HYDRAULIC WITH

INFRA RED GUARD MK2

CIRCUIT 5034

REVISION B

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

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 18" from the trapping point, if the stopping time of the press is less than 200ms.

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 BS6491 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 (12" is the usual distance). The guards should be fixed to the floor using 10mm 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 HYDRAULIC 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/JOG/RUN switch to RESET. The relays will now reset. TURN the switch to JOG. This is to prevent the pump motor starting under load if the beam has dropped to the bottom of its stroke since is was last used.

4. Start the hydraulic motor, and allow it to build up to speed.

5. The press MUST be returned to TDC by either
   - selecting NORMAL or STOP and RUN
   - selecting NORMAL or STOP and JOG and operating the return foot pedal.

6. When the press is at TDC, the photoelectric curtain must be reset by inserting the test template into the curtain.

7. Select the switch functions as required.

3.2 RUN MODE SELECTOR SWITCH

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

RESET — This position must be selected to reset the electrical circuit when the system is first switched on. The key MUST be turned to JOG or RUN for the machine to function. If the key is turned to JOG again the system will return to reset state and the machine will not function.

RUN — When the machine is run in this position the beam will return to the return position when the down footswitch or treadle is released. The machine will remain at the Stroke Stop position if this has been selected.

JOG — When the machine is run in this position the beam will not return to the return position when the down footswitch or treadle is released. To return the beam to the return position, press the Up footswitch or button or select RUN. The machine will remain at the Stroke Stop position if this has been selected.

3.3 STROKE SELECTOR SWITCH

This is a 3 position switch labelled STOP, NORMAL and SHORT.

NORMAL The stroke of the machine is from the return position to the bottom of the tooling where the machine will pressure out (operating the pressure switch if fitted and set) or to the operation of the Bottom Dead Centre (BDC) limit switch.

The RUN MODE switch determines the return of the machine. In both JOG and RUN the beam will return automatically from BDC if the pressure switch or BDC limit switch is operated, but not if BDC HOLD has been selected.

The guard is in circuit from the return point 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 not necessary for the bullet switch to be operated during the cycle.

STOP The operation of the machine is the same as NORMAL 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.

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.

SHORT In this mode the return position is not determined by the Top Dead Centre limit switch but is at the point where the bullet switch is released on the machine's return stroke.

The bullet switch should be set to ensure that the gap between the tool and the workpiece is less than 6mm.

JOG and RUN are still selectable in this mode. In both JOG and RUN the beam will return automatically from BDC if the pressure switch or BDC limit switch is operated, but not if BDC HOLD has been selected.

Care should be taken to ensure that the bullet switch is not released during the approach part of the cycle, since the machine will not return.

When this mode of operation is selected the guard is always out of circuit during normal operation. At first switch on the guard is in circuit for a brief part of the stroke as part of the circuit's checking procedure.

The guard is still checked during the return part of the cycle so a guard fault will still prevent a reset of the circuit at the return point.

This position should be used with great care since the guard is out of circuit. The safe gap distance of 6mm should NEVER be exceeded.

This position should NEVER be used as a means of overcoming a guard fault or for a quicker, less safe way of doing a particular job.

The bullet switch is used as the return point but if a change is made from STOP to SHORT or SHORT to STOP the bullet switch MUST be reset since the two position will not be the same.

3.4 BDC HOLD SELECTOR SWITCH (if fitted)

This is a 2 position switch labelled ON and OFF.

OFF — The BDC HOLD facility is switched off and the stroke will be as set by the selections of the other switches.

ON — In this position the machine will remain at BDC whilst the footswitch is operated after the pressure switch or BDC limit switch has been operated.

The stroke of the machine is still determined by the selection on the other switches.

3.5 CURTAIN INTERRUPTION

If the curtain is interrupted before the press has reached the mute position, the press must be returned to TDC. It is not possible to continue the approach stroke.

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.

- Check Reset/Jog/Run switch is in Jog or Run position.

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, and overload trip, replace or rest if necessary

- Check action of starter, correct if necessary.

- Check for loose terminal screws and connections.

3. Machine has power, motor has run up to speed, but machine cycle cannot be initiated.

- Ensure the curtain has been reset.

- 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 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.

- Check the mute bulb.

- Check the press has been taken back to TDC to reset the electrical circuit.

- Check that the reset switch is correctly set.

- 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. (3)

- Check the light curtain mountings.

5. Stroke stop will not operate.

- Check selector switch.

- Check stroke stop switch(es) for correct operation, replace if necessary.

- Check all plug in relays, observe coil voltages and replace with new correct voltage relays if necessary.

6. If the TDC switch and bullet switch are operated at the same time the circuit will not reset, since relay H will not energise when relay E is operated.

7. If the mute circuit fails (ie the mute bulb blows) the machine will not return from BDC. This is a safety check to ensure that the operator is aware of the fact that the guard is not in circuit. Replace the mute bulb with an exact replacement only.

8. If the guard check fails (ie the guard and hence relays A or B do not drop out) during the check part of the cycle no further approach is possible. The press can be returned to TDC only.

When mute is operational the curtain is put into check mode. Failure of the check mode during short stroke will also prevent operation of the press.

5 INSTALLATION INSTRUCTIONS FOR HYDRAULIC 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 415v 50 Hz 5 Amp max to terminals 59 & 60.

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 16 way connectors as supplied. To ensure a good connection suitable terminations should also be used.

7. The Cambrake circuit controls the whole operation of the machine, except the starter for the pump. All existing connections to the TDC, BDC and footswitch can be discarded.

8. All selector switches are on the front of the control panel except the UP button or footswitch which must be separately mounted if required.

9. Suitable insulated terminations should be used for connections to the terminal strips.

10. See drawing 5034 sheet 6 for external connection details and drawing 5034 sheet 4 for switch contact operation.

5.2 CHASSIS LINKS (see drawing 5034 sheet 6)

25-39 & 6-23	On Infra Red only
20-21	Available for external contacts that must be closed before the circuit can be reset.
33-34	BDC switch (Remove if BDC or pressure switch fitted)
30-33	Remove on single solenoid machines. (BDC hold)
32-33	Gate switches (remove if gate switches normally closed type fitted)
34-35	Available for external contacts that must be closed before the press can approach (eg Backgauge, Delta contact on starter, material feeding equipment)

5.3 OUTPUTS

42-43, 44-45 & 46-47	3 volt free Approach contacts for the control of the Approach solenoid.
48-49	Volt free Return contacts for control of the Return solenoid.
	These may be wired in Parallel on single solenoid machines. (Link 17-18 MUST be removed for this option)
52	X coil is an extra relay fitted for on-site use. (110v relay)
56-57-58	A changeover N contact is available for external use if required.
53-54-55	A changeover X contact is available for external use if required

5.4 CIRCUIT NOTES

	Drawing shown at TDC with power off.
TDC	Top Dead Centre or Return Limit
BDC	Bottom Dead Centre or Approach Limit
SS/Bullet	Bullet operated Limit Switch
BB	Beam Broken Indicator Light

5.5 RELAY FUNCTIONS

A/B	Guard relay
C	Return control
D	Pulsed at Stroke Stop
E	Chassis Mute
F	Footswitch released
G	Enable Return
H	Up/Down selector
I/J	On Bullet
K	Short stroke selected
L	Mute Latch
M	External mute (if fitted)
N	Return Point Relay - de-energises at return point
P	Reset relay when off TDC limit switch
Q	Reset relay when on TDC limit switch
R	Reset relay 1
S	Reset relay 2
T	Reset relay 3
V	Stroke stop changeover relay
W	Stroke stop control relay

App1	Approach contactor 1
App2	Approach contactor 2
Ret	Return contactor
X	Extra relay

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

5.6 FACTORY WIRED CONNECTIONS

5.6.1 SWITCHES (see drawing 5034 sheet 6)

3	Green (Gn)
4	Blue (Bu)
5	Black (Bk)
6	Red (R)
24	White (W)
26	Pink (P)
27	Orange (O)
28	Brown (Bn)
29	Yellow (Y)
206	Violet (V)

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
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.
BS6491 : 1984	British Standards Publication

prEN 50100-1 : 1992
Safety of Machinery : Electro Sensitive Protective Devices
Part 1 : Specification for General Requirements

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.

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

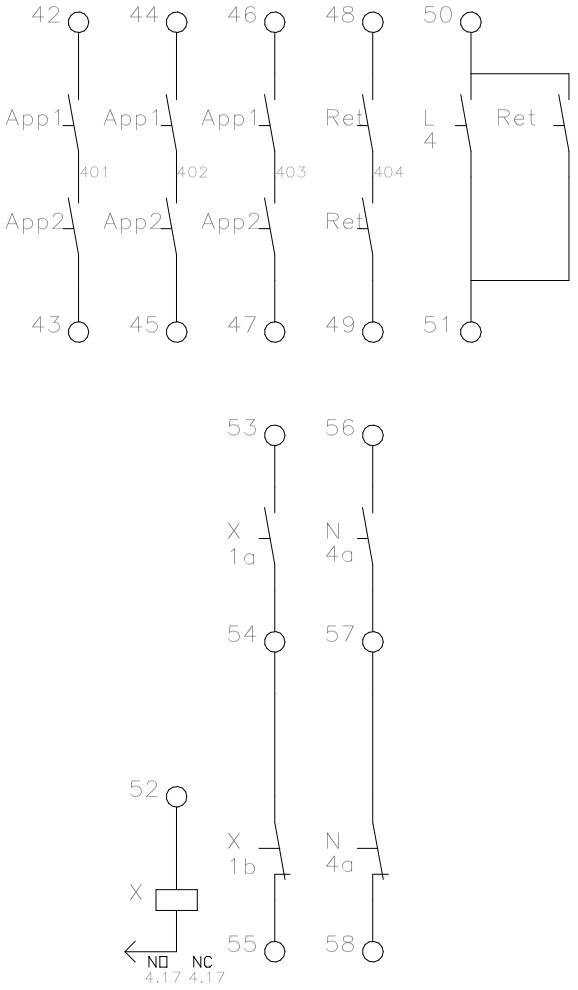
AT TDC POWER OFF VOLT FREE CONTACTS

Key to abbreviations

GTs	Gates
GC	Curtain contacts
M	Mute Bulb (Red)
S1	Stroke Selector switch
S2	Mode selector switch
S3	Hold selector switch
AppA & AppB	Approach footswitch(es)
Sol	Solenoid switch(es)
RetA	Return (foot)switch
App1 & App2	Approach contacts
Ret	Return contacts
TDC	Top Dead Centre
BDC	Bottom Dead centre
SS1 & SS2	Stroke Stop switch(es)
Ext1	External m/c contact
Ext2	External equipment contact

SWITCH KEY

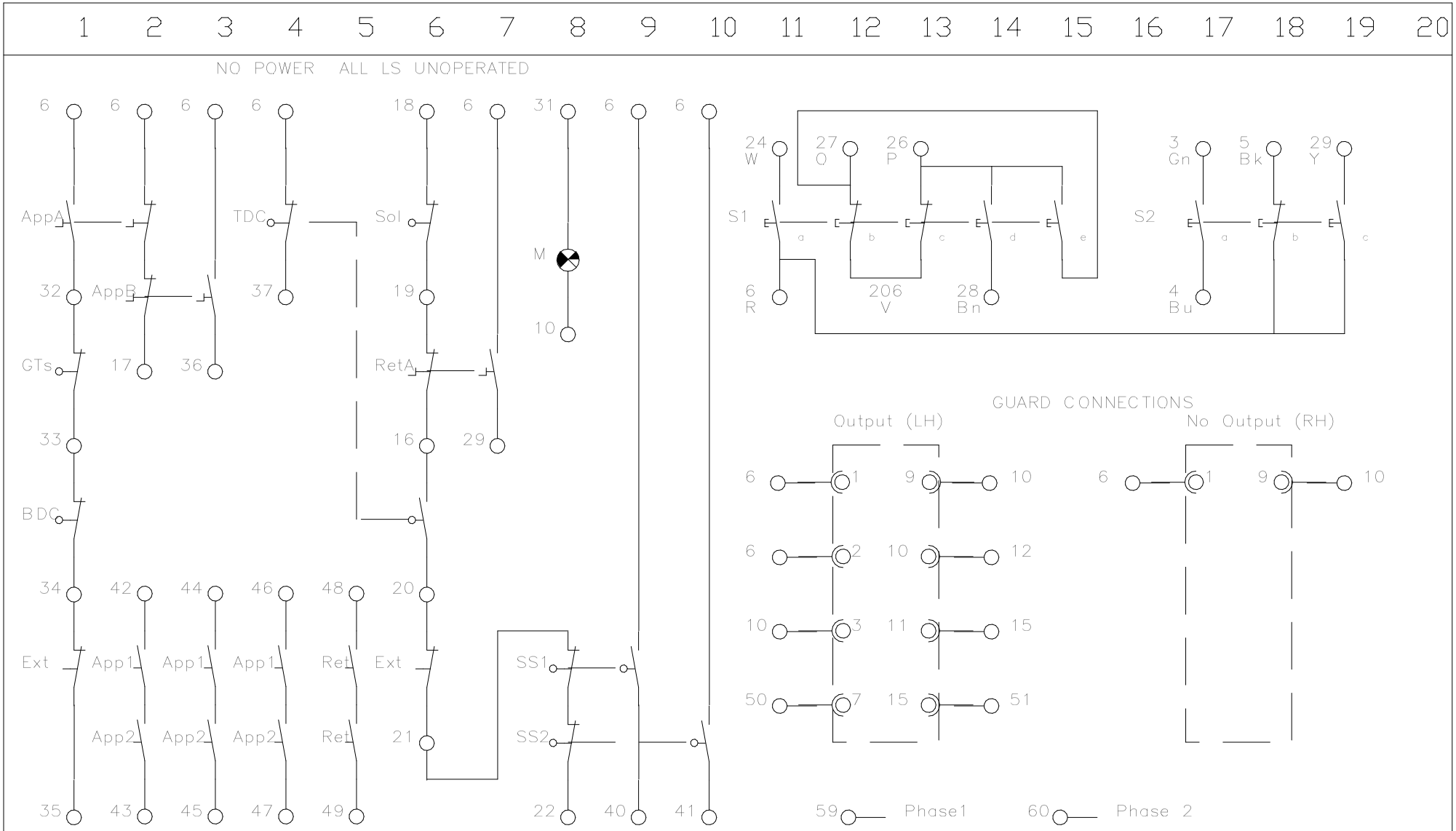
S1		Stop	Normal	Short
	a			x
	b	x	x	
	c		x	x
	d	x		
	e			x
S2		Reset	Inch	Run
	a	x		
	b		x	x
	c			x



Spare Terminals

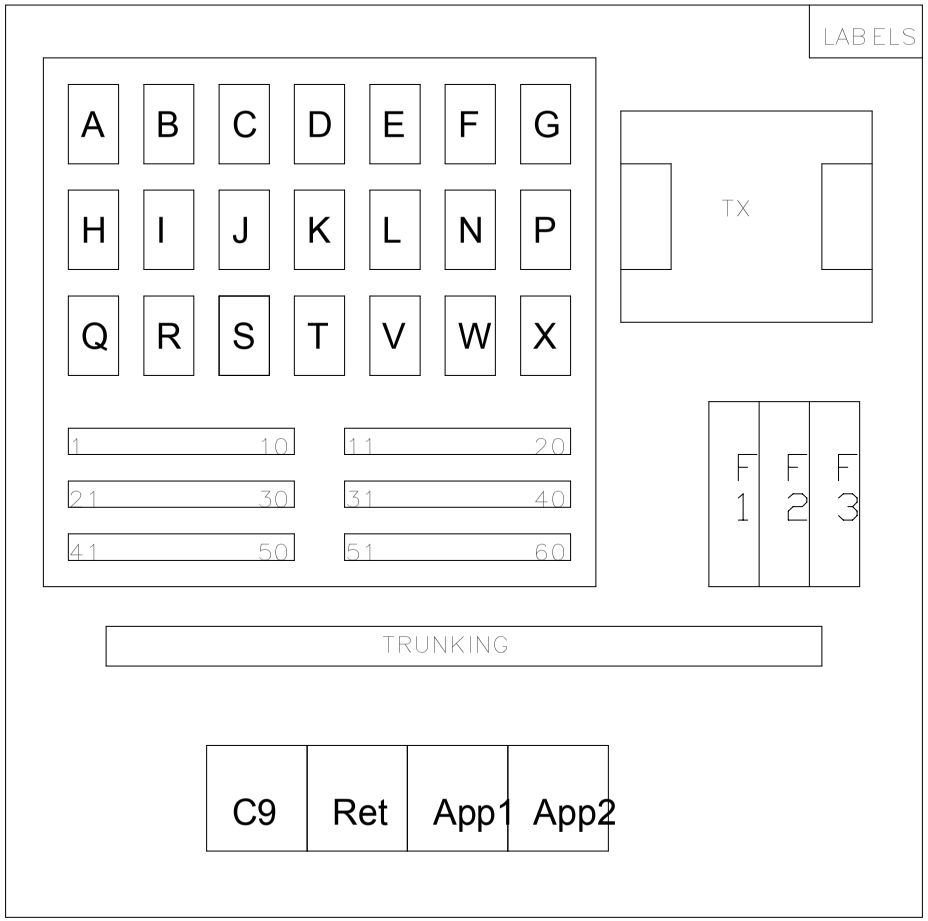
None

CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCS Telephone 01706 815711/818965 Fax 01706 817967	TITLE SCHEMATIC DRAWING FOR 5034 HYDRAULIC CONTROLS – 4	REV B	DRAWN PG 21.05.04 CHECK PG 21.05.04	SHEET 4/14	DRAWING NUMBER 5034



Job Details	Internal Links 6, 7, 8 & 9 110v 10, 11 0v	Links 20–21 EXT Resets 32–33 No Gates 33–34 No BDC 34–35 Ext Approach 25–39 & 6–23 No ext Mute relay

CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCS Telephone 01706 815711/818965 Fax 01706 817967	TITLE EXTERNAL CONNECTIONS FOR 5034 & CAMBRAKE INFRA RED 2	REV	DRAWN PG 21.05.04 CHECK PG 21.05.04	SHEET	DRAWING NUMBER
		B		6/14	5034



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 Legrande 44162 150VA
C9 Cambrake
Ret contactor S&S CA4-S-10-110 + CS4-P04
App1 & App2 contactors S&S CA4-S-10-110 + CS4-P2
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

CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCS Telephone 01706 815711/818965 Fax 01706 817967	TITLE CHASSIS LAYOUT FOR 5034 HYDRAULIC CONTROLS – 1	REV B	DRAWN PG 11.03.98 CHECK PG 11.03.98	SHEET 8/14	DRAWING NUMBER 5034

OPERATION	A	B	C	D	E	F	G	H	I	J	K	L	N	P	Q	R	S	T	V	W	APP	RET	COMMENTS
Select RESET																x	x	x					
Select JOG or RUN & return press to TDC.						x	x						x	x			x	x					
At TDC. All footswitches released & externgl OK.						x	x	x			!				x		x	x					
At TDC. All footswitches released & exts OK. Curtain reset (power up)		x				x	x	x			!				x		x	x					
Press approach footswitch	x	x					x	x			!						x	x			x		Approaching
Drop off TDC Limit switch	x	x					x	x			!		x				x	x			x		Approaching
– Interupt curtain							x	x			!		x				x	x					Stops approaching MUST return to TDC
– NORMAL Operate Stroke stop limit switch(es)					x		x	x	x	x		x	x				x	x	x		x		Mode change – 'bounce' on approach contactors
Release approach footswitch JOG & Return FS or RUN			x			x	x		x	x			x				x	x				x	Returning to TDC then continues as before
– STROKE STOP Operate Stroke stop limit switch(es)				x	x			x	x	x		x	x				x	x					Stops & mutes curtain
Release approach footswitch					x	x		x	x	x		x	x	x			x	x	x	x			
Press approach footswitch				x	x		x	x	x	x		x	x				x	x	x	x	x		
Release approach footswitch JOG & Return FS or RUN			x			x	x		x	x			x				x	x				x	Returning to TDC then continues as before
– SHORT STROKE Operate Stroke stop limit switch(es)					x		x	x	x	x	x	x	x				x	x	x		x		Mode change – 'bounce' on approach contactors
Release approach footswitch JOG & Return FS or RUN			x		x	x	x		x	x	x	x	x				x	x	x			x	Returning
Drop off stroke stop limit switch(es)					x		x	x			x	x					x	x	x				
Release footswitch					x	x	x	x			x	x					x	x	x				
Press approach footswitch					x		x	x			x	x					x	x	x		x		
Operate stroke stop limit switch(es)					x		x	x	x	x	x	x	x				x	x	x		x		
Release approach footswitch JOG & Return FS or RUN			x		x	x	x		x	x	x	x	x				x	x	x			x	Returning

x Relay operated ! K relay will be operated if short stroke is selected

CAMBRAKE Limited
CRESCENT MILL, TODMORDEN, LANCS
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TITLE RELAY SEQUENCE FOR 5034

REV	DRAWN	SHEET	DRAWING NUMBER
A	PG 24.3.97	9/14	5034
	CHECK PG 25.3.97		