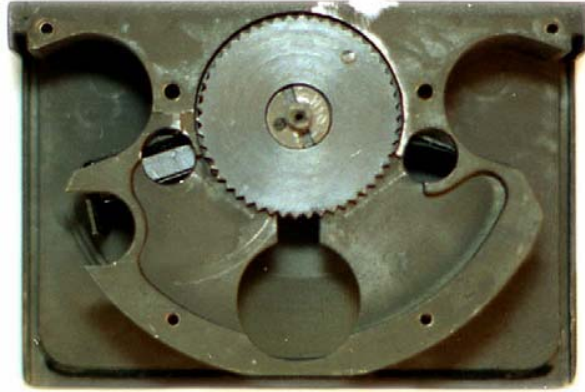


Fig. 4: camera body viewed from top

If you turn round the top cover you just removed you'll see the two 'brakes' that engage into the gearwheel on the lens turret to reduce the rotation speed for the two slower shutter speeds. (Next time I have one of my FT-2s open I'll take a picture of the underside of the cover plate.)

Next thing in taking the camera apart is to remove the lens turret. But be warned, removing it requires to tighten the spring again when you put it back together! So you should only continue if you feel confident enough to get everything back together – and if you see a need to take your camera apart that far.

Turn round the camera and remove the bottom cover as well. It's held in place by another six screws at the same position as found on the top cover. After removing the bottom cover only the camera's body with the lens turret is left.

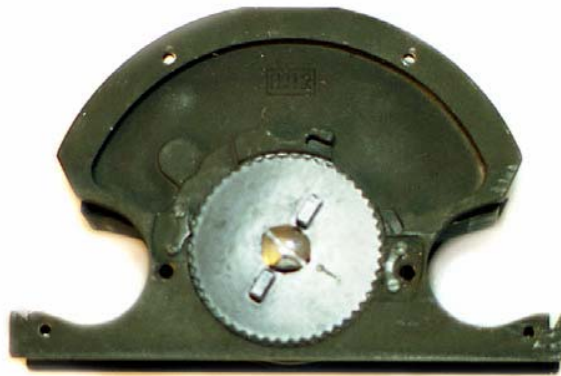


Fig. 5: camera body viewed from bottom

Next to the lens turret there are two small pieces screwed to the body that engage into the gearwheel and determine the tension of the spring by holding the large gearwheel in a fixed position.

In order to remove the turret completely, remove the four screws that fix these 'stoppers'. Please note that once you remove the second one of these stoppers, the gearwheel will spin counter-clockwise and thus release the spring. On the photo above the gearwheel from a camera with a tensioning lever on the bottom is shown. Newer models without this lever have a flat gearwheel surface without the two 'handles'.

To continue remove the big screw in the middle of the gearwheel. After that, the gearwheel can be removed showing the spring underneath (sorry, no photo available). Make sure not to loose the spring when it is jumping out of its place!

Now the lens turret moves freely and can be lifted out of the camera body. To do so, turn it in a position where the lens faces in the direction of the front of the camera and the whole turret can be moved up through the slit in the upper side of the camera body.



Fig. 6: lens turret viewed from bottom, the spring would sit in the groove

To open the lens turret in order to get access to the lens remove the two screws at the edge of the turret (pretty close to the gearwheel). When these screws are removed, the gearwheel can be taken away and the lens holder can be removed from the turret as well.



Fig. 7: screw to open the lens turret

Unfortunately I don't have a picture of the lens holder inside the turret because the screws on my camera were so tight that I didn't manage to get them removed. However, the turret has a hole inside in which the complete lens assembly can be moved back and forth. Moving the complete lens assembly inside the holder changes focus.

To clean the lenses it's even possible to unscrew the lens assembly to get access to the single lens elements. A more detailed description how to do that will follow below.

To put your camera back together follow the above steps in reverse order. – Make sure the turret is turning smoothly inside the body. If you took the turret apart as well, make sure the screws from fig. 7 are sitting flat with the turret's surface.

For info on re-tightening the spring, see the extra information that can be found below. The following paragraphs will give more information on typical problems and how to solve them.

Light Leaks

In case you get light on your film where no light should be (i.e. on the perforation, between exposures or light leaks within the image) it's a good idea to replace the felt tape that is meant to protect light from coming in. Due to the age of the cameras, natural ageing has most likely altered the surface of the materials used. It's important to choose replacement tape with the same thickness like the original tape. Thinner tape will still leave some light through; thicker one will dampen the movement of the lens turret and thus result in uneven exposure or no exposure at all. As a replacement for the black tape on the film pressure plate and the cover between the lens turret and the film cartridge, I used thin black self adhesive velour tape (in Germany available through Brenner Fotoversand or Kinotechnik Wittner).

The most popular place for light leaks showing up in your photos is the upper left third of the image. It's caused by light coming in through the release button. This metallic button is slightly smaller than the hole in the camera cover and thus light can get in and due to its metallic surface the light gets reflected all over the place. I have seen this on almost all FT-2s I have used.



Light leak when release button hasn't been treated.

To fix this problem, use the aforementioned black velour tape and try to cover all slits and openings between the film supply spool chamber and the camera's main chamber. If you put in too much tape you end up with a release button that doesn't release anymore. Painting the release button black would also help reduce the amount of reflected light. Unfortunately paint doesn't stick that well on the button and wears off rather quickly due to the mechanical action.

The film spools are another likely source for light leaks. It's always a good idea to store them in a dark place and load the camera in very subdued light. My personal procedure is to keep the loaded spools in black film containers as used by Ilford and Agfa (instead of the transparent ones used by Fuji and Kodak). When loading the camera I open the film containers inside the changing bag to avoid any light from falling directly on the spools. Exposed film is immediately wound from the FT-2 spool into empty standard 35mm film spools with bayonet mount. These spools are then stored in black film containers again. Most labs even return the spools so they can be reused.

Scratched Films

Due to the long negative format and the construction of the camera it is prone to scratch the film. The aforementioned black self adhesive velour tape is a perfect replacement for the original tape (which is shutter cloth, it seems) on the film pressure plate. Another possible source for scratches are the film spools. When replacing the velour tape in the spools care has to be taken to find a material with the same thickness (or maybe use multiple layers of thinner tape). Otherwise the spools will no longer be light tight and fogging of the film might occur when the spools are exposed to sunlight (see above).

Banding / Uneven Exposure

This can have several reasons. Most common seems to be uneven movement of the lens turret due to hardened oils (aging) or mechanical damage (misuse).

In case banding only occurs at one of the slower exposure times (at 1/200 or 1/100 but not at 1/400 sec.), it's most likely the brake that does not run smoothly enough. Remove the cover of your camera and try to oil the corresponding brake. If the old oil is too hard it should be removed. Also check the tiny set-screw (at the small end of the brake assembly) that adjusts the amount of friction of the brake. In case all times (even 1/400 sec.) show banding, mechanical damping on the lens turret is too high (or uneven) or the spring's tension is too low. If you own a camera with a dial at the bottom, use it to adjust the spring tension. If no dial is present, remove the bottom cover of your camera and adjust the spring tension by rotating the wheel clockwise. You might need to remove the stoppers to be able to move the gearwheel. Only adjust one step at a time and try again. Tensioning too far might break the spring.

Adjusting Focus

Factory default for the focal distance is a setting that produces '*sharp enough pictures of objects placed from 10m to infinity*'. However, the lens might get out of focus over time or maybe you want to specialise on very close subject matter.

To adjust the focus of the lens, simply remove the cocking lever (15) on top of your camera by removing the screw in the middle of the lever (see disassembly instructions above). You'll now see a small set-screw just behind the axis that has to be loosened a little bit. Now, using a Q-tip sliding through the front or back of the lens turret, you can push the lens assembly in the lens turret back and forth.

Moving the lens towards the film results in greater focal distance, moving it away from the film shortens the focal distance. Please note that it is only necessary to move the lens a fraction of a millimetre! If unsure what you did, use very thin paper that you hold in place of the film plane to form a simple ground glass for checking focus. However, even if you are sure you got the desired result shoot a test film to see whether focus is as expected.

Hint: I have two cameras adjusted at different focal distances. One for close subject matter (i.e. taking photos in a town or with important foreground I want to appear sharp in the final image) and another one that preserves sharpness up to infinity for landscape photography without important foreground subject matter.

Cleaning the Lens

The manual describes the standard way of cleaning the lens:

'To get access to the lens, cock the shutter and, holding the lens drum with finger, press the release button and shift the drum slid to the middle of the camera. Dust and fogging traces can be removed from the coated surface of the lens by a soft brush or cotton-wool pad slightly soaked in rectified alcohol, ether or perfume without pressing against the surface cleaned.'

One of my cameras showed dirt between the lens elements that could not be removed following the above procedure. But it's no problem to disassemble the whole camera until one gets access to the lens. The single lens elements are screwed into a metal tube that sits inside the lens turret. To get access to this part, follow the instructions on how to disassemble the camera until the very end. Now unscrew the lens – by removing the black screw-in rings – until you hold the single glass lenses in hand. Clean them very carefully with lens cleaning paper or a cleaning liquid developed for use with photographic lenses. Keep in mind that these are rather old lenses, so the coating on

them might come off. If it does, stop! Assemble them again in the same order and orientation! *Take notes when disassembling on how the parts belong together!*

If you're good at optics, you could even try to find a replacement lens. Although the lens used in this camera can produce quite sharp pictures, some lenses might be scratched or otherwise damaged. Using another lens of the *same focal length* should be possible, as long as it fits inside the tube of the lens turret.

The actual lens used is the Industar 3.5/50mm lens that was also available for the FED Leica clones with M39 screw mount. The lens is a Tessar type. Due to narrowing down the light path the lens in the FT-2 is permanently 'stopped down' to f5.0. So in theory the lens element from a FED Industar 3.5/50mm should fit into the FT-2

FT-2 Advanced and Enhanced

This section describes techniques for advanced users and some enhancements to the FT-2 that help increase the usability of this camera.

Using Filters

The use of filters proves rather difficult on any swing lens panoramic cameras. Some, like the Horizon, provide snap-on or screw-in filters, but the FT-2 does not provide any way to mount a filter. Several FT-2 users seem to have used 4x4 inch gel filters, cut into size and placed over the entire front of the camera. These filters are of common use in professional filter holders and can be found at any good photography equipment store. Cutting one of these filters into three equally sized stripes (100 x 33 mm each) gives three filters from one sheet of gel filter. Since you'd only use one of these stripes at a time, the other two serve as replacement once the first one gets old and scratchy (or lost).

To mount the filter stripe in front of the camera I attached black tape to both ends to form flexible 'ears'. These ears just go under the clamps that hold the cameras body and back cover together, see below.



When using polarising filters, the orientation of the filter is important for the final results. To find out the desired orientation, just look through the filter and rotate it until you find the desired effect. This is also the orientation it should go in front of your FT-2. Please note that different weather conditions might require different orientations of the filter and that rotating our 'stripe filters' in front of the camera is not possible. So using a polarising filter is always a compromise, but an interesting one nevertheless.

Neutral density (ND) filters can help control the amount of light falling onto the film during exposure. Since the FT-2 only covers a range of three exposure speeds and has no adjustable aperture, correct exposure is often impossible.

Using films with a higher than normal sensitivity (400 ASA, for example) often requires exposure speeds shorter than the 1/400s provided by the FT-2. Placing a ND filter in front of the camera allows to get correctly exposed images even in very bright daylight conditions. However, the higher sensitivity of the film allows to continue shooting even when it gets darker or indoors by simply removing the ND filter. To cover a larger exposure range, a ND4 filter (2 stops) or even ND8 should be used.

One drawback of the aforementioned method of mounting the filters should be noted. Since the lens is swinging in a 120 degree arc and the filter stays stationary, the angle under which light has to pass the filter changes dramatically to the sides of the image.

In the middle light passes more or less in a right angle through the filter, as with gel filters in front of regular lenses. To both sides of the 120 degree arc the lens 'looks' through the filter in an angle of about 30 degrees. Depending on the quality of the filter, this causes reduced resolution, colour fringes and other unpleasant stuff.

Changing the Aperture

The lens used in the FT-2 is a 50mm f3.5 Industar type without diaphragm blades. Due to the construction of the lens turret – only a small part of the lens gets used for forming the image on film – it has an effective aperture of f5.0.

Since the camera is a fixed-focus design it would be nice to be able to step the lens down to increase depth of field. Also, due to the rather large aperture ISO 50 films are regularly needed when shooting in sunlight. This can be changed by inserting a diaphragm into the lens turret or by simply narrowing the slit-width of the turret.

Some people have reported success with a diaphragm cut from black cardboard that is put in front of the lens by sliding it into the front of the lens turret. This increases depth of field since it is quite similar to stopping down a regular lens.

Other people have used black tape or cardboard glued to the back of the lens turret in order to reduce the slit-width. This does not change the depth of field. It only affects exposure time and very slightly increases sharpness (since the ideal slit-width for perfectly sharp images would be infinitely small). For example, half the slit width results in half the exposure time. So the 1/400 is now 1/800 (one stop difference).

The hidden 1/60 sec Shutter Speed

The FT-2 has two brakes inside that allow to reduce the 1/400 sec. shutter speed to either 1/200 sec. or 1/100 sec. What the manual doesn't say, it is possible to activate both brakes at the same time.

This results in a shutter speed between 1/50 sec and 1/60 sec.

Depending on the tension of the spring shutter speeds between any two FT-2 cameras vary a lot.

Due to the complete mechanical control of the shutter speeds the exact speed at each speed setting is again different on every camera and also changes with weather! On cold days shutter speeds are usually longer (the lens turret runs slower). If it gets too cold the lens turret might even stop moving at all. This usually affects the 1/100 sec speed the most. 1/400 sec. seems to be the most reliable speed, since it doesn't involve the use of the brakes.

Also, I'd advise to always set the shutter speed before cocking the lens. This makes sure the brakes completely engage into the gearwheel while you cock the lens. Otherwise, they might only engage after you have pressed the shutter and the lens turret has already moved a bit at the un-damped speed.

Making Enlargements

Due to the size of the FT-2's negatives (24x110mm) only a 4x5" or 9x12cm enlarger or bigger can be used.

In order to get the negative placed flat in the enlarger I usually use a piece of anti-reflex glass in the size of the enlarger (4x5" glass for 4x5" enlarger and so on). The negative gets taped to the anti-reflex side of the glass with the emulsion facing away from the glass. So when placing the glass in the enlarger the negative is taped to its underside. On top of the glass I put a mask cut from black cardboard that shields all the extra light away.

In my Beseler 45 enlarger I use a 35mm negative carrier that has been milled out to a 25x112mm frame. That way, glassless enlargements can be made.

One Problem with making enlargements is the huge light fall off in negatives. This is in parts caused by the time the lens turret needs to get to speed, resulting in overexposed area at the right end of the negative. Another important factor is that due to the large image angle the natural light situation being captured on film often changes a lot from one side of the negative to the other, thus probably even requiring different grades of photographic paper. Thus, the use of variable grade paper is highly recommended.

After a first raw test print I try to determine the area of the negative that needs the hardest grade. Also, I try to find the area that needs the shortest exposure time. These two values will be used for an initial exposure of the whole negative. After that, additional exposure is added using the same or softer grades until the desired result is achieved.

For presentation I got picture frames custom made. Presenting an image as long as the FT-2s one in the middle of a regular picture frame looks just awkward to me.

Shooting Portrait Format

The original 'purpose' of panoramic cameras was to capture a wide horizontal view. Nevertheless, a panoramic camera can still be used in 'portrait' orientation, as some photographers have successfully shown.

On the left you can see an example of a portrait being shot underneath the Eiffel tower in Paris. Due to the rotation of the lens, the lower part of the image looks more or less like a conventional portrait while in the upper part one is looking straight into the tip of the tower.

However, due to the missing viewfinder and no bubble level on the side of the camera it is really hard to level the camera exactly vertical.

Depending on the condition of the spring your camera might show different performance depending on which way you turn it. So try both and find out which one works better.



Hearsay and Anecdotes

One of Poncar's students mentioned to me that Poncar said the FT-2's lens is shifted upwards by 4 millimetres. I haven't checked this but it seems to be possible, although it seems to be about 2mm only.

Having this in mind, I once tried to operate the camera turned over-top when shooting a deep canyon to use the shift upwards as a shift downwards. But I had to find out that the release mechanism does not work when the camera is turned over-top. Instead I took a photo of myself when turning the camera back into its normal position as this finally released the shutter.

Literature

Several books dealing with panoramic photography have been published. Most recent books focus on digital panoramas created with stitching software and digital cameras. Below is a list of books that entirely or at least in parts cover real swing-lens panoramic photography.

Mehan: Panoramic Photography; Amphoto Books

Poncar, Jaroslav: Tibet; Edition Panorama

Josef Sudek: Nordböhmen (Northern Bohemia), Verlag Walter Storms, München

Josef Sudek: Prague panoramique, Maison Européenne de la Photographie

...to be extended!