Operating Instruction

Traffic Scanner C
Legal notice

Intelligent Security Systems
Corporation (ISS)
Aspen Corporate Park
1480 U.S. Highway 9 North
Suite 202
Woodbridge, NJ 07095

+1 (732) 855-1111
+1 (732) 855-1175 (fax)
info@isscctv.com
http://isscctv.com/

Legal Notes

Contents
We strive to provide information that is correct, up to date and complete, and we have carefully prepared this document. Still, we cannot give any kind of warranty whatsoever for said information. We expressly exclude any liability for damage and consequential damage in any way related to the use of this document. We reserve the right to modify the documented products and product information at any time.

Data protection
The user as the owner of the data is responsible for the protection of any personal data that were created with the system. This applies particularly to the storage, transmission, blocking and deletion of personal data. The user must comply the applicable data protection regulations that are in force in the country where the user is registered.

Intelligent Security Systems cannot be held liable for any consequences resulting from misuse of the data or from offences committed by the user against the law with regard to the protection of personal data.

Copyright/Industrial property rights
Any texts, images, graphics and the like, as well as their arrangement, are subject to protection under copyright and other laws of protection. The reproduction, modification, transmission or publication of any part of this document or of the entire document in any form is prohibited.

The document serves the exclusive purposes of information and of operation in accordance with the regulations and does not justify any counterfeiting of the products concerned.

All signs contained in this document (protected marks, such as logos and trade names) are the property of Intelligent Security Systems or of third parties and must not be used, copied or distributed without prior written consent.
Table of Contents

1 Concerning this Document ........................................................................................................ - 4 -
   1.1 Symbols and highlightings used in this document .......................................................... - 4 -

2 Basic safety instructions ........................................................................................................ - 5 -
   2.1 Use for Correct Purpose ................................................................................................. - 5 -
   2.2 Qualification of the operating personnel ......................................................................... - 5 -
   2.3 Responsibility of the operating company ........................................................................ - 5 -
   2.4 Marking of instructions .................................................................................................. - 6 -
   2.5 Special risks .................................................................................................................. - 7 -

3 Concerning the Product .......................................................................................................... - 8 -
   3.1 Product description ........................................................................................................ - 8 -
   3.2 Functional description .................................................................................................... - 9 -
       3.2.1 Measuring principle ................................................................................................. - 9 -
       3.2.2 Data transmission .................................................................................................. - 9 -
   3.3 Product view ................................................................................................................... - 10 -

4 Technical data ....................................................................................................................... - 12 -

5 Starting up the system ........................................................................................................... - 18 -
   5.1 The measurement location ............................................................................................ - 18 -
       5.1.1 Basic notes on the location ..................................................................................... - 18 -
       5.1.2 Straight road .......................................................................................................... - 19 -
       5.1.3 Information about lane width ................................................................................ - 20 -
   5.2 Configuration of UMRR with TSC ................................................................................ - 21 -

6 Operating the system ............................................................................................................ - 27 -
   6.1 Setting up the camera .................................................................................................... - 27 -
   6.2 Measuring ..................................................................................................................... - 28 -

7 Service and disposal. ........................................................................................................... - 32 -
   7.1 Maintenance and repair ................................................................................................. - 32 -
   7.2 Cleaning ....................................................................................................................... - 32 -
   7.3 Disposal ......................................................................................................................... - 32 -
1 Concerning this Document

This document provides important information concerning the correct use of the system. A requirement of safe working conditions, however, is the compliance with all of the safety and work instructions that are given.

In addition, the local regulations for the prevention of accidents and general safety regulations governing the area of application of the system must be adhered to.

Read this document carefully prior to performing any work!

The document is part of the product and must be kept close to the system and be accessible to personnel at all times.

1.1 Symbols and highlightings used in this document

In order to enhance the comprehension of the content, the following symbols and highlightings are used throughout this document.

**bold**

The names of program elements, such as the names of fields, buttons, or grouped functional areas, are printed in bold face. The document uses exactly the names that also appear throughout the user interface.

Represents the button to be activated, the function of which will be explained in greater detail in the accompanying instructions.
2 Basic safety instructions

This chapter provides an overview of all the important safety aspects for ensuring optimum protection for personnel as well as safe, approved and faultless operation.

Failure to observe the safety information and instructions described in this document can lead to considerable risks.

2.1 Use for Correct Purpose

The system is solely intended for use as a traffic monitoring system. Any application that is not described in the documentation of the system is considered as non-compliant with the intended use.

The manufacturer cannot be held liable for damage resulting from the use of the unit for purposes other than the one it is intended for, non-observance of this document, the employment of insufficiently qualified staff, and unauthorised modifications of the system. In these cases, the warranty of the manufacturer will be rendered void.

2.2 Qualification of the operating personnel

Only qualified personnel that have been verifiably trained especially for this task are permitted to operate the system and carry out measurements.

2.3 Responsibility of the operating company

The operating company is obligated to inform system's operating personnel about or train in the generally applicable legal and accident prevention regulations as well as all precautionary measures to be observed.
## 2.4 Marking of instructions

Instructions are marked as follows in this document.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="DANGER!" /></td>
<td>This indicates an imminent risk. If it is not avoided, death or serious (irreversible) injuries will result.</td>
<td><strong>DANGER!</strong> This indicates an imminent risk. If it is not avoided, death or serious (irreversible) injuries will result.</td>
</tr>
<tr>
<td><img src="image" alt="WARNING!" /></td>
<td>This indicates a potentially dangerous situation. If it is not avoided, death or serious (irreversible) injuries may result.</td>
<td><strong>WARNING!</strong> This indicates a potentially dangerous situation. If it is not avoided, death or serious (irreversible) injuries may result.</td>
</tr>
<tr>
<td><img src="image" alt="CAUTION!" /></td>
<td>This indicates a potentially dangerous situation. If it is not avoided, slight injuries may result.</td>
<td><strong>CAUTION!</strong> This indicates a potentially dangerous situation. If it is not avoided, slight injuries may result.</td>
</tr>
<tr>
<td><img src="image" alt="Note" /></td>
<td>This indicates a potentially harmful situation. If it is not avoided, damage may result.</td>
<td><img src="image" alt="Note" /> This indicates a potentially harmful situation. If it is not avoided, damage may result.</td>
</tr>
</tbody>
</table>

**Note**

Provides important information concerning the easy and correct use of the device.
2.5 Special risks

To adhere to the safety instructions listed here, as well as adhere to the warning notices in the individual chapters, in order to reduce health risks and prevent hazardous situations.

Danger! Flowing traffic!
Risk of death or serious injury.

- Pay attention to the guidelines and instructions for working in road traffic.
- Adhere to safety precautions.
- Pay attention to the traffic.
- Do not put other road users at risk.

Caution! Dazzling flash!
Eye injury.

- Do not direct the flash directly into the eyes from close up.

Caution! Ingress of dust, dirt and moisture!
Component damage.

- Protect the unit from dust, dirt and moisture.

Caution! Dust and dirt may penetrate into the camera head!
This reduces the quality of the photos.

- If no lens is installed, close the camera head with the housing cover.
- Ensure that no dust or dirt penetrates into the camera head when installing or removing the lens.
- Do not touch or clean the sensor (CCD) in the camera head. Only the manufacturer is authorised to clean the sensor.
3 Concerning the Product

This chapter provides information concerning the specification and mode of operation of the product. In addition, the entire system as well as the individual components, if applicable, are presented with the aid of drawings. The information is complemented by the technical data for the product as well as for the components, if applicable.

3.1 Product description

The Traffic Scanner C (TSC) in a MultaGard container is a speed measuring system based on RADAR. In addition to the speed measurement, also a lane assignment of the measured vehicle is automatically carried out. On highways and country roads, the Traffic Scanner C is typically used to count and classify traffic. Usually three classes are selected and reported in configurable counting/statistics intervals.

The Traffic Scanner C delivers the following data:
- Volume
- Occupancy
- Average Speed
- Vehicle Presence
- 85 percentile speed
- Headway
- Gap
- Wrong Way Detection Trigger

For a fast change of location the following components have been firmly mounted in a MultaGuard container:
1. Digital Video camera acA2000-50gmNIR and acA2000-165umNIR
2. Intel® NUC5i5RYH or Intel® NUC5i5RYK, processor unit (MPU)
3. Radar sensor UMRR Traffic Sensor
4. Flashing infrared system
5. RS 485-USB interface converter
6. Power supply

The power supply is provided by batteries or a special device.

To guarantee driver and number plate recognition the Traffic Scanner C is equipped with flash unit. This makes LPR possible also at night or during poor lighting conditions. The photos are processed in the processor unit (MPU). The incidents can be downloaded via a USB stick or an Ethernet port and then evaluated. Brackets can be used for the components have been firmly mounted in a pole or a gantry.

For special order the Traffic Scanner C can be supplied as OEM set:
1. Intel® NUC5i5RYH or Intel® NUC5i5RYK, processor unit (MPU) and power supply adaptor AC/DC 220/19V.
3. RS 485-USB interface converter (adaptor).

Traffic Scanner C OEM set can be used as a mobile solution with a car when the processor unit (MPU), the power supply adaptor and the RS 485-USB interface converter are arranged inside the car or in an additional housing and the Radar sensor is mounted on a roof of the car with a special car-bracket.
3.2 Functional description

3.2.1 Measuring principle

The term "Radar" stands for "Radio Detection And Ranging".

The radar sensor works according to the Doppler principle, i.e. an antenna continuously transmits a high-frequency radiation of known wavelength (transmit frequency $f_s=24.15$ GHz) and collects it again after reflection.

Whereas the radiation reflected back to the radar sensor by the road - as with all non-moving objects - does not change its frequency, a frequency change $\Delta f$ occurs in case of a moving vehicle because of the Doppler effect. When a vehicle approaches the radar sensor, the frequency always increases and when a vehicle moves away from the radar sensor, the frequency is decreased. The direction of travel can be determined from the type of frequency change (increase or decrease). The amount of the frequency change is proportional to the speed $v$.

The distance and angle to vehicles can be determined by the phase shift.

The radar sensor is aligned to a defined measuring angle $\alpha$ relative to the direction of travel of the vehicles to be measured. The influence of this angle is corrected inside the unit.

3.2.2 Data transmission

The data obtained in the speed measurement are transmitted physically from the radar sensor to the processor unit (MPU) via a RS-485 interface. Data transmission uses a RUSP protocol and a check sum. Using the check sum, the processor unit (MPU) can check the correctness of the transmitted data. They use RS 485-USB adaptor for convenient interconnecting the radar sensor to the processor unit (MPU).
3.3 Product view

Front view

1. Flashing infrared system
2. MultaGuard container
3. Digital Video camera acA2000-50gmNIR
4. Digital Video camera acA2000-165umNIR
5. Radar sensor UMRR Traffic Sensor
6. Bracket

Front view into the container

1. Power supply
2. RS 485-USB interface converter
3. Intel® NUC5i5RYH or Intel® NUC5i5RYK, processor unit
View OEM set:

1. Intel® NUC5i5RYH or Intel® NUC5i5RYK, processor unit (MPU) and power supply adaptor.

2. Radar sensor UMRR Traffic Sensor

3. RS485-USB interface converter (adaptor) and wires.
# 4 Technical data

**acA2000-165umNIR**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution (H x V pixels)</td>
<td>2048 px x 1088 px</td>
</tr>
<tr>
<td>Pixel Size horizontal/vertical</td>
<td>5.5 µm x 5.5 µm</td>
</tr>
<tr>
<td>Frame Rate</td>
<td>165 fps</td>
</tr>
<tr>
<td>Mono/Color</td>
<td>Mono</td>
</tr>
<tr>
<td>Interface</td>
<td>USB 3.0</td>
</tr>
<tr>
<td>Video Output Format</td>
<td>Mono 8, Mono 12, Mono 12 Packed</td>
</tr>
<tr>
<td>Pixel Bit Depth</td>
<td>10, 12 bits</td>
</tr>
<tr>
<td>Synchronization</td>
<td>• external trigger</td>
</tr>
<tr>
<td></td>
<td>• free-run</td>
</tr>
<tr>
<td>Exposure Control</td>
<td>• programmable via the camera API</td>
</tr>
<tr>
<td></td>
<td>• external trigger signal</td>
</tr>
<tr>
<td>Housing</td>
<td>box</td>
</tr>
<tr>
<td>Housing Size (L x W x H) in mm</td>
<td>29.3 x 29.0 x 29.0</td>
</tr>
<tr>
<td>Housing Temperature</td>
<td>0 °C - 60 °C</td>
</tr>
<tr>
<td>Lens Mount</td>
<td>• C-mount</td>
</tr>
<tr>
<td>Digital Input</td>
<td>1</td>
</tr>
<tr>
<td>Digital Output</td>
<td>1</td>
</tr>
<tr>
<td>General Purpose I/O</td>
<td>2</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>Via USB 3.0 interface</td>
</tr>
<tr>
<td>Power Consumption (typical)</td>
<td>2.5 W</td>
</tr>
<tr>
<td>Weight (typical)</td>
<td>80 g</td>
</tr>
</tbody>
</table>
**Conformity**

- CE
- RoHS
- GenICam
- IP30
- UL (in preparation)
- FCC
- USB3 Vision
- USB IF (in preparation)

<table>
<thead>
<tr>
<th><strong>Sensor Vendor</strong></th>
<th>CMOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensor Name</strong></td>
<td>CMV2000 NIR-enhanced</td>
</tr>
<tr>
<td><strong>Shutter</strong></td>
<td>global shutter</td>
</tr>
<tr>
<td><strong>Max. Image Circle</strong></td>
<td>2/3 inch</td>
</tr>
<tr>
<td><strong>Sensor Type</strong></td>
<td>CMOS</td>
</tr>
<tr>
<td><strong>Sensor Size (mm)</strong></td>
<td>11.26 mm x 5.98 mm</td>
</tr>
<tr>
<td><strong>Order Number</strong></td>
<td>106554</td>
</tr>
</tbody>
</table>

**acA2000-50gmNIR**

<table>
<thead>
<tr>
<th><strong>Resolution</strong> (H x V pixels)</th>
<th>2048 px x 1088 px</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pixel Size horizontal/vertical</strong></td>
<td>5.5 µm x 5.5 µm</td>
</tr>
<tr>
<td><strong>Frame Rate</strong></td>
<td>50 fps</td>
</tr>
<tr>
<td><strong>Mono/Color</strong></td>
<td>Mono</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Interface</strong></td>
<td>GigE</td>
</tr>
<tr>
<td><strong>Video Output Format</strong></td>
<td>Mono 8, Mono 12, Mono 12 Packed, YUV 4:2:2 Packed, YUV 4:2:2 (YUYV) Packed</td>
</tr>
<tr>
<td><strong>Pixel Bit Depth</strong></td>
<td>12 bits</td>
</tr>
</tbody>
</table>
| **Synchronization** | • external trigger  
• free-run  
• Ethernet connection |
| **Exposure Control** | • programmable via the camera API  
• external trigger signal |
| **Housing** | box |
| **Housing Size (L x W x H) in mm** | 42.0 x 29.0 x 29.0 |
| **Housing Temperature** | 0 °C - 50 °C |
| **Lens Mount** | • C-mount |
| **Digital Input** | 1 |
| **Digital Output** | 1 |
| **Power Requirements** | PoE or 12 VDC |
| **Power Consumption (typical)** | 2.5 W |
| **Power Consumption PoE** | 2.8 W |
| **Weight (typical)** | 90 g |
| **Conformity** | • CE  
• RoHS  
• GenICam  
• GigE Vision  
• IP30  
• UL  
• FCC  
• IEEE 802.3af (PoE) |
| **Sensor Vendor** | CMOSIS |
| **Sensor Name** | CMV2000 NIR-enhanced |
### Processor unit

| Processor | • 5th generation Intel® Core™ i5-5250U processor (1.6 GHz up to 2.7 GHz Turbo Dual Core, 3 MB Cache, 15W TDP) • Supports Intel® Hyper-Threading Technology6 • Supports Intel® 64 architecture7 |
| Graphics | • Intel® HD Graphics 6000 • One Mini DisplayPort* version 1.2 supporting ultra-high definition 4K displays and multiple monitor functionality • One Mini HDMI* 1.4a port |
| System memory | • Two DDR3L SO-DIMM sockets (up to 16 GB, 1333/1600 MHz) in dual channel configuration, 1.35V |
| Storage capabilities | • One M.2 Type M connector supporting 22x42, 22x60, and 22x80 SATA or PCIe SSDs • One SATA 6Gbps port for connection to 2.5” HDD or SSD (up to 9.5 mm thickness) |
| Peripheral connectivity | • Integrated Intel® Gigabit LAN • Four Super Hi-Speed USB 3.0 ports (two back panel ports and two front ports including one charging port) • Two additional Hi-Speed USB 2.0 ports via internal header • Intel® Dual Band Wireless-AC 7265, 802.11ac, 2x2, up to 867 Mbps • Dual Mode Bluetooth 4.0 |
| System bios | • 64 Mb Flash EEPROM with Intel® Platform Innovation Framework for EFI Plug and Play • Advanced configuration and power interface V3.0b, SMBIOS2.5 • Intel® Visual BIOS • Intel® Express BIOS update support |
| Hardware management features | • Processor fan speed control • Voltage and temperature sensing • Fan sensor inputs used to monitor fan activity • ACPI-compliant power management control |
| Expansion capabilities | • One NFC header • 2x Internal USB 2.0 ports via 1x8 header (for replaceable lid support) • One AUX_PWR header |
| Audio | • Intel® HD Audio5 via Mini HDMI 1.4a and Mini DisplayPort version 1.2 supporting 8 channel digital audio (7.1 surround sound) • Intel HD Audio via front panel analog audio jack (supporting headset, speakers, |

### Specifications

| Shutter | global shutter |
| Max. Image Circle | 2/3 inch |
| Sensor Type | CMOS |
| Sensor Size (mm) | 11.26 mm x 5.98 mm |
| Order Number | 106159 |
**Front-panel connectors**

- Reset, HDD LED, Power LEDs, power on/off

**Mechanical chassis size**

- 4.53” x 4.37” x 1.92” • 115mm x 111mm x 48.7mm

**Baseboard power requirements**

- 19V, 65W wall-mount AC-DC power adapter • Multi-country AC adapter (IEC plug types A, C, G, and I)

**Environment operating temperature**

- 0° C to +50° C

**Storage temperature**

- -20° C to +70° C

**Weight (without power supply)**

- 0.47 kg

**Product safety regulations and standards**

- IEC 60950-1 • UL 60950-1 • EN 60950-1 • CAN/CSA-C22.2 No. 60950-1

**Emc regulations and standards (class b)**

- CISPR 22 • FCC CFR Title 47, Chapter I, Part 15, Subparts A, B • ICES-003 • EN 55022 • EN 55024 • VCCI V-3, V-4 • KN-22 • KN-24 • CNS 13438

**Environmental regulations**


---


### Radar sensor UMRR Traffic Sensor

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensor Performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Range on Pedestrian</td>
<td>50</td>
<td>m</td>
</tr>
<tr>
<td>Max. Range on Passenger Car</td>
<td>160</td>
<td>m</td>
</tr>
<tr>
<td>Minimum Range</td>
<td>1.5</td>
<td>m</td>
</tr>
<tr>
<td>Range accuracy</td>
<td>Typ. &lt; ±2.5% or &lt; ±0.25m</td>
<td>%, m</td>
</tr>
<tr>
<td>(bigger of)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radial Speed Interval</td>
<td>-68.3 … +68.3 (±88.8 available)</td>
<td>m/s</td>
</tr>
<tr>
<td>Minimum abs. Radial Speed</td>
<td>0.1</td>
<td>m/s</td>
</tr>
<tr>
<td>Speed accuracy</td>
<td>Typ. &lt; ±0.28 or ±1% (bigger of)</td>
<td>m/s</td>
</tr>
<tr>
<td>Angle Interval (total field of view)</td>
<td>-6 … +6 (Ei); -18 … +18 (Az.)</td>
<td>degree</td>
</tr>
<tr>
<td>Update time</td>
<td>≤ 50</td>
<td>ms</td>
</tr>
<tr>
<td>Track Initialization time</td>
<td>Typ. 6 … 10</td>
<td>cycles</td>
</tr>
<tr>
<td>Simultaneously tracked objects</td>
<td>Typ. up to 64</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>-40 … +85</td>
<td>degree C</td>
</tr>
<tr>
<td>Shock</td>
<td>100</td>
<td>gRMS</td>
</tr>
<tr>
<td>Vibration</td>
<td>14</td>
<td>gRMS</td>
</tr>
<tr>
<td>IP</td>
<td>67</td>
<td></td>
</tr>
</tbody>
</table>
### Mechanical

<table>
<thead>
<tr>
<th>Pressure / Transport altitude</th>
<th>0...10.000</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>330</td>
<td>g</td>
</tr>
<tr>
<td>Dimensions</td>
<td>See below</td>
<td></td>
</tr>
</tbody>
</table>
| Model No.                    | 0Axxxx-1Dxxx  
0Axxxx-1Exxxx              |   |   |
| DSP Board – Antenna Identification | 0Axxxx-1Dxxx  
0Axxxx-1Exxxx              |   |   |
| Housing Identification       | 050602     |   |

### General

| Power Supply                  | 7 ... 32 VI  
3.7 W DC |   |
| Frequency Band                | 24.15 GHz   |
| Bandwidth                     | 0.1 GHz     |
| Max. Transmit Power (EIRP)    | 20 dBm      |
| Interfaces                    | CAN V2.0b (passive)  
RS485 half-duplex |
| Connector                     | 8 Pin plug Binder Series 712  
CAN, Power, RS485 |

1 Typical values; may vary to higher or lower values depending on clutter environment. All values given for bore sight. Please note that the Radar system – like any other sensor system – although being well optimized and providing excellent performance, will not achieve a 100% detection probability and will not achieve a false alarm rate equal to zero.

II Measured on object having const. radial speed, at bore sight.

IV Total field of view is angle interval where reflectors can be detected; 3dB field of view is narrower.

V IP 67 only when connector or cap attached.

VI measured at connector; min. voltage slew rate 500V/s or max. voltage rise time 15ms; supply source impedance 0.5Ohms.

VII Also available: Ethernet, Relay contacts, see interfaces. It is recommended to use an external surge protection for power, CAN, RS485 and other interface ports.

Compliance

ETSI EN 300-440, FCC part 15, RSS-310, RSS-210, SRRC, KCC, NCC
5 Starting up the system

5.1 The measurement location

5.1.1 Basic notes on the location

The selection of the location for the measurement and the position of the measuring instrument must basically be such that:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Direction</td>
<td>Typ. Approaching &amp; Receding</td>
</tr>
<tr>
<td>Mounting Height</td>
<td>Typ. 6m (4...10m)I</td>
</tr>
<tr>
<td>Sensor Azimuth angle</td>
<td>Typ. -8° (-15 ...+15 deg.)II</td>
</tr>
<tr>
<td>Sensor Elevation angle</td>
<td>Typ. -6° (-9...0 deg.)II, III</td>
</tr>
<tr>
<td>Counting Line Distance (Approaching)</td>
<td>Typ. 35m (20m ... 50m)IV</td>
</tr>
<tr>
<td>Counting Line Distance (Receding)</td>
<td>Typ. 90m (50m ... 160m)IV</td>
</tr>
<tr>
<td>Setback</td>
<td>Typ. 1m (0... 10m)</td>
</tr>
<tr>
<td>Counting Accuracy</td>
<td>Typ. &gt; 95%V</td>
</tr>
<tr>
<td>Classes</td>
<td>Usually 3 classes are used of the following: Bicycle, Motorbike, Passenger Car, Truck</td>
</tr>
</tbody>
</table>

I May affect max. detection range. Occlusion needs to be considered.
II Smaller absolute angles allow longer detection range along a road.
III Application specific. Gantry mount: steeper el. angle possible, with limitations of maximum range. Negative elevation angle means sensor pointing towards road.
IV Typical value for counting applications; may be different for other applications.
V Typical value when properly installed at suitable location. The counting and classification accuracy typically depends on the following main (and other) factors: mounting height, traffic density

The sensor is typically used standalone at straight road.

Additional requirements for the measurement location:

0 The measurement site must provide a solid base for the system, to prevent the alignment from altering during measurement.
0 The radar beam must not be prevented from spreading by obstacles.
5.1.2 Straight road

The monitored section of road within the range of the radar beam must be straight to maintain the specified measuring angle. A section of road counts as straight when its radius of curvature is: \( R > 1600 \text{ m} \).

![Diagram of straight road section](image)

<table>
<thead>
<tr>
<th>( R )</th>
<th>Radius of curvature of the road</th>
</tr>
</thead>
<tbody>
<tr>
<td>( S )</td>
<td>Chord, suitable reference line (lane marking, kerb, etc.)</td>
</tr>
<tr>
<td>( A )</td>
<td>Distance between chord and edge of bend</td>
</tr>
</tbody>
</table>

The radius of curvature can be calculated with the following formula:

\[
R = \frac{S^2}{8A} + \frac{A}{2}
\]

since \( A/2 \) is negligibly small, the following applies:

\[
R \approx \frac{S^2}{8A}
\]

Minimum length of the straight section of road (example)

The minimum length of the straight section of road depends on the distance between the middle of the sensor and the monitored lane. The larger the distance \( D \), the longer section \( g \) of the road must be straight.

![Diagram of monitored lanes](image)

<table>
<thead>
<tr>
<th>Monitored lane</th>
<th>( g ) (minimum length of the straight section of road)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane 1</td>
<td>14 m</td>
</tr>
<tr>
<td>Lane 2</td>
<td>21 m</td>
</tr>
<tr>
<td>Lane 3</td>
<td>28 m</td>
</tr>
</tbody>
</table>
5.1.3 Information about lane width

Identifying and assigning the lane

The Traffic Scanner C can clearly assign a lane to each measured vehicle. Here the dimensions of the lanes and the distance between road verge and radar sensor must be entered accurately when configuring the system (width of lanes). All distances are measured from the middle of the markings.

The calculated lane is stored in the incident file and indicated in script. If the vehicle is not positioned clearly on one lane at the moment of measurement, the system indicates an intermediate area as lane marking.

The following illustrations explain the determination of the lane width and assignment of lanes:

**Diagram**

**Determination of lane widths**

The widths of the individual vehicles and the distance to the system must be measured precisely or be taken from an official plan and entered in the system’s operating software.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$d_0$</td>
<td>Lane offset: Distance of the system (middle of camera) to the 1st lane</td>
</tr>
<tr>
<td>$d_{FS1}$</td>
<td>Width of lane 1</td>
</tr>
<tr>
<td>$d_{FS2}$</td>
<td>Width of lane 2</td>
</tr>
<tr>
<td>$d_{FS3}$</td>
<td>Width of lane 3</td>
</tr>
</tbody>
</table>
Examples on determining lane width

Country road with roadside border and lane line
The country road has one lane for each direction of travelling. It is recommended to set up the system for two lanes to also allow overtaking vehicles to be measured.
Lane 1: Lane width of monitored direction of traffic.
Lane 2: Lane width for overtaking vehicles.

Country road without roadside border and lane line
The country road can be travelled in both directions, yet does not have a lane line. It is recommended to set up the system for two lanes to also allow overtaking vehicles to be measured.
Lane 1: Lane width of monitored direction of traffic.
Lane 2: Lane width for overtaking vehicles.

5.2 Configuration of UMRR with TSC.
In order to deliver accurate results the radar needs specific information like alignment to the road and setup of measurement points. The TSC loads this configuration sets out of the sensor, enables the manipulation with its controls and sends it back into the sensor.
Configurations are stored in the desktop file so that they are present after next start-up of the software. XML-Export and Import enables manual and automatic restoring of configuration sets (for each recording an XML-Export is done which is loaded for replay of file).

A sensor beam is drawn in 2D view to visualize the alignment. The shown beam depends on the antenna type chosen and illustrates the corresponding beam shape. Accurate settings of mounting height, azimuth and elevation angle (all related to road) help the sensor to precisely track objects. All these values influence the detection area of the sensor on the road (more exact: in detection height ~0.5m). A 3D-antenna-model makes it possible to draw this footprint depending on the set values.
The sensor calculates statistic data and checks conditions for relay triggering at defined measurement points. Measurement points are intersections of lanes and measurement lines. Lanes are configured by dragging the manipulators via mouse or numerically.

Analogue to the Lanes, the Measurement Lines can be set via dragging the manipulators, or numerically.

In intersection mode each measurement point is a trigger point that triggers a relay if a specific condition is true.
Next to trigger points the activation and global relay pulse settings are adjusted by TSC.

Configuration of Sensors Statistic Data Output

TSC also sets parameter for statistic data output like report interval, active statistic features and counting zone offsets.
Display of Objects

The sensor detected objects are drawn as boxes in the 2D view. The speed value is optionally displayed next to the object. Object lists show all object information transmitted by the sensor in a grid.

Video overlay allows fast association of sensor detected and filmed objects.
Display of Statistics Data

The statistic data output is displayed in an info box for each measurement point.
6  Operating the system

**Note**

How to operate the software and set the system parameters is described in chapter Measuring.

Switching the unit on
Setting the compulsory menus

6.1  Setting up the camera

Traffic Scanner C OEM set has not the camera and all futures depend with the camera cannot be used for such set.

![Setting up the camera diagram](image)

- Selecting live picture (see chapter System adjustment)

**Setting the aperture**

- Slacken screw (1) slightly.
- Turn the front adjusting ring in the direction of the arrow and set the aperture so that the licence plate of the vehicle to be photographed is just visible on the monitor.
- Tighten screw (1).

**Setting the distance**

- Fully open the aperture at the lens. This is the case when the aperture ring has been set on the smallest digit (see section Setting the aperture)
- Slacken the screw (2) slightly.
- Turn the rear adjusting ring in the direction of the arrow until the object to be photographed is sharply defined.
- Tighten the screw (2).
Checking the settings

The setting of the camera can be checked with the aid of a test photo.

The high speed accuracy of the UMRR sensor makes it very suitable for lane specific speed and red light enforcement applications. According to the specification of the enforcement application the sensor can be used either in approaching or in receding traffic mode.

6.2 Measuring

The data can be retrieved in Push or Record Mode
a) in low data volume as aggregated statistics output
b) as per vehicle record (PVR)
Because of the forward looking principle, the sensor provides the significant higher speed accuracy / general speed based information, compared to other traffic counting equipment. All received statistic data messages are displayed and can be exported with the TMStatisticViewer window. Export of messages to a .csv file can be done manually (all received messages in one file) or automatically (periodically create a new file). Messages can also be exported to a MS SQL Server database.
The volume information is used to create a counting results overview.

All statistic info boxes are aligned under Statistic Boxes tab in TMStatisticViewer.
Display of Relay States

The relay states are displayed in 2D view highlighting also the trigger area. Next to this the active relays are indicated in a bit state window for each sensor.
The background image setup dialog makes it easy to setup an image as the background of the 2D view. It is also possible to load background images directly from map providers of the World Wide Web.

7 Service and disposal.

7.1 Maintenance and repair

If maintenance or repair is required, please contact the after-sales service under the following address:

Intelligent Security Systems Corporation (ISS)
Aspen Corporate Park
1480 U.S. Highway 9 North
Suite 202
Woodbridge, NJ 07095

+1 (732) 855-1111
+1 (732) 855-1175 (fax)
info@isscctv.com
http://isscctv.com/

7.2 Cleaning

Switch the system off prior to cleaning it. Use a soft and dry cloth for cleaning. Do not clean the sensor (CCD) in the camera. In the case of stubborn dirt or if the sensor (CCD) is dirty, please contact the after-sales-service.

7.3 Disposal

The equipment, accessories, batteries and packaging should be disposed of in an environmentally friendly way. Please observe the relevant statutory disposal regulations in your country.