SMARTSCAN INFORMATION

SS-7K
SEP02

7000 SERIES
LIGHT CURTAINS
HANDBOOK

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ISSUE 1

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7000 Series Safety Light Curtains

The 7000 Series offers a wide range of models for finger, hand, leg and body protection.

The 7000 system from Smartscan is compact in size and provides many sophisticated control features as standard, including: 2 and 3 beam floating blanking for press and press brake applications, external test and auto or latched reset control options. A muting function is also provided.

The 7000 Series meets the very highest standards for safety - 3rd Party Approved for compliance to the latest European Standards including BS EN 61496-1 and BS IEC 61496-2. Rated as a Type 4 device the 7000 Series is suitable for ALL machine applications including those categorised 'high risk'.

Typical machine safeguarding applications include:

- Press brakes
- Mechanical presses
- Guillotines
- Production lines
- Robots

7000 Series light curtains comply with British and International Safety Standards for Light Curtains BS EN 61496-1 & BS IEC 61496-2 Type 4. They are normally used in situations which demand a high level of safety integrity, where the risk assessment for the safety related parts of a control system, as indicated in BS EN 954-1, determines a requirement up to and including Category 4 control equipment.

- **EC Type Examined**
- **For high risk applications - Category 4**
- **Simple installation and alignment**
- **Up to 15m scanning range**
- **Two year manufacturers warranty**

Features

- Muting (model dependent)
- Dynamic floating blanking
- Diagnostic and status indicators
- Selectable range setting
- Selectable auto or manual start / restart interlocks
- Safety monitoring feedback loop (External Device Monitoring) EDM
- Auxiliary relay switching contacts
- Mute lamp output with monitoring (model dependent)

Safety Outputs OSSD1 and OSSD2 (F1) - Two independent electronic switches provide the fail-safe outputs for connection to the machine control system. Connections are at terminals J6/10 and J6/11 on the control module. Outputs 'on' = 24V. Outputs 'off' = 0V maximum switching current = 1A.

LED indicators mounted on the control module show the status of the OSSD switches.

Green LED's ON = OSSD1 and OSSD2 active ON
Red LED's ON = OSSD1 and OSSD2 inactive OFF

Safety Relay Outputs (F2) - a number of 7000 Series control module types have on-board cross-monitored output switching relays. With these models the electronic outputs are connected via links to the inputs of the relay coils. Link electronic output switches to relay inputs J6/10 to J6/6 and J6/11 to J6/7. The output relay switching contacts are on terminals J6/4, J6/8 and J6/5, J6/9. Maximum switching power 110V, 2A.

Status Relay Outputs (F3/F4) - Relay switching contacts are provided for guard status indication. The changeover output contacts from this relay are non-safety. The status relay activates when the safety outputs (F1) turn ON and de-activates when the safety outputs turn OFF. Terminal connections are as follows: N/O contact J6/1, N/C contact J6/3, Common 6J2. Maximum switching power 24V, 1A.

Mode (F5) - The mode setting switch is mounted on the control module. The switch enables modes to be selected to suit the specific machine applications. The dip switches can be set to provide the following modes: 1) No interlock. 2) Start interlock. 3) Restart interlock. 4) Start and Restart interlock. For settings refer to the table, Fig. O.

Warning: When using the mute function select only mode 3 Restart interlock or, mode 4 Start/Restart interlock.

Warning: Mode switch changes have no effect until all electrical power is removed from the control module and then re-applied.

Warning: When setting up the light curtain, ensure that mode 1 No interlock is selected.

Range (F6) - The range setting switch is mounted in the control module. The switch enables light curtain scanning ranges to be selected to suit a specific application. The dip switches can be set to provide the following ranges: 1) 0.5m to 1m 2) 1m to 4m 3) 4m to 15m. For settings refer to Fig. N.

Warning: Range switch changes have no effect until all electrical power is removed from the control module and then re-applied.

Mute indicator (F7) - A number of machine types require that a monitored mute indicator be fitted when the light curtain is in a muted condition, e.g. presses and press brakes. The 7000 system is fitted with mute monitoring circuits and outputs for connection of a suitable indicator. The indicator lamp must be 12V, 2.2 Watt to satisfy the monitoring requirements. If no lamp or a lamp of incorrect power is fitted at terminals J1/13 and J1/14 then the light curtain will not mute.

If light curtain muting is used but a mute indicator is not required for a particular application connect a 78 Ohm 2.2 Watt resistor across terminals J1/13 and J1/14.

Mute input (F8) - The complimentary input is provided at terminals J1/11 and J1/12 for connection of suitable switching signals for muting the light curtain. When both signals are active ON, and providing a suitable mute lamp or ballast resistor has been fitted across terminals J1/13 and J1/14 then the light curtain will mute, e.g. the guard output switches will not respond to an interruption of the light curtain.

The mute switching signals must have the following polarity:
Mute signal A at terminal J1/11 = +24V DC
Mute signal B at terminal J1/12 = 0V DC

Note: Signals must be applied to both mute inputs at J1/11 and J1/12 within 200ms of each other. If this time is exceeded the system will go to a lockout condition.

Warning: When using the mute function select only mode 3 Restart interlock or, mode 4 Start/Restart interlock.

Start/restart (F9) - A suitable push button or key switch with a N/O contact must be fitted across terminals J6/12 and J6/13 to reset the light curtain when in the following modes; Start interlock, Restart interlock, Start + Restart interlock.

Floating blanking (F10) - Floating blanking allows selected areas of the detection zone to be disabled. The function is particularly useful for those applications where, for example, a work piece is obstructing the light curtain or possibly moving up and down within the curtain.

The 7000 Series has the capability of 1, 2 and 3 beam floating blanking, offering much increased flexibility.

Floating blanking can be selected to allow one, two or three beam obstructions within the light curtain to be ignored. The obstruction can move or 'float' within the detection zone without initiating a stop signal providing the obstruction does not interrupt more than the selected number of 'floating' beams. If one beam blanking is selected, any single beam in the light curtain can be blocked without the guard outputs de-energising. If two beam floating blanking is selected any two beam obstruction can be ignored. With three beam blanking any three beams blocked will be ignored. The interrupted beams do not have to be adjacent to each other.

Note: Beam blanking increases the size of object which is guaranteed to be detected by the light curtain. (An increased ODC). When selecting 1, 2 or 3 beam floating blanking the worst case ODC should always be taken into account during the risk assessment process. Check the position of the light curtain in relation to the nearest danger point is in line with the requirements of European Standard BS EN 999.

Beam blanking is selected by connecting appropriate input signals to the following terminals on the control module: +24V at J1/7, 0V at J1/8, +24V at J1/9 and 0V at J1/10. For connection details refer to Fig. Q.

Note: The input signal must be applied within 200ms of each other. If this time is exceeded the system will go to a lockout condition. The signals may be applied during operation of the guard and will take immediate effect. This feature can be used to increase the integrity of a guarding application (partial muting).

Monitoring (F11) - External Device Monitoring (EDM) inputs are provided. If external relays are used it may be necessary to ensure the relays respond each time the light curtain is interrupted.

If the monitoring function is not required for a particular application it is necessary to link terminal J1/2 to J1/4 (0V) and J1/1 to J1/3 (+24V). If the links are not fitted the light curtain control will go into a lockout condition.

Note: Both monitoring signals must be applied within 200ms of each other. If the time is exceeded the system will go to a lockout condition.

Power supply (F12) - Use a regulated supply +24V DC, 1.5A ±10% Protect the +24V input with a 1.5A fuse (see note below). Terminal connections: J6/16 = +24V, J6/15 = L- V and J6/14 = Ground.

Note: OSSD current is an addition to the control units quiescent current (no load) For example if the electronic OSSD's are consuming the maximum rated current OSSD1 = 1A & OSSD2 = 1A then the input fuse must be increased as follows 1A + 1A + 1.5A (quiescent current). Therefore fuse rating = 3.5A

Interlock indicators (F13/F16) - Yellow LED interlock indicators are provided on both the transmitter unit and in the control module. When the LED's are illuminated the 7000 system is in a lockout condition e.g. latched in the 'off' state by interlock function F5.

Guard 'clear' indicator (F14) - A green LED indicator mounted on the transmitter unit illuminates when the light curtain is clear and operational ON.

Guard 'block' indicator (F15) - A red LED indicator mounted on the transmitter unit illuminates when the light curtain is blocked and non-operational OFF.

Safety relay input (F17) - Some 7000 Series control module types have on-board cross monitored output switching relays. With these models the electronic outputs are connected via links to the inputs of the relays. Link output switches to relay inputs J6/10 to J6/6 and J6/11 to J6/7. The two output relay switching contacts are on terminals J6/4, J6/8 and J6/5, J6/9. Maximum switching power 110V, 2A.

7000 Series Light Curtains

Number of beams	2 -112
Object detection	30mm, 70mm & Perimeter Guarding
Detection zone	176mm to 2072mm (model dependent)
Range	0.5 - 15m (model dependent)
Light type	Infra-Red 880nm
Response time (relay output)	25ms
Operating temperature	0°C to + 50°C
Light curtain enclosure	IP66/7 (HxWxD) Hx44x56mm
Control module enclosure	IP65 (HxWxD) 108x224x65mm
Power supply requirement	24V DC 2.5 A ± 10% reg
Current consumption	1.5A (NO LOAD)
Light curtain connectors	M12 8 Way IP67
Finish	Polyester powder coated (yellow) RAL 1006
Classification	BS EN 61496-1 BS IEC 61496-2 Type 4 BS EN 954-1 Category 4
Warranty	Two Years

INPUTS	
Safety monitoring (EDM)	Complementary inputs
Start, restart interlock	4 separate modes (selectable)
Floating blanking	1, 2 or 3 beam blanking (selectable)
Muting	Complementary inputs

OUTPUTS	
Safety output relays	2 x N/O fail safe contacts, each rated at 110V AC, 2A
Status output relay	1 x change over contact (non - safety), rated at 24V, 1A
Mute lamp output	12V DC 2.2 Watt (monitored)
Status indication	Status & condition LED's on controller & light curtain

amtri veritas Type Examined

Report Number: 8/005027

Certificate Number: CK/KID/091/99

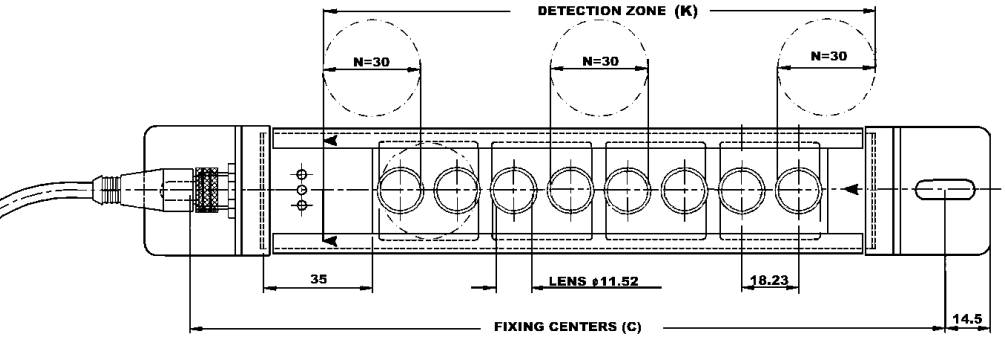
amtri veritas®

Certificate Number: AV EC 1456-A

FM27829

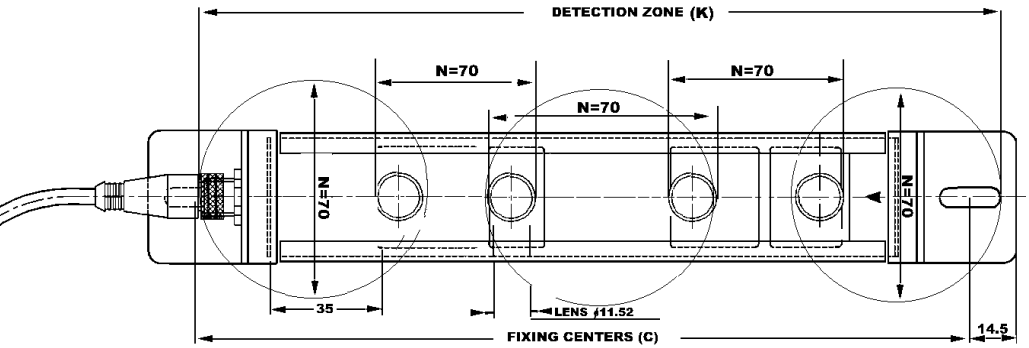
Light Curtains **30mm Detection Capability** **Range 15m**

Model number	Number of beams	Detection zone (K) mm	Weight (Tx + Rx) Kg
072-150	8	176	1.0
072-151	16	321	1.5
072-152	24	467	2.1
072-153	32	613	2.7
072-154	40	759	3.2
072-155	48	905	3.8
072-156	56	1051	4.1
072-157	64	1196	4.7
072-158	72	1306	5.5
072-159	80	1488	6.0
072-160	88	1634	6.6
072-161	96	1780	7.1
072-162	104	1926	7.4
072-163	112	2072	8.2



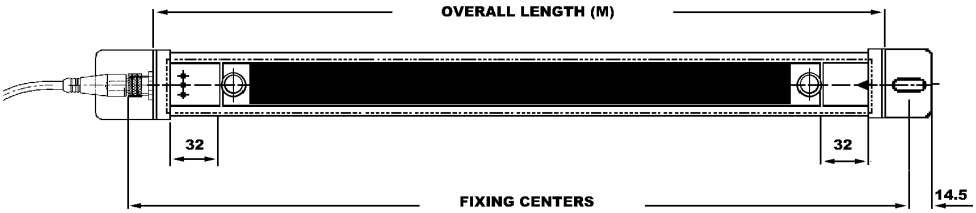
Light Curtains **70mm Detection Capability** **Range 15m**

Model number	Number of beams	Detection zone (K) mm	Weight (Tx + Rx) Kg
072-201	4	303	1.5
072-203	8	536	2.3
072-204	10	653	2.7
072-205	12	769	3.1
072-206	16	1002	4.0
072-207	20	1235	4.8
072-208	24	1469	5.6
072-209	30	1818	6.7



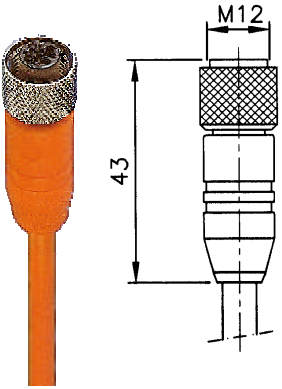
Light Curtains Perimeter Guarding Range 15m

Model number	Beam Pitch	Overall length (M) mm	Weight (Tx + Rx) Kg
072-250	2 @ 500mm	585	2.3
072-251	3 @ 450mm	930	3.3
072-252	4 @ 400mm	1175	4.0



Interconnect Cables

Model number	Length m
071-303	5
071-306	20



Control Module IP65

Mode number	Description
072-103	Relay output (IP65)
072-107	Relay output with mute (IP65)

Warning: Do not use inside control enclosures where temperature may exceed rating

amtri veritas Type Examined

Report Number: 8/005027

Certificate Number: CK/KID/091/99

Certificate Number: AV EC 1456-A

FM27829

Mirror Units

Two or three sides of a machine can be safeguarded with a single light curtain by using mirrors to deflect the light curtain's infra-red beams. (See appendix 2 for installation guidance).

The Smartscan mirror system provides a sturdy floor mounting kit together with an aluminium column for mounting the mirror. The mirror assembly simply slots onto the column and can be adjusted to the height required for the application.

The special mounting stand enables the mirror unit to be rotated through 360 degrees while also allowing full adjustment in all axes.

Note: Mirrors cause a reduction in optical efficiency, reducing the effective range of the light curtain. Refer to appendix 2 for guidance.

Range of the light curtain	Maximum range through 1 mirror	Maximum range through 2 mirrors
0.5m – 15m	9m	6m

Mirrors

Model number	Description
044-252	600mm x 110mm wide mirror unit
044-249	900mm x 110mm wide mirror unit
044-250	1200mm x 110mm wide mirror unit
044-253	1400mm x 110mm wide mirror unit

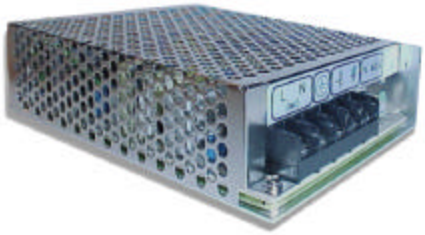
Note: Mirror length must be a minimum of 100mm longer than the overall length of the light curtain to be installed.

Column & Floor Stand

Model number	Description
044-256	1.1m aluminium universal mounting column
044-257	1.3m aluminium universal mounting column
044-258	1.6m aluminium universal mounting column
044-247	1.8m aluminium universal mounting column
044-262	2.0m aluminium universal mounting column
044-248	Floor stand

Note: A universal mounting column and floor stand is required for each mirror unit.

Power Supply



If a suitable stabilised 24V DC, 2.5A power supply is not available the following unit is recommended.

Model number	Description
071-050	Power supply Input 85 - 264V AC Output 24V DC, 2.5A

Features

- High reliability
- High efficiency, low working temp
- Built in EMI filter, low ripple noise
- Compact size, lightweight
- Short circuit, over load, over voltage protection
- Approvals: UL, TUV, CB, and CE

Specification

Type	Switch mode
Input Voltage	85 - 264V AC
Input frequency	47-63Hz
Inrush current	Cold start, 24A, 115V & 50A, 230V
Output voltage/current rating	24V DC, 2.5A
Operating temperature	0°C to 50°C
Storage temperature	-10°C to +70°C
Connection	5P/9.5mm pitch terminal block
Enclosure	160x98x38mm Din rail mounting
Weight	0.5 Kg

Mounting Stands

Designed to accommodate our range of safety light curtains.

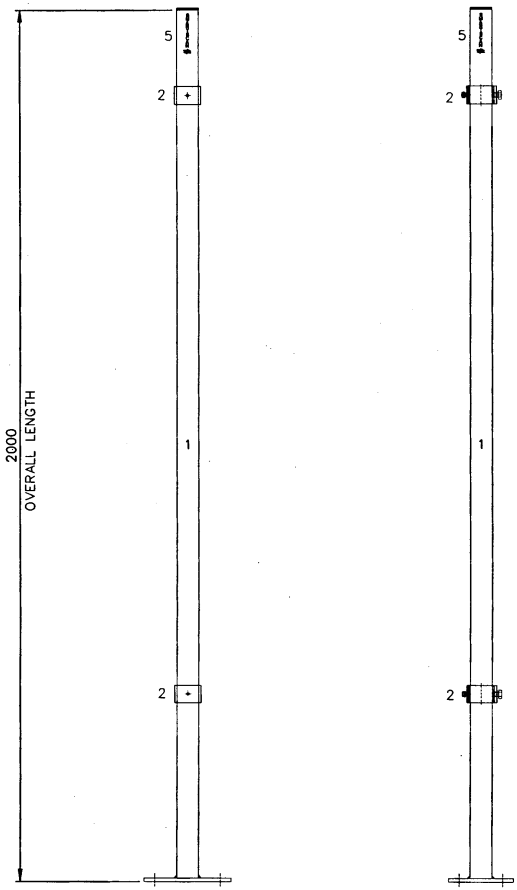
The **Adjustable Stand** (50mm x 50mm) offers the user a flexible mounting option. The stand has adjustable brackets that allow the safety light curtain to be mounted at different positions to suit a specific application.

The **Channel Stand** allows the user to mount the safety light curtain inside a protective housing. This provides protection on three sides to give a more robust installation. Channel stands would typically be used where the safety light curtain is at risk of damage from fork lift truck operations.

Adjustable Mounting Stands

Straight stands

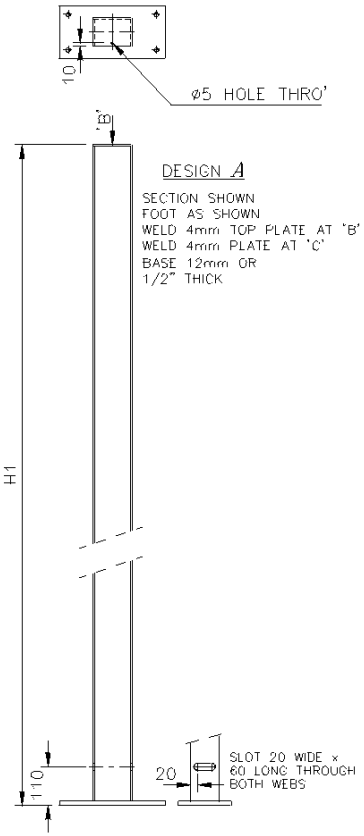
Model number	Description	Height
044 – 408	Pair of adjustable straight stands (with complete bracket set)	2m



Channel Mounting Stands

Straight stands

Model number	Description	Height
044 - 118	Pair of channel floor stands (straight)	1.5m
044 – 218	Pair of channel floor stands (straight)	2m



7000 SERIES

Safety System Solutions

Smartscan recognise the difficult balance that customers have to make between meeting Health & Safety legislation requirements and managing their demanding production needs.

Smartscan design and manufacture systems to meet the particular needs of their customer's safety applications - from single machines to full production lines.

We provide our customers with a total service, from initial safety advice through to regular maintenance of their safety systems.

Expert Advice	**Risk Assessment**
Safety System Design	**Product Specification**
Safety System Installation	**System Maintenance**

7000 SERIES

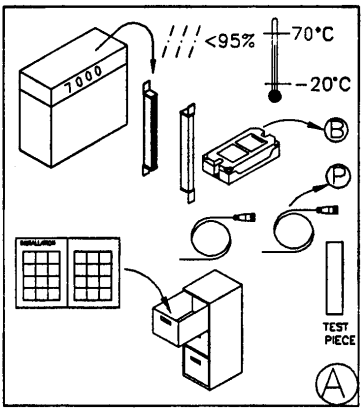
Installation Sheet Number 08-2002 017-700W

Warning: Control modules and Transmitters / Receivers with serial numbers ending in X or T are not interchangeable with previous models. Mixing them may damage the units.

Warning: You must Switch-off or disconnect the 7000 Series light curtain from the 24V power supply before connecting or disconnecting the M12 connectors to the light curtain Transmitter (Tx) and Receiver (Rx) heads.

Unpacking

- Remove all packaging material and retain it
- Locate and keep the delivery note
- Inspect all items for transit damage
- Match goods supplied to those specified on the delivery note
- Keep the Installation Sheet in a safe place



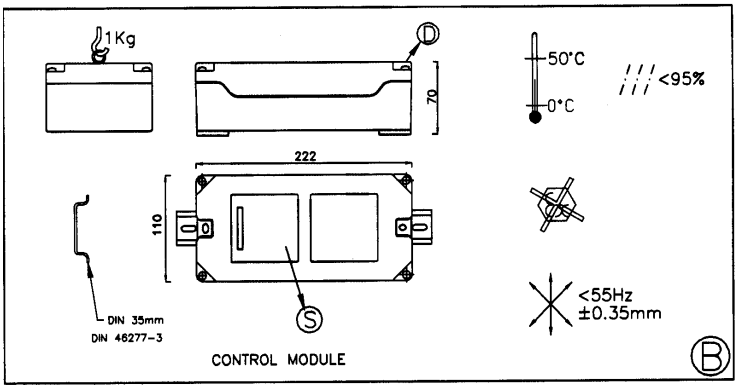
Each 7000 system supplied would normally include:

- Light curtain
- Two cables
- Control module
- Test piece
- Installation Sheet
- Service questionnaire form

Storage requirements

- Humidity - <95%
- Temperature range between –20°C and +70°C

Control module – Protection rating IP65 – Din rail mounting or screw fix, 2 x M6 bolts. Suitable for mounting outside of a control cabinet.

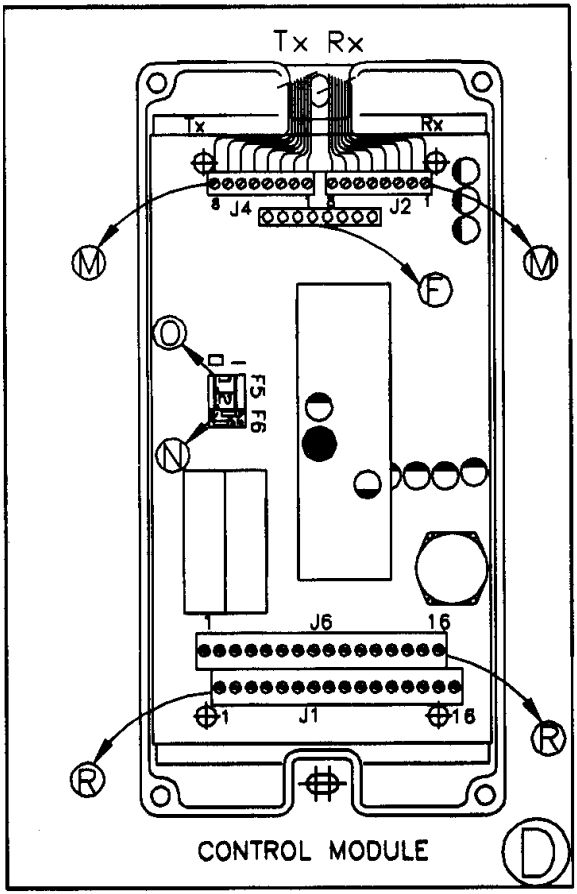


072-103 – Relay output switching
072-107 – Relay output switching with mute function

Control module

Control module printed circuit board layout showing:

- Cable terminals from light curtain transmitter unit (J4) and receiver unit (J2)
- User input / output terminals and power supply (J1 and J6)
- Range setting switch (F6)
- Mode setting switch (F5)
- Status and Diagnostic indicators (F13, F8, F9, F1 and F10)



Indicators

Control module indicators:

F13 – Yellow LED – Interlock ON
F8 – Yellow LED – Mute ON
F9 – Green LED – Start ON
F1 – Green LED – OSSD1 ON
F1 – Red LED – OSSD1 OFF
F1 – Green LED – OSSD2 ON
F1 – Red LED – OSSD2 OFF
F10 – Yellow LED – Floating blanking ON
Mute indicator – Mute ON

T/X Indicators:

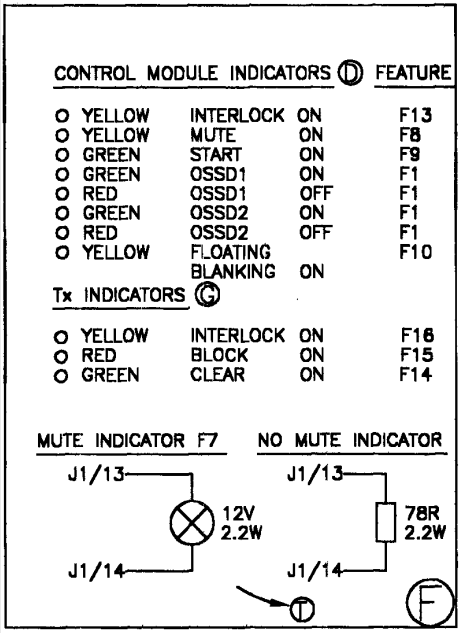
Yellow LED – Interlock ON
Red LED – Guard blocked
Green LED – Guard clear

Note:
The monitored mute indicator lamp is not supplied.

The Smartscan 7000 Series has an in-built mute lamp monitor circuit. In order to establish a mute condition an indicator lamp of the correct voltage and power rating must be fitted between terminals J1/13 and J1/14 on the control module.

Mute indicator lamp: 12V, 2.2 Watt.

If the lamp fails to meet the current requirement of the monitor a mute condition will not be established.

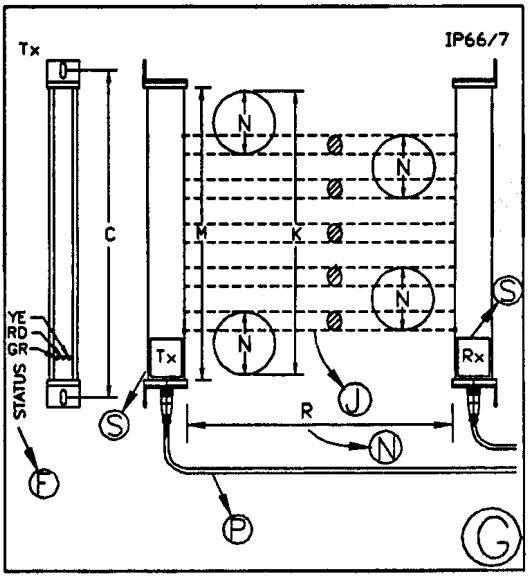


If a mute indicator is not required connect a 78 Ohm, 2.2 Watt resistor between terminals J1/13 and J1/14.

Warning. If muting is not used, make no connections to mute inputs (J1/11 & J1/12) or mute lamp output (J1/13 & J1/14).

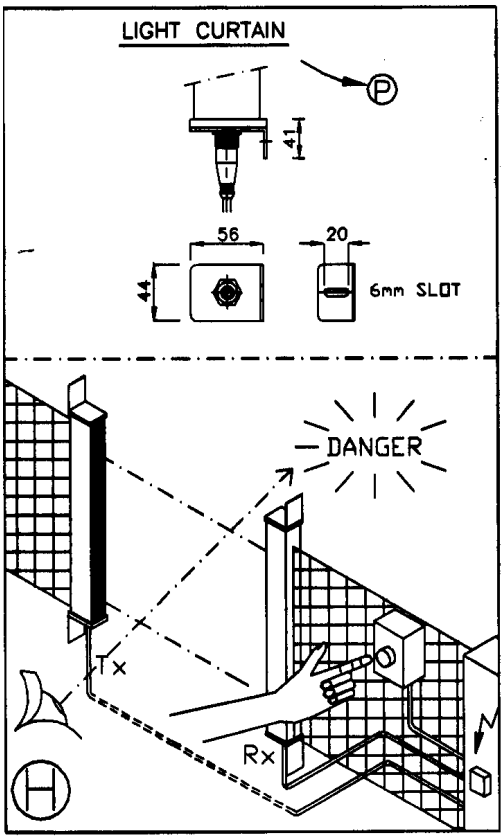
Warning. A partially failed lamp which may be 'ON', may not meet the requirements of the monitor function and therefore a 'mute' condition will not be established.

Fig. G shows important light curtain parameters. Those parameters are shown as C, M, K, R and N. The parameters for each specific light curtain in the 7000 range are shown in the chart entitled 'Light curtains' Fig. P.

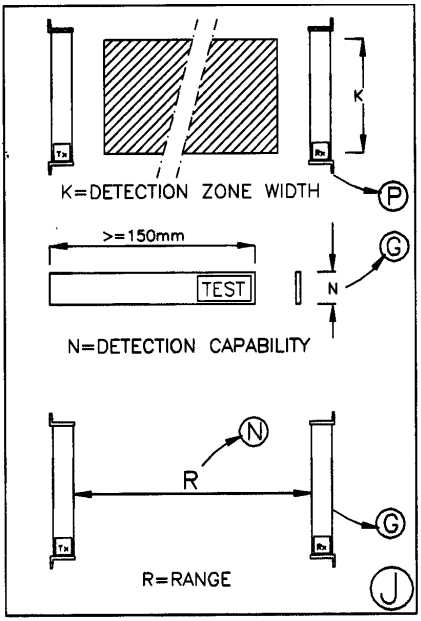


C – Light curtain mounting centres. Use 6mm bolts for mounting
M – Aluminium extrusion length
K – Detection zone width
R – Minimum and maximum scanning ranges of the light curtain
N – Object Detection Capability (ODC). (The object size guaranteed to be detected in the light curtain energy field)

Typical Mounting Arrangement for a Smartscan 7000 System



Reset devices must be located such that the danger area can be seen to be clear of persons before the system is activated.



Detection zone width (K) - Must be of a suitable height for each application, to prevent personnel access to the danger area either over, under or around the light curtains detection zone.

Detection Capability (N) - A test piece of appropriate size is provided to test that the light curtain object detection capability is within the parameter specified for the particular model number.

Range (R) - Ensure the light curtain is capable of satisfying the range requirement for the application.

When installing a Smartscan 7000 Series light curtain your attention is drawn to the following: (Fig. K)

1. Consider reflective surfaces, which may give rise to optically 'short circuiting' the direct path of the light curtain as shown in the diagram. To ensure the light curtain is mounted far enough away from reflective surfaces use the formula provided to calculate the minimum dimension between the light curtain and reflective surface.

X = minimum distance between reflective surface and light curtain.

2. To prevent intermittent tripping of the light curtain ensure extraneous infra red energy between 800 and 1000 nanometers is not directed at the perspex window of the receiver unit (RX). Extraneous sources would include infra red sensors or scanning systems.

3. Ensure the mounting position of the light curtain in respect to the nearest danger point meets the requirements of European Standard BS EN 999. See Appendix 1.

4. Ensure the light curtain transmitter and receiver units are mounted accurately in line with each other and are both perpendicular and parallel to each other within the parameters shown for each axis.

5. If utilising mirrors to deflect the light curtain ensure the mirror length is 100mm longer than the light curtain detection zone width and mounted centrally to the zone. To ensure reliable operation the light curtain deflection angle from the mirror must not be less than 40 degrees and no greater than 100 degrees.

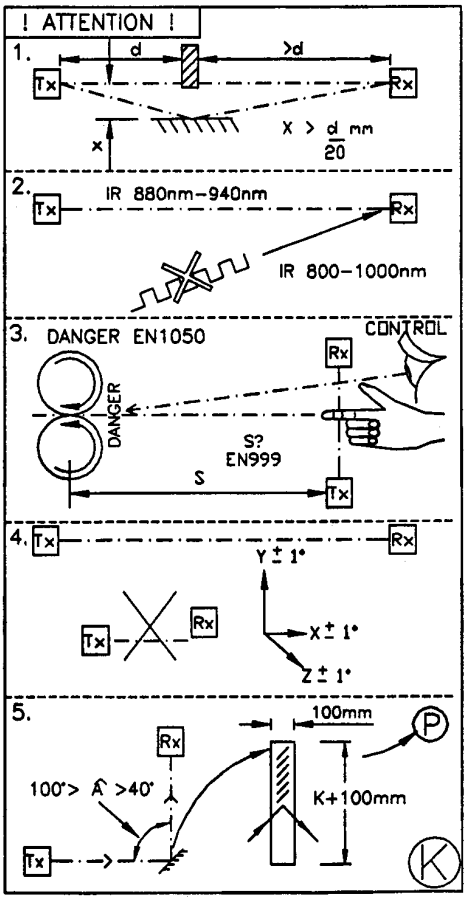


Fig. L defines the features associated with the Smartscan 7000 System.

FEATURE	ON	OFF	RATING	FUNCTION
F1	24V	0V	1A	SAFETY OUTPUT (OSSD)
F2	CLOSE	OPEN	2A 110V(T+10mS)	SAFETY RELAY OUTPUT
F3	CLOSE	OPEN	1A 24V	STATUS RELAY OUTPUT
F4	OPEN	CLOSE	1A	STATUS RELAY OUTPUT
J3	MODE	–	–	SWITCH
J5	RANGE	–	–	SWITCH
F7	12V	0V	2W	MUTE INDICATOR
F8	24V	0V	14mA	MUTE INPUT
F9	24V	0V	7mA	START/RESTART INPUT
F10	24V	0V	14mA	FLOATING BLANKING
F11	24V	0V	14mA	MONITORING
F12	24V	0V	1.5A	POWER SUPPLY
F13	YELLOW	–	INDICATOR	INTERLOCK
F14	GREEN	–	INDICATOR	GUARD CLEAR
F15	RED	–	INDICATOR	GUARD BLOCK
F16	YELLOW	ON	INDICATOR	INTERLOCK
F17	24V	0V	50mA	SAFETY RELAY INPUT

(L)

Fig. M shows cable connections at terminal blocks J2 and J4 on the control module from the transmitter and receiver units.

Cables supplied with the 7000 system are fitted with M12 screw in connectors for termination at the transmitter and receiver units.

LIGHT CURTAIN CONNECTIONS TO CONTROL MODULE

(Rx) J2		(Tx) J4	
1	RED	1	RED
2	BLUE	2	GREEN
3	GREEN	3	YELLOW
4	YELLOW	4	WHITE
5	WHITE	5	PINK
6	BROWN	6	BROWN
7	GREY	7	GREY
8	BRAID	8	BRAID

(M)

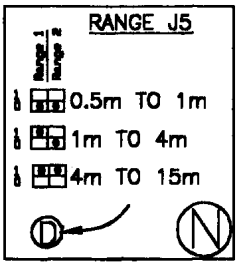


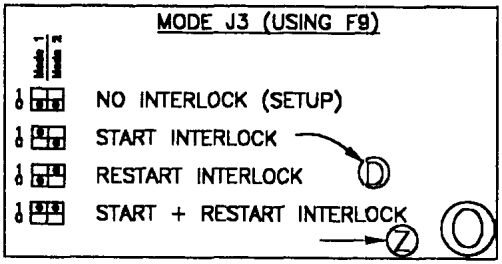
Fig. N shows the position in which the dip switches should be set when selecting the light curtain scanning range for a particular application. The dip switches are mounted on the printed board inside the control module as shown in Fig. D. Activate changes by switching off all power and then on again.

Fig. O shows the position in which the dip switches should be set when selecting system modes. The dip switches are mounted on the printed board inside the control module as shown in Fig. D Activate changes by switching all power off and then on again.

No interlock: (Mode 1) - At power up output switching circuits turn ON immediately if the light curtain is unobstructed. Obstruct the light curtain and the output switching circuits turn OFF. With removal of the obstruction the output switching circuits automatically turn ON again and so on.

Start interlock: (Mode 2) - At power up the output switching circuits remain OFF. Activation of the start control initiates the output switching circuits to ON. Obstruct the light curtain and the output switching circuits turn OFF. With removal of the obstruction the output switching circuits automatically turn ON and so on.

Restart interlock: (Mode 3) - At power up the output switching circuits turn ON immediately if the light curtain is clear. Obstruct the light curtain and the output switching circuits turn OFF. With removal of the obstruction the output switching circuits remain OFF until the start control is activated thereby switching the output circuits ON and so on.



Start/Restart interlock: (Mode 4)- At power up the output switching circuits remain OFF. Activation of the start control initiates the output switching circuits to ON. Obstruct the light curtain and the output switching circuits turn OFF. With removal of the obstruction the output switching circuits remain OFF until the start control is activated thereby switching the output circuits ON and so on. Activate changes by switching all power off and then on again.

Fig. P is the 7000 Series light curtain model list.

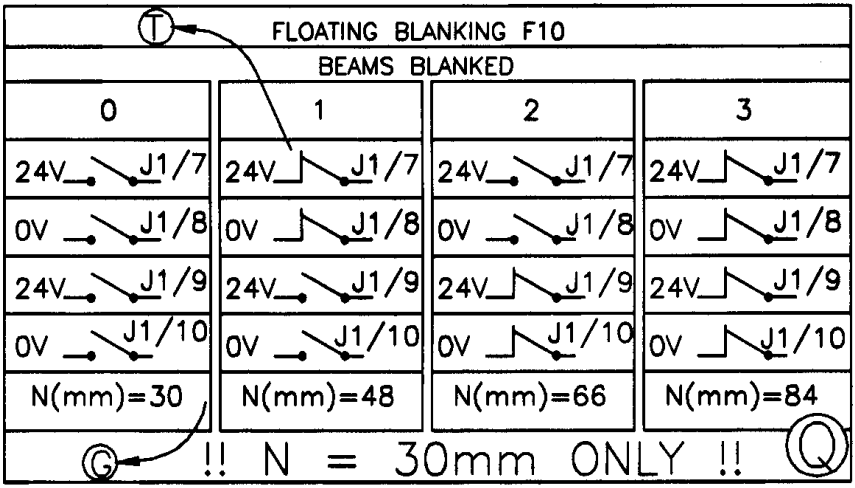
LIGHT CURTAINS							Tx+Rx
MODEL	K(mm)	M(mm)	C(mm)	Beams	N(mm)	R(m)	Kg.
072-150	176	195	243	8	30	0.5-15	1.0
072-151	321	340	388	16	30	0.5-15	1.5
072-152	467	485	533	24	30	0.5-15	2.1
072-153	613	635	683	32	30	0.5-15	2.7
072-154	759	780	828	40	30	0.5-15	3.2
072-155	905	925	973	48	30	0.5-15	3.8
072-156	1051	1070	1118	56	30	0.5-15	4.1
072-157	1196	1215	1263	64	30	0.5-15	4.7
072-158	1306	1365	1413	72	30	0.5-15	5.5
072-159	1488	1510	1558	80	30	0.5-15	6.0
072-160	1634	1655	1703	88	30	0.5-15	6.6
072-161	1780	1800	1848	96	30	0.5-15	7.1
072-162	1926	1945	1993	104	30	0.5-15	7.4
072-163	2072	2090	2138	112	30	0.5-15	8.2
072-200	186	150	198	2	70	0.5-15	1.3
072-201	303	250	298	4	70	0.5-15	1.5
072-202	419	370	418	6	70	0.5-15	1.9
072-203	536	500	548	8	70	0.5-15	2.3
072-204	653	600	648	10	70	0.5-15	2.7
072-205	769	710	758	12	70	0.5-15	3.1
072-206	1002	950	998	16	70	0.5-15	4.0
072-207	1235	1200	1248	20	70	0.5-15	4.8
072-208	1469	1400	1448	24	70	0.5-15	5.6
072-209	1818	1750	1798	30	70	0.5-15	6.7
072-210	2051	2000	2048	34	70	0.5-15	7.5

MODEL	BEAM PITCH	M (mm)	RANGE	Kg.
072-250	2 @ 500mm	585	0.5-15m	2.3
072-253	2 @ 600mm	685	0.5-15m	2.5
072-251	3 @ 450mm	930	0.5-15m	3.3
072-252	4 @ 400mm	1175	0.5-15m	4.0

CONTROL MODULE				
MODEL	IP65	F1	F2	F7/F8
072-103	✓	✓	✓	
072-107	✓	✓	✓	✓

CABLES	
PART No.	LENGTH (M)
071-303	5
071-306	20

Fig. Q shows connection details for initiation of 1, 2 and 3 beam floating blanking.



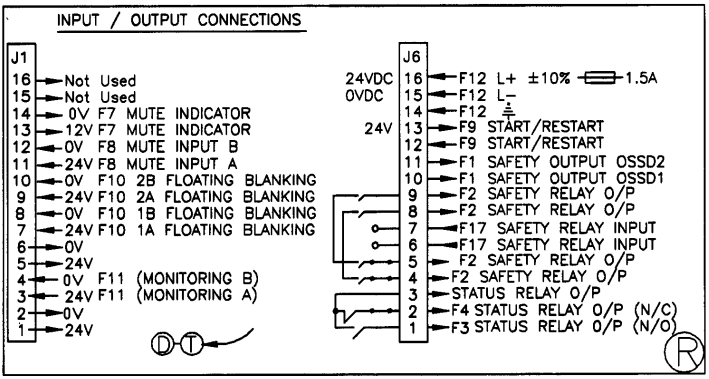
Note: N = 30mm. This refers to the use of floating blanking with light curtains of 30mm Object Detection Capability (ODC) ONLY. Please refer to page 7 of this handbook for the section on floating blanking.

If floating blanking is NOT required terminals J1/7, J1/8, J1/9 and J1/10 should not be connected.

If for example, 1 beam floating blanking is required connect J1/7 to the 24V DC supply and J1/8 to 0V via switch contacts.

The number of beams blanked can be changed during operation. Switching between beam blanking inputs can be achieved manually with a mode switch or automatically via a PLC etc.

Fig. R shows user input and output connections to and from the 7000 Series control module.



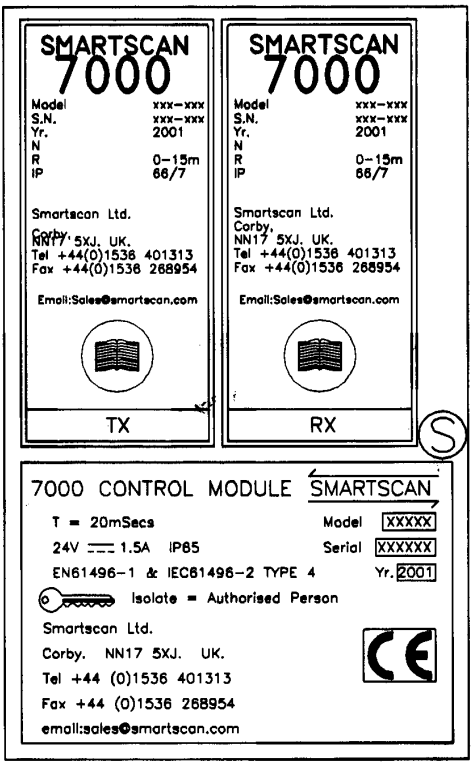
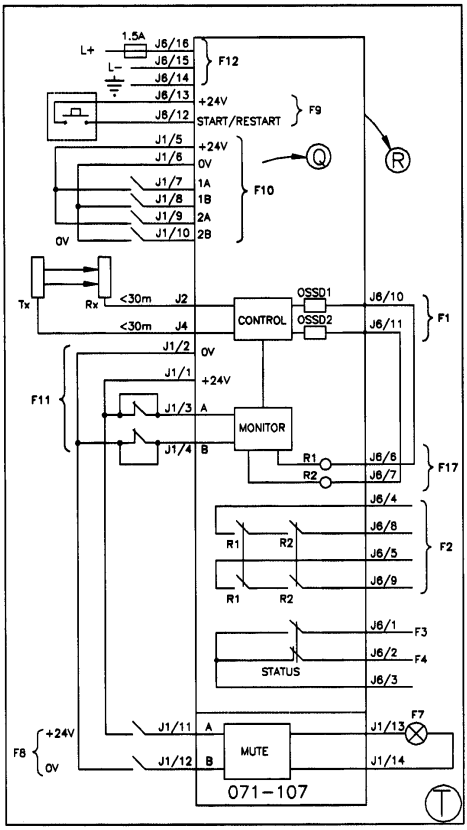


Fig. S shows examples of labels mounted on the transmitter, receiver and control module.

Fig. T shows all input and output connections to and from the 7000 Series Control Module.



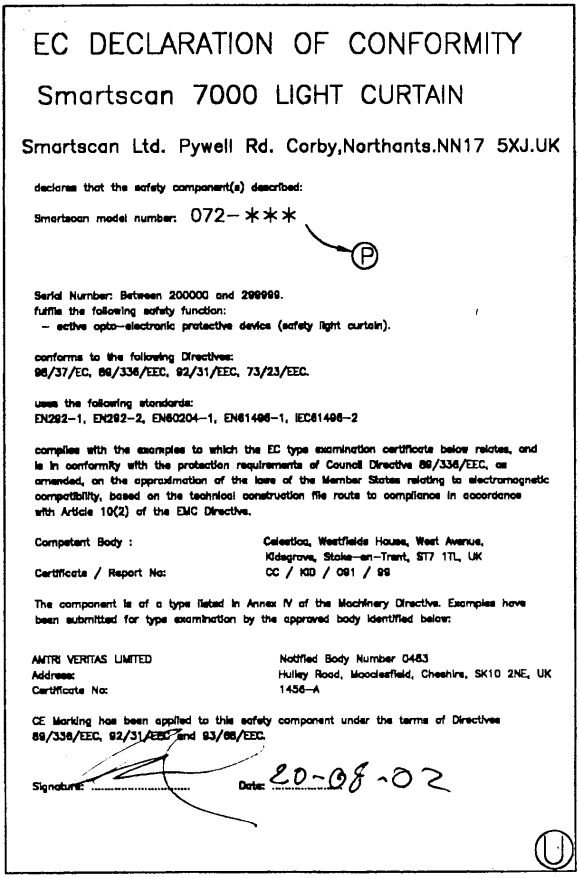
Notes:
Ensure a suitable 24V DC power supply is connected at terminal J6/16 (+24Vdc) and J6/15 (L- Volts). Ground connection to J6/14.

If output switching relays are provided ensure wire links are in place between terminals J6/10 and J6/6 and J6/11 and J6/7. The links connect the outputs from the electronic switches to the coils of the output relays via the monitoring circuits.

If the external device monitoring circuit is not used link terminals J1/3 to J1/1 (+24V) and J1/4 to J1/2 (0V).

Remember to connect a normally open contact from a suitable push button or key switch between terminals J6/12 and J6/13 with the exception of mode 1. If the mute function is required connect mute input switches to terminals J1/11 (+24V) and J1/12 (0V). Also, ensure a suitable mute lamp is fitted (12V 2 watt) or a 68 Ohm, 2 Watt f either a suitable lamp or resistor is not fitted the mute function will not activate. If muting is not used make no connection to terminals J1/11 and J1/12 or J1/13 and J1/14.

The status relay output contacts are for non-safety applications and suitable for indication and signalling purposes. The status relay provides voltage free change over contacts (N/O terminal J6/1, N/C terminal J6/3 and Common J6/2). The status relay is activated to ON when the light curtain output switches turn ON.



EC DECLARATION OF CONFORMITY

Smartscan 7000 LIGHT CURTAIN

Smartscan Ltd. Pywell Rd. Corby,Northants.NN17 5XJ.UK

declares that the safety component(s) described:

Smartscan model number: 072-***

Serial Number: Between 200000 and 299999.
fulfils the following safety function:
- active opto-electronic protective device (safety light curtain).

conforms to the following Directives:
98/37/EC, 89/336/EEC, 92/31/EEC, 73/23/EEC.

uses the following standards:
EN292-1, EN292-2, EN60204-1, EN61496-1, IEC61496-2

complies with the examples to which the EC type examination certificate below relates, and is in conformity with the protection requirements of Council Directive 89/336/EEC, as amended, on the approximation of the laws of the Member States relating to electromagnetic compatibility, based on the technical construction file route to compliance in accordance with Article 10(2) of the EMC Directive.

Competent Body : Celestica, Westfields House, West Avenue, Kidsgrove, Stoke-on-Trent, ST7 1TL, UK
Certificate / Report No: CC / KID / 091 / 99

The component is of a type listed in Annex IV of the Machinery Directive. Examples have been submitted for type examination by the approved body identified below:

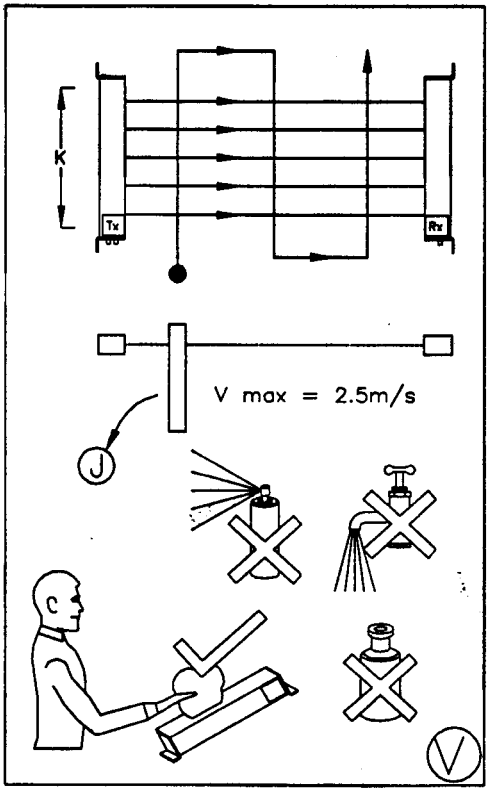
ANTRI VERITAS LIMITED Notified Body Number 0483
Address: Hulley Road, Macclesfield, Cheshire, SK10 2NE, UK
Certificate No: 1456-A

CE Marking has been applied to this safety component under the terms of Directives 89/336/EEC, 92/31/EEC and 93/68/EEC.

Signature: ..... Date: 20-08-02

Testing the Light Curtain with the Test Piece

The test procedure should be carried out frequently as indicated by the risk assessment for the particular installation. Smartscan Ltd recommends the test should be carried out at least daily.



For light curtains with ODC (N) 30mm

Power-up the light curtain and activate the output switching circuits to an ON condition.

Insert the test piece into the bottom of light curtain detection zone 150mm from the transmitter unit. At this point the output switching contacts will turn OFF. Sweep the test piece up through the detection zone parallel to the transmitter. Now sweep the test piece down through the detection zone equal distance between the transmitter and receiver. Now sweep the 30mm test piece up through the detection zone 150mm and parallel to the receiver unit. At no time during these tests should the output switching contacts turn ON.

Now thrust the test piece anywhere in the light curtain detection zone and ensure the machinery stops without apparent delay.

For light curtain models with an ODC of 70mm and above undertake the same tests as above. During these tests the output switching contacts should only turn OFF as the test piece totally obscures each beam in the light curtain. Ensure that while the test piece is obscuring each beam the output switches cannot be turned ON

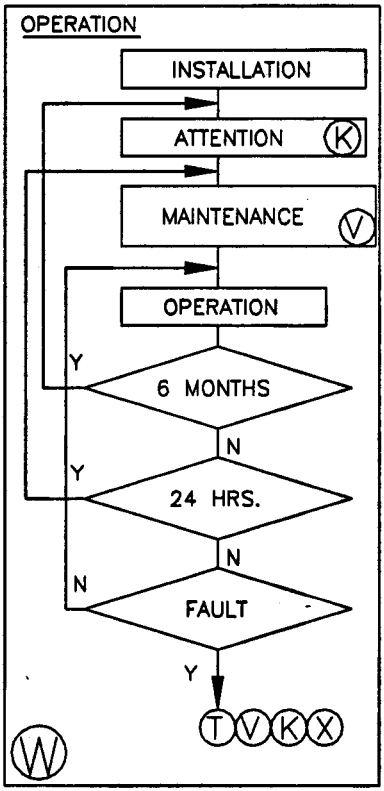
Routine Maintenance

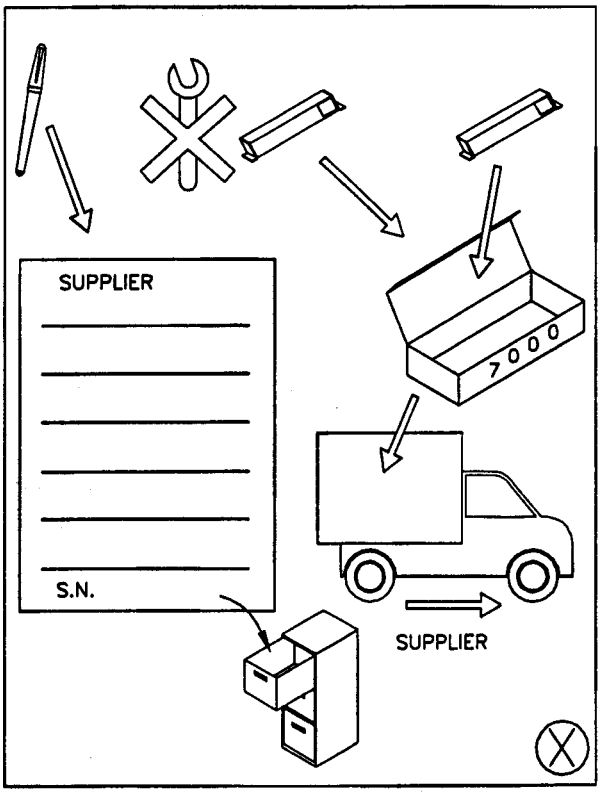
No routine maintenance is required beyond periodic cleaning of the transmitter and receiver windows. Dirt build up on the windows may lead to intermittent tripping or a totally blocked condition of the light curtain. Clear adhesive tape may be applied to the windows of curtains in dirty or abrasive conditions. Renew the clear adhesive tape periodically.

Clean the windows with a clean damp cloth using a mild detergent. Never use abrasive or corrosive cleaners or spray detergents.

Fig. W shows an operations chart for the 7000 system

- Before installation, read and understand the Installation Sheet provided paying particular attention to the information provided in Fig. K
- Refer to Fig. V for test and maintenance procedures
- Every 24 hours carry out tests as indicated in Fig. V
- Every 6 months check the entire installation paying particular attention to Fig. K
- If the equipment fails to operate as intended check the electrical connections as shown in Fig. T





If a fault occurs that cannot be resolved or the equipment is damaged return the system to the nearest Smartscan distributor or Smartscan Ltd. Indicate the nature of the fault and the symptoms displayed on the form provided.

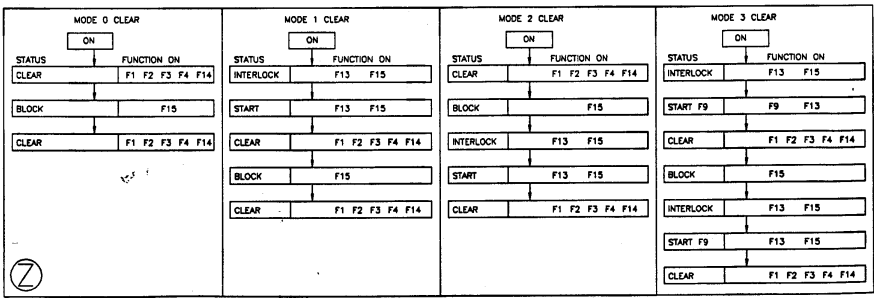
Note: Please ensure that returned guards are matching serial number pairs.

Glossary of words and terminology used in the Installation Sheet in a number of international languages:

GLOSSARY	GLOSSAIRE	GLOSSAR	GLOSSARIO	GLOSARIO	ORDLISTA	ORDBOG
ENGLISH	FRANCAIS	DEUTSCHE	ITALIANO	ESPAGNOL	SVENSKA	DANSK
ATTENTION	ATTENTION	ACHTUNG	–	–	–	OPMÆRKSOM
AUTHORISED PERSON	PERSONNE AUTORISE'	AUTORISIERTE PERSON	PERSONA AUTORIZZATA	AUTORIZADA PERSONA	BEHORIG PERSON	PERSON MED AUTORIET
BEAMS	FAISCEAUX	LICHTSTALEN	RAGGI	VIGAS	STRALAR	STRALE
BLACK	NOIR	SCHWARTZ	NERO	–	–	SORT
BLOCK	INTERROMPE	UNTERBRECHEN	OSTOZIOME	BLOQUE	AVBRYTA	AFBRYDE
BLUE	BLEU	BLAU	BLU	AZUR	BLA	BLA
BROWN	MARRON	BRAUN	MARRONE	MORENO	BRUN	BRUN
CABLES	CABLES	KABEL	CAVO	CABLE	KABEL	KABELS
CLEAR	CLAIR	–	CHIARO	CLARO	KLAR	KLAR
CLOSE	FERMÉ	SCHLEISSEN	CHIARO	CLARO	KLAR	NÆR
CONNECTION	CONNEXION	–	–	–	–	FORBINDELSE
CONTROL	CONTROLE	STEUERN	CONTROLLO	CONTROLAN	KONTROLL	KONTROL
DANGER	DANGER	GEFAHR	PERICOLO	PELIGRO	FARA	FARE
DETECTION ZONE	ZONE DE DETECTION	ABFRAGUNGSZONE	ZONO DE RILEVAMENTO	ZONA DE DETECCION	SKYDDSFALT	BESKYTTELSES ZONE
DETECTION CAPABILITY	CAPACITE DE DETECTION	ABFRAGUNGSFAHIGKEIT	POSSIBILITA DE RILEVAZIONNE	CAPACIDAD DE LA DETECTION	UPPLOSNING	OPLØSNING
FAULT	DEFAUT	STORUNG	GUASTO	INCIDENTE	FEL	FEJL
FEATURE	DISPOSITIF	EIGENSCHAFT	CARATTERISTICA	CARACTERISTICA	EGENSKAPER	EGENSKAB
FLOATING BLANKING	FLOATING BLANKING	FLOATING BLANKING	FLOATING BLANKING	FLOATING BLANKING	FLOATING BLANKING	FLYDENDE
FUNCTION	FONCTION	FUNKTION	FUNZIONE	FUNCION	FUNKTION	FUNKTION
FUSE	–	–	–	–	–	SIKRING
GLOSSARY	GLOSSAIRE	GLOSSAR	GLOSSARIO	GLOSARIO	ORDLISTA	ORDBOG
GREEN	VERTE	GRUN	VERDI	VERDE	–	GRØN
GREY	GRIS	GRAU	GRIGIO	GRIS	GRA	GRA
GUARD	–	–	–	–	–	SIKKERHED
INDICATOR	INDICATEUR	ANZEIGE	INDICATORE	INDICADOR	INDIKERING	INDIKERING
INPUT	DONNEES	EINGABE	INGRESSO	ENTRADA DE INFORMCION	INGANG	INDGANG
INSTALLATION	INSTALLAION	INSTALLAZIONE	INSTALACION	INSTALACION	INSTALLATION	INSTALLATION
INTERLOCK	INTERLOCK	INTERLOCK	INTERLOCK	INTERLOCK	INTERLOCK	AFSLASNING
ISOLATE	–	–	–	–	–	ISOLERE
LENGTH	–	–	–	–	–	LENGDE
LIGHT CURTAIN	BARRIERE	LICHTSCHRANKEN	BARRIERE	BAMMER DE SECURIDAD	–	LYSGITTER
MAINTENANCE	ENTRETIEN	WARTUNG	MANUTENZIONE	MANTENIMIENTO	UNDERHALL	VEDLIGEHOLDE
MAX	MAXIMUM	MAXIMUM	MASSIMO	MAXIMO	MAX	MAKSIMAL
MODE	MODE	MODUS	MODO	MODO	MODE	MODE
MODEL	MODELLE	TYP	MODELLO	MODELO	MODELL	MODEL
MODULE	MODULE	MODUL	MODULO	MODULO	MODUL	MODUL
MONITORING	SURVEILLENT	UBERWACHUNG	SORVEGLIANZA	EL VIGILAR	OVERVAKANDE	OVERVAGE
MONTHS	MOIS	MONATE	MESI	MESES	MANADER	MANEDER
MUTE	MUET	STUMMER	INIBIZIONE	MUDO	FORBIKOPPLING	MUTE
OPEN	OUVERT	OFFEN	APERTO	ABIERTO	OPPEN	ABEN
OPERATION	EXECUTION	OPERATION	OPERAZIONE	OPERACION	OPERATION	OPERATION
ORANGE	ORANGE	ORANGE	–	NARANJA	–	ORANGE
OUTPUT	SORTIE	AUSGABE	USCITA	DALIDA	UTGANG	UDGANG
PART	–	–	–	–	–	DEL
PINK	ROSE	ROSA	ROSA	ROSADA	RELA	PINK
POWER SUPPLY	–	–	–	–	–	SPANDING
RANGE	–	–	–	–	–	OMRADE
RATING	ESTIMATION	MEISTUNG	VALUTAZIONE	GRADO	VARDE	AFSTAND
RECEIVER	RECEPTEUR	EMPFANGER	RICEVITORE	RECEPTOR	MOTTAGARE	MODTAGER
RELAY	RELAIS	RELAIS	RELE'	RELAIS	RELA	RELÆ
RED	ROUGE	ROTES	ROSSO	ROJO	ROD	RØD
RESTART	–	–	–	–	–	GENSTART
SAFETY	SURETE	SICHERHEIT	SIGUREZZA	SEGURIDAD	SAKERHET	SIKKERHED
SHIELD	TERRE	ERDFABEN	SCHERMO	ESCUDO	SKOLD	SKJOLD
SLOT	–	–	–	–	–	RILLE
START	–	–	–	–	–	START
STATUS	STATUT	RAND	STATO	ESTADO	STATUS	STATUS
SUPPLIER	FOURNISSEUR	LIEFERANT	FORNITURE	SURDITOR	LEVERANTOR	LEVERANDØR
SWITCH	INTERRUPTEUR	SCHALTER	INTERRUTTORE	INTERRUPTOR	ANDRA	KONTAKT
TABLE	TABLE	LISTE	TABELLA	VECTOR	TABELL	TABEL
TEST PIECE	–	–	–	–	–	TEST
TRANSMITTER	EMETTEUR	UBERSENDER	TRASMETTITORE	TRANSMISOR	SANDARE	SENDER
USING	–	–	–	–	–	BRUGER
WHITE	BLANC	WEISS	–	BLANCO	–	HVID
YELLOW	JAUNE	GELB	–	AMARILLO	–	GUL
–	–	–	–	–	–	–

Fig. Z describes indicator and function status of each mode from power up.

- Mode 0 No Interlock
- Mode 1 Start interlock ON
- Mode 2 Restart interlock ON
- Mode 3 Start + restart ON



Positioning the light curtain

The following points should be considered before final selection of a light curtain.

- The position of the light curtain in relation to the danger point, particularly the separation distance (S).
- The stopping performance of the machine together with the response time of the safety system (t1+ t2).

To assist with the selection of a Smartscan light curtain for a specific application refer to the following information which has been taken from European Standard BS EN 999.

Detection capability - the dimension representing the minimum diameter of an opaque cylinder which, when placed into the light curtain, at any angle to the detection plane, is guaranteed to actuate the light curtain.

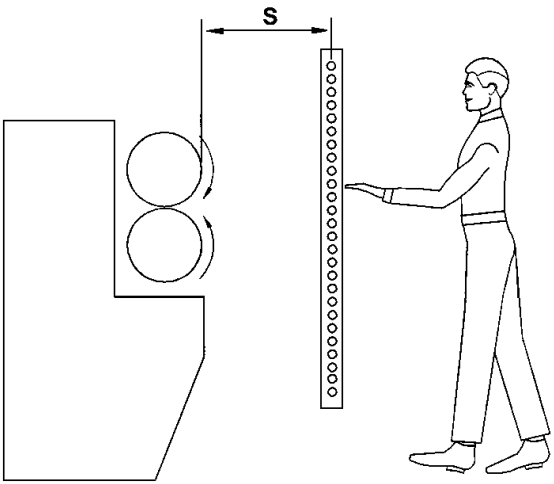
Separation distance (S) - The distance along the direction of approach, between the outermost position at which an appropriate opaque object is detected and the nearest hazardous part.

Abbreviations:

S = separation distance (mm)
H = height of the light curtain above the reference plane (mm)
e.g. floor
t1 = response time of light curtain and control unit (secs)
t2 = stop time of machine (secs)

The detection zone of the selected light curtains must be of a length to prevent access to the hazard from either over or underneath the light curtain. If necessary install additional mechanical guarding to prevent access into the hazardous area.

Normal approach



To calculate separation distance (S)		
Detection Capability (mm)	**Use a formula below when (t1+t2) is less than 0.185 secs**	**Use a formula below when (t1+t2) is greater than 0.185 secs**
30	**2000(t1+t2)+128**	**1600(t1+t2)+128**
70	**1600(t1+t2)+850**	**1600(t1+t2)+850**
2 or 3 beam light curtains	**1600(t1+t2)+850**	**1600(t1+t2)+850**

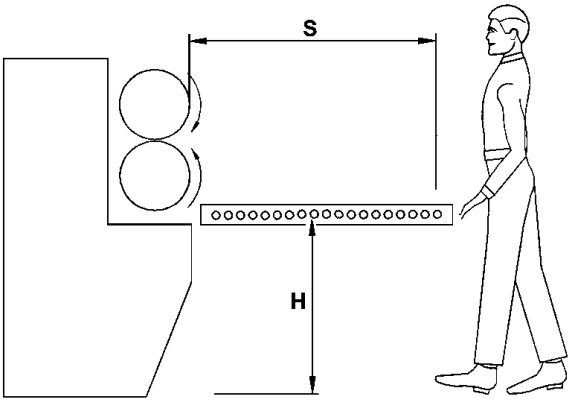
Example for normal approach

Using a light curtain with a 30mm detection capability
Where the response time of the safety system (t1) = 0.025 secs
Where the stopping time of the machine (t2) = 0.05 secs
Therefore (t1+t2) = 0.075 secs
S = 2000 x 0.075 + 128
S = 278mm

Normal approach

Total response time of machine and safety system (t1 + t2)		Separation distance (S) in mm		
		Detection capability of the light curtain		
ms	secs	(30) mm	(70) mm	2, 3 & 4 beam systems
50	0.050	228	930	930
55	0.055	238	938	938
60	0.060	248	946	946
65	0.065	258	954	954
70	0.070	268	962	962
75	0.075	278	970	970
80	0.080	288	978	978
85	0.085	298	986	986
90	0.090	308	994	994
95	0.095	318	1002	1002
100	0.100	328	1010	1010
105	0.105	338	1018	1018
110	0.110	348	1026	1026
115	0.115	358	1034	1034
120	0.120	368	1042	1042
125	0.125	378	1050	1050
130	0.130	388	1058	1058
135	0.135	398	1066	1066
140	0.140	408	1074	1074
145	0.145	418	1082	1082
150	0.150	428	1090	1090
155	0.155	438	1098	1098
160	0.160	448	1106	1106
165	0.165	458	1114	1114
170	0.170	468	1122	1122
175	0.175	478	1130	1130
180	0.180	488	1138	1138
185	0.185	498	1146	1146
190	0.190	500	1154	1154
195	0.195	500	1162	1162
200	0.200	500	1170	1170
205	0.205	500	1178	1178
210	0.210	500	1186	1186
215	0.215	500	1194	1194
220	0.220	500	1202	1202
225	0.225	500	1210	1210
230	0.230	500	1218	1218
235	0.235	504	1226	1226
240	0.240	512	1234	1234
245	0.245	520	1242	1242
250	0.250	528	1250	1250
255	0.255	536	1258	1258
260	0.260	544	1266	1266
265	0.265	552	1274	1274
270	0.270	560	1282	1282
275	0.275	568	1290	1290
280	0.280	576	1298	1298
285	0.285	584	1306	1306
290	0.290	592	1314	1314
295	0.295	600	1322	1322

Parallel approach



To calculate separation distance (S) S = 1600(t1 + t2) + (1200 - (0.4 x H))	
The detection capability of a parallel approach light curtain determines the lowest permissible mounting height between the curtain and reference plane (H) e.g. floor. Refer to the guidance below	
Detection capability (mm)	**Lowest allowable height of the light curtain above the reference plane (H) e.g. floor**
30	**(H) = Any height above the reference plane providing safety can be maintained**
70	**(H) = >450mm**

Example for parallel approach

The light curtain to be mounted 750mm from the floor (H)
Using a light curtain with a 70mm detection capability
Where the response time of the safety system (t1) = 0.025 secs]
Where the stop time of the machine (t2) = 0.08 secs
Therefore (t1 + t2) = 0.105 secs
S = 1600 x 0.105 + (1200 - (0.4 x 750))
S = 168 + 1200 - 300
S = 1068mm

Parallel approach

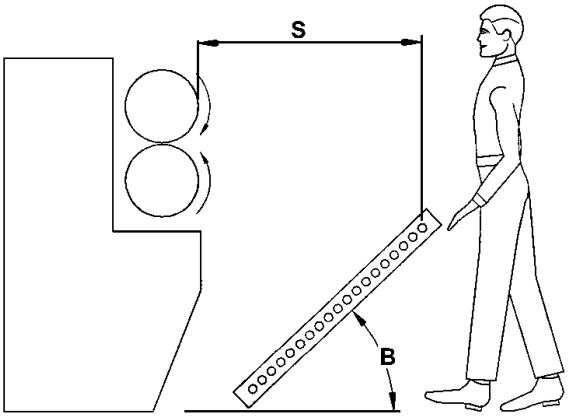
Total response time of machine and safety systems (t1 + t2)		Separation distance where (H) = 750mm
ms	secs	(S) in mm
50	0.050	980
55	0.055	988
60	0.060	996
65	0.065	1004
70	0.070	1012
75	0.075	1020
80	0.080	1028
85	0.085	1036
90	0.090	1044
95	0.095	1052
100	0.100	1060
105	0.105	1068
110	0.110	1076
115	0.115	1084
120	0.120	1092
125	0.125	1100
130	0.130	1108
135	0.135	1116
140	0.140	1124
145	0.145	1132
150	0.150	1140
155	0.155	1148
160	0.160	1156
165	0.165	1164
170	0.170	1172
175	0.175	1180
180	0.180	1188
185	0.185	1196
190	0.190	1204
195	0.195	1212
200	0.200	1220
205	0.205	1228
210	0.210	1236
215	0.215	1244
220	0.220	1252
225	0.225	1260
230	0.230	1268
235	0.235	1276
240	0.240	1284
245	0.245	1292
250	0.250	1300
255	0.255	1308
260	0.260	1316
265	0.265	1324
270	0.270	1332
275	0.275	1340
280	0.280	1348
285	0.285	1356
290	0.290	1364
295	0.295	1372
300	0.300	1380

Note: The chart shows light curtain Separation Distance (S) in relation to the systems response time (t1 + t2).

In the chart 750mm has been chosen as a value for (H).

In this instance Light curtains with 30 and 70mm detection capability to be used.

Angled approach



To calculate separation distance (S)
If B >30 degrees calculate S as for Normal approach
If B <30 degrees calculate S as for Parallel approach

More detailed information on the application of safety light curtains is provided in the Health & Safety Executive booklet HSG180.

Mirrors

Reflector mirrors can be provided enabling two or three sides of a machine to be safeguarded with, what is effectively a single light curtain.

When mirrors are employed it is essential that the mounting of the transmitter unit, receiver unit and mirrors themselves are sufficiently rigid. Alignment becomes increasingly critical as the range and number of mirrors increase. Mirrors cause a reduction in optical efficiency, reducing the effective range. A guide to the practicality of using mirrors is given below.

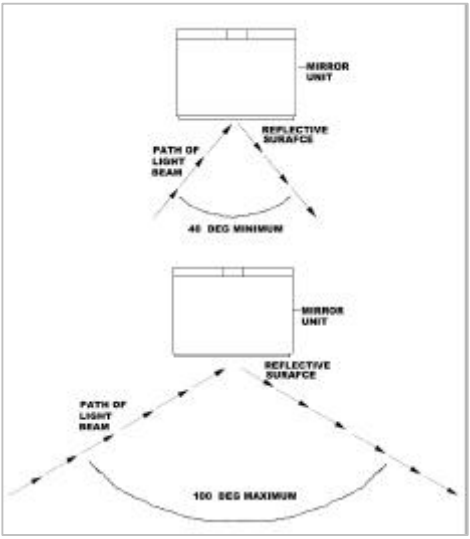
Range of the light curtain	Maximum range through 1 mirror	Maximum range through 2 mirrors
0.5m - 15m	9m	6m

Total Light Path	1 Mirror	2 Mirror
2m*	Easy	Medium
4m*	Medium	Hard
6m*	Hard	Hard
9m*	Hard	Not Feasible

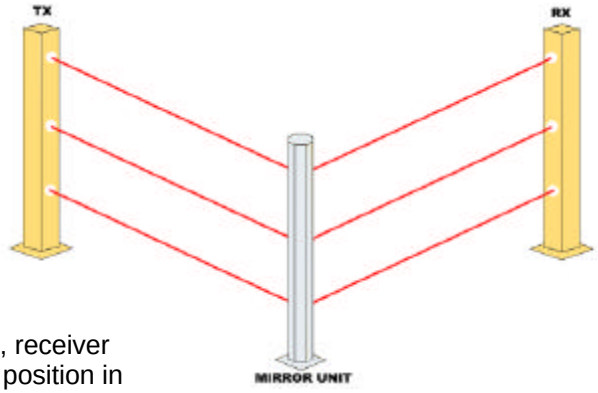
* Based upon a 072-153

Note: Perimeter curtains will be easy to align, curtains over 900mm may be more difficult to align. Check with Smartscan technical department prior to ordering for a particular application. E-mail technical@smartscan.com, Tel: +44 (0) 1536 401313, Fax: +44 (0) 1536 268354

Note: The angle of the light curtain striking the reflective surface must be within defined limits.

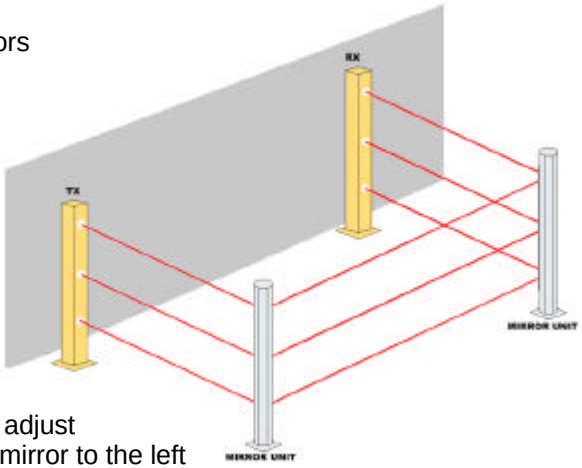


Alignment though one mirror



1. Secure the transmitter, receiver and mirror units in the position in which they are intended to be used.
2. Ensure all units are perfectly upright in all planes by using a sprit level.
3. If the units are floor mounted on stands ensure the floor is even. Shim the floor mounts if necessary to ensure the units are all upright.
4. With one eye looking over the top of the receiver unit in line with the centre of the extrusion look towards the reflective surface of the mirror, in a similar manner to looking through a gun sight.
5. A second person must adjust the mirror to the left and right until the Perspex window of the transmitter unit can be seen reflected in the mirror.
6. If the light curtain is scanning over a long range it may be difficult to see the reflection of the transmitter units Perspex window in the mirror. If so, cut a piece of white paper to the size of the Perspex window and mount directly in front of the window. Now repeat step 5.
7. If the reflection of the white paper is difficult to see in the mirror then employ a third person to hold a flashlight in front of the transmitter unit with the light beam pointing directly in line with the Perspex window towards the mirror. Now repeat step 5.
8. Use shims to ensure the mirror is accurately aligned, to enable the infra red beams in the light curtain to reach the receiver. Alternatively, fabricate mirror mountings to include some form of adjustment to enable movement both left and right and also forward end backwards from the central axis of the mirror.

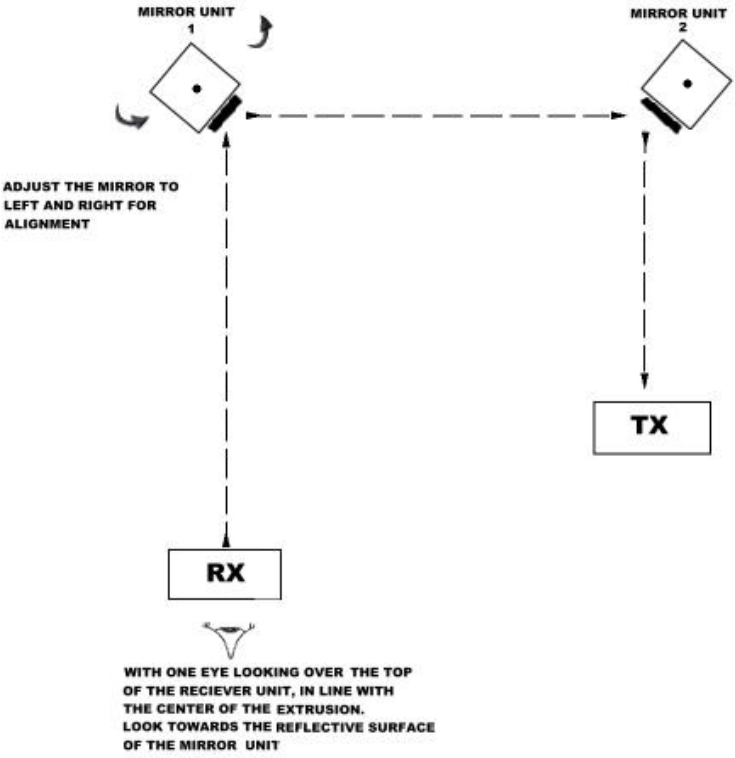
Alignment though two mirrors



9. Follow instruction 1-4
10. A second person must adjust the position of the first mirror to the left and to the right until the entire length of the second mirror is reflected in the first mirror. If difficulties are experienced in seeing the reflection on the second mirror in the first mirror then use a piece of white paper cut to size and position in front of the second mirror.
11. If the reflection of the white paper is difficult to see in the first mirror then employ a third person to hold a flashlight in front of the second mirror with the light beam pointing directly in line with its mirror housing towards the first mirror. Secure the first mirror.
12. Again follow instructions 1 to 4.
13. The second person must adjust the position of the second mirror to the left and to the right until the entire length of the transmitter unit is reflected through both the first mirror and the second mirror. If difficulties are experienced in seeing the reflection of the transmitter unit through both the first then the second mirrors then use a piece of white paper cut to size and position in front of the transmitter unit.
14. If the reflection of the white paper is still difficult to see through the first and second mirrors then employ a third person to hold a flashlight in front of the transmitter unit with the light beam pointing directly towards the second mirror. Secure the second mirror.
15. Ensure the mirrors are directly aligned thus enabling the infra red beams of the transmitter to reach the receiver. Alternatively, fabricate mirror mountings to include some form of adjustment to enable movement both left and right and also forwards and backwards from the central axis of each mirror.

16. Now turn on the power to the light curtain and check that the green LED beam indicator, mounted on the receiver unit is 'on'. If not, it may be necessary to finely adjust each mirror in turn to ensure the infra-red energy from the transmitter unit is being reflected through the mirror(s) to the corresponding receiver unit.

Alignment of the light curtain using mirrors



Note: The mirror length must be a minimum of 100mm longer than the overall length of the light curtain to be installed e.g. 50mm above and 50mm below either end of the light curtain.