

# **SMARTSCAN LTD**

## **5000 SERIES LIGHT CURTAINS**

### **USER MANUAL**

Please retain this manual for future reference



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## INDEX

|                                    | Section:                |
|------------------------------------|-------------------------|
| SCOPE                              | 1                       |
| INTRODUCTION                       | 2                       |
| APPLICATION                        | 3                       |
| MODEL NUMBERING SYSTEM             | 4                       |
| MODEL IDENTIFICATION               | 5                       |
| SPECIFICATION                      | 6                       |
| MODEL SELECTION GUIDE              | 7                       |
| OPERATION                          | 8                       |
| INTERFACES                         | 9                       |
| APPLICATION ENGINEERING            | 10                      |
| INSTALLATION AND COMMISSIONING     | 11                      |
| FUNCTIONAL TESTING AND MAINTENANCE | 12                      |
| DECOMMISSIONING                    | 13                      |
| WARNINGS AND CAUTIONS              | 14                      |
| APPENDICES                         | 15                      |
| A                                  | Glossary of Terms       |
| B                                  | Bibliography            |
| C                                  | Installation Check List |
| D                                  | Inspection Record       |



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 1. SCOPE

This manual applies to all Smartscan 5000 Series light curtains with and without AP interface listed in Section 4.

Information for use is provided for the light curtains used alone and in combination with certain accessories.

When accessories are used, this manual should be read in conjunction with the user information provided with the accessory.

The Smartscan 5000 Series encompasses a wide range of models. Not all sections of this manual will apply to an individual light curtain. Where a section applies to certain models only, this information is clearly given at the beginning of the section. For an explanation of the model numbering system, see Section 4.

A number of accessories are available for use with 5000 Series light curtains, giving additional flexibility and ease of application. Some of these are mentioned in the Application Engineering Section but full details are available from Smartscan Ltd., or authorised distributors.

Smartscan 5000 Series light curtains are a Safety Product, classified as electro-sensitive protective equipment and included within Annex IV of the European Machinery Directive.



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 2. INTRODUCTION

Smartscan 5000 - a range of light curtains to protect persons from coming into contact with dangerous parts of machinery. They are often used in place of conventional fixed guards or interlocked gates. The light curtains can be mounted at any angle and used as trip devices to detect the approach of persons towards the dangerous parts, or as presence sensing devices, which detect the presence of persons in a defined area and which prevent the dangerous parts of machinery from moving while anyone is in that area.

Smartscan 5000AP T and L light curtains are for mounting across conveyors on which products pass into or out of a hazardous area. Additional sensors within the light curtain are positioned to detect product, effectively inhibiting operation of the light curtain during the periods when products are passing through the intangible barrier, but would stop the machine should a person attempt to pass through the light curtain.

### Main features:

- \* decrease in manual operating times compared with other forms of guarding, often resulting in an increase in production throughput.
- \* unobstructed view of the safeguarded area,
- \* manual operation of the guarding system is unnecessary thereby reducing operator fatigue,
- \* self-monitoring fail safe design,
- \* models suitable for all categories of machinery,
- \* models meet the Essential Health and Safety Requirements (EHSR's) of the Machinery Directive
- \* high reliability
- \* models supported by EC Declaration of Conformity
- \* selectable input / output configurations to suit specific machinery control applications,
- \* effective scanning range to 30 metres (model dependent),
- \* strobe immune - even from high energy sources,
- \* simple installation and set-up.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Each Smartscan system comprises:

- \* sensing unit - the light-curtain,
- \* control / monitoring unit,
- \* output signal switching devices,
- \* secondary switching device,
- \* power supply,
- \* mute function.

SENSING UNIT (SU): The parts which detect the presence of a specified object within a defined area.

CONTROL/MONITORING FUNCTION: The function that controls and monitors the sensing unit, receives and processes information from the sensing unit and provides outputs to the output signal switching devices and secondary switching device.

OUTPUT SIGNAL SWITCHING DEVICES (OSSDs): The components of the Smartscan system which, when the sensing unit or safety control / monitoring means are actuated, respond by interrupting the circuit connecting it to the machine primary control element.

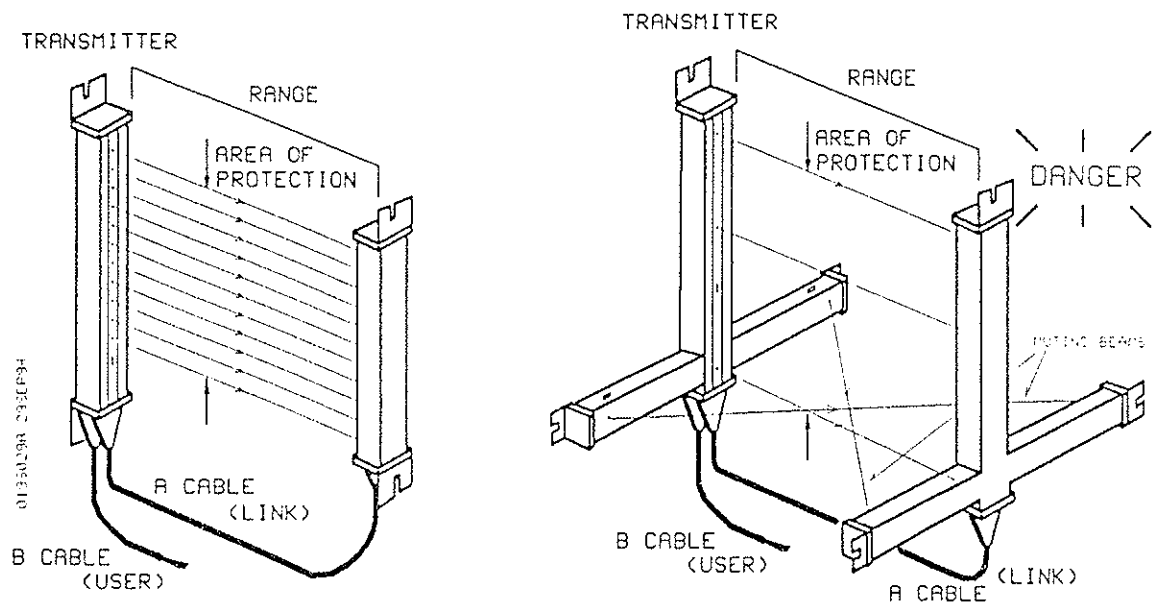
SECONDARY SWITCHING DEVICE (SSD): The component of the Smartscan system which when in a lock-out condition interrupts the circuit connecting it to the machine secondary control element.

POWER SUPPLY: Normally 24V DC, however, a 110/230V AC power supply can be supplied if required.

MUTE FUNCTION: A function for automatically switching the light curtain into a condition where the output signal switching devices (OSSDs) do not respond to actuation of the sensing unit. The mute control / monitoring function also monitors the status of the mute initiating signals. Some models incorporate self-muting. Refer to Sections 4 and 7 for further details of the models available.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

FIG. 1 - EXAMPLE LIGHT CURTAINS



CONVENTIONAL STRAIGHT MODEL

'T' TYPE SELF MUTING MODEL

Two columns house the transmitting and receiving equipment, internal power supplies, control / monitoring unit, output signal switching devices and secondary switching device. Status indicators and diagnostic LEDs are provided to aid set-up and simplify alignment and maintenance of the equipment. Two plug-in interconnection cables are supplied, one for linking between the transmitter and receiver units, (cable A), and the other for connection of a DC supply and user input/output terminations, (cable B).

The transmitter and receiver columns are positioned to face across the area to be safeguarded. The transmitter column contains a row of light emitting diodes which transmit beams of infra red energy to corresponding receptor diodes in the receiver column. Interruption of any of the beams within the light curtain will switch the output signal switching devices (OSSDs) to an OFF-state, which will in turn stop, or prevent start-up of an associated machine.

When a light-curtain is supplied with a remote control unit, additional cables will be required. Refer to the chart in Section 4. - cable layouts.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

The Smartscan system provides a high level of safety integrity which ensures that failure of all, or part of the equipment, interruption of the power supply, or spurious external effects do not reduce the level of protection.

The Smartscan system provides three basic modes of operation:

- Latched output: Once the light curtain has been interrupted the output signal switching devices turn OFF, thus operating the intended safety function. Upon clearance of the obstruction the devices remain OFF. Operation of an external restart key/button is required in order to energise the switching devices to an ON state.
- Automatic restart: Once the light curtain has been interrupted the output signal switching devices turn OFF, thus operating the intended safety function. Upon clearance of the obstruction the output signal switching devices turn ON.
- Mute function: Two muting signal input connections are provided. Provision of appropriate signals at the mute input terminals effectively inhibit operation of the light curtain. Some models have built in self muting in addition to the facility for external muting.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 3. APPLICATION

Light curtains are designed to be used as either trip devices or as presence sensing devices in areas around hazardous machinery. They are only suitable for machinery where the hazard can be quickly eliminated by electrical means. Generally this is achieved by the curtain providing a 'stop' command to the machine control system, which will respond by stopping movement or otherwise achieving a safe state. Light curtains can provide protection against any of the following mechanical hazards: crushing, shearing, cutting, severing, entanglement, drawing-in, trapping, friction, abrasion, stabbing, puncture, impact.

Light curtains do not provide protection against hazards extending beyond the moving parts of the machinery or which are not eliminated by stopping the machine. Examples of these hazards are ejection of solid or fluid materials, high or low temperatures, toxic emissions or harmful radiation.

The application engineering information given in Section 10 is not sufficient for safeguarding against such hazards and other protective measures will be required to reduce the risks associated with them.

5000 Series light curtains are not intended for use as machine initiation or re-initiation devices. The light curtains must be used only within the specification limits given and installed strictly in accordance with the information provided in this manual.

If there is any doubt as to whether 5000 Series light curtains will provide the required protection in a specific application, please contact Smartscan Ltd. or an authorised distributor. Smartscan works with customers to ensure that suitable protection is provided and is ready to provide application assistance at any time from the design and specification phase through to post commissioning.

Any use of these products outside of the limits, applications and other conditions given in this manual may result in failure of intended protection and consequent injury.



## SMARTSCAN 5000 SERIES LIGHT CURTAINS

### 4. MODEL NUMBERING SYSTEM

5000 series model numbers are built up according to the following system:

| A        | B         | C        | D      | E          |
|----------|-----------|----------|--------|------------|
| ----     | --        | --       | --     | --         |
| Base No. | Interface | Geometry | Remote | Max. Range |

#### **A BASE NUMBER**

This is a 4 or 5 digit code (starting with 5) given in table 1. It specifies other parameters such as number of beams and approximate length of the detection zone - Refer to Section 4 - Table 1.

#### **B INTERFACE**

This code may be AP or blank.

**AP** specifies an AP type interface for the user connections.

**Blank** specifies a standard interface for user connections.

Interface types are described in Section 9.

#### **C GEOMETRY**

This is formed in two parts:

Part 1 - the first letter may be L, T or blank. L and T specify self muting curtains having a mechanical profile corresponding to that of the letter. These are illustrated in figures 2 and 3.

Blank specifies a conventional straight housing without self-muting.

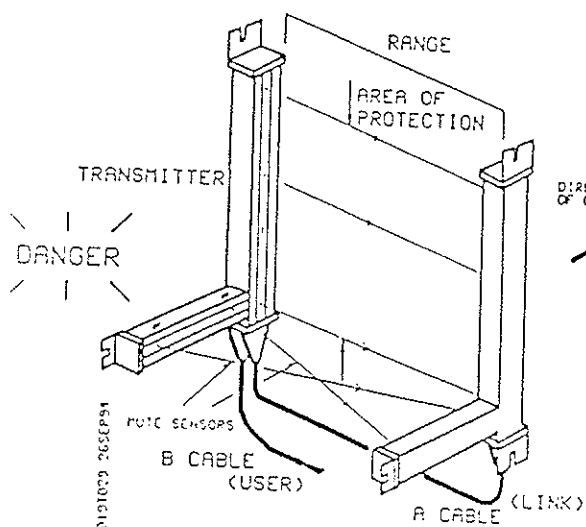
Part 2 - the second letter may be 1, 2 or blank.

L and T geometry curtains are manufactured in 'right hand' (Type 1) and 'left hand' (Type 2) versions. Standing in front of the light curtain facing into the danger area from the safe area, Type 1 has the transmitter and exit for cable B on the right whilst Type 2 has the transmitter and exit for the B cable on the left.

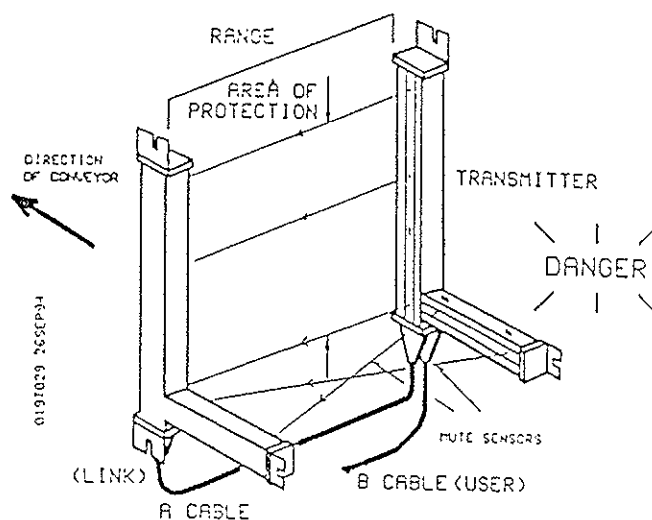
Types 1 or 2 **MUST** be specified for L or T types, but have no meaning for other types, which **MUST** have blank in this position.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Figure 2: L-Version

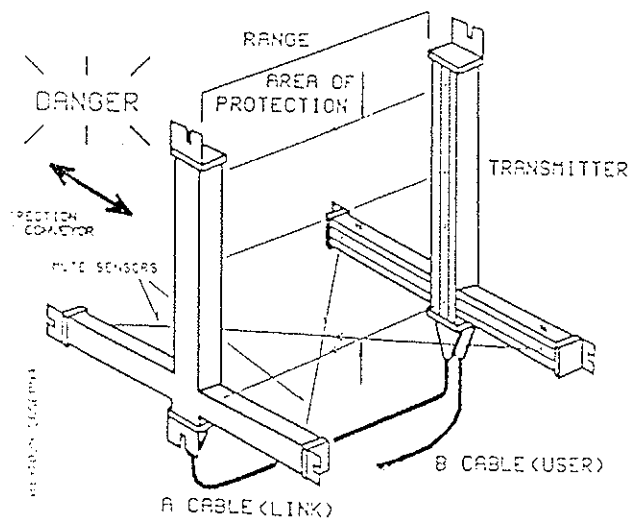


Type 1

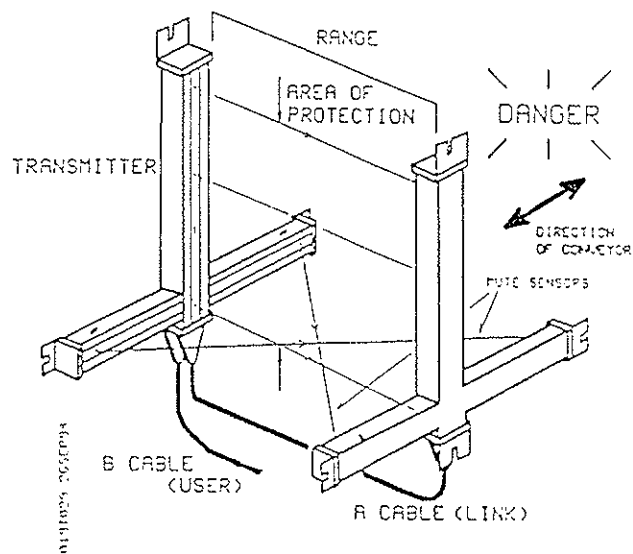


Type 2

Figure 3: T-Version



Type 1



Type 2

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

### D REMOTE

This may be R or blank. All 5000 series curtains are available with the status indicator lights and control electronics fitted into another housing remote from the transmitter head.

R specifies this option and requires the addition of one of the remote control units in Tables 3 or 4 to form a working system.

Blank specifies the control electronics and status indicators integrated into transmitter head.

### E MAXIMUM RANGE

ED specifies a maximum range of 30 metres, available on certain models only.

Blank specifies standard optics. Conventional straight types, up to 16 beams, have a maximum range of 15 metres. 18 to 32 beam models have a maximum range of 5 metres.

T and L models have a maximum range of 2.2 metres.

- Notes:
1. Because of technical constraints, not all permutations are possible.
  2. Remote control light curtains (having an R in the product code) must be used in combination with a Remote Control Unit selected from the types in Tables 3 and 4. Cable, Type C, is required for use with a Remote Control unit. All models require appropriate cables for interconnection and ranging. These should be selected from Tables 5 and 6.

Table 1

| Model | Order Code | No of Beams | Beam Pitch mm | Detection Zone mm | Detection Capability mm | Maximum Range m | Receiver Extrusion mm | Transmitter Extrusion mm | Cat Rate |
|-------|------------|-------------|---------------|-------------------|-------------------------|-----------------|-----------------------|--------------------------|----------|
| 5308  | 041-538    | 8           | 38            | 279.4             | 51.4                    | 15              | 306                   | 386                      | 4        |
| 5308R | 041-539    | 8           | 38            | 279.4             | 51.4                    | 15              | 306                   | 306                      | 4        |
| 5310  | 041-540    | 10          | 30.5          | 287.9             | 43.9                    | 15              | 306                   | 386                      | 4        |
| 5310R | 041-537    | 10          | 30.5          | 287.9             | 43.9                    | 15              | 306                   | 306                      | 4        |
| 5312  | 041-496    | 12          | 25.4          | 292.8             | 38.8                    | 15              | 306                   | 386                      | 4        |
| 5312R | 041-497    | 12          | 25.4          | 292.8             | 38.8                    | 15              | 306                   | 306                      | 4        |
| 5314  | 041-541    | 14          | 25.4          | 343.6             | 38.8                    | 15              | 360                   | 440                      | 4        |
| 5314R | 041-495    | 14          | 25.4          | 343.6             | 38.8                    | 15              | 360                   | 360                      | 4        |
| 5316  | 041-542    | 16          | 19            | 298.4             | 32.4                    | 15              | 306                   | 386                      | 4        |
| 5316R | 041-494    | 16          | 19            | 298.4             | 32.4                    | 15              | 306                   | 306                      | 4        |
| 5402  | 041-546    | 2           | 380           | 393.4             | 393.4                   | 15              | 425                   | 505                      | 4        |
| 5402R | 041-547    | 2           | 380           | 393.4             | 393.4                   | 15              | 425                   | 425                      | 4        |
| 5404  | 041-552    | 4           | 122           | 379.4             | 135.4                   | 15              | 400                   | 480                      | 4        |

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

| Model   | Order Code | No of Beams | Beam Pitch mm | Detection Zone mm | Detection Capability mm | Maximum Range m | Receiver Extrusion mm | Transmitter Extrusion mm | Cat Rate |
|---------|------------|-------------|---------------|-------------------|-------------------------|-----------------|-----------------------|--------------------------|----------|
| 5404R   | 041-553    | 4           | 122           | 379.4             | 135.4                   | 15              | 400                   | 400                      | 4        |
| 5412    | 041-560    | 12          | 38            | 431.4             | 51.4                    | 15              | 460                   | 540                      | 4        |
| 5412R   | 041-561    | 12          | 38            | 431.4             | 51.4                    | 15              | 460                   | 460                      | 4        |
| 5414    | 041-564    | 14          | 30.5          | 409.9             | 43.9                    | 15              | 430                   | 510                      | 4        |
| 5414R   | 041-493    | 14          | 30.5          | 409.9             | 43.9                    | 15              | 430                   | 430                      | 4        |
| 5416    | 041-563    | 16          | 25.4          | 394.4             | 38.8                    | 15              | 410                   | 490                      | 4        |
| 5416R   | 041-492    | 16          | 25.4          | 394.4             | 38.8                    | 15              | 410                   | 410                      | 4        |
| 5420    | 041-566    | 20          | 19            | 374.4             | 32.4                    | 5               | 390                   | 470                      | 4        |
| 5420R   | 041-567    | 20          | 19            | 374.4             | 32.4                    | 5               | 390                   | 390                      | 4        |
| 5422    | 041-568    | 22          | 19            | 412.4             | 32.4                    | 5               | 420                   | 500                      | 4        |
| 5422R   | 041-569    | 22          | 19            | 412.4             | 32.4                    | 5               | 420                   | 420                      | 4        |
| 5502    | 041-572    | 2           | 488           | 501.4             | 501.4                   | 15              | 520                   | 600                      | 4        |
| 5502R   | 041-573    | 2           | 488           | 501.4             | 501.4                   | 15              | 520                   | 520                      | 4        |
| 5502ED  | 041-574    | 2           | 488           | 513.4             | 513.4                   | 30              | 540                   | 540                      | 4        |
| 5502RED | 041-491    | 2           | 488           | 513.4             | 513.4                   | 30              | 540                   | 540                      | 4        |
| 5508    | 041-578    | 8           | 61            | 440.4             | 74.4                    | 15              | 460                   | 540                      | 4        |
| 5508R   | 041-579    | 8           | 61            | 440.4             | 74.4                    | 15              | 460                   | 460                      | 4        |
| 5510    | 041-580    | 10          | 57            | 526.4             | 70.4                    | 15              | 540                   | 620                      | 4        |
| 5510R   | 041-581    | 10          | 57            | 526.4             | 70.4                    | 15              | 540                   | 540                      | 4        |
| 5514    | 041-584    | 14          | 38            | 507.4             | 51.4                    | 15              | 540                   | 620                      | 4        |
| 5514R   | 041-585    | 14          | 38            | 507.4             | 51.4                    | 15              | 540                   | 540                      | 4        |
| 5516    | 041-586    | 16          | 30.5          | 470.9             | 43.9                    | 15              | 500                   | 580                      | 4        |
| 5516R   | 041-587    | 16          | 30.5          | 470.9             | 43.9                    | 15              | 500                   | 500                      | 4        |
| 5518    | 041-588    | 18          | 30.5          | 531.9             | 43.9                    | 5               | 550                   | 630                      | 4        |
| 5518R   | 041-490    | 18          | 30.5          | 531.9             | 43.9                    | 5               | 550                   | 550                      | 4        |
| 5520    | 041-488    | 20          | 25.4          | 496               | 38.8                    | 5               | 510                   | 590                      | 4        |
| 5520R   | 041-489    | 20          | 25.4          | 496               | 38.8                    | 5               | 510                   | 510                      | 4        |
| 5528    | 041-590    | 28          | 19            | 526.4             | 32.4                    | 5               | 540                   | 620                      | 4        |
| 5528R   | 041-591    | 28          | 19            | 526.4             | 32.4                    | 5               | 540                   | 540                      | 4        |
| 5610    | 041-602    | 10          | 61            | 562.4             | 74.4                    | 15              | 612                   | 692                      | 4        |
| 5610R   | 041-603    | 10          | 61            | 562.4             | 74.4                    | 15              | 612                   | 612                      | 4        |
| 5616    | 041-604    | 16          | 38            | 583.4             | 51.4                    | 15              | 612                   | 692                      | 4        |
| 5616R   | 041-605    | 16          | 38            | 583.4             | 51.4                    | 15              | 612                   | 612                      | 4        |
| 5620    | 041-608    | 20          | 30.5          | 592.9             | 43.9                    | 5               | 612                   | 692                      | 4        |
| 5620R   | 041-607    | 20          | 30.5          | 592.9             | 43.9                    | 5               | 612                   | 612                      | 4        |
| 5624    | 041-486    | 24          | 25.4          | 597.6             | 38.8                    | 5               | 612                   | 692                      | 4        |
| 5624R   | 041-487    | 24          | 25.4          | 597.6             | 38.8                    | 5               | 612                   | 612                      | 4        |
| 5632    | 041-610    | 32          | 19            | 602.4             | 32.4                    | 5               | 612                   | 692                      | 4        |
| 5632R   | 041-611    | 32          | 19            | 602.4             | 32.4                    | 5               | 612                   | 612                      | 4        |
| 5708    | 041-618    | 8           | 91.5          | 653.9             | 104.9                   | 15              | 675                   | 755                      | 4        |
| 5708R   | 041-619    | 8           | 91.5          | 653.9             | 104.9                   | 15              | 675                   | 675                      | 4        |
| 5712    | 041-620    | 12          | 61            | 684.4             | 74.4                    | 15              | 710                   | 790                      | 4        |
| 5712R   | 041-621    | 12          | 61            | 684.4             | 74.4                    | 15              | 710                   | 710                      | 4        |
| 5718    | 041-622    | 18          | 38            | 659.4             | 51.4                    | 5               | 685                   | 765                      | 4        |

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

| Model   | Order Code | No of Beams | Beam Pitch mm | Detection Zone mm | Detection Capability mm | Maximum Range m | Receiver Extrusion mm | Transmitter Extrusion mm | Cat Rate |
|---------|------------|-------------|---------------|-------------------|-------------------------|-----------------|-----------------------|--------------------------|----------|
| 5718R   | 041-623    | 18          | 38            | 659.4             | 51.4                    | 5               | 685                   | 685                      | 4        |
| 5720    | 041-624    | 20          | 38            | 735.4             | 51.4                    | 5               | 760                   | 840                      | 4        |
| 5720R   | 041-625    | 20          | 38            | 735.4             | 51.4                    | 5               | 760                   | 760                      | 4        |
| 5724    | 041-628    | 24          | 30.5          | 714.9             | 43.9                    | 5               | 735                   | 815                      | 4        |
| 5724R   | 041-629    | 24          | 30.5          | 714.9             | 43.9                    | 5               | 735                   | 735                      | 4        |
| 5728    | 041-484    | 28          | 25.4          | 699.2             | 38.8                    | 5               | 715                   | 795                      | 4        |
| 5728R   | 041-485    | 28          | 25.4          | 699.2             | 38.8                    | 5               | 715                   | 715                      | 4        |
| 5814    | 041-644    | 14          | 61            | 806.4             | 74.4                    | 15              | 830                   | 910                      | 4        |
| 5814R   | 041-645    | 14          | 61            | 806.4             | 74.4                    | 15              | 830                   | 830                      | 4        |
| 5822    | 041-648    | 22          | 38            | 811.4             | 51.4                    | 5               | 840                   | 920                      | 4        |
| 5822R   | 041-498    | 22          | 38            | 811.4             | 51.4                    | 5               | 840                   | 840                      | 4        |
| 5828    | 041-650    | 28          | 30.5          | 836.9             | 43.9                    | 5               | 860                   | 940                      | 4        |
| 5828R   | 041-651    | 28          | 30.5          | 836.9             | 43.9                    | 5               | 860                   | 860                      | 4        |
| 5832    | 041-482    | 32          | 25.4          | 800.8             | 38.8                    | 5               | 820                   | 900                      | 4        |
| 5832R   | 041-483    | 32          | 25.4          | 800.8             | 38.8                    | 5               | 820                   | 820                      | 4        |
| 5903    | 041-654    | 3           | 437           | 887.4             | 450.4                   | 15              | 915                   | 995                      | 4        |
| 5903R   | 041-499    | 3           | 437           | 887.4             | 450.4                   | 15              | 915                   | 915                      | 4        |
| 5903ED  | 041-656    | 3           | 437           | 899.4             | 462.4                   | 30              | 915                   | 915                      | 4        |
| 5903RED | 041-481    | 3           | 437           | 899.4             | 462.4                   | 30              | 915                   | 915                      | 4        |
| 5908    | 041-658    | 8           | 122           | 867.4             | 135.4                   | 15              | 915                   | 995                      | 4        |
| 5908R   | 041-659    | 8           | 122           | 867.4             | 135.4                   | 15              | 915                   | 915                      | 4        |
| 5910    | 041-660    | 10          | 91.5          | 836.9             | 104.9                   | 15              | 915                   | 995                      | 4        |
| 5910R   | 041-480    | 10          | 91.5          | 836.9             | 104.9                   | 15              | 915                   | 915                      | 4        |
| 5915    | 041-662    | 15          | 61            | 867.4             | 74.4                    | 15              | 915                   | 995                      | 4        |
| 5915R   | 041-663    | 15          | 61            | 867.4             | 74.4                    | 15              | 915                   | 915                      | 4        |
| 5924    | 041-664    | 24          | 38            | 887.4             | 51.4                    | 5               | 915                   | 995                      | 4        |
| 5924R   | 041-477    | 24          | 38            | 887.4             | 51.4                    | 5               | 915                   | 915                      | 4        |
| 5930    | 041-666    | 30          | 30.5          | 897.9             | 43.9                    | 5               | 915                   | 995                      | 4        |
| 5930R   | 041-667    | 30          | 30.5          | 897.9             | 43.9                    | 5               | 915                   | 915                      | 4        |
| 51007   | 041-674    | 7           | 152           | 925.4             | 165.4                   | 15              | 940                   | 1020                     | 4        |
| 51007R  | 041-476    | 7           | 152           | 925.4             | 165.4                   | 15              | 940                   | 940                      | 4        |
| 51016   | 041-678    | 16          | 61            | 928.4             | 74.4                    | 15              | 950                   | 1030                     | 4        |
| 51016R  | 041-679    | 16          | 61            | 928.4             | 74.4                    | 15              | 950                   | 950                      | 4        |
| 51026   | 041-682    | 26          | 38            | 963.4             | 51.4                    | 5               | 990                   | 1070                     | 4        |
| 51026R  | 041-683    | 26          | 38            | 963.4             | 51.4                    | 5               | 990                   | 990                      | 4        |
| 51028   | 041-684    | 28          | 38            | 1039.4            | 51.4                    | 5               | 1065                  | 1145                     | 4        |
| 51028R  | 041-685    | 28          | 38            | 1039.4            | 51.4                    | 5               | 1065                  | 1065                     | 4        |
| 51032   | 041-686    | 32          | 30.5          | 958.9             | 43.9                    | 5               | 980                   | 1060                     | 4        |
| 51032R  | 041-687    | 32          | 30.5          | 958.9             | 43.9                    | 5               | 980                   | 980                      | 4        |
| 51204   | 041-690    | 4           | 396.5         | 1202.9            | 409.9                   | 15              | 1220                  | 1300                     | 4        |
| 51204R  | 041-475    | 4           | 396.5         | 1202.9            | 409.9                   | 15              | 1220                  | 1220                     | 4        |
| 51210   | 041-694    | 10          | 133           | 1210.4            | 146.4                   | 15              | 1220                  | 1300                     | 4        |
| 51210R  | 041-695    | 10          | 133           | 1210.4            | 146.4                   | 15              | 1220                  | 1220                     | 4        |
| 51216   | 041-698    | 16          | 76            | 1153.4            | 89.4                    | 15              | 1220                  | 1300                     | 4        |

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| Model     | Order Code | No of Beams | Beam Pitch mm | Detection Zone mm | Detection Capability mm | Maximum Range m | Receiver Extrusion mm | Transmitter Extrusion mm | Cat Rate |
|-----------|------------|-------------|---------------|-------------------|-------------------------|-----------------|-----------------------|--------------------------|----------|
| 51216R    | 041-699    | 16          | 76            | 1153.4            | 89.4                    | 15              | 1220                  | 1220                     | 4        |
| 51220     | 041-700    | 20          | 61            | 1172.4            | 74.4                    | 5               | 1220                  | 1300                     | 4        |
| 51220R    | 041-474    | 20          | 61            | 1172.4            | 74.4                    | 5               | 1220                  | 1220                     | 4        |
| 51232     | 041-702    | 32          | 38            | 1191.4            | 51.4                    | 5               | 1220                  | 1300                     | 4        |
| 51232R    | 041-703    | 32          | 38            | 1191.4            | 51.4                    | 5               | 1220                  | 1220                     | 4        |
| 5206APR   | 041-083    | 6           | 38            | 203.4             | 51.4                    | 15              | 230                   | 230                      | 3        |
| 5308AP    | 041-001    | 8           | 38            | 279.4             | 51.4                    | 15              | 306                   | 416                      | 3        |
| 5308APR   | 041-084    | 8           | 38            | 279.4             | 51.4                    | 15              | 306                   | 306                      | 3        |
| 5310AP    | 041-002    | 10          | 30.5          | 287.9             | 43.9                    | 15              | 306                   | 416                      | 3        |
| 5310APR   | 041-085    | 10          | 30.5          | 287.9             | 43.9                    | 15              | 306                   | 306                      | 3        |
| 5316AP    | 041-003    | 16          | 19            | 298.4             | 32.4                    | 15              | 306                   | 416                      | 3        |
| 5316APR   | 041-086    | 16          | 19            | 298.4             | 32.4                    | 15              | 306                   | 306                      | 3        |
| 5402AP    | 041-039    | 2           | 380           | 393.4             | 393.4                   | 15              | 400                   | 510                      | 3        |
| 5402APR   | 041-087    | 2           | 380           | 393.4             | 393.4                   | 15              | 400                   | 400                      | 3        |
| 5404AP    | 041-044    | 4           | 122           | 379.4             | 135.4                   | 15              | 400                   | 510                      | 3        |
| 5404APR   | 041-088    | 4           | 122           | 379.4             | 135.4                   | 15              | 400                   | 400                      | 3        |
| 5412AP    | 041-004    | 12          | 38            | 431.4             | 51.4                    | 15              | 460                   | 570                      | 3        |
| 5412APR   | 041-089    | 12          | 38            | 431.4             | 51.4                    | 15              | 460                   | 460                      | 3        |
| 5414AP    | 041-005    | 14          | 30.5          | 409.9             | 43.9                    | 15              | 430                   | 540                      | 3        |
| 5414APR   | 041-090    | 14          | 30.5          | 409.9             | 43.9                    | 15              | 430                   | 430                      | 3        |
| 5420AP    | 041-046    | 20          | 19            | 374.4             | 32.4                    | 5               | 390                   | 500                      | 3        |
| 5420APR   | 041-091    | 20          | 19            | 374.4             | 32.4                    | 5               | 390                   | 390                      | 3        |
| 5422AP    | 041-006    | 22          | 19            | 412.4             | 32.4                    | 5               | 420                   | 530                      | 3        |
| 5422APR   | 041-092    | 22          | 19            | 412.4             | 32.4                    | 5               | 420                   | 420                      | 3        |
| 5502AP    | 041-007    | 2           | 488           | 501.4             | 501.4                   | 15              | 520                   | 630                      | 3        |
| 5502APR   | 041-093    | 2           | 488           | 501.4             | 501.4                   | 15              | 520                   | 520                      | 3        |
| 5502APED  | 041-577    | 2           | 488           | 513.4             | 513.4                   | 30              | 540                   | 540                      | 3        |
| 5502APRED | 041-677    | 2           | 488           | 513.4             | 513.4                   | 30              | 540                   | 540                      | 3        |
| 5508AP    | 041-047    | 8           | 61            | 440.4             | 74.4                    | 15              | 460                   | 570                      | 3        |
| 5508APR   | 041-094    | 8           | 61            | 440.4             | 74.4                    | 15              | 460                   | 460                      | 3        |
| 5510AP    | 041-048    | 10          | 57            | 526.4             | 70.4                    | 15              | 540                   | 650                      | 3        |
| 5510APR   | 041-095    | 10          | 57            | 526.4             | 70.4                    | 15              | 540                   | 540                      | 3        |
| 5514AP    | 041-008    | 14          | 38            | 507.4             | 51.4                    | 15              | 540                   | 650                      | 3        |
| 5514APR   | 041-096    | 14          | 38            | 507.4             | 51.4                    | 15              | 540                   | 540                      | 3        |
| 5516AP    | 041-033    | 16          | 30.5          | 470.9             | 43.9                    | 15              | 500                   | 610                      | 3        |
| 5516APR   | 041-097    | 16          | 30.5          | 470.9             | 43.9                    | 15              | 500                   | 500                      | 3        |
| 5518AP    | 041-009    | 18          | 30.5          | 531.9             | 43.9                    | 5               | 550                   | 660                      | 3        |
| 5518APR   | 041-098    | 18          | 30.5          | 531.9             | 43.9                    | 5               | 550                   | 550                      | 3        |
| 5528AP    | 041-010    | 28          | 19            | 526.4             | 32.4                    | 5               | 540                   | 650                      | 3        |
| 5528APR   | 041-099    | 28          | 19            | 526.4             | 32.4                    | 5               | 540                   | 540                      | 3        |
| 5610AP    | 041-011    | 10          | 61            | 562.4             | 74.4                    | 15              | 612                   | 722                      | 3        |
| 5610APR   | 041-108    | 10          | 61            | 562.4             | 74.4                    | 15              | 612                   | 612                      | 3        |
| 5616AP    | 041-012    | 16          | 38            | 583.4             | 51.4                    | 15              | 612                   | 722                      | 3        |
| 5616APR   | 041-109    | 16          | 38            | 583.4             | 51.4                    | 15              | 612                   | 612                      | 3        |

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

| Model     | Order Code | No of Beams | Beam Pitch mm | Detection Zone mm | Detection Capability mm | Maximum Range m | Receiver Extrusion mm | Transmitter Extrusion mm | Cat Rate |
|-----------|------------|-------------|---------------|-------------------|-------------------------|-----------------|-----------------------|--------------------------|----------|
| 5620AP    | 041-013    | 20          | 30.5          | 592.9             | 43.9                    | 5               | 612                   | 722                      | 3        |
| 5620APR   | 041-110    | 20          | 30.5          | 592.9             | 43.9                    | 5               | 612                   | 612                      | 3        |
| 5632AP    | 041-014    | 32          | 19            | 602.4             | 32.4                    | 5               | 612                   | 722                      | 3        |
| 5632APR   | 041-111    | 32          | 19            | 602.4             | 32.4                    | 5               | 612                   | 612                      | 3        |
| 5708AP    | 041-054    | 8           | 91.5          | 653.9             | 104.9                   | 15              | 675                   | 785                      | 3        |
| 5708APR   | 041-112    | 8           | 91.5          | 653.9             | 104.9                   | 15              | 675                   | 675                      | 3        |
| 5712AP    | 041-015    | 12          | 61            | 684.4             | 74.4                    | 15              | 710                   | 820                      | 3        |
| 5712APR   | 041-113    | 12          | 61            | 684.4             | 74.4                    | 15              | 710                   | 710                      | 3        |
| 5718AP    | 041-055    | 18          | 38            | 659.4             | 51.4                    | 5               | 700                   | 810                      | 3        |
| 5718APR   | 041-114    | 18          | 38            | 659.4             | 51.4                    | 5               | 700                   | 700                      | 3        |
| 5720AP    | 041-016    | 20          | 38            | 735.4             | 51.4                    | 5               | 760                   | 870                      | 3        |
| 5720APR   | 041-115    | 20          | 38            | 735.4             | 51.4                    | 5               | 760                   | 760                      | 3        |
| 5724AP    | 041-017    | 24          | 30.5          | 714.9             | 43.9                    | 5               | 735                   | 845                      | 3        |
| 5724APR   | 041-116    | 24          | 30.5          | 714.9             | 43.9                    | 5               | 735                   | 735                      | 3        |
| 5814AP    | 041-018    | 14          | 61            | 806.4             | 74.4                    | 15              | 830                   | 940                      | 3        |
| 5814APR   | 041-117    | 14          | 61            | 806.4             | 74.4                    | 15              | 830                   | 830                      | 3        |
| 5822AP    | 041-019    | 22          | 38            | 811.4             | 51.4                    | 5               | 840                   | 950                      | 3        |
| 5822APR   | 041-118    | 22          | 38            | 811.4             | 51.4                    | 5               | 840                   | 840                      | 3        |
| 5828AP    | 041-020    | 28          | 30.5          | 836.9             | 43.9                    | 5               | 860                   | 970                      | 3        |
| 5828APR   | 041-119    | 28          | 30.5          | 836.9             | 43.9                    | 5               | 860                   | 860                      | 3        |
| 5903AP    | 041-021    | 3           | 437           | 887.4             | 450.4                   | 15              | 915                   | 1025                     | 3        |
| 5903APR   | 041-120    | 3           | 437           | 887.4             | 450.4                   | 15              | 915                   | 915                      | 3        |
| 5903APED  | 041-121    | 3           | 437           | 899.4             | 462.4                   | 30              | 915                   | 915                      | 3        |
| 5903APRED | 041-122    | 3           | 437           | 899.4             | 462.4                   | 30              | 915                   | 915                      | 3        |
| 5908AP    | 041-058    | 8           | 122           | 867.4             | 135.4                   | 15              | 915                   | 1025                     | 3        |
| 5908APR   | 041-124    | 8           | 122           | 867.4             | 135.4                   | 15              | 915                   | 915                      | 3        |
| 5910AP    | 041-059    | 10          | 91.5          | 836.9             | 104.9                   | 15              | 915                   | 1025                     | 3        |
| 5910APR   | 041-125    | 10          | 91.5          | 836.9             | 104.9                   | 15              | 915                   | 915                      | 3        |
| 5915AP    | 041-070    | 15          | 61            | 867.4             | 74.4                    | 15              | 915                   | 1025                     | 3        |
| 5915APR   | 041-126    | 15          | 61            | 867.4             | 74.4                    | 15              | 915                   | 915                      | 3        |
| 5924AP    | 041-071    | 24          | 38            | 887.4             | 51.4                    | 5               | 915                   | 1025                     | 3        |
| 5924APR   | 041-127    | 24          | 38            | 887.4             | 51.4                    | 5               | 915                   | 915                      | 3        |
| 5930AP    | 041-023    | 30          | 30.5          | 897.9             | 43.9                    | 5               | 915                   | 1025                     | 3        |
| 5930APR   | 041-128    | 30          | 30.5          | 897.9             | 43.9                    | 5               | 915                   | 915                      | 3        |
| 51007AP   | 041-072    | 7           | 152           | 925.4             | 165.4                   | 15              | 940                   | 1050                     | 3        |
| 51007APR  | 041-129    | 7           | 152           | 925.4             | 165.4                   | 15              | 940                   | 940                      | 3        |
| 51016AP   | 041-073    | 16          | 61            | 928.4             | 74.4                    | 15              | 950                   | 1060                     | 3        |
| 51016APR  | 041-130    | 16          | 61            | 928.4             | 74.4                    | 15              | 950                   | 950                      | 3        |
| 51018AP   | 041-024    | 18          | 57            | 982.4             | 70.4                    | 5               | 1000                  | 1110                     | 3        |
| 51018APR  | 041-131    | 18          | 57            | 982.4             | 70.4                    | 5               | 1000                  | 1000                     | 3        |
| 51028AP   | 041-025    | 28          | 38            | 1039.4            | 51.4                    | 5               | 1070                  | 1180                     | 3        |
| 51028APR  | 041-133    | 28          | 38            | 1039.4            | 51.4                    | 5               | 1070                  | 1070                     | 3        |
| 51032AP   | 041-075    | 32          | 30.5          | 958.9             | 43.9                    | 5               | 980                   | 1090                     | 3        |
| 51032APR  | 041-134    | 32          | 30.5          | 958.9             | 43.9                    | 5               | 980                   | 980                      | 3        |

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

| Model    | Order Code | No of Beams | Beam Pitch mm | Detection Zone mm | Detection Capability mm | Maximum Range m | Receiver Extrusion mm | Transmitter Extrusion mm | Cat Rate |
|----------|------------|-------------|---------------|-------------------|-------------------------|-----------------|-----------------------|--------------------------|----------|
| 51204AP  | 041-026    | 4           | 396.5         | 1202.9            | 409.9                   | 15              | 1220                  | 1330                     | 3        |
| 51204APR | 041-135    | 4           | 396.5         | 1202.9            | 409.9                   | 15              | 1220                  | 1220                     | 3        |
| 51210AP  | 041-027    | 10          | 133           | 1210.4            | 146.4                   | 15              | 1220                  | 1330                     |          |
| 51210APR | 041-136    | 10          | 133           | 1210.4            | 146.4                   | 15              | 1220                  | 1220                     | 3        |
| 51216AP  | 041-077    | 16          | 76            | 1153.4            | 89.4                    | 15              | 1220                  | 1330                     | 3        |
| 51216APR | 041-137    | 16          | 76            | 1153.4            | 89.4                    | 15              | 1220                  | 1220                     | 3        |
| 51220AP  | 041-028    | 20          | 61            | 1172.4            | 74.4                    | 5               | 1220                  | 1330                     | 3        |
| 51220APR | 041-138    | 20          | 61            | 1172.4            | 74.4                    | 5               | 1220                  | 1220                     | 3        |
| 51232AP  | 041-029    | 32          | 38            | 1191.4            | 51.4                    | 5               | 1220                  | 1330                     | 3        |
| 51232APR | 041-139    | 32          | 38            | 1191.4            | 51.4                    | 5               | 1220                  | 1220                     | 3        |

Table 2

| Model      | Order Code | No of Beams | Beam Pitch mm | Detection Zone mm | Detection Capability mm | Maximum Range m | Extrusion Length mm |
|------------|------------|-------------|---------------|-------------------|-------------------------|-----------------|---------------------|
| 5502APT1   | 041-448    | 2           | 488           | 501.4             | 501.4                   | 2.2             | 540                 |
| 5502APT1R  | 041-458    | 2           | 488           | 501.4             | 501.4                   | 2.2             | 540                 |
| 5502APT2   | 041-468    | 2           | 488           | 501.4             | 501.4                   | 2.2             | 540                 |
| 5502APT2R  | 041-478    | 2           | 488           | 501.4             | 501.4                   | 2.2             | 540                 |
| 5502APL1   | 041-449    | 2           | 488           | 501.4             | 501.4                   | 2.2             | 540                 |
| 5502APL1R  | 041-459    | 2           | 488           | 501.4             | 501.4                   | 2.2             | 540                 |
| 5502APL2   | 041-469    | 2           | 488           | 501.4             | 501.4                   | 2.2             | 540                 |
| 5502APL2R  | 041-479    | 2           | 488           | 501.4             | 501.4                   | 2.2             | 540                 |
| 5903APT1   | 041-440    | 3           | 427           | 867.4             | 440.4                   | 2.2             | 915                 |
| 5903APT1R  | 041-450    | 3           | 427           | 867.4             | 440.4                   | 2.2             | 915                 |
| 5903APT2   | 041-460    | 3           | 427           | 867.4             | 440.4                   | 2.2             | 915                 |
| 5903APT2R  | 041-470    | 3           | 427           | 867.4             | 440.4                   | 2.2             | 915                 |
| 5903APL1   | 041-441    | 3           | 427           | 867.4             | 440.4                   | 2.2             | 915                 |
| 5903APL1R  | 041-451    | 3           | 427           | 867.4             | 440.4                   | 2.2             | 915                 |
| 5903APL2   | 041-461    | 3           | 427           | 867.4             | 440.4                   | 2.2             | 915                 |
| 5903APL2R  | 041-471    | 3           | 427           | 867.4             | 440.4                   | 2.2             | 915                 |
| 5914APT1R  | 041-454    | 14          | 61            | 806.4             | 74.4                    | 2.2             | 915                 |
| 5914APT2R  | 041-464    | 14          | 61            | 806.4             | 74.4                    | 2.2             | 915                 |
| 5914APL1R  | 041-455    | 14          | 61            | 806.4             | 74.4                    | 2.2             | 915                 |
| 5914APL2R  | 041-465    | 14          | 61            | 806.4             | 74.4                    | 2.2             | 915                 |
| 51204APT1  | 041-442    | 4           | 396.5         | 1202.9            | 409.9                   | 2.2             | 1220                |
| 51204APT1R | 041-452    | 4           | 396.5         | 1202.9            | 409.9                   | 2.2             | 1220                |
| 51204APT2  | 041-462    | 4           | 396.5         | 1202.9            | 409.9                   | 2.2             | 1220                |
| 51204APT2R | 041-472    | 4           | 396.5         | 1202.9            | 409.9                   | 2.2             | 1220                |
| 51204APL1  | 041-443    | 4           | 396.5         | 1202.9            | 409.9                   | 2.2             | 1220                |
| 51204APL1R | 041-453    | 4           | 396.5         | 1202.9            | 409.9                   | 2.2             | 1220                |
| 51204APL2  | 041-463    | 4           | 396.5         | 1202.9            | 409.9                   | 2.2             | 1220                |
| 51204APL2R | 041-473    | 4           | 396.5         | 1202.9            | 409.9                   | 2.2             | 1220                |

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

### REMOTE CONTROL UNITS

The remote control units in Table 3 are only for use with 5000 Series light curtains NOT having AP in the model number. One of these units must be used with "R" type light curtains (types having "R" in the model number). A cable "C" must be used, in addition to a cable "A" and a cable "B".

Table 3

| Model No. | Order Code | Features   |
|-----------|------------|--|
| 5RO       | 041-200    | Start/Run/Restart<br>Keyswitch only                  |
| 5RB       | 041-208    | Start/Run/Restart<br>Keyswitch<br>+ beam test button |

The remote control units in Table 4 are only suitable for use with 5000 Series light curtains having AP in the model number.

Table 4

| Model No. | Order Code | Features                                 |
|-----------|------------|--|
| 5RAPO     | 041-202    | Activate/Run Keyswitch                   |
| 5RAPG     | 041-203    | Activate/Run/Guard<br>Override Keyswitch |

Note:- Some models when supplied with a remote control unit require two cables 'C' - refer to chart at the rear of this section.

### CABLES

Cable A - Transmitter head to receiver head required for all systems.

Table 5

| Model No.  | Order Code | Range (m)<br>Std Models | Range (m)<br>ED Models | Length<br>(metres) |
|------------|------------|-------------------------|------------------------|--------------------|
| 5A00500802 | 031-004    | 0.5 - 0.8               | 1.5 - 2.5              | 2                  |
| 5A00500803 | 031-006    | 0.5 - 0.8               | 1.5 - 2.5              | 3                  |
| 5A00500804 | 031-008    | 0.5 - 0.8               | 1.5 - 2.5              | 4                  |
| 5A00500805 | 031-010    | 0.5 - 0.8               | 1.5 - 2.5              | 5                  |
| 5A00500820 | 031-040    | 0.5 - 0.8               | 1.5 - 2.5              | 20                 |
| 5A00801502 | 031-051    | 0.8 - 1.5               | 2.5 - 4.5              | 2                  |
| 5A00801503 | 031-053    | 0.8 - 1.5               | 2.5 - 4.5              | 3                  |
| 5A00801504 | 031-055    | 0.8 - 1.5               | 2.5 - 4.5              | 4                  |
| 5A00801505 | 031-057    | 0.8 - 1.5               | 2.5 - 4.5              | 5                  |

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

| Model No.  | Order Code | Range (m)<br>Std Models | Range (m)<br>ED Models | Length<br>(metres) |
|------------|------------|-------------------------|------------------------|--------------------|
| 5A00801506 | 031-059    | 0.8 - 1.5               | 2.5 - 4.5              | 6                  |
| 5A01502502 | 031-100    | 1.5 - 2.5               | 4.5 - 7.5              | 2                  |
| 5A01502503 | 031-102    | 1.5 - 2.5               | 4.5 - 7.5              | 3                  |
| 5A01502504 | 031-104    | 1.5 - 2.5               | 4.5 - 7.5              | 4                  |
| 5A01502505 | 031-106    | 1.5 - 2.5               | 4.5 - 7.5              | 5                  |
| 5A01502506 | 031-108    | 1.5 - 2.5               | 4.5 - 7.5              | 6                  |
| 5A01502507 | 031-110    | 1.5 - 2.5               | 4.5 - 7.5              | 7                  |
| 5A02504502 | 031-152    | 2.5 - 4.5               | 7.5 - 11.5             | 2                  |
| 5A02504504 | 031-153    | 2.5 - 4.5               | 7.5 - 11.5             | 4                  |
| 5A02504505 | 031-155    | 2.5 - 4.5               | 7.5 - 11.5             | 5                  |
| 5A02504506 | 031-157    | 2.5 - 4.5               | 7.5 - 11.5             | 6                  |
| 5A02504507 | 031-158    | 2.5 - 4.5               | 7.5 - 11.5             | 7                  |
| 5A02504508 | 031-159    | 2.5 - 4.5               | 7.5 - 11.5             | 8                  |
| 5A02504509 | 031-160    | 2.5 - 4.5               | 7.5 - 11.5             | 9                  |
| 5A02504510 | 031-161    | 2.5 - 4.5               | 7.5 - 11.5             | 10                 |
| 5A02504512 | 031-163    | 2.5 - 4.5               | 7.5 - 11.5             | 12                 |
| 5A02504520 | 031-171    | 2.5 - 4.5               | 7.5 - 11.5             | 20                 |
| 5A02504521 | 031-172    | 2.5 - 4.5               | 7.5 - 11.5             | 21                 |
| 5A04507506 | 031-204    | 4.5 - 7.5               | 11.5 - 15.0            | 6                  |
| 5A04507507 | 031-206    | 4.5 - 7.5               | 11.5 - 15.0            | 7                  |
| 5A04507508 | 031-208    | 4.5 - 7.5               | 11.5 - 15.0            | 8                  |
| 5A04507509 | 031-209    | 4.5 - 7.5               | 11.5 - 15.0            | 9                  |
| 5A04507510 | 031-210    | 4.5 - 7.5               | 11.5 - 15.0            | 10                 |
| 5A04507512 | 031-211    | 4.5 - 7.5               | 11.5 - 15.0            | 12                 |
| 5A04507515 | 031-217    | 4.5 - 7.5               | 11.5 - 15.0            | 15                 |
| 5A07511509 | 031-257    | 7.5-11.5                | 15.0 - 22.0            | 9                  |
| 5A07511510 | 031-258    | 7.5-11.5                | 15.0 - 22.0            | 10                 |
| 5A07511512 | 031-259    | 7.5-11.5                | 15.0 - 22.0            | 12                 |
| 5A07511514 | 031-260    | 7.5 - 11.5              | 15.0 - 22.0            | 14                 |
| 5A07511516 | 031-261    | 7.5 - 11.5              | 15.0 - 22.0            | 16                 |
| 5A11515006 | 031-291    | 11.5 - 15               | 22.0 - 30.0            | 6                  |
| 5A11515014 | 031-302    | 11.5 - 15               | 22.0 - 30.0            | 14                 |
| 5A11515016 | 031-303    | 11.5 - 15               | 22.0 - 30.0            | 16                 |
| 5A11515018 | 031-304    | 11.5 - 15               | 22.0 - 30.0            | 18                 |
| 5A11515020 | 031-305    | 11.5 - 15               | 22.0 - 30.0            | 20                 |
| 5A11515025 | 031-306    | 11.5 - 15               | 22.0 - 30.0            | 25                 |

'A' cables shown in Table 5 are used to set the range of most 5000 Series models and should be chosen both to give the required working range and to have the required physical length. The exceptions are T and L models which have an internally preset working range of 1.0 - 2.2 metres, which is not affected by the 'A' cable, thus, any 'A' cable with the required physical length may be used.

Note 1: Non standard ranges and cable lengths within the maximum and minimum values are available to special order.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Cable B - User cable shown in Table 6 are required for all systems (connects to transmitter unit for integral control models or to remote control unit for models having "R" in the model number).

Table 6

| Model No. | Order Code | Length (m) |
|-----------|------------|------------|
| 5B01-TB   | 041 - 303  | 1          |
| 5B01      | 031 - 350  | 1          |
| 5B02      | 031 - 352  | 2          |
| 5B03      | 031 - 354  | 3          |
| 5B04      | 031 - 356  | 4          |
| 5B05      | 031 - 368  | 5          |
| 5B06      | 031 - 360  | 6          |
| 5B07      | 031 - 362  | 7          |
| 5B08      | 031 - 363  | 8          |
| 5B09      | 031 - 364  | 9          |
| 5B10      | 031 - 365  | 10         |
| 5B11      | 031 - 366  | 11         |
| 5B12      | 031 - 367  | 12         |
| 5B13      | 031 - 368  | 13         |
| 5B14      | 031 - 369  | 14         |
| 5B16      | 031 - 370  | 16         |
| 5B18      | 031 - 371  | 18         |
| 5B20      | 031 - 372  | 20         |
| 5B25      | 031 - 373  | 25         |
| 5B30      | 031 - 374  | 30         |
| 5B35      | 031 - 375  | 35         |
| 5B40      | 031 - 376  | 40         |
| 5B50      | 031 - 377  | 50         |

Note: Models having TB suffix are fitted with a terminal box.

Cable C - shown in Table 7 - Remote control unit to transmitter head only required for "R" type light curtains, having "R" in the model number and therefore used in combination with a remote control unit.

Table 7

| Model No. | Order Code | Length (m) |
|-----------|------------|------------|
| 5C01      | 031 - 401  | 1          |
| 5C02      | 031 - 403  | 2          |
| 5C03      | 031 - 405  | 3          |
| 5C04      | 031 - 407  | 4          |
| 5C05      | 031 - 409  | 5          |
| 5C06      | 031 - 411  | 6          |
| 5C07      | 031 - 413  | 7          |
| 5C08      | 031 - 414  | 8          |
| 5C09      | 031 - 415  | 9          |
| 5C10      | 031 - 416  | 10         |

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

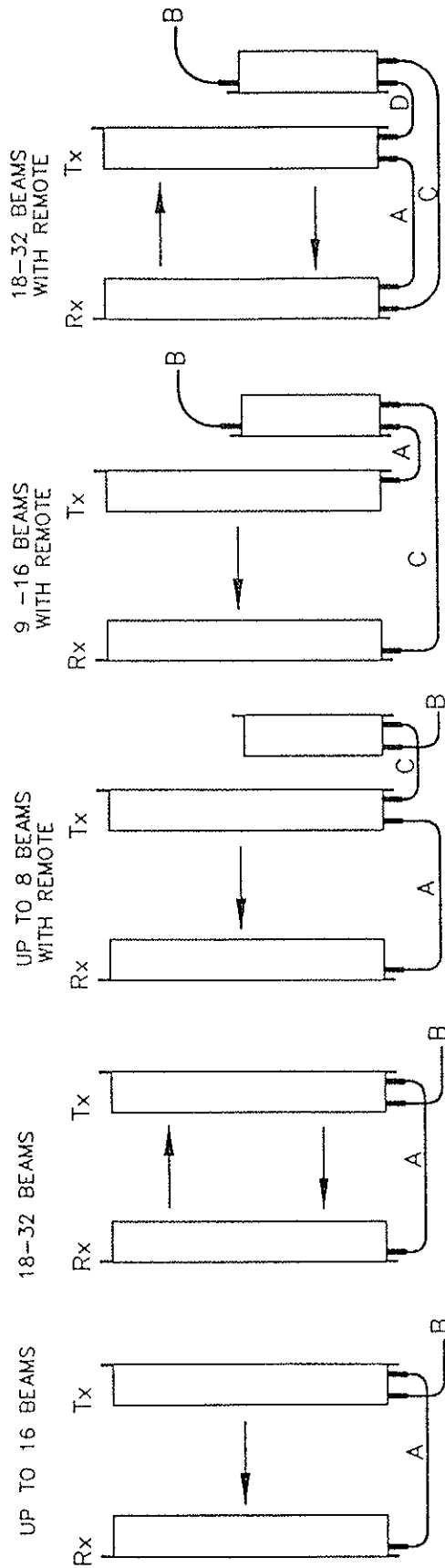
Cable X - shown in Table 8 - Universal extension cable, used to extend standard A or C cables.

Table 8

| Model No. | Order Code | Length (m) |
|-----------|------------|------------|
| 5X03      | 031 - 500  | 3          |
| 5X04      | 031 - 507  | 4          |
| 5X05      | 031 - 501  | 5          |
| 5X09      | 031 - 506  | 9          |
| 5X10      | 031 - 502  | 10         |
| 5X15      | 031 - 503  | 15         |
| 5X20      | 031 - 504  | 20         |
| 5X30      | 031 - 505  | 30         |

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## CABLE LAYOUTS FOR SMARTSCAN 5000 AND 5000AP LIGHT CURTAINS WITH OR WITHOUT A REMOTE CONTROL UNIT.



| CABLE | TYPE         | STANDARD CABLE ARRANGEMENT |
|-------|--------------|----------------------------|
| A     | RANGE        | PLUG PLUG                  |
| B     | USER         | PLUG SOCKET                |
| C     | INTERCONNECT | PLUG PLUG                  |
| D     | INTERCONNECT | PLUG PLUG                  |
| X     | EXTENSION    | SOCKET PLUG                |

NOTE: CABLE 'X' IS USED TO EXTEND CABLES 'A', 'B', 'C' OR 'D'.

021-511B

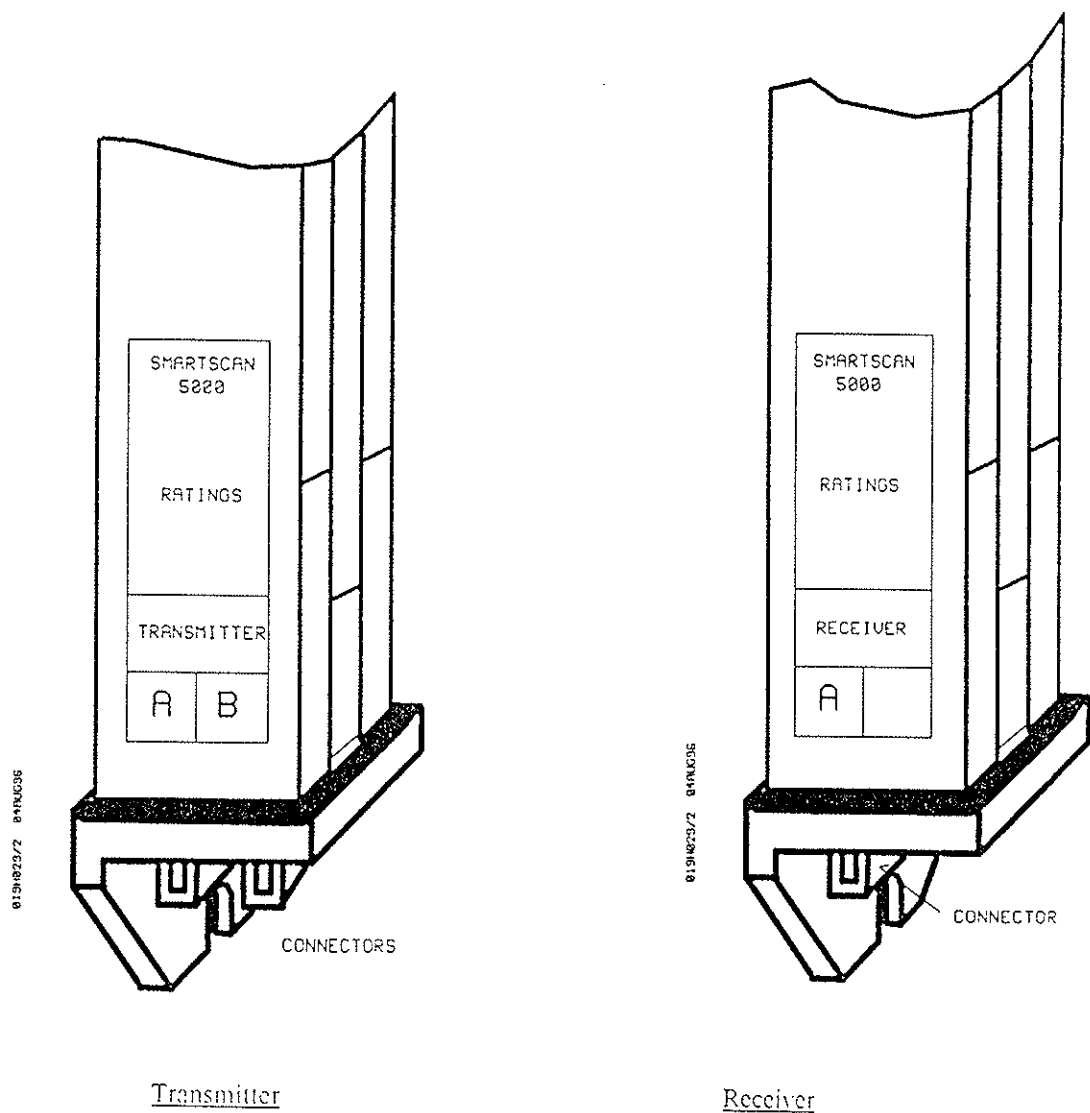


# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 5. MODEL IDENTIFICATION


All 5000 Series housings are labelled adjacent to the connector end cap, as illustrated in Figure 4. Examples of typical labels are given in Figure 5.


Figure 4:



## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Examples of typical labels are given below:

|   |          |
|---|----------|
| <b>SMARTSCAN</b>  |          |
| <b>5000</b>   |          |
| MODEL No  | 5316     |
| S.N.  | 9999 001 |
| BUILT   | 1998     |
| DET ZONE WIDTH  | 398.4mm  |
| DETECT CAPABILITY   | 32.4mm   |
| MAX RANGE   | 15m      |
| RESPONSE TIME   | 20ms     |
| RATED VOLTAGE   | 24V ~    |
| RATED CURRENT   | 0.5A ~   |
| IP RATING   | 54       |
| TEST PIECE PT No  | 5TP32.4  |
| SMARTSCAN Ltd<br>PYWELL RD<br>CORBY<br>NORTHANTS<br>NN17 5XJ U.K.<br>TEL +44(0)1536 401313<br>FAX +44(0)1536 268954 |          |
|                                    |          |
| <b>WARNING</b>  |          |
| READ AND UNDERSTAND INSTRUCTIONS<br>BEFORE INSTALLATION   |          |
| <b>TRANSMITTER</b>  |          |
| <b>A</b>  | <b>B</b> |

|   |          |
|---|----------|
| <b>SMARTSCAN</b>  |          |
| <b>5000</b>   |          |
| MODEL No  | 5316     |
| S.N.  | 9999 002 |
| BUILT   | 1998     |
| DET ZONE WIDTH  | 398.4mm  |
| DETECT CAPABILITY   | 32.4mm   |
| MAX RANGE   | 15m      |
| RESPONSE TIME   | 20ms     |
| RATED VOLTAGE   | 24V ~    |
| RATED CURRENT   | 0.5A ~   |
| IP RATING   | 54       |
| TEST PIECE PT No  | 5TP32.4  |
| SMARTSCAN Ltd<br>PYWELL RD<br>CORBY<br>NORTHANTS<br>NN17 5XJ U.K.<br>TEL +44(0)1536 401313<br>FAX +44(0)1536 268954 |          |
|                                   |          |
| <b>WARNING</b>  |          |
| READ AND UNDERSTAND INSTRUCTIONS<br>BEFORE INSTALLATION   |          |
| <b>RECEIVER</b>   |          |
| <b>A</b>  |          |

Note that either transmitter or receiver is written on the label for identification.

The serial numbers of all the components originally shipped together as a system for a particular installation have the first five digits in common.

Where spares are supplied, the serial numbers will not align with those of the original parts, but the model number and other details must be the same in every respect to maintain the original system performance. Any deviation from this requirement must be confirmed in writing by Smartscan Limited.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 6. SPECIFICATION

Table 9

|   |   |
|---|---|
| Number of beams   | 2 - 32  |
| Beam spacing (mm)   | 19, 25.4, 30.5 and multiples  |
| Range (metres):<br>T and L Models<br>2-16 beam models excluding T,L and ED types<br>18-32 beam models<br>ED suffix models | .<br>1.0 - 2.2 metres<br>0.5 - 15 metres<br>0.5 - 5.0 metres<br>1.5 - 30 metres |
| Detection capability  | See Table 1   |
| Detection zone width  | See Table 1 / See Note 1  |
| Response time (maximum)   | 20 mS   |
| Automatic check interval (maximum)  | 20 mS   |
| Light type and wavelength   | infra-red 940 nm  |
| Ambient light max   | 20,000 lux (failsafe)   |
| Temperature   | Operating 0 - +40°C<br>Storage -20 - +50°C                                      |
| Humidity  | 0 - 95% (non condensing)  |
| Enclosure rating  | IP54  |
| Colour  | Yellow/RAL1006 gloss  |
| Material and finish   | Aluminium, chromate treated and polyester powder coated.                        |
| Weight - transmitter unit   | 2 kg typical<br>(see individual data sheets)                                    |
| Receiver unit   | 2 kg typical<br>(see individual data sheets)                                    |
| Fault resistance category to prEN954-1:<br>5000<br>Other models   | Category 4<br>Category 3  |
| Conformity:<br>Conventional straight models with standard interface only  | EHSR's Machinery Directive<br>BS6491 : 1 & 2: 1987                              |
| Noise   | less than 70 dBA in operation   |
| EMC   | EN 55022 Class B<br>IEC 801 - 3 Level 2   |

\* Note 1 - Detection zone width specified by Smartscan Ltd. is less than that calculated by the industry standard method. Refer to Section 7 for details.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

|                         |   |
|-------------------------|---|
| Primary Output          | 2 independent voltage free, N.O. safety contacts. (OSSD See Section 9 for detail.)                                      |
| Secondary Output        | 1 x voltage free N.O. safety contact. (SSD See Section 9 for detail)  |
| Status Output           | 1 x voltage free N.O. contact (not to be used for safety critical circuits - AP models only. See section 9 for detail). |
| Power Supply            | 24V DC +/- 5%.<br>Maximum ripple 1%.  |
| Power Consumption (max) | 500 mA  |

### Controls and Indicators

All AP light curtains with 'R' in the model number have a condition lamp, status indicators and key/push button controls located in a remote control unit.

All non-remote AP light curtains have condition lamp(s) and status indicators situated in the transmitter column of the light curtain. There are two blue condition lamps, one on either side of the horizontal 'T' section. In Type 'L' light curtains both blue condition lamps are mounted on the horizontal part of the transmitter head. Straight AP models have a condition lamp mounted on the window of the transmitter unit.

All non-remote standard 5000 light curtains do not have a condition lamp but do have status indicators situated in the Transmitter column of the light curtain.

### Output Switching Devices

#### Secondary switching device (SSD):

Type - PCB relay with captive contacts. Contacts available = 1 x normally open (N/O)

#### Output signal switching devices (OSSD 1):

Type - PCB relay with captive contacts. Contacts available = 1 x normally open (N/O).

#### Output signal switching devices (OSSD 2):

Type - PCB relay with captive contacts. Contacts available = 1 x normally open (N/O).

#### Contact ratings (DC):

|                               |     |     |     |         |
|-------------------------------|-----|-----|-----|---------|
| Max switching voltage         | ... | ... | ... | 110V DC |
| Max switching current         | ... | ... | ... | 1A      |
| Max switched load (resistive) | ... | ... | ... | 50W     |
| Max switched load (inductive) | ... | ... | ... | 20W     |
| Max switching rate            | ... | ... | ... | 10Hz    |
| Min switching voltage         | ... | ... | ... | 12V     |
| Min switching current         | ... | ... | ... | 10mA    |

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Contact rating (AC):

|                               |     |     |     |         |
|-------------------------------|-----|-----|-----|---------|
| Max switching voltage         | ... | ... | ... | 110V AC |
| Max switching current         | ... | ... | ... | 1A      |
| Max switched load (resistive) | ... | ... | ... | 50W     |
| Max switched load (inductive) | ... | ... | ... | 20W     |
| Max switching rate            | ... | ... | ... | 10Hz    |
| Min switching voltage         | ... | ... | ... | 12V     |
| Min switching current         | ... | ... | ... | 10mA    |

Status Relay (AP Models only)

Type - PCB relay

|                                |     |     |     |            |
|--------------------------------|-----|-----|-----|------------|
| Contact Rating                 | ... | ... | ... | DC         |
| Max Switching Voltage          | ... | ... | ... | 30         |
| Max Switching Current          | ... | ... | ... | .5A        |
| Max Switching Load (Resisting) | ... | ... | ... | 15W        |
| Max Switching Load (Inductive) | ... | ... | ... | 5W         |
| Max Switching Rate             | ... | ... | ... | 10Hz       |
| Min Switching Voltage          | ... | ... | ... | 12V        |
| Min Switching Current          | ... | ... | ... | 10 $\mu$ A |

## INPUTS

There are two different versions of the user interface. Full details of the functions of each type are given in Section 9.

Inputs are 'active low' and should be driven by voltage free contacts between the input and the 'L-' connection or 'open collector' type PLC outputs using the same voltage reference. The specification for the external switch is given below.

|                               |     |     |            |  |
|-------------------------------|-----|-----|------------|--|
| Off state leakage current max | ... | ... | 10 $\mu$ A | (leakage across contacts)                  |
| Off state voltage max         | ... | ... | L+         | (voltage across contacts)                  |
| On state current max          | ... | ... | 10mA       | (current through contacts)                 |
| On state voltage max          | ... | ... | 1V         | (voltage drop through contacts and wiring) |



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

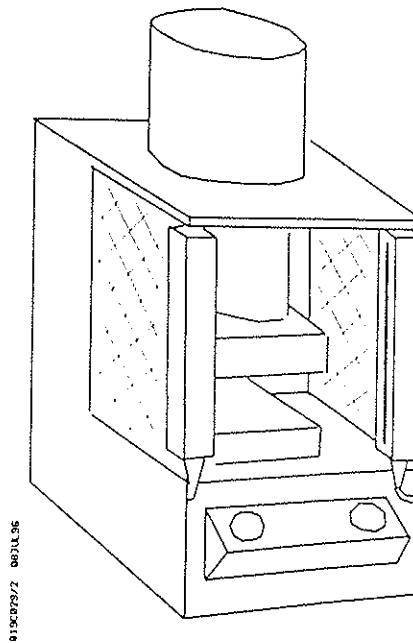
## 7. MODEL SELECTION GUIDE

### 1. APPLICATION TYPE

Smartscan 5000 Series light curtains are used in three main types of application:

- A) Point of Operation Guarding - Part of the body is within the detection zone when a person is able to reach or access the hazard. A typical example is guarding a manually loaded press or guillotine.

Fig. 6 - 'Light Curtain for Press'

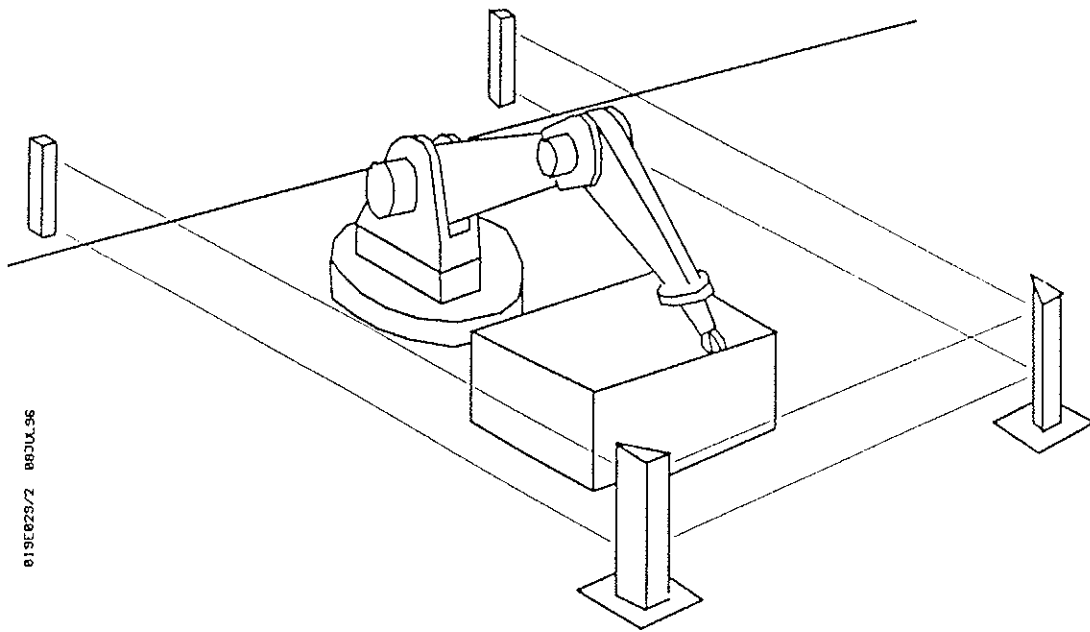


Point of operation guarding usually requires detection of body parts (e.g. arm, hand) rather than whole body detection. Generally a model having narrow beam spacing and hence small minimum object detection capability will be required.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

- B) Perimeter Guarding - The light curtain creates an invisible fence around a zone containing the hazard. A person must pass through the detection zone to reach the hazard but may be within the danger zone without interrupting any of the light beams.

Fig. 7 - 'Perimeter Guard for Robot Cell' (Illustrating the use of mirrors)



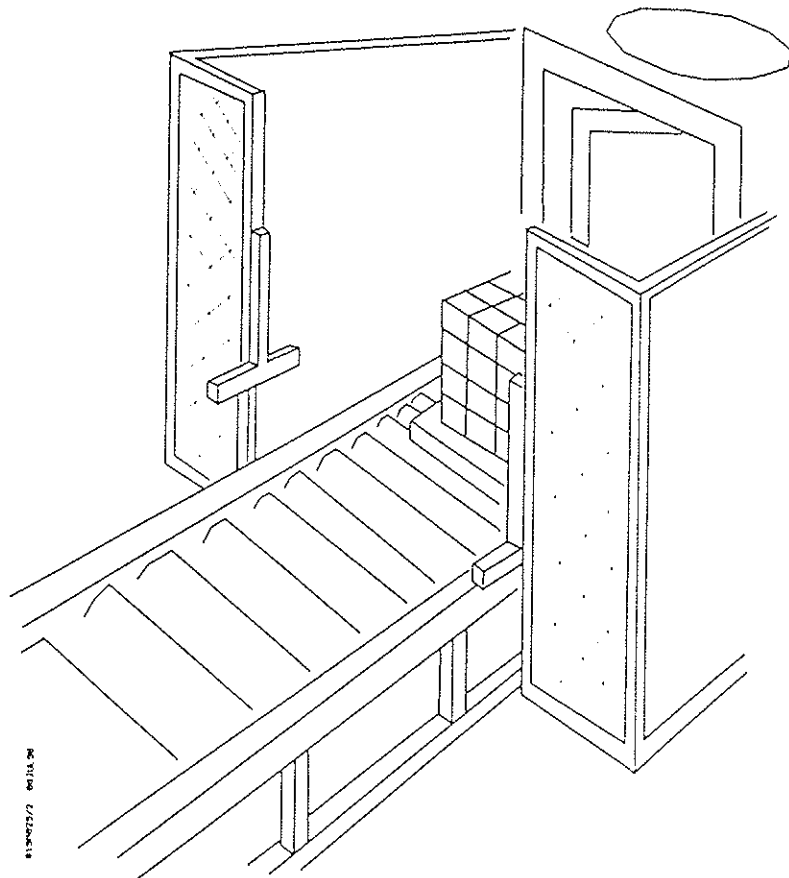
Perimeter guarding is very different from point of operation guarding. Generally whole body detection is acceptable if the curtains can be positioned at a sufficient distance from the hazard. An example of a suitable model is the 5502ED.

It is essential that perimeter guards operate as trip devices, such that once an object is detected, hazardous motion is stopped and remains stopped until restarted by a deliberate action. This requires a latch facility either within the light curtain or within the machine control system. All Smartscan light curtains contain the required latch facility (restart interlock). Remote control units have key switches which may be an ideal way of providing the necessary restart control. Perimeter guards frequently employ mirrors to provide two or three sided protection and may use ED suffix models to achieve the required range (refer to Table 1).

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

- C) Self-muting Guards - where material routinely passes into or out of a danger zone.

Fig. 8 - 'Pallet Exiting Danger Zone'



Self muting guards in T and L shapes are specifically designed for guarding entry and exit points where material passes automatically into or out of a danger zone. The most common application is palletised loads on conveyors but these light curtains will work with other loads and transport systems if reliable actuation of the cross beams for muting can be achieved.

At exit points L type curtains are the preferred choice. With this style, the crossbeams are on the danger zone side of the main light curtain and are thus relatively tamperproof.

At entry points or for two way product flow, T type curtains should be selected. On these types the cross beams are partly outside the danger zone and the possibility of deliberate defeat of the protection system exists. This must be considered during the risk assessment.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Because the range of self-muting guards is limited to 2.2m, by the cross beams, ED suffix versions do not exist. Entry and exit point guarding is normally designed for whole body detection but if space is very restricted a smaller object detection capability may be required to prevent a person reaching through the curtain and into the hazardous parts.

### 2. RISK LEVEL

The fault resistance level of the light curtain must be sufficient for the application. All Smartscan models meet or exceed the requirements of Category 3 according to prEN954-1. When the highest levels of risk are involved, Category 3 is not sufficient and only models meeting Category 4 requirements should be employed. Risk assessment is covered more fully in Section 10.

### 3. REMOTE CONTROL UNITS

Remote control units provide a means of making status information and control functions available in one convenient location. The choice between the user providing his own control station or purchasing a remote control unit type light curtain ultimately rests on whether specific status information is needed for efficient, safe operation of the machinery. It is impossible to generalise, but Smartscan Ltd can provide assistance and describe the alternative models available to suit a given application.

### 4. DETECTION CAPABILITY

Detection capability specifies the smallest size of object guaranteed to operate the sensing unit under all conditions. Generally a protection scheme will be designed based on the detection of either a specific body part or the whole body.

National and International Standards give specific detection capability requirements for the body parts of adults and the values, whilst similar, differ in detail. Installations will usually be designed in accordance with a particular standard or code of practice, which will give the required information.

When children are at risk very different values are required. Do not proceed with such designs without specialist knowledge and advice as little authoritative guidance has been published on this subject.

### 5. DIMENSIONS OF THE DETECTION ZONE

A light curtain provides a rectangular detection zone, one side being the width or height of the zone and the other being the range. Mirrors can be used to make two or three planes, to partly surround a danger zone. When selecting an appropriate model, the width of the detection zone is the first consideration. Free access for observation, normal operation, tool changing, clearing obstructions and maintenance should be provided as far as possible. Mechanical guarding is normally used where routine access is not required. It is essential

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

that there is no possibility of reaching under, over or around the side of the light curtain detection zone and into the hazardous area.

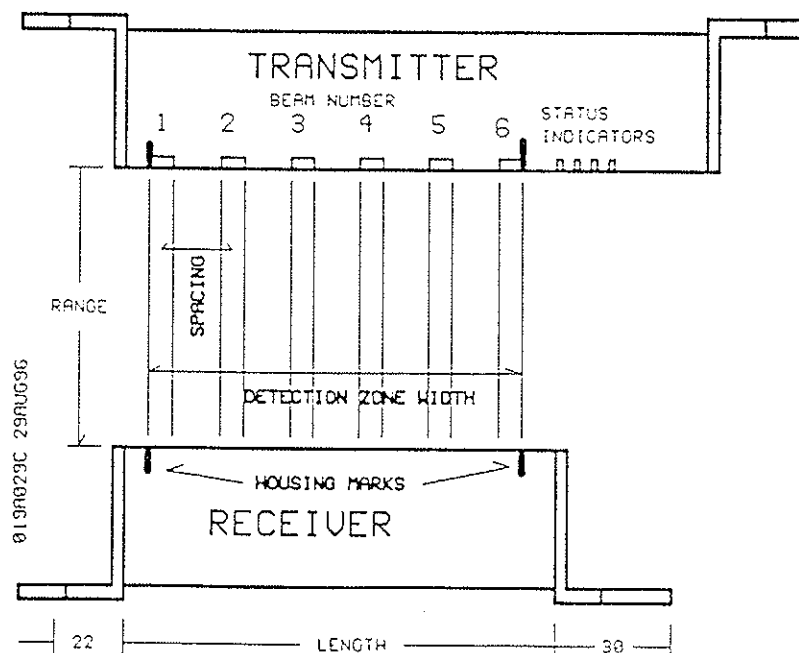
It is the combination of this requirement together with the access requirement which sets the dimension for the minimum width of the detection zone.

### 6. DETECTION ZONE SPECIFICATION

The detection zone is a rectangle with dimensions of range x detection zone width (DZW). Detection zone width is specified by Smartscan Ltd. as the distance between the outer edges of the outermost beams. These positions are marked on the housings (see Figures 9 and 10 below).

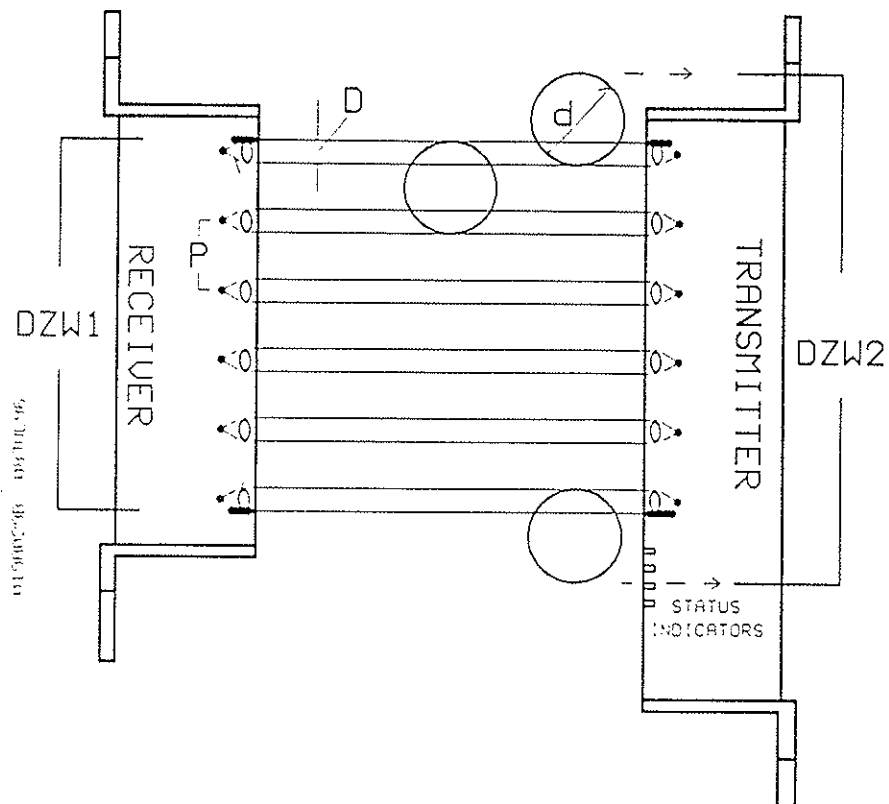
This simplifies installation design by placing beams nearer to the end of the unit. Fixed or moving objects outside the lines will not actuate the curtain, objects equal to or bigger than the detection capability will actuate the curtain in any position inside the rectangle bounded by the lines.

Figure 9



## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Figure 10



DZW1 - Smartscan specified detection zone width

DZW2 - Industry standard detection zone width

$$DZW2 = (N - 1) \times P + 2 \times (d + D)$$

DZW = detection zone width

N = number of beams

P = Pitch of lens grid

d = Detection capability

D = Effective diameter of the beam

Note: The difference between DZW1 and DZW2 increases as P increases and as N decreases.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

### 8. OPERATION

During normal running, operation of Smartscan light curtains are entirely automatic and no operator intervention is required. Depending upon the exact model in use and its interconnection with the machine control system, manual intervention may be required under one or all of the following conditions:

1. Start up - following power up of the machine.
2. Restart - following obstruction of the light curtain
3. Machine blockage - applicable to curtains used across conveyor systems or where material automatically passes through the curtain.

Manual intervention is always required for:

1. Recovery from lockout during normal running.
2. Functional testing
3. Maintenance (including fault finding).

Functional testing and maintenance are covered in Section 12. Other operating information is given below. The instructions for use of the machine on which the light curtain is installed should include all relevant operating instructions for Smartscan equipment.

#### 8.1 Principle of operation

The Smartscan sensing unit consists of a transmitter and a receiver column which face each other across an area to be safeguarded. The transmitter contains a row of infra-red, light emitting diodes which sequentially transmit parallel beams of energy to corresponding receiving diodes in the receiver column. When the control/monitoring unit detects an obstruction in the optical path of one, or more of the beams which form the sensing field, the output signal switching devices (OSSD's) will turn-OFF immediately.

Smartscan systems which employ more than 16 infra-red transmitting diodes in the light-curtain use electronic repeaters to increase the 'beam count' to a maximum of 32 beams.

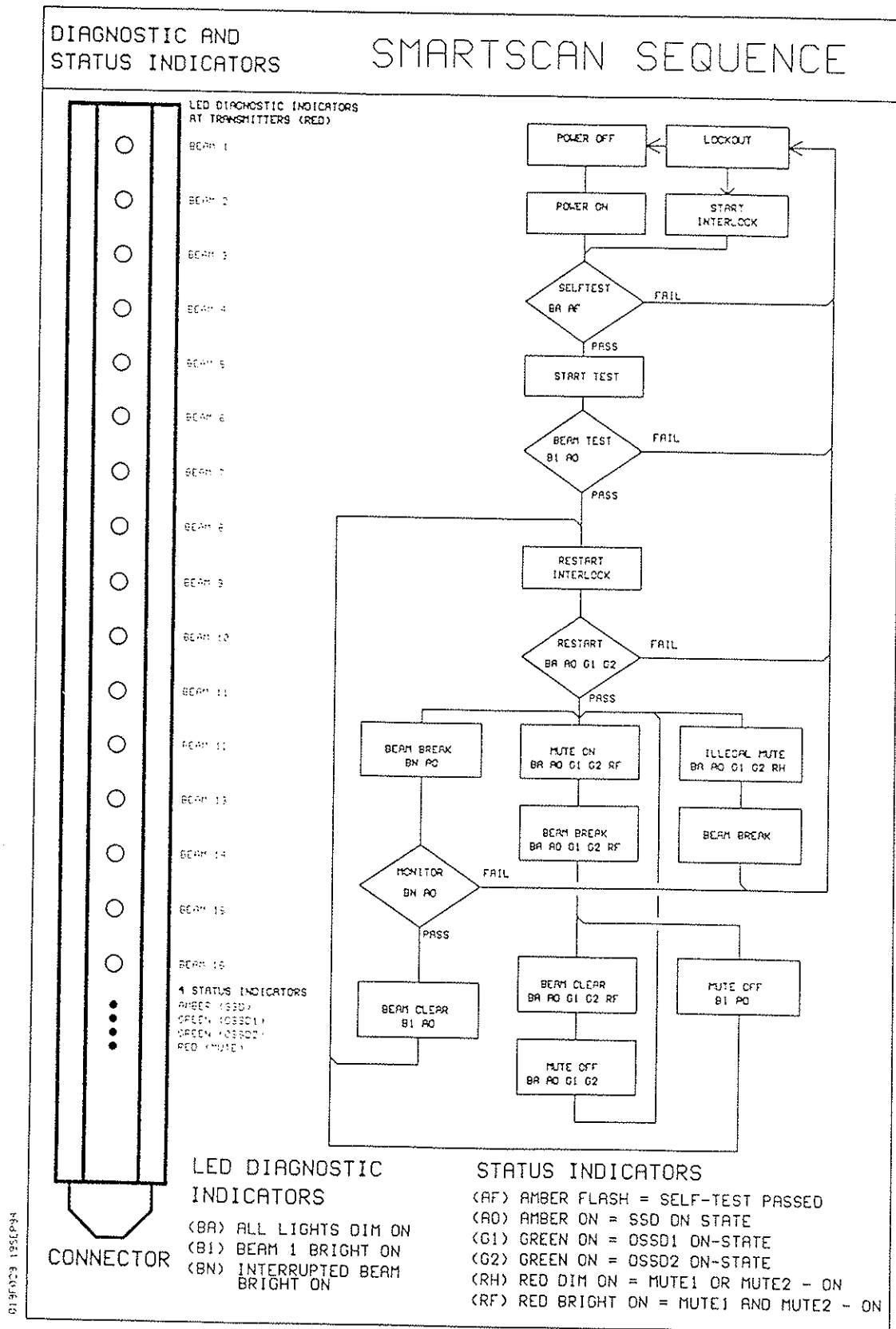
Note: Smartscan 5000 systems employing 2 - 32 infra-red beams have been tested by the Advanced Manufacturing Technology Research Institute (AMTRI) to British Standard BS6491.

Smartscan light curtains can be supplied with variable beam spacing to suit specific applications. Standard beam spacing are 19.0mm, 25.4mm and 30.5mm, or multiples thereof.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 8.2 Operating Sequences

### 8.2.1 Figure 11 -Non AP Models only:



## SMARTSCAN 5000 SERIES LIGHT CURTAINS

### The control/monitoring function

The Smartscan control/monitoring function is designed to meet the levels of safety specified in BS6491. A number of input/output functions are provided with the flexibility to suit most applications.

At power up the control/monitoring function automatically tests the sensing function for correct operation. The test takes approximately five seconds. Following verification for correct operation of the sensing function the amber status indicator LED, mounted behind the exit window on the transmitter column will blink. The system now awaits a 'start test'.

The start test is performed by the operator, by interrupting at least one of the beams in the light curtain with his hand or an opaque object (test piece) for approximately two seconds. A remote test button/key may also be supplied to provide this operation should the light curtain be mounted in an inaccessible position where the operator is unable to reach into the light curtain to perform the test. Providing the control/monitoring function verifies the start test as acceptable, then, upon removal of the test piece from the light curtain, the amber LED status indicator will stop blinking to a steady 'on' condition.

All 5000AP models, the start test is performed automatically; thus eliminating the need for an operator to perform the manual test.

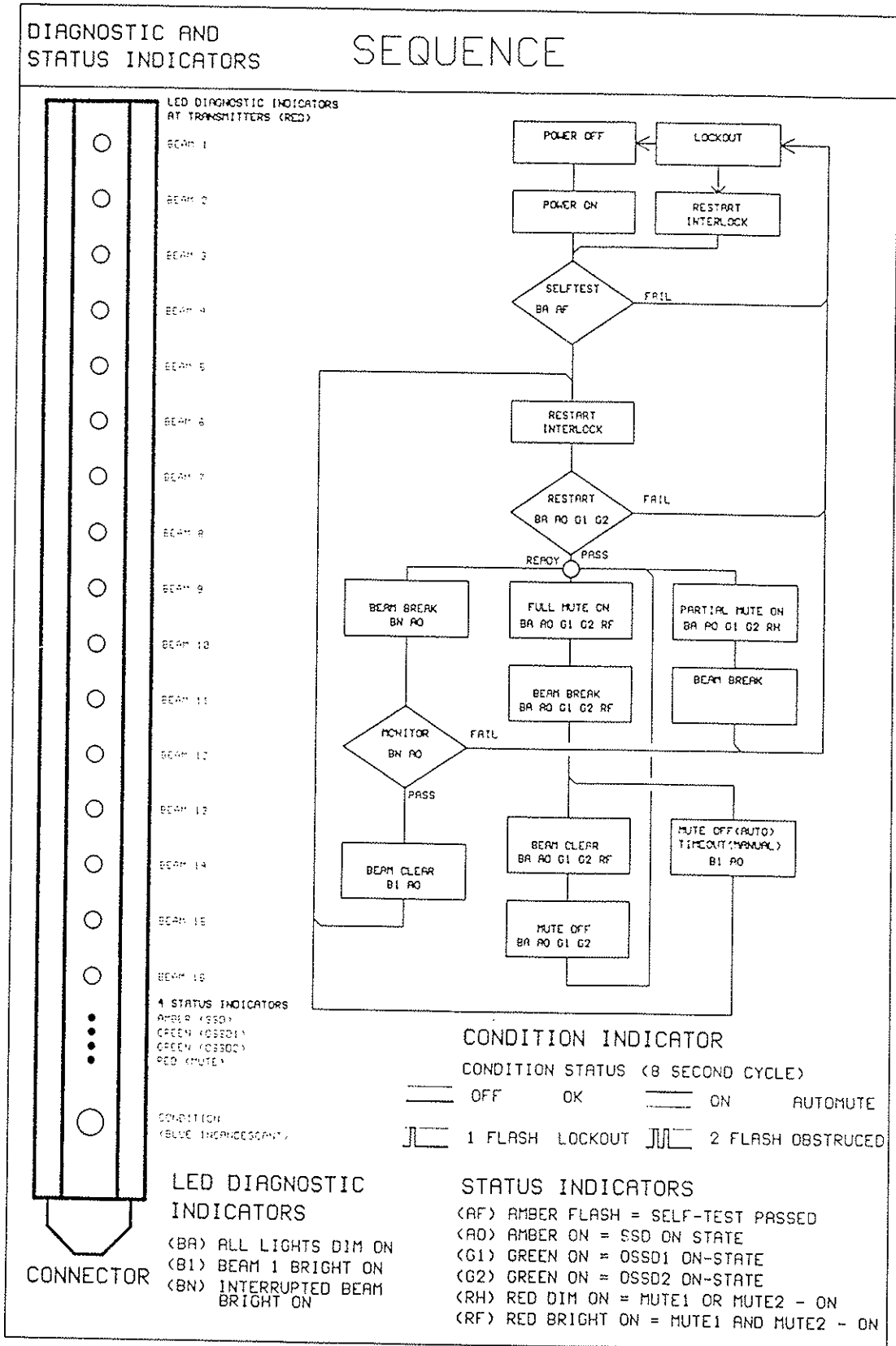
The 'steady' condition of the amber LED status indicator denotes the secondary switching device (SSD) is in the ON-state.

The SSD output switching contacts are often used to remove control power from a machine (lock-out) if a fault within the safety system is detected.

LOCK-OUT - a condition which prevents normal operation of the electro-sensitive protective equipment (ESPE). It is automatically attained when the output signal switching devices (OSSD's) final switching devices (FSD's) and secondary switching devices (SSD's) are signalled to go to the OFF-state. Lockout is the reaction required by the ESPE in response to a fault being detected by the safety monitoring means (SMM).

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

8.2.2 Figure 12 - AP Models





## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Pattern:

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|

Appearance: Flash, flash, long off, flash, flash, long off, etc.

Status: Outputs OFF - the light curtain is obstructed (or is awaiting reset following an obstruction - latched mode only).

Pattern:

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|

Appearance: Equal on/off blinking

Status: Guard Override - the curtain is temporarily muted in guard override condition, 25s max.

Note: The condition indicator lamp(s) is current monitored. Failure of the filament(s) will prevent muting.

Lamp test - to check operation of the lamp, set the keyswitch to the 'activate' position for 4 seconds (activate input to L - Volts.) The lamp should illuminate for two seconds and then go out.

Lamp replacement - see Section 12

### 8.6 Activate Keyswitch - AP Models With Remote Control Unit Only

Two types of keyswitch operation are available:

Activate - Run- Activate - Remote unit 5RAPO

Activate - Run-Guard Override - Remote unit 5RAPG

The activate function is the same in both cases. Turn the key momentarily to the 'activate' position and allow it to return to 'run' position. This momentarily connects the activate input to L - and takes the light curtain through its start-up sequence automatically. This function is required at initial power on and also to recover from a lockout situation which arises during normal operation. If lockouts occur regularly there is a system problem and maintenance is required.

### 8.7 Guard Override Keyswitch - AP Models Only

As noted above Model 5RAPG incorporates a keyswitch having a guard override position.

Guard Override - This function is provided on the AP system to temporarily suspend the protective function of the light-curtain, following a trip condition during the period when the light curtain is obstructed. eg. when a pallet is obstructing the light-curtain following a lock-out condition.

## **SMARTSCAN 5000 SERIES LIGHT CURTAINS**

To initiate OSSD1 and OSSD2 switching contacts to an 'on' condition following a lock out it is necessary to remove the obstruction from the light curtain field of detection.

To remove the loaded pallet, connect Guard Override 1 and 2 to L-Volts via suitable switching circuitry. This action automatically closes the OSSD1 and OSSD2 relays, thereby enabling the machine to be restarted for 25 seconds.

If it takes longer than 25 seconds to remove the load from the light curtain detection field the light curtain times guard override must be reset to enable another 25 seconds period.

To reset the guard override, momentarily open the connections between Guard Override 1 and 2 and L-Volts, and then remake the connections. Guard override of the light curtains is now active for a further 25 seconds.

Use Guard Override only when:

- (a) The reason for the blockage has been established.
- (b) The light curtain is in view
- (c) No danger to any other person can be caused.

### **8.8 Start Keyswitch - Non AP Models With Remote Control Unit Only**

Start-run-restart on control unit types 5RO and 5RB.

The start function is only used to recover from a lock-out. It has the same effect as a power off-on sequence. If the start function is used regularly during guard operation a fault exists in the system and maintenance is required.

### **8.9 Restart keyswitch - Non AP Models With Remote Control Unit Only**

The keyswitch on remote control units 5RO and 5RB also has a restart position. This is only required when the light curtain is set for latched mode operation. It is used to restart normal operation following obstruction and clearance of the light curtain. The restart function is obtained by momentarily turning the key to the restart position and then releasing it. It should only be used when:

- (a) The reason for the actuation of the curtain has been established.
- (b) The danger zone is in full view and no person is within it.

### **8.10 Beam Test Push-button - Non AP Models only**

The beam test push button on remote control unit 5RB provides an alternative way of achieving the start/test function. Instead of physically obstructing the curtain, the button is depressed for approximately two seconds. Additionally this button may be used for a limited functional test of the light curtain and machine control system as its operation is equivalent to obstructing the light curtain.



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 9. INTERFACES

There are two types of user interface available.

1. Standard interface. This interface is provided for models without 'AP' in the model number.
2. AP Interface. This configuration is provided on models containing 'AP' within the model number.

It is essential that the correct interface specification is understood and used. If in doubt, check the model number of the light curtain to see which applies.

The interface is divided into five functional areas:

1. Inputs.
2. Outputs.
3. Power Supply and Earth.
4. SMM.
5. Status.

Only the inputs differ significantly between models so these are dealt with first. All inputs are 'active low', i.e. a connection to L - is required to activate the function. For details of the required external switch characteristics see section 6.

### Standard Interface - Inputs

1. Start - Start interlock - wire colour BLUE.

This input must be high (open circuit) for the light curtain OSSDs to go to the on-state. It is used to reset the light curtain from a lock out condition. A lock out condition can arise from any of the following causes:

- start test failed.
- light curtain fault.
- external equipment fault (if SMM connected).
- severe EMI.

Momentary connection of the 'start' terminal to L - restores the light curtain to a 'just powered up' condition.

2. Restart - Restart interlock - wire colour RED / BLUE.

The restart terminal performs two functions:

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

- Automatic restart mode selection. For this mode, it is permanently connected to L- (Do not use this mode in BS6491 compliant installations).
  - Restart after interruption of the curtain in latch mode. Momentary connection to L- will restore the ON condition of the OSSD following obstruction and clearance of the light curtain. If a beam remains blocked, restart will not be possible.
3. Beam Test - simulates curtain blocked - wire colour YELLOW/RED.

This input, when low, simulates a blocked condition. It is used for two purposes:

- As an alternative to manual start test (minimum two seconds low).
  - In Category 2 type control systems where the control system tests the operation of the safety circuits by simulating actuation of the sensing function.
4. Mute 1 and Mute 2 - external mute inputs wire colours YELLOW and WHITE.

These two inputs need to be activated (low) and de-activated (open-circuit) together or a lockout condition will result when the curtain is interrupted. For safety, mute inputs should come from two separate sources. This prevents a single fault causing a permanently muted condition and thus failure of the protective function. Muting is discussed in Section 10.

### AP Interface - Inputs

1. Activate - general reset - wire colour BLUE. Activate provides several functions, relating to reset and test.
- start up.
  - recovery from a lock condition.
  - restart after interruption and subsequent clearance of the light curtain.
  - lamp test.

It is most unusual to design systems with activate tied low permanently, but this mode may be useful for presence sensing, particularly with horizontal curtains, in low/medium risk applications, perhaps to replace a safety mat. It must not be tied low permanently in applications where muting is employed.

2. Mute 1, Mute 2 - external mute inputs - wire colours YELLOW and WHITE.

These inputs are used for external muting of the curtain. The input signals should come from separate sources, so that a single fault cannot cause a failure of the protective function.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

3. Mute enable - enables self muting and external muting - wire colours RED/BLUE.

This signal must be low for muting to occur. It may be used as a third mute input on externally muted AP types. When self muting light curtains (APT, APL) are used on conveyor systems it is usually actuated by 'conveyor run'. This technique makes deliberate bypass of light curtain more difficult when the machine is stopped.

4. Guard Override 1 - wire colour YELLOW / RED.  
Guard Override 2 - wire colour WHITE / RED.

These inputs are used to provide a temporary mute condition of up to 25 seconds. They are normally used only on conveyor systems. The two inputs may come from a common source as a fault will not result in failure of the protective function, because the internal timers will re-enable the light curtain. Both guard override terminals must be low to achieve the temporary muting.

### Outputs - All Types

1. OSSD 1 - Safety output - wire colours ORANGE and PINK.
2. OSSD 2 - Safety output - wire colours TURQUOISE and GREY.

These two safety outputs respond to interruption of the light curtain (unless muted). The on-state is curtain clear and the off-state curtain blocked. They are voltage free contacts from two independent safety relays, and must be wired to produce a machine stop condition when either is in the off-state. Refer to Section 10 for details.

3. SSD - Lockout output - wire colours BROWN and VIOLET.

This output is a safety back-up. It is a pair of voltage free contacts from a safety relay, which are in the ON state during normal operation and in the OFF state at power-up and under lock out conditions. They should be wired to prevent machine operation unless in the ON state.

### Power and Earth - All Types

L+ - Volts - Positive supply + 24VDC - wire colour RED  
L- - Volts - Negative supply 0VDC - wire colour BLACK

Shield - Protective earth - screen braid.

The 24VDC must be connected with the correct polarity and come from a supply, isolated from the mains, with the negative pole earthed, corresponding to the specifications given in Section 6.

The earth connection must be bonded to the machine frame and the protective earth conductor via low impedance connections.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## SMM - All Types

SMM out - wire colour GREEN / RED.

SMM in - wire colour GREEN

SMM stands for Safety Monitoring Means and is a means of detecting faults in equipment external to the light curtain which is involved in achieving the machine stop condition. BS6491 compliant installations must use SMM and Category 3 or 4 control systems, requiring single fault tolerant safety circuits with fault detection, use SMM as a way of achieving the fault detection within this sub-section of the control system at minimal cost.

SMM monitors the change of state of the final control contactors or valves in the machine and causes a lockout condition when a fault is detected. When SMM is not required, link SMM out to SMM in and do not connect these wires to any other circuit. SMM wiring examples are given in Section 10.

Status Output - wire colours RED / BLACK and RED / BROWN

This output is provided on AP models only.

The status output is a pair of voltage free contacts, which are in the ON-state during muting and the off-state under all other conditions. **They must not be used as a safety output!** Used for signalling status to the machine control system, these contacts are particularly useful in designs incorporating diagnostic features.

## **Notes:**

1. Bi-colour wires above, the first colour is the main colour and the second colour is the tracer.
2. Operational sequences are described in Section 12.
3. Inputs may be activated manually or automatically. Some models have keyswitches and push buttons for manual functions.

## Electrical Connections

All input and output connections from the Smartscan system are via a 25 way 'D' type connector - user cable (B). The cable is terminated in either the user's equipment or Smartscan marshalling unit/power supply.

If an optional control/function module is supplied there may be additional connections related to that function.

Note: If the Smartscan system is connected directly to a 24V DC source supplied by the user, it must be emphasised that the supply should be regulated and suppressed to prevent transient voltages and other forms of electrical interference from affecting correct operation of the Smartscan equipment.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

User Cable (B) for Non AP Light Curtains

Table 11

| Colour | 'D' Pin | Function          | Signal                       | I/O      |
|--------|---------|-------------------|------------------------------|----------|
| Red    | 1       | L+ Volts          | +24V DC                      | +24 V DC |
| Blue   | 2       | Start Interlock   | Reset SSD (from Lock-out)    | Input    |
| Green  | 3       | SMM In            | Safety Monitoring Means      | Input    |
| Yellow | 4       | Mute 1            | Mute Input 1                 | Input    |
| White  | 5       | Mute 2            | Mute Input 2                 | Input    |
| Black  | 6       | L-Volts           | 0V DC (Ground/Earth)         | 0V DC    |
| Brown  | 7       | SSD               | Switching Contact (Isolated) | Output   |
| Violet | 8       | SSD               | Switching Contact (Isolated) | Output   |
| Orange | 9       | OSSD 1            | Switching Contact (Isolated) | Output   |
| Pink   | 10      | OSSD 1            | Switching Contact (Isolated) | Output   |
| Turq   | 11      | OSSD 2            | Switching Contact (Isolated) | Output   |
| Grey   | 12      | OSSD 2            | Switching Contact (Isolated) | Output   |
| Red/Bu | 13      | Restart Interlock | Reset OSSDs                  | Input    |
| Gn/Rd  | 14      | SMM out           | Safety Monitoring Means      | Input    |
| Ye/Rd  | 15      | Start Test        | Mimic of Manual Start Test   | Input    |
| Shield | 25      | Ground/Earth      | To casework                  | Ground   |

User Cable (B) for AP Systems

Table 12

| Colour | 'D' Pin | Function         | Signal                       | I/O     |
|--------|---------|------------------|------------------------------|---------|
| Red    | 1       | L+ Volts         | +24 V DC                     | +24V DC |
| Blue   | 2       | Activate         | Start, Reset SSD, Lamp Test  | Input   |
| Green  | 3       | SMM In           | Safety Monitoring Means      | Input   |
| Yellow | 4       | Mute 1           | Mute Input 1                 | Input   |
| White  | 5       | Mute 2           | Mute Input 2                 | Input   |
| Black  | 6       | L-Volts          | 0V DC (Ground/Earth)         | 0V DC   |
| Brown  | 7       | SSD              | Switching Contact (Isolated) | Output  |
| Violet | 8       | SSD              | Switching Contact (Isolated) | Output  |
| Orange | 9       | OSSD 1           | Switching Contact (Isolated) | Output  |
| Pink   | 10      | OSSD 1           | Switching Contact (Isolated) | Output  |
| Turq   | 11      | OSSD 2           | Switching Contact (Isolated) | Output  |
| Grey   | 12      | OSSD 2           | Switching Contact (Isolated) | Output  |
| Red/Bu | 13      | Mute Enable      | Mute Enable                  | Input   |
| Gn/Rd  | 14      | SMM out          | Safety Monitoring Means      | Input   |
| Ye/Rd  | 15      | Guard Override 1 | Override OSSDs               | Input   |
| Wh/Rd  | 16      | Guard Override 2 | Override OSSDs               | Input   |
| Rd/Bk  | 17      | Status Relay 1   | N.C. During Mute             | Output  |
| Rd/Bn  | 18      | Status Relay 2   | N.C. During Mute             | Output  |
| Shield | 25      | Ground/Earth     |                              |         |



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 10 . APPLICATION ENGINEERING

The design of protection schemes for machinery hazards should proceed in a systematic manner to ensure all relevant issues are addressed and satisfactory solutions developed.

The methodology below represents current European best practice as understood by Smartscan Ltd. For specific designs all relevant standards, codes of practice and legislation must be rigorously applied to ensure a safe final system. If any doubt exists, obtain specialist assistance from a competent person when undertaking such design. When high risk situations are identified, specialist knowledge is always required as the fault resistance of the system as a whole will have to be very high to ensure adequate safety. Automatic checking and/or cross monitoring of many components outside of the light curtain will be required. In such cases Smartscan Ltd. can supply additional equipment and/or arrange for specialist competent engineers to undertake the overall safety system design.

### SAFETY WARNING

The design of safeguarding systems using light curtains requires knowledge and experience of mechanical, electrical and safety engineering. Do not undertake such work without the appropriate skills. EN292-1 and EN292-2 outline the principles, techniques and methodology.

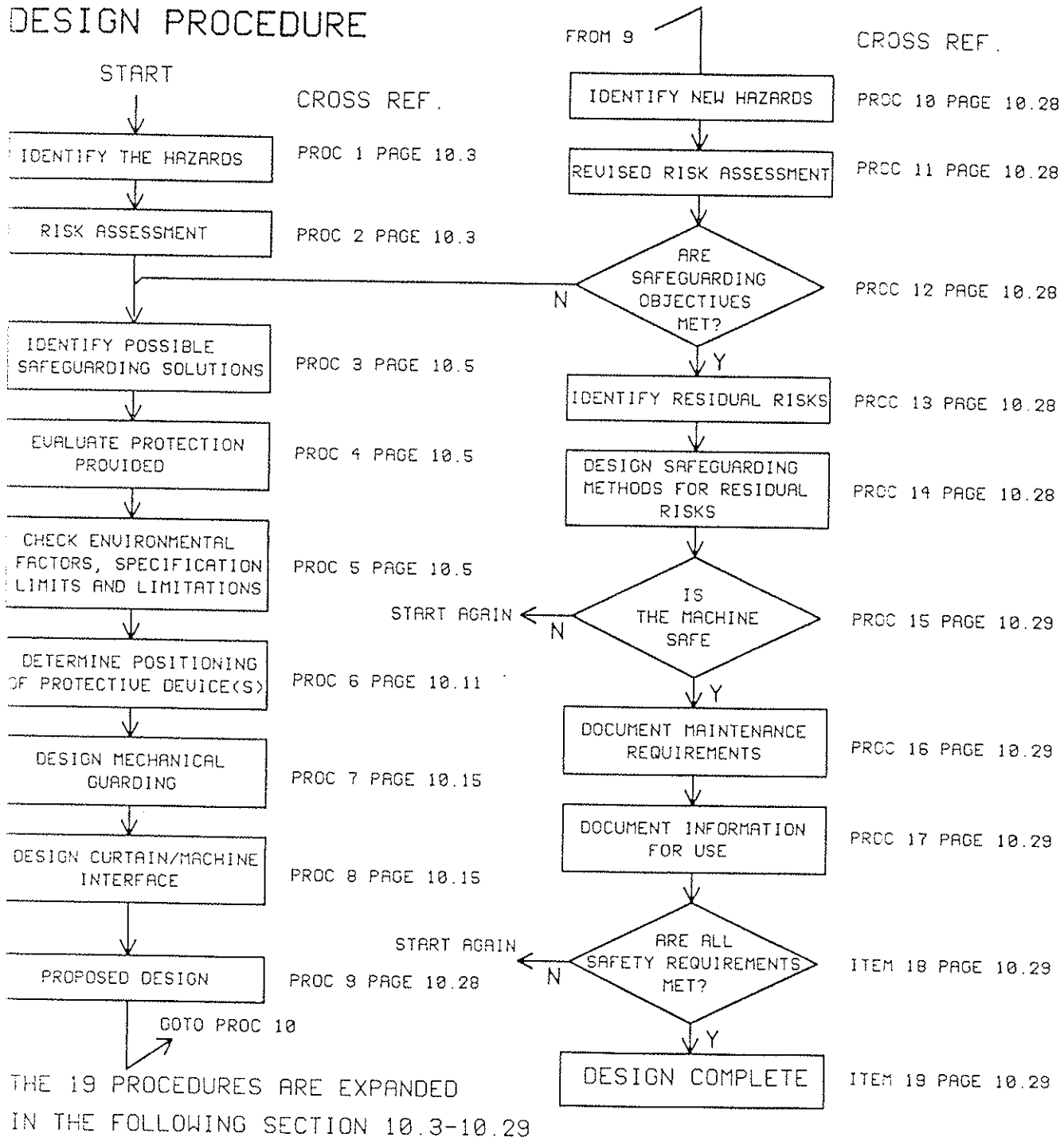
### HOW TO USE THIS SECTION

Proceed through the steps indicated in the following flow chart (Figure 13). Each step is referenced by a number (1 to 19). The text following the chart is numbered 1 - 19 and outlines the recommended procedure for that step.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Figure 13

## DESIGN PROCEDURE



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

1. Hazard identification

Machine 'C' standards, EN414, EN292-1 and EN292-2 provide assistance in this area.

2. Risk Assessment

The principles of risk assessment are given in prEN1050. One method of scoring risk factors is given below.

This risk assessment uses a simple classification based on estimating the severity of injury that might be caused, the frequency of exposure to the hazard and the possibility of the operator avoiding the hazard when exposed to it.

Severity of Injury (SoI)

The risk factor associated with the severity of injury and damage to the health of the person is categorised in the following way:

Table 13

|    |   |        |
|----|---|--------|
| 1. | Slight Injury - recoverable             | Low    |
| 2. | Slight Injury (general) - irrecoverable |        |
| 3. | Permanent Injury - finger/toe           | Medium |
| 4. | Permanent Injury - limb - upper         |        |
| 5. | Permanent Injury - limb lower           |        |
| 6. | Permanent Injury -torso                 | High   |
| 7. | Permanent Disability                    |        |
| 8. | Loss of Limb                            |        |
| 9. | Loss of Life                            |        |

Frequency of Exposure (FoE)

The risk factor associated with the frequency of exposure of the person to the hazard is categorised in the following way:

Table 14

|    |   |        |
|----|---|--------|
| 1. | Only if the operator tampers with and misuses the machine             | Low    |
| 2. | A few times in the lifetime of the machine, or less                   |        |
| 3. | A few times in a period less than the lifetime of the machine or less |        |
| 4. | A few times per day, or less  | Medium |
| 5. | A few times per shift, or less  |        |
| 6. | A few times per cycle or less   | High   |
| 7. | Continuously  |        |

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

## Possibility of Avoidance (PoA)

The risk factor associated with the possibility of avoiding the hazard when exposed to it is categorised in the following way:

Table 15

|    |                                   |        |
|----|-----------------------------------|--------|
| 1. | Easy                              | Low    |
| 2. | Possible in certain circumstances | Medium |
| 3. | Difficult                         | High   |

M and AP models are NOT SUITABLE for use in application having HIGH + HIGH + HIGH risk factors for SoI, FoE and PoA.

Figure 14

RISK FACTORS CAN BE COMBINED TO PRODUCE AN OVERALL RISK RATING BY CONSULTING THE CHARTS OPPOSITE

### SoI

THE SEVERITY OF INJURY IS FIRST USED TO CHOOSE WHICH CHART TO USE (LOW = TOP CHART)

### FoE

THE FREQUENCY OF EXPOSURE IS USED TO CHOOSE THE COLUMN

### PoA

THE POSSIBILITY OF AVOIDANCE FACTOR IS USED TO CHOOSE THE ROW

## RISK RATING KEY:

$R_L$  RISK = LOW  
 $R_{LM}$  RISK = LOW-MEDIUM  
 $R_H$  RISK = MEDIUM  
 $R_{MH}$  RISK = MEDIUM HIGH  
 $R_H$  RISK = HIGH

|       | L                 | M                 | H                 |            |
|-------|-------------------|-------------------|-------------------|------------|
|       | F <sub>OE</sub> L | F <sub>OE</sub> M | F <sub>OE</sub> H |            |
| SoI L | $R_L$             | $R_L$             | $R_{LM}$          | $P_{OA} L$ |
|       | $R_L$             | $R_{LM}$          | $R_{LM}$          | $P_{OA} M$ |
|       | $R_{LM}$          | $R_{LM}$          | $R_H$             | $P_{OA} H$ |
| SoI M | $R_{LM}$          | $R_{LM}$          | $R_H$             | $P_{OA} L$ |
|       | $R_{LM}$          | $R_H$             | $R_H$             | $P_{OA} M$ |
|       | $R_H$             | $R_H$             | $R_{MH}$          | $P_{OA} H$ |
| SoI H | $R_H$             | $R_H$             | $R_{MH}$          | $P_{OA} L$ |
|       | $R_H$             | $R_{MH}$          | $R_{MH}$          | $P_{OA} M$ |
|       | $R_{MH}$          | $R_{MH}$          | $R_H$             | $P_{OA} H$ |

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

3. Identify possible safeguarding solutions

Light curtains may only be used for safeguarding hazards as given in Section 3. Other hazards will require alternative safeguarding measures, outside the scope of this manual. A combination of light curtains and mechanical guarding will generally be required for a cost effective design.

4. Evaluate the protection provided

Ensure that the combination of selected safeguards provides the required protection in principle.

5. Check environmental factors, specification limits and limitations

Consider the limitations and drawbacks of each safeguarding element. Consider all relevant aspects including environmental factors, intended use, damage, bypass, EMC, human factors. All foreseen use of the machinery should be considered including possible product or process change, maintenance, cleaning, tool changes and emergencies. Factors relevant to Smartscan 5000 Series light curtains are listed below.

5.1 Environmental Factors

Temperature and humidity - Smartscan products are intended for use within conventional indoor workshop environments without steam, water spray or dripping water. Steam will interfere with the light beams and make the use of light curtains inappropriate. Waterproof, transparent housings to IP67 are available for some products for use in wet or corrosive environments, contact Smartscan Ltd. for further information. Temperature and humidity at the electronics enclosures must be within the values given in Section 6 (specifications) at all times.

Smoke and dust clouds interfere with the light beams and make light curtains unsuitable.

Chemicals - Smartscan light curtains are not suitable for use in environments having corrosive gases or vapours. The IP67 housings referred to above may provide a solution. Contact Smartscan Ltd. for further information

## SMARTSCAN 5000 & 5000AP LIGHT CURTAINS MUST NOT BE USED IN POTENTIALLY EXPLOSIVE ATMOSPHERES

Severe vibration of the light curtain must be avoided. Special anti-vibration mounts may solve particular problems but care is required to ensure that the transmitter and receiver units are mounted sufficiently rigidly to maintain accurate alignment.

Smartscan light curtains meet industrial generic limits for EMC, both susceptibility and emissions, so normal operation is assured in ordinary industrial environments. Abnormally high

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

levels of EMI may be present near certain types of equipment, eg welding or induction heating equipment, radio transmitters and transceivers. If operation in these situations is envisaged, special measures and compatibility testing will be required. An EMC expert will be able to detail the steps involved.

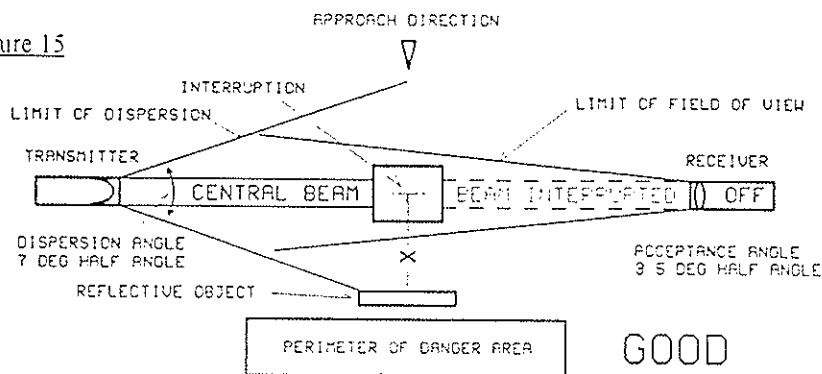
## 5.2 Optical Bypass

To eliminate the possibility of optical bypass, the position of the light curtain, in relation to reflective surfaces, or work-pieces must be taken into account. Alternatively, any reflective parts likely to affect correct operation of the light curtain may be 'dulled' or painted black. Typical surfaces to be considered are parallel machine surfaces, shiny workpieces, all types of plastic material, whatever colour.

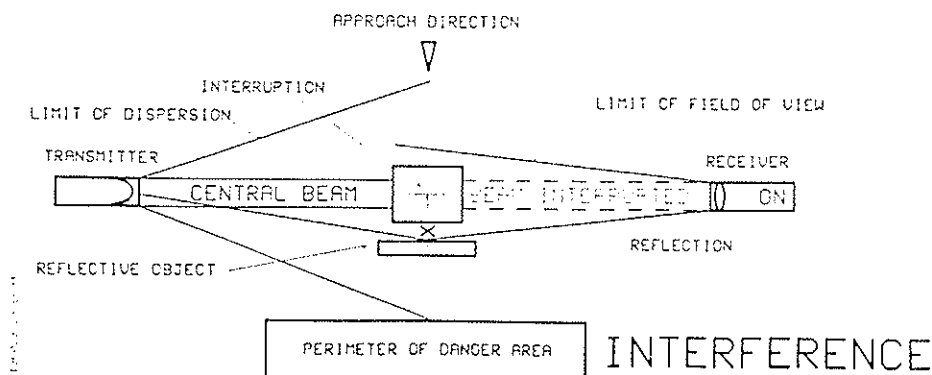
To prevent optical interference affecting correct operation of the safety system it is necessary to position the light curtain a suitable distance from the reflective surface, as shown in figure 15. Calculate the separation distance (X) between light curtain and reflective surface as follows:

$$(61.4) \times (\text{light curtain scanning range in m}) = (X) \text{mm}$$

Figure 15



EXAMPLE OF PROPER ALIGNMENT WHERE REFLECTIONS DO NOT AFFECT DETECTION CAPABILITY



EXAMPLE OF PROPER ALIGNMENT WHERE REFLECTIONS AFFECT DETECTION CAPABILITY. SMARTSCAN CURTAINS ARE DESIGNED TO WORK AT A FIXED BEAM STRENGTH AT THE RECEIVER WHICH MINIMISES THE EFFECTS OF REFLECTIONS. SERIOUS REFLECTION PROBLEMS WILL CAUSE LOCK-OUT

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Note: Optical bypass of the cross beams used for self muting on the T and L model curtains does not constitute a safety hazard. However, muting will not occur when required, resulting in a machine stoppage. Suitable measures should be used to eliminate such problems.

Critical interference - Smartscan light curtains are immune to most type of optical interference, and have been shown to meet the requirements of BS6491 in this respect. However, if the user intends to use other infra-red devices using modulated beams in the vicinity of the sensing units, it should be determined that the devices produce no adverse effect on the function of the safety related system.

## 5.3 Use of 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 mountings 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:

Table 16

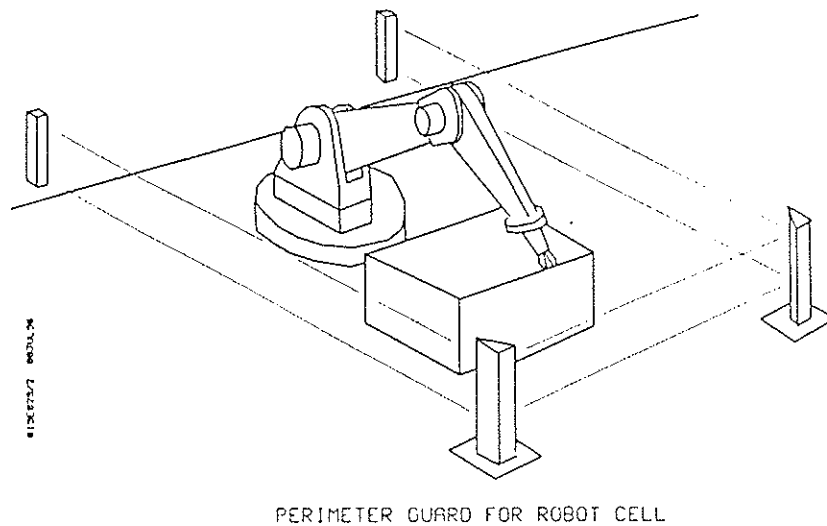
| RANGE (metres) |          |           | DIFFICULTY OF ALIGNMENT |           |
|----------------|----------|-----------|-------------------------|-----------|
| No Mirrors     | 1 Mirror | 2 Mirrors | 1 Mirror                | 2 Mirrors |
| 2.5            | 1.5      | 0.8       | A                       | B         |
| 4.5            | 2.5      | 1.5       | A                       | B         |
| 7.5            | 4.5      | 2.5       | A                       | C         |
| 11.5           | 7.5      | 4.5       | A                       | C         |
| 15             | 11.5     | 7.5       | B                       | C         |
| 22             | 15       | 11.5      | B                       | D         |
| 30             | 22       | -         | B                       | E         |

A - Relatively easy B - Moderate C - Difficult D - Extremely difficult  
E - NOT RECOMMENDED

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

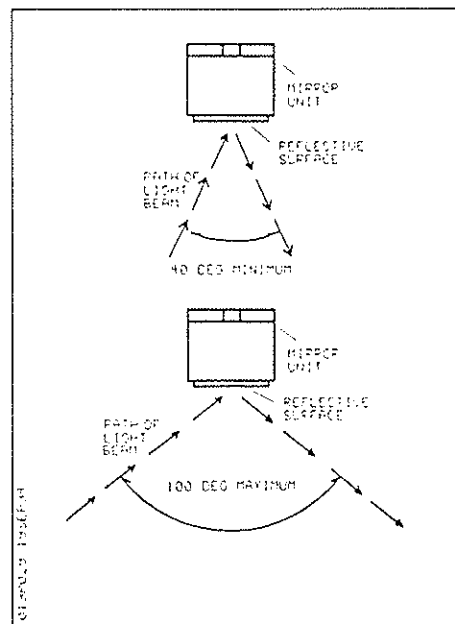
Figure 16



Reflectors are used to deflect the light curtain beams, enabling two or three sides of a machine or work area to be safeguarded.

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

Figure 17



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

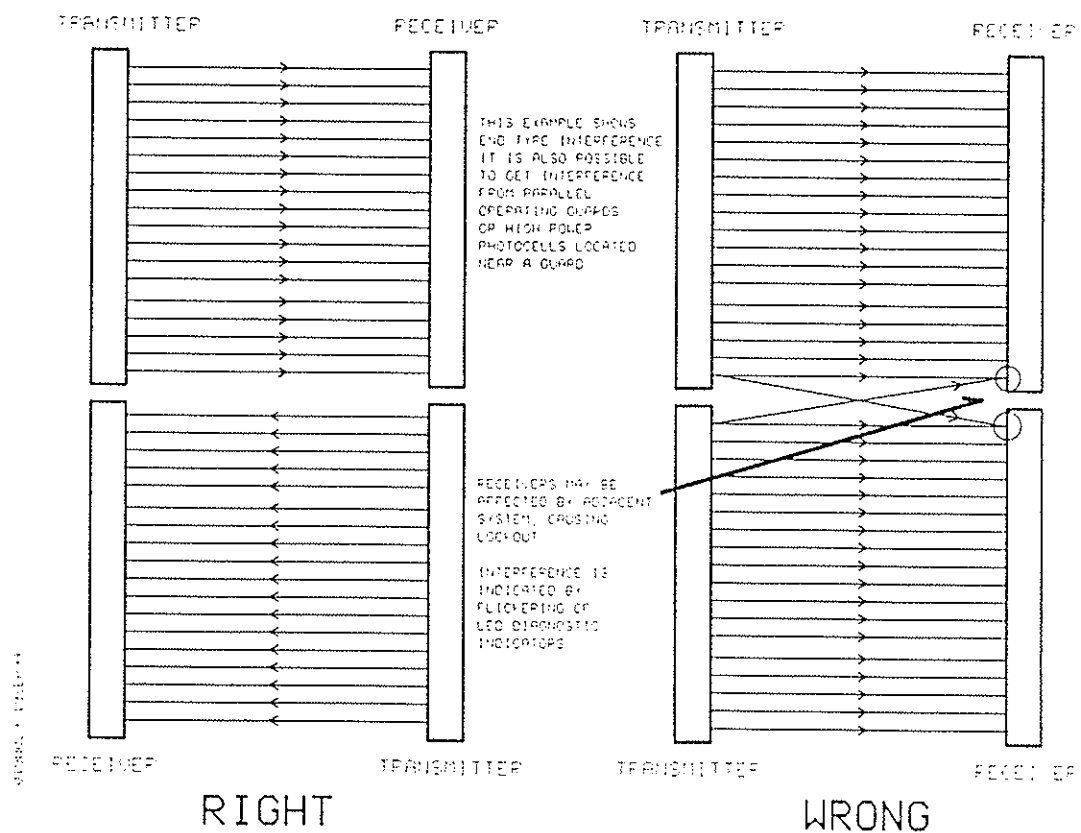
Design Procedures (refer to Figure 13)

## 5.4 Multiple light curtains

If a number of light-curtains are operating in close proximity to each other steps should be taken to avoid the effects of cross-talk between the light curtains. The effects of interference from stray transmitted infra red energy from one light curtain entering the receiver unit of a light curtain in close proximity may cause a lock-out condition. To minimise such problems light curtains operating in close proximity to each other should be positioned as shown below in figures 18 and 19.

Figure 18

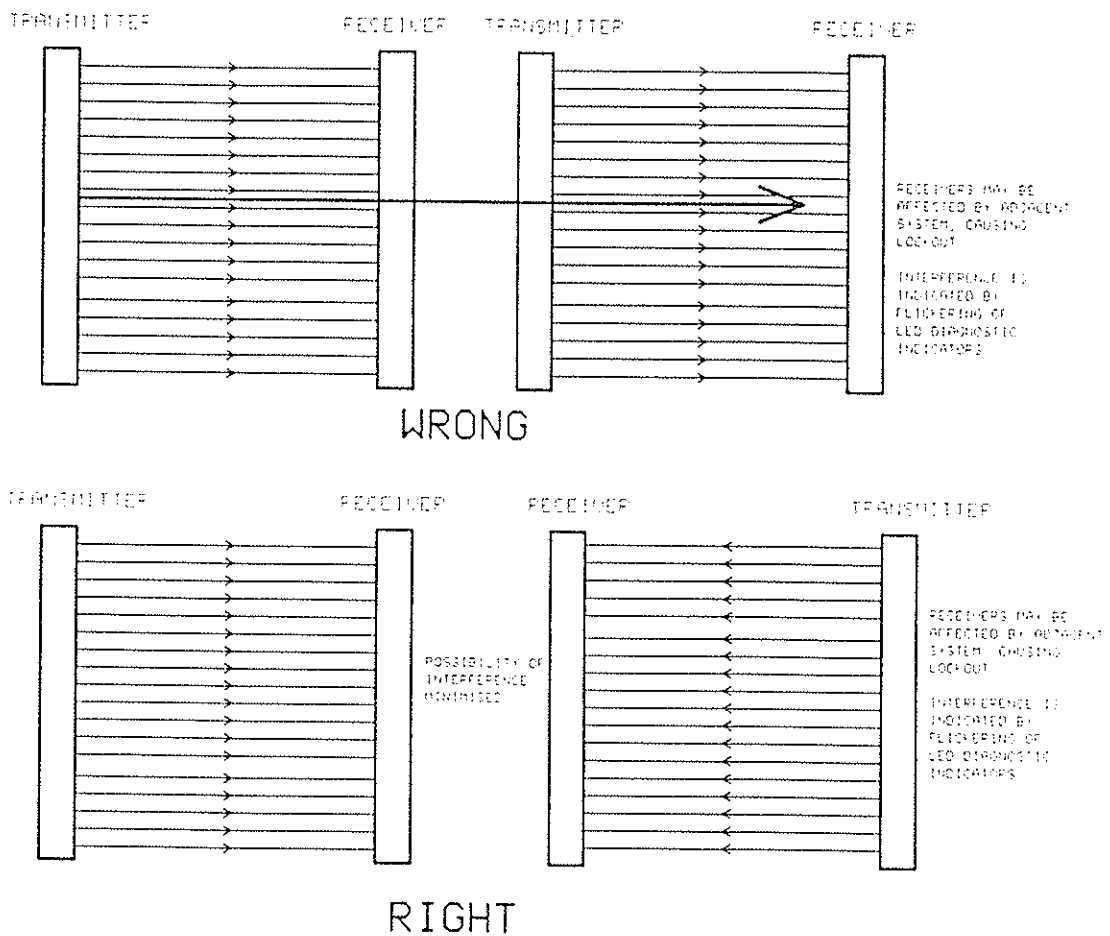
RECOMMENDED POSITIONING OF ADJACENT GUARDS TO AVOID INTERFERENCE



## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Figure 19



To further reduce the likelihood of optical interference affecting operation of light curtains when mounted adjacent to each other, it is recommended that, where appropriate, screens of opaque material be suitably positioned between each light curtain.

Optical interference i.e. major changes in ambient light, can cause intermittent lock-out of the Smartscan equipment. Steps should be taken to avoid pre-set threshold levels of the Smartscan electronic system being exceeded.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

To prevent interference from high intensity lighting, or sunlight, affecting operation of the Smartscan system it is recommended the light be shielded to prevent the light energy directly entering the window of the light curtain receiver column.

### 6. Positioning the Light curtain

The light curtain must be mounted in a position that does not expose an operator to risk of injury from inadequate separation distance.

A number of points must be considered:

- the length of time the hazard, from the initial time of instruction, takes to diminish to a 'safe condition'. In the case of a machine this will be 'the stopping time'.
- the approach speed or hand speed of a person.
- the response time of the light curtain and overall safety system

Light curtains can only provide protection for machinery where the stopping time is predictable.

A Stopping Performance Monitor (SPM) may be required because either the consistency of the stopping time cannot be relied upon or the risk assessment indicates that stopping time is critical for the particular application. No facility exists for the connection of a SPM to Smartscan light curtains, but an independent SPM may be used to inhibit further machine operation if the measured stopping time exceeds the limit value.

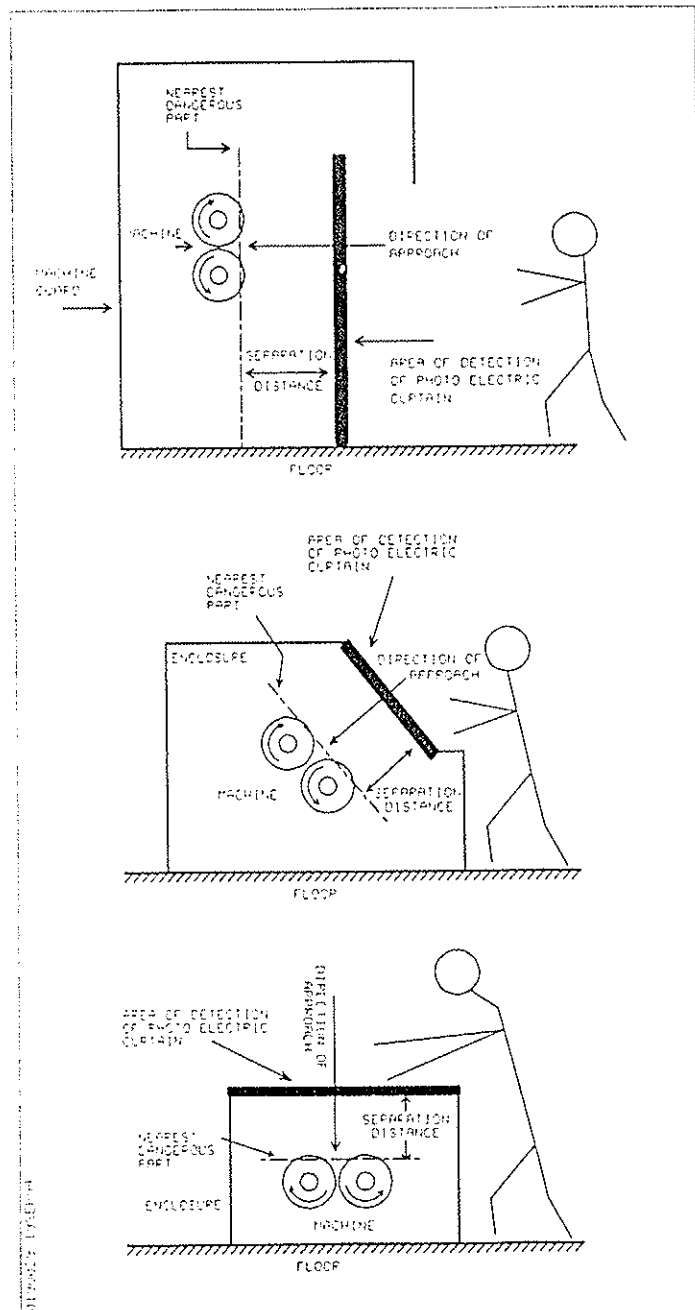
When mounting the light curtain the direction from which the person is approaching the machine must also be considered:

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

NORMAL APPROACH - where the area of detection of the light curtain is normal to the direction of approach.

Figure 20



## SMARTSCAN 5000 SERIES LIGHT CURTAINS

The light curtain should be positioned in accordance with the normal practices for an application or according to published guide-lines if they exist. Refer to prEN999. If children are at risk, do not use the values given. Seek specialist advice.

Note: For high speed, continuously operating or cyclic machines, e.g. mechanically operated friction clutch power presses, where there is often a very high level of risk, it may be appropriate to consider taking expert advice before proceeding.

Figure 21 - PARALLEL APPROACH - where the area of detection is parallel to the direction of approach.

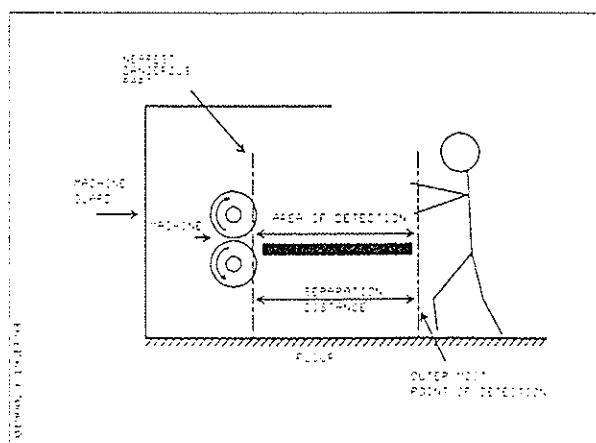
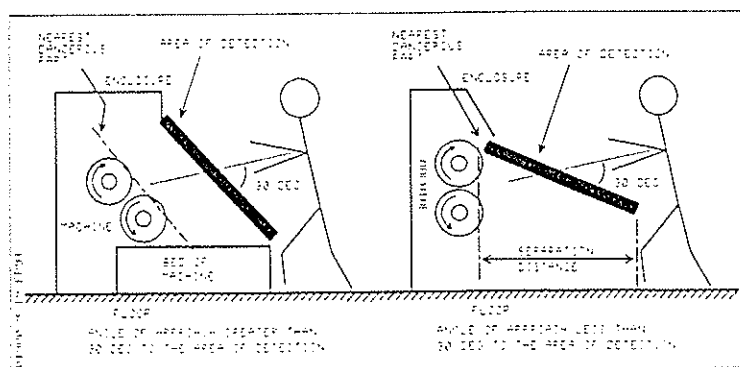


Figure 22 - ANGLED APPROACH - where the area of detection is not normal, or parallel to the direction of approach.



## SMARTSCAN 5000 SERIES LIGHT CURTAINS

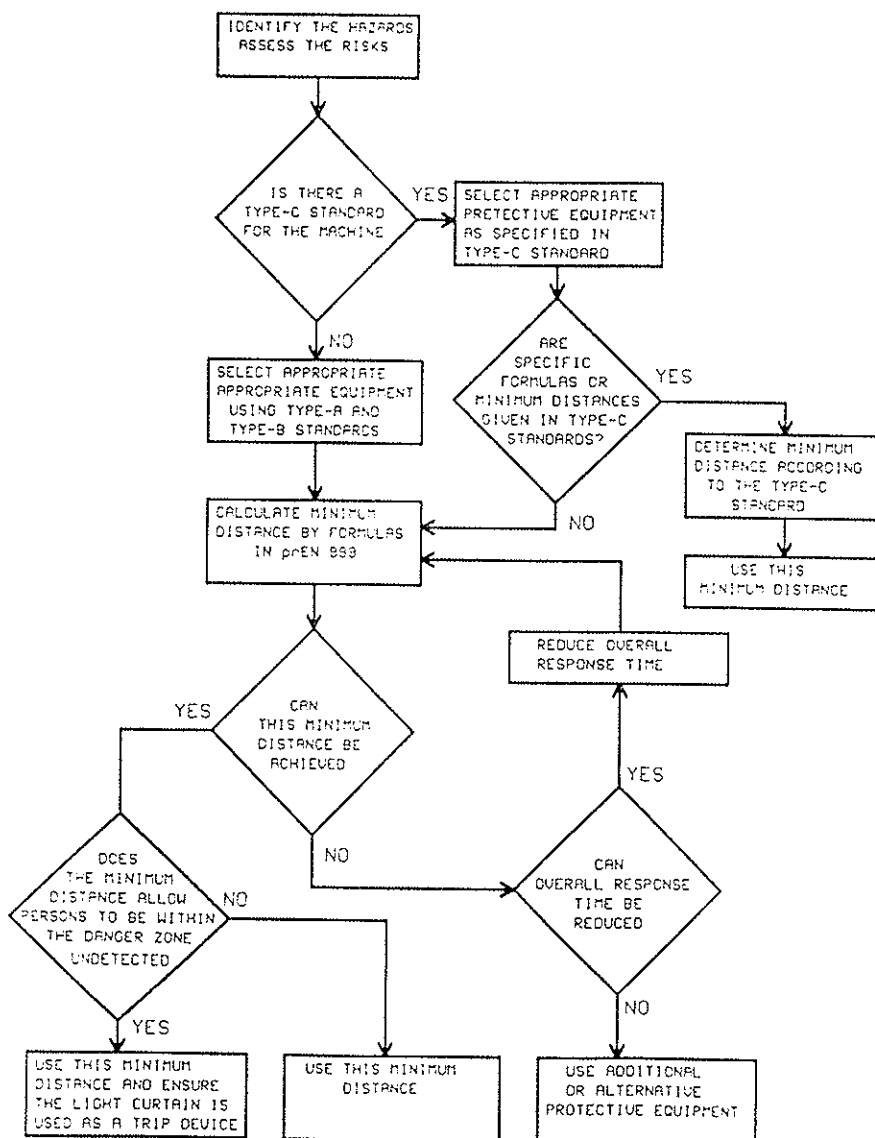
Design Procedures (refer to Figure 13)

If the mounting angle of the light-curtain is closer to the vertical axis calculate as for a normal approach light curtain.

If the mounting angle is closer to the horizontal axis calculate as a parallel approach light-curtain.

Figure 23

SCHEMATIC OF METHODOLOGY - for positioning of the light curtain.



SCHEMATIC OF METHODOLOGY

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

## POSITIONING THE CONTROLS

It is imperative that operator controls are mounted in such a position that they cannot be operated from inside the safeguarded area.

When the light curtain is used as a trip device, (eg perimeter guard) it is essential that there is a full view of the whole of the guarded area from the operator position from which the machine can be re-started. In some applications additional viewing aids may be required, eg mirrors, CCTV.

### 7. Mechanical Guarding

Mechanical guarding should be designed and positioned according to EN294, pr EN811 and prEN953.

### 8. Light Curtain/Machine Interface

BS6491 compliant installations must meet all the requirements of BS6491 Part 1 1984, AMD 5185 1987 and BS6491 Part 2 1987. These requirements take precedence over the information given below. Only 5000 Series models without AP in the model number may be used for BS6491 installations and must be used in combination with an AC power supply unit Model Number 5000PS.

In all cases aspects of interfacing must be considered:

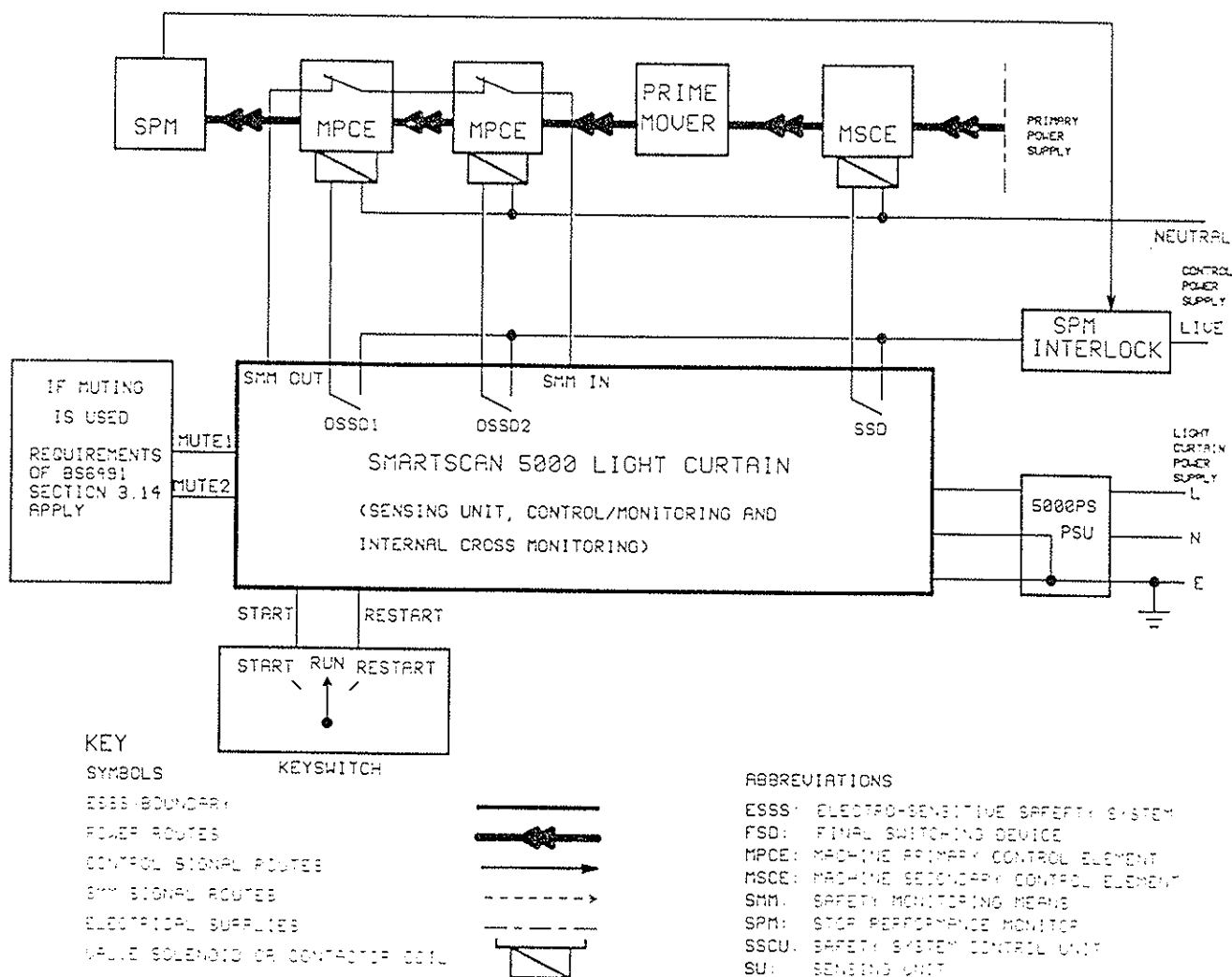
- (i) the outputs from the light curtain which stop the machine and inhibit the machine during lock-out.. This aspect is critical for safety.
- (ii) the manual or automatic inputs which are required for start up and operation.
- (iii) the status output (if applicable).
- (iv) Muting. This aspect is critical for safety.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Figure 24 - Schematic example of BS6491 compliant 5000 Series light curtain/machine interface using an external SPM.

Figure 24



BLOCK DIAGRAM OF SMARTSCAN ELECTRO-SENSITIVE SAFETY SYSTEM ILLUSTRATING TYPICAL APPLICATION TO MACHINE

## 8.1 Outputs

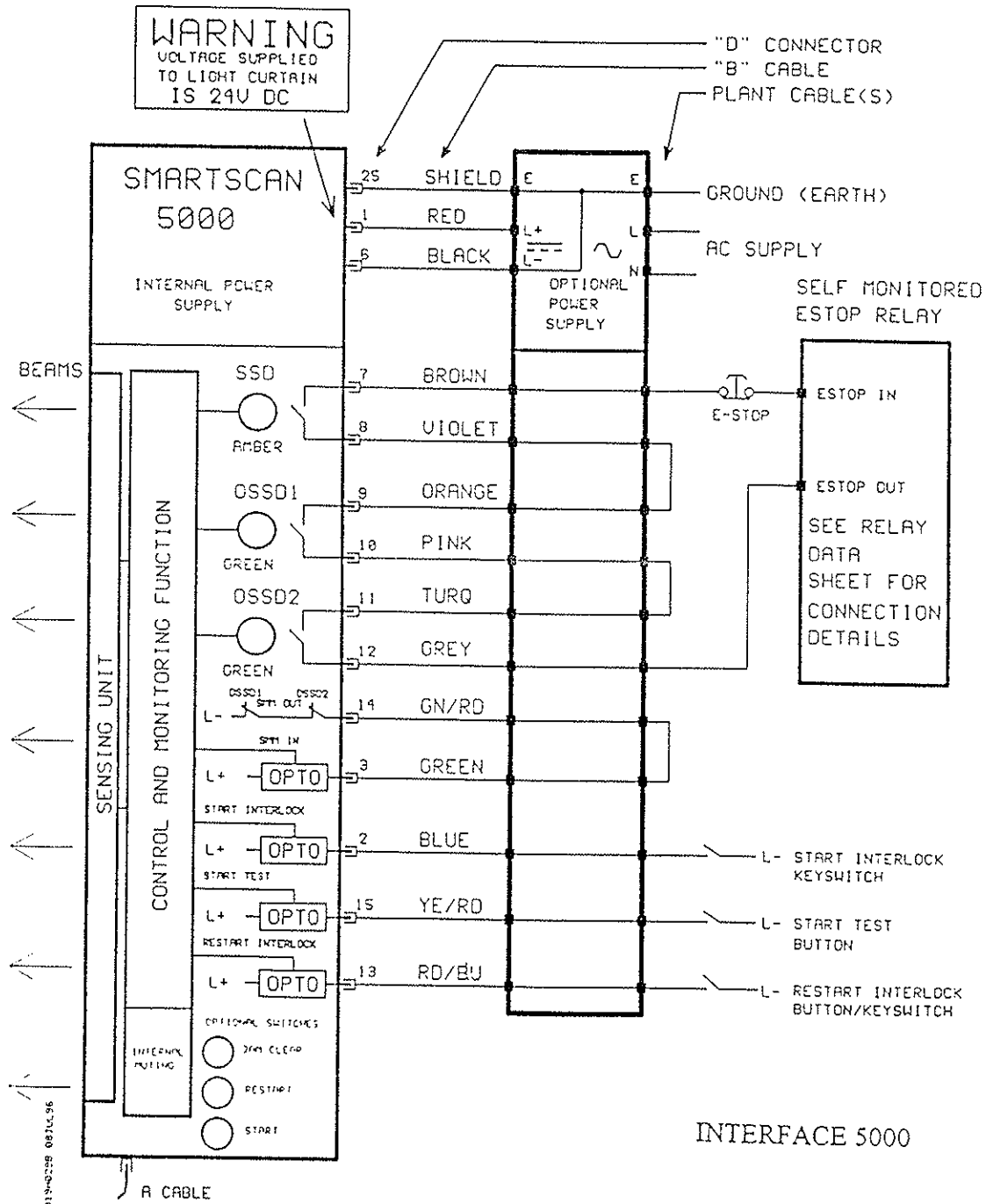
The interface between the light curtain safety outputs: SSD, OSSD1, OSSD2 and the machine control circuit needs to be designed to achieve a level of safety performance appropriate to the application. The required fault resistance of the machine stopping circuits and other safety related control circuits is related to the risk. BS6491 installations must be configured as required by this Standard, an example is given in Figure 21. For other cases prEN954-1 explains the principles involved and prEN954-2 provides information on validation of the control system. Examples of machine interfaces in line with current application practice for machines having different levels of risk are given below:

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

## Example 1

Figure 25 - Smartscan 5000 series system - assessed for low/medium risk application (refer to section 10.3)

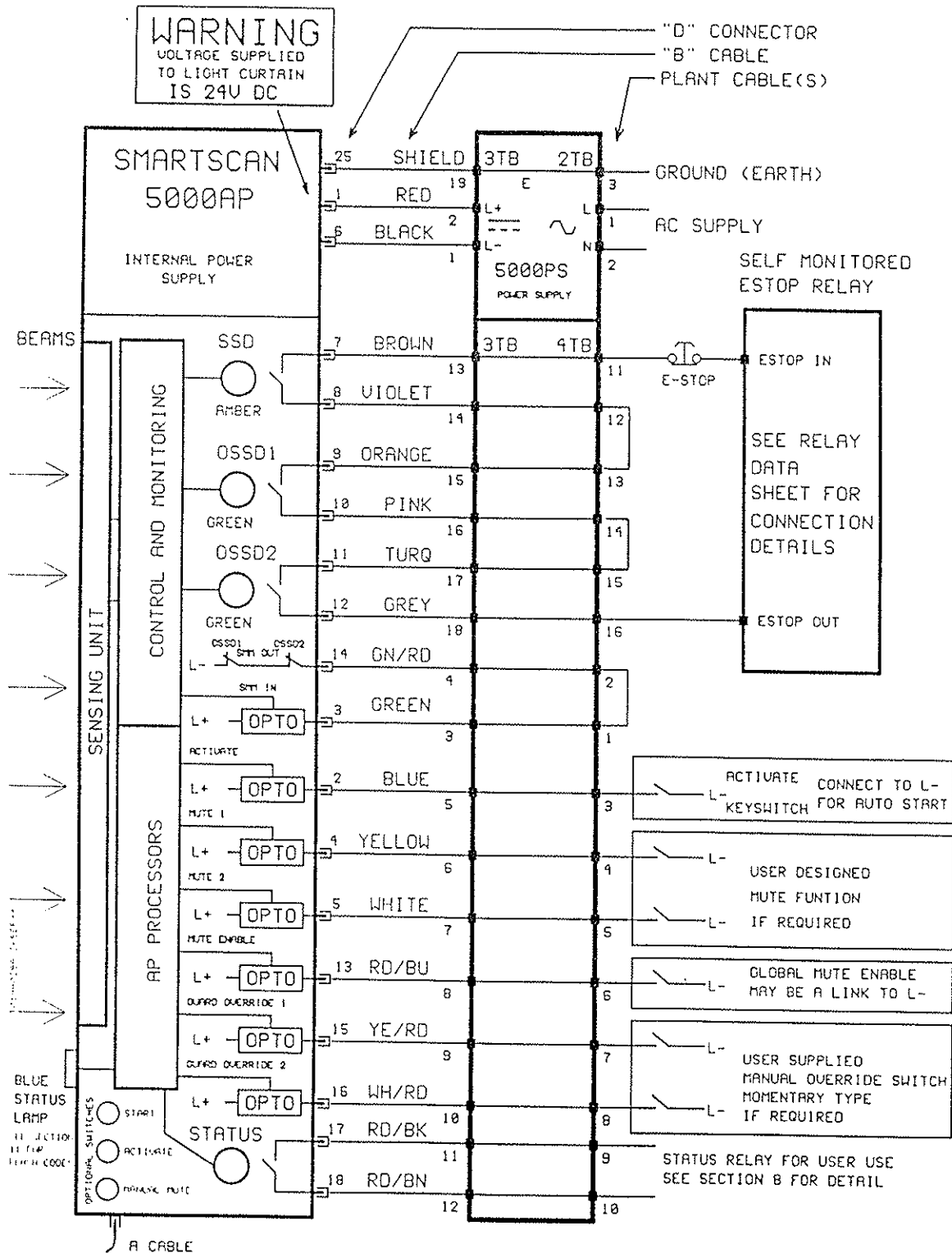


# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

## Example 2

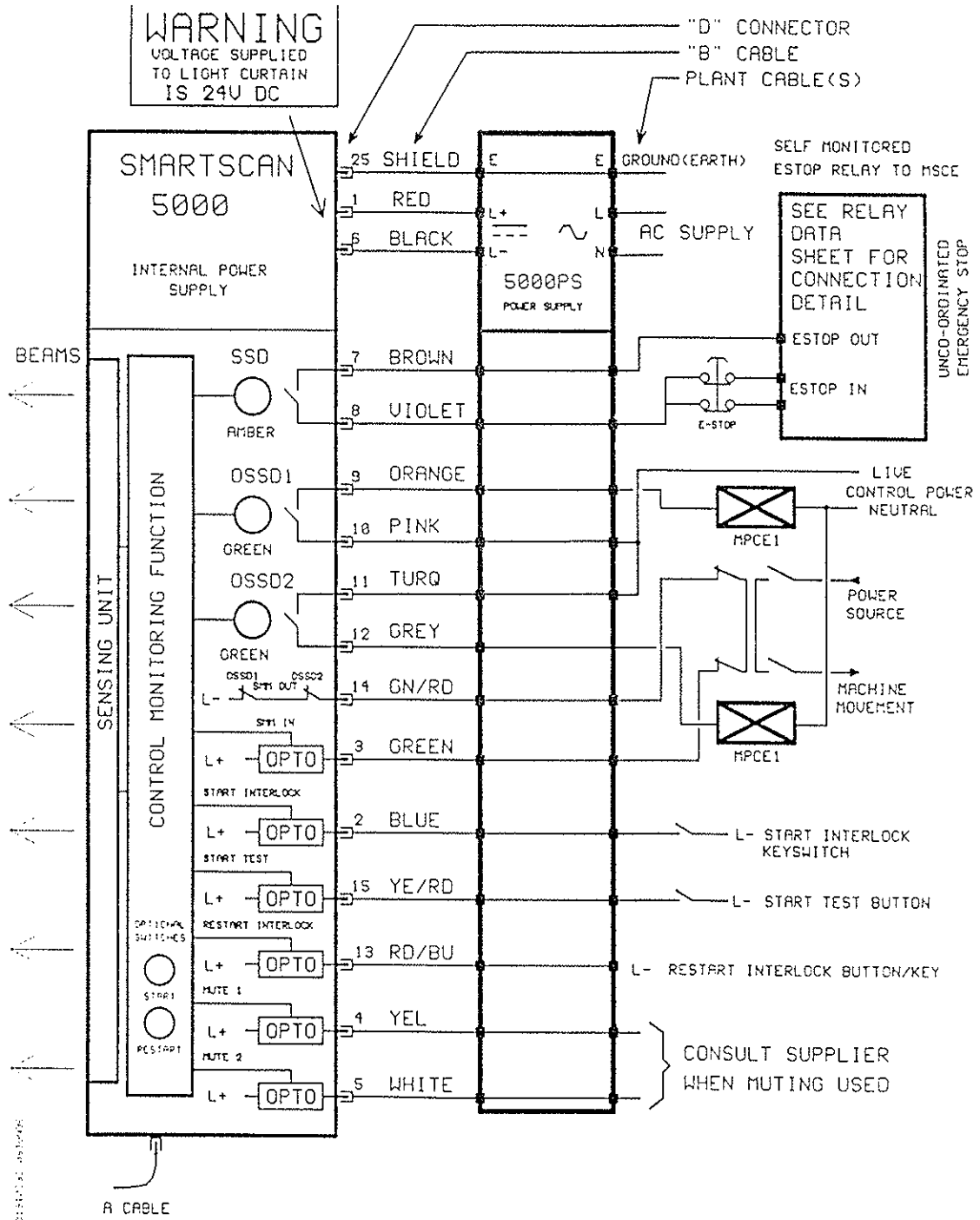
Figure 26: Smartscan 5000AP system assessed for low/medium risk application (refer to section 10.3)



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## Example 3

Figure 27: Smartscan 5000 system assessed for medium/high risk application (refer to 10.3)

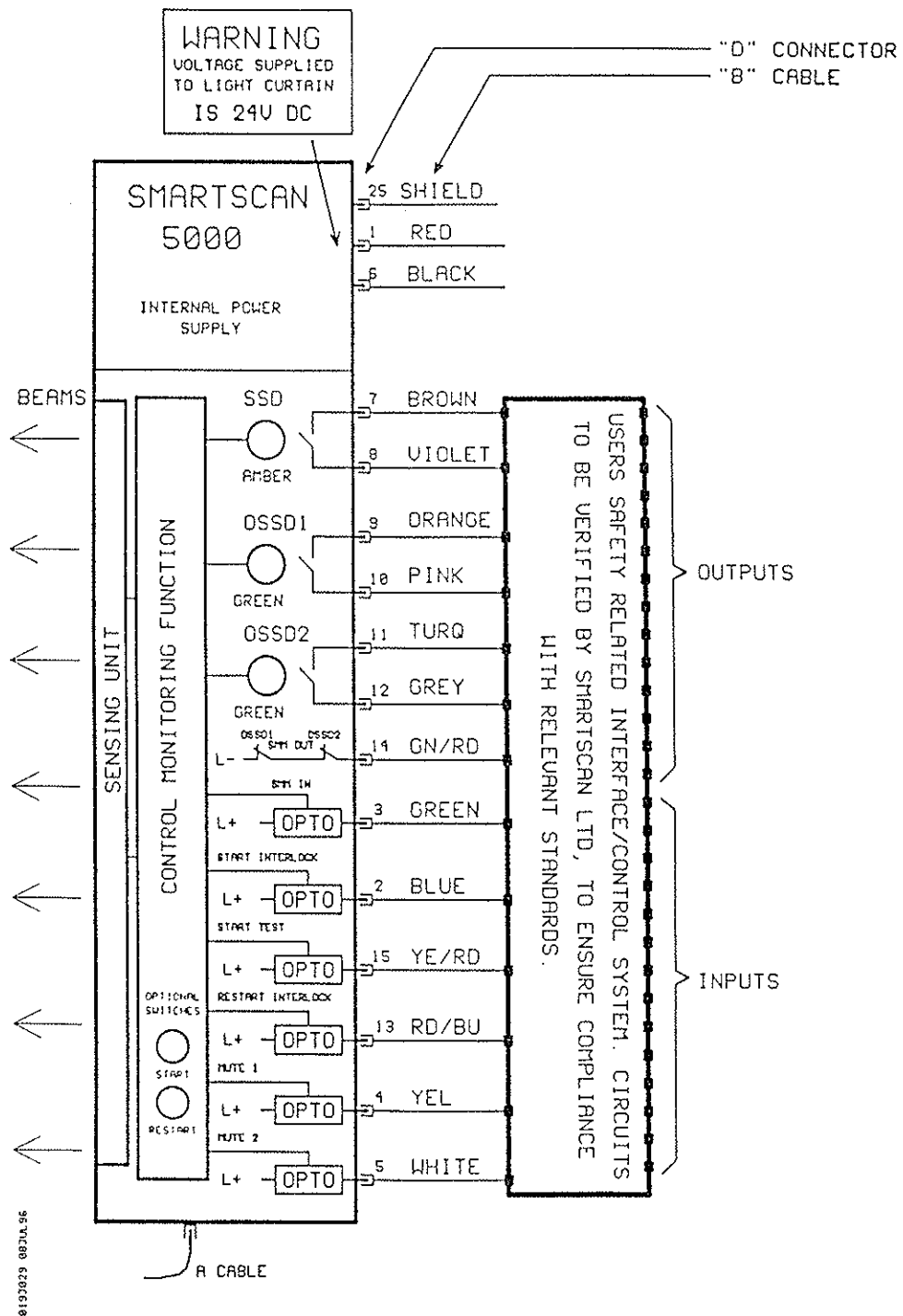


Note : If relay(s) are employed as machine primary control elements (MPCE) then the relay(s) must have positive guided contacts.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Figure 28: Smartscan 5000 system assessed for high risk application (refer to 10.3)



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Take special measures when designing safety systems for machinery defined in Annex 4 of the Machinery Directive. These machines generally require complex safety monitoring functions and as such the Smartscan system must be installed only by fully qualified and experienced personnel.

All AC or DC loads driven by the safety outputs should be suppressed. Fit suppressers across the loads and never across the contacts. Ensure that the specifications for the relay/contactors coils, supply voltage, output contacts and suppresser devices are mutually compatible. Note that diode suppressers slow down the drop-out of DC relays. Varistor or RC suppressers may be used on either AC or DC loads. Suppressers should be placed near to the load and connected with flexible wire to prevent open circuits caused by relay vibration.

## 8.2 Input Controls

Inputs to the light curtain may be from manual controls (keyswitches or pushbuttons) or from the machine control system. The correct solution can only be determined from a detailed study of the specific application.

Notes:

1. Two different interfaces are available. See Section 9.
2. Remote control units and accessory boxes incorporating key switches and push buttons are available. Refer to Section 4 and/or contact Smartscan Ltd. for further information.
3. BS6491 installations must have a keyswitch for the start and restart function. Smartscan Ltd. can supply suitable items for use with the BS6491 compliant models.

## Wiring

All cables supplied with Smartscan light curtain systems are screened and as such are immune to mains pick-up and interference spikes from adjacent cabling.

Despite this inherent immunity good practice should be employed and these signal cables should be kept separate from power wiring. Ensure that the design provides mechanical support and protection for the cables. External wiring associated with the inputs and outputs (eg to mute sources, keyswitches or buttons) should be similarly screened, by the use of screened cable, earthed conduit or trunking to ensure that EMC problems do not occur. This wiring must be kept separate from power wiring. Ensure all cabling is protected from mechanical damage and secured such that it cannot be caught by moving parts or become a trip hazard.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

## 8.3 Status Output

Only models having AP in the model number have a status output. This output must not be used in safety circuits. It is useful for signalling the machine control system or a higher level supervisory system as to the status of the light curtain.

## 8.4 Muting

Muting is a way of inhibiting the safety function of a light curtain. All Smartscan light curtains have provision for muting via external signals.

The self-muting models for entry/exit systems incorporate crossbeams to provide automatic muting when material is passing through the light curtain. In order to maintain safety, muting should be employed only when absolutely necessary and, during muting, safety should be maintained by other means.

BS6491 installations must meet the following requirements for muting:

- a muting facility should be used only if it is essential to the process currently being undertaken on the machine. When muting is not required on a particular machine, the facility should not be available.
- muting is acceptable provided that it occurs only during the time in the operating cycle when safety is maintained by alternative means;
- one or more visual indicators shall be provided, illuminated during muting. The illuminated area shall be at least 1 cm<sup>2</sup> and the brightness at least 200cd m<sup>2</sup>. Failure of a mute indicator shall prevent muting.
- the position at which muting occurs must be independent of the overall system response time and of operator intervention;
- initiation of mute shall not rely on a single electrical signal;
- initiation of mute shall not rely entirely on software signals;
- muting signals, if occurring in an invalid combination, shall ensure that the mute sequence unit does not allow a muted condition;
- when the mute is 'ON' any part of the machine still capable of dangerous movement must not be accessible through the muted light curtain;
- a minimum of two separately sourced signals, in a valid sequence are required for correct operation of the mute control / monitoring unit. These signals must be 'on' only during the 'mute' period.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Note: When operating in conjunction with a muting function equipment additional to the 5000 Series light curtains will be required to satisfy all the requirements of British Standard BS6491. Refer to sub-section 3.14 of BS6491 for further information. Only models assessed to BS6491 are to be used in BS6491 compliant installations.

Other installations need not meet the BS6491 requirements exactly, although they do represent high integrity safety practice for point of operation guarding on manually operated machines. Muting forms a part of the safety related control system of the machine and must comply with all the relevant requirements including fault resistance. The provision of visual mute indicators in perimeter guard applications may cause a reduction in safety by making deliberate by pass easier. The benefits and drawbacks associated with the provision and positioning of indicators must be considered for each application.

IMPORTANT : The mute facility should only be used in the following circumstances :

- where material being processed or transferred would actuate the light curtain during part of the cycle of operations.
- where handling of a component requires an operator to stand in a position which interrupts the light curtain.

Muting always introduces additional failure modes and possibilities for deliberate bypass into a protection system. Analysis and risk assessment will determine whether the protection is adequate for a given application and should also be used to identify any residual risks.

Mute initiating signals are often obtained from additional photo-electric sensors, limit switches, proximity detection devices or process signals derived from within the machine control system. The Smartscan mute control / monitoring function has been specifically developed to provide flexible control and high integrity monitoring of these signals.

## Self Muting Light Curtains for Entry/Exit Systems

Smartscan 5000AP 'entry/exit' light curtains types L & T are for mounting across conveyors on which products pass into, or out from a hazardous area. Additional 'mute' initiating sensors within the light curtain are positioned to detect objects and differentiate between the shape of a specific product and the shape of a person, effectively inhibiting operation of the light curtain during the periods when products are passing through the intangible barrier, but would stop the machine should a person attempt to pass through the light curtain.

Self muting curtains must be correctly selected and fitted. It is imperative that the cross-over point of the crossbeams is on the 'danger' side of the light curtain. L models are unsuitable for material inflow (entry) points.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Figures 29 and 30 describe Smartscan systems and the position of the mute initiating sensors for specific entry/exit applications.

Figure 29 - 'T' TYPE ENTRY/EXIT SYSTEM

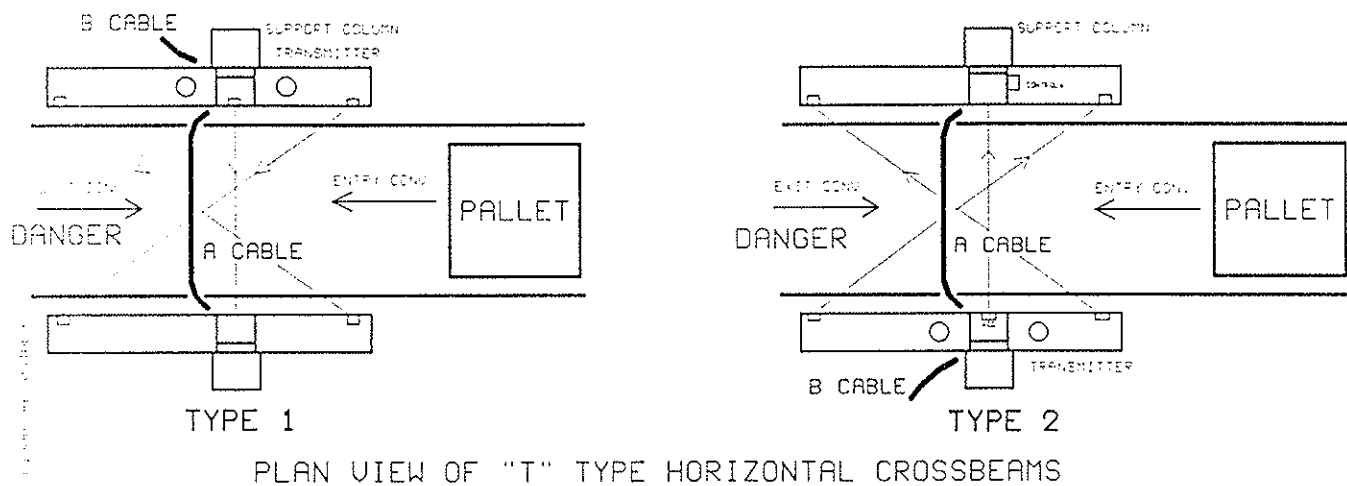


Fig 29 shows a 'T' type entry/exit light curtain normally employed to safeguard an 'INFEED' zone, or when a loaded pallet, or other recognised component is required to travel in both directions through the light curtain. The cross-beam mute sensors are positioned to scan diagonally through the light curtain.

The cross-beam sensors should be located at a suitable height above the conveyor so that the palletised load will interrupt both 'mute' beams prior to interruption of the light curtain by the load.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Figure 30 - 'L' TYPE EXIT SYSTEM

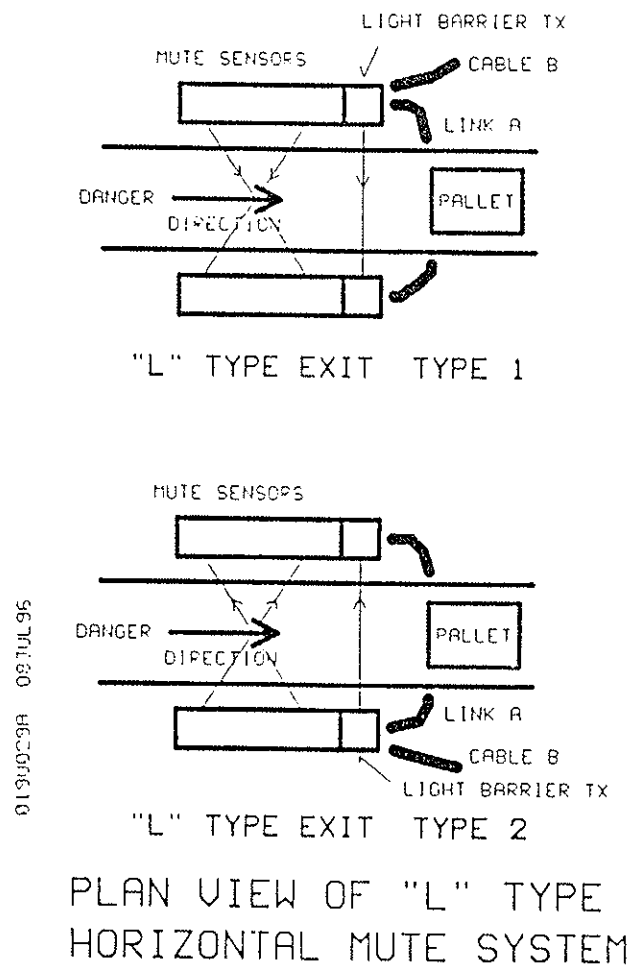


Fig 30 shows an 'L' type entry/exit light curtain normally employed to safeguard an 'OUTFEED' zone, when a loaded pallet, or other recognised component is required to travel OUT from the danger area.

The cross-beam mute sensors are positioned inside the danger zone, inside the detection field of the light curtain.

# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

Applying equally to the Smartscan entry/exit systems described, both mute initiating sensors must be obscured simultaneously by the palletised load before it enters the detection field of the light-curtain. If both sensors are obscured within a pre-set timed period then a mute condition will be established and the palletised load will pass freely through the light curtain without interruption to the machinery operating cycle. However, should either sensor fail to detect the presence of the palletised load then the machinery will STOP immediately the light-curtain is interrupted by the palletised load. All (L and T) models feature a guard override facility which is fully described in Section 8 - Operation.

## Selection of operating mode for self-muting light curtains:

APL and APT models must be used in latched mode only. AP 'straight' models must be used in latched mode if the muting inputs are used.

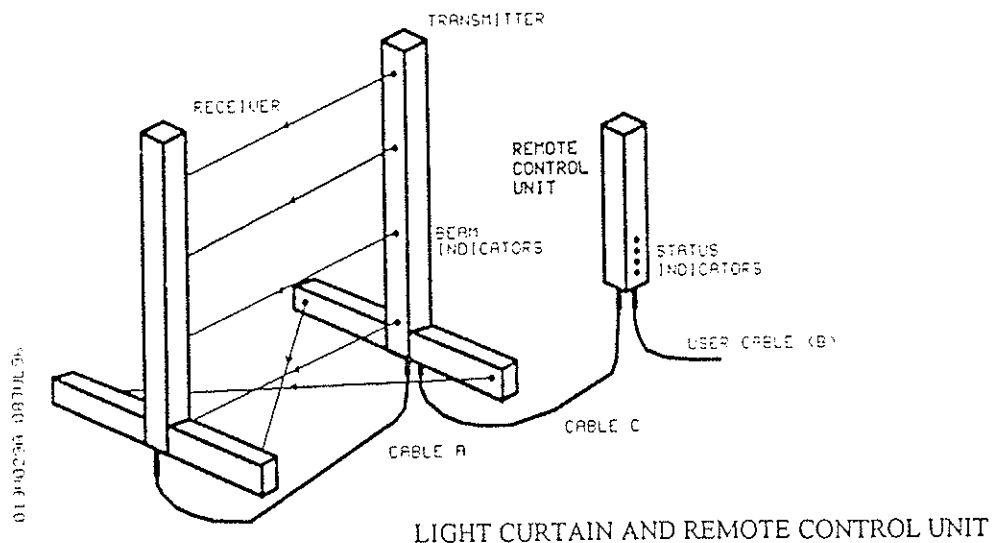
All L and T models will operate as trip devices in the overall system, because of their inherent nature as perimeter guards. Even when a latch function already exists within the machine control system, APL and APT models must be configured in latched mode. This will result in two latches, one in the light curtain, and another in the control system, but provided a common control (keyswitch or similar) is used to reset both, no difficulties will be experienced.

These requirements result from differences in the fault detection circuits employed in different models. Smartscan Ltd. will supply customer control system design engineers, on request, full details of the behaviour under fault conditions of any model, so that control systems can be designed and validated to the required category.

## Remote Control Unit

A remote control unit may be supplied with the Smartscan entry/exit system, to enable operation of all control functions from a remote location. Status indicators are also mounted in the remote unit. Additional plug-in cables are supplied to simplify installation of the equipment - refer to Figure 31.

Figure 31



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

## Installation and Interface Design - Important Notes - All

1. The power of the transmitted signals from the sensing unit is calibrated to operate only at a defined operating distance. The light curtain is designed not to function if the received infra-red energy is either too low or too high. This, combined with a 3.5 degree beam acceptance angle, minimises the possibility of reflective problems.
2. The scanning range of the light curtain is optimised by selection of a 'ranged' interconnection cable (A), for connection between the transmitter and receiver units. Ensure operation of the equipment is within the range marked on the tag attached to the cable. This does not apply to L and T models (see Sections 4 and 6).
3. The equipment is for operation only from a 24V DC power source. Never apply voltages to the sensing units in excess of 24V DC. If 110/230V AC operation is required, then an additional power supply module can be supplied.
4. The L-line must be connected to GROUND (EARTH).
5. The sensing unit internal power supply must not be used for connection to any other equipment.
6. Activation of inputs to the Smartscan control system are by connection of the L-volts to the appropriate signal input terminal. NEVER CONNECT SIGNAL INPUTS TO A POWER SOURCE as such action may damage the Smartscan electronic circuitry.
7. The output signal switching devices (OSSD) and secondary switching device (SSD) provide 'voltage free' relay contacts for connection to the users equipment. It is recommended that maximum loads of 500mA AC, or 100mA/110V DC or 1A/30V DC be maintained.
8. When the electro-sensitive safety system is configured to operate in the 'automatic restart' mode the output signal switching devices (OSSDs) switch from the ON-state to the OFF-state when the sensing field is interrupted. When the obstruction is removed from the sensing zone the OSSDs switch from the OFF-state back to the ON-state. If an object of smaller diameter than the sensing zone object detection characteristic is placed in the sensing zone, and passed rapidly up and down the zone, through the infra-red beams, it will be realised that the OSSDs will turn on and off with equal rapidity, in sympathy with each beam obstruction. To prevent excessive wear of the OSSDs switching contacts due to high speed changes of state, which would reduce their operating life, the Smartscan equipment is designed to go into a lock-out condition should the OSSD switching rate exceed the pre-set maximum switching frequency.
9. All AC and DC loads should be suppressed.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

Design Procedures (refer to Figure 13)

10. Proposed Design At this stage a safeguarding design exists although perhaps not yet fully detailed. Review the design and ensure all aspects have been addressed.
11. Identify New Hazards There may be new hazards associated with the safeguarding itself or with the way the safeguarding restricts access, vision or interferes with operation, including maintenance, cleaning and tool changing. Identify such hazards, including the possibilities for deliberate bypass of the safeguarding.
12. Revised Risk Assessment Repeat the risk assessment in section 10.3.
13. Are Safeguarding Objectives Met? From the revised risk assessment, it will be possible to determine if the safeguarding has achieved the objective without having created new unacceptable risks. If so proceed. If not, revisions to the safeguarding design will be necessary. Sometimes several iterations involving trial designs are needed to arrive at a satisfactory solution.
14. Identify Residual Risks Residual risks associated with light curtains generally involve optical bypass or deliberate bypass made possible by the muting arrangements. A classic example is the possibility of a person riding an empty pallet into a danger zone. Examples of measures to control residual risk are:  
  
Warning notices, written work instructions and supervision, training requirements, personnel protective equipment (PPE), information for use, prevent access by unauthorised personnel.  
  
Residual risks from other sources should also be identified.
15. Design Safeguarding Methods for Residual Risks Having identified all residual risks, the necessary additional measures should be taken to reduce them to an acceptable level. If PPE (for example, heavy gloves) has to be specified, review the effect upon operational tasks. Works instructions should reflect this. Machine design may require amendments.
16. Is the Machine Safe? At this point the machine, all aspects of its utilisation and the human factors involved should be clearly defined and a decision can be taken on the safety of the whole. If overall safety has not been achieved a re-iteration of the design cycle is required. If all is satisfactory, proceed.
17. Document Maintenance Requirements The maintenance schedule for the light curtain should be integrated into that for the whole machine, as far as is practicable. BS6491 installation must have maintenance at six monthly intervals maximum. Other installations may vary the period so long as the nature and frequency of inspection and testing remains commensurate with the intended risk reduction.

## **SMARTSCAN 5000 SERIES LIGHT CURTAINS**

Design Procedures (refer to Figure 13)

18. Document Information for Use Information for use of the light curtain, once installed, will be derived from the information in Section 8, adapted and modified to suit the specific application.
19. Document Installation and Commissioning Installation and commissioning needs to be planned and both material and people scheduled. The requirements for correct installation of the light curtain are given in Section 11. The drawings, hardware, interconnection schemes, will be derived from the preceding design process.
20. Are all Safety Requirements Met? Safeguarding designs should be validated by competent\*, independent persons who have not been involved in the design. This is very important for high risk situations where the consequences of a mistake or omission could be fatal.

By definition a 'competent person' is a person with theoretical knowledge, practical knowledge and actual experience of the types of machinery and protective equipment as will enable him to identify any defects or deficiencies and to assess the safety of the installation.

A 'person' may be an individual or a corporate person such as a company or partnership.

### **IMPORTANT**

Ensure that the warnings and cautions in Section 14 have all been heeded and that the design and intended use are within the limits and guidelines given.



# SMARTSCAN 5000 SERIES LIGHT CURTAINS

## 11. INSTALLATION AND COMMISSIONING

### Installation Sequence

1.      Unpacking
2.      Inspection for transit damage
3.      Match goods and paperwork
4.      Read the installation section
5.      Pre-installation checks
6.      Assemble material and personnel
7.      Mechanical installation
8.      Wiring
9.      Light curtain check-out
10.     External equipment checkout
11.     Final inspection and system functional tests

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

### 1. Unpacking

Remove all packing material and retain it. Locate and keep the Delivery Note.

### 2. Inspect for Transit Damage

Inspect all items for transit damage. Notify the carrier and supplier immediately if any damage is found and do not proceed further.

### 3. Match Goods and paperwork

Check the physical goods correspond exactly with:

- (a) the delivery note
- (b) your order
- (c) the specifications and drawings enclosed.
- (d) the items specified for the installation.

If any discrepancies are found notify the supplier and other relevant persons. Do not proceed with the installation.

Note: Light curtains and accessories must be transported in the original packing or an alternative approved by Smartscan Ltd.

### 4. Read the Installation Section

Prior to starting any work, read through the entire installation section. Anticipate any potential problems. Arrange to have the necessary tools, installation design documentation, equipment and skilled personnel at the right place at the right time. A checklist can be helpful.

### 5. Pre-installation checks

Prior to installation of the equipment it is advisable to test the operation of the Smartscan system. To aid the installer check lists have been provided and can be found at the rear of this manual.

#### Light Curtains without AP in the Model Number

- (a) Lay the two columns on a bench, or floor, positioned apart at approximately the scanning range specified. Ensure the units are positioned in-line and the entry/exit windows are facing each other. Confirm that the aluminium extrusions are not misaligned by 180 degrees in relation to each other. Check the lugs/sockets, mounted on the aluminium extrusion end-caps, are located at the same end. As further confirmation ensure that the 'Smartscan' labels, on the side of each extrusion, are in the same orientation.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

- (b) Plug-in the 'D' connectors - interconnection cable (A) - between the transmitter and receiver columns, and user cable (B). Finger-tighten the two locking screws on each 'D' connector.
- (c) Connect the RED and BLACK wires from User cable (B) to a regulated 24V DC power source, RED = L+ Volts and BLACK = L- Volts. Ensure The L- wire is connected to GROUND (EARTH). Now connect the green/red wire (SMM- OUT) together with the green wire (SMM-IN).
- (d) Turn-ON the 24V DC power supply.
- (e) Check that the light-curtain is operational. The red LED diagnostic indicators mounted adjacent to each transmitting diode should all be 'ON' - at a low brightness level. If any of the LED indicators are not illuminated or only one red LED is ON and glowing bright then check the alignment and confirm the range of the light-curtain is within the specified limits.
- (f) Assuming all red LED diagnostic indicators are 'ON' and at low brightness turn-OFF the 24V DC supply. Wait ten seconds and turn-ON the supply. Observe the amber status LED behind the exit window on the transmitter column. The amber LED should turn-ON, and approximately two seconds later should start blinking.
- (g) If the amber LED extinguishes after a short period then the Smartscan system has failed the self-test. Attempt steps (e) and (f) again. If again the amber LED does not blink then the unit may be faulty.
- (h) Assuming the amber LED is blinking then obstruct one or more of the beams in the light-curtain with a hand or an appropriate test piece for two seconds. The amber LED should now illuminate steady. The secondary switching device (SSD) should be in the ON-state.
- (i) Remove the obstruction from the light-curtain. The amber status indicator will remain ON (steady), and the red LED diagnostic indicators adjacent to each receiving diode will extinguish, apart from the LED indicator at channel 1 (at the top of the transmitter column), which will glow bright.
- (j) Turn-OFF the power source to the Smartscan unit. Now connect the red/blue wire, (RESTART INTERLOCK), to the L- Volts line. Repeat steps (d), (e), (f), (g) and (h).
- (k) Remove the obstruction from the light-curtain. The amber LED status indicator will remain ON (steady) and the green LED status indicators (1 and 2) will turn-ON (steady). The diagnostic LEDs, adjacent to each transmitting diode, will turn ON (steady and at low brightness).
- (l) Output signal switching devices (OSSD 1 and OSSD 2) are both in the ON-state.
- (m) Obstructing the sensing field of the light-curtain once more will extinguish the green status indicators (1 and 2). The amber LED will remain ON (steady). The red diagnostic LEDs will all extinguish apart from the beam obstructed. This LED indicator will glow bright until the obstruction has been removed. This change of state of the LED indicators will take place each time the light-curtain is obstructed and change again when the obstruction is cleared.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

- (n) Now remove the connection between wires SMM-IN (green) and SMM-OUT (red/green). Obstruct at least one of the beams in the light-curtain for approximately two seconds. All LED indicators on the status panel will turn-OFF, demonstrating a 'lock-out' condition. Lock-out will occur because the test function terminals (SMM IN / OUT) are now not connected. An open circuit condition at this point, between SMM OUT and SMM IN would normally indicate to the Smartscan monitoring system that a part of the users equipment has failed in some manner. Refer to Section 10 for an example of connections SMM OUT / SMM IN to user equipment.

NOTE - Following lock-out the LED diagnostic indicators adjacent to each transmitter diode will remain ON (low brightness), providing the light-curtain is clear of obstruction and SSD, OSSD1 and OSSD2 relays are in the 'OFF' state.

- (o) Turn-OFF the power supply and reconnect wires SMM-IN (green) to SMM-OUT (red/green). Also leave wire RESTART INTERLOCK (red/blue) connected to the L- Volts line. Now repeat all the procedures described in steps (d), (e), (f), (g) and (h). Upon completion of these tests remove the obstruction from the sensing field of the light-curtain.
- (p) Without interrupting the power supply, or obstructing the light-curtain, carefully connect the yellow wire and white wire from user cable (B) (MUTE 1 and MUTE 2) respectively, to L-Volts (Black). The red LED status indicator (mute condition ON), should now illuminate.
- (q) At this time the red, green and amber LED status indicators should all be 'ON'. Now interrupt the sensing field of the light-curtain. The red, green and amber LED status indicators will remain 'ON', indicating that the mute function is operational - the sensing function is inhibited.

If all functional tests as described above have been completed satisfactorily the Smartscan system is functioning as intended.

Now turn-OFF the power supply, disconnect all wires and make ready for installation.

If the Smartscan system does not function as described above it is advisable to undertake the entire procedure again to ensure the sequence of tests were undertaken correctly.

If after a second attempt the equipment fails any of the tests then check to ensure the 'D' connector plug and sockets are correctly located.

If there appears to be a problem associated with the interconnection cables then the wiring between 'D' connectors on Cable (A), and 'D' connector to wire ends on Cable (B) can be tested for continuity.

If no solution can be found to the failure of the pre-installation tests then contact the Customer Services department or return the equipment to the supplier for inspection.

**Note that the Smartscan equipment has no user serviceable parts and therefore no attempt should be made to remove the aluminium extruded housings from either the transmitter or receiver units.**

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

- (J) Obstruct the sensing field of the light curtain. The amber LED status indicator will remain on (steady) and the two green LED status indicators will turn off. The red LED diagnostic indicators will turn 'off' apart from the LED indicator of the blocked beam which will glow bright.
- (K) Remove the obstruction to the sensing field. The status LED indicators will remain unchanged. The red LED diagnostic indicators remain off and Beam 1 (at the top of the transmitter column) will glow bright.
- (L) Turn off the power source to the Smartscan unit. Now connect the blue wire (activate) to the L-Volt line. Repeat (A) to (J) again.
- (M) Remove the obstruction from the light-curtain. The amber LED status indicator will remain ON (steady) and the green LED status indicators (1 and 2) will turn-ON (steady). The diagnostic LEDs, adjacent to each transmitting diode, will turn ON (steady and at low brightness).
- (N) Output signal switching devices (OSSD 1 and OSSD 2) are both in the ON-state.
- (O) Obstructing the sensing field of the light-curtain once more will extinguish the green status indicators (1 and 2). The amber LED will remain ON (steady). The red diagnostic LEDs will all extinguish apart from the beam obstructed. This LED indicator will glow bright until the obstruction has been removed. This change of state of the LED indicators will take place each time the light-curtain is obstructed and change again when the obstruction is cleared.
- (P) Turn off the power supply and reconnect wires SMM-in (green) to SMM-out (red/green). Now repeat the procedure described in (L).
- (Q) Remove the obstruction to the light curtain and without interrupting the power supply, or obstructing the light curtain, carefully connect the yellow, white and red/blue wires from user cable (B) (mute1, mute 2 and mute enable) respectively, to L-Volts (black). The red LED status indicator should now illuminate.
- (R) At this time the red, green and amber LED status indicators should all be 'ON'. Now interrupt the sensing field of the light-curtain. The red, green and amber LED status indicators will remain 'ON', indicating that the mute function is operational - the sensing function is inhibited.

For Self-Muting AP systems follow the pre-installation guide (A) to (R) plus additionally:

- (S) Assuming the light curtain is in 'active' state with SSD, OSSD to 'ON' state. Connect the mute enable wire (RD/BU) from the user cable B to L-Volts.
- (T) Obstruct one of the crossbeams with a hand or appropriate test piece. After a delay of approximately two seconds, the amber LED status indicator will remain 'ON' and the two green LED status indicators will turn-OFF.

## SMARTSCAN 5000 SERIES LIGHT CURTAINS

For AP Light Curtains, follow the procedure outlined below:

- (A) Prior to installation of the equipment it is advisable to test the operation of the Smartscan system. To aid the installer check lists have been provided and can be found at the rear of this manual.  
  
Lay the two columns on a bench, or floor, positioned apart at approximately the scanning range specified. Ensure the units are positioned in-line and the entry/exit windows are facing each other. Confirm that the aluminium extrusions are not misaligned by 180 degrees in relation to each other. Check the lugs/sockets, mounted on the aluminium extrusion end-caps, are located at the same end. As further confirmation ensure that the 'Smartscan' labels, on the side of each extrusion, are in the same orientation.
- (B) Plug-in the 'D' connectors - interconnection cable (A) - between the transmitter and receiver columns, and user cable (B). Finger-tighten the two locking screws on each 'D' connector.
- (C) Connect the RED and BLACK wires from User cable (B) to a regulated 24V DC power source, RED = L+ Volts and BLACK = L- Volts. Ensure The L- wire is connected to GROUND (EARTH). Now connect the green/red wire (SMM- OUT) together with the green wire (SMM-IN).
- (D) Turn-ON the 24V DC power supply.
- (E) Check that the light-curtain is operational. The red LED diagnostic indicators mounted adjacent to each transmitting diode should all be 'ON' - at a low brightness level. If any of the LED indicators are not illuminated or only one red LED is ON and glowing bright then check the alignment and confirm the range of the light-curtain is within the specified limits.
- (F) Assuming all red LED diagnostic indicators are 'ON' and at low brightness turn-OFF the 24V DC supply. Wait ten seconds and turn-ON the supply. Observe the amber status LED behind the exit window on the transmitter column. The amber LED should turn-ON, and approximately two seconds later should start blinking.
- (G) If the amber LED extinguishes after a short period then the Smartscan system has failed the self-test. Attempt steps (E) and (F) again. If again the amber LED does not blink then the unit may be faulty.
- (H) Assuming the amber LED is blinking, apply signal to the 'ACTIVE' input either by key switches (if supplied with the light curtain) or by connection of the blue wire to L-Volts momentarily.
- (I) Wait for approximately six seconds. The light curtain will automatically start up from the lock-out stage to SSD and OSSD, and to the 'ON' state.