

**MECHANICAL WITH
INFRA RED GUARD MK2
CIRCUIT 5045
REVISION A**

BEFORE CONTACTING CAMBRAKE LIMITED REGARDING A PROBLEM ON YOUR MACHINE PLEASE
ENSURE THAT YOU HAVE PERFORMED THE VARIOUS TASKS AND FAULT FINDING AS DETAILED
IN THE ENCLOSED INSTRUCTIONS.

Table of Contents

1. SETTING UP INFRA RED GUARD MK2	2
1.1 BASIC OPERATION	2
1.2 FIXING	2
2. INSPECTION	3
2.1 DAILY	3
2.2 ROUTINE MAINTENANCE	3
2.3 MAINTENANCE	3
3. MECHANICAL MACHINE CONTROL	4
3.1 START UP PROCEDURE	4
3.2 RUN MODE SELECTOR SWITCH	4
3.3 MUTE SELECTOR SWITCH	5
4. MACHINE CONTROL FAULTS - INFRA-RED	6
4.1 COMMON FAULTS	6
4.2 CONTROL CIRCUIT FAULTS	8
4.3 RELAY FAILURES	9
4.4 CONTACTOR & OTHER ITEM FAILURES	11
5. INSTALLATION INSTRUCTIONS FOR MECHANICAL CHASSIS	12
5.1 GENERAL NOTES	12
5.2 CHASSIS LINKS	13
5.3 OUTPUTS	13
5.4 CIRCUIT NOTES	13
5.5 RELAY FUNCTIONS	14
6. PUBLICATIONS	15
6.1 PUBLICATIONS REFERRED TO IN THIS MANUAL	15
6.2 OTHER PUBLICATIONS	15
6.3 BRITISH STANDARDS APPLICABLE TO PRESS BRAKE SAFETY	16
6.4 DRAFT DOCUMENTS	16
6.5 SINGLE MARKET PUBLICATIONS APPLICABLE TO SAFETY	17
6.6 OTHER DOCUMENTS APPLICABLE TO RELATED EQUIPMENT	17

1 SETTING UP INFRA RED GUARD MK2

1.1 BASIC OPERATION

Please refer to the INFRA RED MK2 manual for full details of the operation and connections for the photoelectric curtain.

1.2 FIXING

The rejection of the photoelectric guard is better than 35mm allowing the heads to be positioned at 500mm from the trapping point, if the stopping time of the press is less than 20ms.

This figure is only a guide to the position of the photoelectric curtain from the machine, the position should be determined by calculation using the formula in British Standard BS EN 50100 and by reference to HSE publication PM41. Refer to the INFRA RED MK2 manual for further details.

If the photoelectric guard is for floor mounting the heads should be positioned beyond the end of the machine bed to allow full use of the machine (300mm is the usual distance). The guards should be fixed to the floor using M10 Parabolts or equivalent to prevent any movement.

If the equipment supplied is for machine mounting the brackets supplied should be used. The brackets can be repositioned as required to enable a good fixing position to be found. The brackets may also be moved along T-slots. Please ensure that the anti-vibration mounts are reassembled in the correct manner.

2 INSPECTION

Reference should be made to the relevant directives issued by the Health and Safety Executive, H.M. Factories Inspectorate and your own safety department. For your information a copy of HSE IND (G) 7 (C) is enclosed in this documentation. The following details are given as a guide to inspection only.

2.1 DAILY

1. Ensure that neither stand has become loose due to damage by passing forklift trucks, material knocks or vibrations.
2. Check that both the guard heads are securely fastened either to the floor or to the machine.
3. Check that all bulbs are working correctly.
4. Check that no lens/filters are damaged.
5. Clean the lens/filters.
6. Check the rejection of the guard.
7. Check for cable damage.
8. Check that all plugs are secure.

2.2 ROUTINE MAINTENANCE

The system is designed to function with the minimum of maintenance. Ensure that the optical window is kept clean with an anti-static cleaner but do not polish as this will lead to a build up of static electricity. Check that the fixing bolts are all secure and that the external connectors are securely fastened with the locking catches.

2.3 MAINTENANCE

It is recommended that the system is checked at least once a year to ensure that the reliability and operation are maintained.

This can be ensured with our extended warranty scheme, whereby our trained engineers will make at least one visit during the extended warranty period.

3 MECHANICAL MACHINE CONTROL

3.1 START UP PROCEDURE

1. Switch on the 3 phase mains supply at the isolator(s).
2. If compressed air is required to the machine ensure that this is available.
3. Turn the RESET/INCH/RUN switch to the REST position, then return the switch to the INCH position. The control circuit will now be live.
4. Start the electric motor.
5. Select the switch functions as required.

3.2 RUN MODE SELECTOR SWITCH

This is a 3 position switch labelled RESET, INCH and RUN.

RESET This position is used to reset the control circuit at initial switch on and after the circuitry has detected an operating fault. The key must be left in the RESET position for 10 seconds to allow the circuit to reset.

The machine will not function if the switch is left in this position, or if it is put into this position during operation. The curtain must be initialised by interrupting.

If power has been removed from the machine whilst it is not at TDC, the reset procedure is the same as above BUT the stroke selector switch MUST be set to OFF and the press returned to TDC. The mute selector switch can then be set as required.

RUN When the footswitch is pressed the machine will complete one cycle returning automatically to TDC. The footswitch may be released during the cycle without stopping the machine. The machine will remain at the Stroke Stop position if this has been selected.

INCH When the footswitch is pressed the machine will complete one cycle returning automatically to TDC. The machine will stop during the cycle whenever the footswitch is released. The machine will remain at the Stroke Stop position if this has been selected.

3.3 MUTE SELECTOR SWITCH

This is a 3 position switch labelled STOP, OFF and VARI.

VARI The machine will not stop during the cycle, unless the guard curtain is broken, or the footswitch is released in the INCH mode.

The guard is in circuit from TDC to the operation of the bullet switch. The bullet switch should be set to ensure that the gap between the tool and the workpiece is less than 6mm. The red light indicates that the guard is out of circuit.

It is **NECESSARY** for the bullet switch to be operated during the cycle.

The arrangement of the cams prevents the operation of the mute point higher than halfway down the approach stroke.

STOP The operation of the machine is the same as VARI except that the machine will stop its approach when the bullet switch is operated. This allows the operator to always stop the machine approach at a preset position where the guard is out of circuit in order to insert the material for bending.

The footswitch must then be released and operated again before the press will function.

This is useful where the material interrupts the guard, or when working to a line, or when the material must be held against backstops, or when the material must be supported through the bending operation.

OFF In this mode the guard is in circuit for the entire cycle and the machine will stop if the guard curtain is broken.

It is **NECESSARY** for the bullet switch to be operated during the cycle, but the guard will not be muted.

4 MACHINE CONTROL FAULTS - INFRA RED

4.1 COMMON FAULTS

It is assumed that the main isolator has been switched on and the guard control panel has been reset but one of the following faults persists :-

1. No power reaching the machine, no indicator lights on, main motor will not start.
 - Check all fuses or trips in guard control panel, replace or reset, if necessary, also check that the fuse holder makes contact with the fuse base contacts when in position
 - Check fuse(s) in isolator(s) and at the distribution board(s).
 - Check for loose terminal screws and connections.
 - Check incoming cable is securely connected.

2. Machine has power, guard functioning, but motor will not start.
 - Check any latching stop buttons are released and any other stop circuits are released.
 - Check machine motor control circuit fuses & overload trip, replace or reset if necessary.
 - Check the action of contactors T1 and T2 in the guard control panel. See elsewhere in this manual for the relay layout.
 - Check action of starter, correct if necessary.
 - Check for loose terminal screws and connections.
 - Check Run mode selector switch is not in RESET position

3. Machine has power, motor has run up to speed, but machine cycle cannot be initiated.
 - Check that the light curtain between the heads is not obstructed by support arms, tables, or material.
 - Check that the guard is functioning, realign if necessary. Check that initial interruption has been carried out.
 - Check all plug in relays, observe coil voltages and replace with new correct voltage relays if necessary.
 - Check operation of footswitch(es) and/or treadle switch.
 - Check for open side or rear gates.
 - If the machine was started whilst not at TDC, select OFF on the mute selector switch.
 - Solenoid drive contactor(s) faulty.
 - Check the solenoid operation and the functioning of any monitoring switches.
 - Check the operation of other interlocked equipment eg backgauge in position signals or feed equipment etc.

4. Machine stops during stroke and restarts when footswitch is operated. OR Machine stops during stroke but cannot be restarted by operating footswitch.
 - Check that the stroke stop position has not been selected.
 - Check for loose connector screws and terminations.
 - Carry out checks as above. (Section 3/4).
5. Stroke stop will not operate.
 - Check selector switch.
 - Check stroke stop switch for correct operation, replace if necessary.
 - Check pulse module in control box by substitution and replace if necessary.
6. Machine has power, motor has run up to speed, solenoid energises then drops out within 2 seconds. All power removed from the machine.
 - One of the dual solenoid coils may be faulty.
 - Check solenoid monitoring switches (These must operate within preset time period)
7. Lockouts.
 - If automatic check of guard fails at TDC lockout occurs at over-run position.
 - If timer TM3 fails to energise lockout occurs when bullet switch is operated.
 - If mute bulb fails before operating bullet switch and mute selector is either STOP or VARI machine will stop completely when operating the bullet switch.
 - If the mute bulb fails after the bullet switch, the curtain will not be muted and the machine will lockout at over-run.
 - Lockout will occur if TM1 or TM2 energise during the cycle due to non-rotation of the cams in the cambox.
 - Lockouts will occur during cycle if relays fail. See later for full details.
 - Note At a lockout state, the motor will stop, and the solenoid cannot be energised. However, power is not removed from the relay circuit. This enables faults to be diagnosed.
 - A total lockout ie Power removed from the machine, will occur if the valve monitoring switches are faulty.
 - To reset a lockout state, the run mode selector switch must be turned to RESET. See earlier.
8. Reset Failure.
 - Ensure reset position on keyswitch is held for 10 seconds.
 - Failure of either TM1 or TM2.
 - Failure of relays R, S, or contactors T1 or T2.

4.2 CONTROL CIRCUIT FAULTS

1. Machine stops on the bullet but does not mute.

- Bullet set too high. The cams are set to only allow a mute point from halfway down the approach cycle.
- Check mute bulbs and mute relay. Replace if blown.

2. Machine goes through TDC, and all power is removed from the machine. (Lockout)

- Brake fault causing a longer stopping time than the cams have been set for. Check the brake pads for wear.
- Faulty pneumatic control. Check that the exhaust ports from the air solenoid are not obstructed.
- Guard fault. The cyclic nature of the controls require that the guard contacts drop out at TDC. If they do not a lockout occurs. Check that the guard functions correctly when the curtain is interrupted.

3. Machine locks out just after BDC on return half of cycle.

- Bullet switch is set too low and is not being operated during the cycle.

4.3 RELAY FAILURES

	Fails to energise	Fails to de-energise
Relay A	Lockout when drops off O/R	Lockout at TDC
Relay B	Lockout at O/R	Lockout when drops off TDC (SS)
Relay C	Lockout at TDC	Lockout at O/R
Relay D	Lockout when drops off TDC (SS)	Lockout when drops off O/R
Relay E	Lockout at O/R	Lockout when drops off O/R
Relay E1	Runs through TDC. Locks out at O/R	Runs through TDC. Locks out at O/R
Relay F	<u>In OFF</u> - Run through TDC. Locks out at O/R. <u>VARI/STOP</u> - No effect	Stops cycle whenever cycle is interrupted
Relay G	<u>OFF/STOP</u> - No effect <u>VARI</u> - Stops at SS	Stops cycle whenever cycle is interrupted
Relay H	Locks out at TDC	Locks out at O/R
Relay I	Stops cycle after timer preset period	Stops cycle whenever cycle is interrupted
Relay L	Lockout when drops of TDC (SS)	Lockout at TDC
Relay M	<u>OFF</u> - No effect <u>VARI/STOP</u> - Cycle stops at SS	Stops cycle whenever cycle is interrupted
RelayM1	<u>OFF</u> - Locks out at O/R <u>VARI/STOP</u> - Cycle stops at SS	Stops cycle whenever cycle is interrupted
Relay N	<u>OFF</u> - Locks out at O/R <u>VARI/STOP</u> - No mute. Locks out at O/R	<u>VARI</u> - Locks out at TDC
Relay P	<u>VARI/SS</u> - Stops cycle at SS <u>OFF</u> - No effect	Stops cycle at TDC
Relay Q	Stops cycle at TDC or stops cycle whenever cycle is interrupted	Stops cycle at TDC or stops cycle whenever cycle is interrupted
Relay R	Circuit will not reset	Circuit will not function (R and S on only)
Relay S	Circuit will not reset (R only)	No reset possible

Relay T	Machine will stop after preset period of TM3	Stops cycle at TDC or stops cycle whenever cycle is interrupted
Relay U	Cycle stops if not muted	<u>VARI/STOP</u> - cycle stops at SS <u>OFF</u> - Locks out at O/R
Relay V	Cycle stops if not muted	<u>VARI/STOP</u> - cycle stops at SS <u>OFF</u> - Locks out at O/R

4.4 CONTACTOR AND OTHER ITEM FAILURES

	Fails to energise	Fails to de-energise
J	Complete - cycle stops Auxiliary - Base energises but cycle stops Base only - Cycle stops	Complete, Auxiliary only and Base only - Stops cycle whenever cycle is interrupted
K	Complete - J energises only. Cycle stops Auxiliary - J and base energise. Cycle stops Base only - J energises. Cycle stops	Complete, Auxiliary only and Base only - Stops cycle whenever cycle is interrupted
T1	Complete - Cycle stops Auxiliary - Base energises but cycle stops Base only - Cycle stops	Complete, Auxiliary only and Base only - No reset possible
T2	Complete - Cycle stops Auxiliary - Base energises but cycle stops Base only - Cycle stops	Complete, Auxiliary only and Base only - No reset possible
Timers TM1 & TM2	No reset possible	Circuit resets but operation not possible.
Timer TM3	Locks out at SS	Stops cycle whenever cycle is interrupted
Mute bulb fails	<u>OFF</u> - Locks out at O/R <u>VARI/STOP</u> - Stops at SS	Locks out at O/R
Guard fails	Cycle will stop if guard is not muted	<u>STOP/VARI</u> - Cycle stops at SS <u>OFF</u> - Cycle stops at TDC
Solenoid switches	Lockout after TM3 times out	Wont reset when cycle interrupted.

5 INSTALLATION INSTRUCTIONS FOR MECHANICAL CHASSIS

5.1 GENERAL NOTES

1. Solid conduit or heavy duty plastic type (EGA Rhino type is the best) should be used to connect the guard to the machine for external wiring.

2. Supply requirements

Infra red 440v 50 Hz 5 Amp max.

3. Each head to be earthed in 1.5 sq mm cable.

4. External connection between limit switches etc and control chassis to be wired in suitable cable to carry 1Amp

5. Maximum rating of all volt free contacts is 240v 5A inductive.

6. Infra red guard wiring should be to the multi-pole connector as detailed in the manual.

7. The Cambrake circuit controls the whole operation of the machine, except the starter for the main motor and the ram adjustment (if fitted).

8. All selector switches are on the front of the control box.

5.2 CHASSIS LINKS

- 24-26 Remove link if external run latch required.
- 26-27 Gate switches (remove if gate switches normally closed type fitted)
- 27-28 Terminals for the use of external equipment which close for cycle to start.
- 33-34 Terminals for the use of external equipment which close to allow circuit to reset at the end of a cycle or at stroke stop.

5.3 OUTPUTS

- 43-44 Volt free contact for external pneumatic control. (SSD)
- 45-46 Volt free contact for external pneumatic control. (SSD)
- 49-50 Trip contacts. Wire in series with motor stop circuit. (FSD)
- 51-52 Trip contacts. Spare for external use (FSD)
- 47-48 Guard check – primary
- 56-57 Guard check - secondary

5.4 CIRCUIT NOTES

Drawing shown at TDC with power off BUT with air on.

- TDC Top Dead Centre or Return Limit
- SS/Bullet Bullet operated Limit Switch
- BB Beam Broken Indicator Light

T1 and T2 are the FSD contactors (final switching device). They remove/apply power to the motor.

J and K are the SSD contactors (secondary switching device). They control the air solenoids.

5.5 RELAY FUNCTIONS

A,B,C,D	Sequence relays
E,E1	TDC relays
F	TDC mute control relay
G	Prevents stop when VARI and OFF selected
H	Check relay
I,T	Solenoid switches monitors
J	Solenoid contactor (SSD1)
K	Solenoid contactor (SSD2)
L	Overrun relay
M, M1	Mode changeover in mute
N	Guard mute relay
P	Reset relay stroke stop & TDC
Q	Reset relay from TDC & stroke stop
R,S	Switch on relays
T1	Trip contactor (FSD1)
T2	Trip contactor (FSD2)
U	Guard output relay 1
V	Guard output relay 2
TM1 & 2	Timer – Monitor rotation of cams.
TM3	Timer - Monitors solenoid switches.

Only the main function of the relay is given above, the operation of each relay is dependant on several relay contacts and external switches.

6 PUBLICATIONS

The following list is not intended to be an exhaustive list of all publication that are related to safety, but only to show a general cross section of the documents available. Further information can be obtained from the Health & Safety Executive Publication department, HMSO stationery stockists and British Standard Institute. Our sales and technical departments may be able to offer advice if required.

6.1 PHOTOELECTRIC GUARDING PUBLICATIONS

Infra red Manual Mk2	Cambrake Limited
BS6491 : 1984	British Standards Publication
HSE IND(G)7(C)	HSE Publication. Copy enclosed.
Safety Notices and Policies	Your own company publications.
HSE Guidance Note PM41 July 1984	The application of photoelectric safety systems to machines.

6.2 OTHER PUBLICATIONS

Power Press regulations 1965 and 1972.
Health and Safety Executive Guidance ISBN 0-11-885534-4.

Press Brakes.
Health and Safety Executive ISBN 0-11-883784-2.

Health and Safety at Work Act. 1974.

Factories Act.

Electricity at work regulations. 1989.

IEE Wiring Regulations 16th Edition. Regulations for Electrical Installations.

Machinery Directive.

Compressed Air Safety.

6.3 BRITISH STANDARDS APPLICABLE TO PRESS BRAKE SAFETY.

BS2771 : 1986 EN60204 : 1985

Electrical Equipment of Industrial Machines.

BS5304 : 1988

Safety of Machinery.

BS6491 Part 1 : 1984 BS6491 Part 2 : 1987

Electro-sensitive Safety Systems for Industrial Machines.

Safety of Machinery. Basic Concepts, General Principles for Design.

BSEN292 Part 1 : 1991

Technical Principles.

BSEN292 Part 2 : 1991

BSEN294 Safety of machinery.

Safety distances to prevent danger zones being reached by the upper limbs.

6.4 DRAFT DOCUMENTS.

prEN 50100-1 : 1992

Safety of Machinery : Electro Sensitive Protective Devices

Part 1 : Specification for General Requirements

BSEN953 Draft British Standard

Safety Of Machinery - General requirements for the design and construction of guards. (fixed or movable)

prEN692 Draft European Standard

Mechanical Presses - Safety.

prEN693 Draft European Standard

Hydraulic Presses - Safety.

BSEN954-1 Draft British Standard

Safety of Machinery - Safety related parts of control systems.

Part 1 : General principles for design.

6.5 SINGLE MARKET PUBLICATIONS APPLICABLE TO SAFETY.

Management of Health and Safety at work Regulations 1992.
ISBN 0 11 886330 4

A guide to the Provision and Use of Work Equipment Regulations 1992.
ISBN 0 11 886332 0

Manual handling of loads: A guide to the Manual Handling Operations Regulations 1992.
ISBN 0 11 886335 5

Workplace (Health, Safety and Welfare) Regulations 1992.
ISBN 0 11 886333 9

A guide to Personal Protective Equipment at Work Regulations 1992.
ISBN 0 11 886334 7

Work with display screen equipment: a guide to the Health and Safety (Display Screen Equipment) Regulations 1992.
ISBN 0 11 886331 2

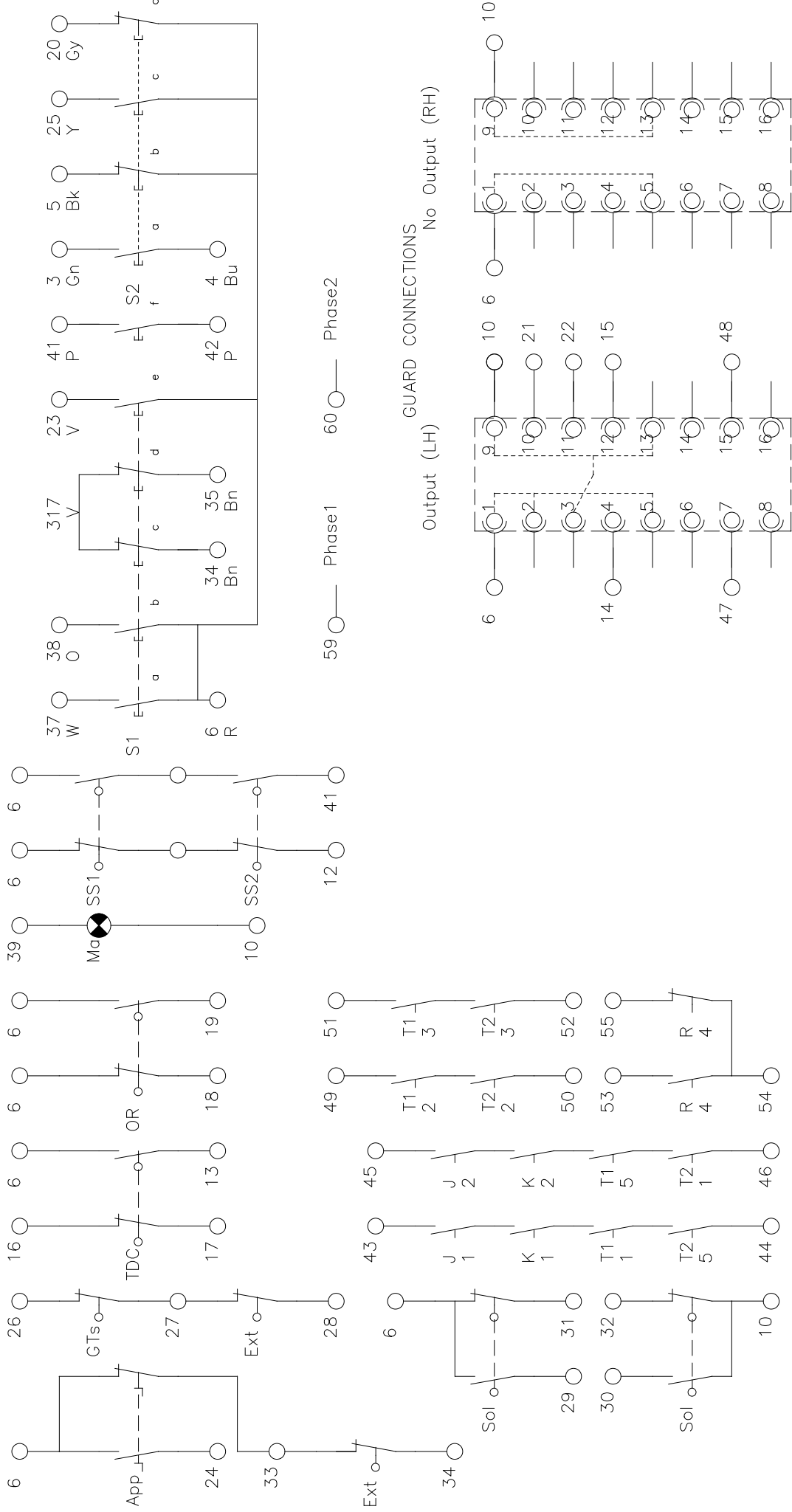
6.6 OTHER DOCUMENTS APPLICABLE TO RELATED EQUIPMENT.

COSHH Regulations.

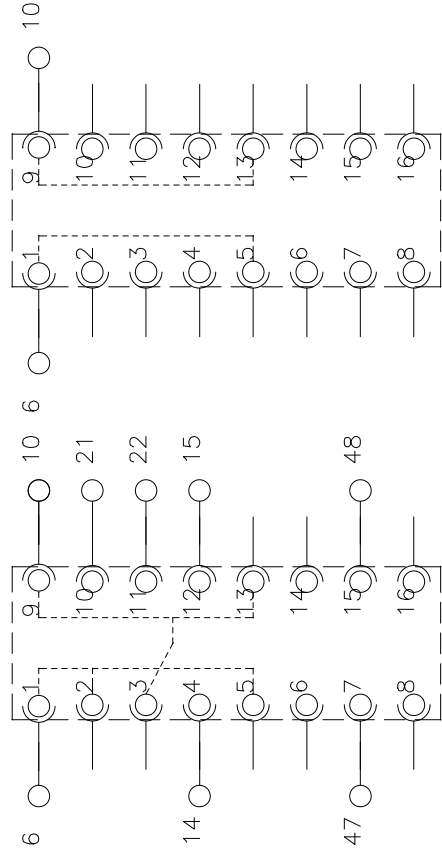
HS/G 42 Safety in the use of metal cutting guillotines and shears.
ISBN 0 11 885455 0

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

NO POWER ALL LS UNOPERATED



GUARD CONNECTIONS
Output (LH) No Output (RH)



Job Details

Internal Links
6, 7, 8 & 9 110v
10, 11 0v

Links
26-27 No Gates
27-28 EXT Resets
33-34 No EXT Starts

CAMBRAKE Limited
CRESCENT MILL, TODMORDEN, LANCOS
Telephone 01706 815711/818965 Fax 01706 817967

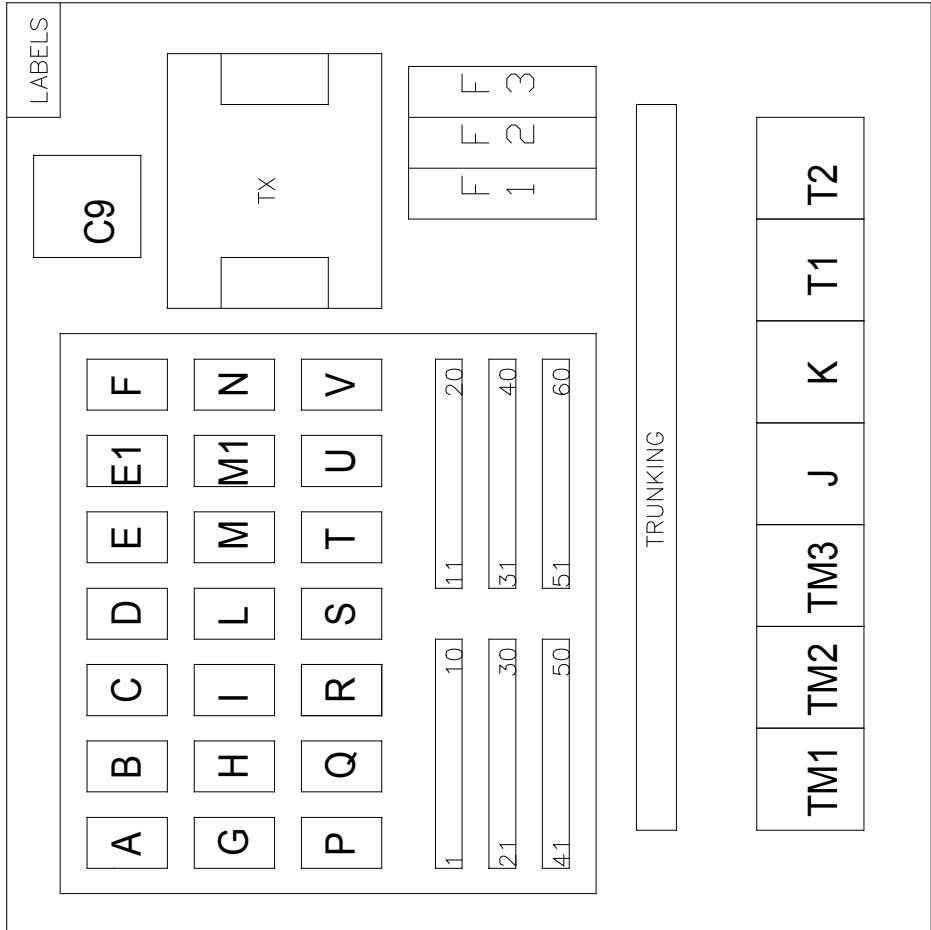
TITLE EXTERNAL CONNECTIONS FOR 5045
WITH CAMBRAKE INFRA RED Mk2

REV A

DRAWN PG 14.04.01
CHECK PG 14.04.01

SHEET 6/14

DRAWING NUMBER 5045



PARTS LIST

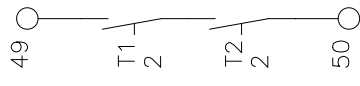
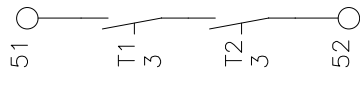
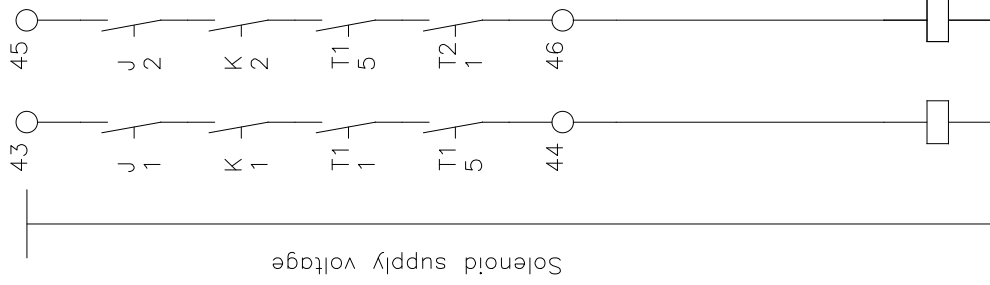
- Relays IMO RY4 1PN 110v AC with Flag & Led indicator
- Chassis Plate Cambrake Drawing 6025
- Fuses Hager L11300 with 5A fuse to BS 1361
- Transformer Legrand 44162 150VA
- C9 Cambrake
- J, K, T1 & T2 contactorS S&S CA4-S-01-110 + CS4-P13
- Enclosure Sarel 400 x 400 58019
- Backplate Sarel 400 x 400 55805
- S1 Telemacanique ZB2-BG0 + ZB2-BZ103 + 2off ZB2-BE102
- S2 Telemacanique ZB2-BG0 + ZB2-BZ103 + ZB2-BE102

POSITION	A	B	C	D	E	E1	F	G	H	I	L	M1	N	P	Q	R	S	T	U	V	J	K	T1	T2	T3	COMMENTS
Reset Procedure Select RESET on key switch																X										Include TM1 & TM2 timeout periods
Select JOG or RUN on key switch	X				X												X						X			
At TDC. All footswitches released & external OK.	X				X									X			X						X			
At TDC. All footswitches released & exits OK. Curtain reset (power up)	X				X			x7									X						X			
Press footswitch	X				X												X						X			Machine cycles
Solenoid energises. Keep footswitch operated if INCH selected.	X				X				X								X						X			
Operate overrun limit switch				X	X					X							X						X			
Interrupt curtain or release footswitch in INCH	x3			x3	x						x3						X						X			Machine stops
Release footswitch & curtain clear	x3			x3	x						x3						X						X			
Press footswitch	x3			x3	x						x3						X						X			Machine cycles
Solenoid energises. Keep footswitch operated if INCH selected.	x3			x3	x				X		x3						X						X			
Operate Stroke Stop limit switch with VARI selected.	X							x5			X	X	X				X					X				Machine cycles
Operate Stroke Stop limit switch with STOP selected	X							x5			X	X	X				X					X				Machine cycles
Release footswitch	X									X	X	X	X	X			X					X				
Press footswitch	X										X	X	X	X			X					X				Machine stops
Solenoid energises. Keep footswitch operated if INCH selected.	X									X	X	X	X	X			X					X				
Cycle continuing in VARI or STOP Drop off overrun switch			X						X	X	X	X	X				X					X				Machine cycles
Operate TDC switch		X			X	X	x5		X			X	X				X					X				Machine stops
Release footswitch		X			X	X			X					X			X					X				

x? indicates a note is available with further information. See sheet 10.

Notes on relay sequence 5045 sheet 9

- 1 Timer is energised for the preset period only
- 2 Timer is energised for the preset period only
- 3 If the overrun limit switch is not operated relays L and D will not be energised.
If the overrun limit switch is operated relay B will not be energised.
- 4 Relays U and V will only re-energise when the curtain is clear and all switches and external equipment has returned to the safe state.
- 5 Relay pulses for a time period set by the C9 module.
- 6 When the solenoid is energised if A, B, C or D fail to de-energise within the time period set by TM1 & TM2 a lockout will occur. The sequence of A, B, C and D is controlled by the rotation of the cams. This lockout indicates no rotation at the cambox.
- 7 Relay H is not energised at reset, only on subsequent cycles.



<p>CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCOS Telephone 01706 815711/818965 Fax 01706 817967</p>	<p>TITLE EXTERNAL DETAILS FOR 5045 MECHANICAL CONTROLS</p>	<p>REV A</p>	<p>DRAWN PG 14.04.01 CHECK PG 14.04.01</p>	<p>SHEET 11/14</p>	<p>DRAWING NUMBER 5045</p>
---	---	------------------	--	------------------------	--------------------------------