

1 OPERATION MANUAL

Section

2

Version 6.2003

CLA 20mm 4 WIRE SYSTEMS

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1.1 INTRODUCTION:

The SIGRA CLA system of Photoelectric Light guards is a further refinement of this unique and innovative concept in light curtain technology, suitable for guarding a variety of powered machines which can be stopped at any portion of a dangerous stroke, with an electrical signal. Two identical Transceiver Bars are used to establish an invisible "curtain" of light between them. A Controller which drives the Transceivers, processes the digital signals from the transceivers and other interlock switches/devices, and provides

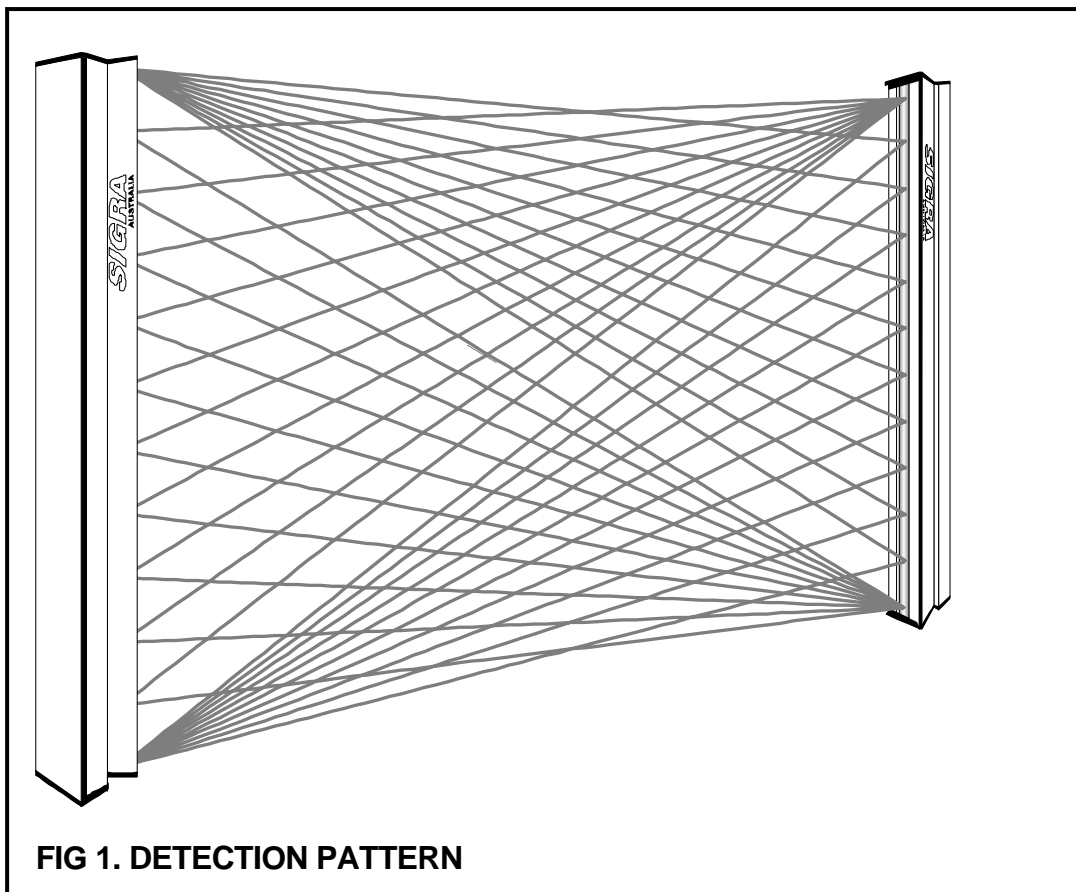
electrical outputs to the machine corresponding to "CURTAIN CLEAR" or "CURTAIN OBSTRUCTED". The CLA System Controller can run up to a maximum of 4 complete curtains.

1.1.1 PRINCIPLE OF OPERATION.

The system essentially operates on the proven through-beam, transmit/receive principle. However, as the transceiver bars are identical and each performs both transmit and receive functions, they generate the unique, invisible Safety Net pattern as shown in **FIG.1**. The area of a curtain is defined by the transceiver lens.



WARNING: SYSTEMS INSTALLED BY UNQUALIFIED PERSONS CAN BE UNSAFE. THE INSTALLER SHOULD BE FAMILIAR WITH LOCAL REGULATIONS, AND MUST READ THIS MANUAL THOROUGHLY PRIOR TO ATTEMPTING INSTALLATION.



1.2 SAFETY:

1.2.1 STANDARDS

The CLA 2 System was designed along guide-lines as defined by Australian and International standards.

1.2.2 INSTALLER.

The CLA System must be installed and commissioned by a competent installer and in a manner conforming to local Occupational Health and Safety regulations. In some states it is mandatory to advise the regulatory authorities of the installation.

1.2.3 PERIODIC CHECKS.

It is recommended that periodic checking of the Light Curtain be done as part of the normal operating procedure of the machine. For example, at the start of a shift, the operator would insert the provided test piece(s) at various positions within the guarded area to verify correct operation of the guard, machine, and interface circuitry.

1.2.4 DETAILED INSPECTION.

It is also strongly advised that regular inspections be carried out, by a competent person, of the safety systems with particular attention to mechanical wear of valves, hydraulics, and relays at intervals not exceeding six months.

1.2.5 ACCESS TO ADJUSTMENTS.

It is recommended that any keys or special tools required for access to

system adjustment or set-up be held by responsible, authorized personnel only.

1.2.6 COVERS AND DOORS.

No covers or doors are to be left opened whilst the system is in normal operation. Failure to comply with this requirement voids safety compliance.

1.3 OPERATING MODE:

1.3.1 GUARD ONLY.

The CLA System standard mode of operation is Guard Only, i.e.; any interruption of the curtain causes the output relays to de-energize and open the circuit to the MACHINE PRIMARY CONTROL ELEMENTS.

1.3.2 RESET FUNCTION.

The CLA controller provides facility for automatic or manual reset via external contacts. This reset facility can also be used for monitoring of external devices such as valve limit switches, stopping performance monitors etc.

1.3.3 MUTING.

The CLA controller provides facility for muting or by-pass of the light curtain. This can be a useful feature for automated processes where access through the curtain is required during the safe portion of a machine cycle.

1.4 SYSTEM MOUNTING PROCEDURE

1.4.1 STANDARDS

Prior to mounting transceivers, the machine to be guarded should be assessed in accordance to **AS4024.2, Sect 2**.

1.4.2 TRANSCEIVER POSITIONING.



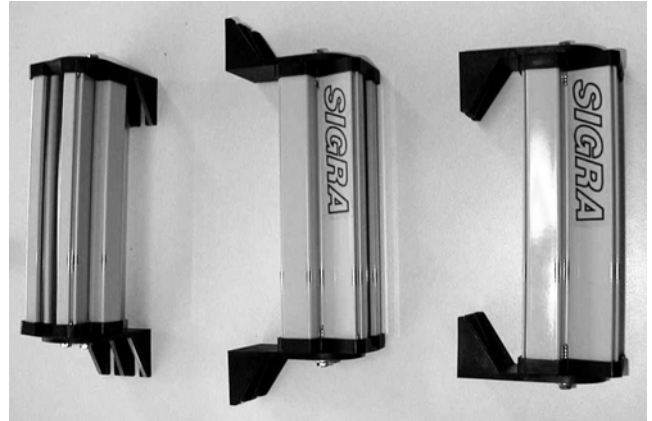
THE MINIMUM SEPARATION DISTANCE FROM THE LIGHT CURTAIN TO THE DANGEROUS PART OF THE MACHINE MUST BE CALCULATED.

Drawing 2.9.6 is a basic guide to separation distances of Sigra Light Curtains compared to total machine stopping time.

Position transceiver allowing at least 20mm clearance from the end of the mounting bracket to any obstruction for easy access. Mark the mounting holes using Transceiver with brackets fitted as a template. **Note: Transceivers must be parallel and at the same height.**

1.4.3 TRANSCEIVER MOUNTING.

Mount brackets and Transceiver, leaving locking screws loose to allow alignment. Note that brackets can be mounted with feet inwards or outwards.



1.4.4 CONTROLLER MOUNTING.

Mount controller cabinet. Be sure to retain the IP54 rating of the cabinet. Allow sufficient clearance at the front of the cabinet to allow removal of the cabinet cover and at the top and bottom to allow fitting of glands and cables.



1.5 ELECTRICAL CONNECTION OF SYSTEM COMPONENTS

The components of the Safety Light Curtain System should be mounted, wired and tested as a separate system before any connection is made to the machine control.

See **Drawing 2.9.4** (Transceiver wiring) for connecting System components.

See **Section 2.8** and **Drawing 2.9.5** (Controller wiring) for connection to machine control.

1.5.1 SAFETY



SYSTEMS INSTALLED BY UNQUALIFIED PERSONS CAN BE UNSAFE. THE INSTALLER SHOULD BE FAMILIAR WITH THE REQUIREMENTS OF LOCAL STATUTORY AUTHORITIES AND THE MACHINE TO WHICH THE SYSTEM IS BEING FITTED. READ THIS MANUAL THOROUGHLY BEFORE INSTALLATION

1.5.2 CABLE TYPE.

For any connections to Transceivers, Mute or Reset, always use screened cables with outside diameter 5 to 7mm. Use 4 core cable for transceivers, mute and reset.

1.5.3 SCREENING.

Cable screens should only be grounded at supply 0V (controller terminals 8, 16, or 26) **DO NOT EARTH.**

1.5.4 LOOSE WIRING.

Note: all loose unscreened wiring and especially mains or switched outputs should be kept away from the controller board and signal wiring to transceivers. Failure to do so may result in false tripping.

1.5.5 COLOUR CODING.

Each transceiver requires four wires from the controller, so it is strongly recommended that suggested wire colours as per **Drawing 2.9.4** be followed to ease installation, and troubleshooting.

1.5.6 PLUG ASSEMBLY.

Individual wiring of the transceivers is achieved by removing plug assembly from transceiver.

The plug can then be dismantled. The outer sheath, foil screen and drain wire should be stripped back 25mm, and the individual wires stripped back 5mm, and fitted to the screw terminals. See **FIG 2**

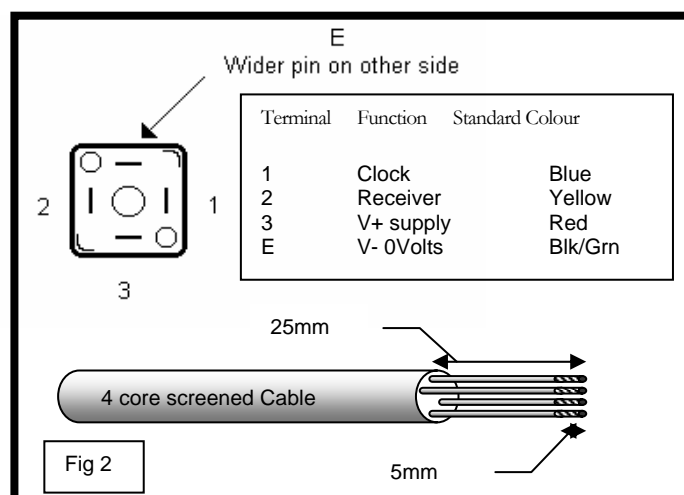


FIG 2. CABLE TERMINATION**1.5.7 CONTROLLER TERMINATIONS**

When running cable from transceivers into controller it is best to leave enough slack inside controller to enable connection to ANY of the terminals.

NOTE: Shield should not be stripped back further than 50mm from terminal block, otherwise inadequate shielding and intermittent trips may result.

1.5.8 LABELLING

Cable markings are essential, especially in multi curtain systems. Label both ends of Transceiver cables and all Transceiver cases with the Transceiver numbers supplied (A1, B1, A2, B2.....etc).

1.6 SET UP AND ALIGNMENT PROCEDURE:**1.6.1 DANGEROUS REFLECTIONS.**

Care should be taken to ensure that a curtain is established between the

Transceivers and not a "false curtain" via reflection from a third object such as a mirror. See **Section 2.7.2.** Where mirrors are intended to be used, the installer should always obtain technical advice from Sibra to ensure safe installation of equipment.

1.6.2 RESET TERMINALS.

For testing purposes, bridge reset terminals 27 - 28.

1.6.3 GREEN ALIGNMENT INDICATORS.

A green status light is provided on each transceiver, these correspond to the signal strength of the receivers at each end of the transceiver. The green status lights increase in brightness with alignment.

1.6.4 RED ALIGNMENT INDICATORS.

A red alignment indicator is provided on each transceiver. This will extinguish when both receivers on the transceiver are receiving all signals from the counterpart transceiver.

1.6.5 MULTIPLE CURTAIN SYSTEMS.



CROSS TALK BETWEEN INDIVIDUAL CURTAINS IN A SYSTEM CAN CAUSE “HOLES” IN ONE OR MORE CURTAINS.

Refer to **Fig 3** for connection details to prevent cross talk when using 2 or more curtains. When Transceivers from second, third or fourth curtains are in close proximity or line of sight, always ensure that:

-“A” transceivers can only see corresponding “B” Transceivers.

-“B” Transceivers can only see corresponding “A” Transceivers.

“A” Transceivers looking at other “A” Transceivers or “B” Transceivers looking at other “B” Transceivers do not cause cross talk.

Align A1 to B1 so that the green status leds on both transceivers are brightest. The red status indicators should extinguish on these Transceivers.

Align A2 to B2 so that the green status leds on both transceivers are brightest, at which time red status leds on these transceivers should extinguish. Continue the procedure for every curtain in the system. Once the Reset terminals are closed, the output relays will close.

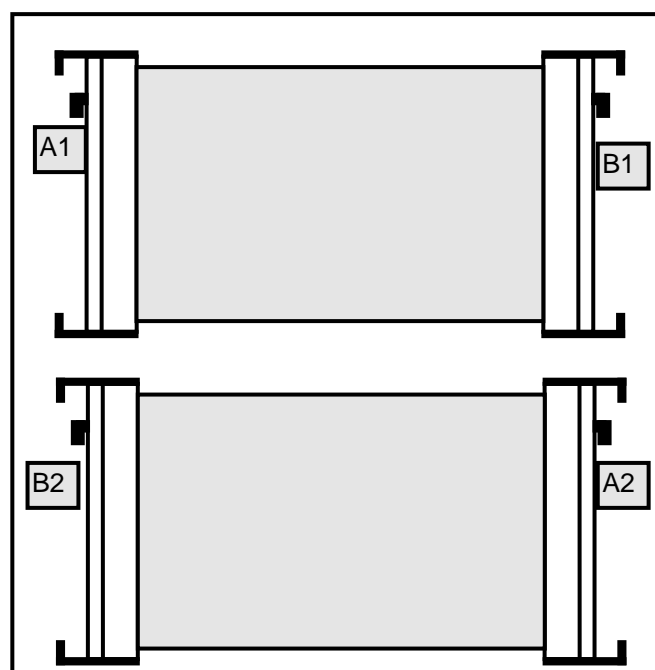
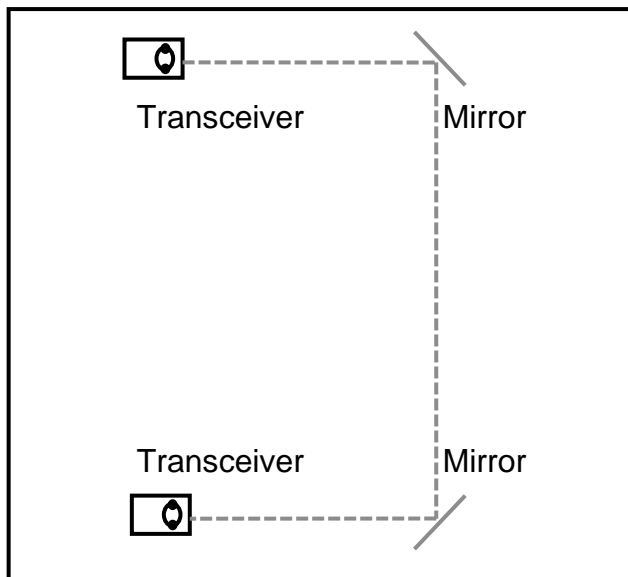


FIG.3 TWO CURTAIN SYSTEMS.

1.6.6 MIRRORS

A curtain can be established between two Transceiver Bars via a mirror. Mirrors to suit different lengths of Transceiver Bars are available from Sigra. Mirrors will attenuate the range of the curtain and care must be taken to ensure "false" curtains are not established. **See FIG 4.** The angle between arms of the reflected curtain must be greater than 90 deg. unless advice is sought from Sigra. This minimum angle prevents objects other than the mirror reflecting the curtain and creating an unsafe condition.

**FIG 4. MIRRORS**

1.7 TESTING PROCEDURE:

1.7.1 TEST PIECE

For each curtain in the system: insert the provided test piece. The output relays must remain in the off position whilst ever the correct test piece is anywhere in the curtain area. The curtain area is formed between the endcaps of each transceiver in the curtain.

1.7.2 FALSE CURTAINS.

When setting up and testing the system, be sure that a "false" curtain has not been established either by Misalignment of the Transceiver Bars or by close positioning to a reflective object. This third object may possibly be a mirror in the case of an intended reflection. Any object can reflect Infrared light under the right conditions and the protected area of the curtain may not be in the intended location or may have dead zones (holes) created within the curtain. **See Fig 5.**

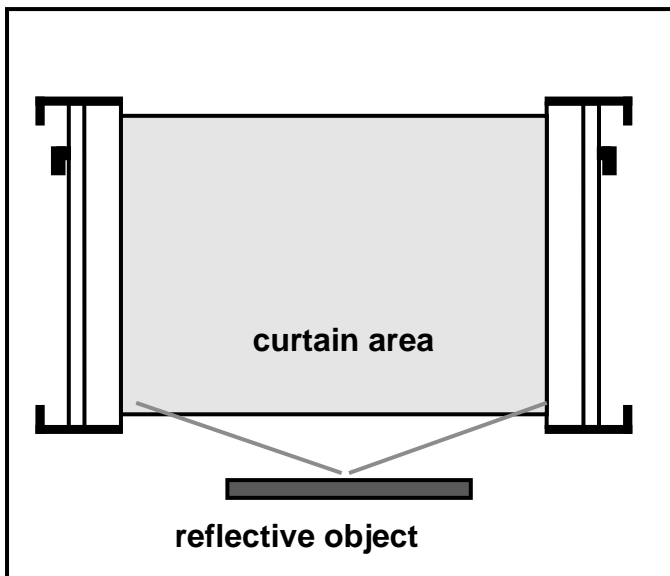


FIG 5. FALSE CURTAINS

1.8 CONNECTION TO MACHINE CONTROL



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1.8.1 SAFE INSTALLATION.

Some local Authorities require the use of two MACHINE PRIMARY CONTROL ELEMENTS, (MPCEs), each driven by separate relays (FINAL SWITCHING DEVICES, "FSD"s). The MPCEs must also be monitored for correct operation, and the overall stopping performance of the machine may need to be monitored. It is not possible to anticipate every type of installation, therefore it is essential that the installer have a good knowledge of local regulations and to interface the CLA system to the machine in conformance to those regulations.

1.8.2 CHECK OPERATION

Once the installer is satisfied that the guard is functioning correctly, connection of the machine interface can be carried out. **See Drawing 1.9.5.**

1.8.3 OUTPUT

Two output relays are provided OUT 1 and OUT 2. Terminals 19 – 20 and 21 – 22 are both normally open contacts.

1.8.4 INDUCTIVE FLYBACK.

When switching inductive loads e.g.; contactors, solenoids etc.. arc suppressors should be used across the inductive load to preserve contact life. **NOT ACROSS THE RELAY CONTACTS (refer FIG.5).** SINGLE LOOP CONTROL.

Where local regulations do not require two separate MACHINE PRIMARY CONTROL ELEMENTS and your machine control does not have facility for two separate inputs, you must provide a series link from terminal 20 to 21 and can then consider this arrangement as a single relay.

1.8.5 MUTE CONNECTION.

The **MUTE** function is available by shorting terminals 28 - 29 and 28 - 30 e.g.; via spare contacts on limit switches etc. **AS 4024.2** requires mute selection to be by key operated switch which is to be supplied by the installer.

1.8.6 STOPPING PERFORMANCE MONITORING

May be required on certain applications, see **Section 1.8.1.**

1.8.7 AUXILIARY RELAY

The outputs of this relay will operate whenever the light curtain is broken even if muted.

1.8.8 CONTROLLER LED INDICATORS

There are several indicators on the control board, they indicator the following:

LED 1 Light curtain obstructed Red

LED 2 Light curtain obstructed Red

LED 9 Light curtain obstructed Red

LED 3 Output relay energized Green

LED 4 Output relay energized Green

LED 5 Mute on Amber

LED 6 Mute on Amber

LED 7 Output relay denenergized Red

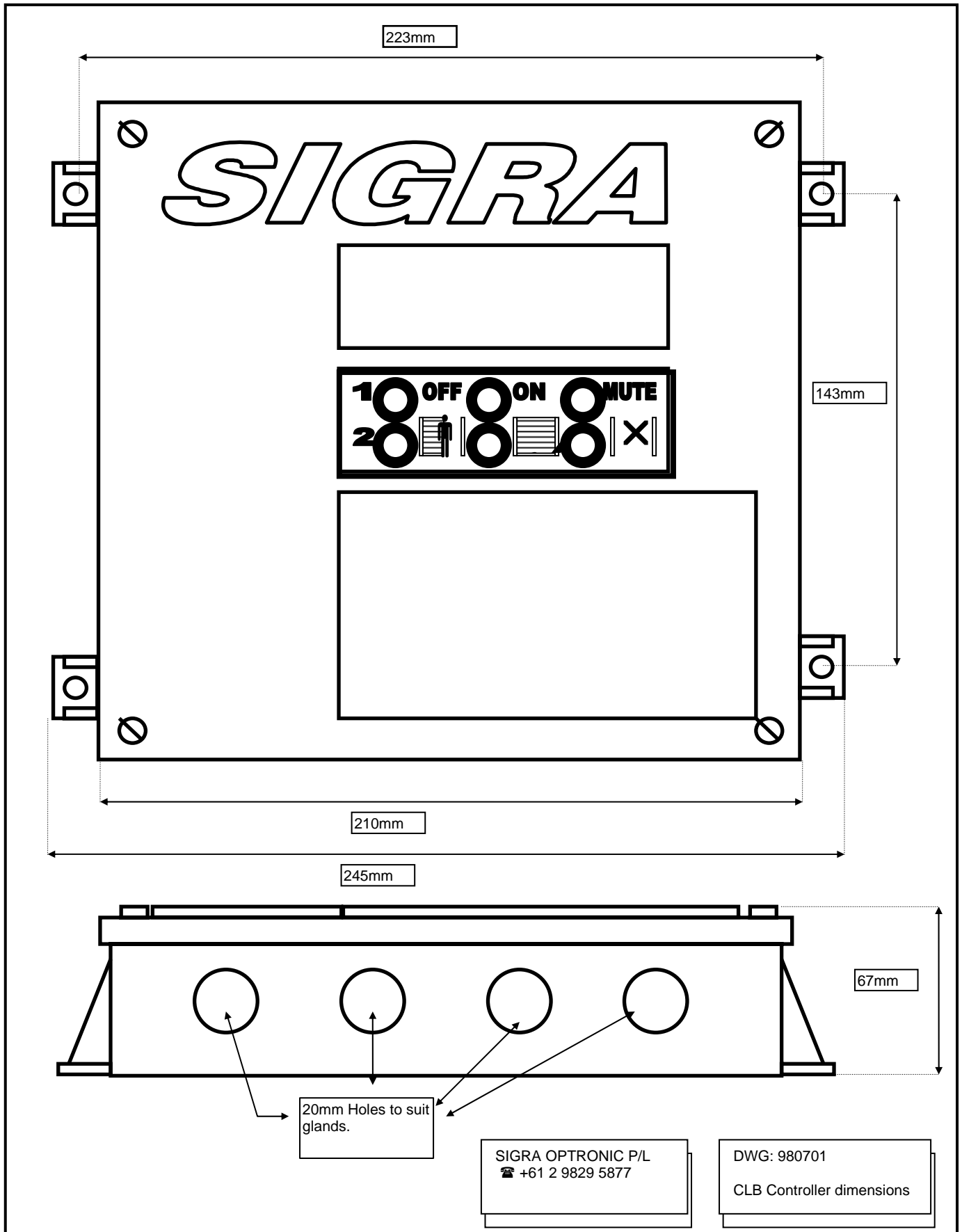
LED 8 Output relay denenergized Red

LED 10 Auxiliary relay denenergized Red

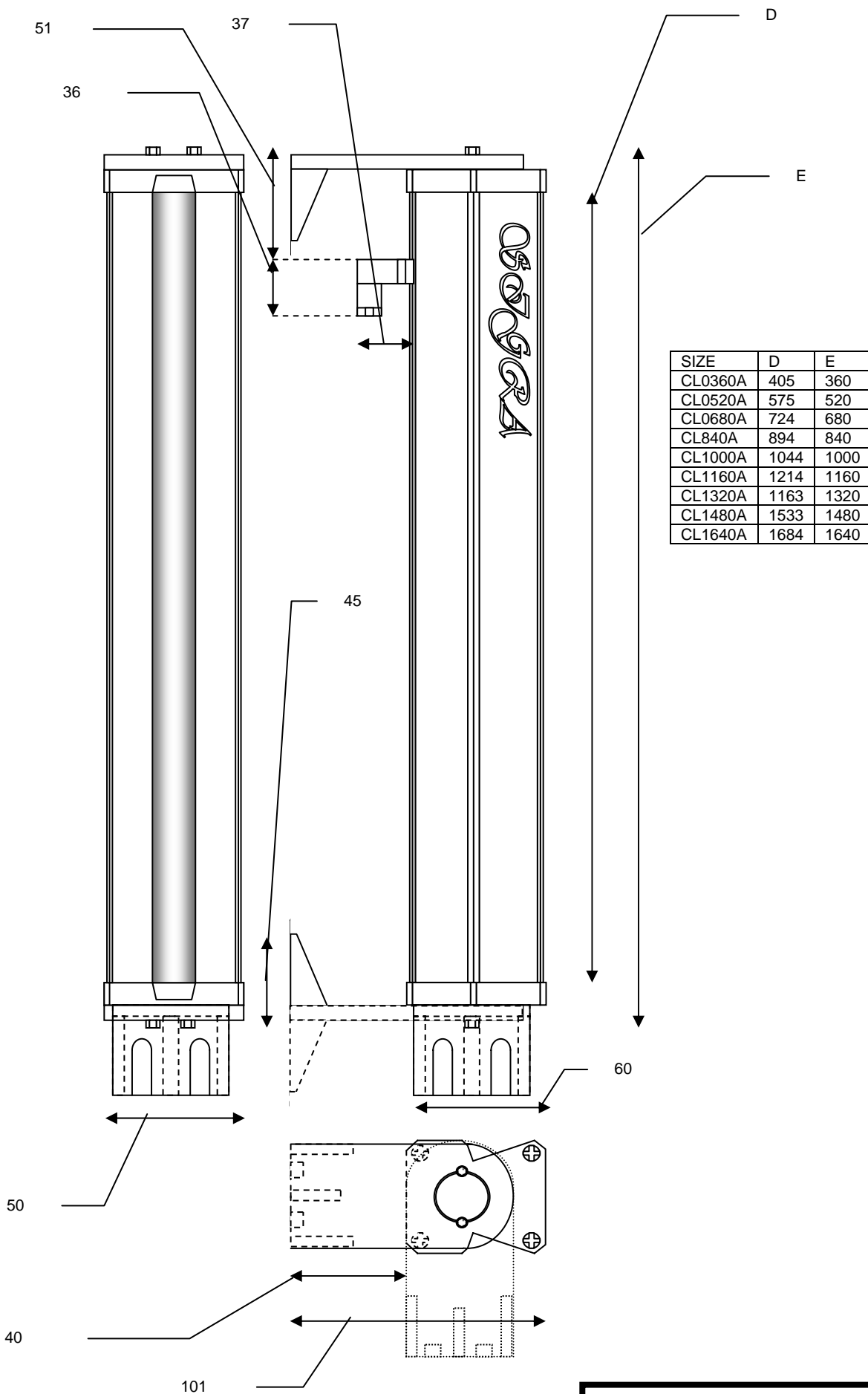
LED 11 Auxiliary relay energized Green

1.9 DRAWINGS

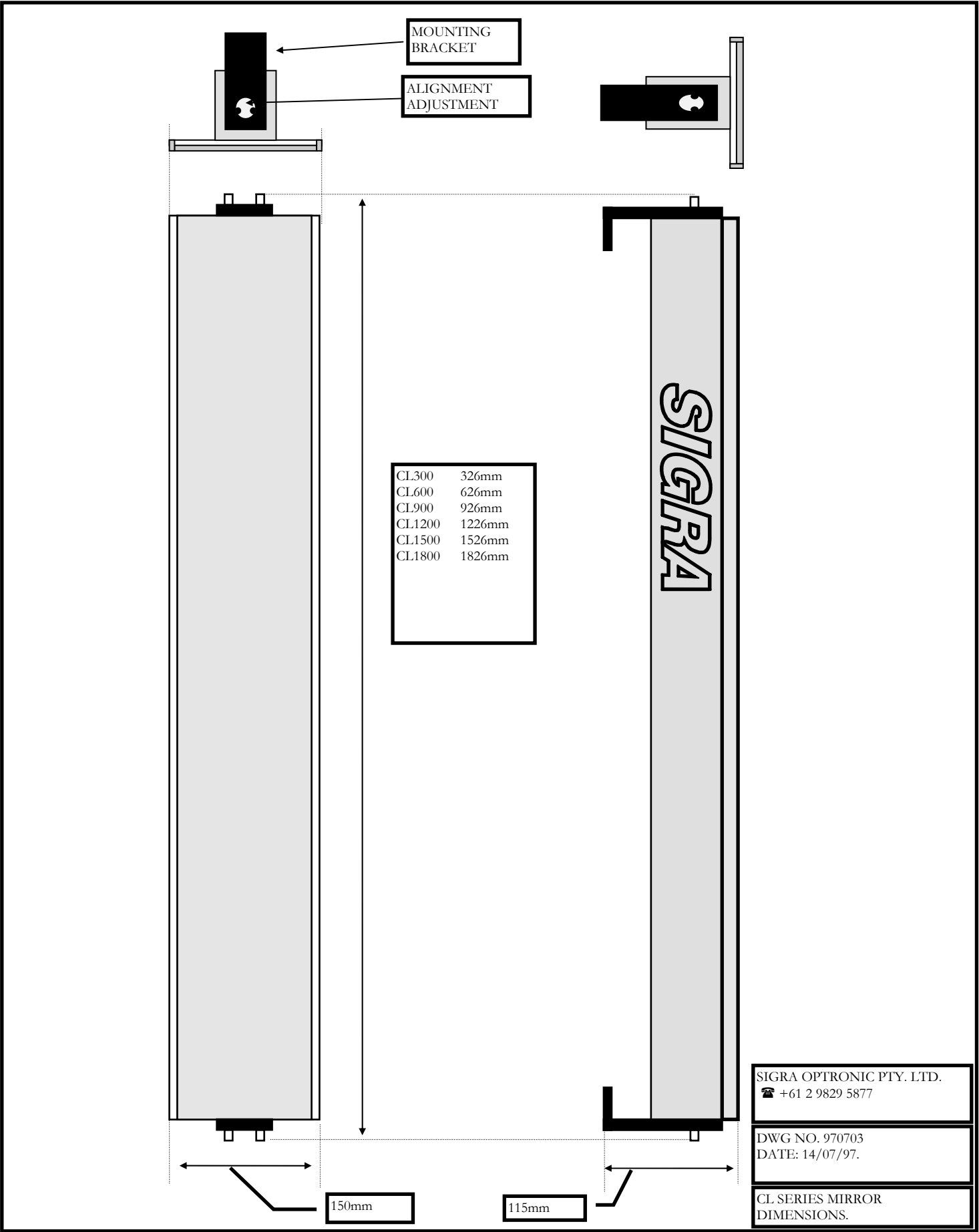
1.9.1 CLCBA5 Controller Dimensions



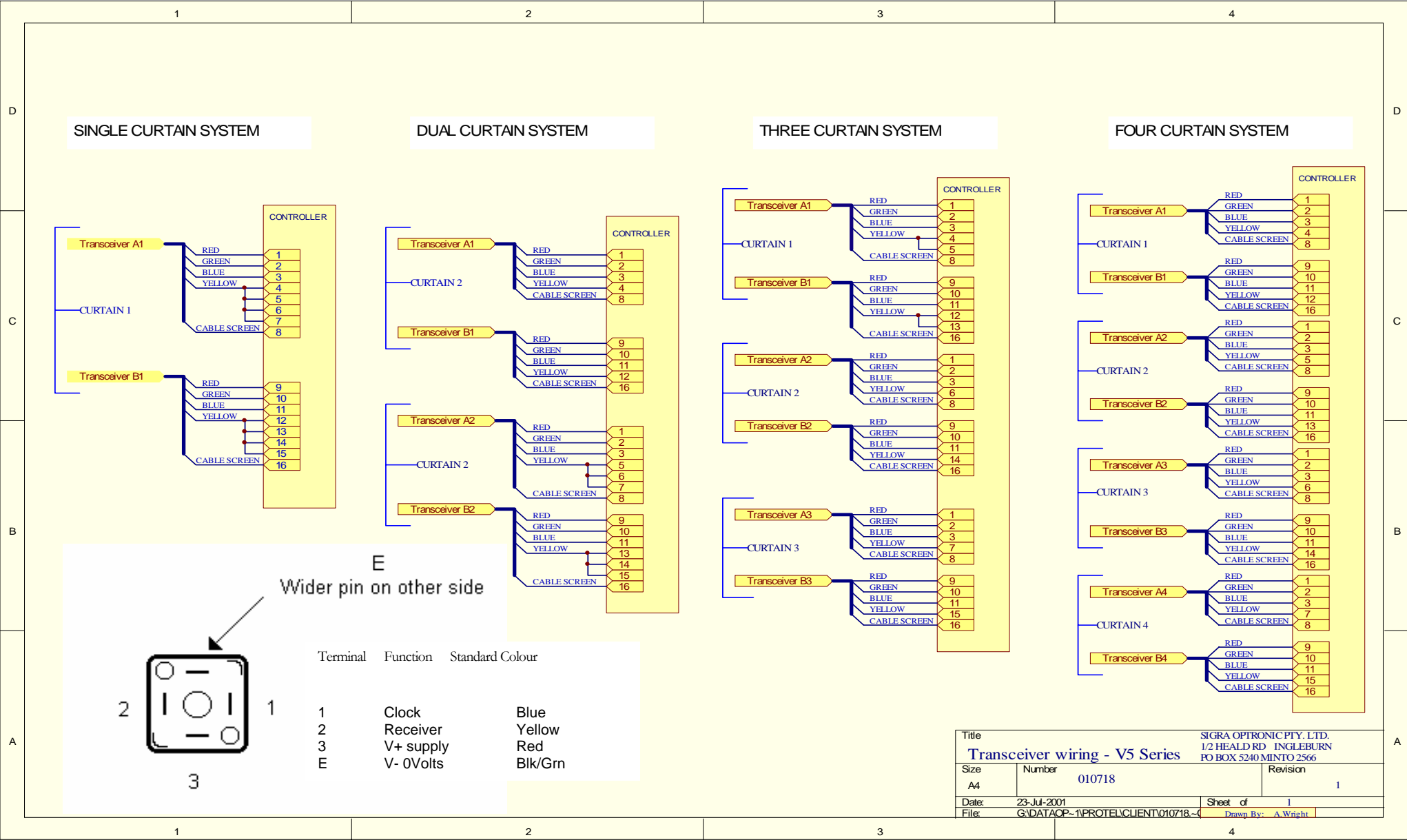
1.9.2 TRANSCEIVER DIMENSIONS



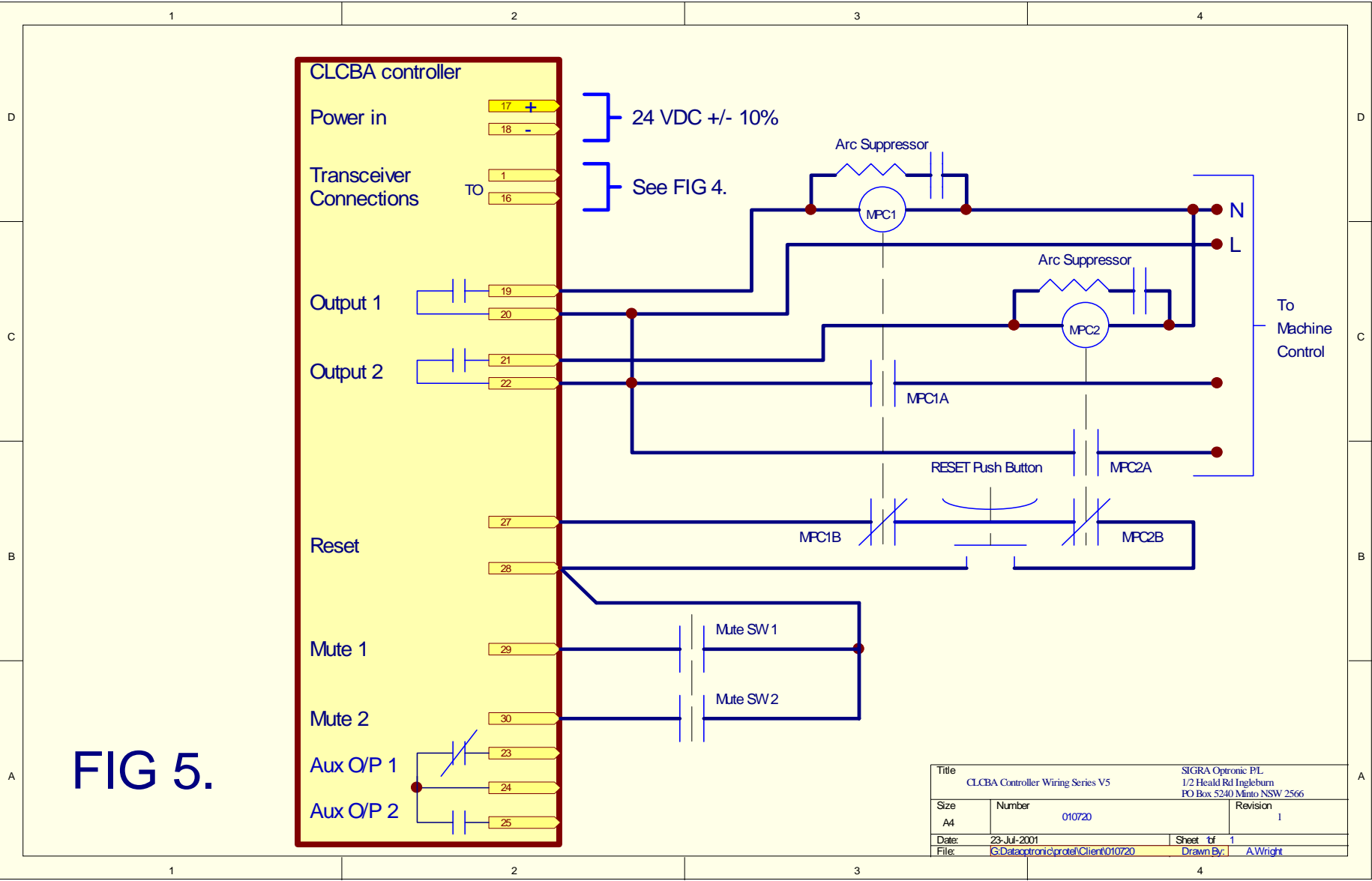
1.9.3 CL300MIR TO 1200MIR MIRROR DIMENSIONS

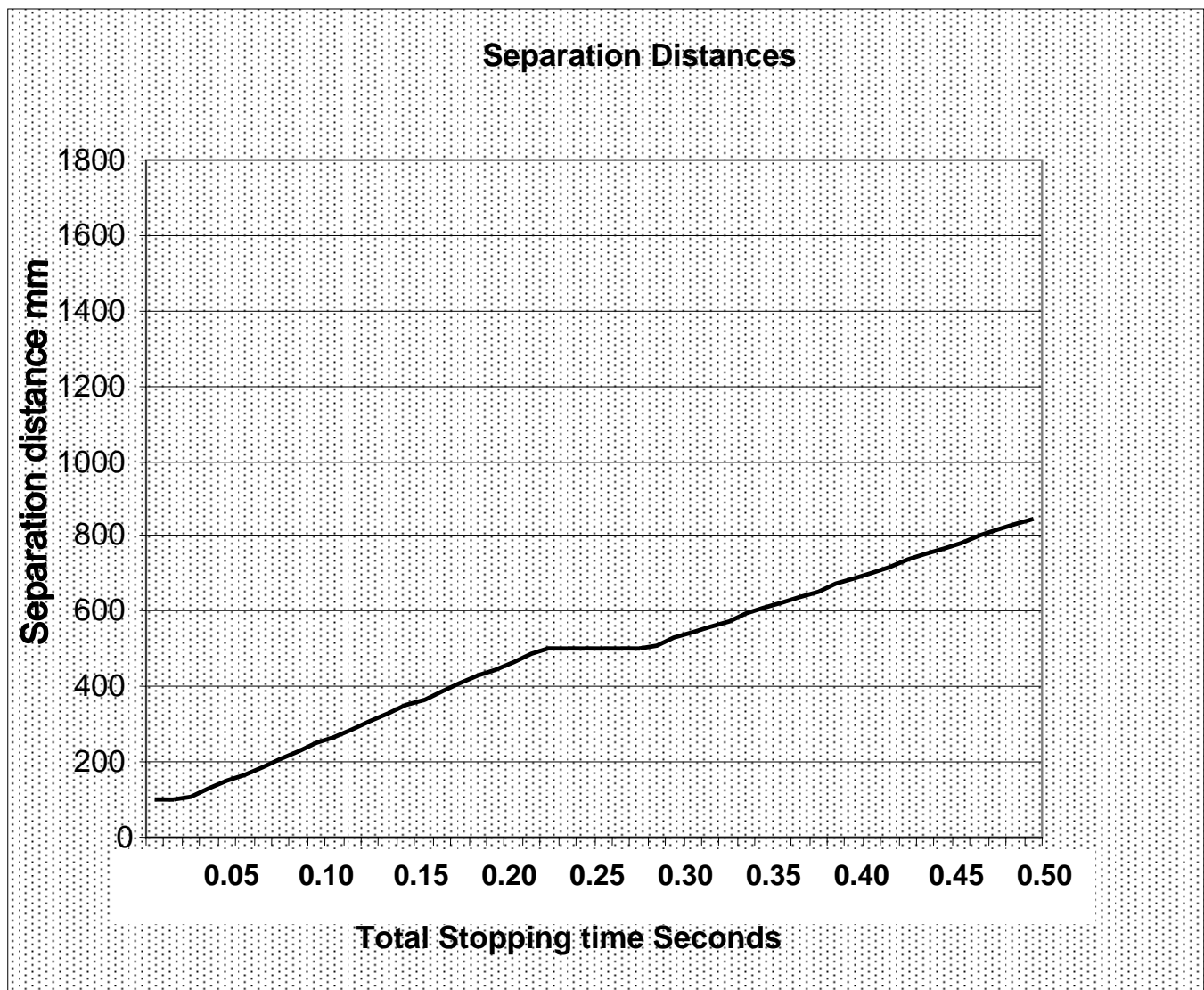


1.9.4 TRANSCEIVER WIRING.



1.9.5 LA CONTROLLER WIRING



1.9.6 SEPERATION DISTANCE (as per A.S.4024.2

1.10 TROUBLESHOOTING

1.10.1 GUARDS WON'T ALIGN (RED LIGHTS ON)

1.10.1.1

Sections 2.5 and 2.6 of the manual should be read thoroughly before attempting to fault find. All electrical connections should be checked before proceeding.

1.10.1.2

Are transceivers within the correct lens to lens range specified on serial number label?

1.10.1.3

Is reset link fitted as per section 1.6.2?

1.10.1.4

Check transceiver alignment as per section 1.6.3, 1.6.4 & 1.6.5.

1.10.1.5

Do green status on each bar vary in brightness when aligned and misaligned? (If the green status indicator does not respond, replace transceiver.

1.10.1.6

Are transceivers parallel and at the same height? Both horizontal and vertical alignment is required. (Do not assume the floor is level).

1.10.1.7

Is 18-24VDC present between terminals 1 and 2? (If not, check fuses and verify that the correct mains voltage is being supplied to the system.)

1.10.1.8

Using terminal 18 as 0V reference, and Drawing 1.9.4 for cable identification, look at the voltages at controller terminals for individual transceivers:

Terminal DC voltage

1.	15 - 28
2.	0
3.	0.7- 1.1
4.	6-9
5.	6-9
6.	6-9
7.	6-9
8.	0
9.	15 - 28
10.	0
11.	0.7 – 1.1
12.	6 - 9
13.	6 - 9
14.	6 - 9
15.	6 - 9
16.	0

1.10.1.9

Check wiring to transceiver (including plug assembly) if voltages not correct. If wiring OK, replace transceiver and retest.

1.10.1.10

If at this stage the fault has not been found, contact Sigra for technical advice before proceeding.

1.10.2 GUARDS TRIP FOR NO APPARENT REASON.

1.10.2.1

Check as per 1.10.1.1, 1.10.1.2, 1.10.1.4 & 1.10.1.6

1.10.2.2

Controller board should be mounted inside Sigra control box as it provides shielding.

1.10.2.3

Move all loose wiring away from controller PCB and unshielded sections of transceiver and reset wiring.

1.10.2.4

Ensure shielded cable has been used for connections to transceivers and reset terminals. Shields are connected at controller only to terminals 8, 16 or 26 and not earth. Ensure also that shielding is not stripped back further than recommended in 1.5.4

1.10.2.5

Transceivers must be mounted using the insulation kits. With the transceiver unplugged and using an ohm-meter (not a megger), check that there is no circuit from each transceiver bracket screw to earth.

1.10.2.6

Ensure the transceivers are mounted securely so that they cannot be misaligned through bumping or vibration.

Check the possibility of any optical crosstalk from other light curtains or photo-electric devices.

1.10.2.7

Contact Sigra if fault persists.

1.11 SPECIFICATIONS.

Power requirements 24 VDC +/- 10% ; Controller 500mA, Transceiver 70mA.

Outputs Safety Captive Contact 2 x 2Amp Fused Normally Open Contacts.

Auxiliary 1 Set of change over contacts

Size and Detection Capability.

Curtain Heights;	Resolution.	Response time
360mm	20mm	13mS
540mm	20mm	26mS
680mm	20mm	26mS
840mm	20mm	39mS
1000mm	20mm	39mS
1169mm	20mm	52mS
1320mm	20mm	52mS
1480mm	20mm	65mS
1640mm	20mm	65mS

Maximum Operating Range 30 metres

Environmental Protection Transceivers I.P.67.

Controller I.P.54.

Ambient Temperature; -5 to 60⁰ Centigrade.

The CLA system uses state of the art electronics and techniques. Advances in technology may change specifications from time to time.

Optional Specifications on request;

S.K. Chemical Sealing Kits.

Ex D Flame Proof Housing.

MIR Corner Mirrors.

1.12 STATEMENT OF COMPLIANCE

***SIGRA* OPTRONIC** PTY LTD A.C.N. 092 011 320
P.O. BOX 5240 Minto Business Centre, MINTO N.S.W. 2566
PHONE: 61 (2) 9829 5877 FAX: 61 (2) 9829 4855

Statement of Compliance

The Siga CL system of safety light curtains has been independently verified for compliance to AS4024.3-1998 and meets the criteria for a Category 4 safety control system, and Interlock Category 6.

Relevant documentation;

WorkCover Authority Test Report 9004 File No. 92/4239.

Standards Australia Document MDS:mds sf41 19th February 1998.

ADI Ltd. Test Certificate 8757

George Sich

Product Manager.

