TOPCON

VARIABLE-ANGLE RETINAL CAMERA

Models TRC-W, TRC-WT

Topcon TRC-WT Retinal Camera Instruction Manual
For digital camera upgrades and service contact:
Richard J Kinch, PhD
Palm Beach County, Florida USA
http://www.truetex.com/
+1 (561) 966-8400

TOPCON

TOKYO OPTICAL CO., LTD.
has officially become
TOPCON CORPORATION
effective April 1, 1989.

This page intentionally blank.

Congratulations on your choice of the TOPCON Variable-Angle Retinal Camera, Model TRC-W(or TRC-WT), which has been designed for use in retinal fluorescein angiography and thus is a very important diagnostic tool for the internist, as well as the ophthalmologist.

Photographs of the ocular fundus, including the papilla and macula lutea, as well as ocular anterior are possible with the instrument. The standard Auto Winder Attachment provides easy, automatic operations controlled by the release button on the control lever of the cross-slide base, thus making handling procedures very simple and convenient for the user.

Furthermore, the TOPCON Variable-Angle Retinal Camera, Model TRC-W(or TRC-WT), features a revolutionary angle changing system which makes it possible to take retinal photographs at 45, 30 and 20 degree angles of coverage, with the last giving a narrow enlarged view and the first giving an extra-wide view covering the complete retinal area.

A complete assortment of optional equipment is also available for use with the Model TRC-W(or TRC-WT), which will greatly increase the versatility of the instrument.

We would like to recommend that you read through the instructions before touching the instrument, as you will be able to obtain maximum utilization of its capabilities when you are fully acquainted with the retinal camera and its operations.

IMPORTANT

1. Check the primary voltage set to the instrument before connecting it to the line current. If unsuitable, adjust as per instructions.
2. Use the instrument within ±5 percent of the rated voltage, as otherwise recycling time will take longer.
3. Always switch OFF the power switch of the power supply unit before disconnecting or connecting cords. Furthermore, wait at least for five minutes after switch-OFF before disconnecting the 5-pin and 16-pin connector cords from the power supply unit.
4. Wait, at least for five seconds after switch-ON before using the instrument.
5. Do not touch the flash control switch of the power supply unit while the Xenon flash lamp is discharging(flashing) or charging(recycling) and, furthermore, do not touch the flash control switch together with the power switch.
6. Because of the high voltage, ground the power supply unit in accordance with approved electrical standards and, preferably, have a competent electrician take care of this matter. Furthermore, do not tamper with the power supply unit under any condition.
7. Check whether all electrical cords are properly connected before using the instrument.
   Do not switch the light on and off unnecessarily, as lamp-life will be shortend.
8. Grip the connector or the plug, when disconnecting the connector cord, and never pull on the cord itself.
9. Use the instrument in a clean, dry and, preferably, air conditioned room, without direct sunlight. Avoid rooms which are dusty, have drafts, are damp or in which direct sunlight falls on the instrument.
10. Do not touch the lens surface directly with your fingers or, for that matter, with any hard object. Furthermore, do not use silicone-treated eyeglass cleaning cloth on it.
11. Use the exclusive finders supplied with the instrument, since they have been designed to cover the full field of view even at the wide-angle setting.
12. Use only the exclusive Auto Winder attachment supplied with the instrument. Auto Winder attachments supplied with previous TOPCON retinal cameras are not compatible.

Retain this manual after you have read it and keep it close at hand for future reference.

CONTENTS

1. NOMENCLATURE AND FUNCTIONS

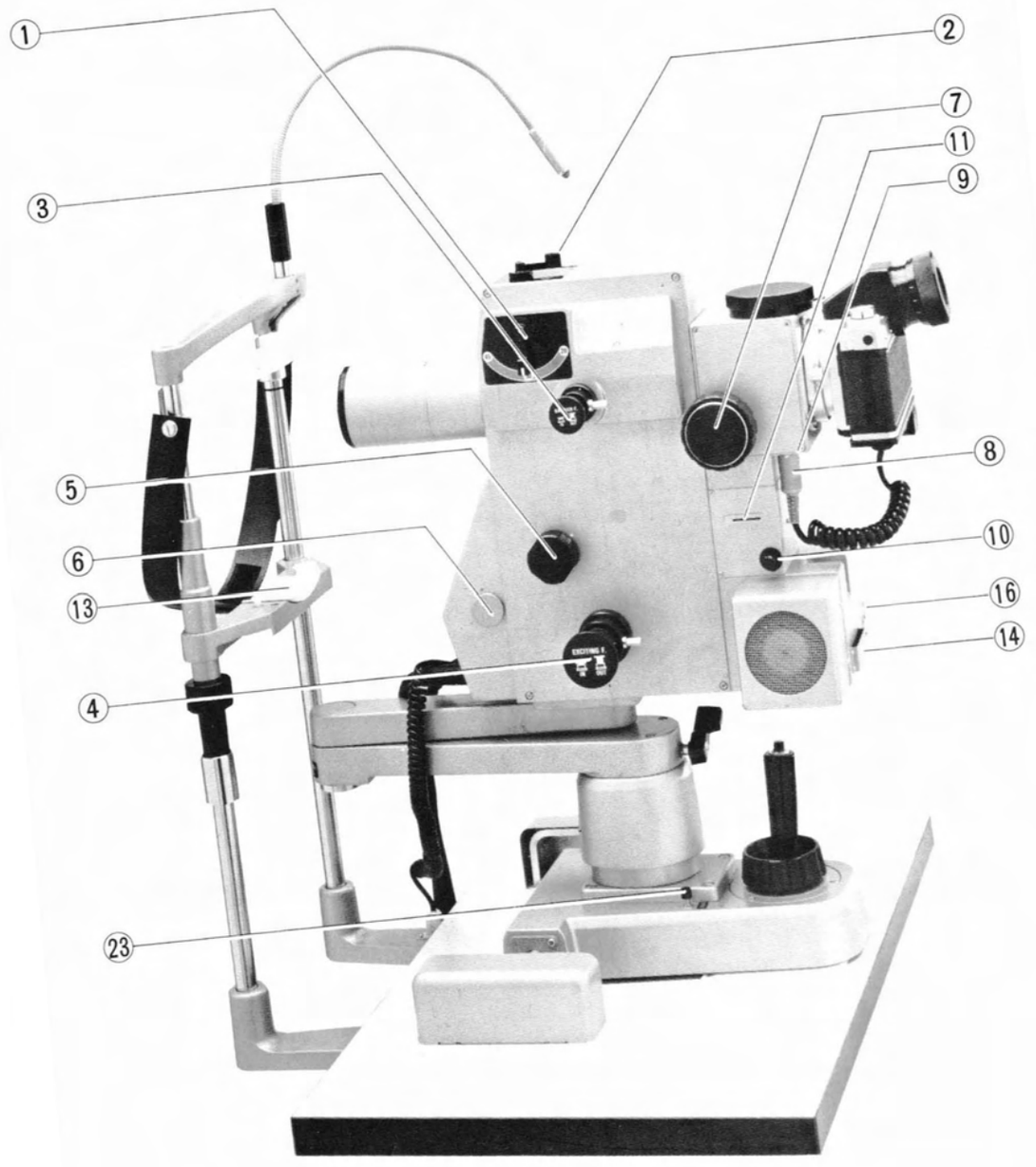

Fig. 1

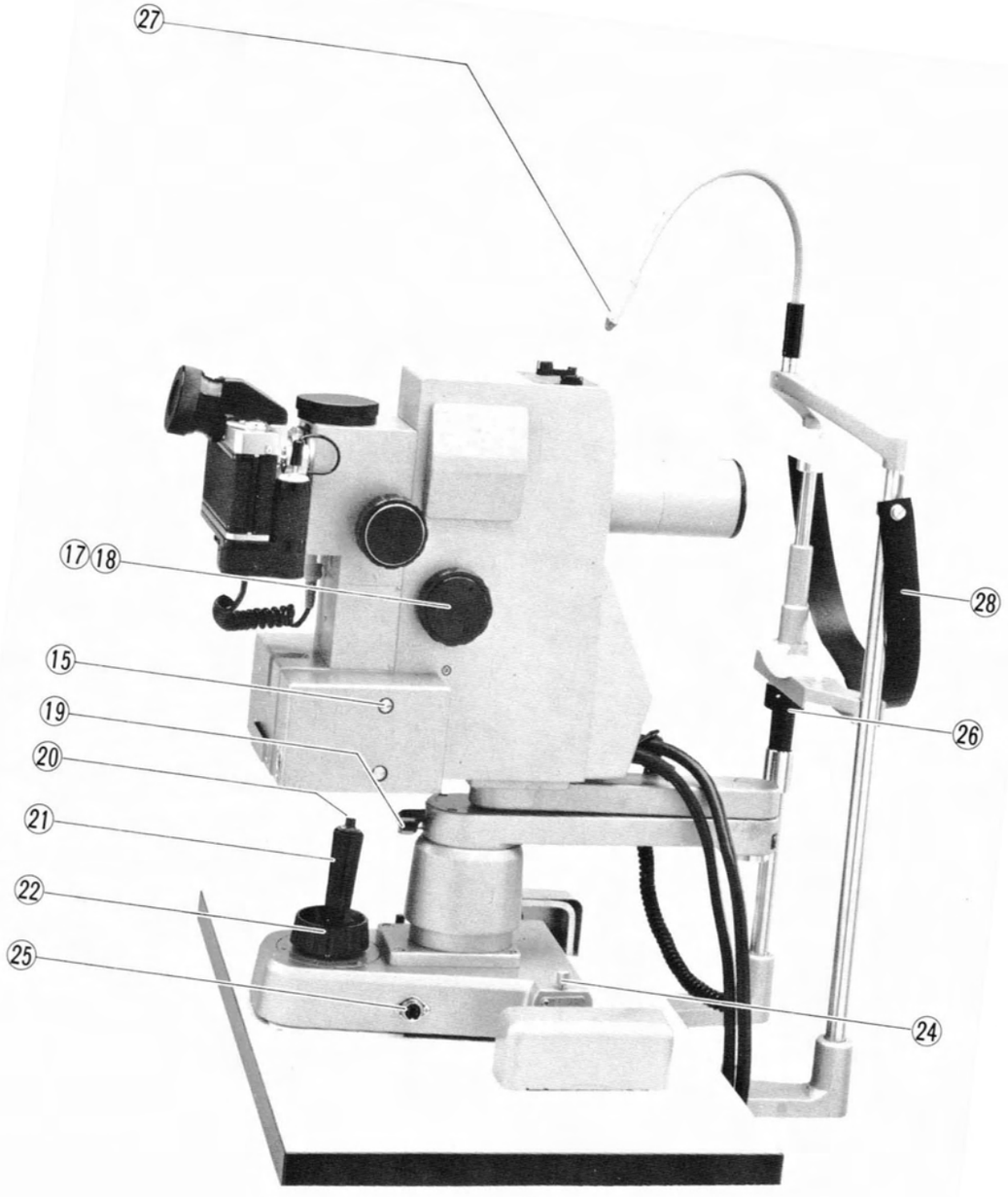

Fig. 2

Optical Head and Cross-Slide Base

① Angle changing lever — Used to change the angle of coverage to 20°, 30° and 45°.

② Diopter compensation lever

③ Barrier filter holder — Push in fully to insert the barrier filter into the optical path for fluorescein angiography. Must be pulled out until a white line can be seen, when not required.

④ Excitation filter holder — Also push in fully to insert the excitation filter into the optical path for fluorescein angiography. The illumination for the observation system is simultaneousdy increased to its maximum brightness. Must also be pulled out until a white line is visible, when not required.

⑤ Photography switching knob — Has four settings, including one blank opening which can be used for inserting a filter of user's choice, to match the type of photography planned, as follows:—

FLUOR/COLOR	For normal 35mm color photography and color fluorescein photography.
POLA	For Polacolor photography.
GREEN	For red-free photography.
OPEN	A blank setting which can be used for fitting a filter required for specialized photography.

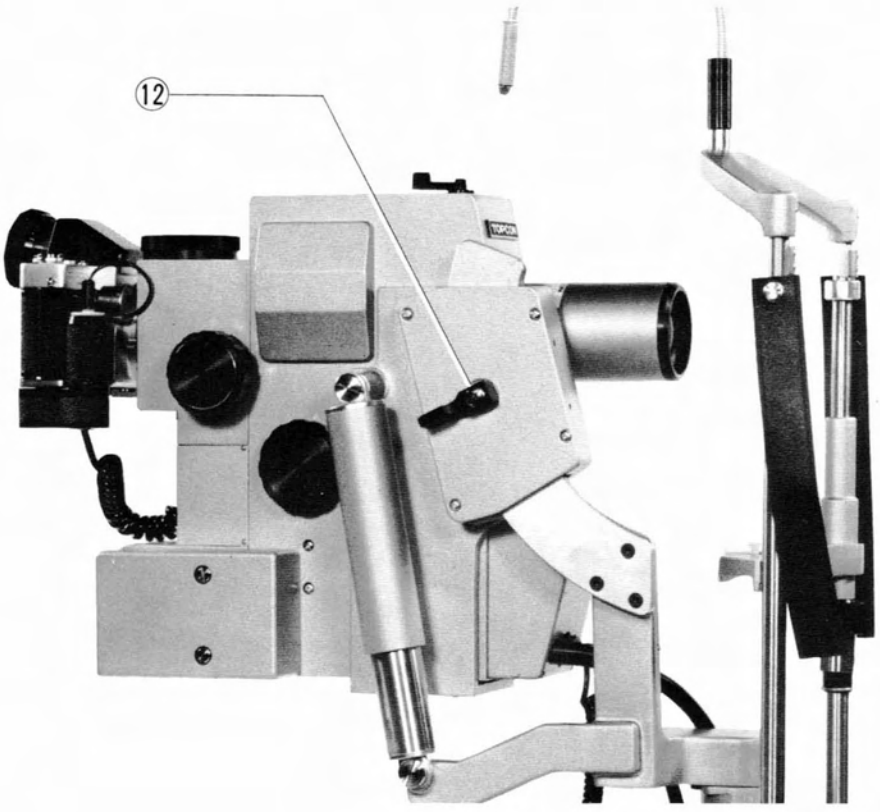

Fig. 3

⑥ Internal fixation target mount

⑦ Focusing wheel

⑧ Output connector — For connection of the spiral cord from the Auto Winder Attachment(or the optional Motor Drive Attachment, when it is being used).

⑨ Cable release socket — For use with the optional Polaroid Camera Attachment, Type PA-4, with the double-locking end of the double cable release being connected to this socket.

⑩ Zero resetting lever — Used for resetting the four digit electromagnetic timer to zero(0000).

⑪ Plate insertion slot — For inserting a plastic data plate on which pertinent information is hand-written with a marker pen, for photographing together with the retinal image and the time or frame number.

⑫ Optical head fixing lever(Model TRC-WT)

⑬ Chin-rest

⑭ Plate holder — For holding the plastic data plate when it is not inserted in the plate insertion slot.

⑮ Starter section attachment screws

⑯ Synchro-flash connector — Used for connection of the synchro-flash cord from the camera body when the Auto Winder Attachment or optional Motor Drive Attachment is not being used.

⑰ Main lamp socket

⑱ Main lamp locking ring — Must be loosened for detachment of the main lamp socket, when exchanging the main lamp.

⑲ Optical head fixing knob

⑳ Release button — Simply depressed to release the focal plane shutter in the camera body for taking flash-illuminated retinal photographs.

㉑ Control lever

㉒ Elevating wheel

㉓ Timer switch — Depressed to switch the counter to timing operations, and shows the time from 0000 to 999.9 seconds, in 0.1 second increments. The timers operation is suspended when the switched is depressed a second time.
When the timer switch is not depressed, the number of frames exposed is photographed in one frame increment each time the shutter is released.

㉔ Base fixing screw

㉕ Connector — Used for connection with the electronic flash connector on the Electric Flash Device FD-30.

㉖ Chin-rest adjusting wheel

㉗ Annular fixation target — May be adjusted with the the adjustment lever㉘ for the proper focusing distance of the patient's eye.

㉘ Head-strap

Camera and Auto Winder

㉙ Eyepiece

㉚ Film winding lever — Used for manual film winding and shutter charging operations.

㉛ Rewind crank

㉜ Back cover lock

㉝ Solenoid release — Is screwed into the cable release socket of the shutter release button(on the camera body) for activating the focal plane shutter when the Auto Winder is attached. Must be detached for use of the optional Motor Drive Attachment or for manual operations.

㉞ Rewind button(camera)

㉟ Finder catch

㊱ Rewind button(Auto Winder)

㊲ Auto Winder switch — Should be switched OFF when auto-winding is suspended midway in operation, with the red lamp㊳ lighting up to warn that operation has been suspended. Further operations, winding or rewinding, should be continued manually, with the film winding lever.

㊳ Red lamp — Illuminates when auto-winding is suspended while in operation, usually indicating that there is no more film to advance; but may illuminate when film is catching and cannot be advanced.

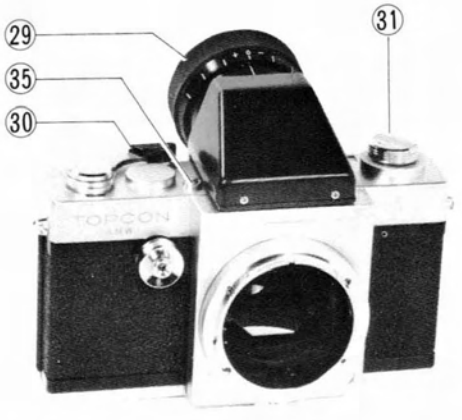

Fig. 4

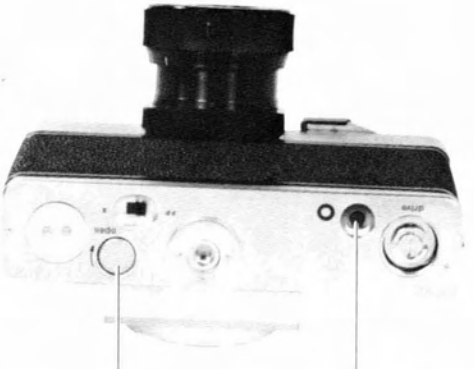

Fig. 5

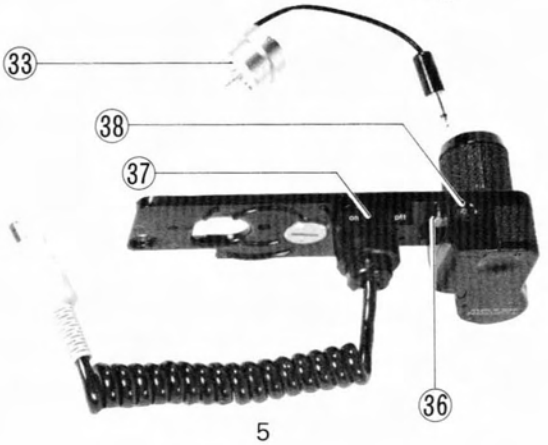

Fig. 6

Elcetronic Flash Device FD-30

㊴ Power switch

㊵ Illumination control switch — Used for adjusting brightness of the observation system illumination, by the continuous adjustments of adjusting the input voltage from 3 to 8 volts.

㊶ Flash control switch — Used to adjust the intensity of the electronic flash illumination, in nine steps, from 18 to 300 wattseconds, or 18, 25, 36, 50, 75, 100, 150, 200 and 300WS.

㊷ Readylight — Lights up when the electronic flash is fully charged for the next exposure.(Recycling time changes from 0.4 sec. in the 18 to 150WS range to 0.9 sec. in the 200 to 300WS range.)

㊸ Voltage selector/fuse holder

Fig. 7

Fig. 8

2. ASSEMBLING THE INSTRUMENT

1) Unpacking the Instrument

The TOPCON Variable-Angle Retinal Camera, Model TRC-W, is usually packed in six packages for shipment abroad, which means that the instrument is disassembled and packed carefully to protect the instrument from any damage.

Be extra careful when unpacking the cases. Locate all cases with their top side up and open up the top of the case first. Take out the contents very carefully and do not drop them as they can be damaged beyond repair.

Once everything has been unpacked, check the contents against the following list:—

① Optical head and cross-slide base	1 set
② Objective lens cap	1 each
③ Camera body mount cap	1 each
④ Table	1 each
⑤ Roller bars	2 each
⑥ Rail covers	2 each
⑦ Chin-rest section	1 each
⑧ Electronic Flash Device FD-30	1 each
⑨ Type AMW camera body	2 each
⑩ Finder	2 each
⑪ Auto Winder attachment	1 each
⑫ Auto Winder solenoid release	1 each
⑬ Synchro-flash cord	1 each
⑭ Shutter release connector cord	1 each
⑮ Observation main lamp	1 each
⑯ Fixation target lamp	1 each
⑰ Fuse(15A or 8A, as the case may be)	1 each
⑱ Plastic data plates	5 each
⑲ Chin-rest pads	1 pack
⑳ Rubber-ball air blower	1 each
㉑ Plastic dust cover	1 each
㉒ Instruction manual	1 each

There may be minor differences from the above list, depending on the market. In other words, the Auto Winder and its solenoid release are not included for some markets, while the Internal Fixation Target is included as a standard accessory for other markets. And, although two AMW camera bodies are normally supplied with the instrument, some markets get one AMW and one AMW-FL camera body each. Therefore, always check against the standard set composition for your market.

2) Checking the Primary Voltage

Before assembling the instrument, first check whether the primary voltage of the instrument matches that of the line current.

Check the voltage selector fuse holder㊸ on Electronic Flash Device FD-30 and see what voltage is set, i.e., what voltage is seen in the opening on the rim of the voltage selecter. If the voltage set is not suitable, simply unscrew the fuse holder in the center, pull out the voltage selector and reset it so that the required voltage is exposed in the opening of the rim.
Normally, the instrument is set for the required voltage, at the time of final inspection and, therefore, this adjustment should not be required.
If the instrument purchased has a fixed primary voltage of AC 120V, no adjustment will be possible.

Since a 15 ampera fuse is used for the 100—120 volt range and an 8 ampere fuse for the 200—240 volt range, check whether the fuse is also suitable when the above adjustment has been made.

3) Checking the Plug of the Power Cord

Check wheather the plug connected to the end of the power cord matches the receptacle from which the power is to be taken. If not, exchange it for a suitable one. Or, if the plug has not been attached because of special regional requirements, please connect a suitable one.

In the above cases, please note that of the three wires in the power cord, the grounding(earthing) wire is either green-colored or a bias-striped yellow and green colored one.

4) Installing the Table

Install the table on top of the TOPCON Adjustable Instrument Table, Model AIT-3, which should also be purchased at the same time, if not already available.

Simply unscrew four attachment bolts from the Model AIT-3 and use them to fix the table on top of the elevating mechanism.

5) Assembling the Instruments(Model TRC-W)

Simply place the cross-slide base section on top of the table, with the outrigger rollers aligned on top of the toothed rails.

Next, fix the roller bars securely in place on the table surface, over the outrigger rollers, and then insert the rail covers in place over the rails.

Next, attach the chin-rest section to the table, with three attachment screws.

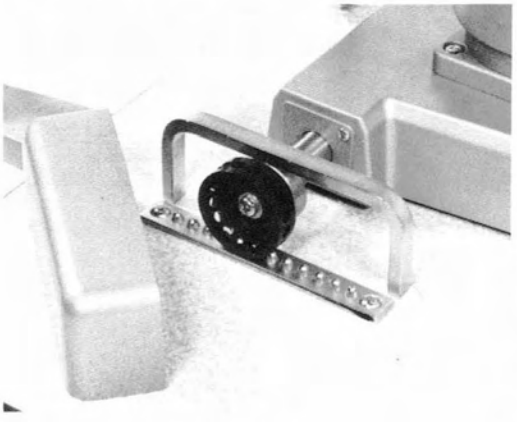

Fig. 9

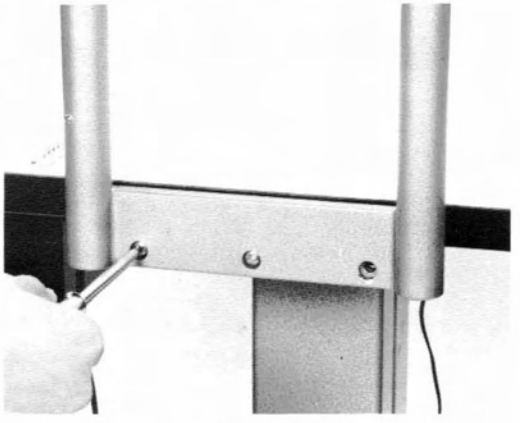

Fig. 10

6) Assembling the Instrument(Model TRC-WT)

The arm section and optical head of the instrument are separated from the base section, as well as from each other.

Therefore, after placing the base section on the table and inserting the rail covers in place over the rails, locate the end of the lower arm over the short upright column on the base, while aligning four screwholes on the arm with four screwholes on the column. Then, fix the arm to the column with four attachment screws.

Next, while supporting the optical head, align four screwholes on the forward end of the optical head with four screwholes on the attach-

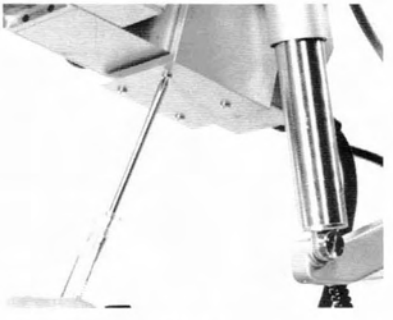

Fig. 11

ment bracket, which is connected to the upper arm section. When aligned, fix securely with four attachment screws.

The screws should be lightly tightened at the beginning, and only tightened securely and with equal force after ascertaining that the attachment is properly aligned.

Finally, attach the chin-rest section to the table, with three attachment screws.

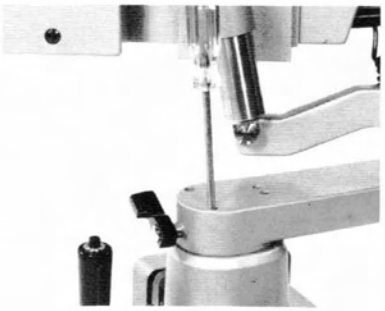

Fig. 12

7) Connecting the Electrical Cords

First, connect the two-pin connector on the end of the spiral cord from the optical head to the connector at the base of the chin-rest section

Next, connect the 5-pin and 16-pin connector cords from the optical head to 5-pin and 16-pin connectors on the rear surface of Electronic Flash Device FD-30.

Then, connect the connector㉕ on the side of the base section with the electronic flash connector on the rear surface of Electronic Flash Device FD-30, using an exclusive 5-pin connector cord.

Finally, connect the spiral connector cord from the Auto Winder Attachment to the output connector⑧.

3. BASIC OPERATING PROCEDURES

1) Attachment of Camera Body to the Optical Head

(1) First, attach the view finder on the camera body, by sliding it in from the back cover side until it clicks into place and catches securely.

To remove, simply depress the finder catch㉟ and slide the finder out towards the back cover ride.

Use only the exclusive view finders supplied with the instrument, since they have been designed to cover the full field of view even when the instrument is set to the 45° setting. View finders supplied with previous TOPCON retinal cameras will only prove effective for the standard 30° and narrow 20° fields.

(2) Check the synchro-switch on the base of the camera body and set it to the FP-setting.

(3) Next, attach the Auto Winder attachment to the camera body.

First, unscrew the DRIVE cover on the base of the camera body if it should be covered, and this will expose the motor drive shaft. Next, align driving claw and attachment screw of the Auto Winder with the motor drive shaft and the tripod socket on the base of the camera body. When properly aligned, screw the attachment screw in the clockwise direction and attach the two.

If the driving claw and motor drive shaft are not engaged, at this time, proper attachment will not be possible and, therefore, simply stroke the film winding lever㉚ so that the two are properly engaged.

The Auto Winder can be detached by simply unscrewing the attachment screw.

NOTE:
Only the exclusive Auto Winder attachment, supplied with the instrument, should be used. Auto Winder attachments supplied for previous TOPCON retinal cameras are not compatible and cannot be used.

(4) Screw the solenoid release㉝ into the cable release socket of the shutter release button on the camera body and connect the other end to connector⑧.

NOTE:
The solenoid release is not supplied, unless specifically ordered, when the Auto Winder attachment is purchased as an optional equipment, separately from the instrument.

(5) Attach the camera body to the optical head mount.

Line up red dots on the camera body flange and the optical head mount. Then, revolve the camera body in the clockwise direction until the locking lever catches and the camera body is securely attached.

To detach, depress the locking lever inwards and then revolve the camera body in the counter-clockwise direction until it can be pulled out of the optical head mount.

Always lock the optical head fixing knob⑲(and fixing lever ⑫, in the case of the Model TRC-WT) before attachment or detachment.

2) Film Loading

Film can be loaded(and unloaded) in the camera body with the Auto Winder attached, although some users may find it easier to do so with the camera body detached from the optical head.

(1) Open the back cover of the camera body, by push-turning the back cover lock㉜.

The back cover will spring open if it is not being pressed.

(2) Pull up the rewind knob fully.

(3) Place a fresh film cartridge in the empty film chamber and push the rewind knob back in to engage the film cartridge.
If necessary, rotate the rewind knob slightly so that the two engage.

(4) Pull out the leading end of the film about 15 centimeters or so and insert it into one of the multi-slots on the take-up spool.

(5) Revolve the serrated flange of the film take-up spool so that the film perforations at the top and bottom fully engage the film transport sprocket teeth.

(6) Once the perforations are fully engaged, close the back cover, by pushing it in until it catches and is locked securely.

(7) Rotate the rewind knob in the arrow-indicated direction slowly, to take up any slack in the loaded film.
Then, stroke film winding lever㉚ until it makes a full stop.

At the same time, check whether the rewind knob is rotating counter-clockwise which will show that the film is being advanced properly. (If not, the film is not caught on the take-up spool and operations must be repeated from (4) preceding.)

(8) Depress the release button⑳ and then release pressure. A blank shot will be taken. Depress the release button once more which will normally take care of any frames which may have been exposed during film loading. If film is being loaded with the camera body detached from the optical head, press the shutter release button on the camera body.)

3) Unloading the Exposed Film

If there are no more frames to expose on the film loaded in the camera body, the Auto Winder will stop auto-winding operations(even midway) because the attachment will not be able to advance the film anymore. The red lamp㊳ will stay illuminated, indicating that the auto-winding operation is continuing; therefore, turn off the auto winder switch㊲.

When the attachment is not being used, the action of the film winding lever㉚ will become heavy. Therefore, check the exposure counter which should confirm the fact that there are no more frames to expose.

It may prove easier to unload the exposed film with the camera body detached from the optical head.

(1) Depress rewind button㊱ to depress rewind button㉞ on the camera body, or depress the latter directly if the Auto Winder is not attached.

(2) Unfold the rewind crank㉛ on the rewind knob and turn in the arrow-indicated direction or clockwise.

(3) Rewind smoothly and evenly, until tension decreases which will indicate that the film has slipped off the take-up spool.

Do not rewind the film completely back into the cartridge but leave the leading end extending out from the cartridge, as it will prevent light leaking into the cartridge.

(4) Open up the back cover of the camera body. Pull up the rewind knob fully. Tilt the camera body slightly so that the cartridge falls out(into your hand).

4) Adjustment of the Eyepiece

The eyepiece㉙ must always be adjusted for the user's eyesight, as otherwise the instrument will not be focused properly on the retinal surface. Place a white sheet of paper before the objective lens for this purpose.

First, draw out the eyepiece completely by rotating its adjustment ring in the counter-clockwise direction, which will make the cross-hairs appear completely blurred.

Next, rotate the adjustment ring slowly in the clockwise direction while checking the cross-hair image in the field of view. Stop when the image is sharply focused.

Should the adjustment ring be rotated past the point of sharpest focus, start all over from the beginning, as this should prove much easier and faster than moving the ring back and forth around the point considered to be in sharpest focus.

IMPORTANT
When properly adjusted, the cross-hairs must be seen distinctly as double cross-hairs.

Furthermore, when focusing, both cross-hair image and retinal image must be seen distinctly at the same time.

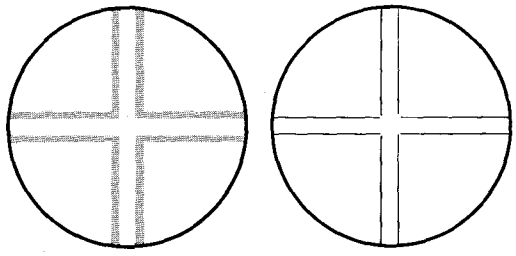

Fig. 13

5) Adjustment of the Instrument

(1) Cross-Slide Base
The base fixing screw㉔ must be loosened to make coarse adjustments of the cross-slide base with the control lever㉑. The control lever is simply held upright and moved forcefully in the required direction over the gliding plate of the table, in this case.

Always tighten the base fixing screw, when the base is positioned, as required.

For fine cross-slide adjustments of the base, up to 9mm, simply tilt the control lever slightly in the required direction.

Keep the gliding plate clean and smooth at all times to insure smooth floating movements.

(2) Optical Head
To raise or lower the optical head, in relation to the cross-slide base, simply rotate the elevating wheel㉒.

Clockwise rotation will raise it and counter-clockwise rotation will lower it.

To swing the optical head laterally or in a horizontal plane, loosen optical head fixing knob⑲ which will permit manual rotation up to 30 degrees of the arc, from the straight forward position. When positioned, as required, tighten the fixing knob securely.

To swing the optical head vertically up and down, loosen the optical head fixing lever⑫ of Model TRC-WT, which will permit manual rotation up to 15 degrees of the arc, from the horizontal plane. When positioned, retighten the fixing lever securely.

In both cases, the optical head is rotating around the center of the optical axis on the corneal front surface.

(3) Chin-Rest
The chin-rest is raised or lowered with the chin-rest adjusting wheel㉖. Clock-

wise rotation will raise it and counter-clockwise rotation will lower it.

6) Use of the Diopter Compensation Lever

The diopter compensation lever② has four settings, or a white ring(○), a minus(−) mark, a plus(+) mark and an ANT setting.

The white ring setting is without compensation for use with the non-emmetropic eye, and its vertex power range is −10 diopters through zero to +6 diopters. The minus setting shows that a minus compensation lens has been inserted, for the strong myope, with the vertex power range extending from −7 diopters to −25 diopters.

The plus setting shows that a plus compensation lens has been inserted, for the strong hyperope, with the range changing to +6 diopters to +25 diopters. The ANT setting shows that a compensation lens has been inserted for photographing the ocular anterior.

The instrument must be refocused when the diopter compensation lever is adjusted.

7) Use of the Internal Fixation Target

When the internal fixation target is supplied with the instrument(otherwise it is an optional accessory), it can be fixed on the internal fixation target mount⑥.

First, unscrew the slotted cover of the mount⑥ with a coin or similiar object. Then screw in the accessory in place of the cover. (Remember to keep the mount cover for future use.)

The internal fixation target can be adjusted in or out, right or left and back and forth, for pin-pointing the fixation spot or area, as checked in the field of view.

4. PROCEDURES FOR TAKING RETINAL PHOTOGRAPHS

1) Preparations

(1) Use a dark room.

(2) Dilate the patient's pupil completely about 20 minutes before photography, with a few drops of Mydriatic, etc. If the pupils are not dilated to more than 7mm in diameter, there will not be sufficient illumination.

(3) Turn ON the power switch㊴ and check whether the main observation lamp and fixation target lamp are illuminated or not.

(4) Next, depress the release button⑳ and make several blank shots, to check whether there is flash illumination each time.

(5) Next, adjust the eyepiece to the user's eyesight.

(6) Have the patient sit down properly before the instrument and, if necessary, adjust the height of the chin-rest.

(7) Set the controls of the instrument, according to Table 1, depending on the type of film being used and the type of photography.

2) Pointers on Taking Retinal Photographs

(1) To coincide the light beam properly to the patient's pupil, first, move the optical head in towards the patient's eye, i.e., move it in from the operator's side towards the patient, and stop when the field of view is observed evenly illuminated.
Then, move it in further very slightly which will be the optimum position at which the light beam will de properly coincided to the patient's pupil.

(2) When focusing the retinal image with the focusing wheels, it should be remembered that not only the retinal image but the cross-hairs must also be observed sharply and distinctly in the field of view at the same time. Otherwise, the retinal image will not be focused properly on the film plane.

(3) When changing the angle of coverage.

a) It will not be necessary to refocus when changing the angle of coverage from 20° to either 30° or 45°, if the retinal image has already been properly focused at the 20° angle of coverage, and

b) Flare will not occur when the angle of coverage is changed from 45° to either 30° or 20°, if the light beam has been properly coincided to the patient's pupil at the 45° angle of coverage.

(4) In order to have the patient fixate the annular fixation target properly, i.e., coincide the patient's line of sight to the fixation target properly, directing the light beam from the fixation target into the patient's pupil.
At the same time, in order to eliminate accomodation so that the patient can properly focus on the fixation target, adjust the annular fixation target with its adjustment lever㉘ so that the target is located at the far point of the patient's eye.

3) Photography with 35mm Color Film

(1) As in Table 1, adjust the flash control switch, photography switching knob and counter illumination plate, based on the ASA film speed of the film loaded in the camera body.

(2) After adjusting the dioptric power of the eyepiece to the user's eyesight, align the optical head and, therefore, light beam to the patient's pupil and, then, focus the retinal image.

Table 1—**Exposure Guide for TRC-W/WT/W3/WT3**

Type of Photography / Control Settings	**35mm Color Photography**				Polacolor **Photography**	Polaroid **Black-&-White**	Fluorescein **Photography**	Red-Free **Photography**
ASA Film Speed	64	100	160	200	75	3,000	400	400
Flash Control Switch	75WS	50WS	36WS	25WS	300WS	25WS	300WS	25WS
Photography Switching Knob	FLUOR/COLOR				POLA	POLA	FLUOR/COLOR	GREEN
Note: The flash control switch setting noted above is for the average retinal area.								

(3) Follow instructions in "2)Pointers on Taking Retinal Photographs" and take the required photographs.

(4) Should the Auto Winder Attachment get out of order while taking retinal photographs, simply detach it and manually continue with the release button on the control lever, while using the film winding lever㉚ to advance the film and to charge the shutter.
In this case, however, the synchro-flash cord must be used to connect the flash socket(on the rewind side of the camera body) with the socket on the starter section(below the optical head). The procedure is only recommonded for emergency use.

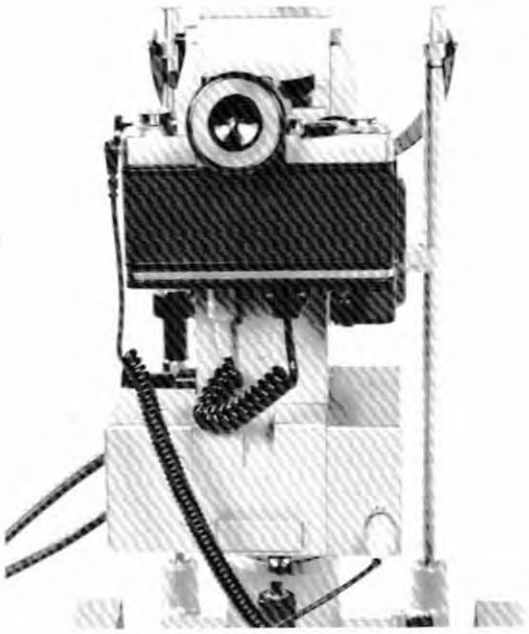

Fig. 14

(5) The barrier filter must be completely out of the optical path, in the above case, which can be confirmed when the white line is visible on the barrier filter holder③.

4) Fluorescein Photography with Black-and-White Film

(1) Set controls according to Table 1.

(2) Next, make the same adjustments, as noted for color retinal photography, and focus the retinal image properly.

(3) Depress the timer switch㉓ at the same time an intravenous injection of fluorescein is given to the patient.

(4) Insert the excitation filter holder④ and barrier filter holder③ into the optical path, by pushing both in fully.

The main lamp illumination will be increased automatically to its maximum brightness when the excitation filter holder is pushed in and will be decreased to its former level when the holder is pulled out fully.

(5) Development of the film.
Development of the film, in the case of fluorescein retinal photography, should differ according to conditions and, therefore, the film should be developed under inspection.

The following is a guide for developing films under average conditions:

a) Film — Kodak Tri-X Pan(ASA 400)
b) Developer — Konidor Super(Konishiroku)
c) Development — Tank development with developer temperature 20°C and 13 to 18 minutes of development.
d) Fixing time — 10 to 20 minutes.
e) Washing time — More than 30 minutes.

NOTE:
The developer, in the above, can be replaced with a special fine grain developer E-24(Adox), in which case, developing time should be shortened to 10 to 15

minutes.

(6) When using the optional Type AMW-FL camera body, which is for use exclusively in fluorescein retinal photography, the barrier filter holder③ should not be pushed into the optical path, although other operations will be the same.
NOTE :
The Type AMW-FL camera body is supplied as one of the two camera bodies for the instrument, for certain markets, but most markets are supplied with two AMW camera bodies.

5) Retinal Photography with the Polaroid Camera Attachment

(1) Use the optional Polaroid Camera Attachment, Type PA-4; other types of attachments should not be used on the instrument.

(2) Connect the attachment on its exclusive attachment mount, on top of the instrument, as illustrated.

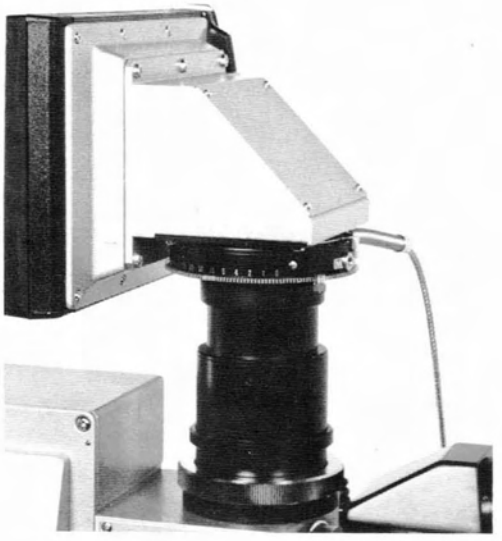

Fig. 15

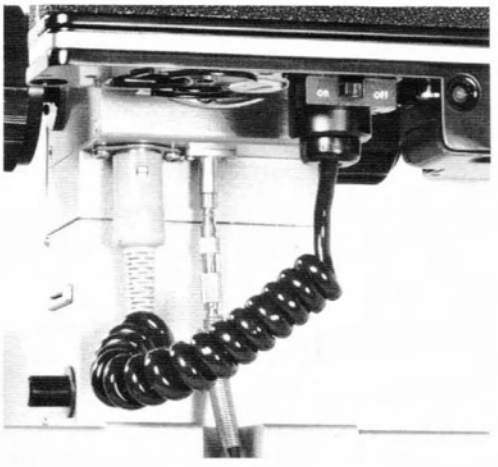

Fig. 16

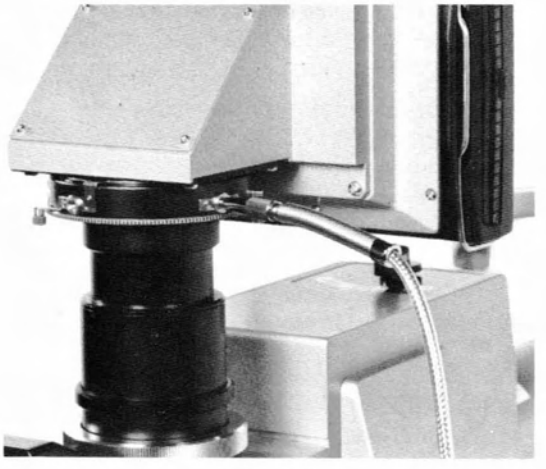

Fig. 17

(3) Attach the double-locking connector of the double cable release to the release socket⑨ on the optical head section while the other end should be connected to the attachment.

NOTE :

Since the cable release socket⑨ is utilized to place the reflex mirror in the optical path and thus divert it upwards to the Polaroid Camera Attachment, the double cable release must be adjusted so that the cable release socket⑨ is activated before the shutter release on the attachment.

(4) Connect the synchro-flash cord, as illustrated.

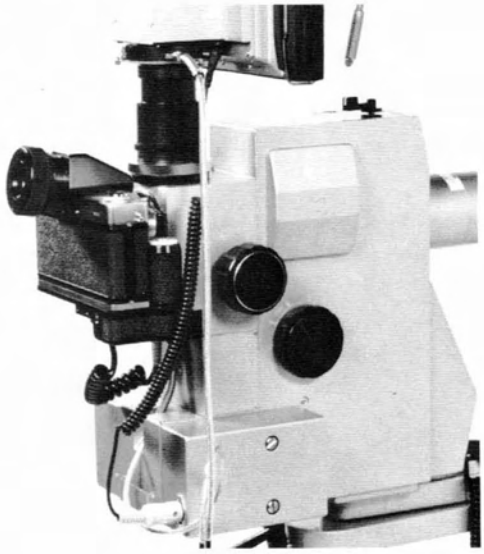

Fig. 18

(5) Set controls as per Table 1.

(6) Focus on the patient's retina.

(7) Photographs are taken with the double cable release, in this case, with the cable release being pushed in until the shutter of the attachment is released.
The shutter speed of the attachment should be set to 1/15 second and the aperture opening to B.

(8) Pull strongly on the white backing paper with the number printed on it(while holding the attachment with the other hand). When the tab of the sensitized paper also comes out with the white backing paper, pull strongly on the tab, too. Start timing the development when the sensitized paper is pulled out.
See the instructions enclosed with the film regarding development of the film, as well as instructions supplied with the accessory for attachment and operations.

5. EXCHANGE OF LAMPS AND FUSE

Lamps should be exchanged only after switching OFF the power switch.

1) Main Illumination Lamp

(1) Loosen the main lamp locking ring⑱ and pull out the lamp socket.

(2) Exchange with the spare main lamp and tighten the main lamp locking ring⑱ when fully inserted.

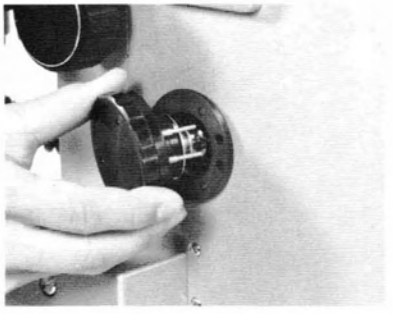

Fig. 19

2) Xenon Flash Lamp

(1) Loosen the starter section attachment screws⑮ and pull off the starter section.

(2) Grip the flange of the Xenon flash lamp firmly and pull straight upwards for detachment.

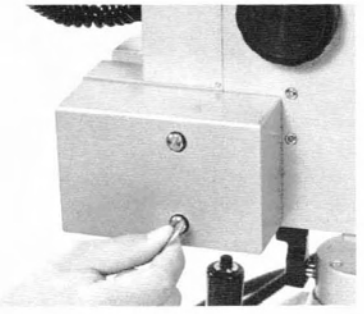

Fig. 20

(3) Insert the replacement lamp by coinciding the pins on the base of the lamp to the sockets on the starter section and then push in strongly.

Always grip the flange of the Xenon flash lamp and never touch the glass bulb itself, as fingerprints on the glass surface will affect the light intensity and the lamp-life.

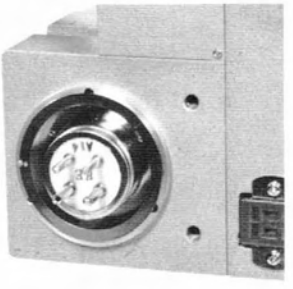

Fig. 21

(4) Attach the starter section to the optical head, by coinciding the pins on the former with openings on the bottom of the optical head side and then inserting fully.

(5) Finally, screw in the starter section attachment screws firmly.

3) Annular Fixation Target amp

(1) Loosen the knurled knob of the fixation target slightly and detach the target end, which will expose the lamp.(Do not turn the knob too much, as it will come off.)

(2) Grip the exposed lamp bulb and revolve it in the counter-clockwise direction until it comes off. Replace with a new lamp bulb, by revolving in the clockwise direction.

After exchanging the required lamp, always switch ON the power switch and check whether the lamp is in working order.

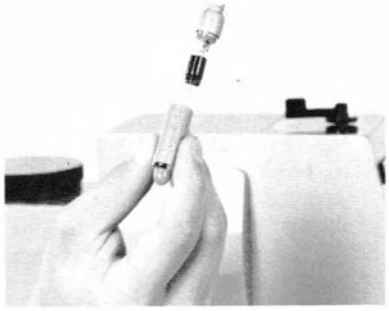

Fig. 22

4) Exchanging of the Main Fuse

(1) First, switch OFF the power switch and disconnect the power cord.

(2) Next, unscrew the fuse holder㊸ cover on the rear of the power supply unit.

(3) Pull out the exposed fuse and replace with a new glass-shielded fuse of same rating, i.e., 15 amperes in the case of 100—120V and 8 amperes in the case of 200—240V.

(4) Replace the fuse holder cover and, at the same time, check whether the voltage selector is also set to the required voltage, i.e., the required voltage is observed in the rim of the voltage selector.

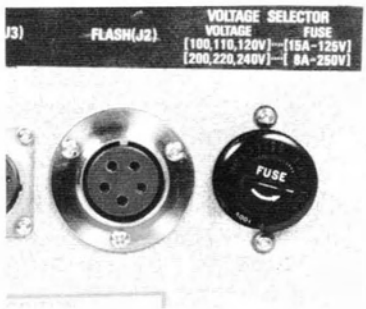

Fig. 23

(5) Connect the power cord and switch ON the power switch. Check whether electricity is being supplied to the instrument.

6. SPARE PARTS

When ordering spare parts, such as lamps, fuses, etc., please indicate the name of the item, the part number and the quantity required, as well as the model that is being used.

Xenon flash lamp	Part No. 404525501
Main lamp	Part No. 405101089
Fixation target lamp	Part No. 403504211
15 ampere fuse	Part No. 404335054
8 ampere fuse	Part No. 404525109
Chin-rest pads	Part No. 403104082

7. CARE AND MAINTENANCE

(1) Keep the room in which the instrument is located as clean as possible, at all times. Furthermore, keep the objective lens covered with its cap, and the instrument protected with its plastic dust cover, when it is not actually being used.

2) Protect the lens surfaces, especially the aspherical lens surface of the objective, from scratches, dust, dirt and/or fingerprints, at all times.
When necessary, clean the lens surface by, first, blowing away dust or dirt with a rubber-ball air blower or brushing with a soft, clean camel hair brush. If the lens surface is still not clean, try wiping it gently with a lint-free clean cloth or a good quality lens tissue. If necessary, dip very lightly in a mixture of ether and alcohol and wipe in ever-widening circles from the center out. Wipe gently and do not rub under any condition. If necessary, repeat, as many times as required but do not attempt to rub it clean.

3) Do not touch the reflex mirror of the exclusive camera body, especially with your finger or a hard object. If the mirror surface is found dirty, try blowing the surface clean with a rubber-ball air blower or resort to gentle brushing, but always blow or brush the dust or dirt out of the camera body instead of in.
If absolutely necessary, clean the surface in the same manner as the lens.

4) If the instrument is not being used for a long period, detach the Auto Winder and store it separately.
In the above case, place covers on both the optical head mount and the camera body mount, to prevent entry of dust and to protect the inner mechanisms.
Store the instrument in a dry, cool room, with freely circulating air(but not drafty or windy).
Do not keep the shutter tensioned when storing the camera body but always depress the shutter release button on the body.
This is because the springs should not be kept tensioned inside the camera body for a long period.

5) Clean the filter inside the optional Type AMW-FL camera body, when there is dust on it, since such dust will be photographed together with the retinal image.(Otherwise, never touch the filter.)
   (1) First, stroke the film winding lever㉚.
   (2) Next, detach the bar "A" from the top of the camera body and insert it into the opening "B".
   (3) Then, depress the shutter release button which will swing up the reflex mirror and expose the filter to view, from the front side.(The camera body should be detached for this purpose, with the back cover also opened in order to expose the rear side of the filter, too.)
   (4) Clean both surfaces of the filter with a rubber-ball air blower or soft camel hair brush. Be extra careful not to scratch the filter surface, leave fingerprints, dirt or oil on the surface and never leave brush hairs inside the camera body.
   (5) Once the filter has been cleaned, advance the film winding lever once more, detach the bar "A" and replace it in its original position. Then, press the shutter release button once more.

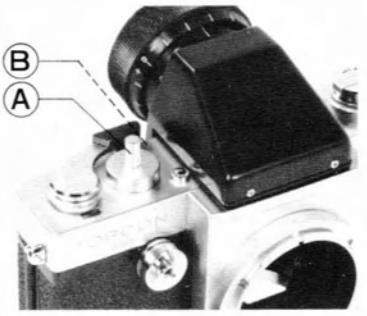

Fig. 24

6) Cleaning the Gliding Plate and Rails

The gliding plate on top of the table, as well as the rails, must be cleaned from time to time, in order to insure smooth movement of the cross-slide base.

Clean the gliding plate with a silicon cloth and the rails with a brush. If the former is too dirty, clean it with a cloth soaked in a soapy solution or in detergent. In this case, however, finish with a clean wet cloth and, finally, wipe dry with a clean cloth.

Clean the other plastic parts of the instrument in similiar manner.

7) Other Troubles

As long as the instrument is used properly, according to instructions, there should be no other troubles, both optically and mechanically.

However, the mechanical moving parts may be affected after repeated usage over a long period, in which case, the instrument should be sent out to a competent optical repair shop, if available and depending on the nature of the trouble. Otherwise, contact the authorized dealer or our export office.

The moving parts will wear out faster if dust is allowed to be rubbed into them which means that the instrument should be covered with its plastic dust cover when not in use and, of course, the instrument should be used in a clean room.

Incidentally, if the instrument is tampered with in any way that could affect its performance, or is remodeled, modified and/or adapted, or taken apart by inexperienced personnel, we cannot be held responsible for any problems which may arise and/or we may not be able to help you repair the instrument.

8. SPECIFICATIONS

1.	Angle of coverage	45°, 30° and 20°, with manual switching.
2.	Working distance	45mm(objective lens surface-to-corneal surface)
3.	Area photographed	22mm diameter(on the 35mm film)
4.	Photographic magnifications	1.7× at 45°, 2.5× at 30°, and 3.7× at 20°, at zero diopter.
5.	Total observation magnifications	11× at 45°, 16.4× at 30°, and 24.4× at 20°, at zero diopter.
6.	Diopter compensation range for patient's eye	
	0 setting	−10 to +6 diopter(w/o compensation);
	+ setting	+6 to +25 diopters(with positive lens);
	− setting	−7 to −25 diopters(with minus lens);
	ANT	Ocular anterior photography range.
7.	Built-filters	
	For fluorescein photography	Interference filter. Filter holder is exchangeable.
	Red-free photography	Green filter
8.	Data photography	Number and name can be photographed coincidentally. Four digit additive counter coupled to shutter action. Timer activated with push-button switch, shows time from 0000 to 999.9 seconds, in 0.1 second increments, with counter being switched out at the same time. Patient's name photographed by inserting plastic data plate with written information.
9.	Electronic Flash Device FD-30	
	Primary voltage	AC 100, 110, 120, 200, 220 or 240 volts, with built-in voltage selector. (Fixed 120V for certain markets.)
	Frequency	50/60 Hz
	Output rating(with 100V input voltage)	8V(max.) for observation illumination; DC 440V 300WS(in 9 steps) for flash illumination; DC 15V 100mA for electromagnetic counter; 1.5V 100mA for fixation target lamp; DC 15V 1A for moter drive attachment; DC 5.5V 1.3A for Auto Winder attachment. DC 14V 2.5A for solenoid shutter release.
	Flash recharging time(with 100V input voltage)	
	At 18—150WS	450ms or less.
	At 200—300WS	900ms or less.
10.	Base movements	
	Coarse	70mm longitudinally; 90mm laterally.
	Fine	9mm cross-slide adjustments
11.	Optical head swing	Up to ±30° of the arc lateral swing(around the center of the optical axis on the corneal front surface); Model TRC-WT also has up

		to ±15° of the arc vertical swing in similiar manner.
12.	Optical head vertical travel	15mm up; 15mm down
13.	Chin-rest vertical travel	80mm
14.	Weights	
	instrument	22.5 kgs.
	Electronic Flash Device FD-30	26 kgs.
15.	Dimensions	
	Instrument	560mm wide × 627mm high × 468mm deep
	Electronic Flash Device FD-30	293mm wide × 191mm high × 459mm deep
16	Power consumption	1.5KVA

Subject to changes in design and/or specifications, without advance notice.

9. ADDITIONAL OPERATING PROCEDURES

(Models TRC-W3 and TRC-WT3)

For those who have purchased the Models TRC-W3 and TRC-WT3, the following instructions must also be followed.

The Model TRC-W3 is basically identical to the Model TRC-W in most of its handling procedures while the Model TRC-WT3 is identical to the Model TRC-WT, However both Models TRC-W3 and TRC-WT3 are supplied with the Motor Drive Attachment (in place of the Auto Winder Attachment) and Electronic Flash Device FD-100(in place of the Electronic Flash Device FD-30) and, therefore, require slightly different operating procedures.

1) Checking the Primary Voltage

The Models TRC-W3 and TRC-WT3 must be used on single phase 200, 220 or 240 volts, within ±5% of rating, and, furthermore, must be grounded properly, according to your local electrical regulations.

The voltage set to Electronic Flash Device FD-100 can de checked with the voltage adjuster bar, on its rear surface. If the voltage set to the instrument is not suitable, loosen the winged nuts and set the voltage adjuster bar to the required setting. Then, retighten the winged nuts.

2) Attachment of the Camera Body to the Optical Head

(1) First, attach the finger on the camera body.(Follow instructions for Models TRC-W and TRC-WT.)

(2) Check the synchro-switch setting and set it to the FP-setting.

(3) Next, attach the Motor Drive Attachment to the base of the camera body.

First, unscrew the DRIVE cover on the base of the camera body which will expose the film winding coupling disc for coupling with the Motor Drive attachment.

Next, place the spacer between the attachment and the camera body, by placing it on top of the motor drive. Insert a pin on the attachment into an alignment hole on the spacer.

Next, stand the shutter release coupling bar of the attachment up vertically and slide it up along the front of the camera body so that the bottom edges of the coupling bar slip under the shutter release button. The bar will catch firmly on both sides of the shutter release button, when pushed up properly.

At the same time, see that the driving claw of the motor drive couples with the film winding coupling disc and the attachment screw is lined up with the tripod socket. Finally, screw in the attachment screw.(The spacer must be located between attachment and camera body, when the two are attached.)

(4) Stroke the film winding lever㉚ and check whether the motor drive is coupled to the camera body.

(5) Check the stroke of the shutter release screw on the shutter release coupling bar, by depressing the shutter release button near the base of the coupling bar.

If the shutter release screw does not activate the shutter release button on the camera body, adjustment is required. Revolve the shutter release screw fully in the counter-clockwise direction and do the same with its lock nut. Next, screw the shutter release screw in slowly, while checking whether its extension is satisfactory or not. When satisfactory, revolve the lock nut clockwise and fix the

stroke of the shutter release screw.

(6) Finally, attach the camera body to the optical head.(Follow instructions for Models TRC-W and TRC-WT.)

3) Connecting the Electrical Cords

First, connect the two-pin connector on the end of the spiral cord from the optical head to the connector at the base of chin-rest section.

Next, connect the 5-pin and 16-pin connector cords from the optical head to the 5-pin and 16-pin connectors on the rear surface of Electronic Flash Device FD-100.

NOTE :
Use only the exclusive 5-pin connector cord supplied with the Motor Drive Attachment, as former connector cords should not be used.

Then, connect the connector cord from the Motor Drive attachment to the output connector⑧.

Next, connect the synchro-flash socket on the camera body with the synchro-flash connector.

And, if the optional foot switch is being used, connect its connector cord with its connector on the Electronic Flash Device FD-100.

4) Adjusting the Controls on the Motor Drive Attachment

After properly attaching the camera body to the optical head and connecting the cords, as well as loading film, make the following adjustments, as required:—

(1) Exposure Indicator
The exposure indicator on the right rear rurface of the motor drive attachment must be adjusted for the number of exposures available on the film loaded in the camera body, since motor drive operation will be suspended automatically when the subtractive-type exposure indicator reaches zero.

Push-turn the milled wheel of the exposure indicator and set the index to 20 or 36(more frames cannot be exposed without using a bulk film magazine).

(2) Timer Dial
The timer dial on the rear side of the motor drive attachment(over the S-C Switch) can be set for the required firing rate, when sequential frames are being exposed continuously.

There is a choice of 1, 2 and 3 frames per second.(When used with Models TRC-W and TRC-WT, in place of their Auto Winder Attachment, the 3 fps firing rate cannot be used, although it can be set.)

(3) S-C Swich
The S-C switch can be set for either single frame exposures(S) or continuous shooting(C), with the latter used normally for fluorescein angiography.

5) As for taking retinal photographs with th Model TRC-W3 and TRC-WT3, follow instructions on the preceding pages for the Model TRC-W and TRC-WT, in general, but with control settings as per Table 2 for fluorescein angiography.

Incidentally, the optional Motor Drive Attachment can also be used with Model TRC-W and TRC-WT(but only at 1 and 2 fps firing rates), in which case, control settings should be as per Tadle 3 which also follows.

In any case, when push-development is required, always develop under inspection.

NOTE :
The Auto Winder attachment is also available optionally for use with Models TRC-W3 and TRC-WT3 but the solenoid release(which is supplied with the Models TRC-W and TRC-WT when the Auto Winder is a standard accessory) is only available optionally, which means that it, too, must be specifically ordered.

6) Circuit Breaker
Electronic Flash Device FD-100 has a circuit breaker in place of the fuse.

This means that the circuit is always broken, when there is a surge of current in excess of the capacity of the Electronic Flash Device, which can be closed by moving the lever of the circuit breaker ON.

However, if the reason for the power surge is not rectified, the circuit breaker will, of course, operate once more to protect the Electronic Flash Device.
Therefore, always check for the cause before closing the circuit.

Table 2—**Exposure Guide for Fluorescein Angiography**(Models TRC-W3 and TRC-WT3)

Control Settings	Type of film		
	Black-and-White		**Color Transparency**
ASA Film Speed	400	400	160
Flash Control Switch	300WS	300WS	36WS
Photography Switching Knob	FLUOR/COLOR	FLUOR/COLOR	FLUOR/COLOR
Firing Rate	3 fps	2 fps	1 fps

Note: (1) The flash control switch setting noted above is for the average retinal area.
(2) ASA 400 black-and-white film is the equivalent of Kodak Tri-X Pan.
(3) ASA 160 color slide film is the equivalent of Kodak High Speed Ektachrome, Daylight.

Table 3—**Exposure Guide for Fluorescein Angiography**(Models TRC-W and TRC-WT)

Control Settings	Type of film		
	Black-and-White		**Color**
ASA Film Speed	400	400	160
Flash Control Switch	300WS	150WS	36WS
Photography Switching Knob	FLUOR/COLOR	FLUOR/COLOR	FLUOR/COLOR
Firing Rate	1 fps	2 fps	1 fps
Push-Develop for ASA		800	

Note: (1) The above is based on the use of the optional Motor Drive Attachment.
(2) The flash control switch setting noted above is for the average retinal area.
(3) ASA 400 black-and-white film is the equivalent of Kodak Tri-X Pan.
(4) ASA 160 color slide film is the equivalent of Kodek High Speed EKtachrome, Daylight.

TOPCON

TOKYO OPTICAL CO., LTD.
75-1 Hasunuma-cho, Itabashi-ku, Tokyo 174, Japan.
Telex : 0272-2384 Phone : 03-967-1101

TOPCON INSTRUMENT CORPORATION OF AMERICA
65, West Century Road, Paramus, New Jersey 07652, U.S.A.
Telex : 134338 Phone : 201-261-9450

TOPCON EUROPE B.V.
Groothandelsgebouw, P.O. Box 29039, 3001 GA Rotterdam, Netherlands.
Telex : 23783 Phone : 127279

TOPCON DEUTSCHLAND GmbH
Krefelderstrasse 19-21, D-4156 Willich 1, West Germany.
Telex : 8531981 Phone : 02154 427061～6

TOPCON SINGAPORE PTE. LTD.
International Plaza, 10 Anson Road, No. 23-12, Singapore 0207.
Telex : 26622 Phone : 2218824

Printed in Japan 8402-1SW