

LASERMET ICS-5 INSTRUCTION MANUAL



**FAIL SAFE LASER
INTERLOCK CONTROL SYSTEM**

Serial 388 onwards

Lasernet ICS-5 Instruction Manual

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LASERNET LIMITED

INTERLOCK CONTROL PANEL ICS-5

Drawing Number 00484-00-000 Issue 6

DECLARATION OF CONFORMITY

This is to declare that the ICS-5 has been found to comply with the requirements of the following directives:

Machinery Directive 98/37/EC
 Low Voltage Directive 2006/95/EC
 EMC Directive 2004/108/EC

And meets the following European Standards:

EN954-1 Safety Related Control Systems
 EN 60947-1 Low Voltage Switchgear and Control
 EN 61010-1 Safety Requirements for Electrical Equipment.

Supplier:

Lasernet Limited
 137 Hankinson Road
 Bournemouth
 BH9 1HR
 Dorset
 United Kingdom

Country of Origin: England.

Signed:  Date: 8 August 2011
 Quality Assurance Manager

CE

Concept

The ICS-5 provides control of an interlock system primarily intended to protect persons from accidental exposure to hazardous lasers. It is able to monitor several doors, windows, curtains etc. fitted with safety interlock switches and disable the laser if any are open. In this manual the term 'Door Switch' refers to any interlock switch which may be fitted to a door, cover, window blind etc.

The versatile ICS-5 system can be connected to any number of door switches and can indicate the status of up to 4 switches or groups of switches.

The ICS-5 has an Arm Laser button which can be pressed to arm the laser when all the safety requirements are met.

A key lock prevents unauthorised use of the system.

Three safety interlock outputs each rated at 6A resistive, 250Vac, are provided to enable the laser, operate door locks etc. The interlock outputs are volt-free contacts which close when the system is armed. Each contact actually comprises two contacts in series. In the event of one contact failing to open, the other contact will open and the system is then disabled, preventing further use and maintaining safety. The contacts can be configured for a variety of options.

The ICS-5 is available in enhanced versions which offer the following options:

Nine Interlock Output contacts, seven rated at 8A, 50VDC maximum and two rated at 8A, 250Vac.

Three-pole safety power contactors which may be used to switch single or three-phase laser mains supplies.

A separate changeover contact is provided for operating one or two-way illuminated warning signs.

A remote master switch or master interlock system may be connected such that one or more ICS-5's can be controlled by one central point. The master system can prevent the ICS-5 and its associated laser from being armed. Optionally, each ICS-5 can indicate its status to the master system or to a remote indication panel.

Other features include emergency stop control with indication, and provision for an entry/exit timed override option with pushbutton or coded keypad entry.

Lasernet provides a full range of equipment including interlock switches, illuminated warning signs, laser shutters, entry keypads with built-in fail-safe override timer, door locks, external power supplies etc. which can be connected to the ICS-5 to provide a complete system. Full support, design and installation is available from Lasernet, please contact us for any queries. Contact details are given at the end of this manual.

Configuration Options

Lasernet have designed the ICS-5 to be a highly versatile unit. Consequently there are a large number of different ways in which it can be configured and you must be sure which you are going to use before you attempt to wire the unit into your laser system. This section is included to help you clarify how you wish to use the ICS-5. If after reading this section you require further assistance please call Lasernet technical help, contact details at the end of this manual.

Do you want to interlock your laser power supply?

If so and your laser operates from mains voltage, drawing no more than 6 amps with an inductive load of less than 1 kVA, go to 'Laser Power Supply' in the 'Wiring' section.

For lasers outside this specification use the enhanced ICS-5 equipped with appropriate contactors for the required load. Please enquire if you require this option.

Do you want to interlock your laser shutters?

This can be done instead of, or in addition to, interlocking your laser power supply.

If your shutters require an external power supply, go to 'Laser Shutter Supply' in the 'Wiring' section. (Generally speaking up to four Lasernet LS-10 shutters or two LS-100 shutters can be powered from one ICS-5, - see the current specification in 'Laser Shutter Supply' section).

If your shutters have their own power supply or work from an existing power supply go to 'Laser Shutter - with own power supply' in the 'Wiring' section.

Do you want to use the laser interlock connector?

If you want to interlock your laser using the existing interlock connector, go to 'Interlock Connectors' in the 'Wiring' section. The ICS-5 has three interlock operator outputs which may be used for laser interlocks if they haven't been used for any other purpose.

Do you want to operate illuminated warning signs from the ICS-5?

If you want to operate a basic one way sign, which comes on when the ICS-5 power is switched on, go to 'Warning Lights, Option 1' in the 'Wiring' section.

If you want to operate a basic one way sign, which comes on when the ICS-5 has armed the laser, go to 'Warning Lights, Option 2' in the 'Wiring' section.

If you want to operate a two way sign which shows 'Laser Controlled Area' and additionally shows 'Laser On' message when the laser is armed, go to 'Warning Lights, Option 3' in the 'Wiring' section.

If you want a two-way sign which says 'Laser Off' when the ICS-5 is switched on but not armed, and 'Laser On' when the laser is armed, go to 'Warning Lights, Option 4' in the 'Wiring' section.

Do you want to operate door or enclosure locks from the ICS-5?

The ICS-5 can be used to operate fail safe electric door locks on either entry/exit doors or enclosures. These will prevent anyone entering the room or opening an enclosure while the laser is on, so avoiding the possibility of an experiment being interrupted. If fail safe locks are used, fire regulations must also be complied with. If you want to use this option, go to 'Electro Magnetic Door Locks' in the 'Wiring' section.

Do you want emergency stop buttons?

If so, go to 'Emergency Stop and Breakglass Switches' in the 'Wiring' section.

Do you want to be able to override the interlock system?

You may wish to have the option of leaving or entering the interlocked room without interrupting the laser beam. To enable this, Lasernet can supply either an entry keypad ICS-KP12 with built-in fail-safe override timer, or a fail-safe override timer board which can be fitted inside the ICS-5.

The timed override can be adjusted between 6 and 27 seconds. For wiring instructions go to 'Override Switch' in the 'Wiring' section.

Do you want any audible alarms?

If you are using the Lasernet ICS-KP12 keypad or plug in Override Board you can have an alarm which comes on while the override is in operation, to warn that the interlocks are temporarily defeated (a red indication on the ICS-5 panel will light while the override is on in any case). To select or deselect this option see 'Override Alarm' in the 'Wiring' section.

Other audible alarms may be connected to the system and Lasernet offer a range of options including both short-duration and continuous 'Laser Activated' alarms.

Do you want to use mechanical or coded magnetic door interlock switches?

Either type can be used in conjunction with the ICS-5. Generally speaking, the coded magnetic switches are more suitable for environments requiring a high degree of hygiene (eg Operating Theatres). They are also easier to align and more tolerant to misalignment due to doors drooping on hinges etc.

See 'Mechanical Interlock Switches' or 'Coded Magnetic Interlock Switches' in the 'Wiring' section.

Installation

The ICS-5 is designed to be permanently attached to a wall or other fixed vertical surface.

Positioning

The ICS-5 should be mounted in a convenient position for use and wiring. During installation, wired connections will need to be made from the ICS-5 to all the interlocked doors, warning signs, laser interlocks, shutters and other equipment as required by the system, and allowance should be made for the installation of electrical conduits, trunking etc. to make entry to the unit.

There should be adequate clearance above the unit to allow the front door to be fully opened downwards. Installation will be impaired if the door cannot be fully opened. Care should be taken that any conduit or trunking beneath the unit will allow the door to open sufficiently.

During use it will be necessary for operators to access the controls and to observe the indications. The unit is often mounted near the entry door.

To open the unit, unlock the catch by turning the lock with a flat screwdriver until the slot is horizontal. Press the release bar downwards and the cover will unlock. It can then be hinged downwards and will snap into the upright position.

Four Ø5mm fixing holes are provided in the four corners of the case for mounting purposes.

The cables for mains supply, door switches, laser control etc. are usually fed to the unit through plastic trunking or 22mm diameter plastic conduit, and holes are required to be made in the case to accommodate the entry points. An electrician's conduit hole cutter is the ideal tool for this purpose. The conduit may be surface mounted or buried in the wall, and should be arranged to ensure that holes can be made in the enclosure in the required positions.

All connections are made on the narrow circuit board located in the bottom of the case. All of the terminals are identified on the circuit board.

The connection circuit board may be temporarily removed during installation. With the exception of the 9-way Interlock option in the shallow case, the board can also be refitted in any of three different locations in the case to suit the cable entry points.

Care should be taken in the running of conduits that the proposed entry position in the ICS-5 can be accommodated and that the front cover of the ICS-5 can be opened.

Wiring

Warning This unit operates from mains electricity. There is mains voltage on the circuit boards and some of the terminals. Always disconnect the mains power supply before opening the unit or attempting any wiring alterations. We recommend that a 13A switched fused spur with neon indicator is provided.

The ICS-5 is a versatile interlock system and there are a variety of ways in which it can be used. Be sure you know which configuration you require before you attempt to wire the unit. The 'Options' section in this manual will help you to decide, but if you require further assistance please call Lasermet technical help.

All connections are made to plug-in terminals on the narrow circuit board located in the bottom half of the case. It is usually easiest to unplug the terminals while the connections are being made.

Mains In (230 V or 110Vac)

ICS-5 Serial Number 388 onwards are universal voltage input and do not need setting for different supply voltages.

For older units ensure the voltage selector switch on the main circuit board on the inside of the hinged door is set to the correct mains voltage (115V or 230V) before connecting.

It is recommended that a fused switched spur or equivalent is provided for the mains supply to the unit, fused at either 5A or 13A depending on the amount of additional equipment connected to the ICS-5.

Wire the incoming mains power to the following terminals on the narrow circuit board in the bottom of the case:

Live	-	L IN
Neutral	-	N IN
Earth	-	E

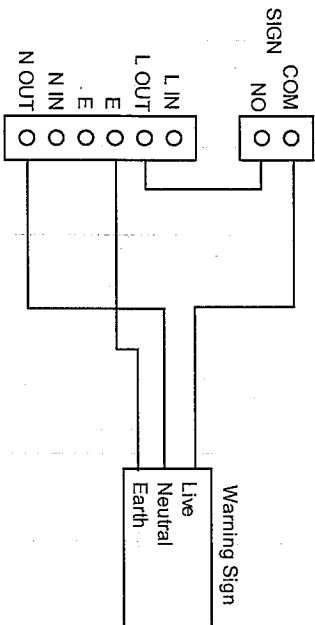
Warning Signs (Mains voltage)
The following options are for mains-powered warning signs
Option 1 - One Way Illuminated Sign

The warning sign will come on as soon as the mains switch of the ICS-5 is turned on.

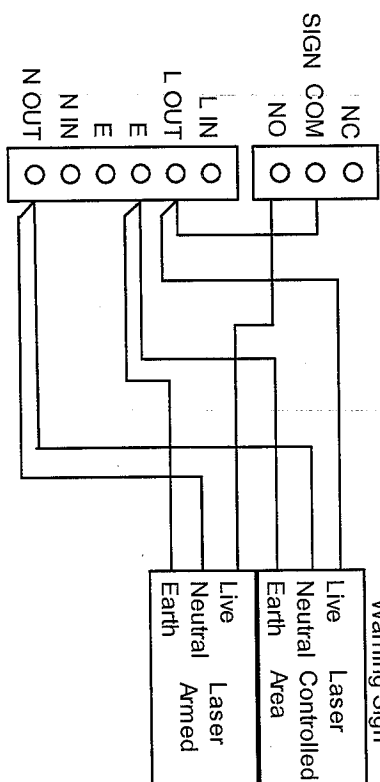
Live contact	-	L OUT
Neutral contact	-	N OUT
Earth contact	-	E

Option 2 One Way Illuminated Sign

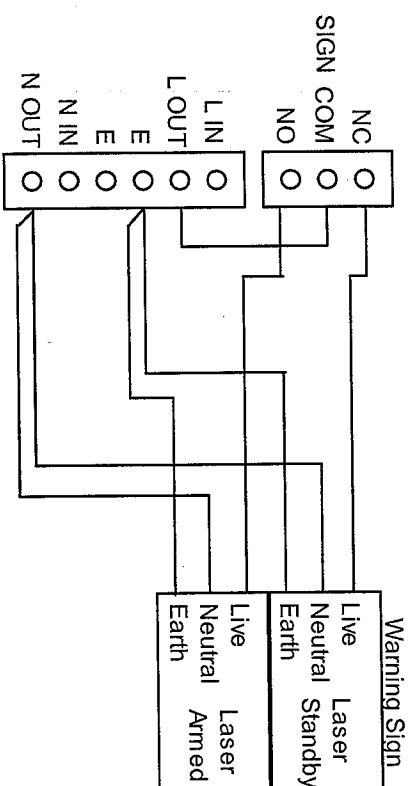
The warning sign will come on when the 'Arm Laser' button is pressed.


Option 3 Two way Illuminated Warning Sign

The first warning sign will come on when the ICS-5 mains switch is turned on. The first warning sign will stay on and the second warning sign will come on as well when the 'Arm Laser' button is pressed.

Warning Sign

Option 4 Two way Illuminated Warning Sign

The first warning sign will come on when the ICS-5 mains switch is turned on. The first warning sign will go off and the second warning sign will come on when the 'Arm Laser' button is pressed.

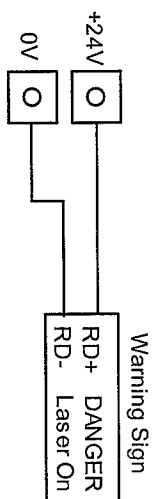


Warning Signs (24VDC)

The following options are for low voltage warning signs such as Lasernetmet's Miniature Warning Signs

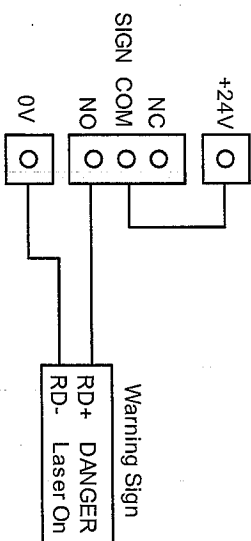
Option 1 - One Way Illuminated Sign

The warning sign will come on as soon as the mains switch of the ICS-5 is turned on.



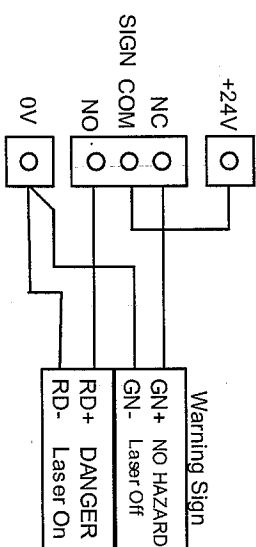
Option 2 - One Way Illuminated Sign

The warning sign will come on when the 'Arm Laser' button is pressed.



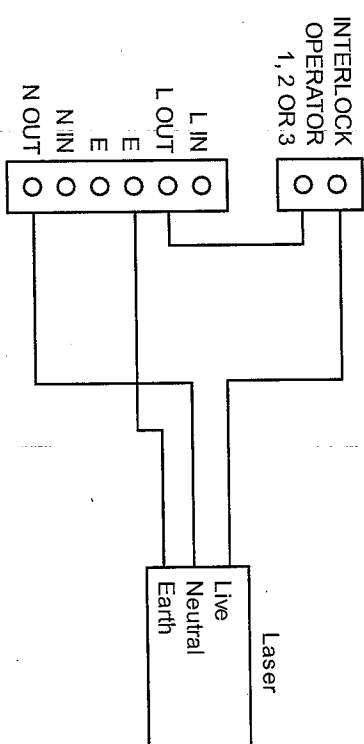
Option 3 Two way Illuminated Warning Sign

The first warning sign will come on when the ICS-5 mains switch is turned on. The first warning sign will go off and the second warning sign will come on when the 'Arm Laser' button is pressed. Note that in the case of the Lasernetmet Miniature Warning Sign, both indications are displayed in the same unit.



Laser Power Supply (6 A max)

With this option, the laser mains supply is only switched on when the Arm Laser button is pressed.

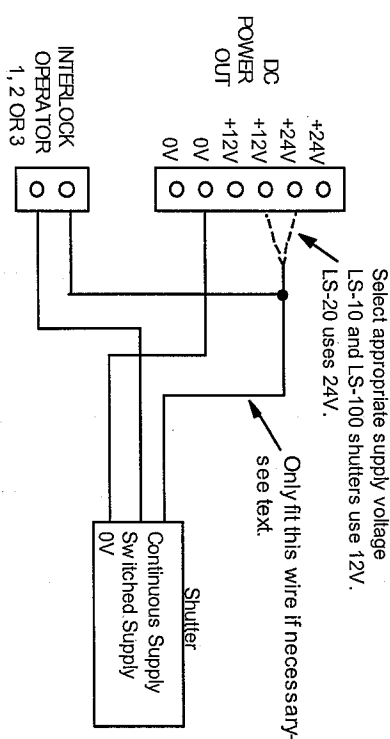


If the laser mains supply requirement exceeds the capability of the ICS-5, please contact Lasernetmet who can provide an enhanced version equipped with monitored safety contactors for switching higher powers.

Laser Shutter Supply (12 VDC 0.8 A maximum or 24 VDC, 1.5 A maximum)

The ICS-5 has a built-in DC supply for operating laser shutters, and is able to provide both continuous and switched supplies using one of the Interlock Operator outputs.

If your shutter power requirements exceed 0.8 A at 12V or 1.5A at 24VDC, contact Lasernet for an optional external power supply.



Note that the standard LS-10 shutter should NOT have the Continuous Supply wire connected.

The Continuous Supply is required for LS-100 and modified LS-10 shutters which require a continuous 12V supply for cooling or monitoring purposes.

LS-20 shutters operate off 24V and require the Continuous Supply.

NOTE: The selected Interlock Operator used for switching shutters must not be used for any other purpose.

Laser Shutter - with own power supply

If your shutters have their own power supply or are to be run from an existing supply, you can use an Interlock Operator operate them. The connections should be arranged so that the shutter closes when the Interlock Operator contact opens. If an Interlock Operator is used for this purpose it must not be connected to any other circuit.

Interlock Connectors

The standard ICS-5 has three volt-free Interlock Operator contacts, any of which may be used to operate a laser interlock control, provided they haven't been used for any other purpose. Each contact is rated at 240Vac / 50VDC 6A resistive load. The contacts are closed when the ICS-5 Arm Laser button is pressed.

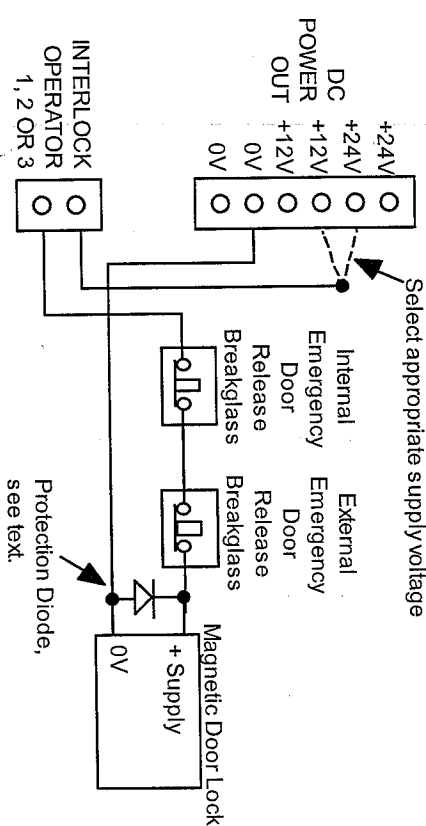
One Interlock Operator contact must be used for each laser interlock. It is not possible for several lasers to share an Interlock Operator.

Lasernet supply distribution boxes and leads which allow convenient plug-in connection to laser interlock sockets. An example is shown in the drawing, 'Typical Installation' later in this manual.

An optional 9-way Interlock Operator board is available from Lasernet.

Electro Magnetic Door Locks

Use only fail safe door locks provided by Lasernet (electric door strikes or maglocks). These will prevent access to the room while the laser is on while always allowing people to enter or leave the room in the event of a power loss. In order to ensure that people can always enter or leave the room in the event of an emergency it will be necessary to put an emergency stop or break glass switch near each door. If in doubt call Lasernet technical help.



Note that the total combined current available from the 24V and 12V outputs from the ICS-5 is 1.5 A, so whilst both shutters and door locks may be used at the same time, care should be taken not to exceed this rating in total. The locks supplied by Lasernet are preconfigured for 12V, but it is recommended that they are reset for 24V and run from the 24V DC Supply. This halves the current consumption

potentially allowing more locks to be run from the ICS-5 without requiring additional power supplies.

Lasernet's standard maglocks draw 0.5A at 12V setting or 0.25A at 24V setting. To set the Maglock for 24V operation, open the terminal access cover on the lock. Remove the two black links from the circuit board and refit one of them across the middle two pins. Park the spare link with one side on one of the empty end pins, so it is not lost. If in doubt, refer to the instructions supplied with the maglock.

If the ICS Power Output is not compatible or sufficient for the door locks, the door locks should be powered by an external power supply with it's live main terminal connected through one of the Interlock Operators.

In all cases a diode rated at 1A 50V or more must be wired directly across the terminals of each door lock. Maglocks usually have the diode fitted as standard, in which case it is essential that the supply is connected the right way round. Any override switches used here should be normally closed (n/c) and wired in series with the lock (Where door interlock switches are being used with an override system, an override switch with one n/c contact and one n/o contact must be used. The n/o contact should be wired as described in the 'Override Switch' section. If a keypad is used in conjunction with the Override Switch, refer to the Remote Keypad Operation diagram.

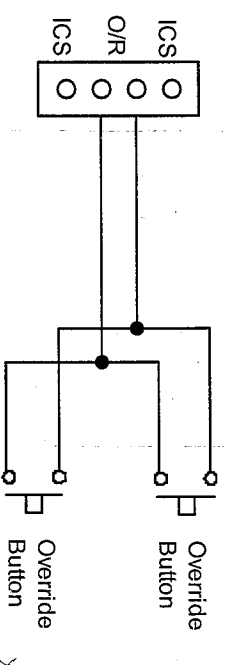
Override Switch

The optional Lasernet Override Board allows an interlocked door to be opened for a short time without interrupting the laser. When the override is activated a warning indication is shown on the ICS-5 and a buzzer sounds.

The Override board must be fitted to the ICS-5 by inserting the male connector on the plug-in board into the female connector near the bottom of the main board of the ICS-5 on the back of the door. Align the hole in the Override board with the peg on the ICS-5 main board and insert the screw into position. Ensure the jumper link J2 'O/RIDE CTRL' on the ICS-5 Main Circuit Board is set open. The override is time-limited and the duration of override can be adjusted between 6 and 27 seconds by adjusting the potentiometer marked R19, on the Override board. Turn clockwise to increase the time and anticlockwise to decrease it.

To activate the override function connect one or more switches in parallel across the two terminals marked O/R on the 'ICS/O/RIDE' terminal block. When activated the switch should momentarily connect the two terminals together - although it doesn't matter if the contact is made permanently as the override will cut out when the time limit is up anyway. Lasernet supply suitable pushbuttons and keyswitches for operating the override function.

The diagram below shows a typical installation with Override pushbuttons on both sides of a door. By using keyswitches instead of buttons, unauthorised use of the override can be prevented.



Override Alarm

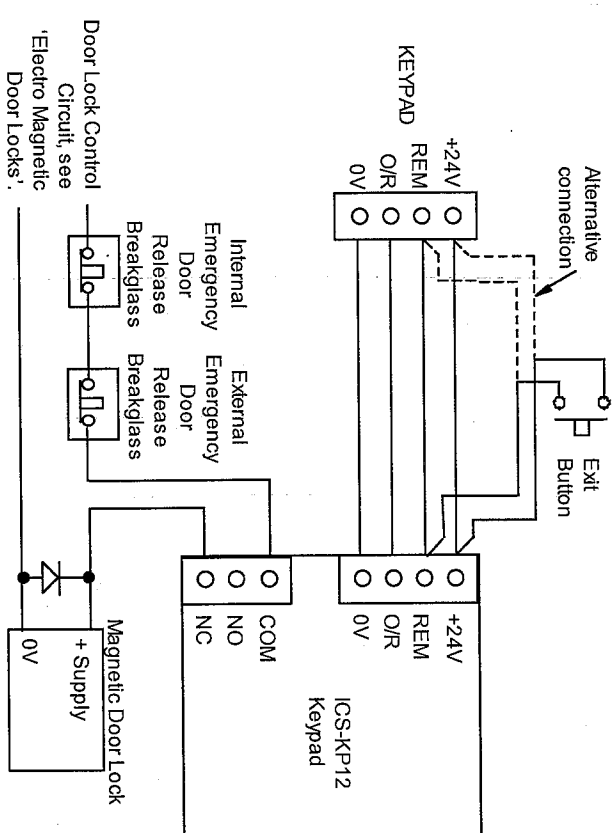
There is an audible Override alarm inside the ICS-5 which is enabled when the BUZZER CTRL link J4 is closed on the main PCB. There is also an audible alarm on the Override board which is enabled by closing link 10.

Override / Entry Keypad

The Lasermet ICS-KP12 is an entry keypad with built-in fail-safe override timer. It may be used either as a key-coded override control, as a door release where door locks are used, or both. A dedicated connector is provided for it in ICS-5, and the Lasermet Override Board mentioned in the previous section is not required. The keypad is usually fitted adjacent to the entry door on the outside of the controlled area, and a door release exit button is provided on the inside which activates the keypad remotely. The exit button may be wired to the keypad or ICS-5 according to installation preference. Note that if the door is fitted with a magnetic lock, emergency door release breakglass switch(es) should be provided to release the door in the event of evacuation emergency.

The access code and durations of the timed override and door release are programmable, refer to the keypad instruction leaflet. Ensure that the jumper link J2 'O/RIDE CTRL' on the ICS-5 Main Circuit Board is closed across both pins so that the keypad can operate the Override circuit inside the ICS-5.

The diagram below shows the circuit where a lock is provided on the door. If no lock is provided this part of the circuit may be omitted, and the keypad may be programmed not to activate the door relay and 'Door Unlocked' indication. Refer to the keypad instruction leaflet.



Mechanical Interlock Switches

Up to four door interlock switches may be directly wired to the ICS-5. By making external connections, more switches can be added and arranged in groups for indication purposes.

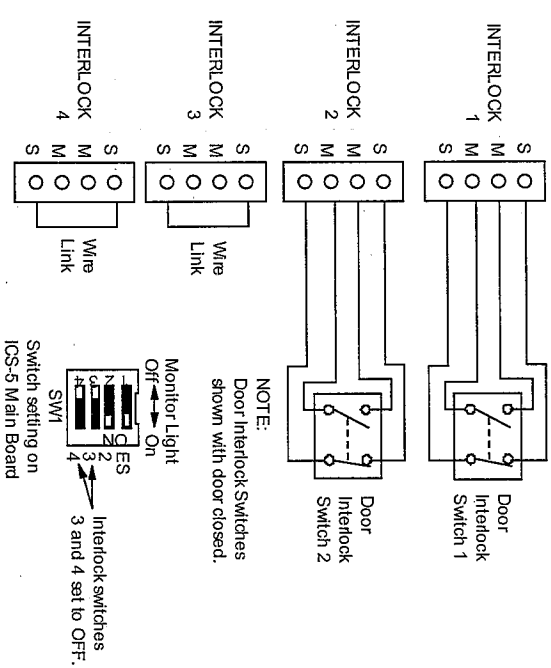
The interlock switches are wired to the terminals labelled INTERLOCK 1 through to INTERLOCK 4. Each interlock switch should have a safety contact which is closed when the door is closed, and a monitor contact which is closed when the door is open.

A 4-way terminal block is provided for each door interlock switch. The safety contact which is closed when the door is closed is wired to the 'S' terminals. The monitor contact which closes when the door is opened, is wired to the 'M' terminals.

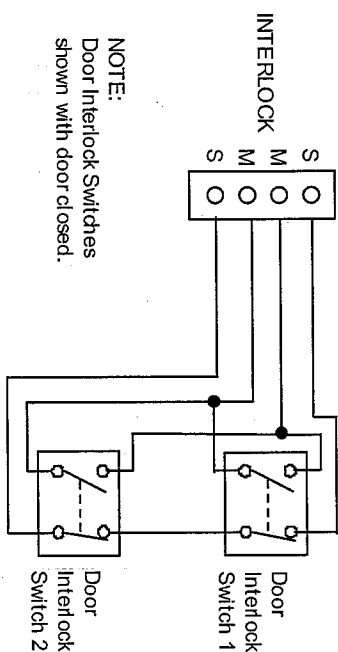
It is usual to use low voltage 4-core flexible wire for these connections.

If an interlock input is not used, a wire link should be fitted to connect the 'S' terminals together on each unused terminal block. Also on the main circuit board on the back of the door, the corresponding monitor indicator should be switched off by setting the corresponding switch on SW2 to off. Note that there is always at least one interlock switch which should always be connected to the interlock 1 terminals. No switch is provided to turn off the monitor indication for interlock 1.

The example diagram below shows a system with two door interlock switches:



If you have more than four door interlock switches you can wire them in groups. A common situation is where there are double doors. An interlock switch needs to be fitted to both, and the two switches can then be wired together so that a single monitor indication light will illuminate on the front panel of the ICS-5 if either of the doors is open. The switches in a group should be wired with their safety contacts in series and their monitor contacts in parallel. Each group may have several switches. An example diagram for two door interlock switches wired in a group is shown below.



NOTE:
Door Interlock Switches
shown with door closed.

Coded Magnetic Interlock Switches

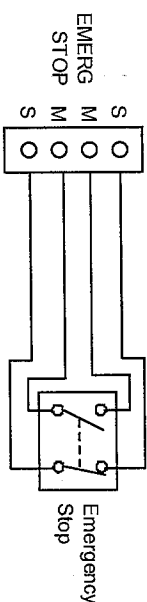
Coded magnetic switches supplied by Lasernet cannot be overridden by the use of a magnet. Wire the safety and monitor circuits in the same way as described in the 'Mechanical Interlock Switches' section.

Emergency Stop and Break Glass Switches

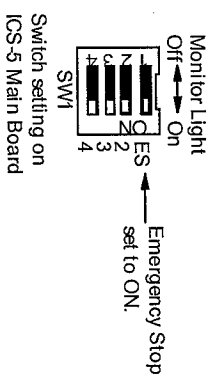
The ICS-5 treats Emergency Stop switches in the same way as Door Interlock switches. Ideally the Emergency Stop switch should have two contacts- a safety contact which opens when the button is pressed, and a monitor contact which closes when the button is pressed. Switches supplied by Lasernet have these contacts. The monitor contact allows the ICS-5 to indicate when the Emergency Stop button has been pressed.

Connect the safety contact, which opens when the button is pressed, to the 'S' terminals of the EMERG STOP terminal block.

Connect the monitor contact which closes when the button is pressed, to the 'M' terminals of the EMERG STOP terminal block.



NOTE:
Emergency Stop shown
unactivated.

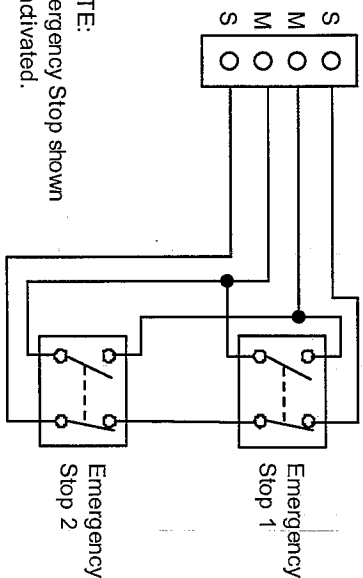


If an emergency stop is not used, a wire link must be fitted between the two 'S' terminals on the EMERG STOP terminal block, and the 'ES' switch on SW2 on the ICS-5 Main Board set to OFF.

N.B The E-stop switch should be checked periodically.

If you wish to have more than one emergency stop switch, wire the safety contacts in

series and the monitor contacts in parallel as shown below



NOTE:
Emergency Stop shown
unactivated.

Master Control

The ICS-5 has the option of being remotely 'locked out' by a remote master switch or a remote interlock system. The remote switch is connected to the two terminals marked 'ICS' on the 'ICS/ORIDE' terminal block. If the switch is open, the laser cannot be armed.

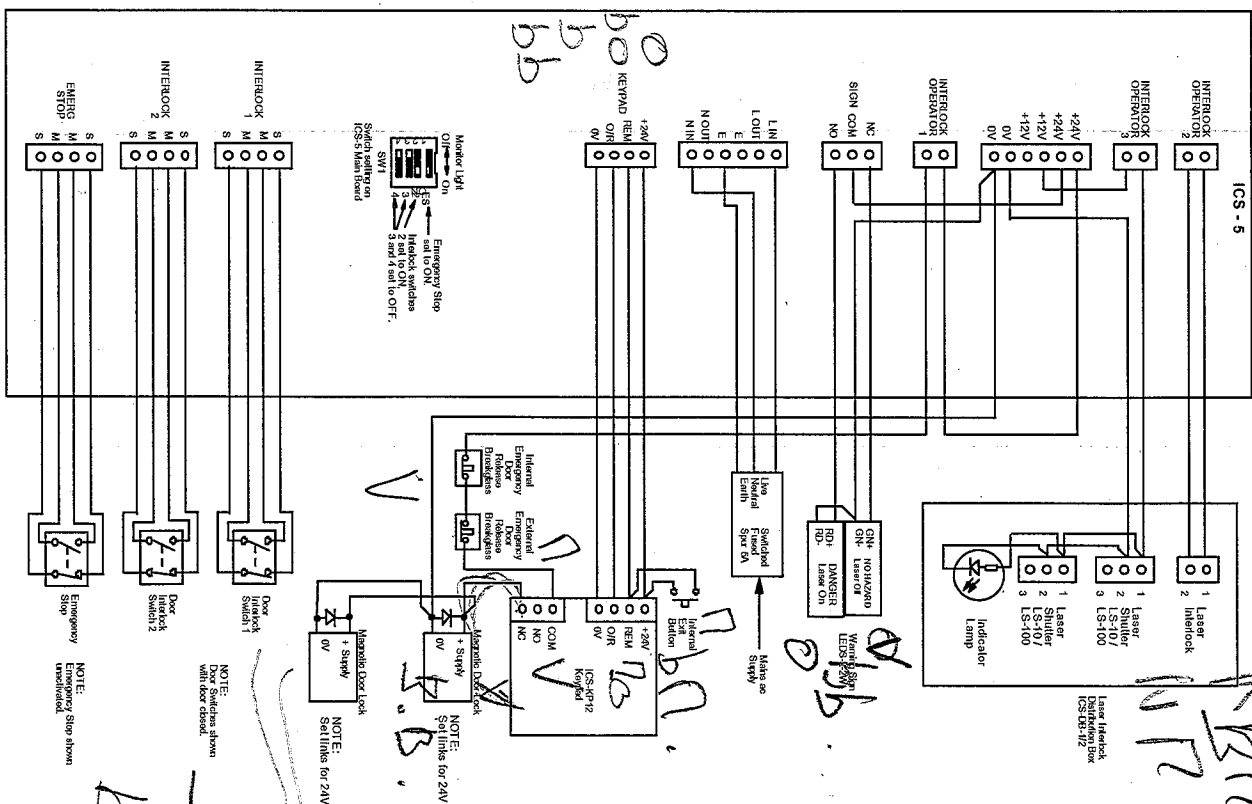
„there are several ICS-5's to be controlled by one master switch or control system, each ICS-5 must have it's own switch pole which must be isolated from the switchers for the other ICS-5's.

Typical Installation

The diagram on the next page shows the full wiring of a typical installation using Lasermet equipment, with two interlocked doors with magnetic door locks, control of one laser interlock and two shutters and override to allow time-limited entry/exit by authorised persons.

Breakglass switches are provided inside and outside the room for emergency door unlocking.

A Lasernetet LED warning sign is included.



Emergency Stop shown
unactivated.

NOTE:
Door Switches shown
with door closed.

Set links for 24V

Set links for 24V

00484-53-000

LED Indicators

'Interlock' LEDs

Two LED's are provided for each of the four Interlock Monitors. Each pair refers to an interlock switch or group of switches, depending on how the system has been wired up.

For each Interlock, a green LED indicates that the interlock is present. This is set on off by the installer during wiring to show which interlock monitors are being used (see 'Mechanical Interlock Switches' above).

The adjacent yellow LED lights up when the corresponding door is open.

'Safety Circuit Complete' LED

When the ICS-5 is ready to be armed, this LED will light green.

If this LED is not lit, the system will not arm. This may be due to any one of the following:

- a) The 'Interlock' key switch is off.
- b) A door interlock switch is open.
- c) The emergency stop switch (if present) is activated. (reset switch to deactivate)
- d) The system has been disabled by a master control switch or other remote system

'Laser Armed' LED

When the 'Safety Circuit Complete' LED has lit and the Arm Laser button has been pressed, the 'Laser Armed' LED will light orange to warn that the ICS-5 has enabled the laser. If the 'Safety Circuit Complete' LED is illuminated but the 'Laser Armed' LED does not illuminate when the Arm Laser button is pressed, this could indicate that the internal checking circuitry of the ICS-5 has detected a fault condition.

'Override On' LED

When the override is in operation this LED will light red to warn that the interlocks are temporarily defeated.

Operation

Once correctly wired the ICS-5 is extremely easy to use.

Starting Up

- 1) Set the mains switch on the unit to '1'.
- 2) Insert the key into the interlock keyswitch and turn to the right, 'Enable'.
- 3) Close all interlocked doors. The LED's on the front panel will indicate yellow when the corresponding door is open.
- 4) Check any Emergency Stop buttons are released- if any have been pressed the Emergency Stop light will illuminate yellow.
- 4) The 'Safety Circuit Complete' LED will light.
- 5) When you are ready to operate the laser, press the Arm Laser button.

N.B. Be aware that this action restores power to the shutters or the laser, and may result in accessible laser beams, depending on your system set up. This button should only be pressed when everyone is ready and the necessary safety precautions have been taken e.g. protective eyewear etc.

Resuming Operation after an Interlock Switch has been opened

When any interlocked door is opened or the emergency stop button is activated, the ICS-5 will cut the power to the laser or the shutters. To resume laser operation:

- 1) Close all interlocked doors (where necessary). Note LED state on front panel.
- 2) Reset the emergency stop button (where necessary).
- 3) When ready to restart, press the ICS-5 Arm Laser button.

N.B. Be aware that this action restores power to the shutters or the laser, and may result in accessible laser beams, depending on your system set up. This button should only be pressed when everyone is ready and the necessary safety precautions have been taken e.g. protective eyewear etc.

Using The Override

The override facility, where fitted, allows interlocked doors to be opened for a short time without the laser being interrupted. The override is time limited and is not dependent on the properties of the switch used to activate it.

- 1) To activate the override with a push button, simply press the button on the

push-to-exit switch. The system will now go into override mode for a short time, and a buzzer will sound.

N.B. If any of the interlock switches are still open when the timed override expires, the ICS-5 will cut the power to the laser or shutters.

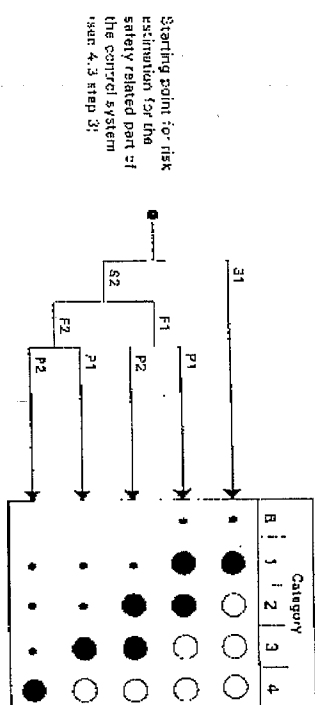
- 2) To activate the override externally with the use of an ICS-KP12 keypad simply type in the user 4 digit code (default is 3333) the system will now go into override mode for typically about 15 seconds. If there is a magnetic lock on the door this will be released for typically 5 seconds. The access codes and times are may be adjusted by authorised persons by reference to the keypad instruction leaflet.

N.B. As with the push button if any of the interlock switches are still open when the timed override expires, the ICS-5 will cut the power to the laser or shutters.

- 3) If the override is activated by a keyswitch:
 - a) Place the key in the override switch
 - b) Turn the key. The timed override begins from this moment. The red LED will light on the ICS-5 panel, and the override alarm will sound.
 - c) Remove the key. Any of the doors can now be opened without the laser or shutter power supply being interrupted.
 - d) Close all doors before the timed override has finished. The time is adjustable between 6 and 27 seconds - see 'Wiring' section for instructions on how to adjust.

Notes on Risk Assessment

The Lasermet ICS-5 has been specially designed to meet the requirements of EN



954-1, Safety Related Control Systems. This standard sets out the following means of risk assessment:

- S Severity of injury**
 - S1 Slight (normally reversible) injury.
 - S2 Serious (normally irreversible) injury including death.
- F Frequency and/or exposure time to the hazard**
 - F1 Seldom to quite often and/or the exposure time is short.
 - F2 Frequent to continuous and/or the exposure time is long.
- P Possibility of avoiding the hazard**
 - P1 Possible under specific conditions.
 - P2 Scarcely possible.

Most class 4 and class 3B lasers (excepting those emitting less than five times the class 1 AEL under pre-2001 classification), come into risk category 2 or 3.

Notes On Fail Safe Requirements

Safety switchgear and control gear systems have an inherent safety problem due to the need to use relays. A relay can fail in the 'on' position due to contact weld. Safety control gear which simply involves the switching of a single relay, is therefore not fail safe, since the safety function may be lost in the event of a relay failure. Using two relays with coils in parallel and contacts in series, provides redundancy but unless there is system checking there is no warning when a fault occurs and the system reverts to being a single relay, without the knowledge of the user.

EN 954-1 sets out the fail safe requirements for each risk category (as described in the 'Notes on Risk Assessment' section), and these can be summarised as follows:

Category 2

The safety functions of the control system shall be regularly checked by the machine control system, and in the event of a fault, either render the system safe or if this is not possible, provide a warning of the hazard.

Category 3

In the event of a single fault the safety function shall be maintained. In addition, wherever reasonably practicable, the occurrence of a single fault shall be detected before the next demand on the safety function.

The ICS-5 has been specially designed to meet these requirements and is suitable for use with systems up to risk category 3. No single fault will cause the loss of the safety function, and in addition, the unique self checking circuitry used in the ICS-5 checks the system for faults at every use of the Arm Laser button, and in the event of a fault being detected, will not arm.

Contact Details

For sales and technical support::

Lasernet Ltd.
Lasernet House,
137 Hankinson Road,
Bournemouth
BH9 1HR
United Kingdom.

Tel.: +44 (0) 1202 770740
Fax: +44 (0) 1202 770730

E-mail: sales@lasernet.com
Website: www.lasermet.com