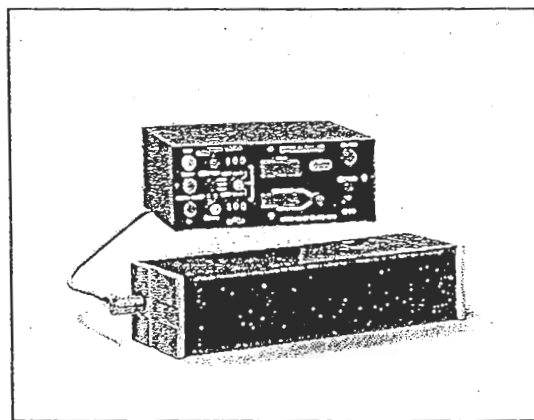
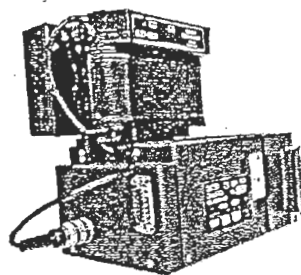
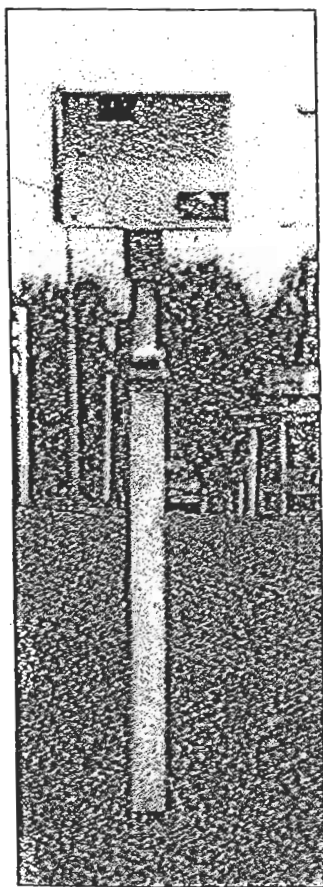


Gatso FIP installation with radar 24 and traffic camera type AUS-S (mph version)



CE 0122 !

56

Important Notice:

This device is a radar speed device intended for enforcement in all EU and EFTA member states, except in below crossed out countries where restrictive use applies.

Note: This device is also authorized for use in all EFTA member states (CH, ICE, LI, NOR)

AUS	B	DK	FIN
F	D	GR	IRE
I	LUX	NL	P
E	S	UK	

5. The 30 m film cassette 3

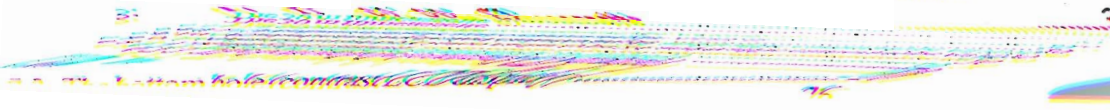


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General introduction

Gatsometer speed control equipment measures the speed of vehicles. A photo is taken of those, who exceed a preset threshold speed. With the camera type AUS it is possible to make 2 exposures of each offence. In the upper right corner of the result photo, the reflecting image is positioned with the superimposed data. Apart from the offender's speed, also date, time, range, direction, film number, exposure number and the handwritten information of the camera information panel is shown.

The speed control equipment is placed in a cabinet mounted on a hinged pole, called the Fixed Installation Post, placed at the roadside.

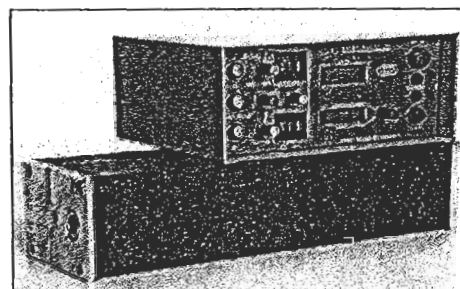
1.1 The equipment

The complete equipment consist of:

- * Gatso radar type 24C
- * Gatso traffic camera type AUS-S
- * Gatso FIP flash unit
- * 30 m film cassette

1.1.1 The radar unit type 24C

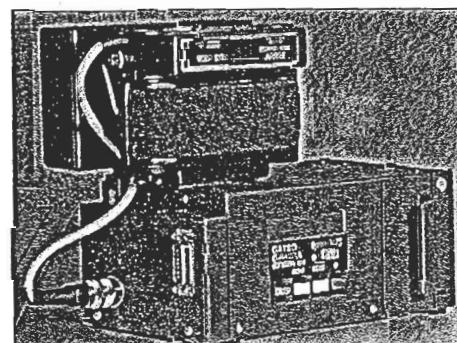
The radar unit consists of a radar antenna and control unit.



1.1.2 The traffic camera type AUS-S

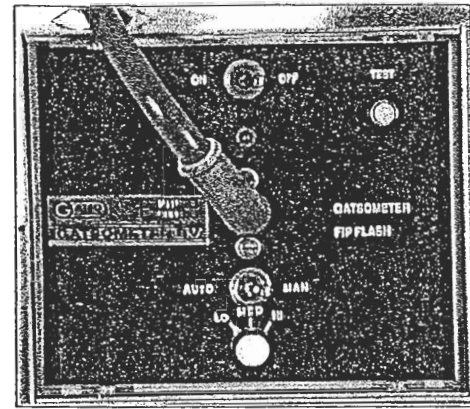
This camera is equipped with a memory card and its function is the registration of:

- * measured vehicle with road situation
- * date/time information
- * traffic direction (approaching or receding)
- * range setting of radar antenna (1 or 2)
- * handwritten information



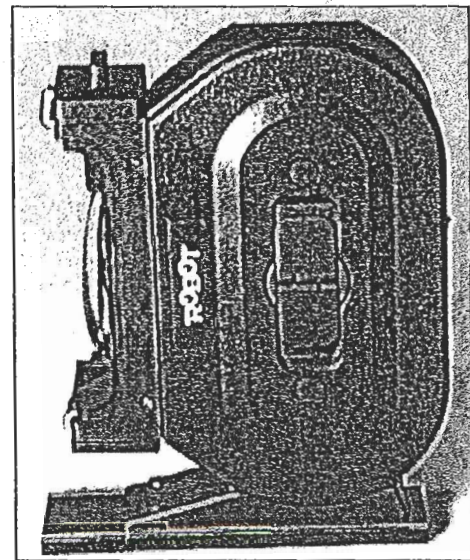
1.1.3 The flash unit

The flash unit is also installed in the cabinet and its power is supplied by the mains. The flashgenerator has three flash intensities: low-medium-high. >



1.1.4 The 30 m filmcassette

With this cassette 800 exposures can be made.



2

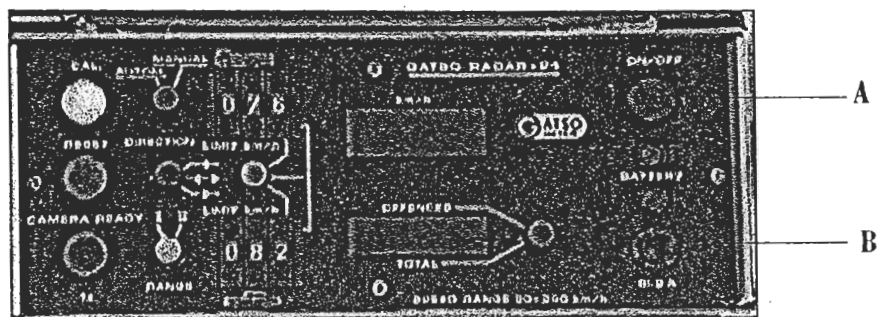
Gatso radar type 24C

In this chapter you will be informed about the radar control unit type 24. Both the front- and rearside of the unit will be reviewed. Special attention will be paid to the function of all switches and buttons on the control unit.

The first part of this chapter will review the frontside of the control unit, the second part informs about the rearside and the last part gives you technical details about the radar antenna and control unit.

2.1 The frontside of the radar control unit

Before all buttons will be discussed we would first like to show you a photo of the frontside



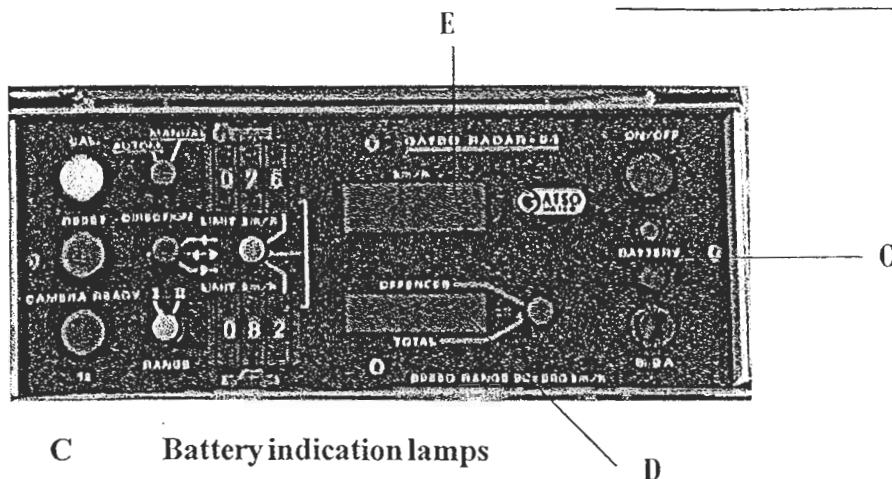
A Switch on/off(red)

When the radar is switched on, the green battery lamp should be lit. Immediately after the green lamp is on, a power up test will be done and when completed after 4 seconds, the radar is ready for use. If the red lamp is lit, the battery condition is too low; the radar is inhibited. See also pushbutton reset.

Remark: If no light are on at all, check the connectors and/or fuses.

B Fuse 2A

The radar is protected against false polarisation. The fuse will only be blown after a failure in the radar.



If the radar is turned on, the green battery indication lamp should be lit. If the red battery indication lamp is lit, the battery condition is too low. See also push button on/off and reset.

D Total/Offences

With the green switch the required read-out on the 'Total/Offences' display can be selected. The top position is for 'offences, the lower position for 'total'. Both data are registered, independent of the selected position of the switch. If the switch **Direction** is set from receding to approaching or the other way round, the counter keeps adding up. The only way to reset it is to switch the radar off and on again.

HLP1: the internal calibration level is too low (<60)

HLP2: the internal calibration level is too high (>60)

HLP3: the antenna signal during the calibration was a lorry signal

HLP4: the antenna is not connected correctly, the signal cannot get through

In case one of above mentioned codes appears on the display, contact the manufacturer.

E Speed display (LCD display)

The display shows:

20-250 km/h (speed)

arrow (approaching traffic has been measured. If no arrow is shown, receding traffic has been measured)

+

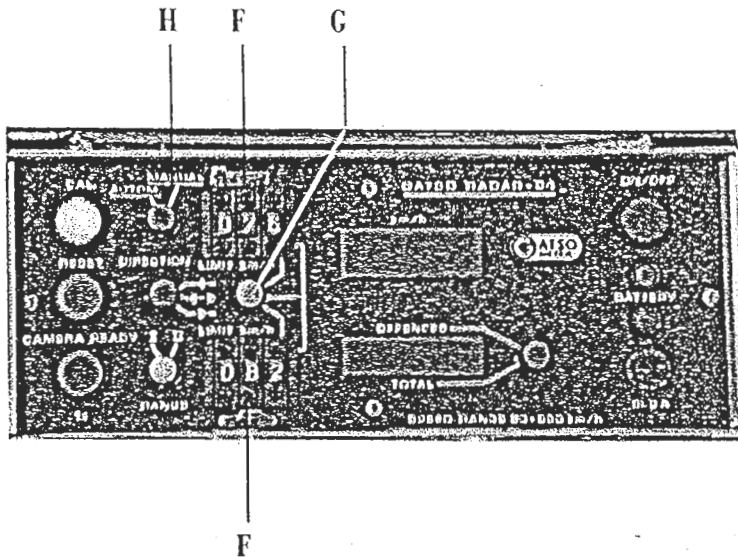
(+ lights up when one of the threshold speeds is exceeded)

ILL (illegal measurement)

0— (queue)

IPA (Information Periodically Absent. This is shown when the data flow from radar control unit to the camera is not correct)

I" P" A (P is flashing, which means that the data flow is not accepted by the camera). Check the connections and the camera.



F Thumbwheel switches Lorry and Passenger car

These switches set the thresholds for passenger cars and lorries to the desired value. If the radar measures a speed higher than the threshold speed, the radar will register it and a photo will be taken. During mobile control, the thresholds are set at the desired overtaking speed. Every speed between 20 and 199 km/h can be selected for the threshold speeds. Radar and camera register speeds up to 250 km/h.

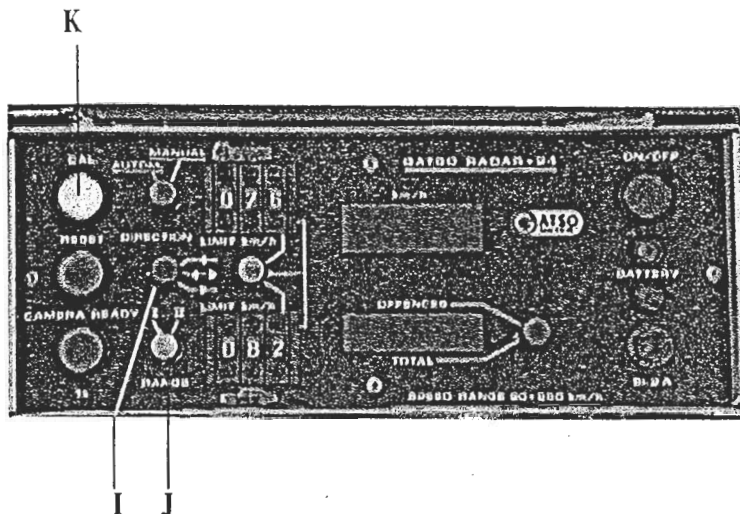
G Switch Limit (3 positions, yellow)

Normally the yellow Limit switch will be in the middle position so that the system will measure and photograph all passing vehicles. If switched to Lorry, only long vehicles or passenger cars with trailers will be photographed when exceeding their threshold speed. If switched to passenger cars only these and motorist will be photographed.

H Switch Autom./Manual (blue)

Position Autom. is used when the camera is connected. In this position a photo is automatically taken of every vehicle exceeding its threshold speed. The radar will reset within 0.5 seconds. The speed display will remain the same until a next measurement.

In position Manual the camera is not activated automatically, only via the + button on the camera unit. An audio alarm is heard when an offence is measured. The speed display is fixed at the offending speed. The radar and speed display have to be released for a next measurement by depressing pushbutton Reset.



I Switch Direction (red)

The desired direction can be selected with this switch. If both directions are to be measured, put the switch in the middle position. For receding traffic choose the -> position (lower position). For approaching traffic the upper position is chosen. An arrow is shown in the upper left corner on the speed display when approaching traffic is selected. If switched from one to the other direction, the radar will first finish the ongoing measurement before starting the new setting. "

J Switch Range (grey)

Advised settings are for:

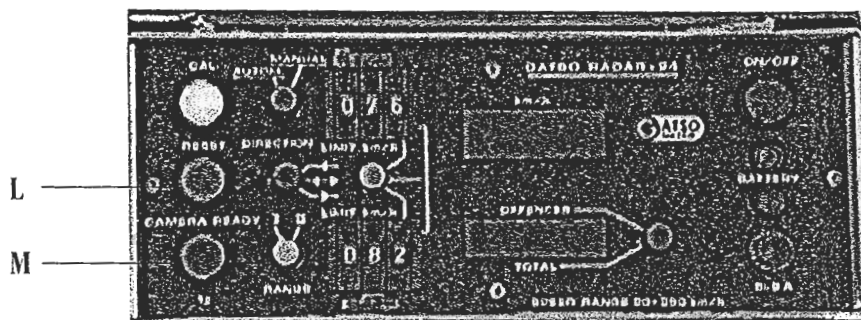
Short range and built-up areas (I) : 1-2 lanes

Long range and open roads (II) : 1-4 lanes

K Push-button Cal(white)

Pressing push-button Cal (calibration) will start a test program which lasts 10 seconds. In the first 5 seconds both LCD-displays (speed display and Total/Offence display) will be blanked, the next five seconds will give "8" on the displays (speed 288; total/offences 8888).

When the test procedure is done and the radar functions correctly, the speed display will show the passenger car threshold speed afterwards. During the testprogram the + and symbols, positioned just in front of the speed information, are flashing. Counter Total/Offences will be updated with 1. When switch Autom./Manual is on Autom., a picture will be taken automatically and the reflecting image on the picture will give 'CAL' as well as the threshold speed. A lamp is built in this switch. It will light up when a vehicle in the chosen measurement direction is in the radar beam.



L Push-button Reset (yellow)

When switch **Autom./Manual** is on **Manual** and the audio alarm is heard, it is necessary to push this button in order to reset the speed display to '000' and to release the radar for a next measurement. If switch **Autom./Manual** is on **Autom.**, the radar will reset automatically.

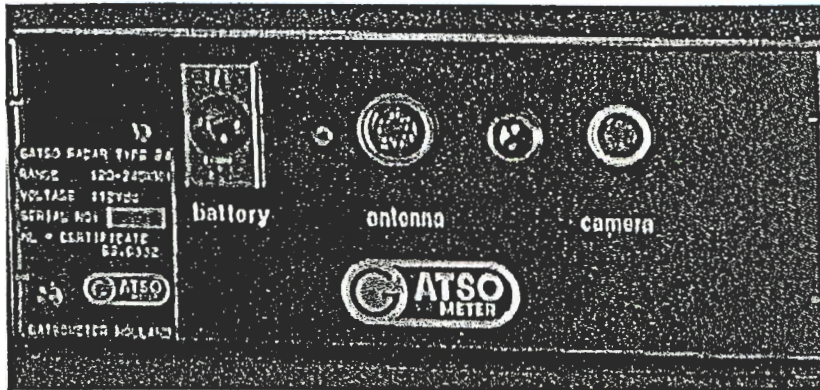
Remark:

Immediately after the radar is switched on, before starting a control, this button should be pushed once.⁵¹

M Pushbutton Camera Ready 1x (green)

If this button is pushed, the first passing vehicle is photographed whether or not the threshold speeds are exceeded. After taking this photo, the system instantly returns to the normal position. **Camera Ready 1x** works only once every time it is pushed.

2.2 The rear side of the radar control unit



<i>Battery</i>	<p>12V input. Power supply from the enerybox. Standard connection cable 2.5m Wire dimensions 2x1.5qmm Control unit plug (on cable) XLR-3-11C Battery plug (on cable) MS 3106 A 14S 7P</p>
<i>Antenna</i>	<p>Connection cable control unit -antenna 5m Wire dimensions 7x0.25qmm screened Control unit plug (on cable) FGD 3B 308 C 0070 Antenna plug (on cable) F 3E 308 NB 067</p>
<i>Buzzer</i>	<p>Is situated between connections for antenna and camera. The alarm goes when switch Autom./Manual is on Manual and the threshold speed is exceeded to inform the operator that the radar is inhibited.</p>
<i>Camera</i>	<p>Connection cable from control unit - camera 1.5m Wire dimensions 7x0.25qmm screened. Control unit plug (on cable) FGD 2B 308 C 0070</p>

The radar serial number is imprinted on the identification plate.

2.3 Technical data Gatso Radar Type 24

Antenna

Type	slotted wave guide
Beam	5 ° horizontal, 22 ° vertical
Measuring angle	20 ° to road verge
Setting angle	parallel to road axis
Transmitter frequency	24.125 GHz \pm 25 MHz
Power output	15mW max.
Measuring sequence	2 measurements per second
Mounting height	min. 40 cms
Accuracy	Speeds up to 100 km/h plus/minus 2 km/h above 100 km/h plus/minus 2%

Control unit

Range I	1-2 lanes
Range II	1-4 lanes
Approved measuring range	20-250 km/h
Thresholds	setting of threshold speeds in steps of 1 km/h with coding switch
Impulse duration	300 mS
Camera release impulse delay for receding traffic speed dependent	20mS
Camera release impulse delay for approaching traffic	0 mS
Power supply	12 V dc (10.8 - 15 V dc)
Power consumption	nominal 10 VA
Temperature range	-20 ° to +60 °

Dimensions and weight

Antenna	340 x 80 x 105 mm approx. 2,7 kg water resistant
Control unit	220 x 160 x 90 mm approx. 2 kg

2.4 Preparing the radar unit for speed control

Switch the radar control unit on by pushing the red On/Off switch. Below this switch two lights are positioned; the green light should be on, the radar is then ready for use. If the red light is on, the battery condition is too low and the radar is inhibited. Recharge the batteries. If no lights are on at all, check the connections and/or fuses.

Set the required threshold speeds for lorries and passenger cars by pushing the switches below resp. above the signs.

The yellow switch Limit is usually set in the middle position (all offending cars are photographed). In the top position only lorries and in the bottom position only passenger cars are photographed.

Turn the blue switch Autom./Manual to the required position.

Autom. for use with camera

Manual for use without camera

In general the last position will be used for stationary control, when a policeman is involved, stopping the offending motorist further down the road.

Turn the red Direction switch to the required position

- <--- for approaching traffic

- <--> for both directions

- ---> for receding traffic

An arrow is shown in the left top corner of the display. **Remember this last position cannot be used for mobile speed control.**

Important: if the switch is turned from one to the other position, the radar will first finish the ongoing measurement after which it will start in the new position.

Turn the grey switch Range to position I or II:

Position I (1-2 lanes) for built-up areas short range

Position II (1-4 lanes) for open roads long range

Push the white button CAL (calibration), and the test program, lasting 10 seconds, will be started. A photo is taken automatically after this test program. After calibration, the speed display should show the same value as the passenger car threshold speed, until the next measurement. Counter Total/Offences will be added up by one.

Explanation of measuring methods

The radar type 24 speed control system can be positioned in several ways.

Figure 3.1

Correct positioning.

The radar is parallel to the road axis.

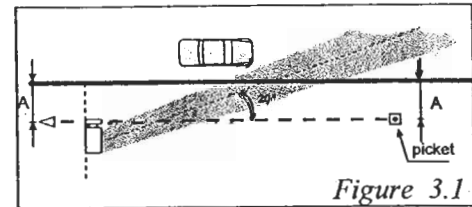


Figure 3.1

Figure 3.2

Wrong positioning

The radar beam angle is too big (the beam goes too much across the road)

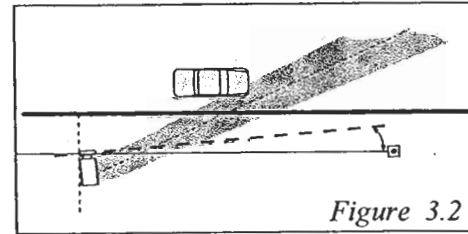


Figure 3.2

Measurement results.

Measured speed will be lower than it really is. For example, if the angle is too big by

1° speed is 0.65 % too low

2° speed is 1.3 % too low

5° speed is 3.5 % too low

If a cars' speed is 100 km/h, the measured speed will be 96 km/h in case the angle is 5° too big.

Figure 3.3

Wrong positioning

The radar beam angle is too small (the radar beam is almost parallel to the road).

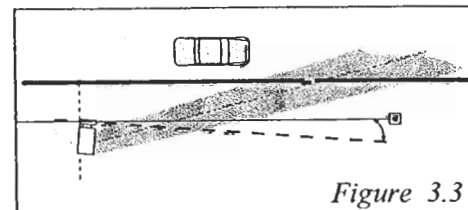


Figure 3.3

Measurement results

Measured speed will be higher than it really is. For example, if the angle is too small by:

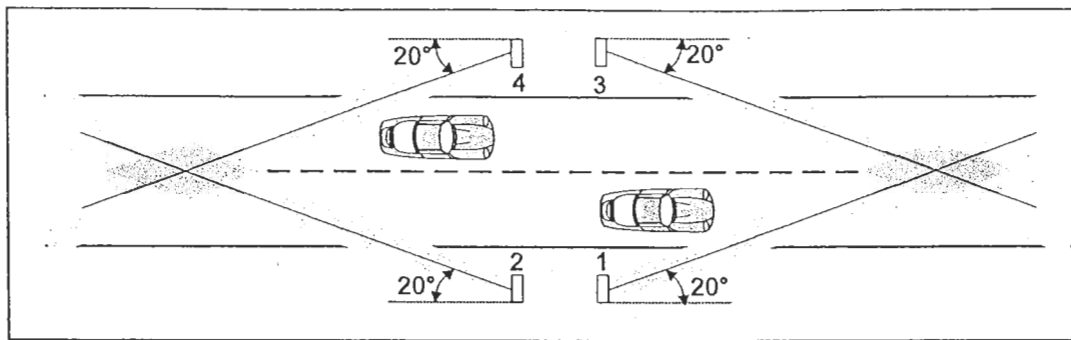
1° speed is 0.64 % too high

2° speed is 1.2 % too high

5° speed is 2.58 % too high

If a cars' speed is 100 km/h, the measured speed will be 103 km/h in case the angle is 5° too small.

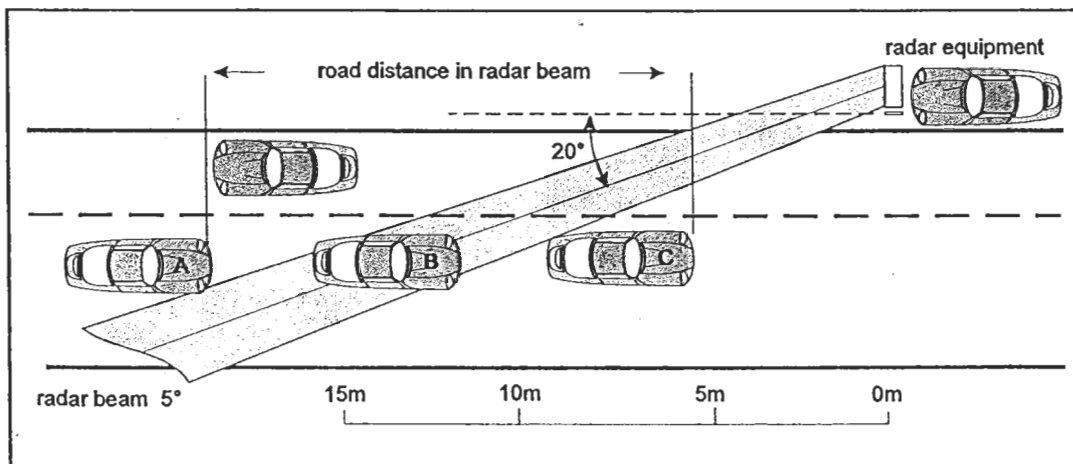
3.1 Receding and approaching traffic



Measurements from positions 1 and 4, of receding as well as approaching traffic, are possible. The radar antenna is installed with the black beam angle indicator on top, aiming at the traffic flow. The camera faces the same direction, and is placed against the right stop.

Measurements from position 2 and 3 of receding and approaching traffic are possible. Now the red beam angle indicator is on top, so that the radar beam is facing the correct direction. The camera will have to be placed against the left stop.

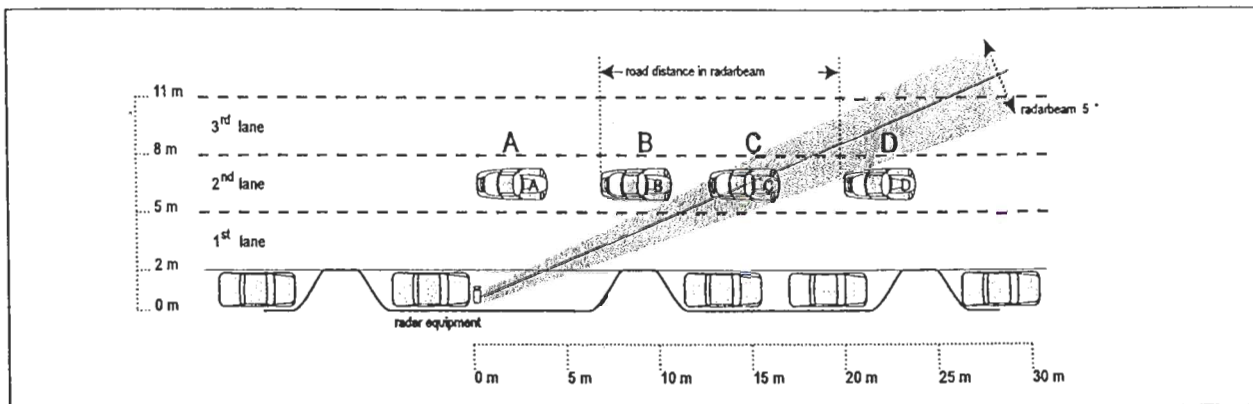
3.2 Approaching traffic



Position of the vehicle

- A drives into the radar beam, start of the measurement
- B is continuously measured. If the vehicle exceeds its' threshold, a photo is taken which is approx. 3.5 m after the vehicle entered the radar beam
- C leaves the radar beam, end of the measurement

3.3 Receding traffic



A passes the radar equipment

B drives into the radar beam, start of the measurement

C is continuously measured

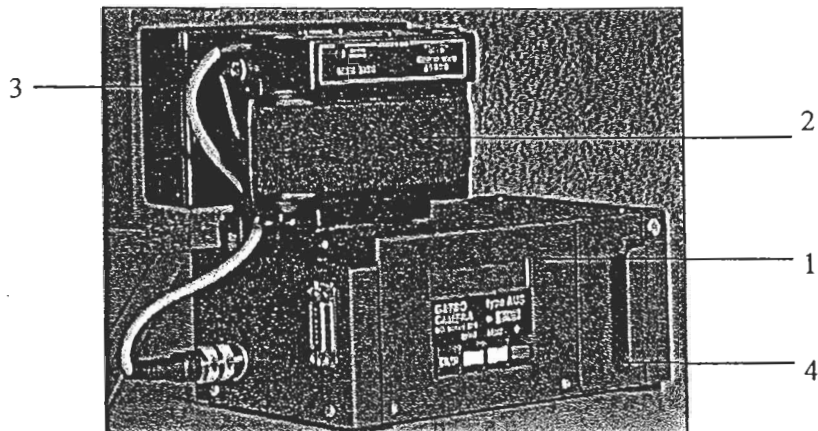
D leaves the radar beam, end of the measurement

If the threshold speed was exceeded, a photo would have been taken

Gatso traffic camera type AUS-S

The Gatso traffic camera type AUS-S consists of the following main parts:

1. Camera control unit
2. Robot 36DCE camera (12 V)
3. Automatic diaphragm control (12 V) with 90mm lens
4. Memory card 128k



4.1 The camera control unit

The camera control unit has the following features, which shall be explained in the next subparagraphs:

1. LCD display
2. Switch On/Off
3. Pushbutton Select
4. Pushbutton Adjust
5. Pushbutton +
6. Information panel (19 x 48 mm)
7. Memory card 128k (good for 6239 registrations)

4.1.1 LCD display

The LCD display is able to screen various information through 5 settings. Later in this manual these settings will be explained. For this moment we will already show you five settings:

1st setting

95-01-14 Film..?
10:26:32 nr. 000

2nd setting

95-01-14 SELECT
10:26:32 CLR->000

3rd setting

Film Nr. 000000
Speed Zone 000

4th setting

Free space for
+/- 6239 records

5th setting

Int B/W Frames
400 034

4.1.2 Switch On/Off

With this switch you can turn the camera on and off.

4.1.3 Push-button Select

With this push-button you are able to switch between the above mentioned 5 settings on the display. Now you can select a setting which have to adjusted.



4.1.4 Push-button Adjust

With this button you can position the cursor on the display to places which must be changed.

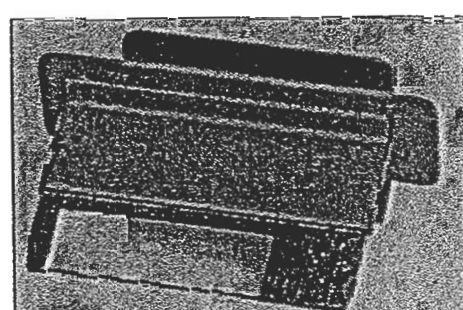
4.1.5 Push-button +

With this button alterations can be made in settings 2, 3 and 5. This is not possible in setting 4 which gives information about the memory card (donot forget to use the Adjust button to bring the cursor to the right position). A second possibility is making a picture, but this can only be done in setting 1.⁵¹



4.1.6 Information Panel

The camera information display is situated on the right side of the buttons Select, Adjust and +. You can pull this slide unit out and write down the information on the window. The area for handwritten is 19 x 48 cm.

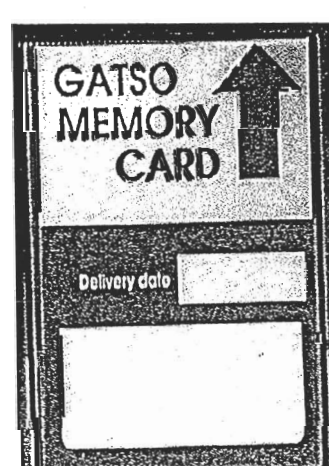


This handwritten information will be superimposed in the result photo.

Note: the markerpen, used for writing on the window, should be of a non-permanent type, so that the information can be removed easily.

4.1.7 Memory card 128k

On this card approximately 6239 measurements can be stored as is said in the fourth setting on the LCD display. This number informs how many measurements can be registered on this memory card. The memory card has an internal battery. Lifetime of this battery is approximately 2 years. If the battery is removed out of the memory card, all stored data will be erased.

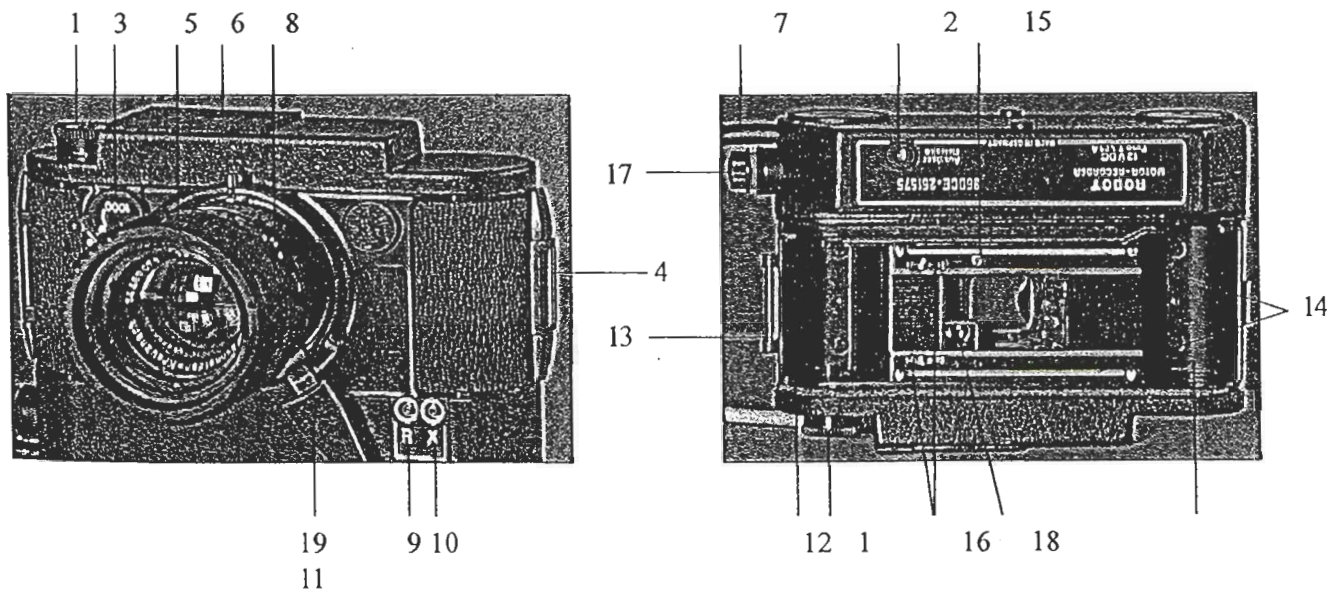


4.2 Robot 36DCE camera (12 V)

The Robot 36DCE camera is installed on the control unit and contains a f3.8/90mm objective.

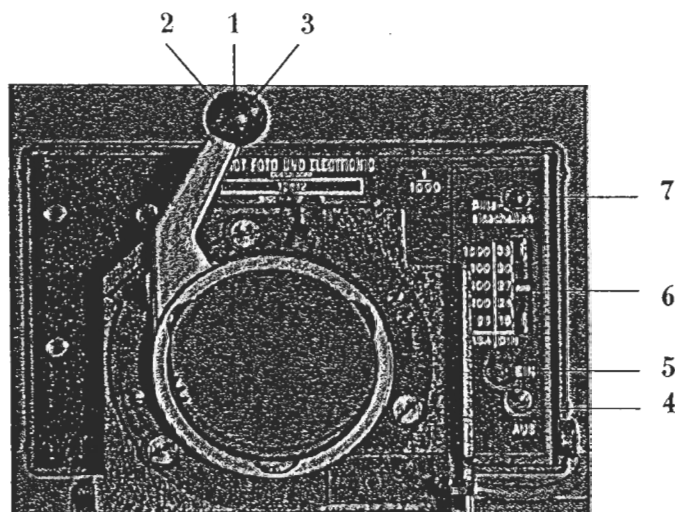
The 36DCE has the following features:

1. Wind knob
2. Shutter release button
3. Exposure speed dial
4. Lock for camera back
5. Diaphragm ring
6. Mounting block (foam)
7. Power supply cable 12V
8. Focussing ring (18 m fixed)
9. R-contact (film end)
10. X-contact (for flash synchronization)
11. Chamber for standard 35 mm cartridge
12. Chamber for NR film take up cassette
13. Hinge for camera back
14. Inner film tracks
15. Microswitch for automatic stop
16. sprockets
17. Fuse 1.25A slow blow
18. Reflecting image lens
19. Lens locking lever



4.3 Automatic diaphragm control

1. Camera locking lever
2. Camera locking lever in position closed
3. Camera locking lever in position open
4. On/Off switch for automatic diaphragm
5. On/Off indication lamp (yellow)
6. Setting of film speed sensitivity
7. Red indication lamp (lens fully opened)



4.4 Memory card 128k

The memory card is located on the right side of the buttons besides the information panel. The LCD display can show several messages about the memory card in setting 4.

Normally you see

'Free space for
+/- 6239 records'

Remark: This display will only be shown when the memory card is installed.

Other possibilities are:

- A. There is no card placed in the control unit and the red led is blinking.
Solution: place the card in the control unit.

'No card placed'

- B. A card is placed in the control unit, except the slide unit or this is not placed correctly.
 Red led is blinking.
Solution: Place the slide unit correctly so that the memory card is covered.

'RamCard Present
 Door Still Open?'

- C. The memory card and slide unit are placed correctly. The card battery is empty,
 So this must be replaced.
Solution: Replace the battery or else replace the card. The batteries have a lifetime
 of approximately 2 years. In the meantime the LCD display shows the first setting.
 If you press on the button **Select** three times you arrive in the fourth setting again.
 If the display shows the normal setting 'Free space for +/-records' everything
 is OK. The red led is not blinking.

'Ram-Card Present
 Card Battery Low'

- D. Memory card is damaged. This message can also appear on the LCD display after
 just replacing the empty battery.
Solution: Donot use the card, return it to Gatsometer for repair. Use another (new)
 card. In the meantime the LCD display shows the first setting. If you press on the
 button **Select** three times you arrive in the fourth setting again. If the display shows
 'Free space for +/-records' everything is OK. The red led is not blinking.

'Ram-Card Present
 Ram-Card Damaged'

- E. Memory card is placed and OK, except that it is full.
Solution: Replace the card by another (new) card or erase the recorded data with
 the help of the Gatso software after confirming the status of the card.
 Note: Make sure that either a new or an erased card is formatted before being used
 in the camera.

'Ram-Card Present
 RamCard Full'

4.5 Preparing the camera for operation

Remark: Before using the traffic AUS-camera together with the memory card, first put the card in the interface for the Personal Computer and check if the card is OK and how many measurements are already stored.

Switch the camera on by pressing push-button On/Off (black)

4.5.1 The first setting

If the camera is loaded with film, it is operational and the display shows for example:



95-01-14 000 mph
10:26:32 nr. 000

If the camera contains no film, the display shows f.e.:



95-01-14 Film..?
10:26:32 nr. 000

Film..? means that the camera contains no film.
The camera will give 5 audio bleeps when activated.

4.5.2 The second setting

When button Select is pressed, the display shows the second setting:



95-01-14 Select
10:26:32 CLR -> 026

If you press button **Adjust** now, a flashing cursor appears behind "CLR". By pressing button +, the exposure counter can be set on "nr. 000".

Press **Adjust** gives the possibility to step around in the display and the required time and date can be set by pressing +.

Non-existing values will be corrected automatically. You can change the seconds to "00" when pressing +.

When all changes have been made, button Select should be pressed to go on to the next setting.

4.5.3 The third setting

The display shows for example:

Film Nr. 115555
Speed Zone 430

By pressing **Adjust**, the flashing cursor appears on the first figure of the Film Nr. With button **+** you can give the required film nr. The flashing digit will be elevated/updated by one.

After the Film Nr., the cursor appears on the first figure of the Speed Zone. Now the Speed Zone can be setted by **+**.

4.5.4 The fourth setting

By pressing **Select**, the display shows the fourth setting (only when the memory card is installed):

Free space for
+/- 6239 records

In this setting you cannot use the buttons **Adjust** and **+**. When you press these buttons, you will only hear the camera bleep. Other messages concerning the memory card can be seen in chapter 4.4.

Therefore we will continue to the last setting by pressing **Select**.

4.5.5 The fifth setting

The display shows:

Int B/W Frames
-- 400 034

By pressing **Adjust**, the cursor appears again and the following adjustments can be made:

Cursor below Int (=Interval);

by pressing **+** you can adjust the interval time from 0.5 up to and including 1.0 seconds. 0.0 seconds means no interval time so only one exposure will be made of each offence.

Example:

In this example the interval time between two exposures is 0.8 seconds.

Int B/W Frames
0.8 400 034

Cursor on B/W (Black/White) film; by pressing + the B/W film can be changed in Colorfilm.

Cursor on 400 (ASA value). All ASA values between 100-900 can be selected.

Cursor below Frames; by pressing + 034 will be changed in 800, pressing + again 800 will be changed in ---.

800 = stops at 800 exposures (30 m filmcassette)
--- = no maximum of exposures (no stop is built in)
034 = stops at 34 exposures (normal 36 filmcassette)

When all data have been set, button Select will return the LCD display into the first setting again. If no changes have been made during 1 minute, the display will return automatically to the first setting.

Other read outs on the display are:

REPLACE REALTIME
CLOCK IC6 on PCB

This display will be shown when the camera is switched on and the internal clock battery is empty. This internal battery, IC6, should be changed by the local agent or Gatsometer. IC6 has an expected lifetime of approximately 2 years.

INITIALIZING
PLEASE WAIT

The following display can be shown after switching the camera on. The time/date information is disturbed, because of a mistake or because of stopping the clock display. After approximately 2 seconds, the display will show the normal date, time, speed and exposure counter. Correct time, date etc. have to be set by the operator.

4.5.6 Information panel

After having the camera ready, the camera information panel is pulled out.

With a non-permanent marker (as used on overhead sheets) the required data is written on the window. Then insert it again.

4.5.7 Automatic diaphragm

The switch at the bottom right corner of the automatic diaphragm control should be switched to EIN. The yellow light should go on.

The DIN-ASA (ISO) value should be correct for the type of film used. If the red light at the top right corner goes on, more light is needed. Switch the flash unit on.

4.6 Preparing the memory card for operation.

Put the memory card in the camera control unit right to the information panel. The arrow on the memory card must be opposite to the green arrow on the control unit itself.

If the camera unit is in operation and the slide unit (information panel) is removed, the red indicator should blink. When putting the slide unit into the control unit, the memory card will be covered and the red indicator turns off.

If the red indicator does turn off, everything is OK. You can check the minimum number of registrations which still can be stored on the memory card (by pressing Select until the fourth setting). The number +/- 6239 means an empty or erased card.

If the red indicator does blink; the display informs you in the fourth setting what is wrong. The messages with solutions are already said in chapter 4.4.

4.7 Adjusting contrast backlight

When the camera information panel is pulled out, on the right side of the slot three holes are situated. A small screwdriver is supplied with which these functions can be operated.

4.7.1 The upper hole (back light intensity)

The upper one is for adjusting the back light intensity of the handwritten information screen on the reflecting image. Turning the potentiometer clockwise increases the light intensity. This way you can adjust the optimal contrast between back light and handwritten information.

4.7.2 The middle hole (calibration)

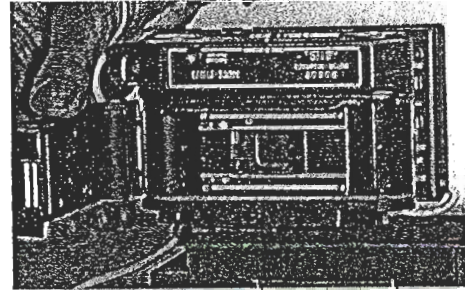
The middle hole has no function.

4.7.3 The bottom hole (contrast LCD display)

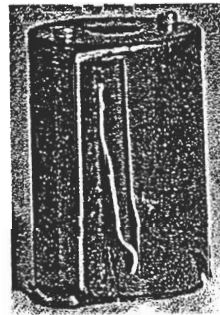
The bottom hole is for adjusting the contrast of the LCD display on the camera control unit for optimal readability. Turning the potentiometer clockwise decreases the display intensity.

4.8 Loading the camera

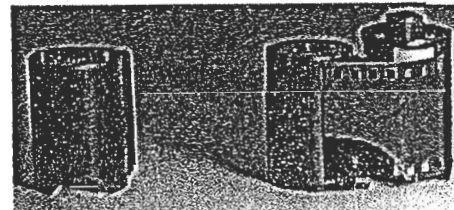
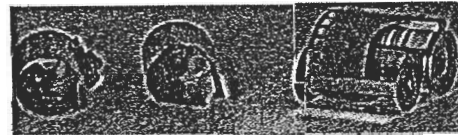
Open the camera back on the right side. Pull it backwards and open or unhinge it completely.



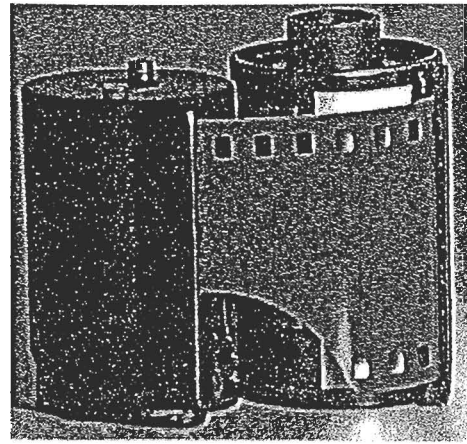
Open NR film take up cassette, grip the inner shell on its finger holes, and turn both shells opposite directions, separating inner from outer shell.



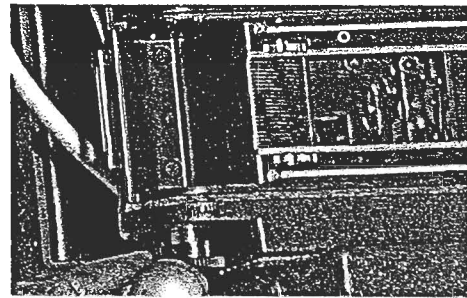
Take spool out and place the tongue of the new film under the spring of the spool until the hook catches the second hole of the film. NEVER use the first hole, since it may be too weak.



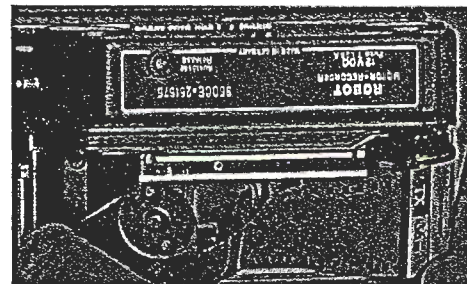
Insert the inner in the outer shell by slowly turning it. Do not press the two shells together with great force, since this might damage the velvet light traps.



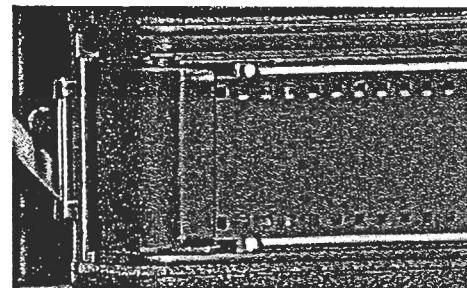
Pull out the wind knob.



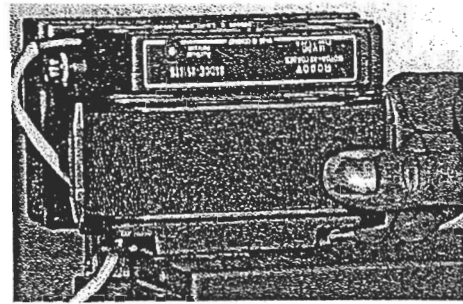
Place the cartridge with unexposed film and NR cassette in the camera. The guidepins of the NR cassette should slide into the positioning guide. The emulsion side of the film has to face the lens.



Turning the knob clockwise until the film leader disappears completely in the NR film take up cassette. Press the film down with finger or thumb to ensure that the sprockets of the film transport roller are exactly in the perforations of the film. Make sure that the film lies evenly and tightly on the film gate.



Close camera back and make certain that it is closed correctly, by pressing it firmly against the camera body until a snap is heard.



Take two photos by hand, using the red + button to make sure that unexposed film is behind the lens and reset the exposure counter to zero ("000").

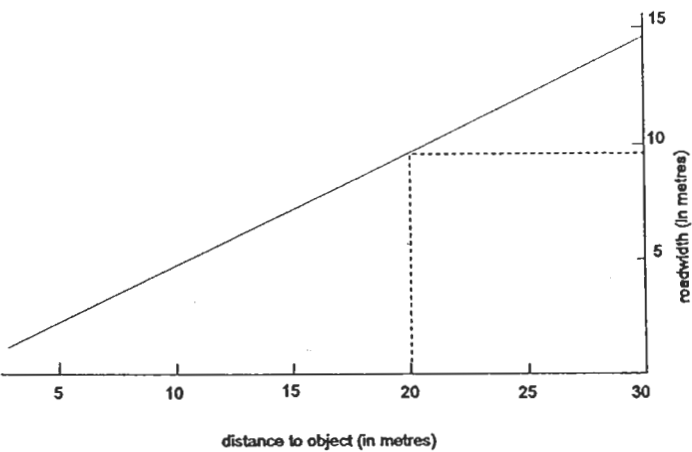
In case the film transport is not functioning, the reasons might be:

- the film transport is not firmly secured to the spool of the NR cassette
- the inner and the outer shell of the NR cassette are bent or they are not pushed together properly
- the catch does not engage in the take up spool (catch lever to release cassette stays down)
- attempts have been made between exposures to tighten the film with the winding knob
- the filmleader does not engage with the spring on the spool, at its second perforation hole, but is pushed in further instead
- the film perforation hole is broken, so that the sprockets cannot transport the film

4.9 Area covered by Gatso radar type 24 and traffic camera type AUS

Use of 90 mm lens

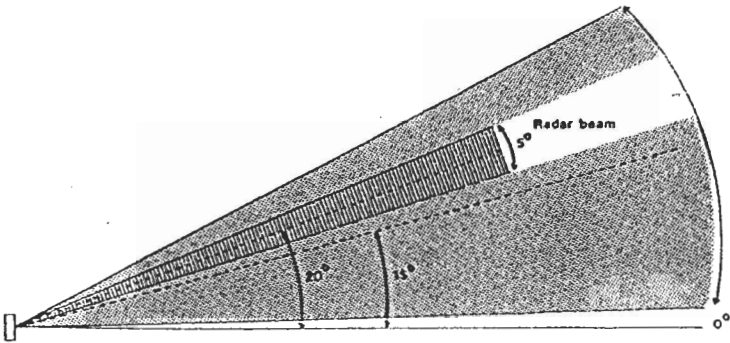
Example:
Distance to object is 20 meters
Roadwidth on photo is 8.6 meters



4.10 Radarbeam angle and camera angle

Gatso radar type 24
Antenna aligned parallel to the road axis
Antenna measuring angle is 20 degrees
Antenna beamwidth is 5 degrees

Gatso traffic camera type AUS-S
Traffic camera type AUS-S with 90 mm lens
Standard angle between camera and radar is 12 degrees
Negative view: 15.6 degrees vertical
23.4 degrees horizontal



4.11 Technical data Gatso camera type AUS-S

Overall dimensions	260 x 195 x 160 mm
Weight without 30 m filmcassette	approx. 4 kg
Weight 30 m filmcassette	1.8 kg
Dimensions ground plate of control unit	205 x 125 mm
<i>Camera</i>	<i>Robot Motorrecorder 36DCE</i>
Negative size	24 x 36 mm
Reflecting image (data area)	8 x 8 mm
Shutter speed	1/1000 fixed (flash synchronized)
Exposure sequence	2 pictures per second
Film material	Black/White or Colorfilm 35 mm 100-900 ISO filmsensitivity
Filmcapacity	standard 36 exposures, cassette of 800 exposures possible
Release	by radar impulse or via pushbutton on photographic unit
<i>Camera control unit</i>	
Power supply	12 V dc (+/- 10%)
Power consumption	3.5A at release during 0.2 seconds, 0.3A standby
Fuse	1.25A (5x20) slow blow
Mounting hole	M10 (for orange handscrew)
Clock	24 hrs quartz clock, gives hours, minutes, seconds
Clock time accuracy	max. 2.034 ppm = 5.35 sec./months at a temperature form 20 to 30 degrees
<i>Lens</i>	<i>Schneider Tele-Xenar f3.8/90 mm</i>
Angle of view	23.4 degrees horizontal, 15.6 degrees vertical
Distance setting	18 m fixed
<i>Automatic diaphragm control</i>	
Film sensitivity setting	25 - 1600 ASA (ISO)
<i>Memory card</i>	
Memory card 128k	good for 6239 registrations

The 30 m filmcassette

5.1 Use of the 30 m filmcassette

The 30 m filmcassette can be used for color slides and black/white film. Since it can contain a film up to 800 exposures, it can be left for some days when installed. Loading or emptying the cassette should be done in complete darkness. Placing or removing the cassette can be done in daylight, but a loss of approx. 30 cm of film has to be expected. We recommend to transport the film some 6 exposures before placing it and after removal, to ensure minimal loss. It is advisable to practise loading the cassette a few times, with a piece of dummy film.

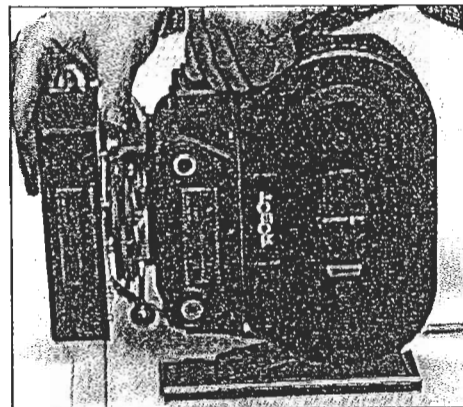
5.2 Film transport

Careful loading of the cassette is very important for a good filmtransport. Mistakes that are often made, are:

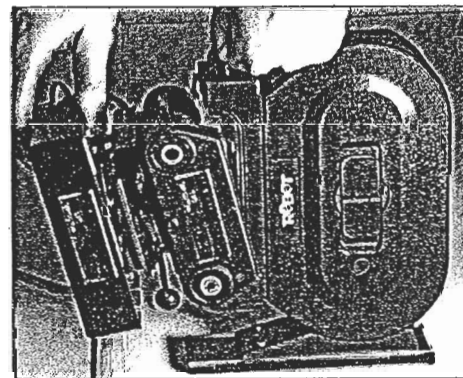
- * The film is too tight over the pressure plate, so that film transport is difficult. Take the film out of the cassette and reload it, ensuring that a finger can be put between film and pressure plate easily.
- * The film supply indication lever is not resting on the film. This can only happen during the loading procedure, so that it does not show immediately. Check the lever during the loading procedure and make certain it is in its proper place before closing the cover.
- * The take up spool should be checked thoroughly before it is used, since it becomes distorted easily.
- * The sprockets of the film transportation wheels of the camera donot engage in the perforation properly. If that is the case, take the cassette out of the hinge and turn its film transportation wheel a little, so that the perforations sit correctly into place.

5.3 Loading of the film

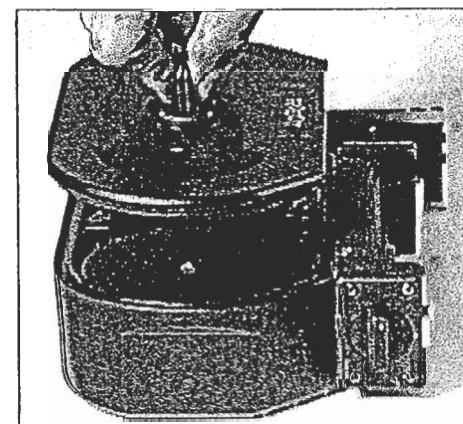
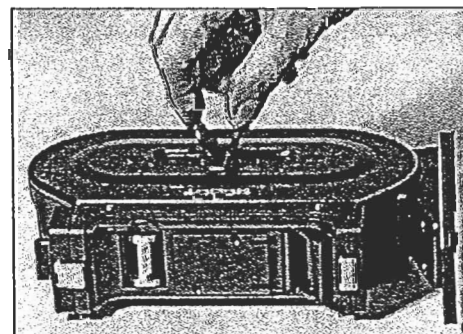
Remove the camera by turning the bolting knob counterclockwise. Prevent the camera from falling.



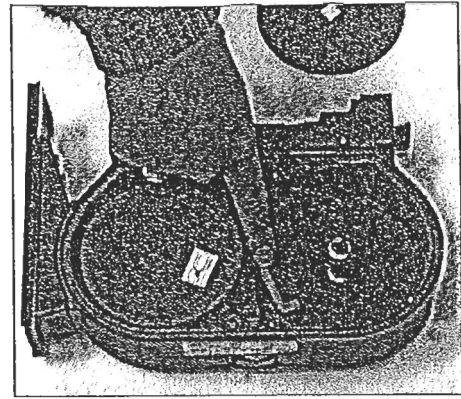
Pull the camera back on the side of the bolting knob, so that it can be lifted out of the hinge.



Turn the cassette lock counterclockwise. Remove the cassette cover by lifting it up straight.

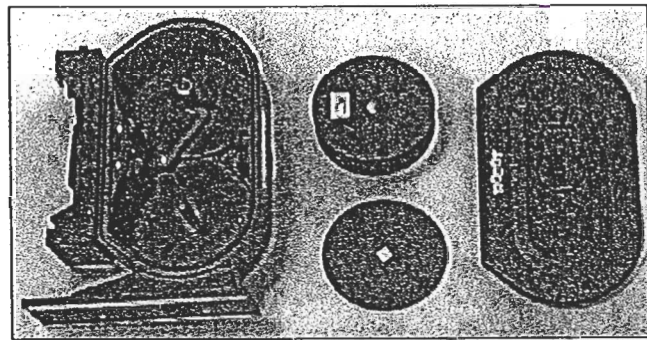


Remove the cover of the feeding spool and push the film supply indication lever back, so that the spool turns freely. It will be hold in place by a spring lock at the bottom of the cassette.



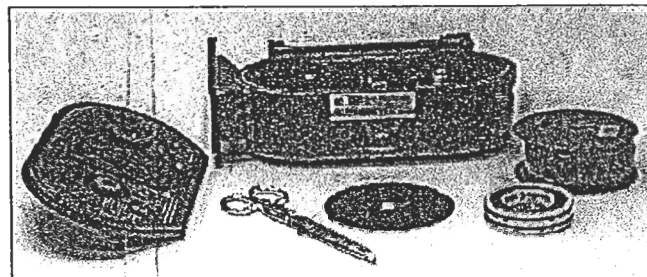
This photo shows the opened 30 m filmcassette

1. The 30 m filmcassette
2. Feeding spool
3. Film supply indication lever
4. Feeding spool cover
5. Take up spool
6. Cassette cover
7. Cassette lock



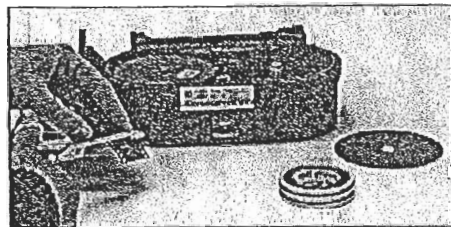
The equipment, necessary for correct loading:

- A. Cassette cover
- B. Adhesive tape
- C. Film
- D. 30 m cassette
- E. Scissors
- F. Feeding spool cover

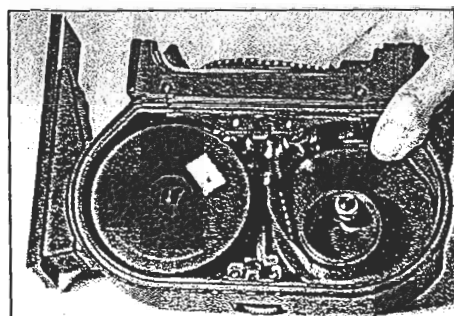


FOLLOWING STEPS SHOULD BE DONE IN ABSOLUTE DARKNESS!!!

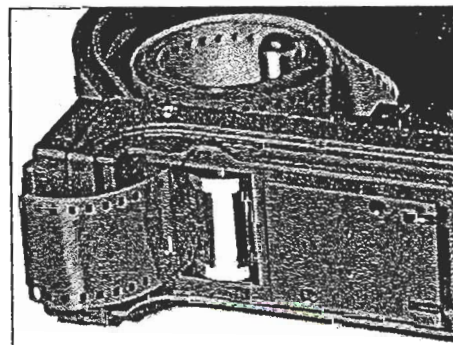
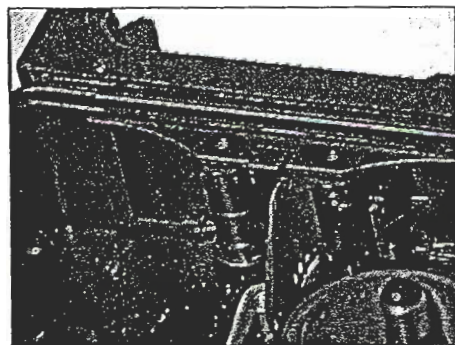
Take the film out of the container and cut its beginning straight.



Put the film on the feeding spool, with the emulsion on the inside. The film should roll off clockwise.

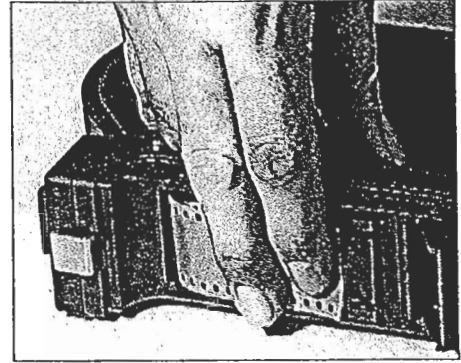


Lead the film along the left side of the right transport roll. When turning the take up spool clockwise, the feeding spool will turn too and the film is led outside.

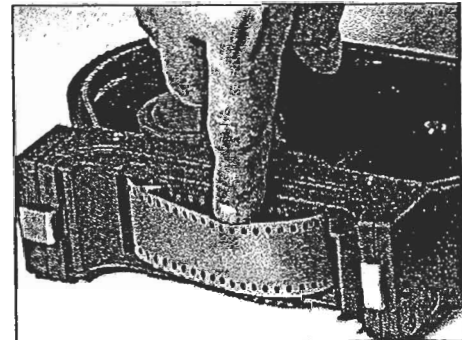
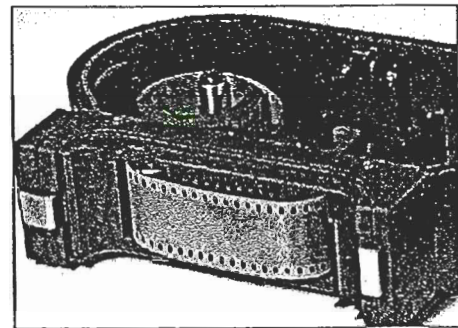


FOLLOWING STEPS SHOULD BE DONE IN ABSOLUTE DARKNESS!!!

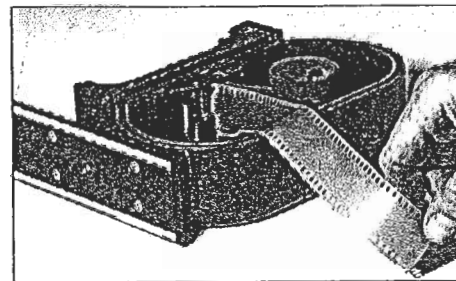
Take the filmleader and lead it along the pressure plate.



Lead the film back in towards the take up spool, by turning that spool. Ensure the film is loose so that a finger can be inserted between it and the pressure plate.

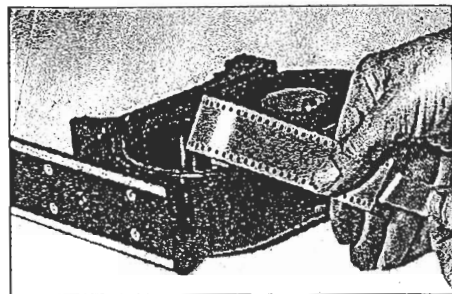


Pull the film through for approx. 15 cm.

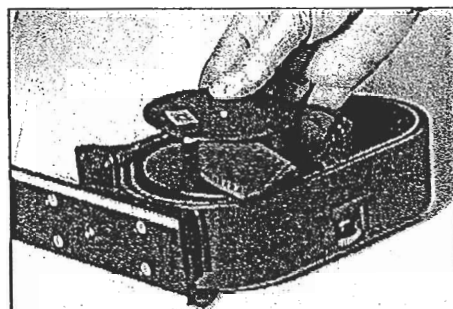


FOLLOWING STEPS SHOULD BE DONE IN ABSOLUTE DARKNESS!!!

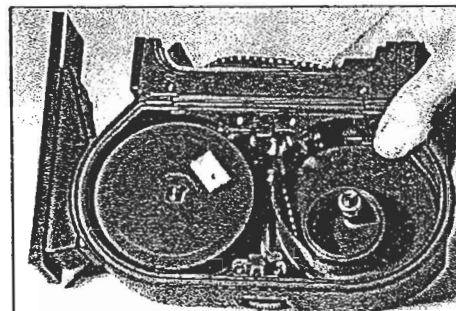
Stick a piece of adhesive tape to the back of the filmleader - NOT on the emulsion side. On the photo, the emulsion side is shown.



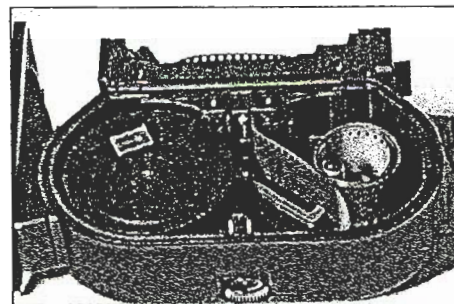
Fix the film to the take up spool with the adhesive tape. The emulsion side should be on the inside and the film should roll up clockwise.



Place the take up spool on the axis. Recheck that a finger can be put between the film and the pressure plate.

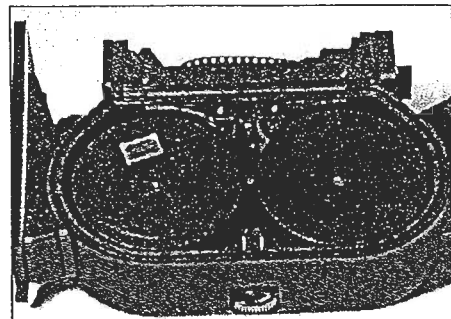


Push the film supply indication lever in operational position, so that it rests on the film.

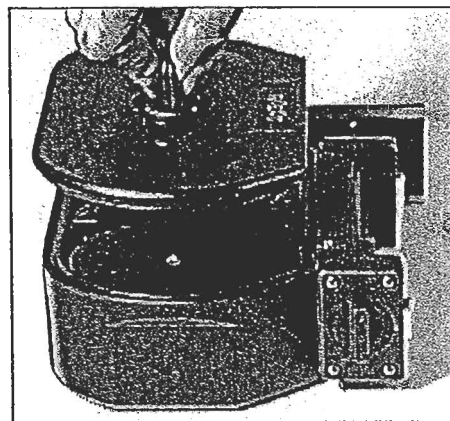


FOLLOWING STEPS SHOULD BE DONE IN ABSOLUTE DARKNESS!!!

Replace the cover on the feeding spool.

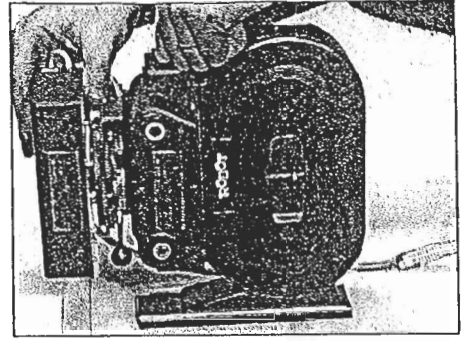


Put the cassette cover straight down and close it.



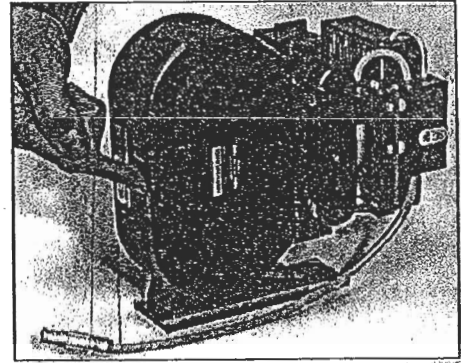
Now the 30 m cassette can be exposed to daylight again. Only the protruding film - approx. 30 cm, will be unusable. If this is not acceptable, following actions will have to take place in the dark room too. Coupling the camera to the 30 m cassette is done in reverse order: place the camera in the 30 m cassette hinge and push it against the cassette. Prevent the camera from falling. Press the cassette-camera lock and turn it clockwise (to the right).

Check whether coupling the camera to the 30 m cassette was done properly.



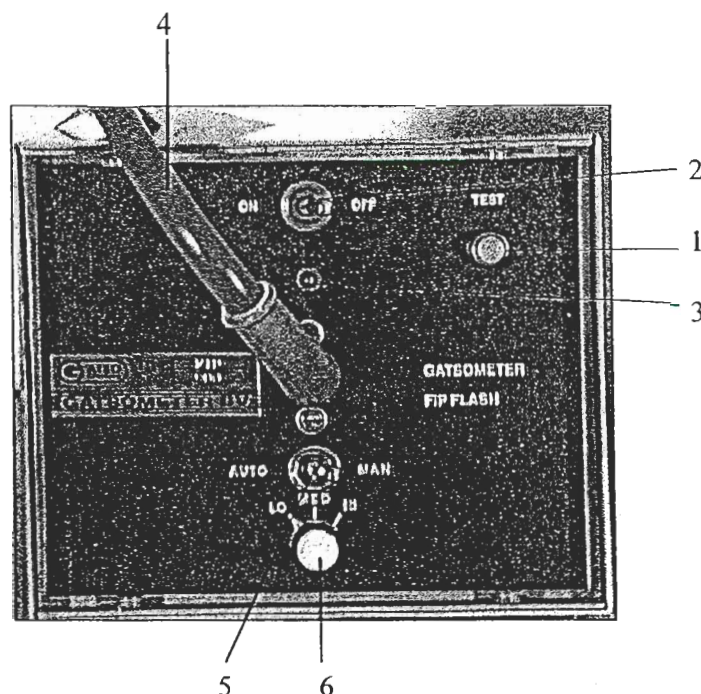
Now the film is no longer exposed to light, the camera unit can be taken out of the dark.

Turn the red film transport wheel in the direction of the arrow, until resistance is felt.



The camera unit is now ready for use.

The Gatso FIP flash unit



1. Test-button; when this button is pushed once, one flash is given.
2. On/Off switch; it is advisable to leave the switch ON so that it is always operational.
3. Red lamp; indicating that the flash unit is switched on.
4. Cable, connection flash unit X-contact and power supply. The connection runs via the power supply unit.
5. MAN/AUTO switch; when the switch is on MAN, a flash will be given with every photo. When the switch is on AUTO, a flash will only be given when the surrounding light is insufficient. The flash is then activated by the automatic diaphragm control. When the sun shines straight into the lens of the camera, a flash is necessary, because the license plates of the vehicles will be in the shade of the bumper bar. Therefore Gatsometer advises to keep the switch always in position MAN.
6. LO/MID/HI switch; the flash unit can be set at 3 different flash intensities with this switch, low medium and high.

6.1 Use of the flash unit

When the flash unit is in Autom. mode, the automatic diaphragm control will activate the flash unit as soon as the light is insufficient to guarantee a good negative, with a shutter speed of 1/500 or 1/1000 and a fully opened lens. If the shutter speed is 1/500 or less, moving objects on a photo become blurred. Especially license plates of moving cars become almost unreadable. Using the flash unit under these circumstances is advisable.

Also, if the sun shines straight into the lens the flash unit should be used. It means that the license plates of the cars will be in the shade of the bumper bar. Switch AUTO/MAN should be in position MAN.

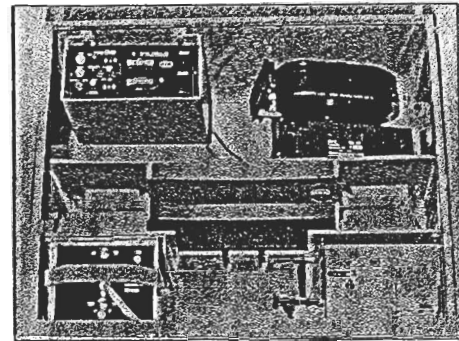
If no flash is given the following should be checked:

- * Check whether the flash unit is turned on and if it is in automatic or manual mode
- * Take the Robot 36DCE camera out of the automatic diaphragm control and check whether the X-contact is clean. If not, clean it with a piece of paper. Put the Robot 36DCE camera back again
- * Check the X-contact of the flash unit and the automatic diaphragm control
- * Check whether all switches on the flash unit and the automatic diaphragm control are in the correct positions.
- * Flash once by hand (button TEST on the flash unit)

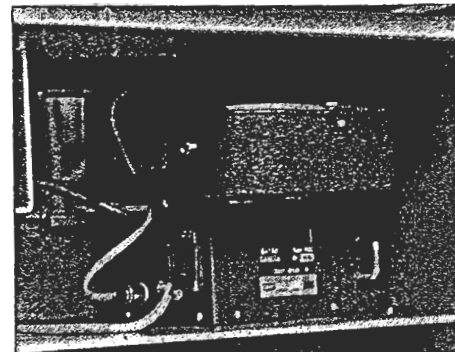
7.

Installation in the cabinet

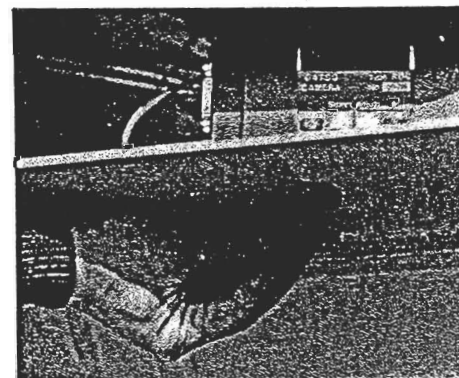
Topple the hinged pole, so that the cabinet is in the lowest possible position. The equipment can be placed easily now. Open the cabinet with the two special keys. The 12V power supply, the flash unit and some connection cables are already installed.



Place the camera unit, with the 30 m filmcassette, in the cabinet and turn the camera in the correct direction, against the stop.

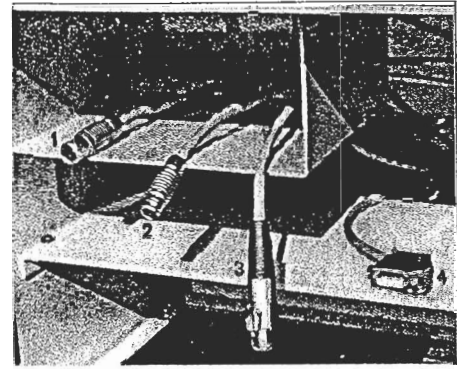


Fasten the camera unit with the orange M10 handscrew.



Following cables are already present in the cabinet:

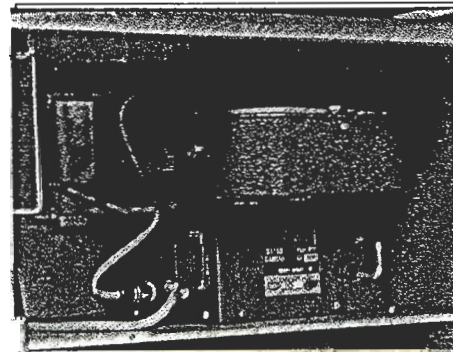
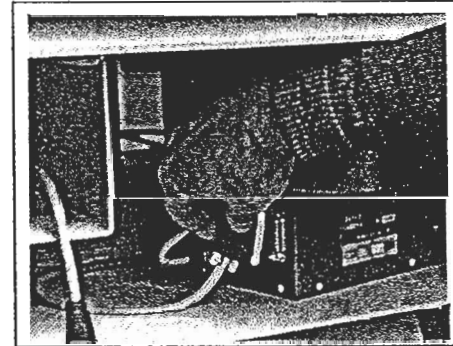
1. Antenna cable
2. Camera connection cable for camera input on radar control unit
3. 12V power supply cable
4. Camera connection cable for camera input on camera control unit



Connect the camera with the camera cable (4)

The connection cables, permanently present in the cabinet are:

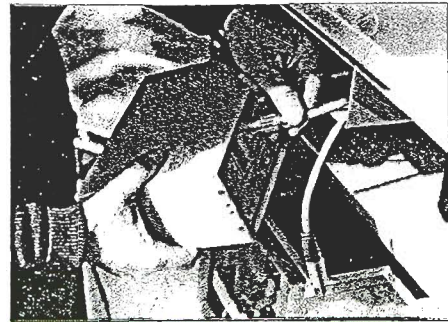
1. 12V power supply cable
2. camera cable
3. antenna cable



Take the radar control unit from its transport case and connect the camera information cable at the rear, in the 'camera'-socket.



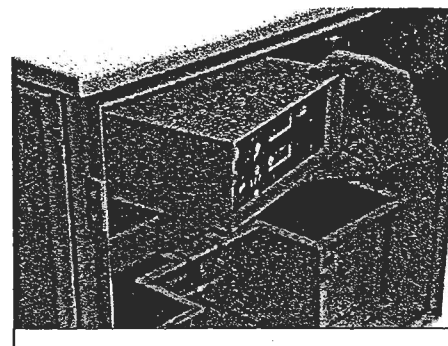
Take the antenna cable from the antenna transport case and connect it at the rear of the radar control unit, in the 'antenna'-socket.



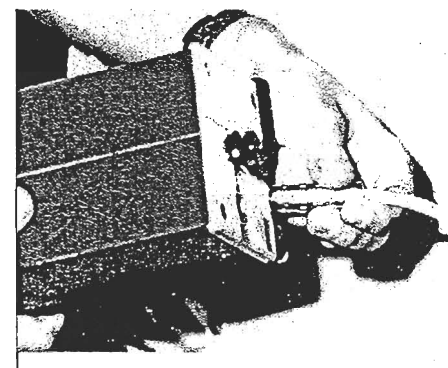
Connect the 12 V power supply cable at the rear of the radar control unit, in the 'battery'-socket.



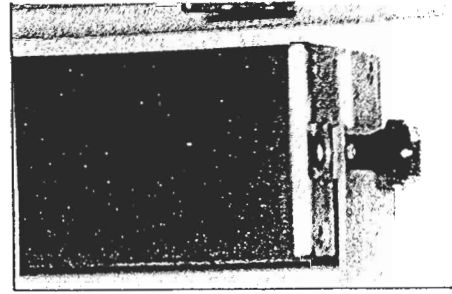
Place the radar control unit in its brackets in the cabinet.



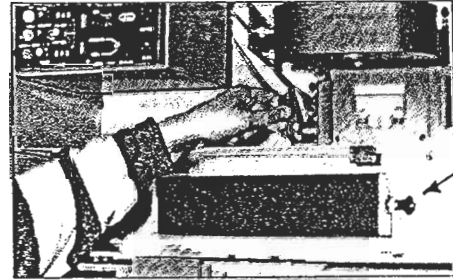
Take the antenna from the transport case and connect the antenna to the radar control unit, with the antenna cable.



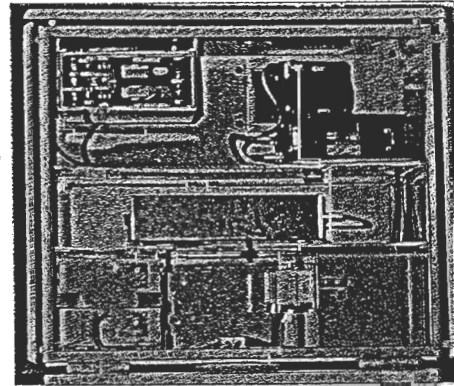
Place the antenna in the cabinet.
Remark: make certain that the radar bundle indicator is pointing in the correct direction. it should point towards the traffic.



Fasten the antenna with the 6 mm black hand screws.

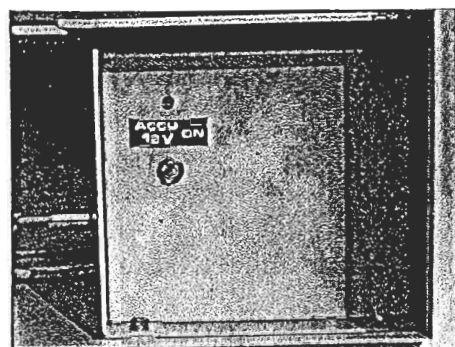


The equipment has now been installed and is connected. The installation is ready and the settings of the various parts of the equipment can be made.

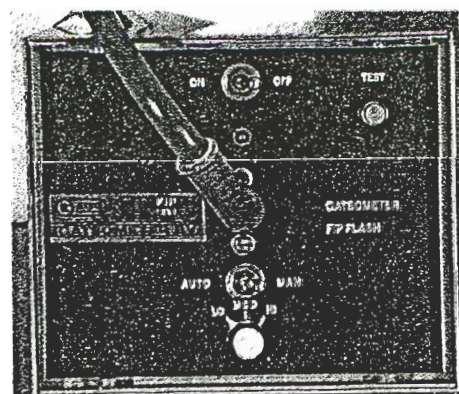


7.1 Preparing the FIP installation

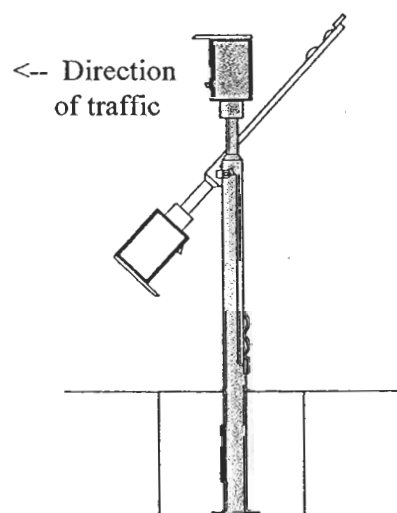
Switch the power supply to 'ON'.



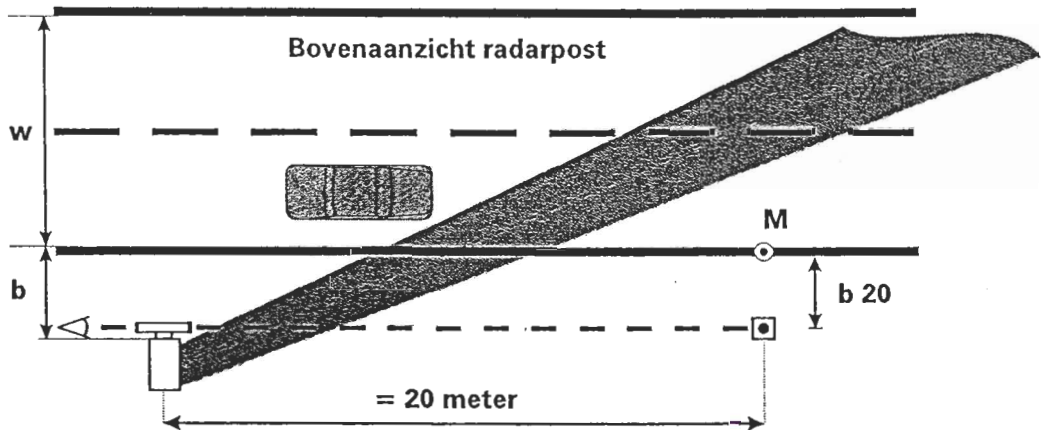
Switch the flash unit to 'AAN' (=on; 'UIT'=off) and select AUTO/MAN and the flash intensity (LO/MD/HI)



Lock the cabinet and return the installation to its normal position.



The visor should be mounted on the pole (the position is marked), in order to check whether the installation is aligned properly.



- w = roadwidth between the white lines
- b = distance between pole and roadside (front of the white line)
- b20 = distance between the heart of the picket, at 20 m from the pole, to the measuring point. It is the same distance as 'b'.

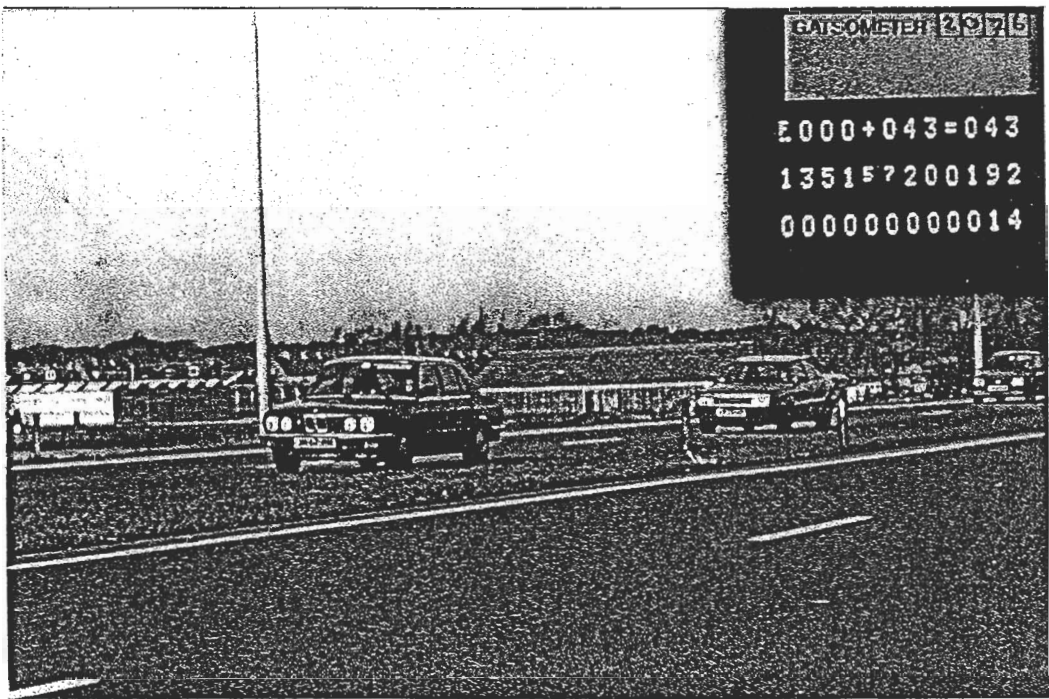
b20 is different for each pole and has to be written down. The heart of the picket should be placed at the same distance from the roadside, next to the measuring point.

When looking through the visor, the picket should fall under the hairline. A tolerance of approx. 20 cm is allowed, since the difference in the measurements will still be less than 0.5.

If the above is correct, the installation is ready for use.

Resulting photos and reflecting images

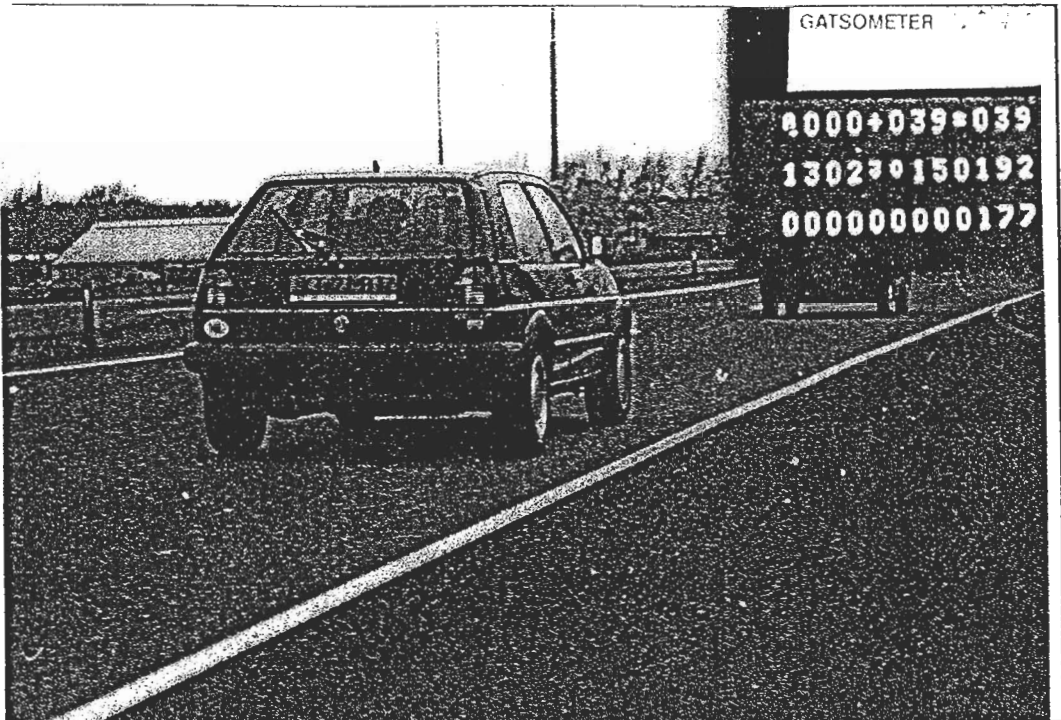
8.1 Resulting photo of stationary, approaching measurement



On the reflecting image in the photo, an 'F' is shown when approaching traffic (front measurement) was photographed. The photo leaves no doubt about the offender, if only one vehicle is on the photo. Then it is not necessary to use a template. If more than one approaching vehicle are shown on the photo, a template can be placed over the photo (if a negative is used, always take the complete negative and not a partial enlargement of it). The '0' point of the scale is in the middle of the photo.

With stationary, approaching traffic, a part of the front of the vehicle and the license plate have to be in the correct section of the template. When radar and camera were positioned on the opposite side of the road, use the left section on the template. Otherwise use the right section. If the offending car is not in the correct section of the template, do not use that particular photo and annul the measurement.

8.2 Result photo of stationary, receding measurement



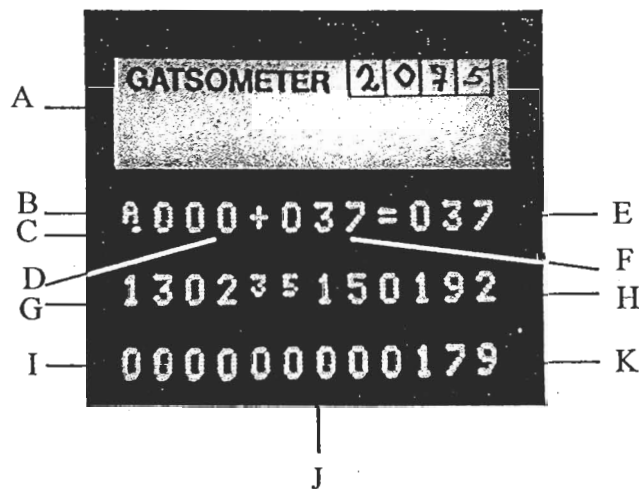
On the reflecting image in the photo, an 'A' is shown when receding traffic (tail measurement) was photographed. The photo leaves no doubt about the offender, if only one vehicle is on the photo. Then it is not necessary to use a template. If more than one approaching vehicle are shown on the photo, a template can be placed over the photo (if a negative is used, always take the complete negative and not a partial enlargement of it). The '0' point of the scale is in the middle of the photo.

With stationary, receding traffic, a part of the front of the vehicle and the license plate have to be in the correct section of the template. When radar and camera were positioned on the opposite side of the road, use the left section on the template. Otherwise use the right section. If the offending car is not in the correct section of the template, donot use that particular photo and annul the measurement.

8.3 Explanation of several reflecting images

All result photos give besides the information panel also time, date, film number, site identification number and exposure number.

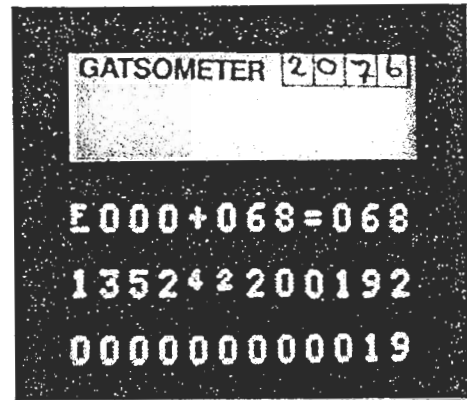
In this chapter we will first show an example of a reflecting image with an explanation. Secondly, all possible reflecting images will be explained.



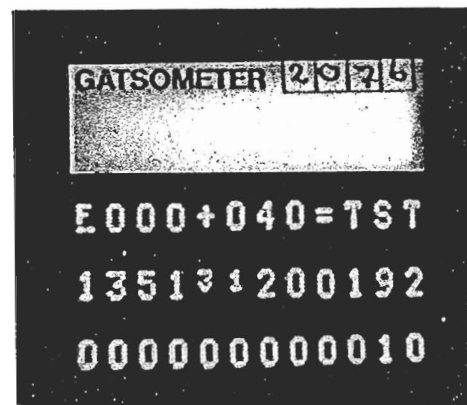
A	camera information panel
B	'A' : tail measurement (receding traffic)
	'F' : front measurement (approaching traffic)
C	'--' : this indicates the preset range (on the radar control unit)
	'-' : here the selected range is I
D	'000' : own speed of the patrol car. Here a stationary situation is given.
E	'037' : Radar speed of the offending vehicle
F	'037' : Total speed of the offending vehicle. Here it is the same as the radar speed since it is a stationary situation.
G	'13:02:35' : time indication. Here 13.02 hrs and 35 seconds
H	'150192' : date indication. Here January 15, 1992
I	'000000' : film number/operators code
J	'000' : site identification number
K	'179' : exposure counter

8.4 Reflecting image of front measurement, stationary control

F front measurement
 -- range II
 000 own speed
 068 radar speed
 068 offenders speed
 13:52:42 time; 13:52 hrs.
 200192 date; January 20, 1992
 000000 film number
 000 site identification number
 019 exposure number



F front measurement
 -- Range II
 000 own speed
 040 radar speed
 TST test photo
 13:51:31 time; 13:52 hrs and 31 sec.
 200192 date; January 20, 1992
 000000 film number
 000 site identification number
 010 exposure number

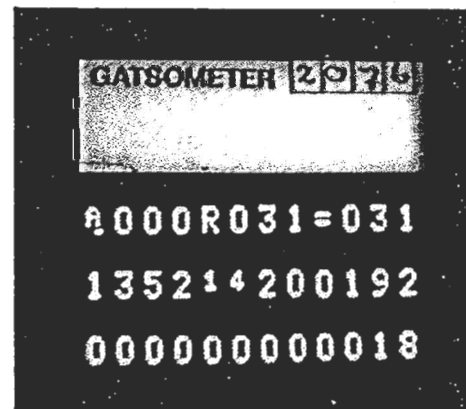


8.5 Reflecting image of receding measurement, stationary control

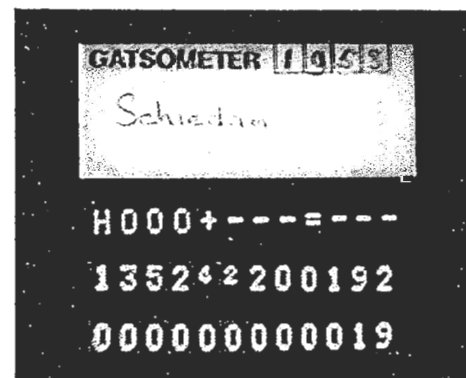
A tail measurement
 -- range II
 000 own speed
 038 radar speed
 038 offenders speed
 13:02:28 time; 13:02 hrs. and
 28 sec.
 200192 date; January 20, 1992
 000000 film number
 000 site identification number
 019 exposure number



A tail measurement
 -- Range II
 000 own speed
 R camera ready button activated
 040 radar speed
 TST test photo
 13:51:31 time; 13:52 hrs and 31 sec.
 200192 date; January 20, 1992
 000000 film number
 000 site identification number
 010 exposure number



H exposure made by hand
 000 stationary control
 --- no radar speed
 --- no total speed



Gatso traffic camera type AUS-S with second exposure option

As you can conclude from paragraphs 3.1.1. and 3.5.5 the traffic camera type AUS-S also has a possibility to make a second picture of the offender in receding traffic.

Information about the second picture option can be found in the 5th setting on the LCD display. By pressing on the button Select one can step through the menu until the 5th setting which shows:

Int	B/W	Frames
400		034

With button **Adjust** and + you can change the data.

Int = interval time between two pictures.

The interval time can be set between 0.5 and 1.0 seconds in steps of 0.1 second.

If the interval time is set on 0.0, only one picture of each offender will be made.

9.1 Example reflecting images in 2nd picture mode

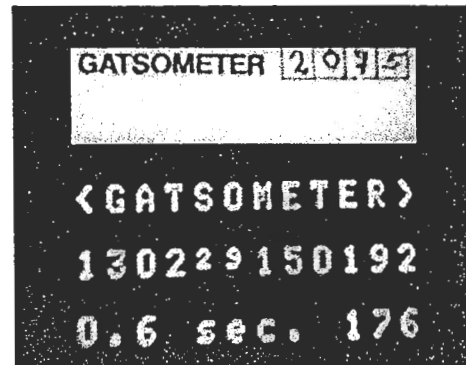
In this paragraph we will show an example of reflecting images in the second picture mode with an explanation:

A	tail measurement
-	range I
000	own speed
038	radar speed
038	offenders speed
130228	time: 13.02 hrs and 28 sec.
150192	date: January 15, 1992
000000	film number
000	site identification number
176	exposure counter



SECOND PICTURE

130229	time: 13.02 hrs. and 29 sec.
150192	date: January 15, 1992
0.6 sec	selected interval time
176	exposure counter (same as above)



GATSOMETER

0000+046=046

130233150192

00000000178



Doppler speed measurements

10.1 General introduction

The Gatso radar type 24 is a doppler radar with a digital velocity readout intended for a wide variety of uses in traffic analyses. The radar system consists of two main sub-units. The main radar control unit contains the signal processing circuits including their appropriate voltage supply networks and digital readout displays, audio and reset controls.

The antenna housed in a stainless steel watertight box contains the microwave transmitter/receiver system, doppler frequency amplification and signal processing for direction.

Special features of the radar system are as follows:

- * it has a digital speed presentation. A digital readout provides a more accurate, more clear and unambiguous presentation than the previous methods.
- * The radar is suitable for both use on both sides of the road. The radar can be used on a tripod or in a parked vehicle for stationary measurements. It is also possible to use the equipment in a driving vehicle (mobile radar camera, MRC-system)
- * The alarm speed is selectable in the range 21-199 km/h in unit steps. The speed of any target moving less than 20 km/h will not be displayed on the readout unit nor recorded on the counters. This excludes slow moving targets such as bicycles or pedestrians from being recorded.
- * The radar has an automatic shut down facility in case the battery voltage falls below the level for correct operation. A red and green pilot lamp are mounted on the panel of the main control unit to show the battery condition.
- * The system can discriminate between lorries and passenger cars, so that separate approaching traffic can be measured and, if a traffic camera is connected, take photos of these measurements.

10.2 Introduction to C.W. (continuous wave) radar theory

It is beyond the scope of this handbook to give a full rigorous treatment to C.W. Radar Theory and those persons wishing to consult an authoritative textbook on the subject are recommended to consult the work "Introduction to Radar Systems", by Skolnik and published by McGraw-Hill.

However, since it is appreciated by the manufacturers that the Gatso radar finds major applications in fields where radar expertise is unlikely to be found, it is desirable that a simplified explanation of the basic principle should be included in this handbook in order that the user can fully appreciate the equipment and obtain the maximum usefulness from it.

A C.W. radar basically comprises a source of radiated (transmitter) which operates continuously, as apposed to pulsed operation and a sensing system (receiver) which intercepts and amplifies a back scattered radiation from objects in the field of view of the radar.

Conventional radars operate in a frequency range of 1.000 to 40.000 MHz (1 MHz = 1 Megahertz = 1 million cycles per second), which frequencies are known generally as the microwave frequencies. The use of the high frequencies of this order is very largely due to the desirability of having aerial systems which can be readily directed towards a target and will have maximum aerial directivity and gain.

In general it is desirable to use as high a frequency as possible for C.W. radar because of a number of advantages, such as reduction in size of the aerial system. But high frequency engineering techniques become more costly and tolerances much more critical as the frequency increases and a balance has to be made between a number of such factors when choosing the operating frequency of a radar system.

In operation, the transmitted signal and the received echoes can be fed through the same aerial system and thus the aerial gain and directive properties can be made use of twice.

The most effective way to increase the range of a C.W. radar is not, as one might expect, to increase the transmitted power but to increase the size of the aerial system, which will result in a greater dimensional size. Another point to note is that the received power, is inversely proportional to the radar range to the FOURTH power, i.e $1/R$

(R = range)

The narrower the required system bandwidth the more sensitive the receiver can be, and it is desirable that the bandwidth used should be just adequate for the information which is desired to receive, in order to optimize the system.

However, the most important effect associated with C.W. radar is known as the Doppler effect. This effect is, as the target moves away from or approaches the radar, the change of path length for the 'outward' and 'return' signals from the radar gives rise to a change in frequency of the returned signal with respect to the 'outward' signal by an amount dependent of the velocity to the radar. In fact, the change corresponds to a complete cycle of frequency difference for each half wavelength moved by the target since this is equivalent to 360 degrees of phase change.

Thus, if the target has traveled 1 cm towards or away from 2 cm wavelength radar, 1 cycle of a 'Doppler' or difference frequency will be established. The rate of change of radar range to the target is thus easily obtained by counting the number of cycles of Doppler signal obtained in, say, a second. Therefore it can be seen that the Doppler frequency is directed proportional to the target velocity towards or away from the radar.

This can be expressed in the following two mathematical relationships:

$$\text{I} \quad f_d = \frac{2V \cos \Theta}{\lambda}$$

f_d = Doppler frequency in Hz (cycles/sec)
 V = velocity of target (in m/sec)
 $\cos \Theta$ = wavelength of transmitted signal in m.
 $\cos \Theta$ = angle between target and axis of the radar aerial
 $\cos = 20^\circ = 0,9397$

$$\text{II} \quad \text{wavelength} = \lambda = \frac{V \text{ light}}{f_r}$$

$V \text{ light}$ = velocity of light (= $3 \cdot 10^8$ m/sec)
 f_r = transmitted frequency (= 24.125 GHz)

$$\text{So that:} \quad = \frac{3 \cdot 10^8}{24.125} = \frac{300}{2412.5} = 1.24 \text{ cm}$$

At the Gatso radar type 24 operating frequency, this expression yields the result that a 4.8 Hz Doppler signal is generated by a moving target directly in line with the radar per 1 km/h velocity. Since the target crosses the radar beam at 20 degrees this is reduced to 42.1 Hz/km/h (since $\cos 20 \text{ degrees} = 0.94$).

When using a C.W. radar, it is therefore important to have precise knowledge of:

- the microwave frequency or wavelength
- the angle of incidence

In most cases these parameters are measurable to a high degree of accuracy, and the accuracy of measurement of target velocity becomes a question only of the accuracy of the Doppler frequency measuring system used.

This means that a Doppler-frequency of 42.1 Hz conforms with a speed of 1 km/h.

Example: measured Doppler frequency = 3000 Hz

Thus: $3000/42.1 = 71 \text{ km/h}$