MONOTYPE

Studio-lettering Machine Mark 3

Service Manual

Part 1 General service and adjustments

Part 2 Electrical checks

The Monotype Corporation Limited

Monotype Studio Lettering Machine Mark 3

Service Manual

The above publication is now complete and a copy is enclosed for your attention.

Further copies are obtainable from the Technical Literature Department.

Technical Literature Department Nov. 73.

'MONOTYPE' STUDIO-LETTERING MACHINE

MARK 3

SERVICE MANUAL

Printed in England

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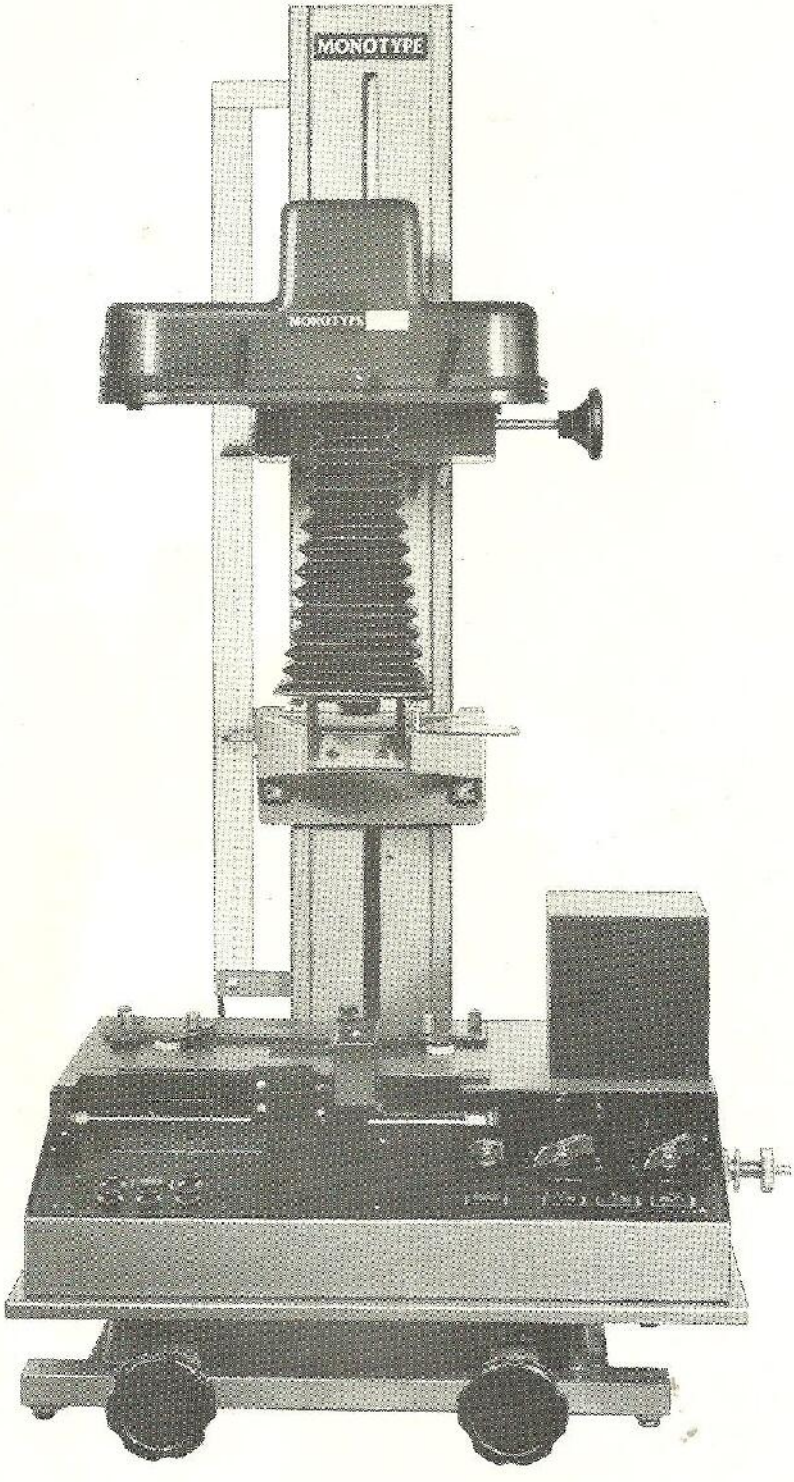
IT SHOULD BE EMPHASISED THAT THE REMOVAL OF THE COVERS OF THIS EQUIPMENT MAY EXPOSE WIRING AND COMPONENTS CARRYING THE SUPPLY MAIN VOLTAGE. CONTACT WITH SUCH EXPOSED PARTS IS DANGEROUS AND CAN BE LETHAL.


MONOTYPE

CONTENTS

'Monotype' Studio-lettering Machine

Fault finding, repair and maintenance

INTRODUCTION

The maintenance of a studio-lettering machine, using the term in the sense of care rather than repair, is easy. Week-to-week routine for the operator is confined to keeping the machine clean, especially the optical components in the matrix head. As long as the machine is running normally, there are no adjustments required beyond the few concerned with the efficient operation of the machine, e.g. variation of pecker height when changing from paper to film, which are given in 'Instructions for operators'.

There are not many moving parts in a studio-lettering machine and therefore faults of mechanical origin should be infrequent. It will, however, be necessary to remove some components in order to carry out tests for malfunctions and to make adjustments as a result of the tests. Most of the following instructions deal with the removal and re-assembly of items which it may some time be necessary to take out of the base unit. Such faults as may occur are most likely to be due to electrical and electronic malfunctions usually of a minor but occasionally puzzling nature. Logical procedures for finding faults of this kind are given in flow chart form, and the sequences the charts detail should be followed accurately for the methodical diagnosis of malfunctions that have no visible or instantly detectable cause. Where a fault appears obviously to be concerned with a particular phase of operation, refer to the sequence dealing with that phase for the method of verifying the cause, and its cure.

The man for the job

Ideally the person who makes use of the electronic fault-finding charts should have received training either at the Monotype School or from one of our technical representatives. If no one so qualified is available, whoever attempts the job should have electrical knowledge and experience. He should be capable of handling and reading accurately a multiple-range meter, such as an Avometer, should be able to understand the circuit drawings provided and should have sufficient simple mechanical ability to remove and replace

components (if necessary) in accordance with the instructions given in this booklet. Should no one with the required ability be available, the wise course is to seek assistance from the nearest Monotype branch or agency.

Recognising that there may be machines in places where it would be difficult or impossible for qualified service men to attend urgently, we provide in the 'Instructions for operators' an alternative diagnostic flow chart for operators lacking the desirable qualifications. Although the procedures in these charts do not demand the skills implied in those for service personnel, the limitations stated in the introductory notes accompanying the charts should be thoroughly understood and observed.

It is not expected that repairs to circuit boards will be carried out by customers, although it is possible there may be exceptional cases where a skilled electronic engineer is available, for example in a large establishment with some computer-aided typesetting and other electronic equipment. In all other cases, a board on which a component or wiring is found to be defective should be removed, or replaced by a serviceable board.

Before any cover is removed from the base unit at the start of an investigation, power to the machine must be disconnected. If it is necessary to switch the power on again in order to carry out electrical checks, great care must be taken subsequently, bearing in mind that there is mains voltage on all multi-socket connectors, and none of these is protected after the base unit cover plates have been removed.

All directions given in these notes are from the point of view of an operator facing the machine: e.g. the carriage control rods assembly is on his right; the column housing the flat springs assisting control of matrix unit movement are at the rear. The same policy applies to directions referring to sub-assemblies.

In most instructions, elementary points like the removal and replacing of bolts, nuts and washers are assumed, except where any doubt could exist as to the correct items involved.

Take care when it is almost completely wound off, because when the end of the tensator spring leaves the bobbin it will snap sharply on to the newly made coil. In the case of a tensator spring that has broken close to the retaining stud, and has an anchor hole in the opposite end, it is possible to rewind it with the broken end on the storage bobbin.

When the new or repaired tensator spring is wound on to the bobbin, do not allow the end with the anchor hole curl itself on. Take the end of the new or repaired tensator spring with a pair of pliers, stretch it out, align the tensator spring and bracket holes, insert the securing screw and tighten.

The base unit (Fig 2)

In any investigation of the base unit, having switched off the mains and removed the plug, it will be necessary first to remove the top cover and possibly the front control panel. Lift away the latter with care as follows:
Before proceeding ensure that the photocell slide is fully retracted. Remove the two top retaining screws then slide the control panel forward until the lower retaining clips are clear of the case. Lift the lower end of the control panel and withdraw from the machine. Since it is plugged into a multi-socket the connections could be damaged by incautious handling. Disconnect the multi-plug carefully.

A fundamental adjustment is that of the carriage guide rod (2,17); fundamental because if it is not accurately done it can have an adverse effect upon other variables:e.g. the location of the kerning carriage spring-abutment plate (2,8) and the height of the photo-cell (2,13) in relation to the base unit top plate and the paper guide locators.

Before attempting to adjust the position of the carriage rod it is advisable to check the efficiency of the pecker's contact with its gripper pad (Fig 3), so as to ensure that the solenoid has full movement and will not chatter. The anvil bearing the gripper pad will have been carefully set for height at the works and it should seldom be necessary to vary the adjustment, which is held by the bolt that secures the anvil to the right-hand side of the carriage (Fig 4).

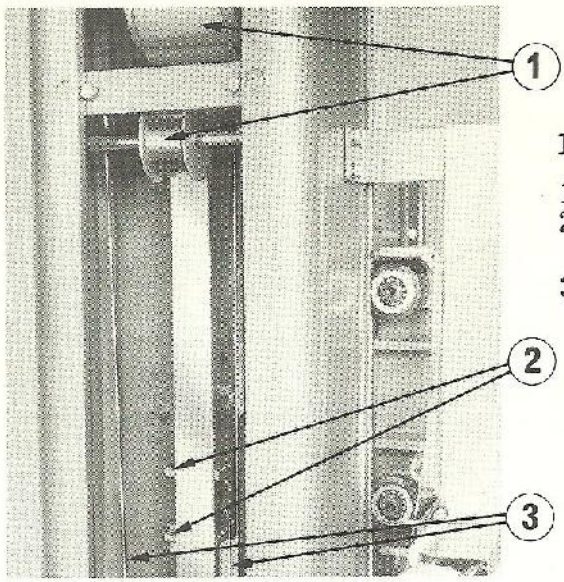


Figure 1

1 Springs
2 Adjusters for cable tension (partially obscured)
3 Wire cables

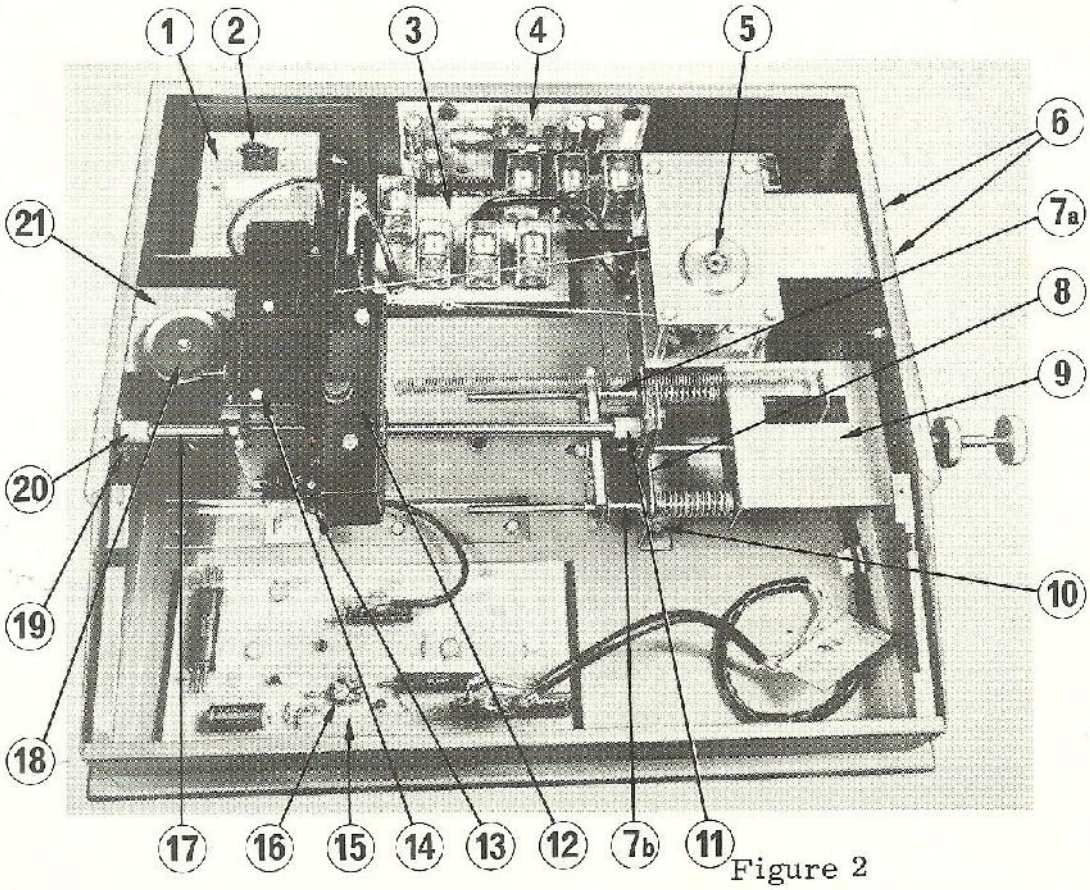


Figure 2

1 Power supply pack
2 Voltage selector plug
3 Base for relays
4 B8 circuit board
5 Drive motor shaft ballrace (clutch and motor beneath)
6 Doomed nuts, motor drive plate
7 (a and b) Kerning carriage guide rods
8 Kerning carriage spring abutment plate
9 Kerning carriage
10 Bolt (2 off) for adjustment of item 6
11 Nut and collar, carriage guide rod
12 Pecker assembly
13 Photo-cell and bearer
14 Carriage for photo-cell
15 B4 circuit board
16 Adjustable timer
17 Carriage guide rod
18 Carriage return pulley, motor and clutch
19 Plate for carriage guide rod
20 Nut and collar, for guide rod
21 Cable assisting carriage return

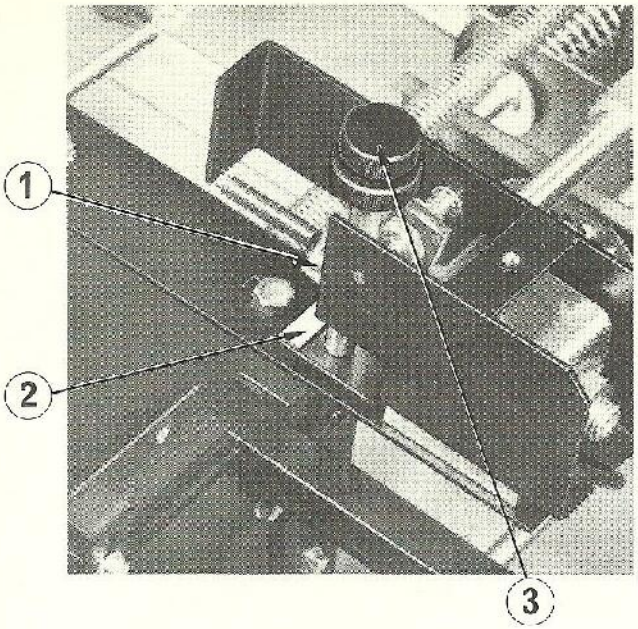


Figure 3

1 Pecker
2 Pecker pad
3 Pecker height adjuster

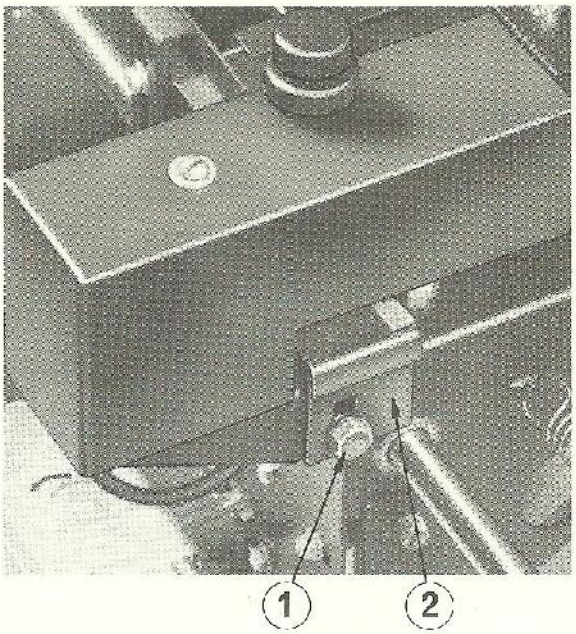


Figure 4

1 Adjusting bolt
2 Pecker anvil

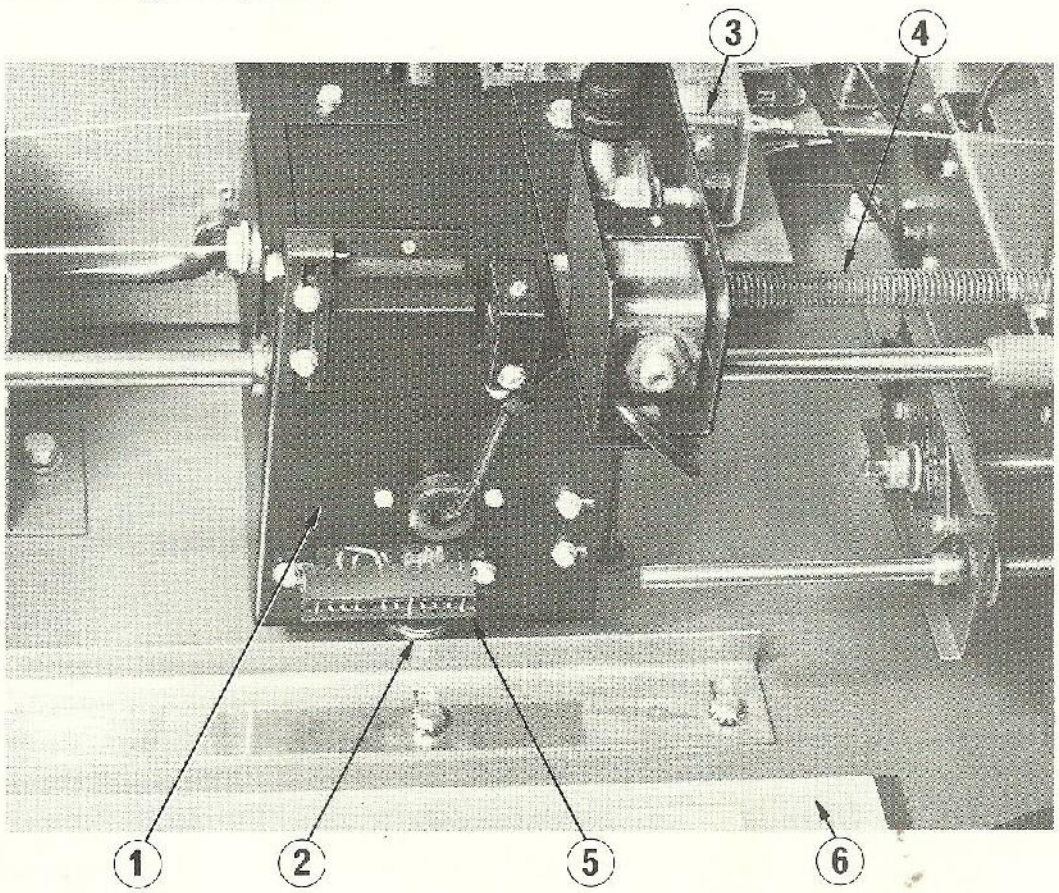


Figure 5

1 Carriage for photo-cell
2 Carriage wheel
3 Anchorage for carriage cable
4 Carriage return spring
5 Electrical multi-socket on....
6 B4 circuit board

If it has to be altered, slacken the bolt only enough to allow controllable, sliding movement of the anvil. Make fine adjustment by use of the screw through the pecker cover.

When this adjustment has been satisfactorily, the level of the carriage assembly (2,14) should be adjusted so that the top of the gripper pad is level with the top plate of the unit, which must be replaced (not necessarily screwed down) for this operation. It is also vital that carriage movement runs parallel with the front edge of the top plate. These objectives are achieved by moving the carriage rod in the oversize hole in its retaining plate (2,19) on the left-hand side of the casing and at the right-hand end in the vertical slots in the kerning carriage spring-abutment plate (2,8), with the nuts at each end (2,11 and 20) just sufficiently loosened to allow movement of the rod. The level must be maintained at both ends of the carriage movement, and the rod must be parallel with the base unit top plate, to ensure that the paper guide pads will be in alignment with the carriage movement. It is important that the carriage moves parallel to the paper guide pads, which need not necessarily be to the front edge, however desirable.

Note that any undue tension upon the guide rod could cause distortion of the base unit casing. Any such tension can be eliminated by slackening the bolts (2,10) that secure the kerning carriage return-spring abutment plate to the base (through oversize holes in the flange of the plate), and allowing the plate to take up a new position dictated by the release of the tension that was in the guide rod. Then re-tighten the bolts.

After adjustments have been completed, the carriage should be parallel to the base in the front-to-rear direction because the height of the carriage from the base, at the rear, is governed by the position of the ballrace wheel (Fig 5,2) against the guide plate upon which it travels, and this will have been determined and locked during manufacture. In the rare event of suspicion that this position has shifted, an adjustment can be made by easing off the bolts securing the guide plate and manipulating while checking with a spirit level, until the carriage is correct over the whole of its travel. When satisfied, tighten the bolts and check that the adjustment has held.

Removal of carriage (Fig 5)

Detach the small spring (5,3) linking the carriage cable to the carriage and release the cable from the carriage drive wheel. Now detach the carriage return spring (5,4) from the right-hand side of the carriage. Remove the multi-plug (5,5) feeding the carriage from the centre of the B4 printed circuit board (5,6).

Turn inwards the knurled nuts (2,11 and 20) at each end of the carriage rod (2,17), and lift out the rod with the carriage (2,14) on it. Slide the carriage off the rod.

Trip micro-switches (Fig 6)

With the carriage removed, the trip micro-switches (6,1 and 3) become readily accessible and they can then easily be checked for continuity with the meter set to the ohms range. If, when following the procedure detailed in the fault diagnosis chart, failure of continuity in the micro-switches is suspected, e.g. if the machine fails to prime; before removing the carriage to test them, first operate each one manually a number of times. Infrequent use may be the cause of resistance remaining high in the circuit, and a little action may clear the trouble and obviate the necessity of removing the carriage from the machine.

Carriage drive motor and clutch removal (Fig 7)

Detach the cable from the carriage and main drive wheel. Withdraw the plug from the socket adjacent to relay No 3. Remove the two cheese-headed bolts (2,6) (top, centre, right-hand side of the base unit). With a box spanner withdraw the four bolts securing the motor housing to the floor of the base unit. Slide the complete assembly to the left and lift it out.

Unscrew and remove the bolts holding the plates and motor housing together and remove the long spacing tube (7,4), hold the top plate and main drive wheel in one hand as you withdraw the long bolts. When these are out, you will be holding the top plate with its ballrace, the main drive wheel (7,1) and the clutch plate (7,2) on a common shaft as a sub-assembly. Ease off the respective grub screws to remove the wheel and the clutch plate.

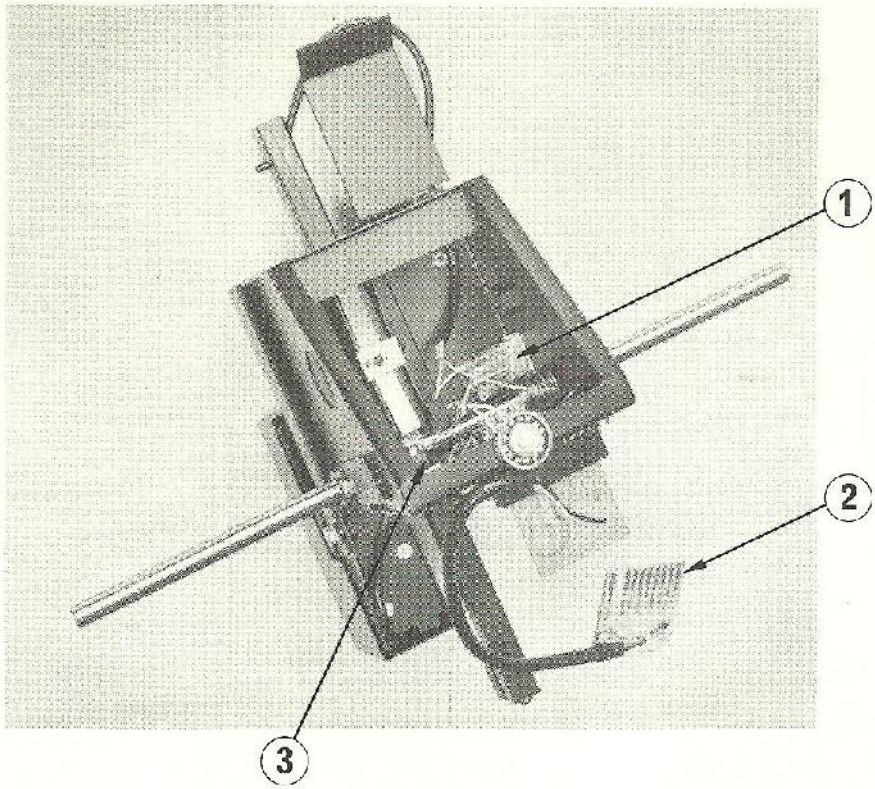


Figure 6

Carriage inverted to show:

1 Micro-switch forward override
2 Cable and multi-plug to B4 board
3 Micro-switch, rearward override

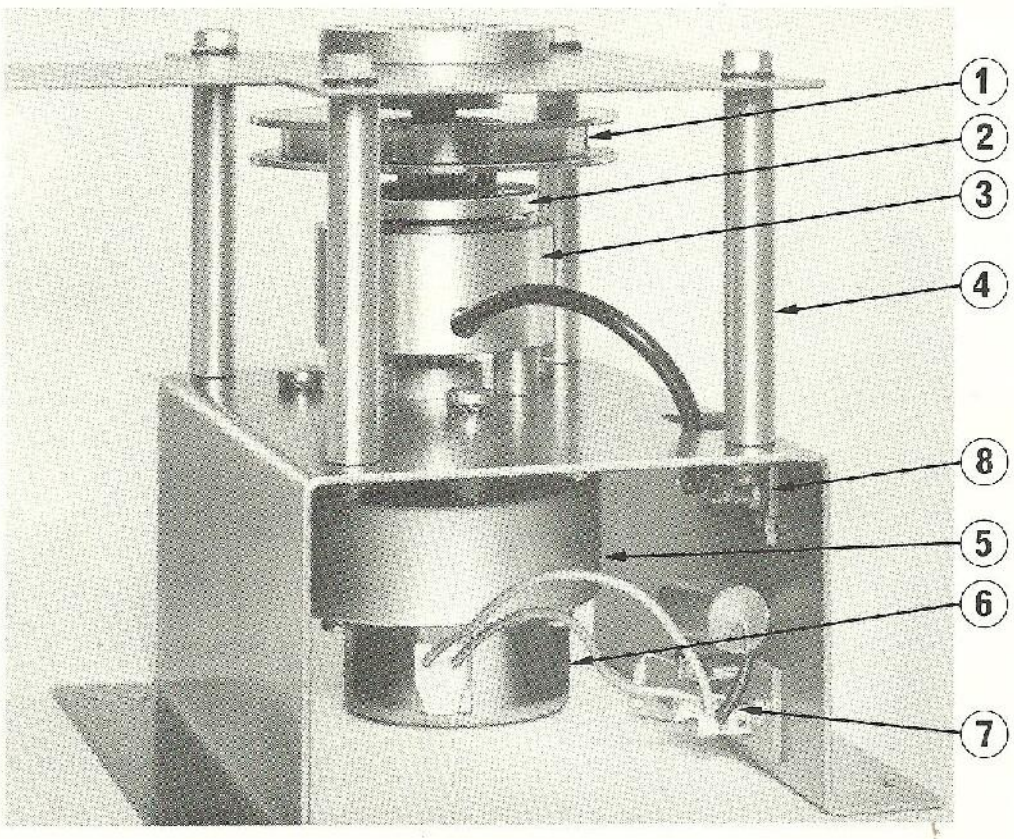


Figure 7 Carriage drive assembly

1 Pulley for carriage cable
2 Clutch plate
3 Clutch body
4 Spacing tubes
5 Gear box
6 Motor
7 Power connection for motor
8 Power connection for clutch

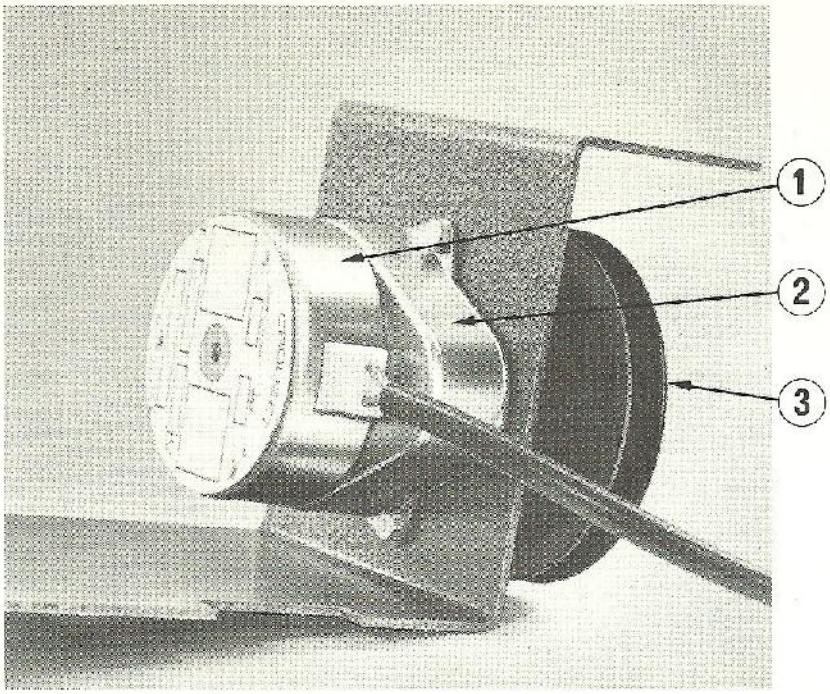


Figure 8 Carriage retuen assembly

1 Motor
2 Gear box
3 Pulley

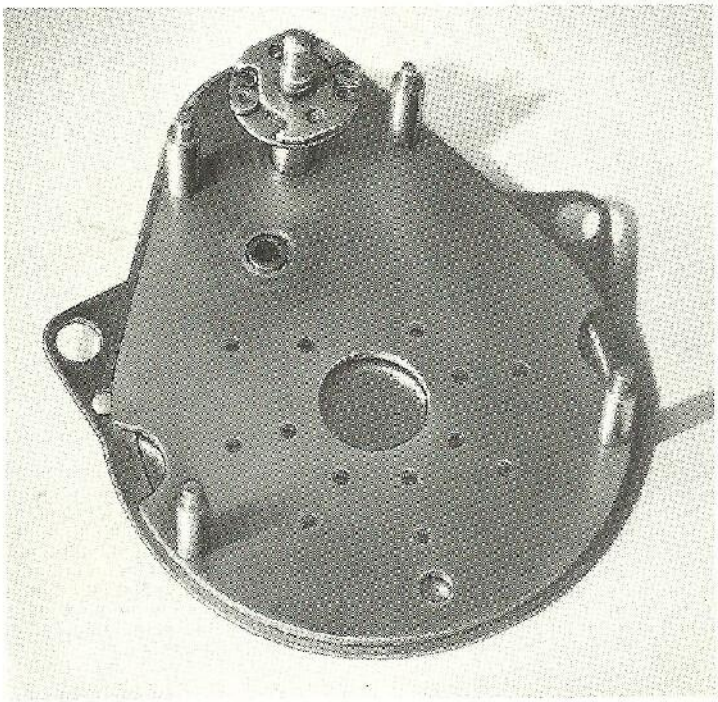


Figure 9
Carriage return gear box disassembled to show correct placing of springs and rollers in the auto-lock device

If the clutch has been found by electrical checks to be unserviceable, detach it from the plate by undoing the three retaining screws, which are accesible after removing the motor and gear box. To detach the gear box (7,5) and motor (7,6) from the metal housing it is only necessary to remove three retaining screws. If electrical tests have shown that the motor is unserviceable, it can be removed and replaced by a new unit.

Re-assembly

Re-assemble the top plate, main drive wheel, clutch plate and shaft, locking the wheel on the shaft so that a clearance exhists between the pulley and the bearing. The upper end of the shaft and the upper side of the ballrace should be set flush before the clutch plate is locked on to the shaft.

Fit the clutch body over the gear box shaft and secure with the three screws. Re-attach the motor and gear box to their housing (three screws).

Assemble the long spacers and bolts, fit the top plate and replace the retaining screws (finger tight). Centralise the clutch plate by dropping a 4" long $\frac{1}{8}$" diameter pin down the pulley shaft, then tighten the four retaining screws. Now release the two grub screws on the clutch plate and lower the plate so that a clearance is established between the plate and the rotor. Tighten the grub screws. Lower the complete assembly into the case. Replace the two side plate bolts (2,6) and tighten. Replace the four base plate bolts together with the washers and tighten.

Refitting steel cable

When replacing a steel cable, take care, when leading the cable around the main drive wheel, to feed it in low i.e. touching the bottom flange. Bring it round in a rising movement until the grub screw attached to the cable can be placed in its hole (the smaller of two): then carry on the rising movement, bringing the cable out close to and parallel with the top flange of the wheel and secure the spring (5,3) to the carriage.
NOTE:- Ensure that the cable runs parallel with the brake motor pulley. Adjust the clutch pulley to achieve this.

Carriage return motor (Fig 8)

The brake (carriage return) motor pulley (8,3) should revolve

freely in a clockwise direction and should not be movable in the reverse direction. This condition is controlled by an auto-lock system on the output shaft of the gear box (8,2) attached to the motor (8,1). It could happen that this system might fail either through a breakdown of the U springs in the auto-lock, fracture of the output shaft or undue wear on the gears, in which case it will be necessary to remove the complete assembly for inspection and repair. It is also conceivable, although unlikely, that the motor itself could fail, a condition which electrical checks would determine. In either case it is necessary to remove the complete assembly from the case unit.

Withdraw the power plug from the socket in the power pack. Disconnect the cable from the carriage and withdraw it from the pulley.

Undo and remove the nuts and bolts securing the assembly to the base and lift it out. Ease the grub screw and take the pulley off the shaft.

Undo the two nuts and bolts and remove the gear box and motor. Lift the gear box away from the motor. This is as far as it is necessary to go if it is simply a matter of replacing a defective motor with a serviceable one; re-assembly follows the stripping procedure in reverse order.

Should a gear box defect be suspected, invert the component and slide the protective cover from the detachable bearing plate. Very carefully lift the plate off its locating pins so that the gears remain undisturbed with the under-shafts still in their bearings in the gear box casing. Closely note their relative positions. The gears can now be lifted out individually and inspected.

The auto-lock device is incorporated in the output gear and the two elements must be separated for a complete inspection. This is best done by lightly gripping the larger diameter shaft of the assembly in a vice so that the smaller diameter shaft, which has a circlip and washer, faces upwards. Gently remove the circlip - any undue or awkward pressure could impose a shock on the shaft or even fracture it - and then very carefully rotate the gear wheel in a clockwise direction and at the same time lift off, so that the auto-lock assembly with its rollers and U-springs, remains undisturbed.

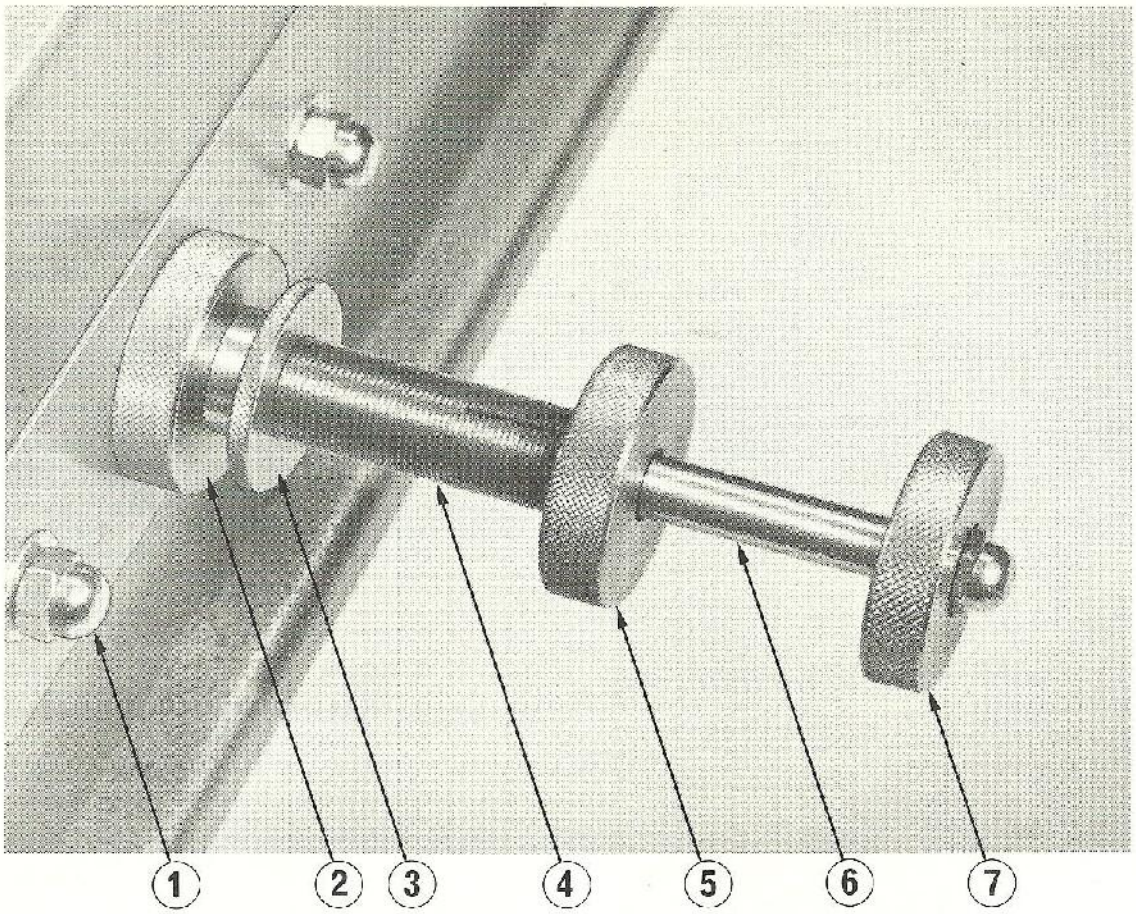


Figure 10

Carriage control rods assembly

1 Domed nuts securing kerning carriage guide rods
2 Annular ring for kerning etc.
3 Locking ring for above
4 Outer carriage control rod
5 Locking ring, securing intermediate rod (6) in outer rod
6 Intermediate rod
7 Handwheel on inner control rod

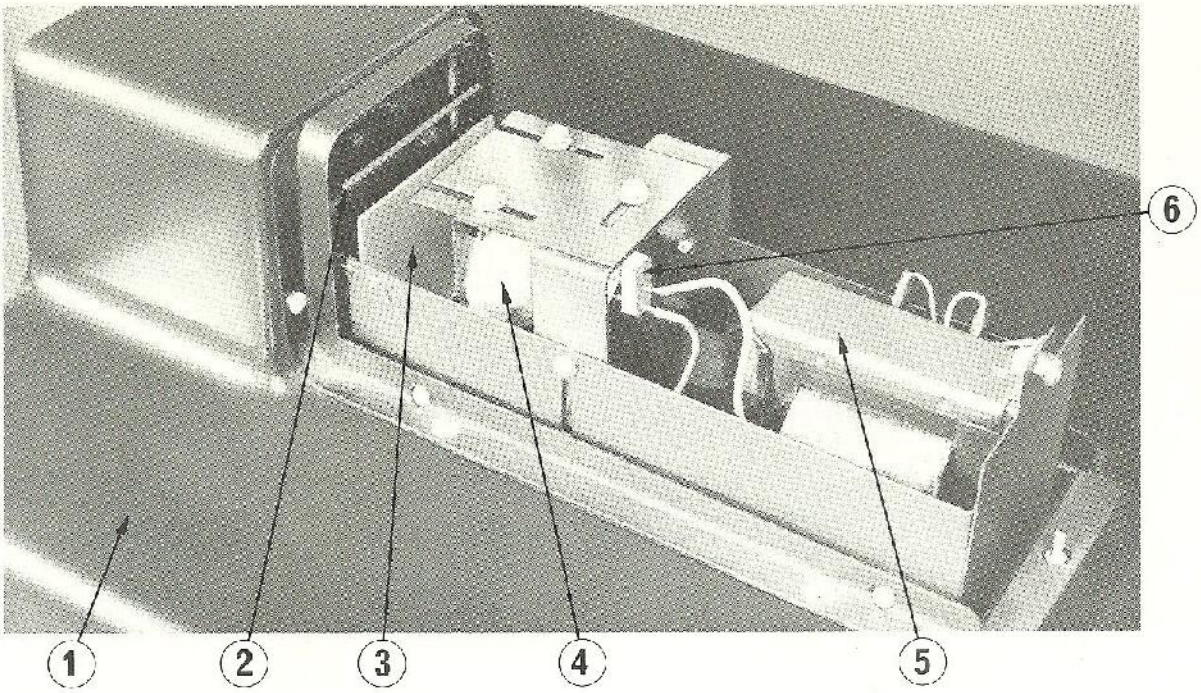


Figure 11 Lamp housing assembly

1 Casing containing condenser
2 Mirror
3 Diffusing screen
4 Lamp
5 Transformer
6 Lamp socket

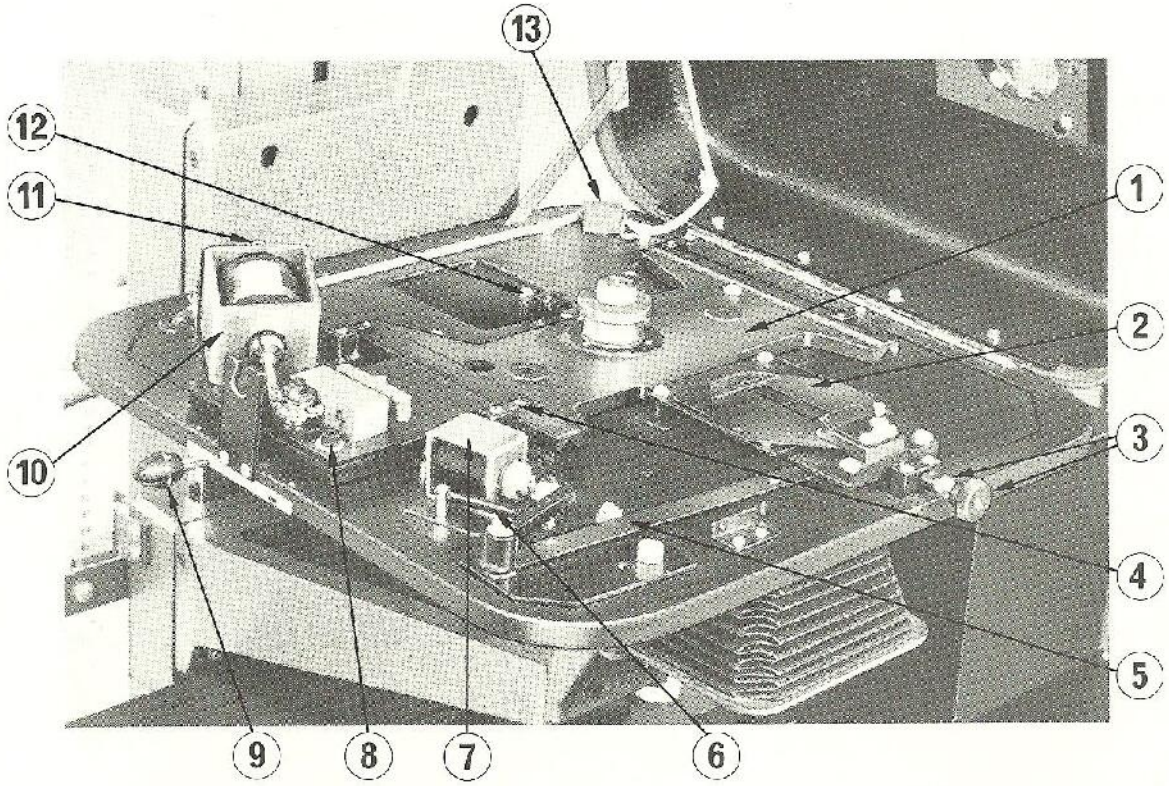


Figure 12 Matrix unit

1 Matrix disc carrier plate
2 Shutter mask
3 Disc carrier plate, front stop
4 Carriage plate spring-and-ball retainer (4 off)
5 Shutter flag arm
6 Shutter flag return spring
7 Shutter solenoid
8 Knurled screws, disc lock solenoid plate
9 Fount selector lever
10 Disc lock solenoid
11 Disc lock solenoid, plunger adjusting screw
12 Carrier plate, rear stop adjuster
13 Lamp switch

Before inspecting the parts take careful note of the relative positions of the U-springs and rollers (Fig 9): if they are taken out it is all too easy to replace them wrongly. Indeed, if they appear to be in good condition, do not take them out.

Should the shaft have been fractured, this would have been obvious before the components parts of the auto-lock were separated, if not examine it, especially at the point where the circlip bears, for signs of cracking, fatigue or burrs. Burrs can be carefully relieved with a stone, but if there is any doubt that the item is serviceable, the complete unit should be replaced.

Replace all items in the reverse order to the removal procedure. Note that the plug and lead to the power pack must pass inside the right-hand vertical plate of the motor casing (or through the hole in it). If the lead is brought around the outside, the wire will prevent the carriage from operating the override micro-switch, with the consequent possiblility of burning out the drive motor.

Carriage control and rods assembly (Fig 2, Fig 10)

The positioning of the kerning carriage spring-abutment plate (2,8) which is attached by bolts (2,10) to the base through a flange with oversize bolt holes to allow for variable positioning, is most important. The plate also acts as the right-hand end support for the carriage guide rod (2,17) and it must be located (as described earlier).

Provided that the machine is used with proper care, there is little that can go wrong with the carriage control rods assembly: nevertheless there are certain points to watch. For example, the externally threaded outer sleeve (10,4) of the assembly, which goes through the right-hand side of the case and is fitted into a spring-loaded kerning carriage (2,9) can work loose, causing inaccurate positioning of the carriage, particularly during a kerning operation. Always ensure, therefore, that the two locking nuts which secure the sleeve in the right-hand vertical wall of the kerning carriage, are fully tightened.

Normally, the spring-loaded carriage is maintained in a fixed position resting against the inner lock nuts on the two lower guide rods (2,7) which run partway across the unit parallel to the carriage guide rod.

The kerning ring (10,2) on the outer sleeve of the control rods assembly must not be tightened against the casing but just brought to rest against the side wall and then secured by its locking ring (10,3). If it is over-tightened, the case may be distorted. The ring should remain in this position unless characters are being kerned or overlapped; the amount of kern depending on the distance that the ring is set to the right (away from the wall of the casing) where it is again locked in position.

When the inner ring is set and locked for kerning, and for this purpose is moved by hand towards tha wall of the casing, the kerning carriage assembly should slide freely, steadily compressing the springs upon which the kerning carriage bears. If there is a tendency for the movement to be stiff, release the two domed lock nuts (10,1) on the ends of the tie rods, located at either side of the kerning ring, allow the rods to re-align themselves and re-tighten the nuts.

Coarse adjustment of the carriage stop is controlled by the clamping ring (10,5), the third knurled ring from the right-hand side of the casing, which clamps the outer sleeve onto the inner sleeve (10,6), which is smooth externally and threaded internally. The clamping ring should never be tightened if the inner sleeve is pushed right inside the outer sleeve: indeed, operators should always ensure that at least the end of the inner sleeve protrudes.

If the ring is tightened without the support of the inner sleeve, the effect will be to pinch the threaded split section upon which the ring operates, making the sliding action of the inner sleeve within the outer very stiff or impossible.

This is a difficult condition to correct: it is necessary to remove the outer sleeve from its carriage by undoing its locking nuts and drawing the sleeve to the right, out of the casing and finally off the complete control rods assembly, having first detached the handwheel (10,7) at the end of the

inner (click stop control) rod. When the sleeve is out of the carriage, the clamping section must be carefully opened up with a tapered punch to a point where the intermediate sleeve will again slide freely.

Another defect that can occur is that the inmost, externally threaded rod becomes bent through careless handling, especially if the length left protruding from the inner sleeve is too great; normally it should be no more than $\frac{1}{2}$ inch, when it is non-operational.

If the rod is bent it becomes difficult, or impossible, to remove the inner sleeve, which normally can be screwed along it and completely withdrawn when the outer handwheel has been detached. Straightening the rod, even partially, to a point at which it is just possible to remove the inner sleeve is a tedious, delicate and time-consuming operation; and it may even then be necessary to remove the rod from the unit after first detaching it from the carriage stop plate, in order to straighten it completely.

When replacing the inner rod's handwheel, some difficulty may be found in tightening the locking nuts, because the recess into which it is turned is deeper than normal. In such a case, reverse the wheel so that its flat face is away from the base unit. The nut can then be fully locked without impedance.

Removing the kerning carriage control rods assembly and associated items

Remove the carriage, carriage-return spring and carriage rod.

Remove the bolts securing the kerning carriage return-springs abutment plate to the base of the unit. This will release spring tension.

Remove the handwheel from the end of the click-stop rod, and all rings from the control rods assembly.

Remove the inner sleeve by screwing it to the right along the click-stop rod.

Move the control rod with the carriage return stop plate and the kerning carriage all to the left until the rod end is inside the base unit.

Remove the outer nuts from the ends of the kerning carriage rods.

By moving the rods to the left, the complete assembly can be lifted out of the case; then, the other items can be slid off the rods. The click-stop rod can now be removed by undoing the lock nut at the left-hand end plate.

Re-assembly

Re-assembly is carried out by the same procedure in reverse order, but attention should be paid to the following points.

Do not tighten down the bolts that secure the kerning carriage return-springs abutment plate to the base until the springs and the carriage rod appear to have taken up their natural positions. If, after tightening the bolts, the movement of the kerning carriage and springs feels unduly stiff, ease off the base bolts and move the plate so that the carriage slides freely: the elongated bolt holes in its flange permit this adjustment. It may in this event be necessary to make a compensating adjustment to the carriage rod. Tighten the bolts when the movement feels correct.

Now tighten the nuts on the tie rods, working with the inner ones first, positioning them so that there is an equal amount of the thread on each protruding from the right hand side of the casing, sufficient to allow the dome nuts to seat firmly when they are replaced.

When replacing the inner sleeve of the carriage control rods assembly, ensure that the end with the relieved position is to the left i.e. leads over the click-stop control rod. Turn it inwards until approximately 1 inch of the click-stop control rod's thread remains visible. Replace the knurled rings and handwheel in correct order.

At all times handle the click-stop control rod very carefully. As explained earlier, it can easily be bent or distorted if it is subjected to undue pressure or careless handling.

The matrix unit optics (Fig 11)

Routine checks, projection system: all the elements in the optical system - lamp (11,4), diffusing screen (11,3), mirror (11,2), condenser lenses and projection lens - must be free from dust and smears i.e. thoroughly clean. To maintain

them in this condition use a camel-hair brush and a 'selvyt' cloth.

The mirror must be set at 45° and must be secure on its locating supports otherwise the projected light source will be reflected in the wrong direction with consequent loss of efficiency. Check by looking through the condenser lenses 'square on': the light source should appear central in the lenses and the diffused area should form a centred square and not a tilted image distorted by appearing wider on one side than any other. If such distortion is apparent, it is likely that the mirror has become dislodged from its locating supports. One method of correcting this fault is to remove the mirror and press the walls of the lamp housing inwards at the front end. This action will improve the grip of the supports. The mirror should then be carefully and firmly replaced.

Light output check

Whenever there is a reason to suspect that illumination may be less than efficient, for example, should the machine fail to prime, carry out a check on lamp output, using a light meter. It is also a good plan to carry out this test immediatley a new machine is installed to ensure that the optical system is fully efficient before starting production work. This is the procedure:

1. Bring the matrix unit to the top of the columns.
2. Fit the 80mm lens, open at its widest aperture.
3. Centre the lens plate to ensure that its two locating balls are seated in the small holes in the lens mounting.
4. Remove the shutter mask (12,2) and aperture plate below it.
5. Place a standard matrix disc on the matrix unit hub.
6. Select and focus a character (cap H) using switch 8 depressed towards the white dot.

7. Place the meter in the area of the projected set-width light rectangle at photo-cell height, making sure that the entire surface of the meter is in the light.
8. With switch 8 depressed towards white dot take a reading.

The desirable reading is at least 6 lumens per square foot: more is satisfactory, less is not. In the latter event, check the optical system for cleanliness, ensure that the reflecting mirror is secure in its retaining pins, that the lamp is fimly seated in its socket. With a suitable meter, check that there is voltage at the input connections to the lamp socket. If there is, take a second light reading: if this is not satisfactory, vary the position of the lamp by partially slackening the three bolts securing the top lamp plate allowing movement forwards, backwards or sideways as required, and the two side bolts allowing movement up or down as required. If progressive adjustment by this means brings no satisfactory reading, the lamp is defective and should be replaced by a new one. NOTE:- When replacing defective lamp repeat the lumens and light spread tests.

Matrix disc location (Fig 12)

The movement of the matrix disc carrier plate (12,1) has two stop positions: one at the rear and the other at the front. That at the rear (12,12) does not normally require any adjustment as it is precisely set at the works before delivery of the machine. This is the stop that takes care of capital letter alignment. The operator (or inspector, in case of error) will adjust the front stop to align lower-case characters with capitals, by manipulation of the small knurled knob and locking ring (12,3) at the front of the machine.

Should a technical representative or a service engineer find it necessary to re-adjust the rear stop, he must consider two basic requirements:

1. that the fount selector lever (12,9) must have just a little tension on it when it is located in its slot at the left-hand side of the machine in the forward position;
2. that the bracket and control rod for selecting the character required does not foul the case at any point.

If condition 1 is satisfied, then, when the lower-case stop at the front is adjusted correctly, there should also be a little tension on the lever when it takes up its position in its rear locating slot. The tensions on the lever should be balanced by adjustment of both front and rear stops so that they they are equal in the forward and rear positions, provided that condition 2 is satisfied, again in both positions.

It is advised that the above tests are implemented using the II of capital and lower-case and adjusting the item in 1 and 2 until the base line of the characters are aligned.

Matrix disc lock and release (Fig 12)

The solenoid (12,10) controlling locking and release of the matrix disc is mounted on a bracket attached to the matrix unit base plate. The solenoid must be correctly adjusted in two ways: angularly to the centre of the matrix disc hub, and at a set distance from the centre of the hub. The angular position is governed by the relationship between the vertical alignment of the capital and lower-case positions. This can be controlled by adjusting the position of the solenoid bracket by releasing the fixing screws (12,8), so that the set-width pips are perfectly aligned to each other in both forward and rear positions.

To achieve this, draw a straight line on a piece of stiff card. Project any capital-letter image and lay the line directly through the two pips on the light rectangle. Then, leaving the card in position, change the disc to the lower-case position and check that the pips lay in exactly the same as for the capital. If they do not, adjust the angular position of the solenoid, by loosening the Allen bolts (12,8) securing its bracket and moving the latter as required, repeating the procedure until satisfied.

What is being achieved is that the standard alignment of both capital and lower-case characters is being adjusted to fall directly in line with the path of movement of the disc carrier plate, which travels on four vee blocks fixed to the unit's base plate. The plate is retained against the V's by four flat spring clips and four nylon balls (12,4). The spring clips must always press the balls on to the carrier. Check that the balls have no flats worn on them. If the springs do not control the pressure onto the carrier remove and set springs to give bearing.

The position of the solenoid in relation to the centre of the hub must be set so that the disc locking tooth just locates firmly into the notches in the periphery of the disc. If it is set too far out, the disc will always be free to move a certain extent and therefore will never be positively positioned. If it is set too far in, when the solenoid is operated, the tooth will not move clear of the disc and character selection will be impossible, or the chain will come off its guide pulley and possibly jam or break. Check that when the locating tooth is in a V that the centre core of the solenoid is loose but not so that the chain appears to drop off its guide pulley. The placing of the solenoid must also permit the core to make its maximum movement; if not, the solenoid will rattle when button 4 is pressed. The lock screw and nut (12,11) on the back of the core will not normally require re-adjustment but if they become loose they must be adjusted to limit the forward movement of the solenoid core when there is no matrix disc located on the centre hub.

Exposure shutter (Fig 12)

There is no adjustment for the shutter-controlling solenoid (12,7), but it must be ensured that the solenoid makes its full physical movement without driving the shutter against its ultimate stop position, and that, when the shutter is released, the return spring (12,6) brings the arm (12,5) back against its stop spring. When in this position the stop must hold the edge of the shutter flag in such a location that the whole character area is covered by the shutter.

Shutter mask (Fig 12)

The position of the shutter mask (12,2) must be adjusted so that both the largest capital character area and the largest lower case

area (including descenders) are projected without any cut-off and without any light straying outside those areas.

The mask is controlled by three fixing screws attaching it to the matrix unit base plate; if these are loosened, it may be re-positioned as required and the screws re-tightened.

Note that if a larger character, for example on a new matrix disc, than those which have already been projected is called for, it may be necessary to make slight adjustments to accommodate it, if a master character area has not been used to set up the mask.

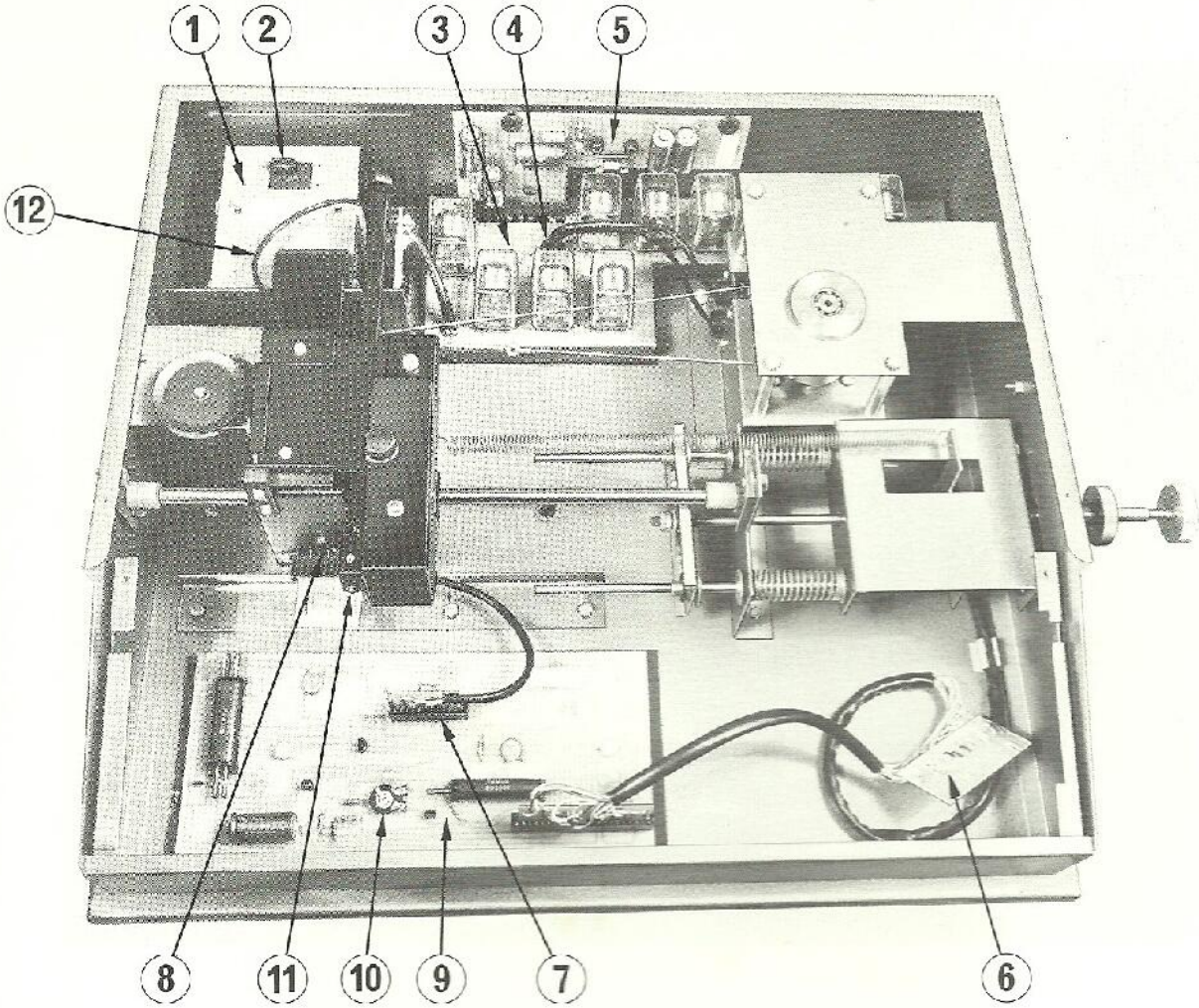


Figure 13

1 Power supply pack
2 Voltage selector plug
3 Base for relays
4 Power connectors for carriage clutch and drive motor
5 B8 circuit board
6 Control panel connector
7 Power connector for pecker solenoid
8 Power cable for photo-cell
9 B4 circuit board
10 Exposure timing, fine adjustment
11 Photo-cell block
12 Power connector for carriage return motor

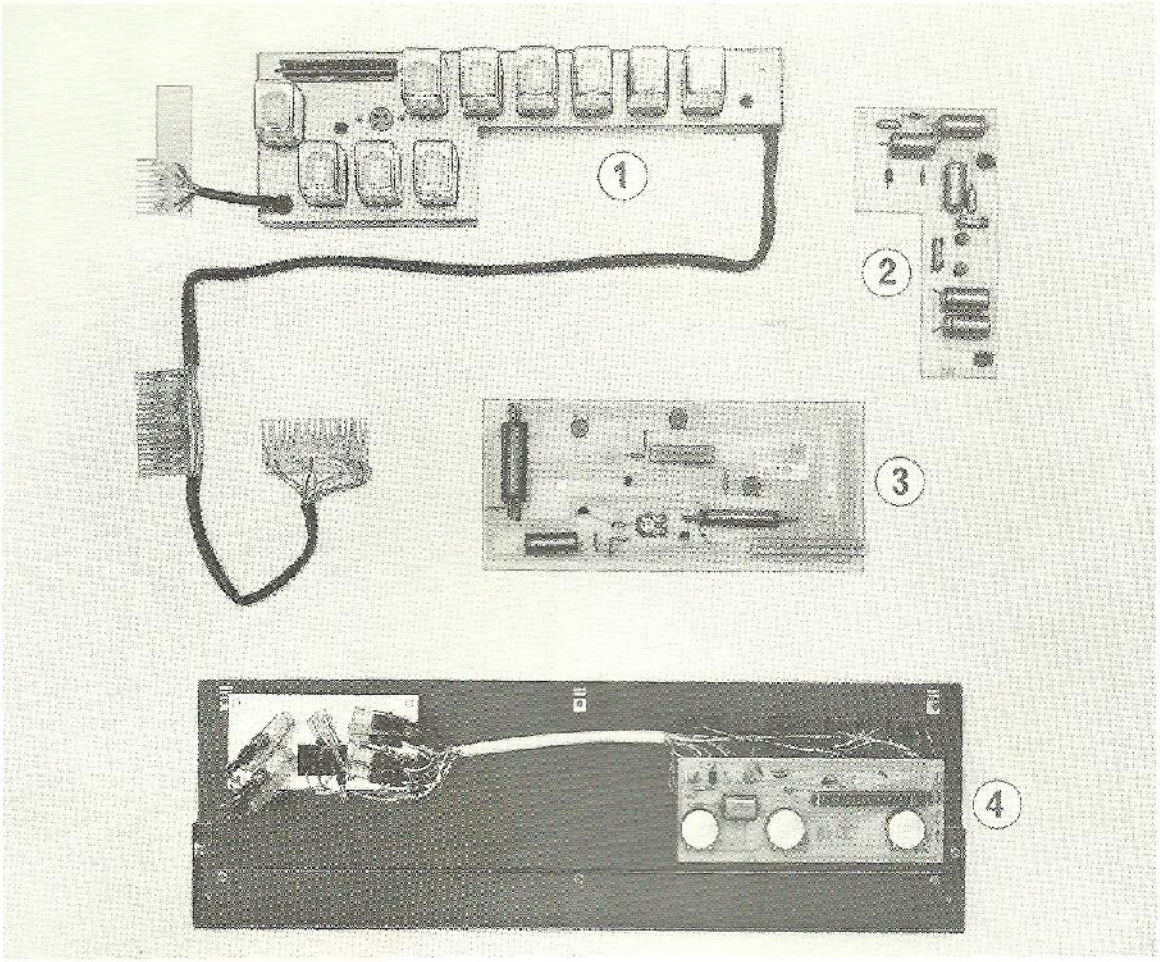


Figure 14

1 Relay chassis, showing position of relays

2 B8 circuit board

3 B4 circuit board

4 Control panel (underside)

PRELIMINARY SEQUENCE

Check 1

Check the supply voltage and set the selector plug to the nearest value measured.
Ensure that:
the 3-pin plug and the 4-pin plug for the matrix unit are fully home and making good contact;
the correct fuse is fitted (5 amp) and is serviceable.
Switch on mains at the rear of the unit (switch UP).

Check voltage (18vDC) across zener diode on B8 board.

if none

Check voltage (26vDC) at rectifier No. 2.

if no voltage

Check 2 amp fuse (fuse 2) for continuity.
Check voltage (20vAC) at rectifier.

if correct

Rectifier is faulty. Before replacing rectifier, measure the resistance(approaching infinity) across zener diode on B8 board to ensure that no short circuit has occurred. (Red lead to + side of zener diode.) Correct before proceeding.

if still no voltage

Suspect transformer and check wiring. Check that 20vAC is available at pairs of blue and grey terminations on mains transformer. If voltage, suspect poor connections with B8 board.

if still no voltage

Suspect transformer. Remove power pack, inspect and rectify any obvious defect, or replace power pack.

Proceed with Check 2

Check 2

Neon indicators should glow.

if one (or more) does not

Check voltage across the indicators (240vAC).

if AC voltage

Check lamp and connections: replace lamp and/or remake the connections as required.

if no AC voltage

Check connections. Replace or remake as necessary.

Proceed with Check 3

Check 3

Exposure lamp should be illuminated when switch is depressed.

if not

Check lamp: replace if defective.

if still no light

Check voltage (12v) at lamp transformer output socket.

If none, check lamp circuit connections. Remake if necessary.

if still no light

Check lamp transformer input voltage (240v). Care must be exercised when taking this measurement as the transformer leads are very close to the lamp housing.
See Fig 11.

if satisfactory

Transformer or thermistor is defective. With blue lead to the transformer disconnected, check resistance of both. Change as necessary if faulty. Switch off and disconnect plug before proceeding with above.

if no voltage

Check connections, wiring and on/off switch.
(Transformor 25R, Thermistor 100R).

Proceed with Check 4

Check 4

Carriage should return after being moved gently by hand to the left.

if not

Check voltage (240vAC) at the 2-pin socket feeding the brake motor.

if satisfactory

Check resistance of motor across the 2-pin plug (10KR).

If short circuit or open circuit change the brake motor.

if no voltage at 2-pin socket

Check contact and connections

also

Check voltage across the 240v and 0v of transformer. If none with the voltage tapping set to 210, 190, or 115v, suspect transformer or wiring. If set at 240v, suspect wiring only.

Proceed with Check 5

MATRIX DISC UNLOCK OPERATION AND CANCEL OPERATION

Check 5

Press and hold down button No. 3. Observe whether disc locating pawl disengages and re-enagaes as soon as button is released. To check cancel circuit, hold button 3 and depress button 2 and note the disc pawl re-engages each time button 2 is depressed.

if not

Check voltage (240vAC) across disc lock solenoid. If no voltage, check contacts and connections, remaking if suspect.

if AC voltage

Switch mains off and check solenoid resistance (12OR). If none, or very high, replace solenoid.

if no AC voltage

Switch off and disconnect mains plug. Check for continuity across buttons No. 2 and 3 with button 3 in 'on' position. If correct, check wiring from button 3 to solenoid block (white and black at No. 3, yellow at block), and button 2 to connection C14. If meter indicates an open circuit check for broken wire or bad connection.

Proceed with Check 6

EXPOSE WITHOUT SCAN SEQUENCE

Check 6

Set time switch to 10 secs and switch 7 to the right. Press button No. 1 and release to start sequence:
RL2 changes over and immediately releases, causing RL3 to change over and start the timer sequence.
RL4 to operate the shutter. The single reed relay holds relay 3 and 4 during the timimg sequence.
After the preset time, RL3 and RL4 drop out, re-setting the timer and closing the shutter.

if shutter fails to open

Hold button 1 and check AC voltage (240) at shutter solenoid. If none, check connections, remaking if suspect.

if satisfactory

Switch mains off. Check solenoid resistance (1200R). If poor, or none, replace the solenoid.

if shutter fails to close

Check return spring and mechanism: replace according to condition.

if whole sequence fails

Change RL2

If RL2 is satisfactory, visually check that RL3 operates.

if still not satisfactory

With button 1 depressed measure continuity between pin 7 of relay 2 and the normally open contact of button 1, between the common contact of button 1 and 2uF capacitor. (Board 7)
With button 1 released, measure continuity between common contact of button 1 and the junction of the diode, capacitor and 2KR. (value should be 2.2KR).
If RL2 operates but remains energised whilst button 1 is depressed. Change 2uF capacitor. (Board 7)
Measure between pin 2 of relay 2 and 0v line at transformer.

if still not satisfactory

Check continuity as follows:

1. Measure between 0v line at on/off switch to pin 2 of RL3.
2. Measure between pin 7 of RL3 to pin 8 of RL2 via RL5/2 (with RL2 and RL3 removed).

If RL3 operates, RL4 should operate.

if not

Change RL3 and RL4.

if still not satisfactory

Measure continuity from pin 6 of RL2 via RL1A/2 to the 240v connection of the transformer.

If RL3 and RL4 de-energise immediately RL2 is released.

Change RL4, RL3, RL2, board 4 and control panel. (If board 4 cures the problem it is likely to be the single reed relay at fault).

If RL4 is changed and shutter fails to operate change RL4 again. (Contacts 1 and 3 fail to close).

If RL3 resets when RL4 operates, change RL3 (RL3/2 non-operative).

If still not satisfactory check wiring between RL3/6 and RL4/7. (The above fault would show a consistently short exposure not affected by the exposure controls).

If RL2 does not reset, change RL4, RL2 and RL1B. Press button 1 several times to establish correct operation.

If RL3 and RL4 fail to rest after the preset time, adjust the variable resistor on board 4.

If still fails to reset at all, change RL2, RL4 or board 4.

Check timing accuracy.
Set timer control to 10 secs.
Press button No. 1;

Compare shutter time against a datum from the instant the button was pressed until the time the shutter closes.

Proceed with Check 7

PRIMING SEQUENCE

Check 7

Press primer switch (4) and hold. Turn sensitivity switch slowly until neon glows: then advance pointer one division. The double reed and RLs 1A, 1B, 2 and 6 should change over and lock, operating the clutch and pecker solenoid.

if

Relays 1A, 1B nor pecker operate, check priming circuit by shorting out photo-cell lead connections and repeat the priming cycle. If the circuit reacts, check that contacts and wires to cell are satisfactory. (Cell contacts may be sorted out using a crocodile clip).

if cell is still not activated

Change board 4.

if cell is still
not activated

Switch off mains. Test continuity of over-ride trip switches circuit: short out cell and with meter set to ohms, check continuity.

if no reading

Remove carriage from machine and check continuity of switches, replacing any defective.

If pecker grips but neon fails to glow, continue with the scan and expose sequence check. Providing this is satisfactory then the neon lamp or wiring has failed. Rectify as necessary.

if satisfactory

Proceed with Check 8

Check 8

If a complete failure of 7 occurs proceed as follows:
The functional operation is as below:

RL1A should operate RL6 and also the priming neon.

RL1B should operate RL2 and the clutch.

RL6 will close the neutral side of RL5 and RL5A but not operate the relays.

This sets the circuit ready for the operation of the carriage drive motor when the scan and drive sequence is initiated.

RL2 will be held.

if the above sequence fails

If RL6 fails to operate, change RL1A and RL6.

if failure continues

Check continuity between 240v line and RL1A pin 1, RL1A pin 3 &4, RL6 pin 7, RL6 pin 2 and neutral line.

If RL2 fails to operate change RL1B.

if failure continues

Check continuity between 240v and RL1B pin 8, RL1B pin 6 and RL2 pin 7. RL2 pin 2 and 0v line.

If RL3 operates, change RL1A.

If RL1A or RL1B fail, change the relay that has failed to operate.

If failure continues check wiring.

NOTE: If RL1A fails to operate the symptom would be that of the timer only sequence (Check 6).

If RL1B fails, the clutch will not energise, RL2 would not operate although the priming neon would be lit.
When button 5 is depressed no scan sequence will be implemented.

If relays 1A, 1B, 2 and 6 operate but the scan neon fails to glow, change the neon or check the associated wiring. (This is not imperative).

Proceed with Check 9

Check 9

Press primer button (No. 4). Sequence 7 and 8 should start and the pecker should operate.

if

Relays operate and pecker fails to operate, remove plug at front of carriage. Check voltage at socket (240vAC). If none, check voltage (240vAC at multi-plug connection to B4 board) across E3, and E2, and across D5 and D11 with unit switched on. This will

indicate whether the supply voltage is at the terminals. If not, suspect broken wire or poor connection. Correct fault.

if voltage

Switch off mains. Visually check plug wiring, if satisfactory, check solenoid resistance (1200R). Replace solenoid if defective.

Proceed with Check 10

Check 10

When the primer button (No. 3) is pressed, RL1B should operate and the magnetic clutch should engage the carriage main drive wheel.

if not

Change RL1B.

if still not satisfactory

Check voltage (24vDC) across the two capacitors on B8 board.

if voltage

Test clutch winding resistance. Switch off mains, remove 4-pin plug from chassis and test over closer-spaced pins (100R). If no result, windings have failed, or plug connections have failed, rectify as necessary.

if no DC voltage

Check for 24vAC across rectifier No. 1.

if voltage present

Switch off mains and disconnect mains plug.
Suspect defective rectifier, but before replacing it (or the B8 board) ensure that there is no short circuit by measuring the resistance across the 2 x 470 uf capacitors. (approximately 100R clutch resistance).

if no AC voltage

Verify that 24vAC is available at pairs of orange-black terminations on power pack terminals. If not, check fuse 1 (2 amp), connections and wiring. If still no 24vAC suspect transformer.

If scan and expose sequence operates immediately button 4 is depressed, suspect button 5 or RL5A. Change as necessary.

Proceed with Check 11

SCAN AND EXPOSE SEQUENCE

Check 11

Prime the system as described. Press scan-and-expose button (No. 5), RL5 and RL5A should change and lock; carriage should move to the left.

if not

Visually check that relays RL5 and RL5A have operated. RL5A should hold the carriage drive motor in operation and RL5, holding itself on by closing its own contact 1. Through contact 2 it should charge up the brake motor circuit (D1, 10KR and 15uf capacitor).
RL5 should maintain the removal of the supply to RL3. Until the forward/reverse carriage movement is completed.

Replace faulty relay or relays.

If RL5 and RL5A do not operate and the carriage fails to move to the left. Check switch button 5 and wiring and connections. Replace any which are defective.

If the carriage moves but RL5 and RL5A do not operate, then change RL6.

if failure continues

Check wiring and connections from RL5 pin 2 and RL5A pin 2 to RL6 pin 8 and RL6 pin 6 to neutral rail. Rectify as necessary.

If RL5 and RL5A lock and carriage fails to move. Change RL6.

if relays correct but still no movement

Switch off mains. Remove 4-pin plug from relay chassis and measure the resistance (5,000 ohms) across the wider-spaced pins. If poor or no reading, drive motor is defective and must be replaced.

Switch on mains. Check that 240vAC is available at 4-pin socket across wider-spaced holes. If not, replace RLs 5A and 6.

if still not satisfactory

Check wiring for continuity.

If after completing the scan and expose sequence the operation immediately repeats, check that switch 6 is depressed to the right. If the repeat scanning process continues.
Check that RL7 is non operative. If it operates at the same instant as RL4, check switch 6 and its associated circuitry.

if all serviceable
Proceed with Check 12

Check 12

Re-prime the sequence by depressing button 4 and 5.
NOTE: Ensure that the light path to the photo-cell is not obscured.
Relays 1A and 1B and the pecker will release and the clutch resets as soon as cell moves out of illuminated area. The carriage will return to its starting point.
The R.H. micro-switch will unlock RLs 5, 5A and 6. RL3 will change over, causing 4 to change and 2 unlock and open shutter.
At the end of pre-set time, the circuit will open:
RL4 opening will close shutter.
AC voltage will be removed from drive motor by RL6, but applies a DC break through RL5A/2.

If the carriage returns rapidly then the brake motor slow motion clutch has failed to operate due to weak 'U' springs. These must be replaced as follows.

1. Remove top cover.
2. Remove Bowden Cable and carefully place to one side and hold down with sellotape.
3. Remove the two nuts securing the brake motor to the chassis.
4. Remove the brake motor 2 pin plug.
5. Lift out the brake motor.
6. Slacken the drive pulley grub screw and remove the pulley.
7. Remove the two nuts and bolts securing the motor to the mounting plate.
8. Lift the gear box away from the motor unit.
9. Apply downward pressure to the gear box plate and slide towards you.
   Carefully pull the cover plate away from the gear box proper.
10. Remove gear box top plate to expose the gears.
11. Remove the centre gear. Then remove the free wheel unit gear (902109) and discard.
12. Replace new free wheel unit (902109).
13. Re-assemble gear box and motor unit in reverse order.

NOTE: When replacing drive pulley ensure that the end of the shaft and the centre boss of the pulley are flush.

If previous checks have been carried out and necessary adjustments and replacements made, all these functions must operate efficiently.

Proceed with Check 13

Check 13

A small decaying DC current provides a brake condition to motor.

to test DC brake circuit

With meter at 250vDC test 16 mfd capacitor on B8 board, while pressing button 5 with priming held at 3. A rising DC voltage should be shown as carriage moves. Cancel prime; carriage should return and the DC voltage decay.

If no rising voltage is indicated, the B5 board is faulty and should be replaced.

Proceed with Check 14

SHUTTER OPEN OPERATION

Check 14

With switch 8 depressed towards the white dot, check that the shutter operates.

if not

Visually check that RL4 operates

if not

Change RL4 or check the wiring and switch 8 for continuity.

if still not satisfactory

Check voltage at shutter solenoid If no voltage check wiring and connections

if voltage

Change shutter solenoid.

Proceed with Check 15

REPEAT SCAN AND EXPOSURE SEQUENCE

Check 15

With switch 6 depressed towards the white dot, carry out check 7 and 11.
When the exposure operation has been completed the carriage movement and the exposure will be repeated.

if failure to do so

Visually check that RL7 energises and de-energises at the same instant as RL4.

if not

Change RL7

if still not satisfactory

Check wiring between pin 2 of RL7 and switch 6, and pin 7 of RL7 and pin 7 of RL4.
Check that RL1 operates immediately RL7 de-energises and de-energises 0,5 seconds later.

if not

Change RL1

if RL1 still fails to operate

Check that when RL7 operates that the 10uF capacitor charges up.

if not

Check diode and wiring

if satisfactory

Change RL7

If RL1 still fails to operate

Check wiring between RL7 pin 1 and capacitor, and RL7 pin 3 and diode.

If RL1 operates but the carriage fails to scan.

Change RL1

if still not satisfactory

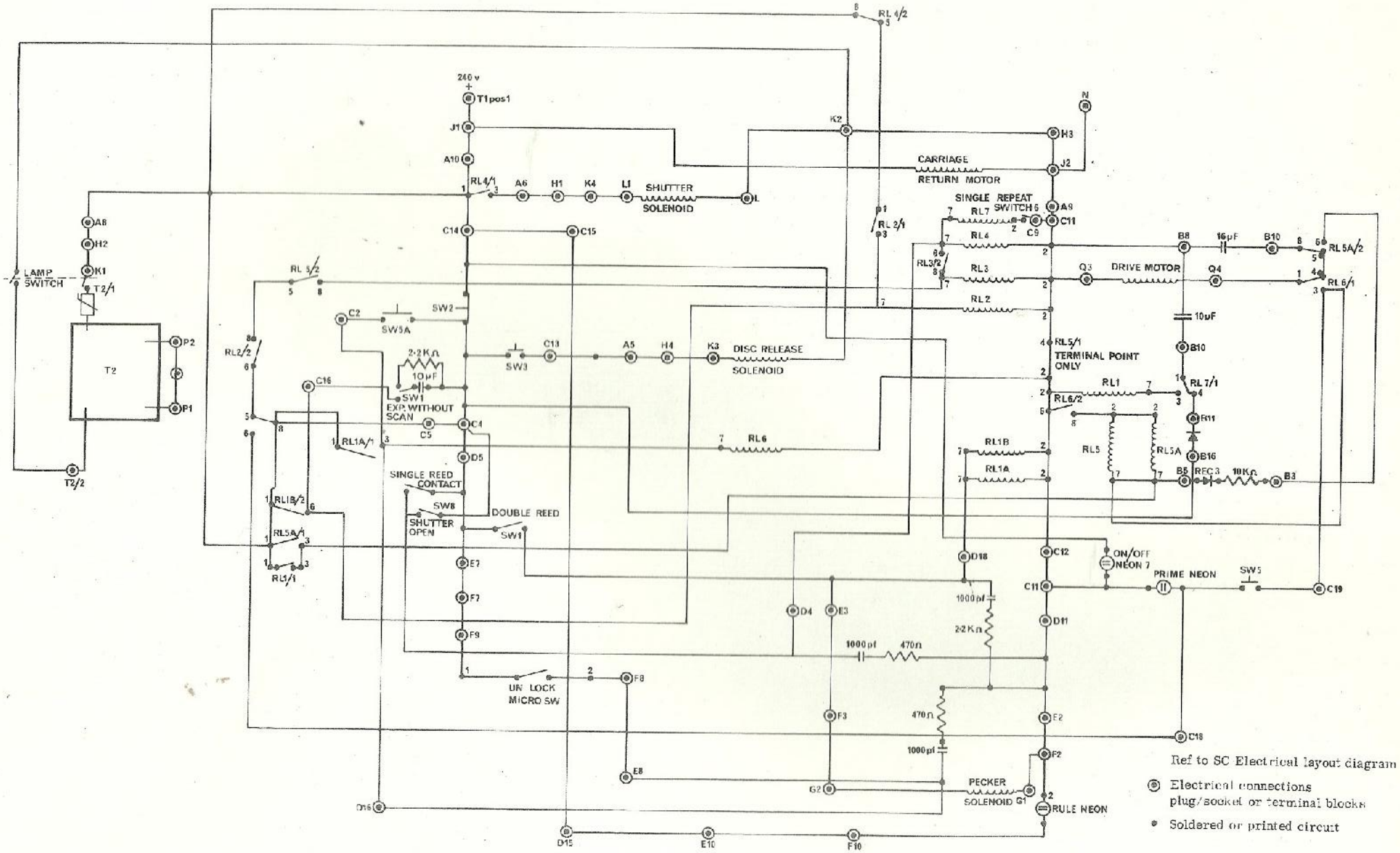
Check wiring between RL1
pin 6 and button 3 and RL1
pin 8 and button 2A.

If the pecker operates and
the priming neon lights,
but the carriage fails to scan,
check that RL6, RL5 and RL5A
operate.

If RL6 operates but not RL5
and RL5A, change RL1.

if still not satisfactory

Check continuity between RL1
pin 1 and button 2, and RL1
pin 3 and RL5 pin 7.

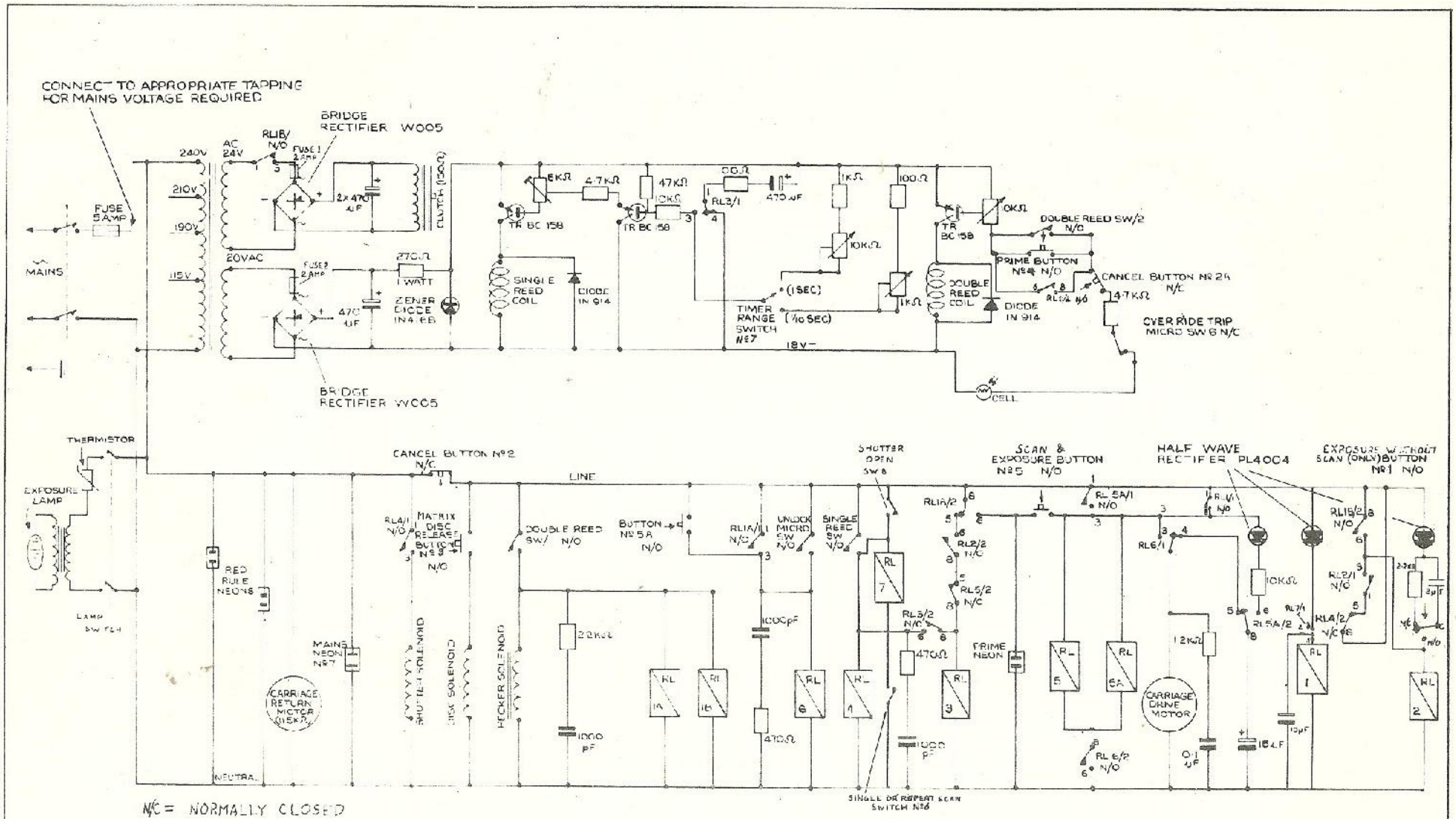


Ref to SC Electrical layout diagram

⊛ Electrical connections plug/socket or terminal blocks

* Soldered or printed circuit

WIRING DIAGRAM FOR STUDIO-LETTERING MACHINE MARK III



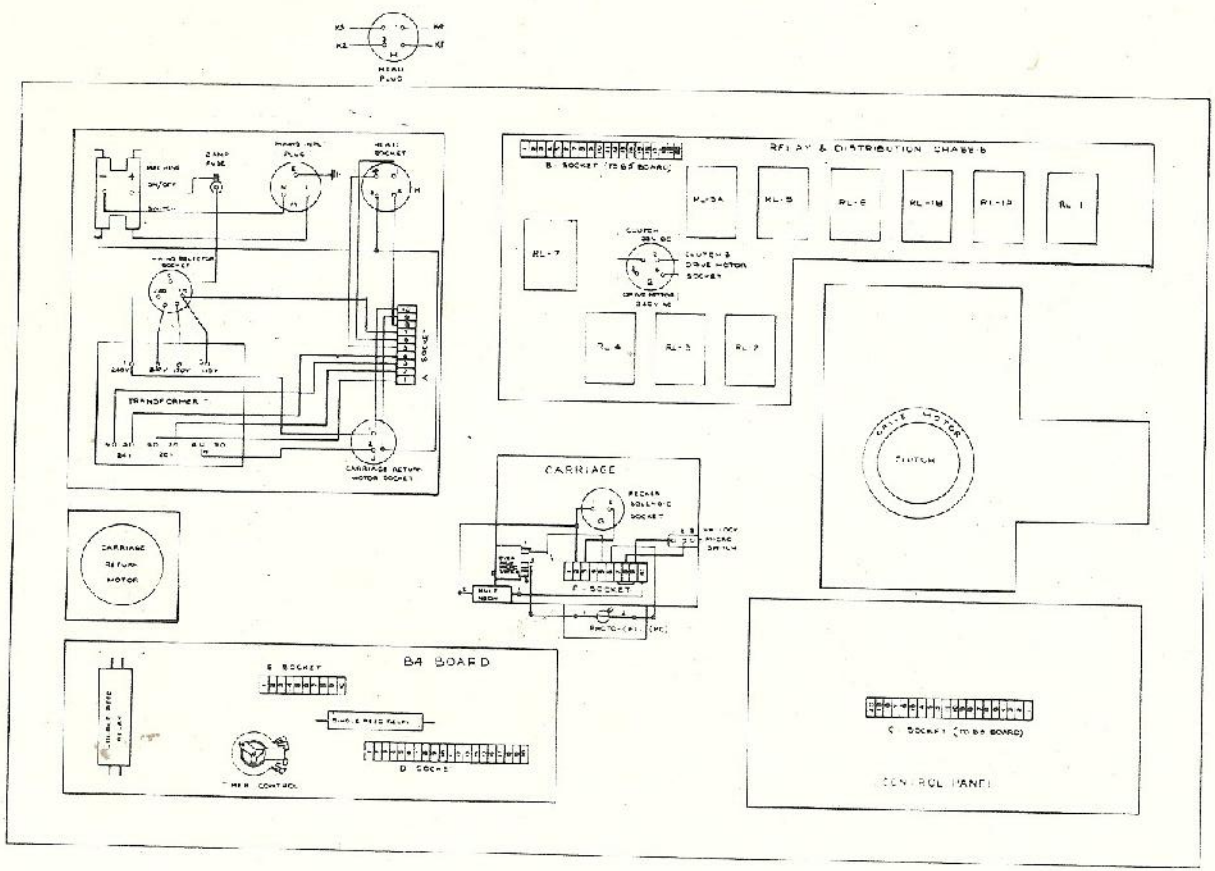
N/C = NORMALLY CLOSED

C = COMMON

N/O = NORMALLY OPEN

THEORETICAL CIRCUIT DIAGRAM FOR STUDIO LETTERING MACHINE MARK III

THE MONOTYPE CORP LTD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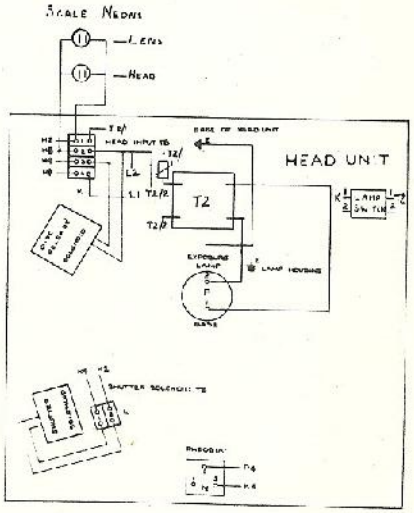
CARRIAGE
CARRIAGE RETURN MOTOR
DRIVE MOTOR
CLUTCH
B4 BOARD
CONTROL PANEL


HEAD UNIT
T2
EXPOSURE LAMP
LAMP HOUSING