'Monotype' 31-Channel Punch

Instructions for Maintenance Engineers

The Monotype Corporation Limited
Salfords, Redhill RH1 5JP

'MONOTYPE' 31-CHANNEL PUNCH

INSTRUCTIONS FOR MAINTENANCE ENGINEERS

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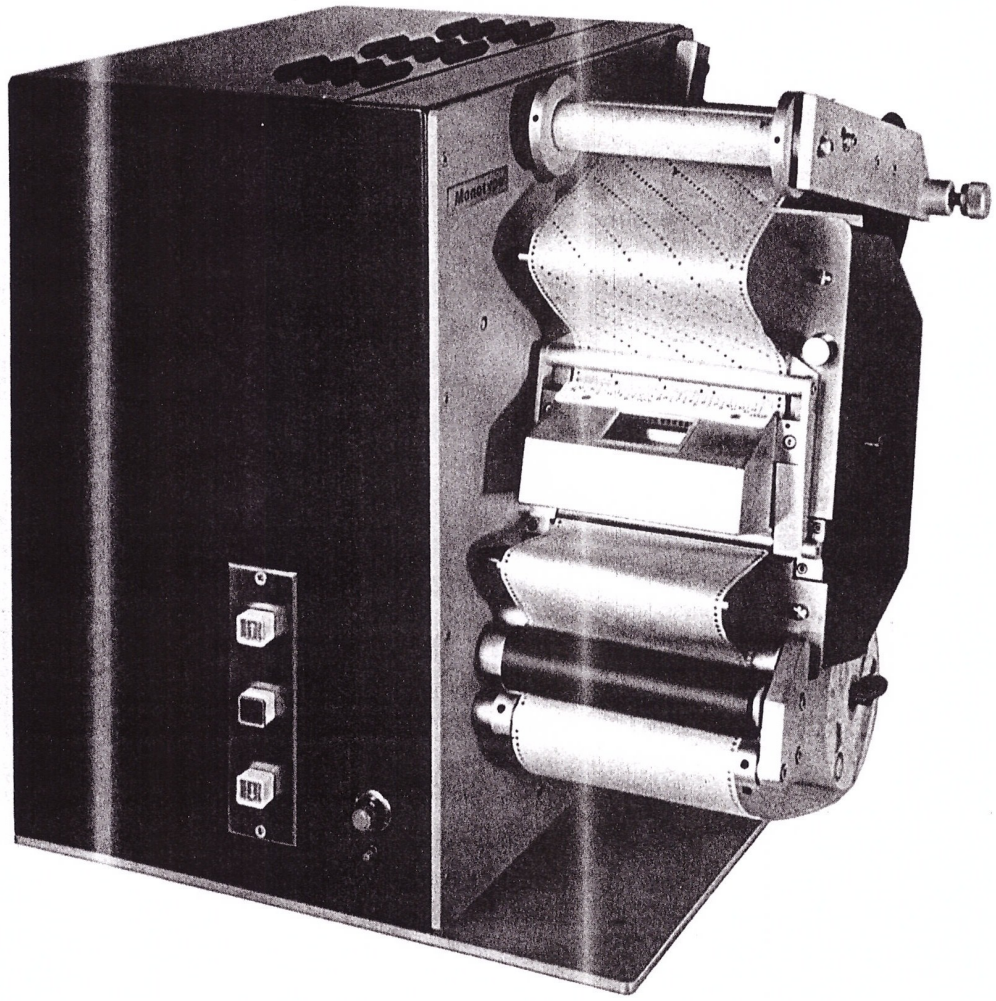

THE 'MONOTYPE' 31-CHANNEL PUNCH

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ILLUSTRATIONS

1 INTRODUCTION

'Monotype' 31-Channel Tape Punch

A 'Monotype' 31-Channel Tape Punch is a self-contained unit employed to perforate operating codes in 31-channel programme tape. It has been designed primarily as part of either a 'Monotype' Electronic Perforator or a 'Monotype' Tape Conversion System. However, information can be accepted from any suitable data processing system where a 31-channel programme tape output is required.

Handbook arrangement and graphical representation

This manual supplements the Instructions for Operators issued with a 'Monotype' 31-Channel Tape Punch, and provides information for the Service Engineer. For reference purposes, certain sections of the Instructions for Operators, e.g. Specifications, Routine Maintenance, Recommended Spares List etc., are included, whilst the more elementary descriptions and instructions are omitted. It should be noted that the logic symbols used in certain of the diagrams differ from those recommended by British Service Standards. These differences are illustrated in Fig 1.1.

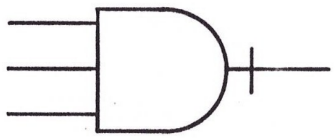
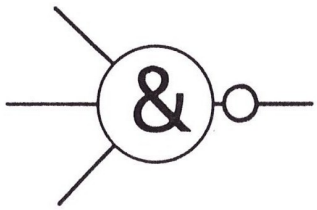
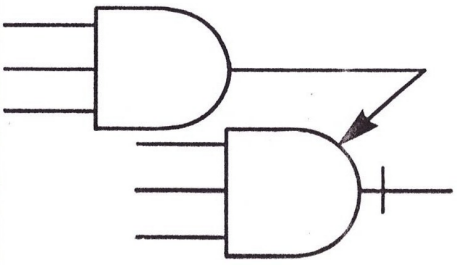
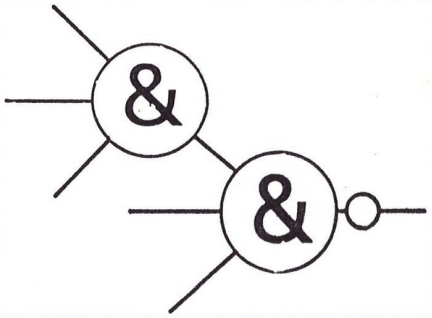
FUNCTION	SYMBOL USED IN HANDBOOK	B.S. SYMBOL
NAND GATE		
NAND GATE WITH EXPANDER		

FIG 1.1 COMPARATIVE TABLE OF LOGIC SYMBOLS

Punch Variants

Two types of 31-Channel Punch have been used in conjunction with a 'Monotype' Electronic Perforator and a 'Monotype' Tape Conversion System, i.e. The Honeywell and the Harting versions of the punch. Whilst the information contained in this handbook is concerned specifically with the Honeywell version, much of the information is applicable also to the Harting punch and the relevant differences are noted in the Appendix hereto. In addition, certain modifications affecting the Honeywell punch (serial numbers 601 and onwards) are described in Appendix 2.

2 SPECIFICATIONS

Physical

Overall dimensions:

Height	406.4 mm	(16 in)	
Width	419 mm	(16½ in)	
Depth	431.8 mm	(17 in)	(including data connector and function buttons)
Weight	38 kg	(84 lb)	(excluding paper roll)
Ambient working temperature	35° C	(95° F)	

NOTE: The temperature of any surface on which the punch is placed must not exceed 40°C (140°F). The louvres in the punch case and the cooling fan grill in the punch block assembly cover must be kept free from obstruction at all times.

Electrical

Input requirements:

Mains supply	200-240 V single phase, 50 Hz or 110-120 V single phase, 50/60 Hz (to special order)
Power consumption	200 VA peak

Data inputs:

Active level	+ 2.8 V (min) + 5 V (max)
Inactive level	+ 0.3 V /- 0.3 V (max)
Pulse duration	2.8 ms (min) 3.4 ms (max)
Rise/fall time	20 μs (max)
Current consumption	2 mA per channel (max)
Negative input level	- 0.3 V (max)

Paper feed:

Two input lines	(a) Single forward step: duration to be coincident with data input (b) Single reverse step: asynchronous NOTE: Unused inputs must be kept at ground level (inactive)
Active level	+ 2.8 V (min) + 5 V (max)
Inactive level	+ 0.3 V /- 0.3 V (max)
Current out (active)	0.04 mA (max)
Current in (inactive)	1.6 mA (max)
Feed motor trigger point	On trailing edge of input pulse

Inhibit feed:

Active level	+ 0.3 V/- 0.3 V (max)
Inactive level	+ 2.8 V (min) + 5 V (max)
Current out (active)	0.04 mA (max)
Current in (inactive)	1.6 mA (max)

Output signals:

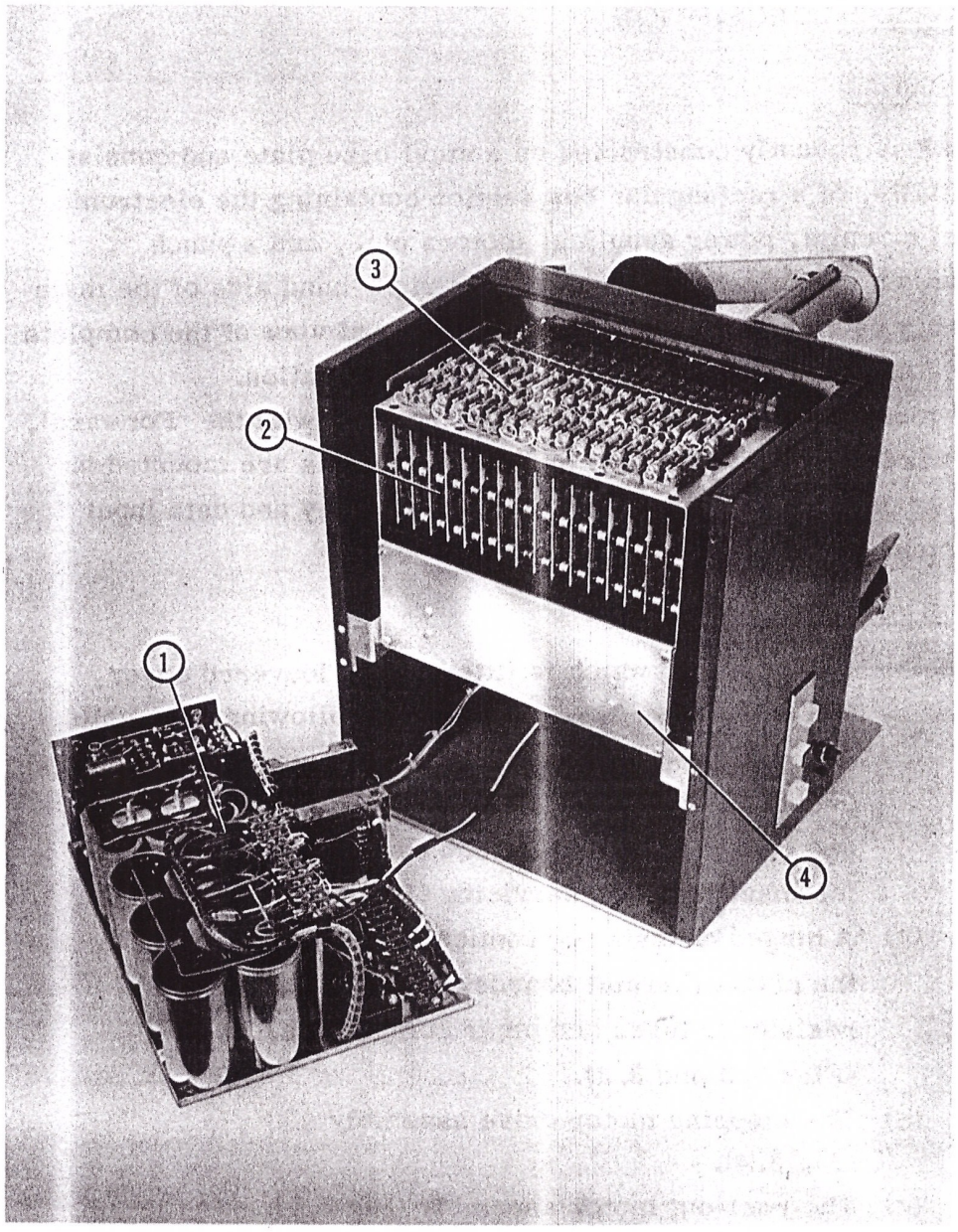
Tight tape condition	+ 5 V
Normal condition	0 V (Monitoring point on contact 'SS')

Punching capacity:

Maximum number of punches energised simultaneously	8
Maximum mean number of punches to be operated per character over a 10 minute period at maximum punching speed	4

NOTE: No punch must be operated continuously for a period in excess of 4 seconds

Punching speed 20 characters per second (max)



1 Power supplies chassis

2 Punch amplifiers

3 Punch amplifier fuses

4 Hinged chassis

FIG 3.1 POWER SUPPLY CHASSIS
WITHDRAWN FROM MAIN HOUSING

3 GENERAL DESCRIPTION

Construction

The unit is robustly constructed on a steel base plate and consists, essentially, of a rectangular box section containing the electronic control circuits, power supplies, motors etc., and a punch mechanism unit which is secured to the right-hand side of the main assembly as viewed from the front. A general view of the complete punch unit is provided by the frontispiece illustration.

The mains supply 'On-off' switches, together with the 'Forward', 'Backward' and 'Run-out' tape feed punch-buttons are mounted on the front panel of the unit whilst the mains supply and data input connectors are to be found at the rear.

Internal Arrangement

The rectangular housing, which is fitted with a louvered cover, secured by six posidriv screws, contains the following assemblies:

(a) A power supplies chassis which is normally secured to the base of the main housing by two socket-head screws and can be withdrawn for inspection and servicing (Fig 3.1).

(b) A hinged chassis upon which are mounted the printed circuit boards, capacitors, resistors, fuses and other components. (Figs 3.2 and 3.3).

(c) The stepping motor drive assembly (Fig 3.4).

(d) The reel-out motor assembly (Fig 3.5).

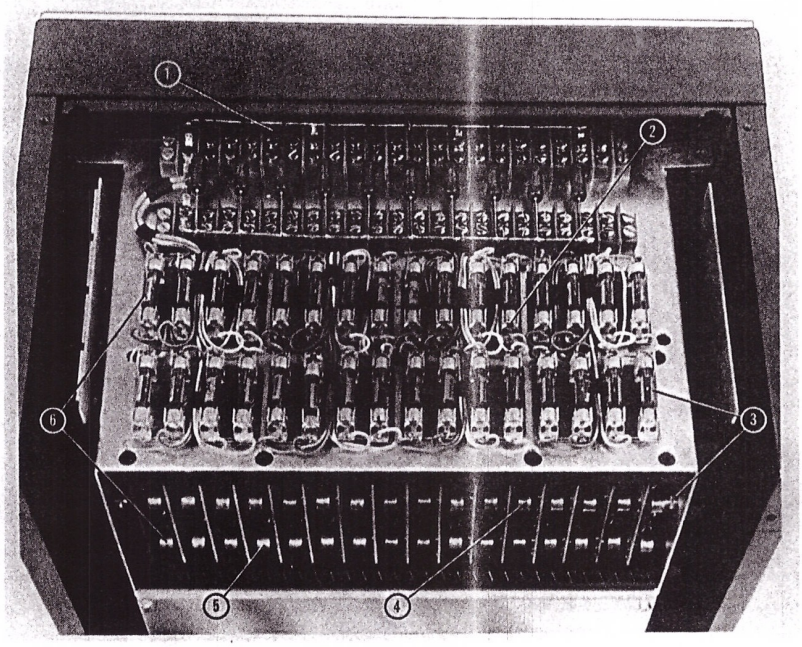
(e) The take-up motor assembly (Fig 3.4).

(f) The sensing arm and switching assemblies.

These various parts of the unit are considered separately in the following paragraphs.

Power supplies chassis

The power supply components are arranged on a rigid base plate which contains also an elapsed time counter. The connecting leads are sufficiently long to permit the complete unit to be withdrawn from the main housing when necessary, thus giving access to the various components, the 5-volt stabilised supply fuse, mains transformer tappings for supply voltage adjustment etc.



1 Stepping motor voltage - dropping resistor (R1=10 x 2.7)

2 Punch amplifier fuses

3 Spare position fuse and associated punch amplifier

4 Upper row of punch amplifiers

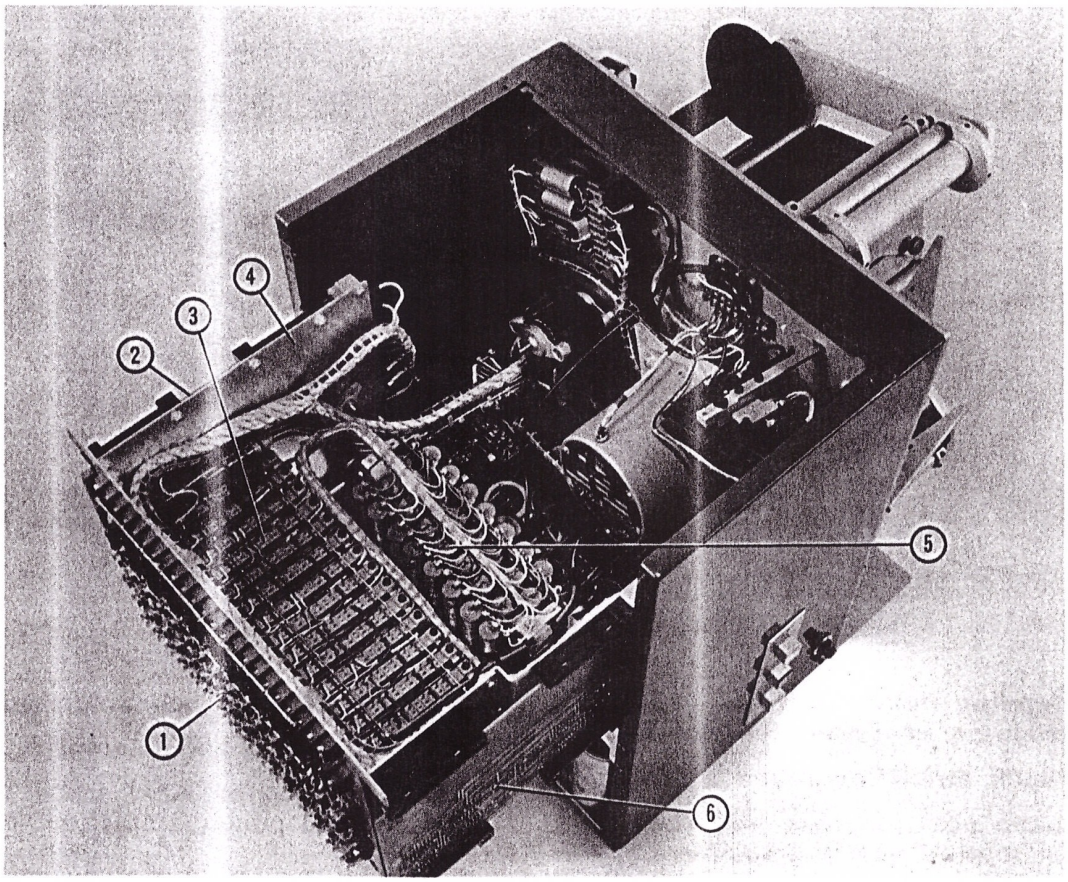
5 Lower row of punch amplifiers

6 Fuse 'N' (upper row) and associated punch amplifier

FIG 3.2 HINGED CHASSIS IN NORMAL POSITION

Hinged chassis

In its normal position, access is provided to the punch amplifier printed circuit boards (Fig 3.2) from the left-hand side of the unit and to the punch amplifier fuses (at the top of the unit). The punch fuse allocations are detailed in Fig 4.3. Punch N, is on the extreme left of the upper row as shown in Fig 3.2, with the spare position at the extreme right of the lower row. The upper row of fuses is associated with the lower row of amplifiers in corresponding order, whilst the lower row of fuses is associated with the upper row of amplifiers. The chassis is held in position by two screws which engage with threaded bosses in a bracket fitted behind the right-hand side panel of the main housing. Removal of these screws enables the chassis to pivot toward the left (Fig 3.3), thus giving access to the punch amplifier connectors and capacitors. The motor drive assemblies and sensing arm switches etc., are also thereby partly exposed.

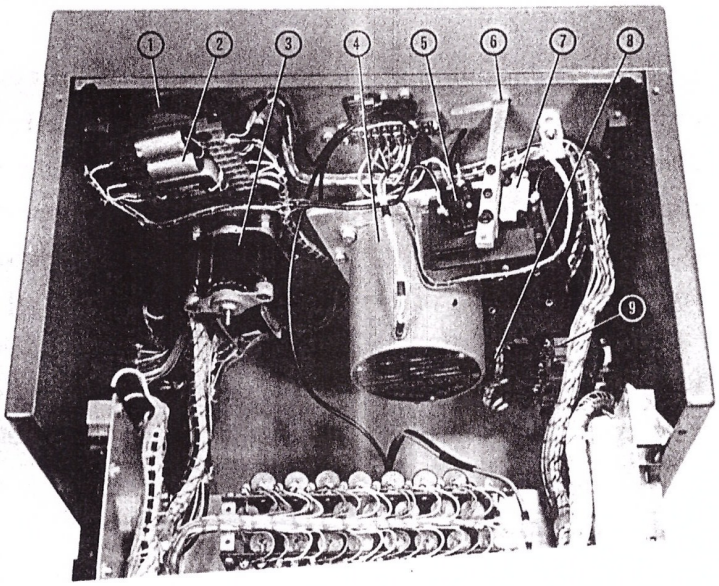


1	Punch fuses and resistors	4	Hinged chassis (open position)
2	Stepping motor drive board	5	Capacitor banks
3	Punch amplifiers connectors	6	Function/Indicator board

FIG 3.3 HINGED CHASSIS IN OPEN POSITION

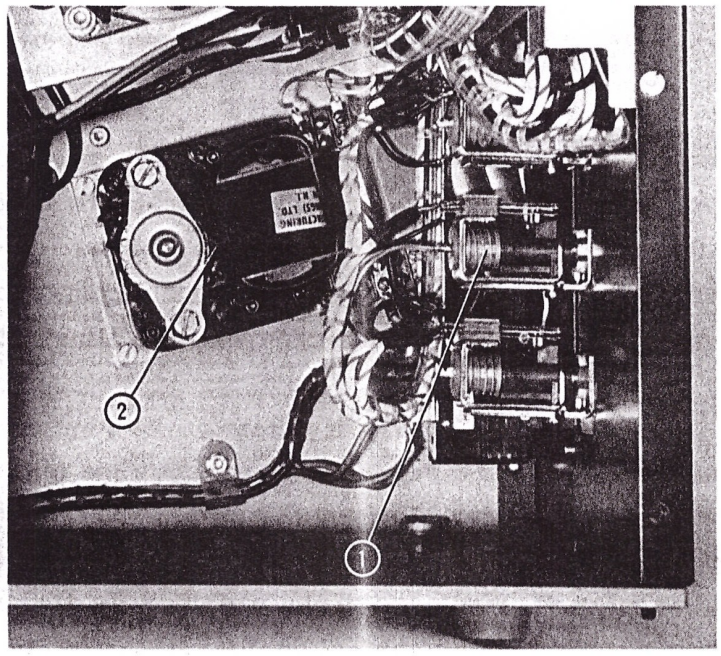
Function and motor drive printed circuit boards

The two sides of the hinged assembly are fitted with printed circuit board guides and connectors to accommodate the function indicator board at the end nearest the front of the main housing, and the stepping motor drive board at the opposite end.



1 Paper take-up motor gearing
2 Suppressor
3 Paper take-up motor
4 Stepping motor
5 Micro-switch
6 Upper sensing arm
7 Micro-switch (amplifier supplies)
8 Position of reel-out motor (under stepping motor assembly)
9 Push-button switches and indicator

FIG 3.4 INTERIOR OF PUNCH UNIT SHOWING DRIVE MOTORS ETC



1 Push-button switch assembly
2 Paper reel-out motor

FIG 3.5 REEL-OUT MOTOR ASSEMBLY AND PUSH-BUTTON SWITCHES

Stepping motor assembly

The stepping motor is mounted on a plate to which are secured brackets carrying the sensing arm pivots and micro-switches. The driver of the stepping motor is extended into the punch mechanism unit to drive the sprocket wheels. The motor plate is secured to the side plate of the main housing by means of screws and threaded spacing pillars. Access to the fixing screws for removal of the motor plate, if necessary, is obtained by opening the hinged chassis. Before the motor can be withdrawn, the Allen screw which secures the flexible drive to the motor shaft must be slackened.

Take-up and reel-out motor assemblies

The take-up motor assembly is illustrated in Fig 3.4. The motor, with its selected suppressor and associated reduction gearing, is mounted on two parallel plates which are secured to spacing pillars. The complete assembly is secured by three screws passing through the side panel of the main housing. The reel-out motor is mounted in a similar assembly but situated beneath the stepping motor and micro-switch brackets so that it is not normally visible from the top of the housing (Fig 3.5). Access to certain of the fixing screws which secure the take-up and reel-out motor assemblies can be obtained by removing the cover from the punch and paper drive mechanism.

The paper-sensing arms

The two paper sensing arms are arranged on brackets which are attached to the stepping motor assembly and arranged one above and the other, below the motor. Mounting arrangements for the two arms are similar and that of the upper arm is illustrated in Fig 3.4.

The arm is spring loaded so that it tends to move outward; thus keeping it in contact with the paper. The arm is free to travel in a slot, cut in the side panel of the housing, and is arranged to operate one of two micro-switches according to the direction in which it is driven by the tightness of the paper or its absence when the roll is exhausted. During normal operation, the arms are moving continuously, in accordance with the pressure exerted by the paper, thus switching on and off the motors as required.

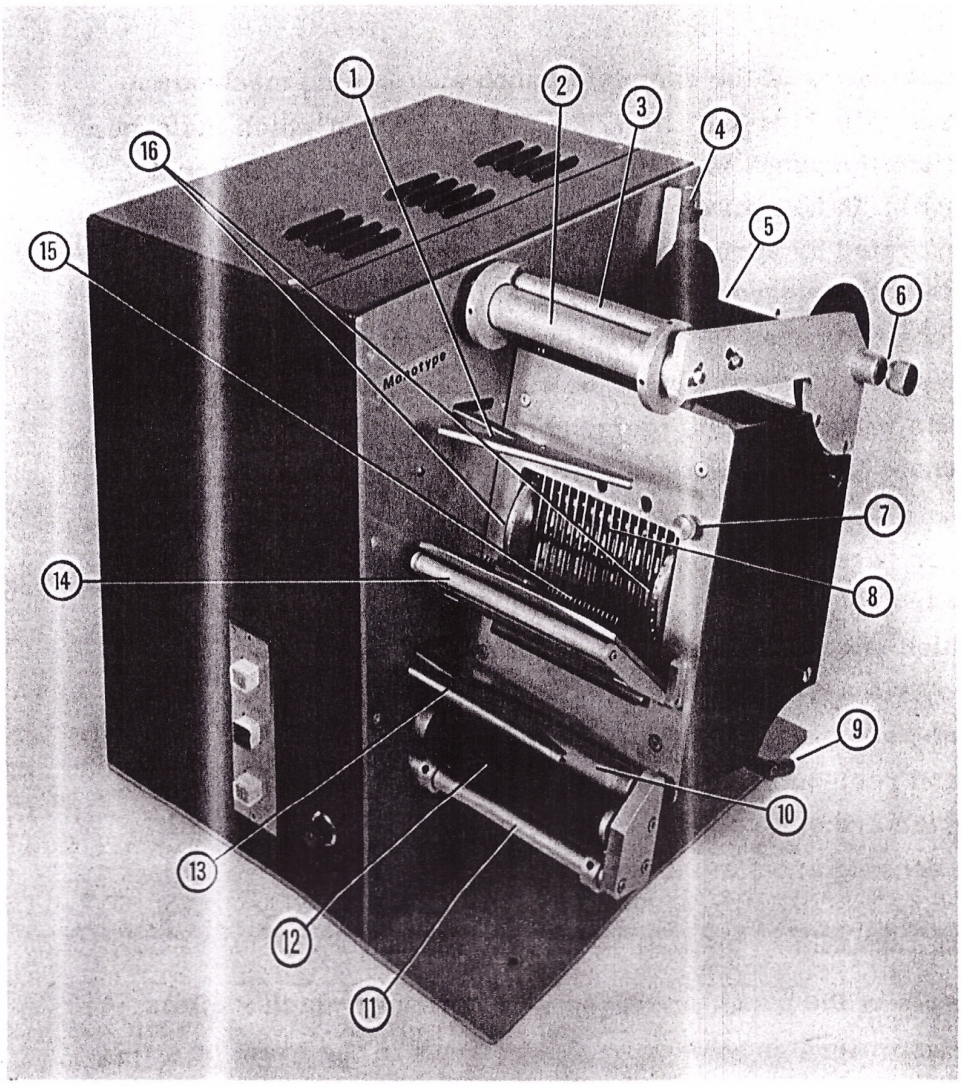
Punch mechanism

The essential parts of the complete punch and driving mechanism are illustrated in Figs 3.6 and 7.3. The manner in which the paper is loaded into the punch is described and illustrated in Section 5 (Installation). In operation, the paper passes through a punch gate and is perforated by spring-loaded punch pins. The punch plates are mounted on a hinged gate which is held in position by a latch so that it can be opened for inspection and maintenance. The thirty-one punch pins, which can be extracted from or inserted into the gate without special tools, normally abut onto the punch drive solenoid levers which are activated by their associated solenoids.

The paper is moved according to the drive demand signals (i.e. forward, backward, run-out etc.,) by a pair of sprocket wheels which engage with the edge perforations of the paper and are driven, via a flexible drive, by the stepping motor, in discrete steps, corresponding to a single frame of punched codes. Take-up and reel-out of the paper is accomplished by separate motors which are controlled by micro-switches associated with the paper sensing arms as already described.

Fuse failure warning

Later models of the punch are fitted with a circuit which inhibits all punch amplifiers and the paper feed circuit in the event of a fuse failure, or if a punch solenoid becomes open-circuited. Simultaneously, the tight tape warning lamp flashes to provide visual indication of a fault condition. A conversion kit is available for the modification of existing punches not equipped with the warning circuit.



1 Upper sensing arm
2 Large friction guide
3 Small friction guide
4 Quick-release mechanism
5 Take-up spool
6 Wind-up spool retainer plunger
7 Die plate latch
8 Punch solenoid lever arms
9 Paper roll retainer
10 Loading roller
11 Input guide
12 Rubber drive roller
13 Lower sensing arm
14 Die plate
15 Punch pins
16 Sprocket drive wheels

FIG 3.6 PUNCH AND DRIVE MECHANISM

4 ELECTRICAL OPERATION

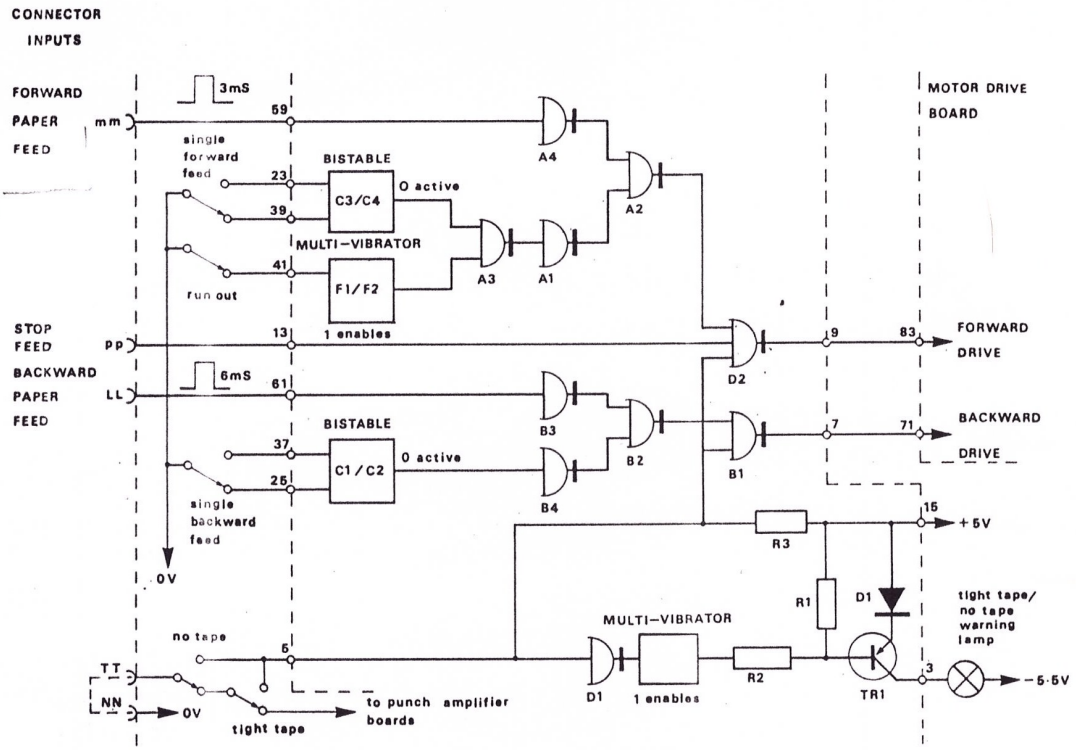
Circuit functions

The electronic circuits of the 31-Channel Punch are designed to accept signals from an input source such as a 'Monotype' Electronic Perforator or a 'Monotype' Tape Conversion System and to derive from them signals to control the punching and tape drive functions of the mechanism. These signals are obtained mainly from solid-state devices which are grouped, according to their functions, on a number of printed circuit boards. An overall circuit diagram of the equipment appears as Fig 8.12 and should be referred to in conjunction with the descriptions which follow. The various circuit boards and their functions are listed below:

Board Identification	Inputs	Outputs
Function Indicator Board (54100-1)	Forward and reverse paper drive signals and stop feed	Forward and reverse drive to Motor Drive board
	Manual forward, reverse and run-out signals	Drive to 'no-tape/ tight-tape' warning
	Inhibit signals from 'no-tape' and 'tight-tape' switches	
Motor Drive Board (54183-1)	Forward and reverse signals from Function Indicator Board	4-line drive to stepping motor
Punch Amplifier Boards (54062-1) (16 boards used)	Punch code signals from data inputs	Drive to punch solenoids via protective fuses
	Inhibit signal from tape warning switch	
Power supplies	A.C. Mains supply via circuit breaker	+25V, +42.5V, +35V, +5V and -5.5V d.c. supplies, with respect to common 0 volt line

In addition to the printed circuit boards, circuits for driving and braking the take-up and reel-out motors are provided together with a mains input circuit-breaker and an elapsed-time counter.

The operation of the various parts of the circuit is described in the paragraphs which follow.



1001/M

FIG 4.1 SIMPLIFIED DIAGRAM, FEED AND INDICATOR FUNCTION BOARD

Function indicator board circuits

The Function Indicator Board contains the logic circuits for the forward, backward, stop-feed and run-out functions together with a drive circuit for the no-tape and tight-tape condition warning lamp. A paper feed input signal can be a logic '1' pulse of any duration, provided that the back (or trailing) edge of the pulse coincides with the trailing edge of the punch instruction signal.

Forward paper feed (Automatic)

Reference is made to the simplified diagram Fig 4.1. An incoming logic '1' signal, applied via terminal 59, is inverted successively by gates A4, A2 and D2. Gate A2 is enabled because the output of A1 is at '1'; D2 is enabled because the stop-feed input is at '1' and the no-tape input (switch open-circuited) is held at '1' via resistor R3. A logic '0' signal therefore appears at the forward drive terminal (9).

When, at the end of the feed pulse, the logic '1' signal reverts to '0', the forward-drive output condition reverts to '1' and this 'back-edge' transition provides the paper feed signal.

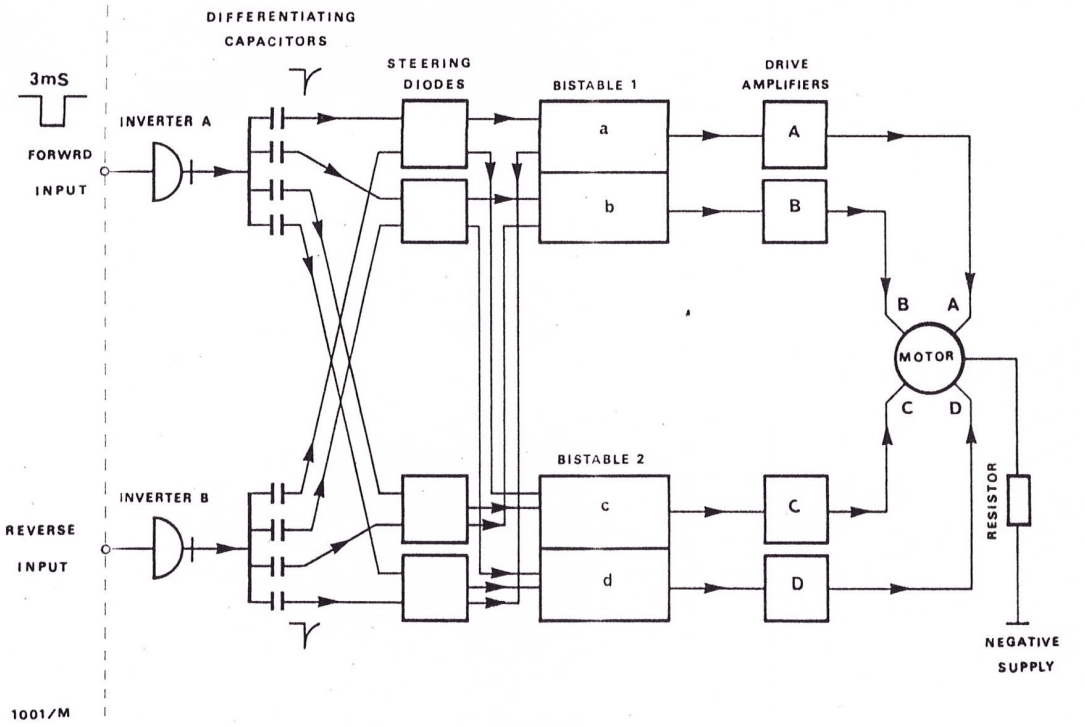


FIG 4.2 SIMPLIFIED BLOCK DIAGRAM, MOTOR DRIVE CIRCUIT

Single forward paper feed (Manual)

Operation of the 'Single Forward Feed' switch produces a logic '0' condition at the output of bistable C3, C4. Successive invertion occurs through gates A3 (enabled by a '1' condition from bistable F1, F2), A1, A2 (enabled by a '1' condition from A4), and D2 (enabled as in the preceding paragraph). A '0' condition therefore appears at the forward drive output terminal (9). When the 'Single Forward Feed' switch is released, the logic levels return to the 'rest' state and the condition at terminal 9 reverts to '1' thus providing a paper feed signal.

Run-out

Operation of the 'Run-out' switch enables multi-vibrator F1, F2 which thereupon feeds a train of alternate '0' and '1' signals to the gate A3 (enabled by a '1' condition from bistable C3, C4). Following this, the sequence of forward paper feed signals is exactly as described in the foregoing paragraphs.

Reverse paper feed

Operation of the 'Single Backward Feed' switch produces a logic '0' at the output of bistable C1, C2. Successive inversion occurs through gates B4, B2 (enabled by a '1' condition from B3) and B1 (enabled by a '1' condition through R3 while the 'No-tape' switch

is open-circuited). A logic '1' condition thus appears at the reverse-drive output terminal (7). In this instance, the leading edge of the output pulse initiates the reverse-drive feed, and hence, the feed is coincident with the operation of the 'Reverse-feed' button and not with its release.

No-tape and tight-tape warnings

Operation of either the no-tape or the tight-tape micro-switch inhibits the transmission of feed signals through gates D2 and B1. Multi-vibrator E1, E2 is enabled via the inverter gate D1, and the resulting train of '0' signals switches transistor TR1 on and off to flash the warning lamp.

Note that the warning lamp is energised by a supply of effectively 10.5 volts.

Stepping motor and motor drive board

Following each frame of punched codes, or in response to a manual forward or backward demand, the paper tape is moved in discrete steps of one frame at a time, in the required direction. This movement is instigated by a stepping motor which responds to a particular sequence of signal combinations at its four input terminals to effect forward or backward feed. Referring to the block diagram Fig 4.2., it will be seen that separate forward and backward inputs are provided. Input signals are inverted and applied to one of two sets of differentiating systems. The switching transients which result are applied to diode steering systems which determine the correct sequence of bistable switching consistent with forward or reverse feed. The conditions at the motor inputs change coincidently with the edges of logic '1' pulses applied to the forward or reverse inputs in accordance with the truth table which follows:

STEPPING MOTOR TRUTH TABLE (TYPICAL)

	FORWARD					REVERSE			
Feed input edge	A	B	C	D		A	B	C	D
Rest	1	0	0	1	Rest	1	0	0	1
Forward 1	1	0	1	0	Reverse 1	0	1	0	1
2	0	1	1	0	2	0	1	1	0
3	0	1	0	1	3	1	0	1	0
4	1	0	0	1	4	1	0	0	1

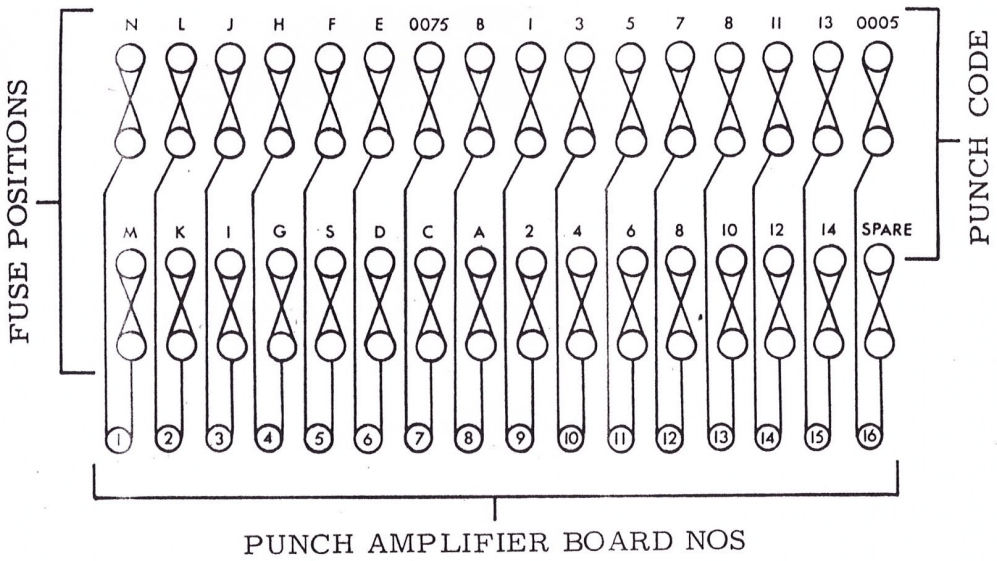


FIG 4.3 PUNCH FUSE ALLOCATIONS

The two conditions can be interpreted in terms of voltage between a motor input and the common lead as follows:

Logic '1' = -2.9V to -3.3V
Logic '0' = 0V to -0.3V

With reference to the truth table, note that a forward feed results if inputs C and D are reversed as an initial change, but reverse feed results if inputs A and B are reversed initially.

Punch amplifier allocation

A separate amplifier is provided for each punch solenoid, two identical amplifiers being accommodated on a single printed circuit board. A list of the data inputs via the multi-way connector, with their respective punches and amplifiers is to be found in Section 5.

Punch amplifiers

Each amplifier circuit contains a pair of transistors arranged in a modified Darlington configuration, driving a single output transistor which is coupled (externally to the board), to the associated punch solenoid. The amplifier has considerable current gain, the input current being in the region of 1.5 mA, while the output current through the solenoid is in the region of 7 amps.

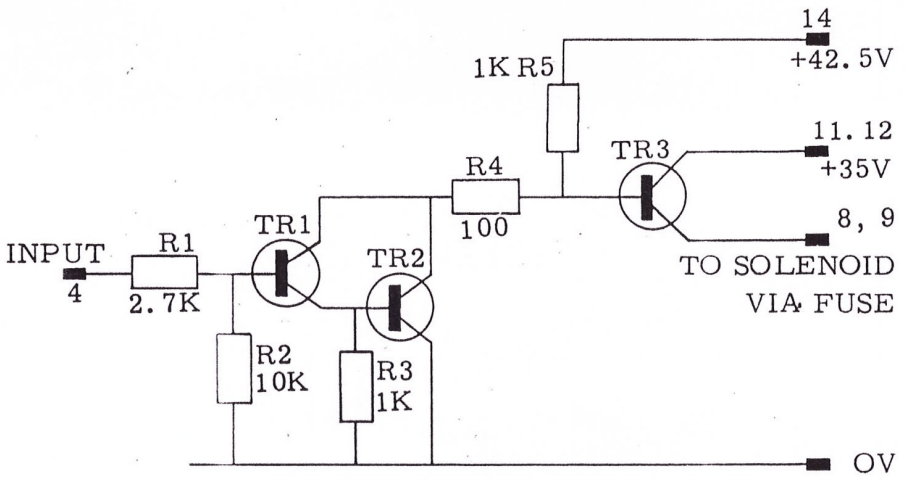


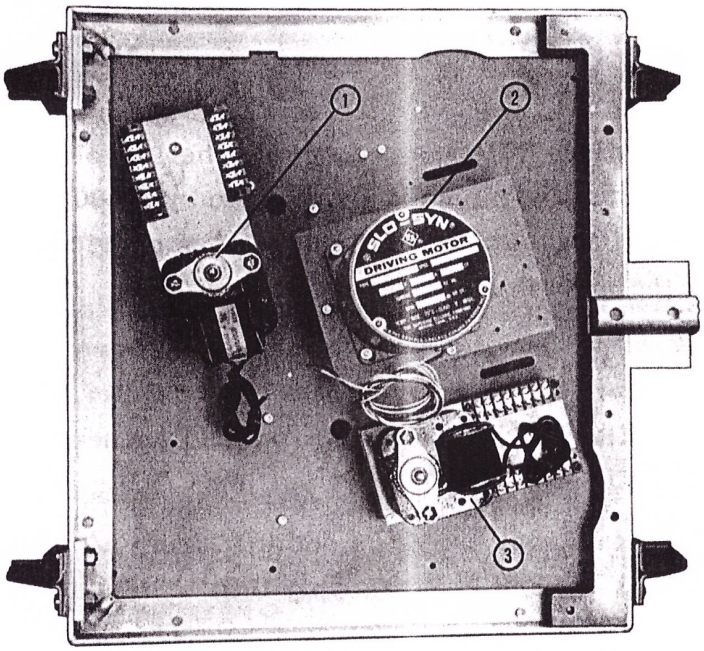
FIG 4.4 PUNCH AMPLIFIER CIRCUIT DIAGRAM

With no signal input, the transistors in the amplifiers are cut off and current consumption is negligible. Rapid cut-off of the output transistor is achieved by returning the base of the +45.5 volt supply via a 1-kilohm resistor which serves also as a load for the Darlington pair of transistors. Reference is made to the circuit diagram of the amplifier Fig 4.4. When an input pulse is applied, the input transistors are switched on and the base current of the output transistor TR3 flows via resistor R4 and the bottomed transistor TR2; transistor TR3 conducts and energises the punch solenoid. When TR3 is again switched off, a back-e.m.f. spike is produced by the solenoid. This spike is suppressed by a capacitor connected across the solenoid and fuse, thus limiting the amplitude to approximately 30 volts.

Protective anti-surge fuses are provided in each punch circuit; individual fuses are identified in Fig 4.3.

Take-up and reel-out motors

The take-up and reel-out motors (Fig 4.5) are mechanically coupled to their respective spool shafts through suitable reduction gearing. The motors are switched on and off by micro-switches, controlled by sensing arms which are in contact with the paper. The circuit arrangement is shown in simplified form in Fig 4.6. The two motor circuits are similar in operation. When a micro-switch is moved by its associated sensing arm to the position in which the motor is driven, the motor winding is connected to the a.c. mains supply via a 56-ohm, 10-watt resistor. Release of the sensing arm moves the



1 Take-up motor 2 Stepping motor 3 Reel-out motor

FIG 4.5 INCOMPLETE SIDE PLATE SHOWING MOTOR POSITIONS

switch to its alternative position in which the motor winding is connected via a 47-ohm, 3-watt resistor, to the positive terminal of a supply of 25-volt d.c. (with reference to mains neutral), in the power supply unit. This d.c. supply connected across the motor winding, produces an immediate braking effect and thus, the motor is prevented from over-running. Suppression of the a.c. supply contacts of the micro-switch is obtained from a resistive-capacitive network in a suppressor unit connected across the switch contacts.

Power supplies

A circuit diagram of the power supplies appears as Fig 8.10.

The mains transformer has tappings on the primary winding to suit single-phase, 50 Hz a.c. supplies in the range 220V - 250V (or 110V - 120V to special order). The input connections are illustrated in Fig 8.5. The transformer has four secondary windings which have the following nominal voltage and current ratings:

6V 1 amp
6V 9 amps
18V 1 amp
25V 1.8 amp

D. C. supplies are derived from these windings as follows:

(a) A 25V d.c. supply to provide d.c. braking for the take-up and reel-out motors is obtained from a bridge rectifier (MR1), connected to the 18-volt, 1-amp winding. Smoothing is effected by a 5000 uF capacitor (C1). A bleed resistor (R1) is provided across the smoothing capacitor.

(b) The +42.5V, +35V and -5.5V d.c. supplies are obtained from separate bridge rectifiers (MR4, MR2 and MR3) having their d.c. outputs connected in series.

(c) A +5 volt stabilised supply is obtained from a Kingshill Stabilised Power Supply Unit.

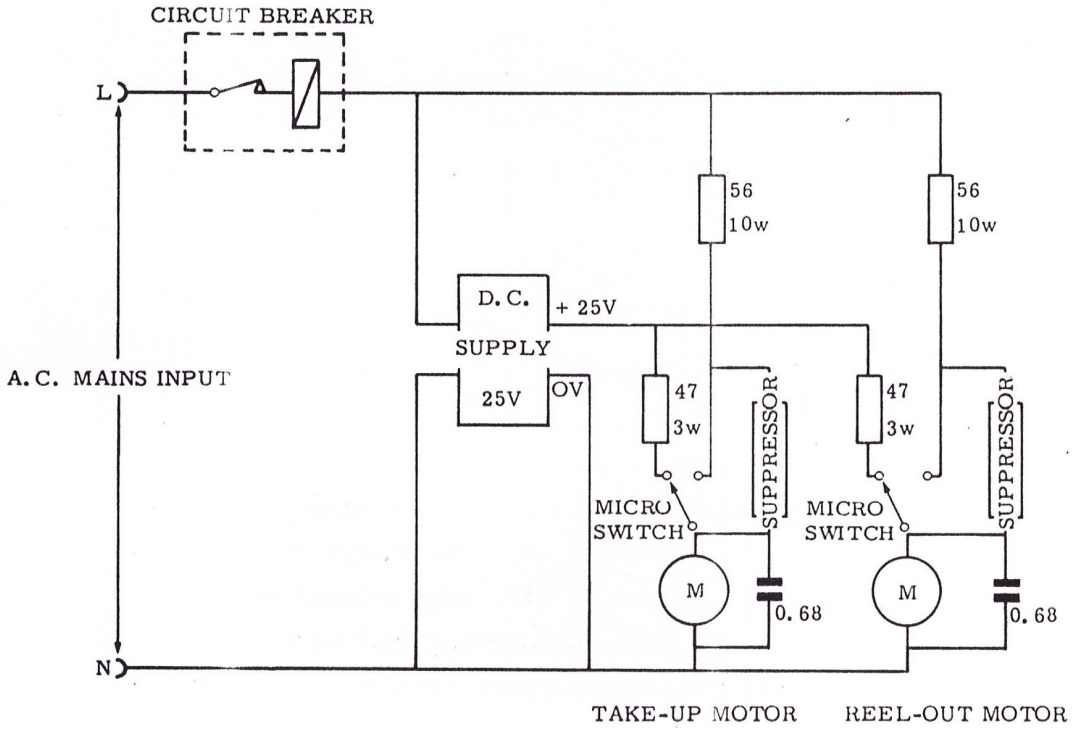


FIG 4.6 SIMPLIFIED DIAGRAM, TAKE-UP AND REEL-OUT MOTOR CIRCUITS

Fuse failure warning circuit

Later models of the punch are fitted with a warning circuit (illustrated in Fig 4.8) which inhibits all punch amplifiers and the paper feed circuit in the event of a fuse failure or if a punch solenoid becomes open-circuited. Simultaneously, the tight tape warning lamp flashes to provide visual indication of a fault condition. A conversion kit is available for the modification of existing punches not equipped with the warning circuit.

The circuit diagram of the fuse failure warning unit is shown in Fig 4.7. Each of the 31 solenoid drive amplifiers is connected, via an isolating diode, to the input of a two-stage amplifier TR1, TR2. The amplifier is normally switched off by the application of 0 volts to the base of TR1, via resistor R2. The amplifier is switched on when a potential of +35 volts (Honeywell punch) or +27 volts (Harting punch) is applied to the base of TR1. A potential approaching this value is applied instantaneously, via the associated diode, each time a punch solenoid amplifier is energised, but the pulse period is very

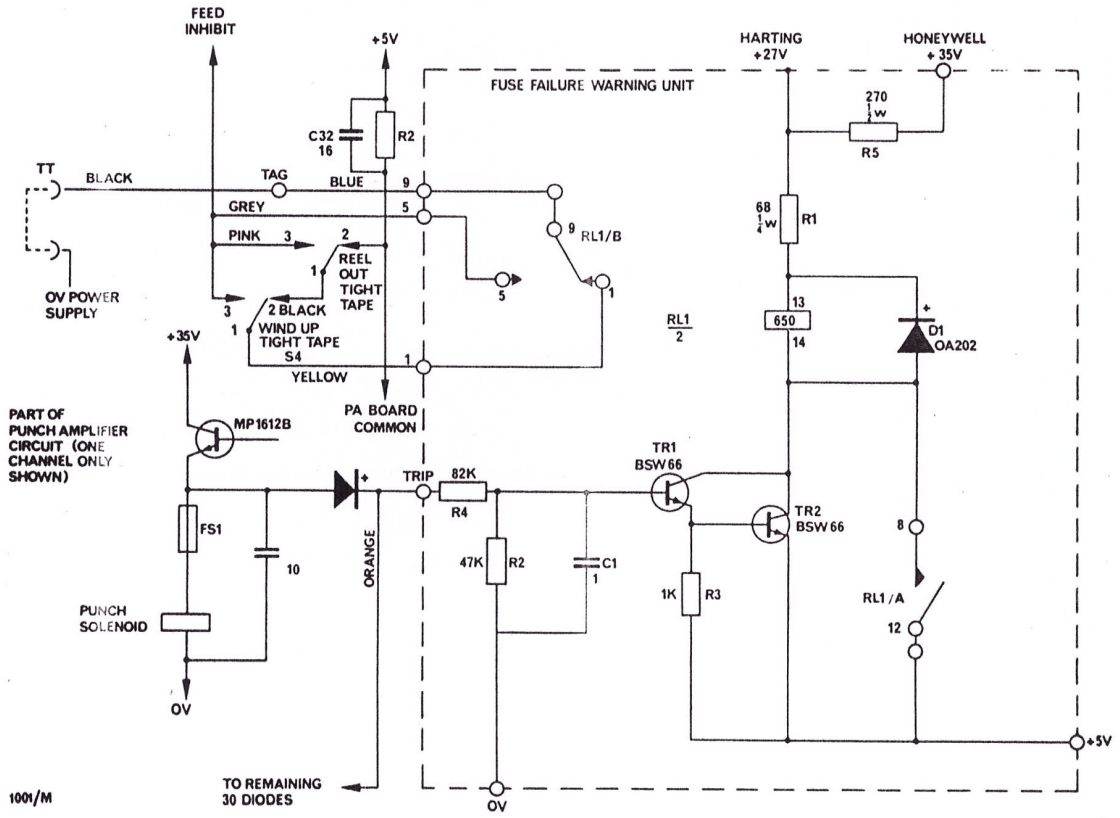


FIG 4.7 FUSE FAILURE WARNING UNIT, CIRCUIT DIAGRAM, SHOWING EXTERNAL CONNECTIONS

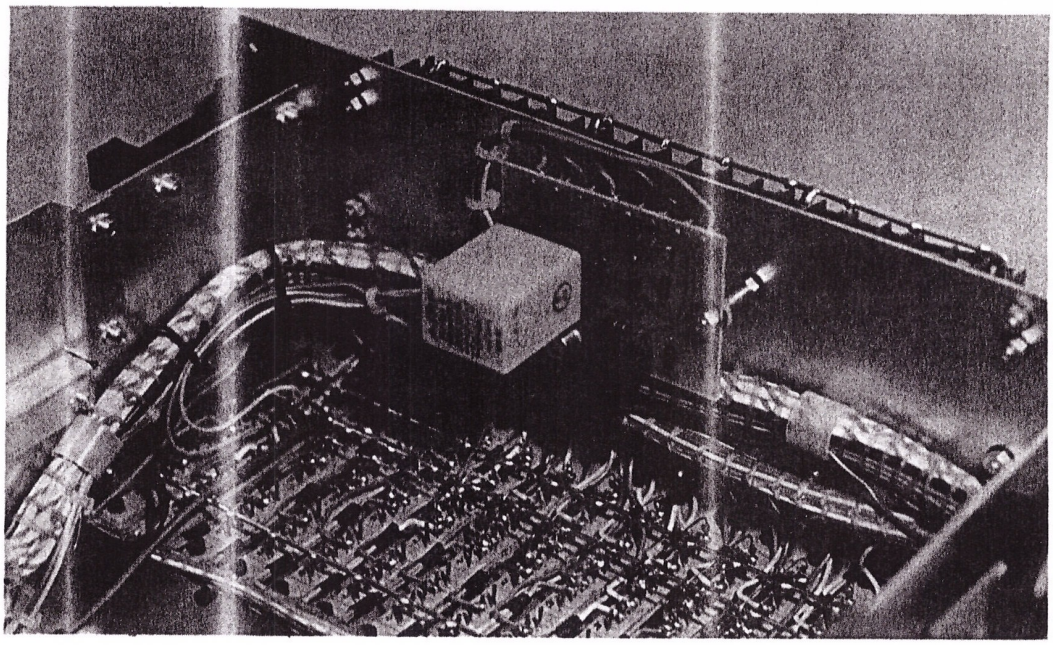
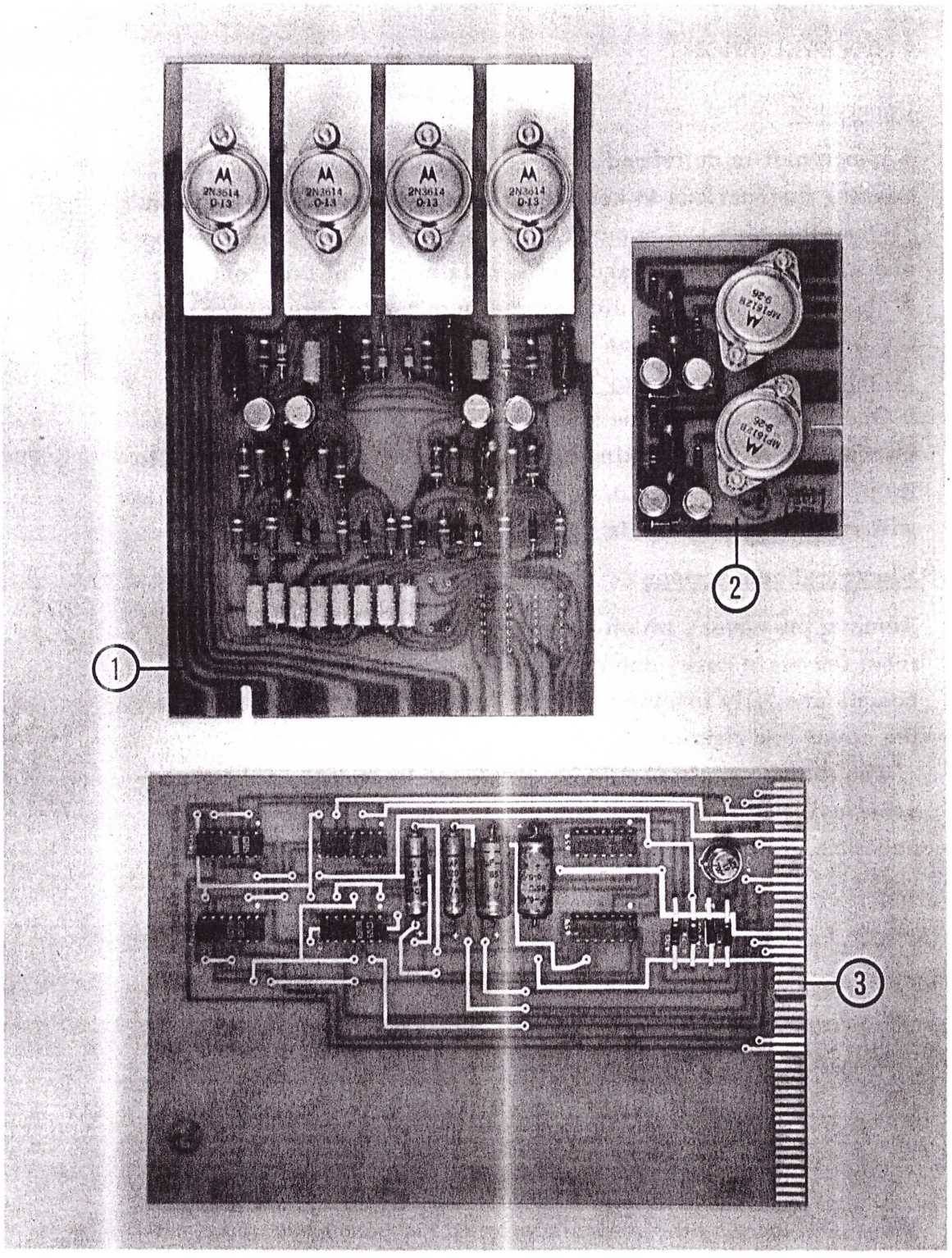


FIG 4.8 THE FUSE FAILURE WARNING UNIT

short and the charging current of capacitor C1 produces a sufficient voltage drop across R4 to prevent the amplifier from being switched on. Discharge of the capacitor, between pulses, occurs through the resistor R2.

When a fuse fails or a punch solenoid becomes open-circuited, the emitter of the associated solenoid amplifier is permanently raised to +35 volts, since the suppressor capacitor cannot discharge after that channel has been energised. This potential is then applied continuously through the associated diode and resistor R4 to C1 and the base of TR1 which conducts.

With TR1 conducting, TR2 conducts also and energises the relay RL1. Relay contact RL1/A locks the relay in the permanently energised condition through a connection to the +5 volt line, whilst the remaining contact RL1/B applies a 0 volt condition to the punch amplifier inhibit line thus halting the action of all punch solenoids and causing the warning lamp to flash.



1 Stepping motor drive board 3 Function/Indicator board

2 Punch drive board

4.9 MOTOR DRIVE, PUNCH DRIVE AND FUNCTION/INDICATOR BOARDS

5 INSTALLATION

Unpacking

A punch unit is delivered securely packed in a wooden case bearing instructions to keep the contents in an upright position.

Open the case and remove the packing material from the top and sides to expose a cardboard container. Cut this container at the top and down the side seams in order to obtain access to the webbing lifting straps which are already in position.
Do not lift the unit by any other method at this stage.

Open and roll down the sealed polythene bags so that the internal protective packing can be removed. Move the punch to its permanent site by lifting at the base plate only, since damage will result is pressure is applied elsewhere.

Electrical connections

Remove the cover, which is secured by six posidriv screws, from the main case, and check that all the printed circuit boards are fully inserted into their edge connectors. Replace the cover and tighten the screws.

The mains supply should be connected by means of the three-core mains lead supplied with the punch. The connectors, according to current International Standards are as follows:-

LINE	BROWN
NEUTRAL	BLUE
EARTH	YELLOW/GREEN

However, cables which conform with the former British Standard should be connected as follows:-

LINE	RED
NEUTRAL	BLACK
EARTH	GREEN

The fuse carrying the mains supply to the punch should be rated at 10 amps for 200-240 volt operation, or 20 amps if the equipment has been supplied for operation from 110-120 volt mains. Additional protection is provided by a circuit-breaker switch which trips to disconnect the mains supply in the event of a dangerous overload condition occurring.

Data input connections are made by a 38-way connector which is situated adjacent to the mains connector at the rear of the case. The free connector containing fixed contacts, to which data cable wires are soldered, must have these contacts sleeved to prevent the possibility of short-circuits occurring. Connections to the various pins of the data connector are as shown in the Interconnection Table. When a punch is supplied as part of either an Electronic Perforator or a Tape Conversión System, it is supplied with ready-made mains and data cables to suit the system.

Preliminary tests

With the mains and data inputs connected, switch on the unit and check that all conditions are correct for the proper operation of the punch.

Load a spool of programme tape in accordance with the information contained in the operating instructions (Section 6) and carry out the normal procedure to check the operation of the feed system. When the punchings container has been clipped into position, the punch is ready to accept data input.

Arrangements should now be made to energise all the punch inputs in accordance with the limits detailed in the Electrical Specification (Section 2), coincident forward paper feed signals being provided also.

Check that all code punches perforate the tape in strict accordance with the data inputs, since, following a period of inactivity, the punches may tend to stick in the unit. However, this condition can normally be cleared during a short initial test operation.

Verify that all the holes are punched clearly and that, in the absence of a 'stop feed' signal input, single forward advances of the tape occur following each frame of information punched. Check that a single back-space input signal produces a single back-space feed action. The application of a number of back-space signals results eventually in the operation of the "tight tape" switch which inhibits further back spacing.

TABLE 1, DATA CONNECTOR PIN FUNCTIONS

Pin	Function	Pin	Function
A	Punch N	Y	Punch 5
B	Punch M	Z	Punch 6
C	Punch L	AA	Punch 7
D	Punch K	BB	Punch 8
E	Punch J	CC	Punch 9
F	Punch I	DD	Punch 10
H	Punch H	EE	Punch 11
J	Punch G	FF	Punch 12
K	Punch F	HH	Punch 13
L	Punch S	JJ	Punch 14
M	Punch E	KK	Punch 0005
N	Punch D	MM	Forward Paper Feed
P	Punch 0075	PP	Stop Paper Feed
R	Punch C	LL	Backward Paper Feed
S	Punch B	NN	Common Line
T	Punch A	RR	+5V (test purposes only)
U	Punch 1	SS	External indication of tight tape condition (+5V with respect to NN)
V	Punch 2		
W	Punch 3	TT	External Inhibit (Normally connected to NN)
X	Punch 4		

The remaining terminals of the data input connector are routed as follows:-

Connector Pin	Signal	Destination
MM	Forward paper feed	Function board
LL	Backward paper feed	Function board
PP	Stop feed	Function board
NN	0 volts	0 volt line
SS	0 volts except for tight tape/no tape condition	Warning switches and punch amplifiers 0 volt supply line
TT	Normally 0 volts (external connection)	Warning switches

6 OPERATING INSTRUCTIONS

Switching on and off

The mains electricity supply is switched on by firmly pressing the large green button on the front of the case. Light pressure on the small red button switches off the mains.

Loading procedure

Switch on the mains supply and load a spool of joint-free tape onto the lower (feed) spindle so that it turns in a clockwise direction to unroll. Tear the tape leader to form an arrow head and, following the diagram Fig 6. 1 thread the tape through the guide rollers and the punch plates. Operating the reel-out tape arm by hand, feed the arrow head beneath the rubber driving roller so that it is picked up between the driving roller and the driven roller.

Feed approximately one metre (three feet) of tape through the rollers to facilitate passing it through the die plates and into the winding system. Switch off the mains supply to permit free rotation of the tape feed wheels, then load the tape through the die plates and onto the take-up spool as illustrated in Fig 6. 1. Check carefully that the programme tape is loaded straight in the die plates.

Checking routine

Having loaded a programme tape satisfactorily, switch on the mains supply and check that the tape feed controls function correctly. Operate the 'Run-out' button for a few seconds and check that the tape is winding correctly onto the take-up spool. The 'Run-out' button provides a paper feed rate of approximately sixteen steps per second. The 'Tight tape' indication can be checked by operating the tape arms to their fullest extent, toward the punch housing face plate, and observing that the warning indicator lamp flashes. Under tight-tape conditions, the forward tape feed action and all the punches are rendered inoperative.

Normally, the paper guide systems should not need adjustment for first-time operation. However, it should be noted that the tension of the tape being wound onto the take-up spool is governed by the attitude of the friction guide assembly; winding-up tension is increased by rotating this assembly in a counter-clockwise direction. Excessive tension creates a tendency for the tape to wander or to tear and the winding-up motor and gear box are over-loaded by this condition.

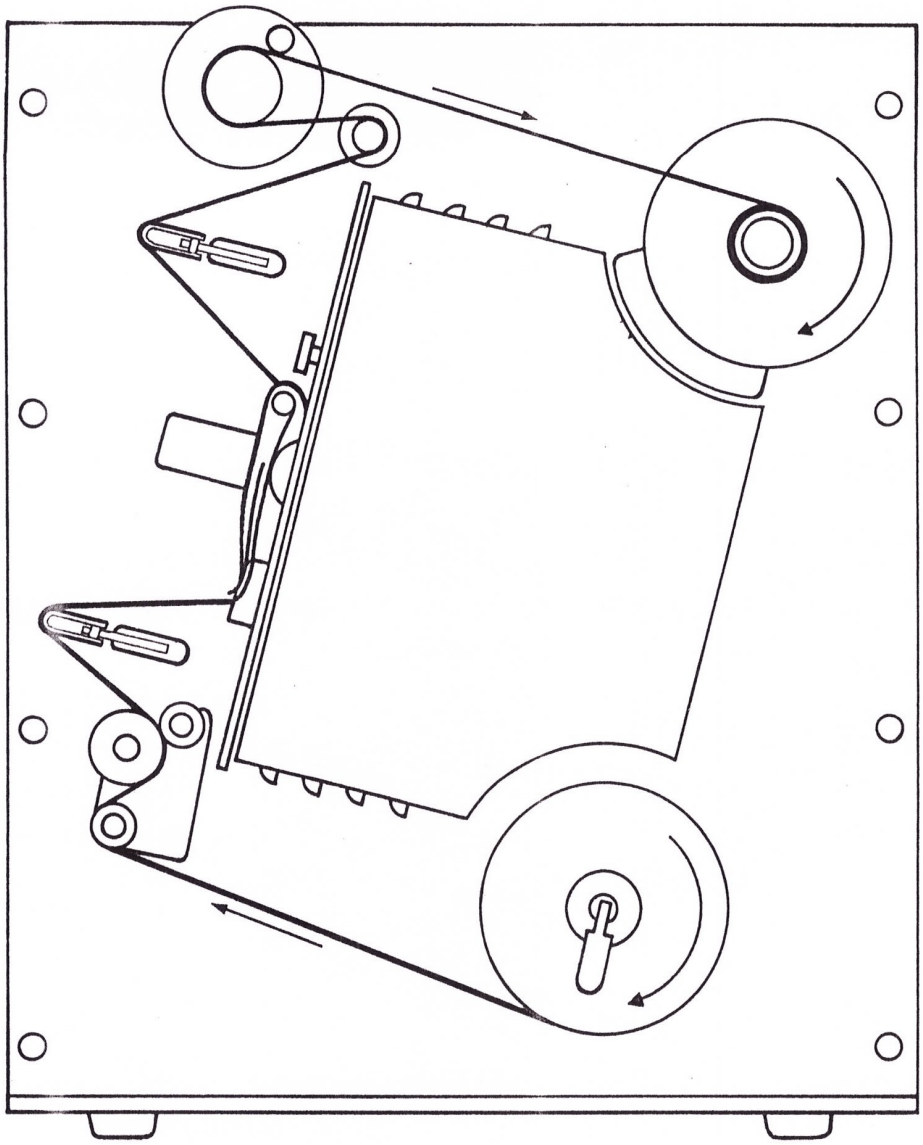


FIG 6.1 METHOD OF THREADING TAPE ONTO 31-CHANNEL PUNCH

Switching-on routine

Because of an inherent characteristic of the tape feed motor drive system, there is a possibility of a tape feed occurring each time the punch is switched on. The direction of this feed (forward or reverse) is unpredictable; also, after switching on, an initial forward tape-feed signal can result in a reverse feed of tape, and vice-versa. Consequently, when a punch is used in conjunction with a 'Monotype' Electronic Perforator, it is necessary to ensure that a 31-channel tape which remains incomplete at the end of a period of operation, is suitably marked for repositioning before the equipment is switched off.

When operation is resumed and the equipment is switched on again, the normal feed controls should be used to move the tape either forward or backward. The tape must then be correctly repositioned even if no tape feed has occurred when switching on. Also, the manual controls should be operated immediately after loading programme tape into the 31-channel punch, irrespective of the system with which it is associated. Operation of the manual controls primes the tape feed system so that initial feed errors are eliminated before information is fed to the punch.

Tight tape condition

A tight tape condition is indicated by a flashing red lamp contained in the continuous tape feed control button. While tight tape conditions prevail, both the data punch and tape feed systems are inoperative.

Lower tape arm

One or more of the following conditions can cause the lower tape arm to assume a 'tight tape' position:-

a) End of the blank 31-channel tape supply. (The end of the tape glued to the reel causes the tight tape condition).

b) Incorrect operation of paper drive capstan (see Routine Maintenance for cleaning instructions).

c) Failure of reel-out motor system.

Upper tape arm

One or more of the following conditions can cause the upper tape arm to assume a 'tight tape' position:-

a) Excessive use of the backspacing facility (when used with an Electronic Perforator) without first ensuring that sufficient loose paper has been released from the take-up spool.

b) Continuous operation of the winding-up motor system.

c) Sticking punches preventing the movement of paper from the die plates prior to the winding-up action.

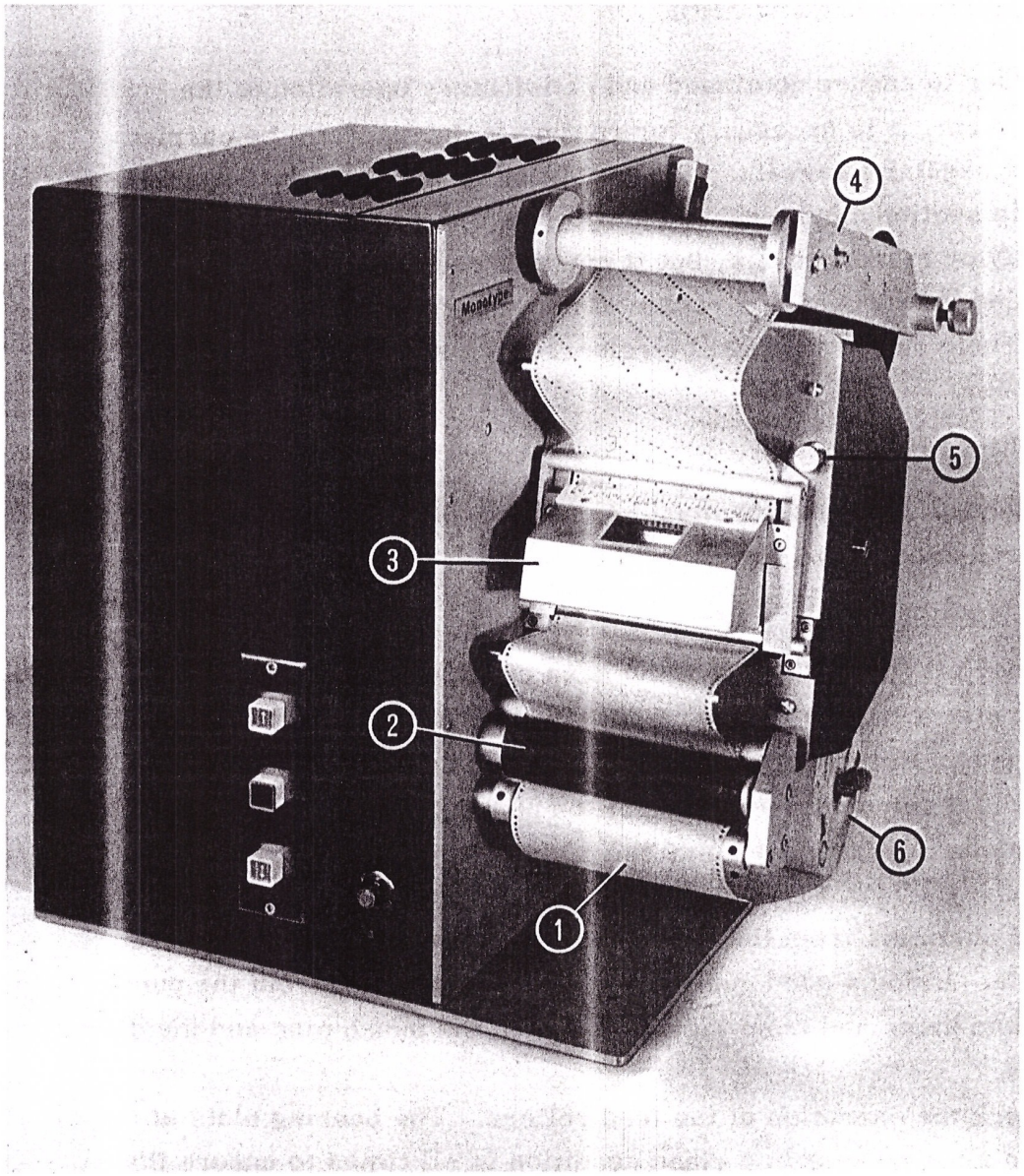
Failure of either of the paper control motor systems must be reported immediately to the engineer responsible for maintaining the equipment.

Correction of tight tape condition

When a 'tight tape' condition occurs as a result of backspacing the condition can be corrected by winding back the spool by hand after disengaging it by means of the take-up spool release mechanism. Perforation can then be continued after locking the take-up spool release mechanism again. Slack tape is taken up automatically.

Emptying the punchings container

It is important to empty the punchings container at regular intervals and at least as frequently as the programme tape spool is renewed. Failure to observe this precaution results in tearing of the tape when the container becomes full.



1	Feed-out roller	4	Take-up spool
2	Rubber roller	5	Punch gate latch
3	Punchings container	6	Paper roll

FIG 7.1 EXTERIOR OF PUNCH SHOWING ROLLERS AND PUNCHINGS CONTAINER ETC

7 ROUTINE MAINTENANCE

In order to ensure continued and satisfactory operation of the equipment, it is necessary for routine maintenance to be carried out at regular intervals. The maintenance procedures described in this section can be carried out by the operator on a daily, weekly or monthly basis, but it must be emphasised that more detailed maintenance or repair of the equipment, including the electronic sections, must be referred to a skilled maintenance engineer.

Punchings container

The punchings container must be emptied as least as frequently as the programme tape spool is renewed, and more often if necessary.

Daily routine

Remove all paper dust from the area of the die plates and the tape feed rollers. Open the punch gate by operating the die plate latch (Fig 7.1). Note that the gate must be opened and closed carefully to avoid disturbing the seating of the punch pins which could cause severe damage if closed onto the die plates whilst incorrectly seated. Use a 0.1524mm (0.006in) berylium copper shim to clear small particles from the die plates,particularly near the tape feed wheels. Using a good quality brush, clear the dust from the punch solenoid arms and from the rear ends of the punch pins and the die plates.

Check the operation of the feed rollers. The bearing slots of the roller must be kept in a clean condition at all times to ensure that the roller falls freely onto the rubber driving roller.

Check that the cooling fan is operating satisfactorily.

Operate a suitable test routine to ensure that all 31 punches perforate the tape correctly. Check the linearity of punching; when the punch is used with an Electronic Perforator, linearity can be checked conveniently by using the 'Line Fill' facility.

Use of test unit

Punch operation and feed linearity can be readily checked by temporarily disconnecting the data input connector and fitting the Test Unit (GTE 1122 Honeywell, or GTE 1132 Harting) to the punch connector. The Harting and Honeywell versions of the punch can be identified by the serial numbers as follows:

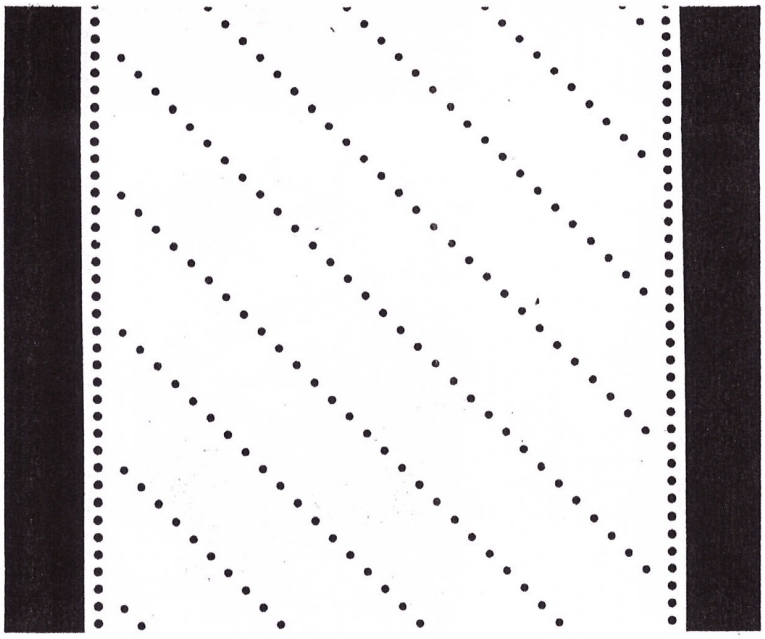


FIG 7.2 EXAMPLE OF CORRECTLY PUNCHED TAPE USING THE TEST UNIT

Honeywell, serials 200 to 499 inclusive and 600 upward
Harting, serials 500 to 599 inclusive

With the tape running, the Test Unit produces a multiple diagonal pattern (Fig 7.2) which makes any malfunction of a punch or irregularity of the feed immediately obvious.

Weekly routine

The following routine should be carried out every week or after approximately 50 hours of operation.

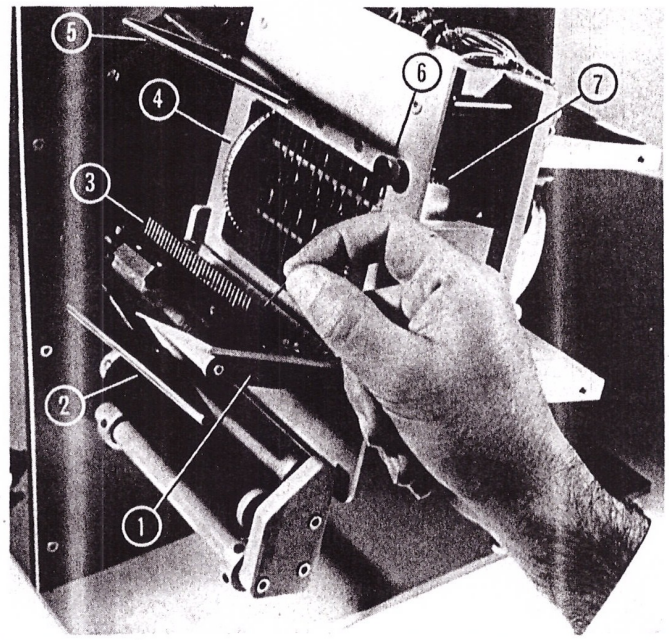
Perform the daily routine maintenance and in addition, while the punch gate is open, apply keyboard oil to the parts of the punch pins which protrude from the die. Remove surplus oil with a lint-free cloth.

Use a paper tissue pad and methylated spirit to wipe clean the rubber driving roller.

Monthly routine

The following routine should be carried out every month or after approximately 200 hours of operation.

Open the punch gate, remove all the punch pins (Fig 7.3) and lay them in order of assembly on clean paper or a lint-free cloth. Thoroughly clean each pin with a lint-free cloth or paper tissue, taking care to retain their order of assembly.



1	Die plate	5	Paper take-up sensing arm
2	Paper reel-out sensing arm	6	Punch gate latch
3	Punch pins	7	Sprocket drive wheel
4	Sprocket drive wheel		

FIG 7.3 INTERIOR OF PUNCH GATE, REMOVAL OF PUNCH PINS

While the punch pins are removed and the punch gate is open, clean the die plates in the following manner: apply a volatile solvent so that it runs through the holes in the die plate without splashing. Collect the dust-laden solvent in a suitable receptacle. With the aid of an air line, blow out suspended dust from inside the die plate holes and clean the exterior surfaces of the die plate thoroughly.

Taking each punch pin in turn, dip the small end in Molyslip G to a depth of approximately 2mm (1/16in) from the tip, and replace the pin into its respective hole, spinning the part to distribute the lubricant in the guide hole before finally positioning.

Lubricate the punch pins with keyboard oil as described in the weekly routine procedure and apply a film of Molyslip G to the ends of the punch pins which contact the solenoid levers.

Removal of jammed paper from die plates

Paper may become jammed between the die plates as a result of a sticking punch or foreign matter in the paper.

A sticking punch usually causes an elongated tear in the paper, with torn paper folding up behind the pin. With care, it is possible to free the paper without jamming the die plates.

Switch off the mains supply to the punch. Release the punch gates so that the sprocket holes are free from the feed wheels and release the paper by tearing it across the elongated hole as shown in Fig 7.4.

To clear jammed paper particles from between the die plates, use the 0.1524mm (0.006in) berylium shim to pull the paper toward the sides of the plates from whence it can be easily removed.

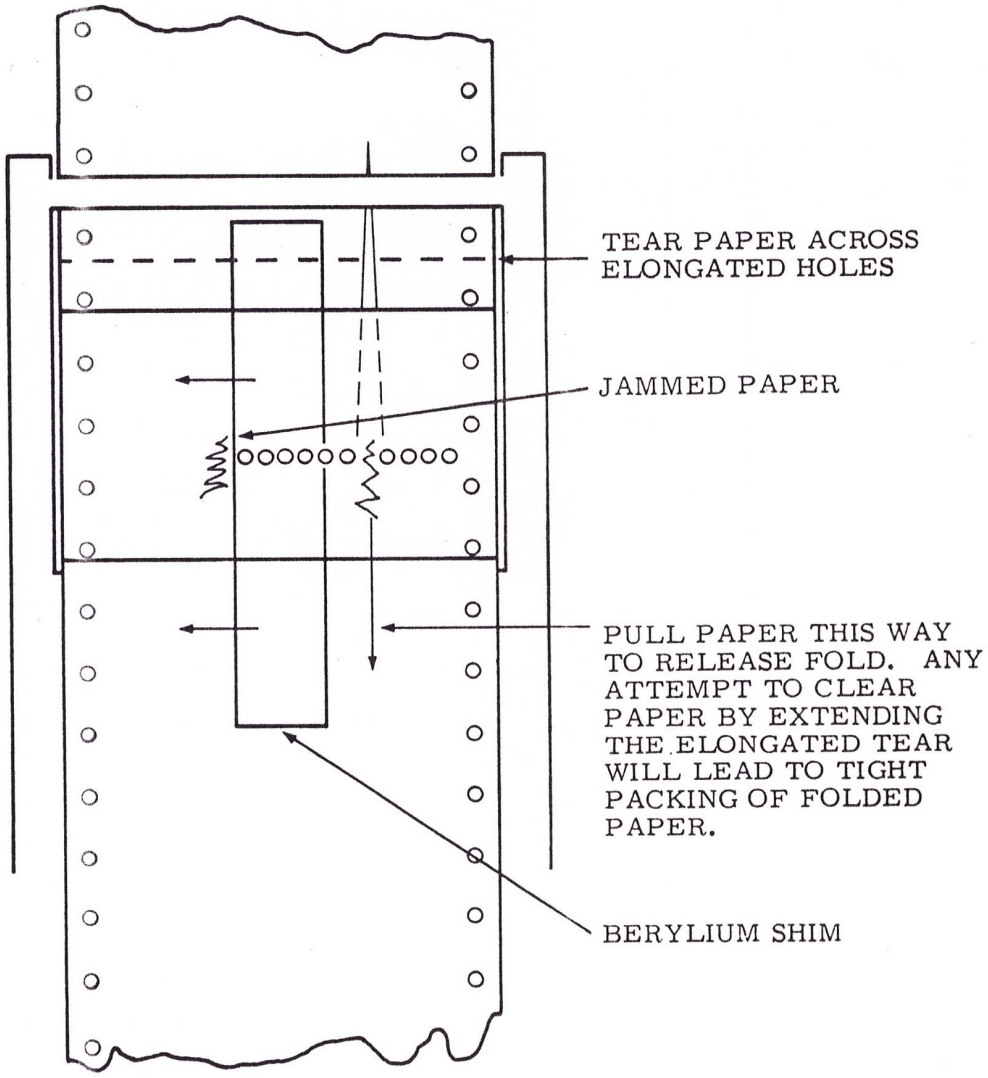


FIG 7.4 REMOVAL OF JAMMED PAPER FROM THE DIE PLATES

Replacement of warning indicator lamp

(a) Remove the plastic lens by placing a screwdriver or a penknife blade under the projecting lip and easing it outward (Fig 7.5). Push one side of the diffuser inward. This causes the other side to project outward so that it can be grasped and withdrawn (Fig 7.6).

(b) Push the extractor tool over the lamp bulb and when it grips the lamp, pull it outward, thus extracting lamp (Fig 7.7). Remove the lamp from the extractor tool and discard the old lamp.

(c) Fit a new lamp into the extractor tool and insert it into the lamp holder with the contacts to right and left of the holder (not top and bottom). Push the lamp firmly home and withdraw the extractor tool, lifting and twisting it slightly as necessary to ensure release.

(d) Refit the diffuser and lens.

(e) Check that the lamp is illuminated when the appropriate condition is produced (i.e. tight paper or no paper).

NOTES:

(a) Never use abrasive substances to clean punch pins or die plates. Always use a mask or shield in front of the solenoid arms when removing pins or cleaning die plates.

(b) Use only the approved 0.1524mm (0.006in) berylium copper strip for cleaning jammed paper from the die plates and avoid disturbing either the die plate fixing screws or the punch gate hinge blocks.

(c) In the event of an improperly seated punch pin causing damage to a die plate when attempting to close the gate, do not attempt to force the pin into its correct position since this action will cause further damage.

(d) Removable wind-up spools must be maintained in good condition in order to function properly. Bent or loose side plates necessarily affect the quality of tape wind-up.

(e) Faults which cannot be rectified by routine maintenance as described in this section must be referred to a skilled technician (see Section 8).

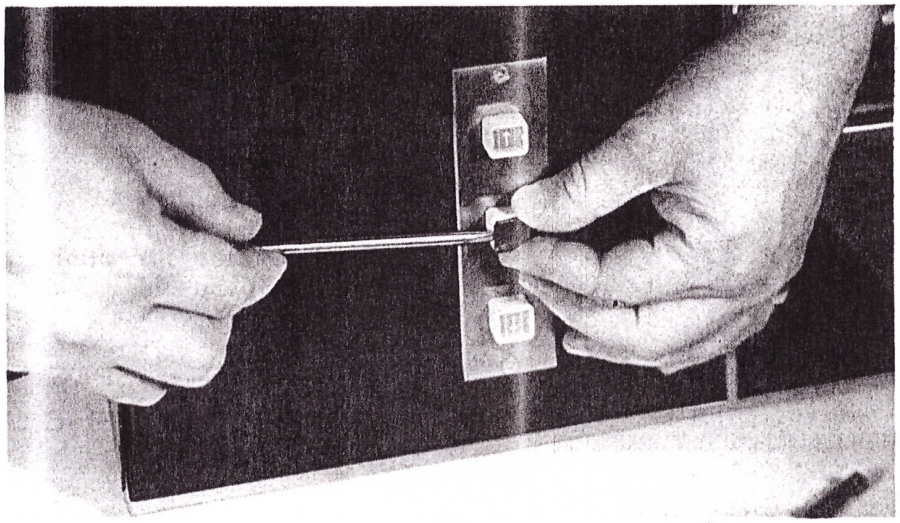


FIG 7.5 REMOVING PLASTIC LENS OF INDICATOR LAMP

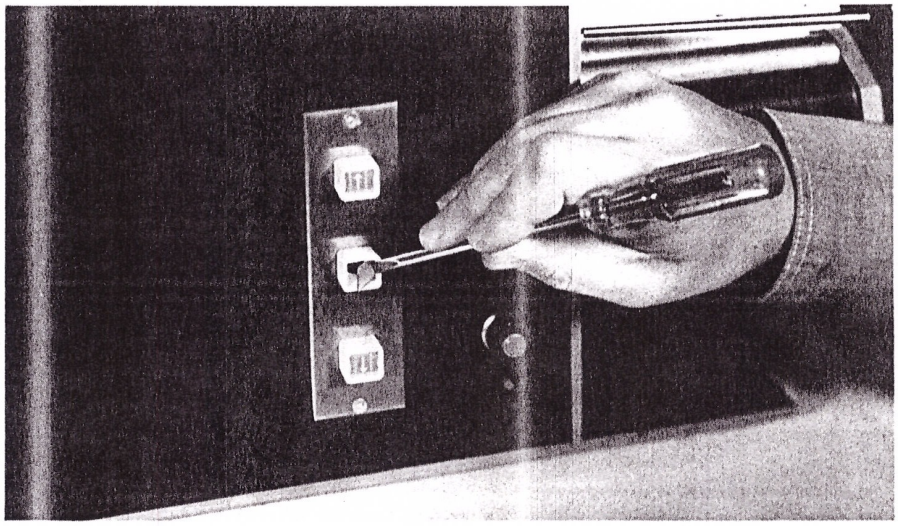


FIG 7.6 REMOVING LAMP DIFFUSER

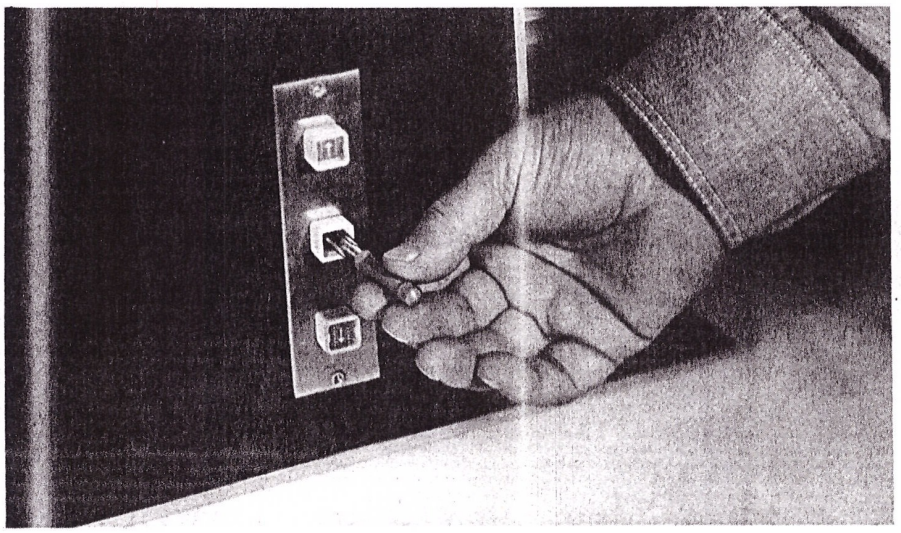
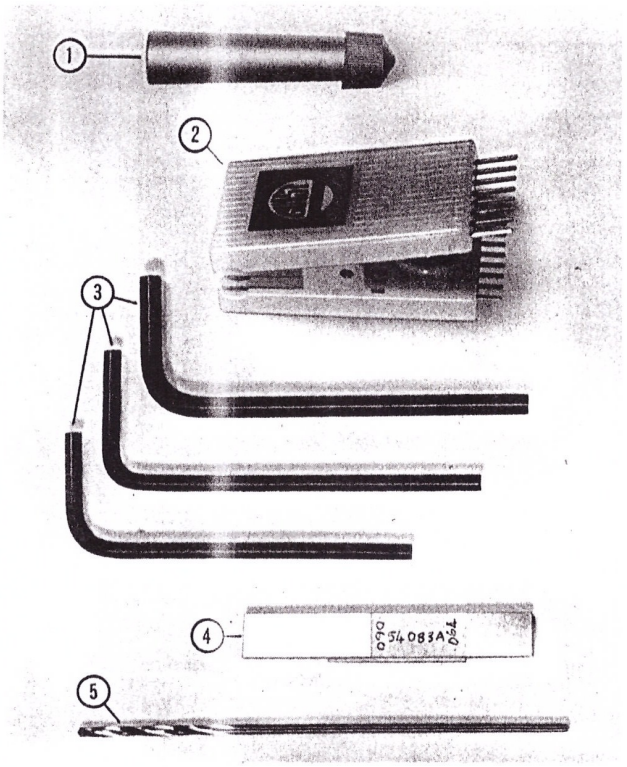


FIG 7.7 USING THE LAMP EXTRACTOR



1 Lamp extractor

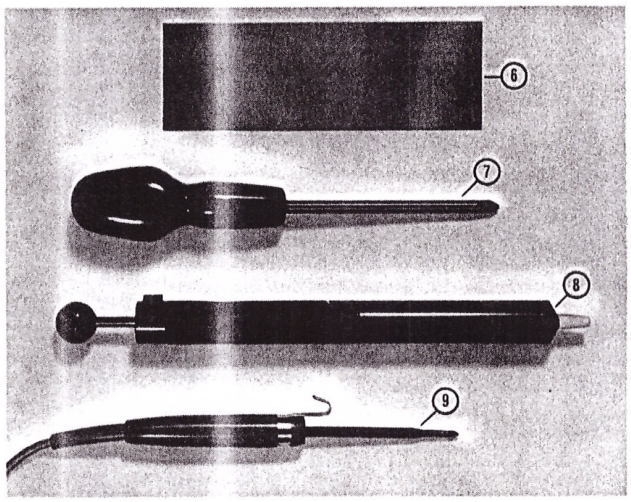
2 Integrated circuit test clip

3 Socket wrenches

4 Slip gauge

5 Reamer for punch plates

FIG 8.1(a) - SPECIAL TOOLS FOR USE WITH 31-CHANNEL PUNCH



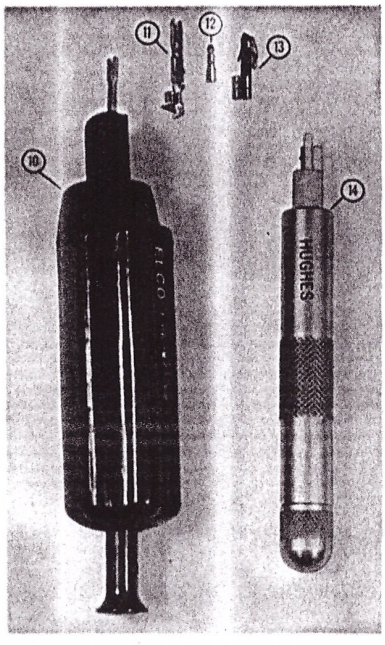
6 Punch clearing tool

7 Pozidriv screwdriver

8 Solder removing tool

9 10-watt soldering instrument

FIG 8.1(b) - SPECIAL TOOLS FOR USE WITH 31-CHANNEL PUNCH



10 Data plug extractor tool

11 Data plug contact insert

12 Edge connector jack pin

13 Edge connector contact insert

14 Edge connector extractor tool

FIG 8.1(c) - SPECIAL TOOLS FOR USE WITH 31-CHANNEL PUNCH

8 TECHNICAL MAINTENANCE AND REPAIR

The procedures described in this section should be undertaken only by a skilled technician who is familiar with solid state devices and printed circuit board techniques. Before any work affecting the electronic circuits is attempted the General Information and Instructions should be read carefully and must be observed at all times.

Special tools

The following is a list of special tools which should be available during maintenance, in addition to the standard Tool Kit and normal wiring tools (Fig 8. 1).

Designation	Reference
Contact extractor for data connector	GTE 1058
Contact remover, edge connector (motor drive and function indicator boards only)	GTE 1060
Tape clearing tool	55318
Lamp extractor	GTE 1127
Posidriv screwdriver	GTM 989
Slip gauge	54083A
Reamer for punch plates	GTE 1112
Edge connector extension board	54000N
Solder removing tool	GTE 1067
10-watt soldering instrument (for I/Cs only)	GTE 1156
Solenoid travel gauge	54083A
Solenoid travel gauge for modified punch (see appendix 2)	
Socket wrenches, various:	
Integrated circuit test clip	GTE 1231

Test equipment

The following (or equivalent) pieces of test equipment should be available:

Test unit (Honeywell Punch)	GTE 1122 (for serial numbers 200 to 499 and 600 upwards)

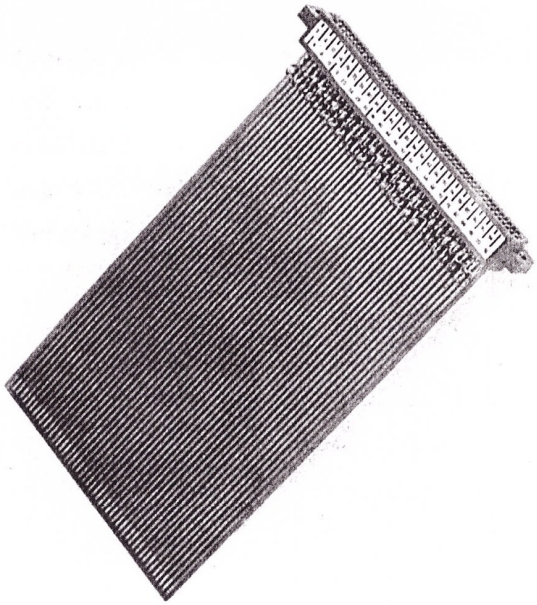


FIG 8.2 PRINTED CIRCUIT EXTENSION BOARD

Test unit (Harting Punch) GTE 1132 (for serial numbers 500 to 599)

Multi-range test meter (e.g. Avometer, model 8)

General-purpose Oscilloscope

General information and instructions

Logic potentials

With the exception of the drive to the stepping motor, positive logic is employed throughout the logic system, the extreme values being:

Logic 1 = +5 volts
Logic 0 = 0 volts

In practice, because of circuit conditions, logic 1 can be represented by any potential in the range of +2.4 volts to +5 volts and logic 0 can have a value between 0 volts and +0.4 volts.

Note that while the value at the open-circuited input of a NAND gate is nominally logic 1 the voltage measured at such an input will not be within the normal limits or +2.4 volts to +5 volts.

Before any logic checks are carried out on a particular circuit board, it is necessary to ensure that the correct conditions exist at all inputs for a particular state condition.

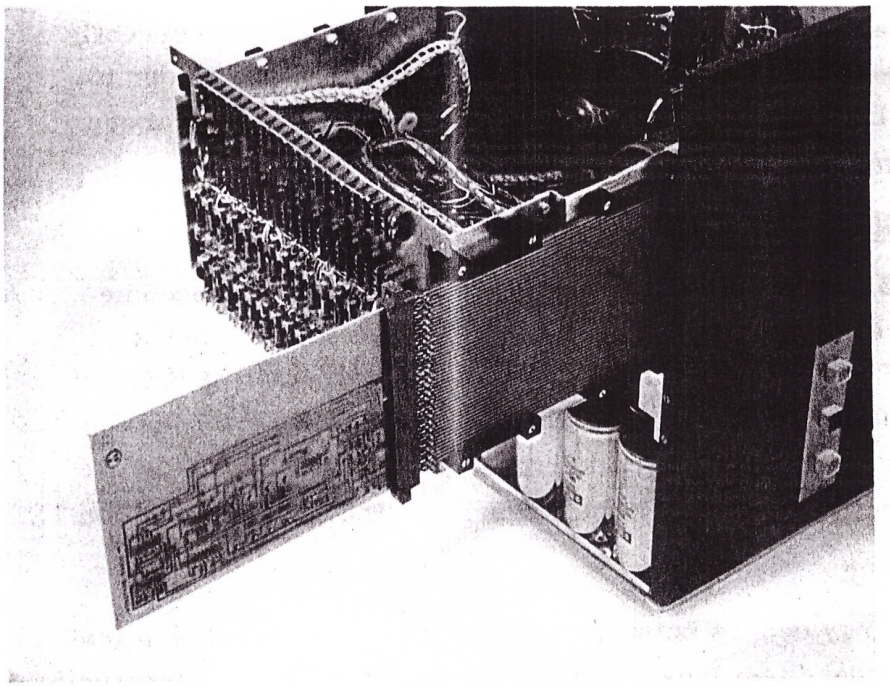


FIG 8.3 PRINTED CIRCUIT EXTENSION BOARD IN USE

To avoid misleading results, it is essential to ensure that all I/C packages are correctly connected to both 0 volt and +5 volt supplies at the respective power supply pins. Reference should be made to Fig 8.5 for the pin connections of all I/C packages.

The output of an I/C should never be connected directly to either the 0 volt or +5 volt supply in order to produce a particular logic condition, since damage to the I/C will almost inevitably result.

Replacement of solid state devices

The solid state devices are secured to the printed wiring boards by means of pins (or wires) which extend through holes in the boards and are soldered to the printed wiring. Replacement of the device involves melting the solder around each pin in turn and removing the solder with the aid of the solder-removing tool, leaving the pin or wire-end clean. With all the pins clean, the device can be withdrawn without physical damage.

NOTE: Solid state devices can be permanently damaged or destroyed by excessive heat. Soldering operations must therefore be carried out quickly, using a soldering instrument having a rating which is not in excess of 10 watts.

When fitting a solid state device, ensure that the pins are correctly orientated. Insert the pins carefully through the holes and solder to the printed wiring, using a minimum of solder. Remove any excess solder and examine for dry joints.

Systematic fault finding

Failure of the 31-channel punch to operate correctly should become apparent as a result of the routine tests carried out by the operator. The test unit (Fig 8.4) fits directly into the data connector at the rear of the punch unit and produces a multiple diagonal pattern across the paper tape thus making it easy to determine whether all channels are operating correctly and to check the linearity of the feed (see Section 7).

Faults in punching

When a discrepancy occurs between the perforations punched in a test tape and the standard test tape, it is advisable to repeat the operation for the code or codes concerned to establish that a repeatable fault exists.

Loss of 5 volt supply

The 5 volt stabiliser unit has an automatic regulating circuit which causes the output voltage to drop to zero if a short-circuit occurs externally, for example, on one of the printed circuit boards. Withdrawal of the faulty board restores the supply. The testing of individual boards is facilitated by the use of the extension board (Fig 8.2), which permits access to the components under operational conditions as shown in Fig 8.3. Note that the locator insert must be removed from the connector of a printed circuit board before the extension board can be inserted. The insert should be replaced subsequently, before the printed circuit board is reinserted normally in the connector.

Ensure that the correct mains tappings are connected for the supply in use; the positions of these tappings and the 5 volt supply fuse are shown in Fig 8.5.

Off-load power supply voltages

When checking power supply voltages, it should be noted that the off-load values of the unstabilised supplies differ considerably from the normal values obtained under load conditions; the table which follows is intended as a guide to the variations which can be expected:

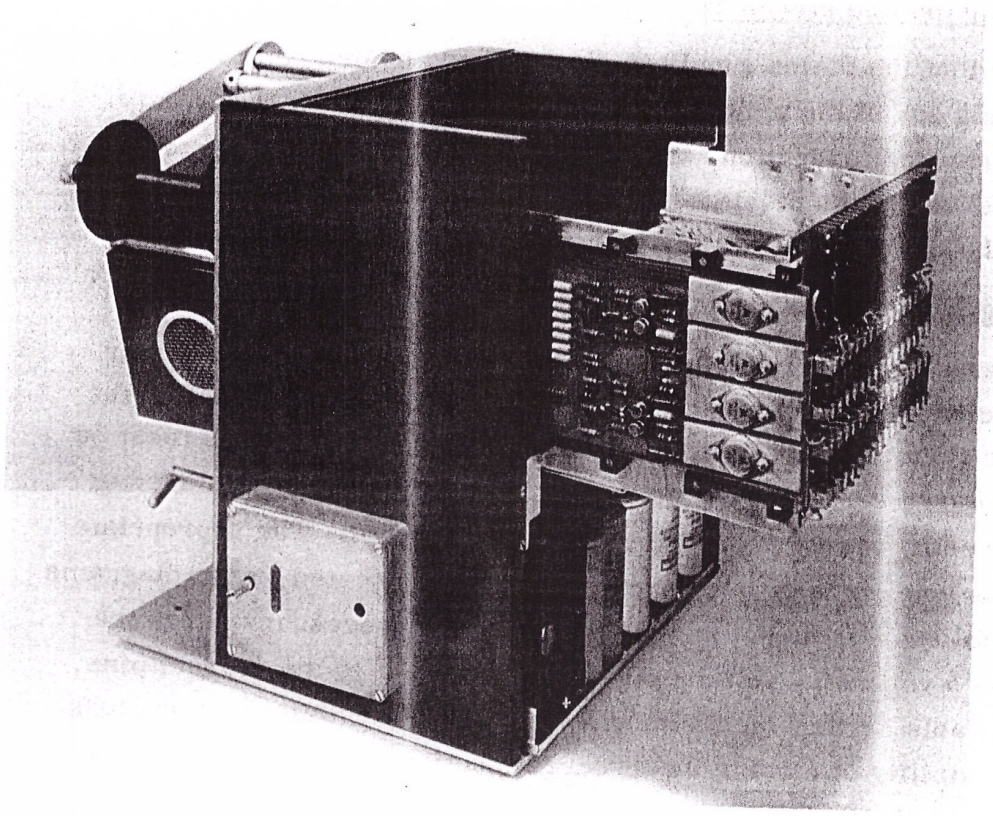


FIG 8.4 THE TEST UNIT IN POSITION

Supply on-load value	Off-load value
+35V	+41 to +42V
+42.5V	+47 to +48V
+18V (w.r.t. mains neutral)	+24 to +25V
-5.5V	-7.5 to -8V

All voltages measured with respect to the common 0V line unless otherwise stated.

Checking printed circuit boards

Ensure that the mains supply is disconnected before removing or replacing any of the printed circuit boards. In the event of faulty or intermittent operation, and prior to carrying out more extensive tests, examine the printed circuit board connectors. If necessary, clean the connectors with trichlorethylene.

Testing integrated circuits

In order to test the logic functions of an integrated circuit, it may first be removed from the printed circuit board as described in the earlier paragraphs of this section. The integrated circuits must be handled very carefully during testing. They are easily damaged or destroyed by excessive voltages or short circuits. The appropriate tests for each type of integrated circuit are indicated on the diagrams which follow (Fig 8.6). In all instances, it is necessary to ensure that the 5 volt and 0 volt supplies are connected to the correct pins, and suitable arrangements should be made for testing which exclude the possibility of making incorrect connections accidentally. In the diagrams, the test information is presented in the form of truth tables which indicate the relevant input and output conditions for each type of integrated circuit. Where a package contains a number of of independent circuits, only one is referred to in the truth table as an example; similar tests should be applied to each circuit in turn in order to ascertain whether the complete package is operating satisfactorily. The corresponding pin numbers for each circuit are shown on the diagrams. The semi-circular cut-outs indicate the relative positions of the pins.

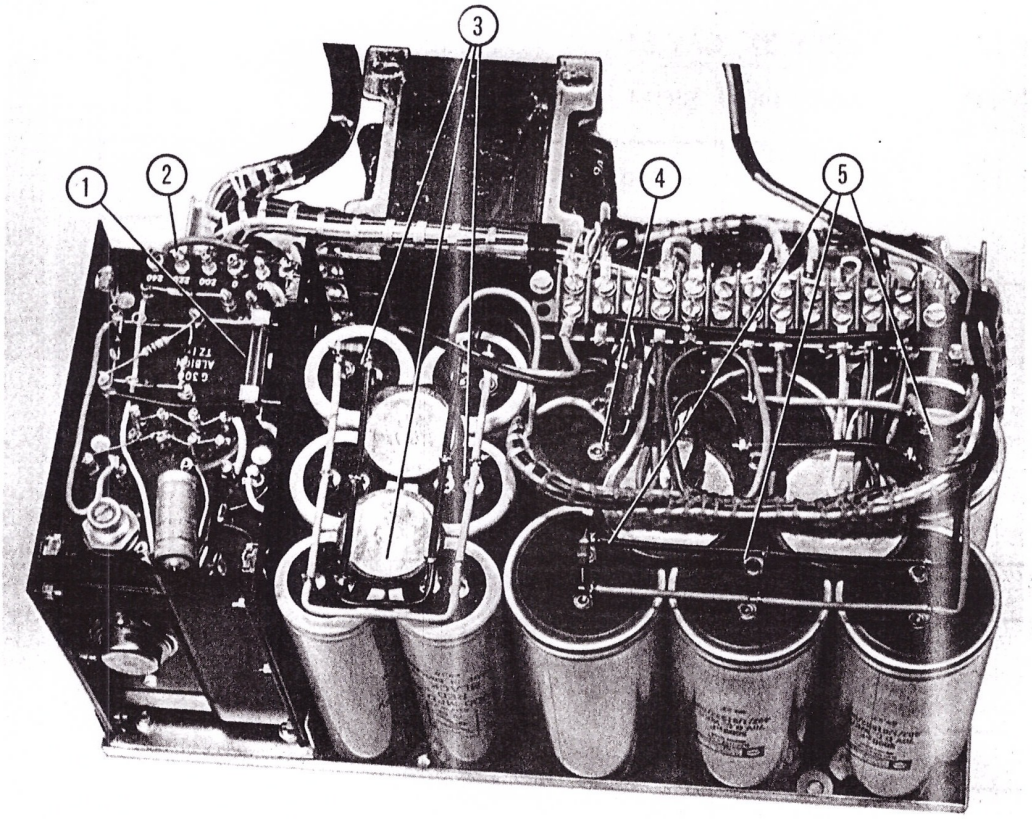
WARNING

The +5 or 0 volt supply must NOT be connected directly to any output.

Printed circuit board functions

P.C. Board	Functions
Function/Indicator Board , (Mfg No 54100)	The board accepts 'forward', 'backward', 'stop feed' and 'run-out' demands and produces appropriate signals for the motor drive board. Signals for 'no-tape' and 'tight tape' conditions are produced also.

Motor Drive Board (Mfg No 54183)	The board accepts signals from the function board and alarm circuits and produces discrete drive signals for the stepping motor.
Punch Amplifier Boards (Mfg No 54062)	Sixteen similar boards are used to produce outputs which drive the 31 channel punches. Inputs are taken from the data input connector and the alarm (inhibit) circuits.



1 Fuse (5-volt stabilised supply)

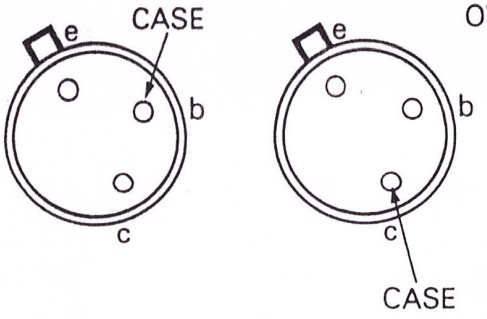
2 Mains input transformer tappings

3 Capacitor bank C7 - C12

4 Capacitor C1

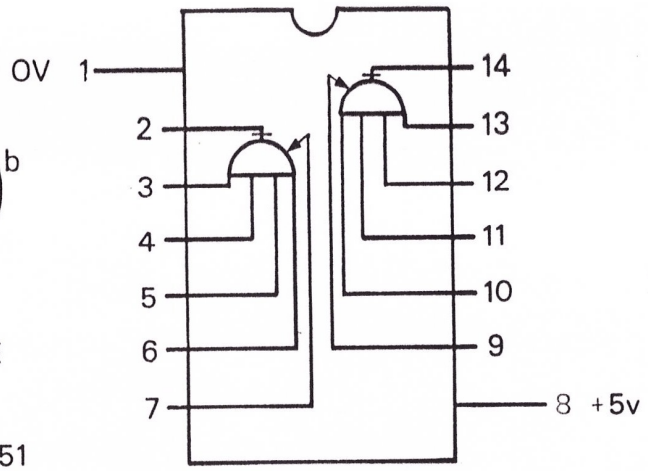
5 Capacitor C2 - C6

FIG 8.5 MAINS INPUT TAPPINGS AND FUSE (5-volt supply)



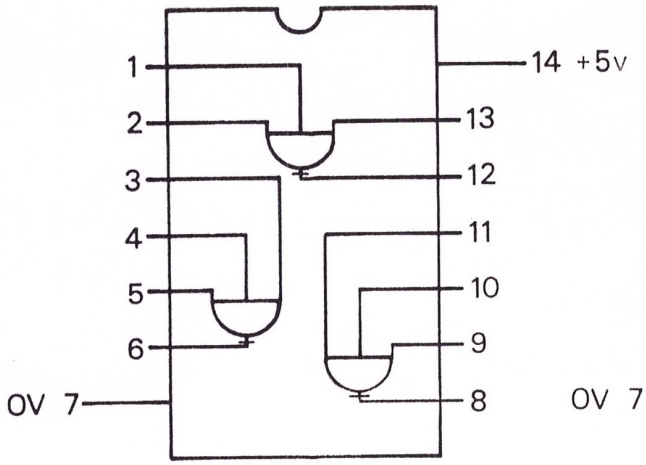
ACY 19 BFY 51, BFY 51

(VIEWED FROM CONNECTION SIDE)

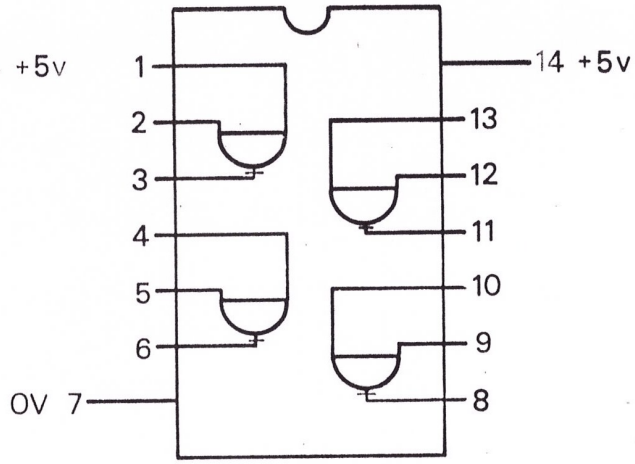


ST 659A

PIN	7	6	5	4	3	2
LOGIC	1	1	1	1	1	0
CONDITION	One or more inputs at 1					1



N 8879A



N 8889A

PIN	3	4	5	6
LOGIC	1	1	1	0
CONDITION	One or more inputs at 0			1

PIN	1	2	3
LOGIC	1	1	0
CONDITION	One or more inputs at 0		1

FIG. 8.6 SOLID STATE DEVICES, PIN CONNECTIONS AND LOGIC

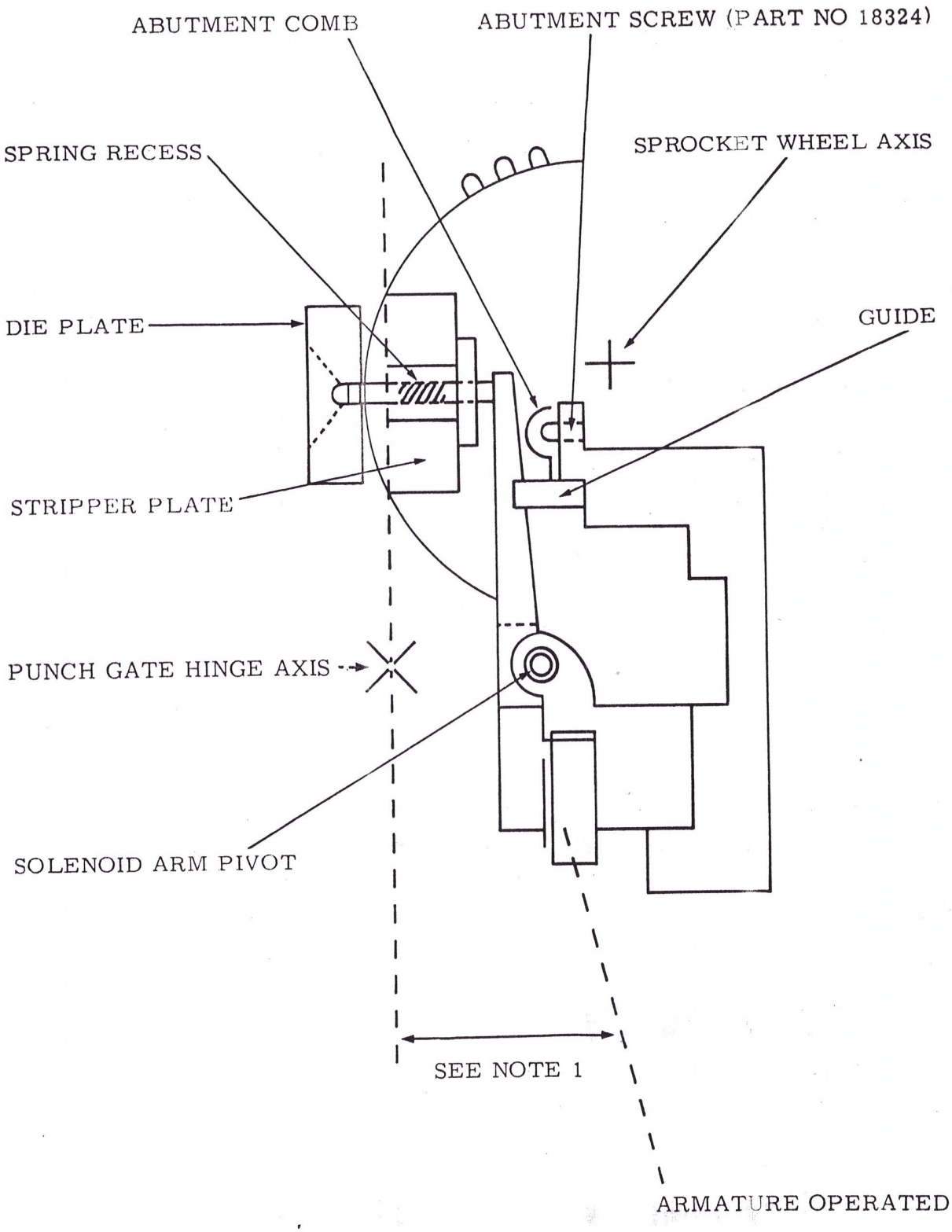


FIG 8.7 (a) PUNCH PIN AND SOLENOID ARM ASSEMBLY

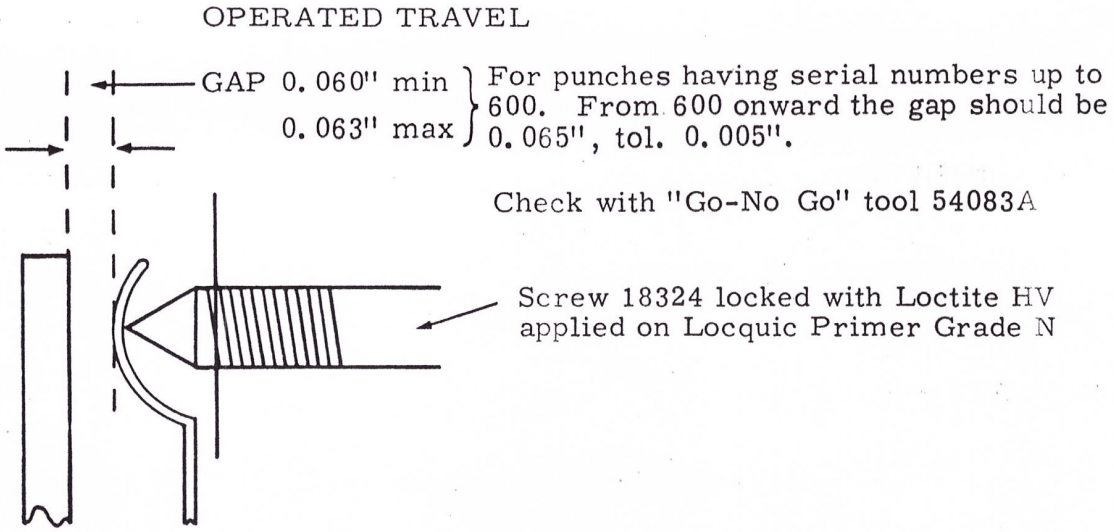


FIG 8.7(b) ABUTMENT COMB AND SCREW ADJUSTMENT

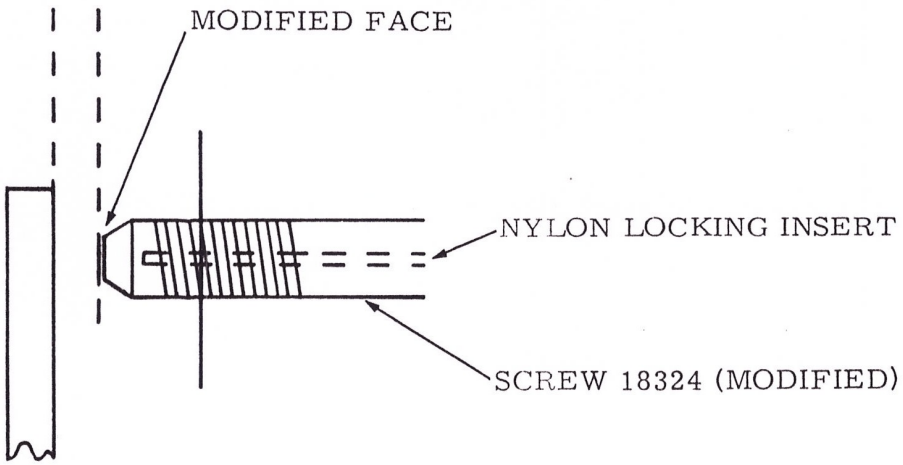


FIG 8.7(c) MODIFIED FACE AND SCREW ADJUSTMENT

FAULT FINDING CHART PART 1 MECHANICAL

NOTE: Whilst the information contained in this manual refers specifically to the Honeywell 31-channel punch, much of it is applicable also to the Harting model, the relevant differences being set out in Appendix 1. In the fault-finding charts which follow, the information is applicable to both types of punch excepting where otherwise noted.

Fault	Possible Mechanical Cause	Remedy
Sticking punch pins. Dragging punch pins. Partial perforation (ghosting)	Punch return spring recess not concentric with pin hole in guide plate or stripper plate	Change plate(s) - see Fig 8.7(a)
	Damaged stripper plate holes due to careless closure of punch gate	Clear obstruction using tool GTE 1112 or replace plate - see Fig 8.7(a)
	Worn or broken punch return spring Punch return spring too long or too short. Wrong punch pin (Harting pins are shorter). Blunt punch pin. Damaged punch pin. Broken Solenoid arm.	Replace - see Fig 8.7(a)
	Excessive dust and congealed lubricant. No lubrication. Wrong lubricant	Clean Lubricate correctly
	Poor quality paper. Lumps or joints in paper	Replace paper Check batch quality
	Plate which carries punch gate hinges bowed outwards effectively increasing dimension, (see note 1 Fig 8.6)	Replace - see Fig 8.7(a)
	Punchings receptacle needs emptying	Empty regularly (see Routine Maintenance)

Fault	Possible Mechanical Cause	Remedy
	Punch gate latch loose or incorrectly adjusted	Adjust
	Misalignment of solenoid levers and punch pins	Adjust solenoid block position for optimum alignment
	(Honeywell) Misalignment of solenoid levers and punch pins	Levers may be set slightly between tufnol guide and pin - see Fig 8.7(a)
	(Harting) Misalignment of solenoid levers and punch pins	Slight repositioning of solenoids may achieve better alignment - see Figs 8.7 (a), (b) and (c). Assembly dwg No 54900
	(Honeywell) Solenoid lever binding on tufnol guide	Reset lever - see Fig 8.7(a)
	(Honeywell) Lever pivot worn and locking NOTE: Replacement punch solenoids being currently supplied may have levers which are wider than those of solenoids removed as faulty. When fitting such replacement solenoids it is necessary to increase the width of the slots in the tufnol guides into which the solenoid arms locate. Care should be taken to ensure that the slots are widened symmetrically with respect to the slot centre, in order to provide clearances which are consistent with existing slots	Replace solenoid

Fault	Possible Mechanical Cause	Remedy
	(Harting) Solenoid lever or linkage freedom impaired	Adjust solenoid positions for best result - see Figs 8.7 (a), (b) and (c) Assembly dwg No 54900
	(Harting) Rear solenoid pivot pin missing	Replace solenoid block with modified version. Advise The Monotype Corporation Ltd, Salfords, Redhill, Surrey, England
	(Honeywell) Abutment screw adjustment incorrect. Broken abutment comb (if fitted)	Adjust residual screw position for abutment gap of 0.060" to 0.063" use tool 54083A. If abutment comb broken or worn: Replace all abutment screws with 18324 (modified) and do not replace abutment comb- see Fig 8.7(a), (b) and (c)
	(Honeywell) Loose solenoid coil impeding armature action	Secure coil with adhesive or replace solenoid - see Fig 8.7(a)
	Loose solenoid	Tighten screws and check alignment
No paper feed variable pitch feed	Loose or damaged flexible coupling between stop motor and sprocket shafts	Tighten screws onto shaft flats. Replace coupling (Compress coupling .015")

Fault	Possible Mechanical Cause	Remedy
	Insufficient engagement between paper and sprocket wheel	Check for bowed punch gate mounting plate. Replace if necessary. Check punch gate latch
	Solenoid blocks incorrectly positioned impeding rotation of sprocket wheel	Adjust solenoid block position, but check lever/pin alignment
	Faulty stepping motor	Check for rotor binding on stator when hot by carefully rotating by hand with power off. Replace motor if necessary
	Loose stepping motor	Tighten motor securing screws but check perforation/sprocket hole alignment
	Faulty pivots on paper sensing arms causing variable tension on paper entering punch gate	Check pivots for wear. Lubricate pivots. Replace if necessary
	Insufficient supply of paper to sprocket wheel	See following notes on paper reel-out problems
	Sprocket hole pitching in paper varying. Lumps or joints in paper	Check paper for quality
Perforations consistently out of alignment with sprocket holes	Paper not aligned on sprocket wheel when first fed through punch gate or due to the effect of dragging punch pins Insufficient engagement of paper with sprocket wheel	Align paper correctly. If misalignment occurs after a period of running, check direction of misalignment as a guide to faulty punch pin. Check paper/sprocket engagement as described above

Fault	Possible Mechanical Cause	Remedy
	Incorrect sprocket holes in paper	Use correct paper
	Sprocket hole pitching in paper varying. Lumps or joint in paper	Check paper batch for quality
	Punch gate alignment incorrect	Re-align. Note; when removing punch gate always mark position of hinge block for correct re-assembly
Insufficient paper supply from paper roll	Reel-out capstan system slipping and supplying insufficient paper	Clean capstan roller bearings. Check loading roller for free fall on to rubber roller. Lightly lubricate loading roller slots and rubber roller bearings. KEEP OIL OFF RUBBER ROLLER Clean rubber roller with methylated spirit
	Paper roll jamming on spindle	Check for damaged spools. Adjust stop collar for slight roll retardation
	Worn drive motor or gearbox. Insufficient lubrication in gearbox leading to excessive noise	Change motor and/or gearbox. Lubricate gears with high melting point grease and bearings with light oil
Continuous or irregular paper reel-out	Lower paper sensing arm not moving freely	Check arm pivots for wear or tightness. Very sparingly lubricate pivots with light oil. Check for arm rubbing on main plate in elongated slot. Check spring
	Lever spring damaged	

Fault	Possible Mechanical Cause	Remedy
Irregular or no paper wind-up	Upper paper sensing arm not moving freely Lever spring damaged	Check for pivot wear, tightness, interference with side plate slot etc, as for lower arm. Check spring
	Gearbox motor rotor jamming. Gearbox worn or needs lubricating	Change motor and/ or gearbox Lubricate gears with molybdenum grease and bearings with light oil
	Paper tensioning system over-adjusted, thus over-loading wind-up motor and possibly tearing paper	Readjust by rotating clockwise
	Flanged take-up spool not engaging drive spigot	Check for damaged or incorrectly inserted spool. Check release catch for correct operation
Wind-up roll irregularities Too tight Too loose Edges tearing against metal spool flanges	Damaged or bent flanges on wind-up spool	Replace
	Loose spring loaded plunger pivot for wind-up spool	Replace complete end plate carrying plunger

Fault	Possible Mechanical Cause	Remedy
	Paper tension too tight or too loose	Adjust tension device for best result. Check all guides for parallelism and positions of guide collars for best guidance Note:- the loose bail roller held by the large diameter collars need not be parallel with other fixed guide spindles, but may be adjusted for best wind-up results. The paper must run in the large roller recess. Aim to obtain equal tension on both edges of the paper between the tension device and the driven wind-up spool

FAULT FINDING CHART PART 2 ELECTRONIC

Fault	Possible Electronic Fault	Remedy
Sticking punch pins. Dragging punch pins	Faulty punch amplifiers:- e.g. transistor MP161213 short circuited transistor MFY51 short circuited	Replace circuit board D.C. test and replace if necessary Note:- Failure of transistor will normally cause failure of punch solenoid protection fuse, but transistors with high leakage current may induce prolonged operation of solenoid, leading to pin drag etc. Without initial fuse failure. Note that failure of either BFY51 will cause the fuse to fail but will also cause the high power base resistor for the MP1612B (or A) to become overheated, leading to burning of the circuit board. (see appropiate Punch Amplifier Circuit Diagrams)
	e.g. dry soldered connection	Inspect and resolder
	e.g. dirty edge connections	Clean with suitable solvent or contact cleaner

Fault	Possible Electronic Fault	Remedy
	Failure of punch amp bias supply (Honeywell +42.5V, Harting +32V)	Symptoms similar to high transistor leakage current fault. Check power pack and connections to circuit board
	(Harting) Incorrect paper feed signal delay	Change or check logic of Function Indicator circuit board. Forward paper feed signal delay should be 1.5 - 2.5mS for correctly adjusted punch solenoid system
	Fault in paper feed system	See notes on paper feed faults (see Pt 1 of Fault Finding Chart)
No perforation Partial perforation	Punch protection fuse failure	Replace <u>once</u> with correct fuse but check for fault if fuse fails again DO NOT FEED WITH FUSES primarily, check punch amplifier, short circuit solenoid coil, incorrect data signal conditions such as continuous d.c. level from perforator or tape converter
	Protection fuse loose in its clip holder Open circuit solenoid	Carefully reset clip springs or replace complete holder. Check solenoid resistance

Fault	Possible Electronic Fault	Remedy
	General wiring fault	Check wiring continuity using an ohmeter with reference to circuit diagrams. On data signalling wiring check contacts in data connector and soldered connections on edge connectors. On solenoid power wiring check soldered joints on fuse clip, edge connector, solenoid connector tag block and Harting solenoids. Also check solenoid for intermittent open circuit where lead wires enter encapsulation
	Faulty punch amplifier	Replace or check as above for dry soldered connections, dirty edge connections etc. (see above)
	Incorrect data signal	Check for correct data input signal:- Honeywell 3mS Harting 6mS Amplitude +2.8V to +5V = Active, with or without punch connected

Fault	Possible Electronic Fault	Remedy
	Punch power supply failure +35V Honeywell 7Amp +25V Harting 10Amp (per solenoid)	Check power pack for wiring faults, failed components etc. Check operation of punch with simulator to load power pack
	Mains supply voltage regulation poor or incompatible with mains selector setting in punch. This may cause marginal mechanical or electronic faults to become effective	Check mains regulation for long term variation. Check for nearby equipment (welding gear for example, which may produce very temporary reduction in mains voltage effecting one or two frames of punching). Check mains selection tappings on power supply transformers
	Punch inhibit system fault	Check for correct logical condition on punch inhibit data connection. Change or check Function Indicator Logic
No paper feed. Irregular paper feed. Alignment between sprocket holes and perforation varying irregularly, particularly on repetitive automatic perforation (e.g. Electronic Perforator line fill or Tape Converter drive)	Stepping motor power supply failure	Check power supply and all connections to motor
	Failure of paper feed signals	Check signals from associated equipment (same as punch data signals). Check manual feed switch signals. Check manual feed switches

Fault	Possible Electronic Fault	Remedy
Continuous paper feed when punch switched on	Failure of 5V power supply	Monitor 5V supply while removing Function Indicator, Motor Drive circuit boards and data input connector. If 5V appears check for short circuit on relevant board or connector. If 5V does not appear check wiring for short circuit. Lastly check power supply for fault (especially zeners)
	Failure of motor drive of Function Indicator circuit board	Change circuit board or check logic. Use manual feed switches to check successive switching of motor coils. If only one stepping direction is affected suspect Function Indicator circuit board or relevant direction manual feed switch, or connections
	Mains supply voltage regulation poor or incompatible with mains supply selector setting in punch	Check as for Perforation faults. Note that severe mains-borne electrical interference may affect paper feed

Fault	Possible Electronic Fault	Remedy
		Check for external local sources of interference. Also check paper wind-up and reel-out motor switching systems (actuated by paper sensing arms). Faulty suppression components or poor micro-switch contacts. Avoid sensing arm flutter by optimum adjustment of associated microswitches particularly on reel-out arm
	Stepping motor faulty	Check coil continuities
Alignment of sprocket holes and perforations incorrect but error constant	Paper incorrectly fed onto sprocket wheel	Load paper correctly
	Misalignment occurs after a period of running	Suspect sticking punch. Examine perforated paper for punch drag effects, lumps or joints in paper. (see electronic and mechanical punch faults)
Paper reel-out or wind-up system fault (Both systems are identical electrically except for switching sense)	Failure of motor drive gearbox. D.C. braking not effective	Motor winding failure. Check solder joints and screw terminal connections

Fault	Possible Electronic Fault	Remedy
	Reel-out or wind-up failure. D.C. braking effective	Failure in mains supply circuit to gear-box motor. Check suppression components connections and mains/ d.c. micro-switch
	Motor drives gearbox but overruns when switched off (i.e. No braking)	Failure of +24V braking supply. Check power supply, relevant connections, components and mains/d.c. microswitch
Failure of tight tape indicator. No lamp or lamp illuminated continuously	Faulty or wrongly adjusted microswitch. Faulty Function/ Indicator circuit board. Lamp failed. Faulty lamp holder	Check micro-switch for continuity and correct position. Replace or check Function Indicator circuit board. Replace lamp check holder

9 RECOMMENDED SPARES LIST

It is recommended that the following spares should be kept available for routine replacements:-

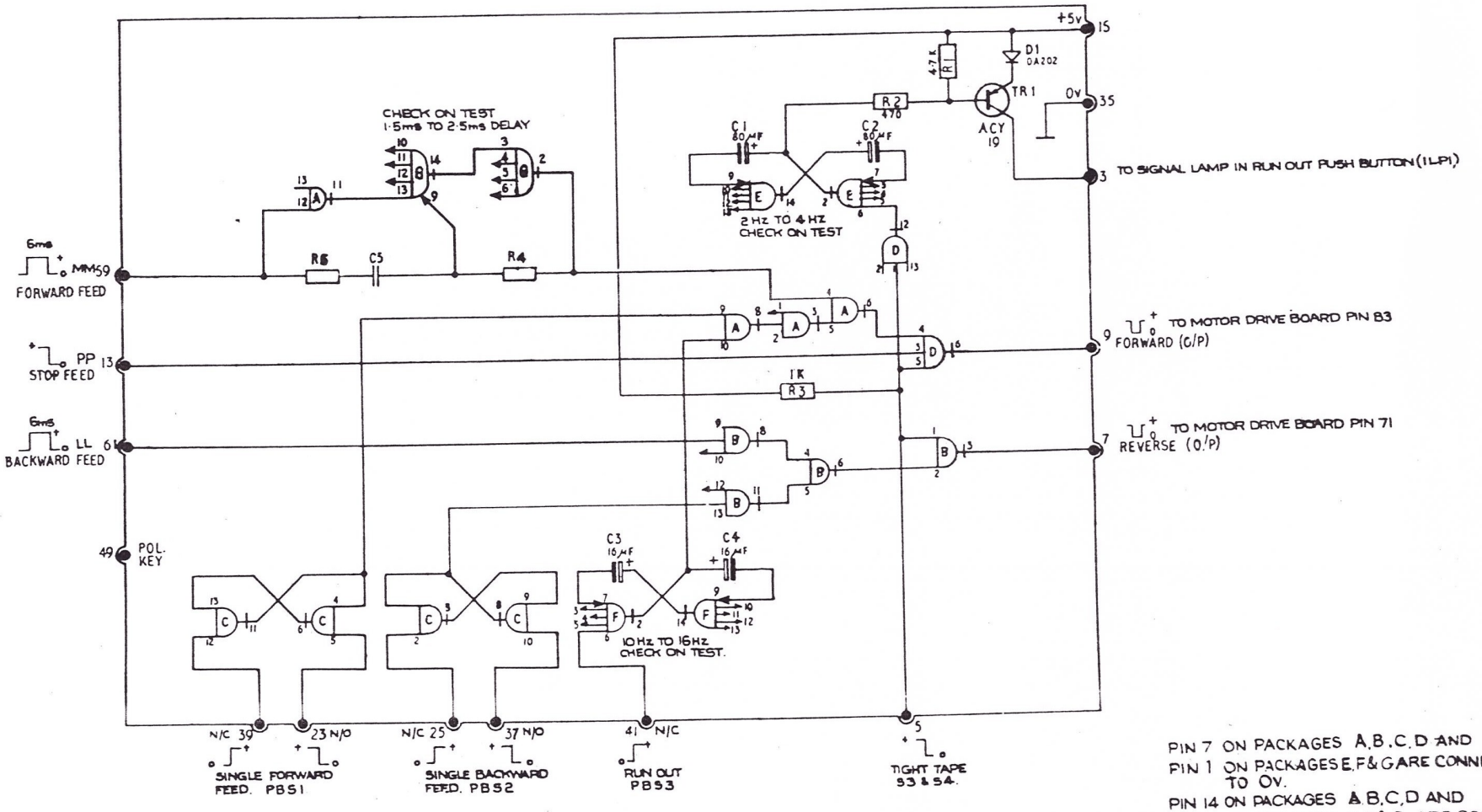
	Description	Manufacturing Number	Quantity
Honeywell Punch			
	Lamps, 12V	54288	2
	Fuses, anti-surge, 1A	54240	6
	Punch pins	54109	6
	Punch springs	54108	6
	Punch amplifier board	65062-2	1
	Solenoids, straight	55416	2
	solenoids, cranked	55417	2
Harting Punch			
	Lamps, 12V	54288	2
	Fuses, anti-surge, 1.5A	54902	6
	Punch pins	54873	6
	Punch springs	54872	6
	Punch amplifier board	55019-2	1
	Solenoids, front	54763	2
	Solenoids, rear	54762	2

In addition to the above, it is recommended that the following spares should be available for technical servicing and replacement:-

	Description	Manufacturing Number	Quantity
Honeywell Punch			
	Function/Indicator board	54110-1	1
	Motor drive board	54183-2	1
	5V Power supply unit	54208	1

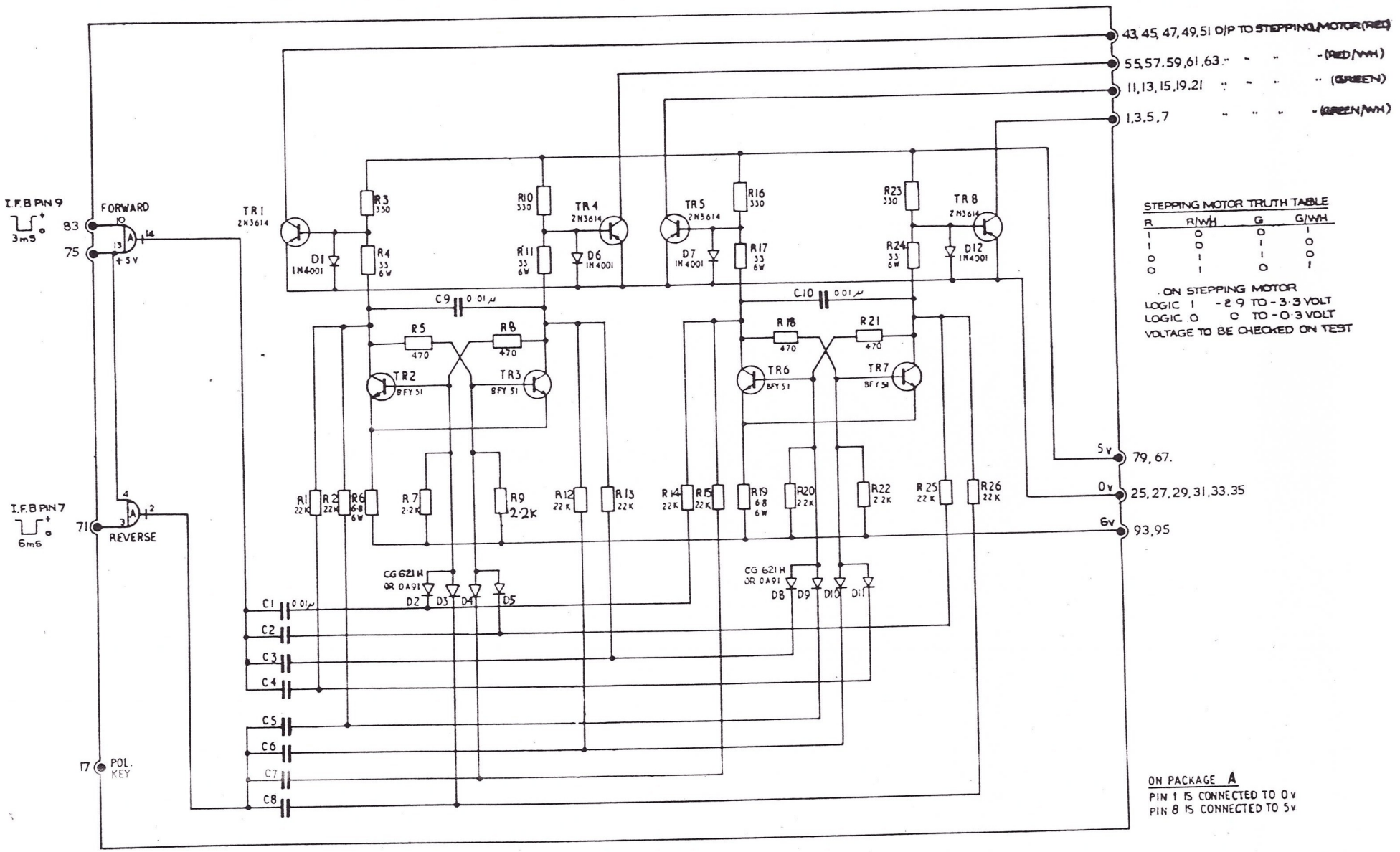
	Description	Manufacturing Number	Quantity
	Integrated circuit type ST659	54234	2
	Integrated circuit type FJH131,7400 or N8889A	54588	2
	Integrated circuit types FJH121, 7410 or N8879A	54589	2
	Transistor type MP1612B	54096	6
	Transistor type BFY51	54193	6
	Transistor type ACY19	54250	2
	Microswitches	36870	2
	Posidriv screws	54194	6
Harting Punch			
	Function/Indicator board	55067-2	1
	Motor drive board	55020-2	1
Additional items for punches fitted with Fuse Failure alarm			
	Relay	55509	1
	Diodes OA202	33622	2
	Transistor BSW66	37181	1

MFG.No. 55067-1



PIN 7 ON PACKAGES A,B,C,D AND
PIN 1 ON PACKAGES E,F & G ARE CONNECTED TO 0V.
PIN 14 ON PACKAGES A,B,C,D AND
PIN 8 ON PACKAGES E,F & G. ARE CONNECTED TO +5 VOLTS.

FIG 8.8



STEPPING MOTOR TRUTH TABLE

R	R/WH	G	G/WH
1	0	0	1
1	0	1	0
0	1	1	0
0	1	0	1

ON STEPPING MOTOR
LOGIC 1 -2·9 TO -3·3 VOLT
LOGIC 0 0 TO -0·3 VOLT
VOLTAGE TO BE CHECKED ON TEST

ON PACKAGE A
PIN 1 IS CONNECTED TO 0v
PIN 8 IS CONNECTED TO 5v

FIG 8.9

MFG. No. 54062-1

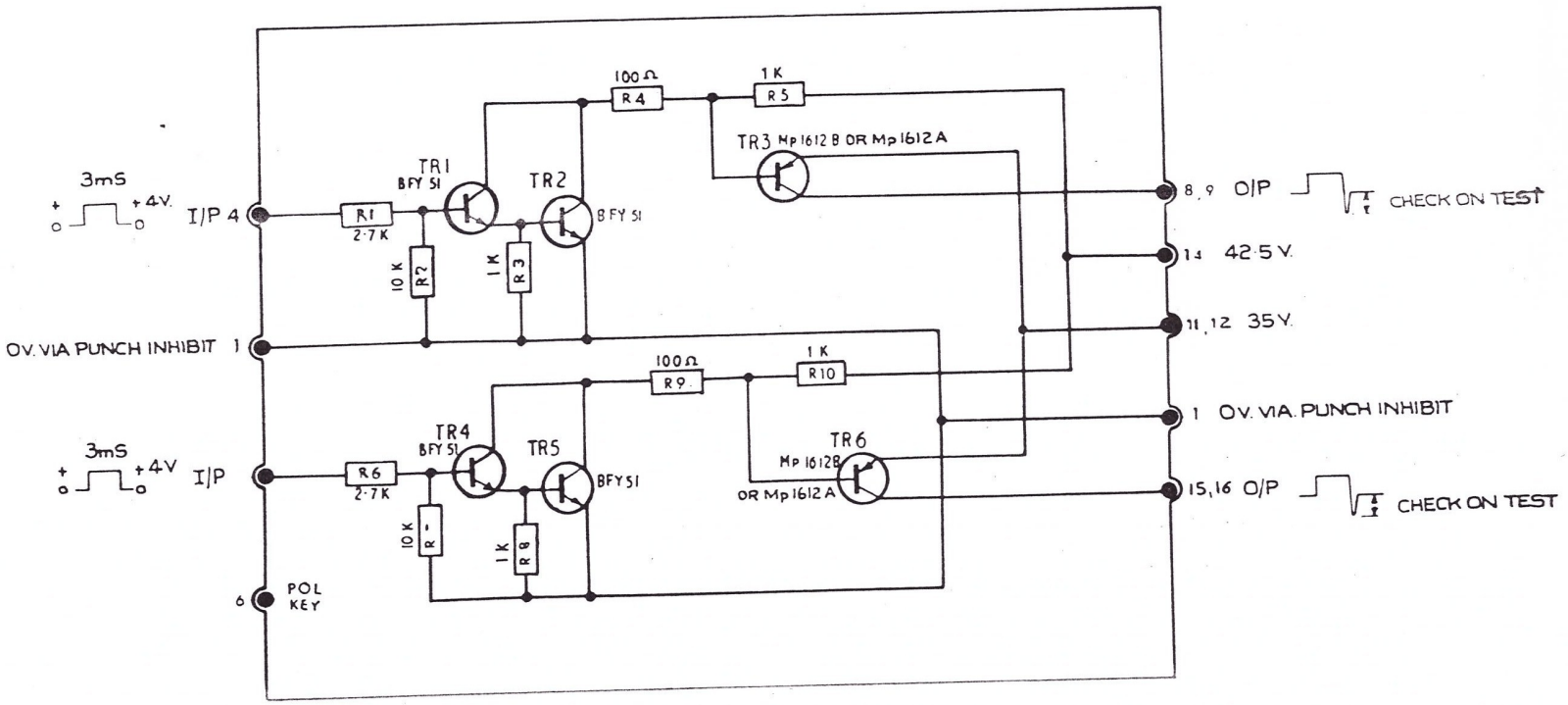


FIG 8.10

MFG. No. 54005

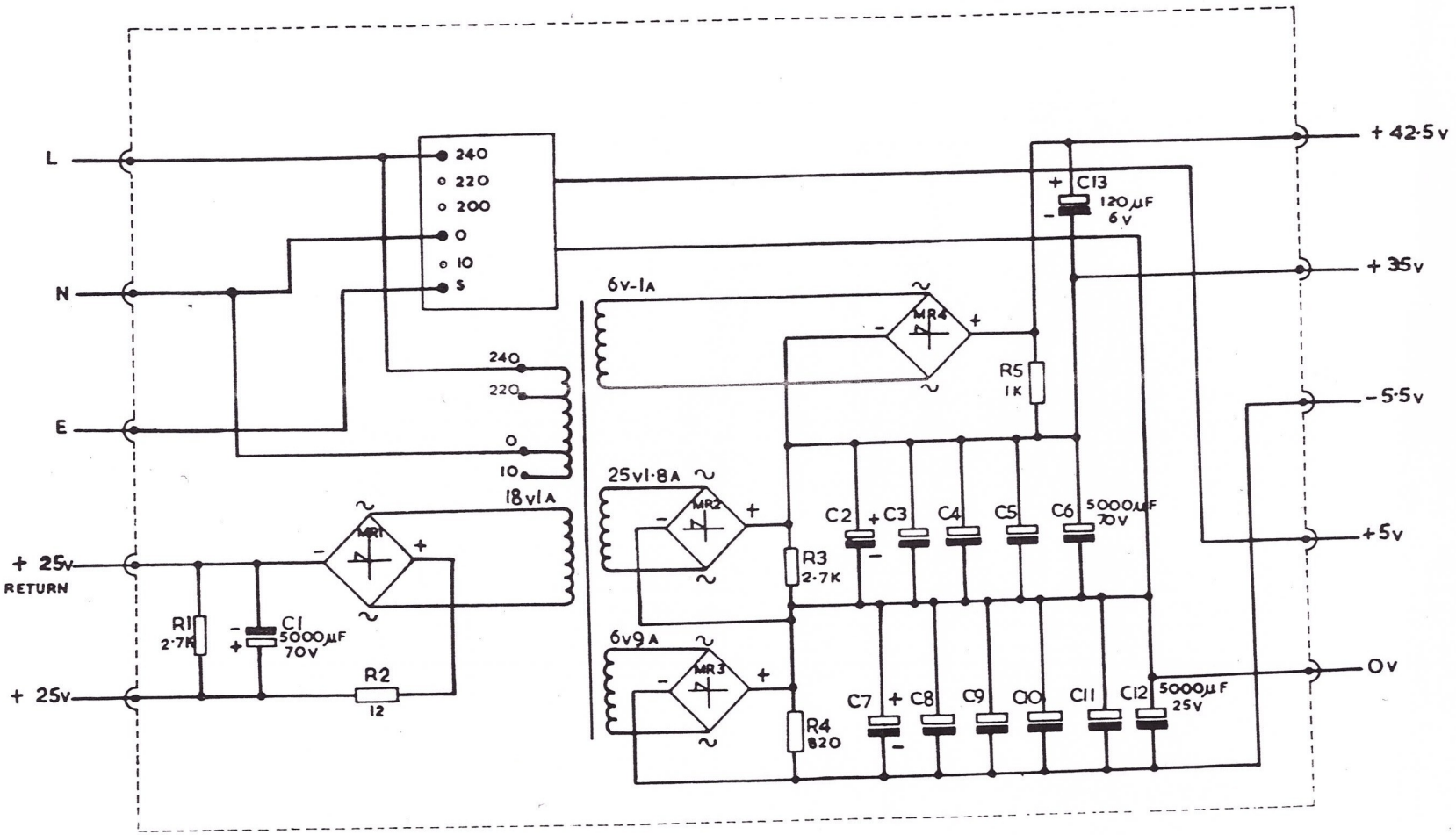


FIG **8.11**

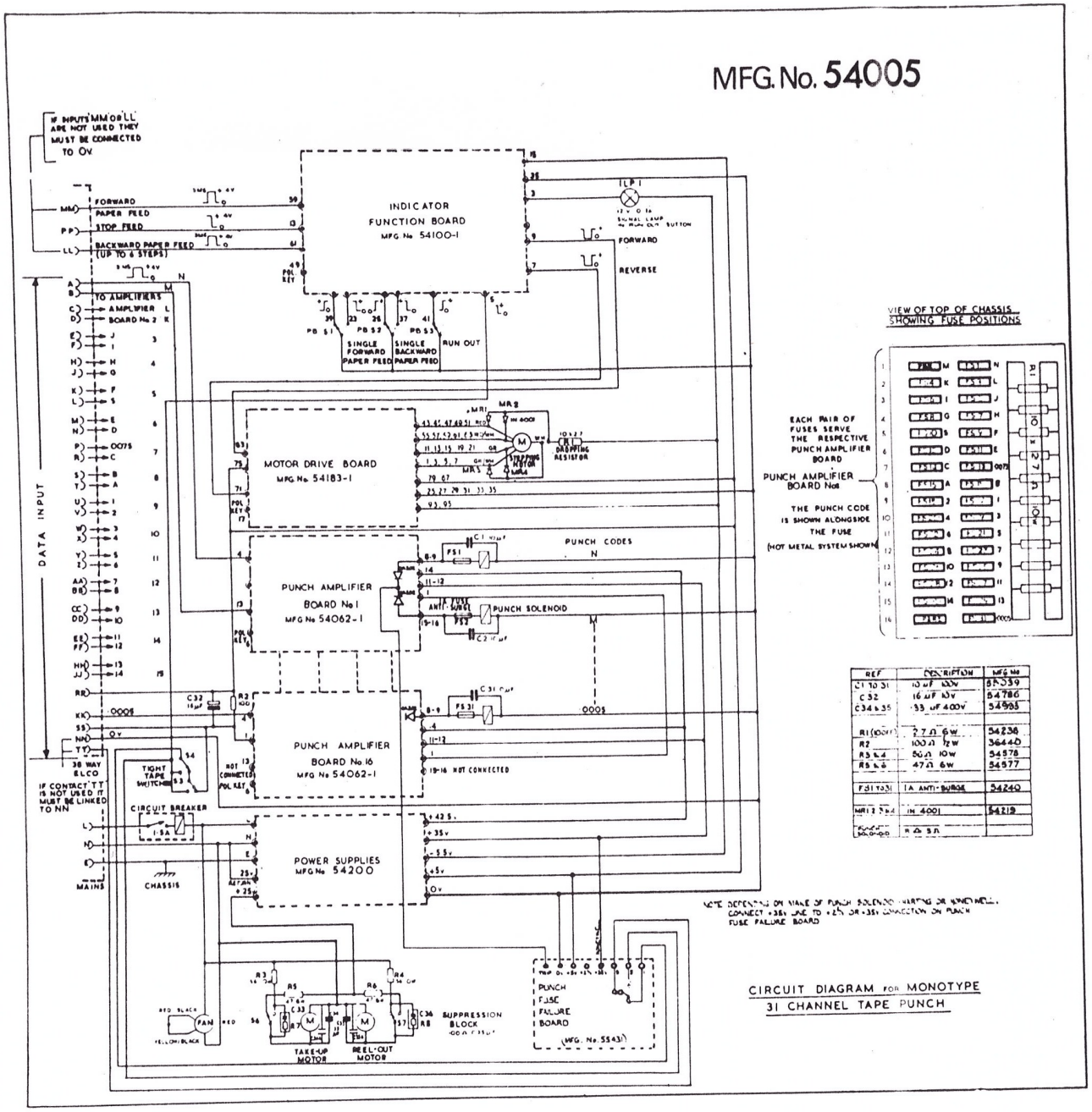

MFG. No. 54005
INDICATOR FUNCTION BOARD MFG No 54100-1
MOTOR DRIVE BOARD MFG No. 54183-1
PUNCH AMPLIFIER BOARD No 1 MFG No 54062-1
PUNCH AMPLIFIER BOARD No 16 MFG No 54062-1
POWER SUPPLIES MFG No 54200
PUNCH FUSE FAILURE BOARD (MFG. No 5543)
SUPPRESSION BLOCK
TAKE-UP MOTOR
REEL-OUT MOTOR
DATA INPUT
FORWARD
REVERSE
PAPER FEED
STOP FEED
BACKWARD PAPER FEED (UP TO 6 STEPS)
SINGLE FORWARD PAPER FEED
SINGLE BACKWARD PAPER FEED
RUN OUT
PUNCH CODES
PUNCH SOLENOID
TIGHT TAPE SWITCH
CIRCUIT BREAKER
MAINS
CHASSIS
VIEW OF TOP OF CHASSIS SHOWING FUSE POSITIONS
EACH PAIR OF FUSES SERVE THE RESPECTIVE PUNCH AMPLIFIER BOARD
PUNCH AMPLIFIER BOARD Nos
THE PUNCH CODE IS SHOWN ALONGSIDE THE FUSE
(NOT METAL SYSTEM SHOWN)
CIRCUIT DIAGRAM FOR MONOTYPE 31 CHANNEL TAPE PUNCH

FIG 8.12

APPENDIX 1 - HARTING PUNCH

The Harting punch incorporates certain modifications in that it has a non-adjustable solenoid assembly, having a maximum punching speed of 18 frames per second and requires certain differences in its electronic circuits. Notably, these differences involve a data input signal duration of 6 milli-seconds (in place of the 3 milli-second signal required for the Honeywell punch); the rear edge of the punch feed signal is delayed with respect to the rear edge of the punch code signal, and different power supply voltages are necessary.

The appropriate circuit and mechanical diagrams, together with an overall circuit diagram are to be found in this section and are listed below:

Title	Mfg No	Dwg No
Solenoid Plate Assembly	54900 shts 19/20	XA 3333/4
Punch Amplifier Board Circuit Diagram	55019-1 sht 2	XA 128/15 (rev)
Motor Drive Board Circuit Diagram	55020-1 sht 2	XA 128/14 (rev)
Power supply, Circuit Diagram	54860 sht 4	XA 128/12
Overall Circuit Diagram	54900 sht 3	XA 128/13 (rev)

MFG. No. 55019-1

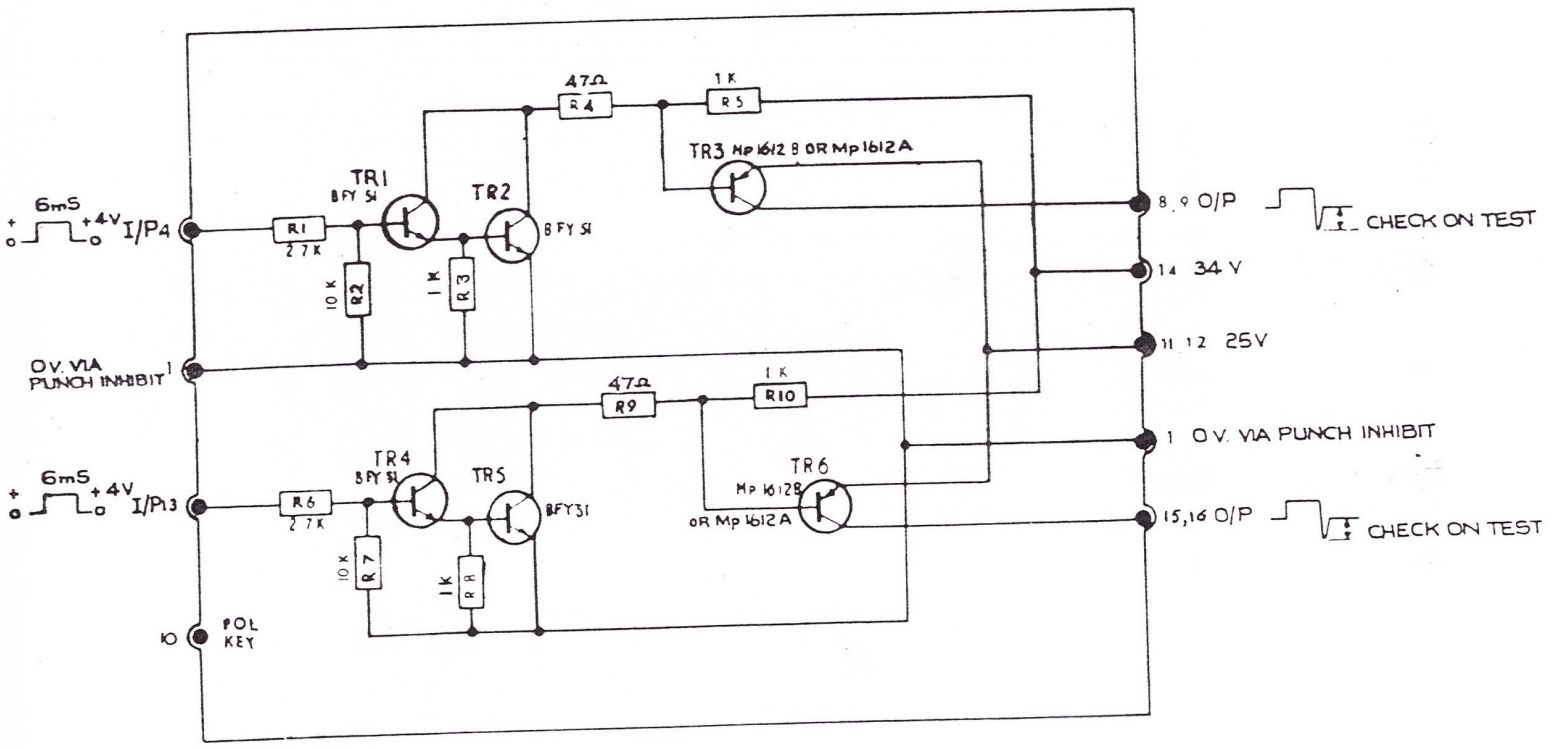
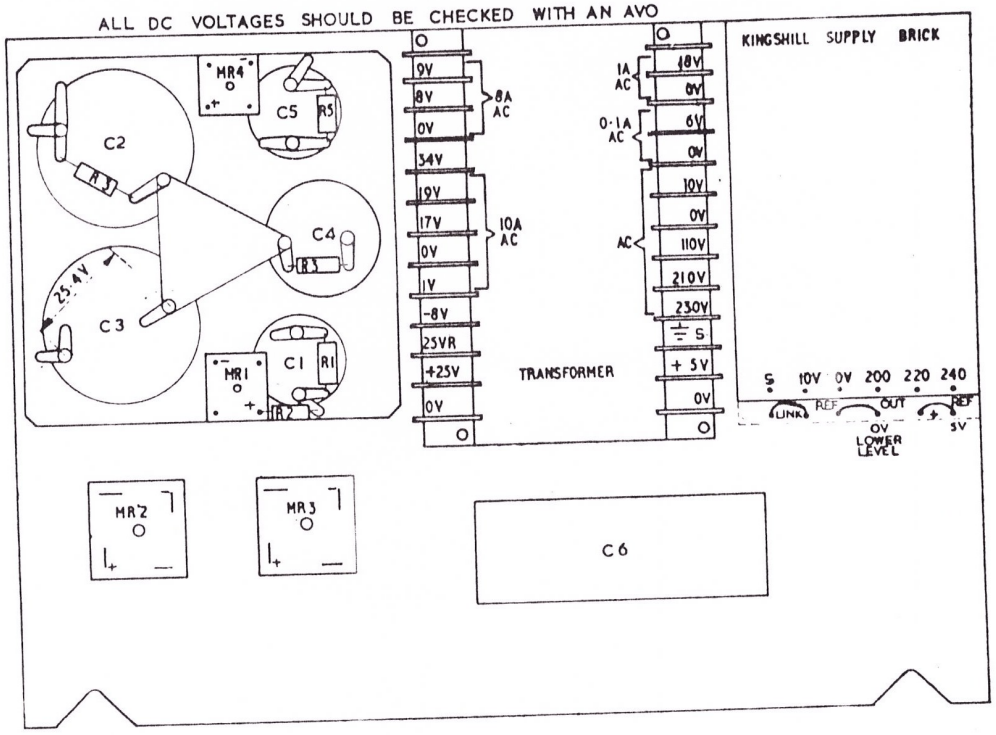


FIG A1/2

NOTE 1:- CONNECT TO 17V TAPPING CHECK IF PUNCHES FUNCTION AT 230V AND 1mSEC PULSE WIDTH RECONNECT TO 19V TAPPING IF UNSATISFACTORY

NOTE :- ALL VOLTAGE VALUES INDICATED TO BE MEASURED AT 240 VOLTS AND MEASURE ON THE TERMINAL STRIP.
ALL D.C. & A.C. VOLTAGES MEASURED WITH VOLTMETER 20KΩ/V.

CIRCUIT REF	MFG No.	DESCRIPTION	QTY
C1	54898	6800 MFD, 40V TYPE 106 17682 (MULLARD)	1
C2 & C3	54895	33000 MFD, 40V TYPE 106 17333 (MULLARD)	2
C4	54896	47000 MFD, 10V TYPE 106 14473 (MULLARD)	1
C5	54897	22000 MFD, 10V TYPE 106 14223 (MULLARD)	1
C6	54893	1MFD ±20% 400V	1
MR1 & MR4	54433	TYPE IB10J60 (TEXAS)	2
MR2 & MR3	54891	MINIBRIDGE TYPE PB10 (WALMORE)	2
R1 & R3	54559	2·7K 1/2W (RADIO SPARES)	2
R2	54561	12Ω 1/2 W	1
R4	54899	680Ω 1/2 W (RADIO SPARES)	1
R5	54195	1KΩ 1/2 W (RADIO SPARES)	1
	54889	TRANSFORMER	1
	54208	KINGSHILL SUPPLY BRICK 5151, PRESET TO 5V	1



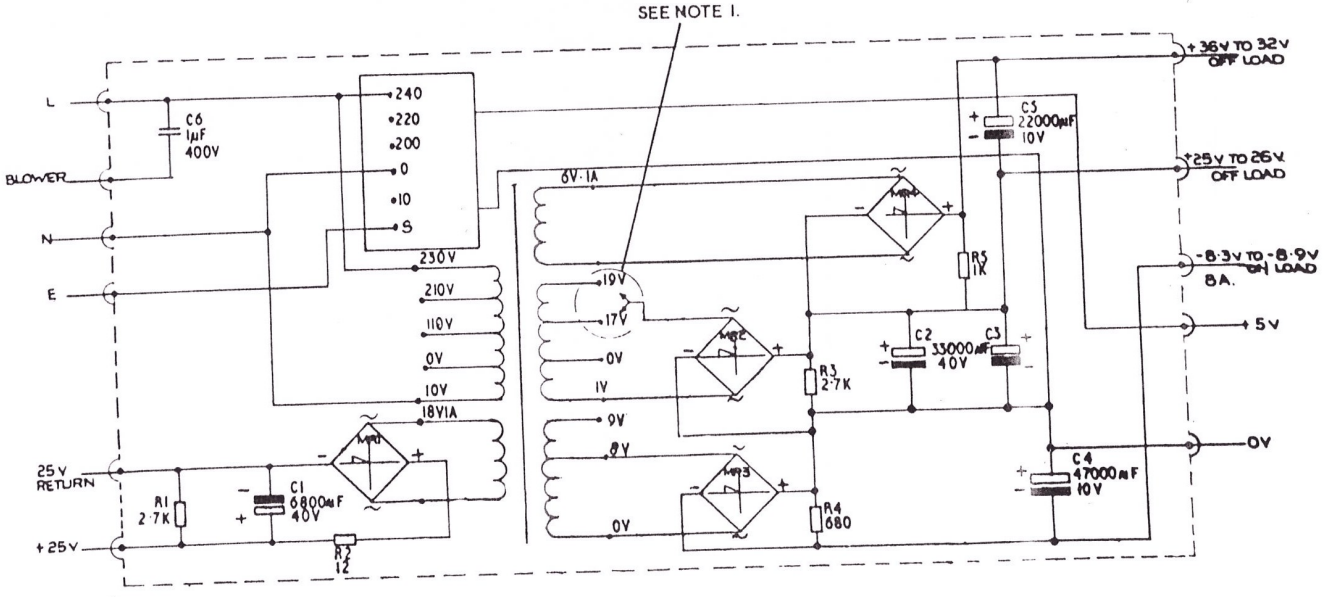
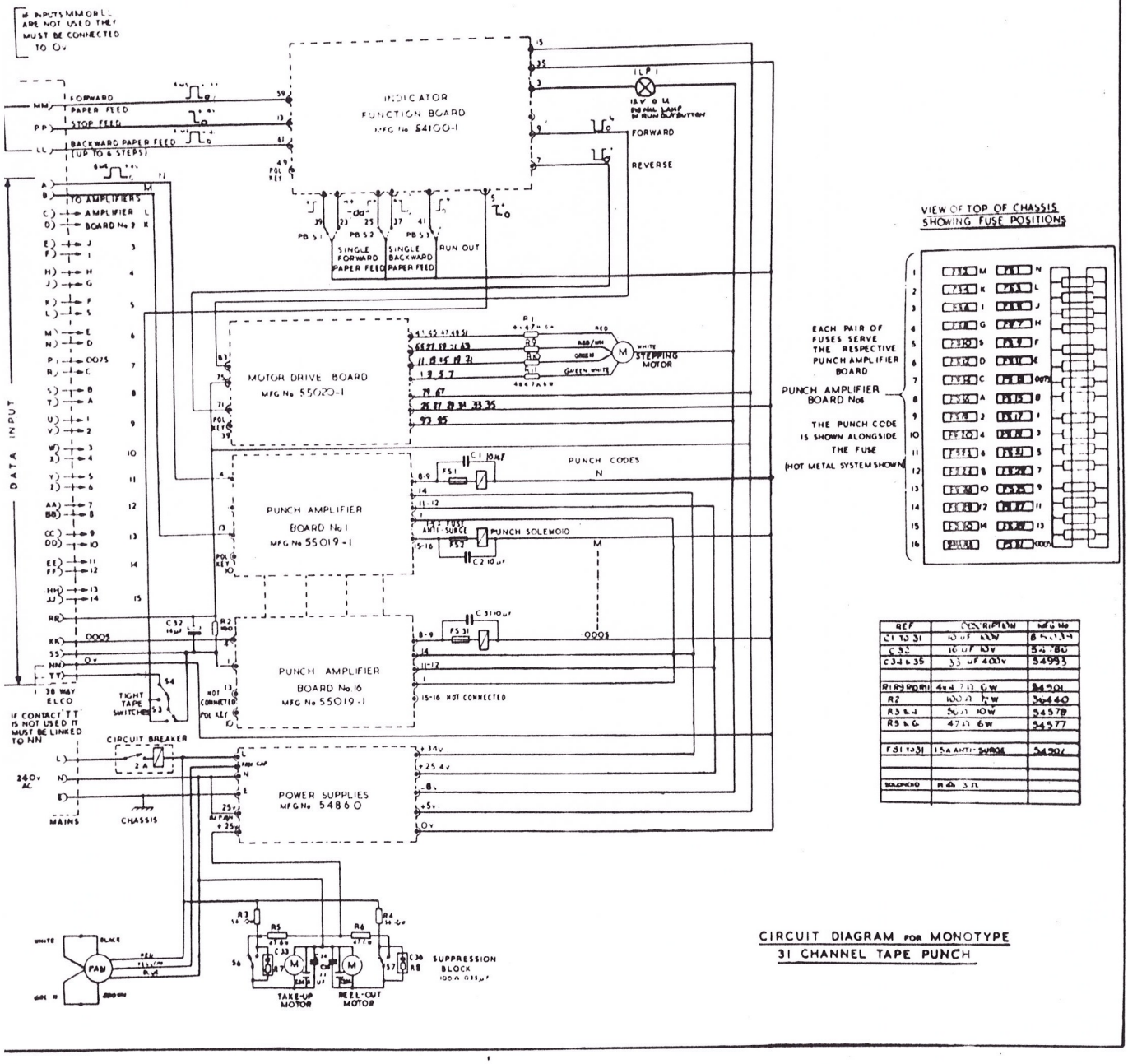


FIG A 1/3

MFG No. 54900



VIEW OF TOP OF CHASSIS SHOWING FUSE POSITIONS

EACH PAIR OF FUSES SERVE THE RESPECTIVE PUNCH AMPLIFIER BOARD

PUNCH AMPLIFIER BOARD Nos

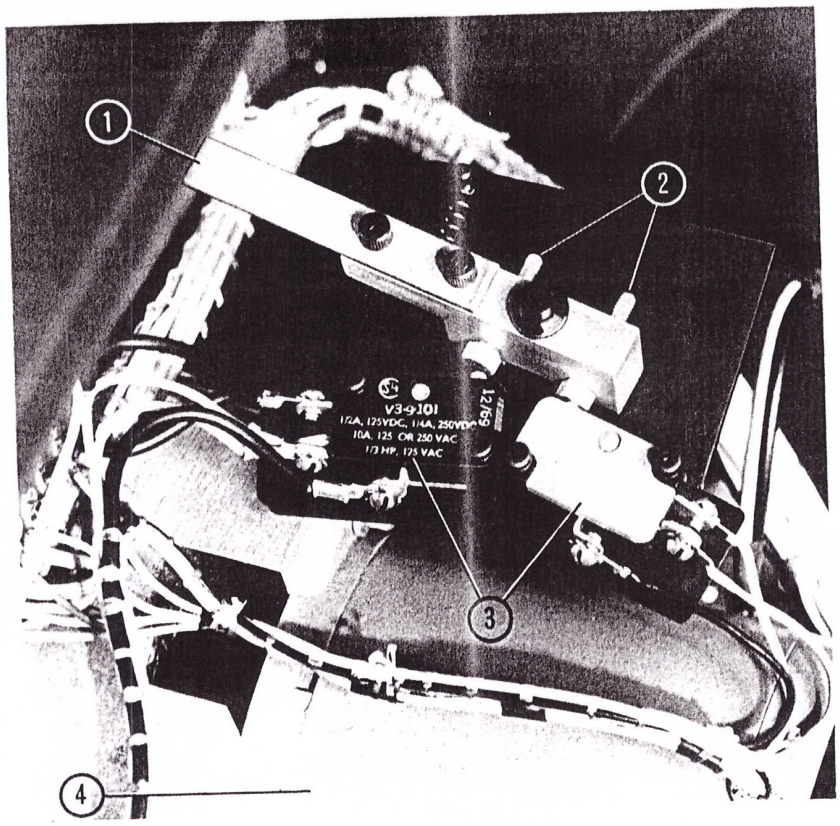
THE PUNCH CODE IS SHOWN ALONGSIDE THE FUSE

(HOT METAL SYSTEM SHOWN)

REF	DESCRIPTION	MFG No
C1 TO 31	10 uF 63V	54780
C32	16 uF 63V	54780
C34 & 35	33 uF 400V	54993
R1 R3 R4 R7	4k7 7 W	54901
R2	100 R 7 W	54440
R3 & 4	5k6 10W	54578
R5 & 6	47 R 6W	54577
F31 TO 31	1.5A ANTI-SURGE	54902
SOLENOID	8 Ω 3 A	

CIRCUIT DIAGRAM FOR MONOTYPE 31 CHANNEL TAPE PUNCH

FIG A1/4



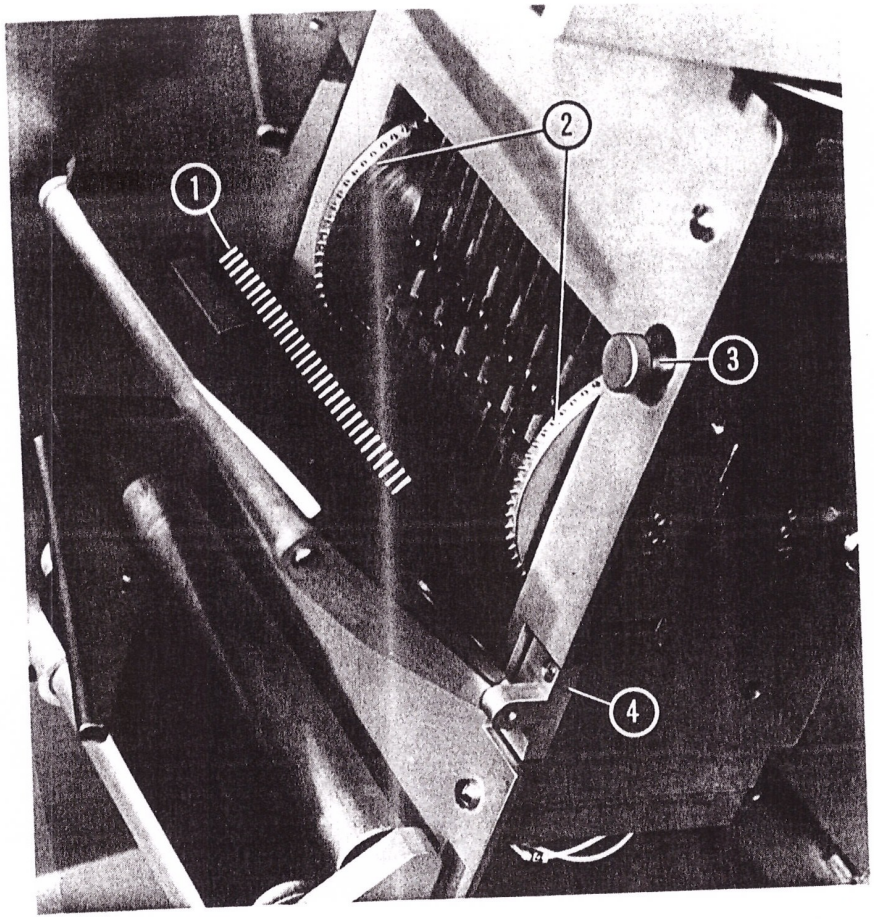
1 Upper sensing arm
2 Adjustable screws
3 Microswitches
4 Take-up spool drive motor

FIG A2.1 MODIFICATIONS TO SENSING ARM AND MICROSWITCH ARRANGEMENT

Certain modifications have been incorporated in the Honeywell punch, which affect Serial Numbers 601 onward. These modifications are as follows:-

Modified sensing arm switching

Modification to the sensing arm switching arrangements are illustrated in Fig A2.1. The two micro-switches which control the operation of the reel-out and take-up motors are now mounted on the same side of the sensing arm and screws fitted with locking nuts permit very accurate adjustment of the switch operations. Only the switches which control the take-up motor are shown in the illustration.



1 Punch pins

2 Sprocket drive wheels

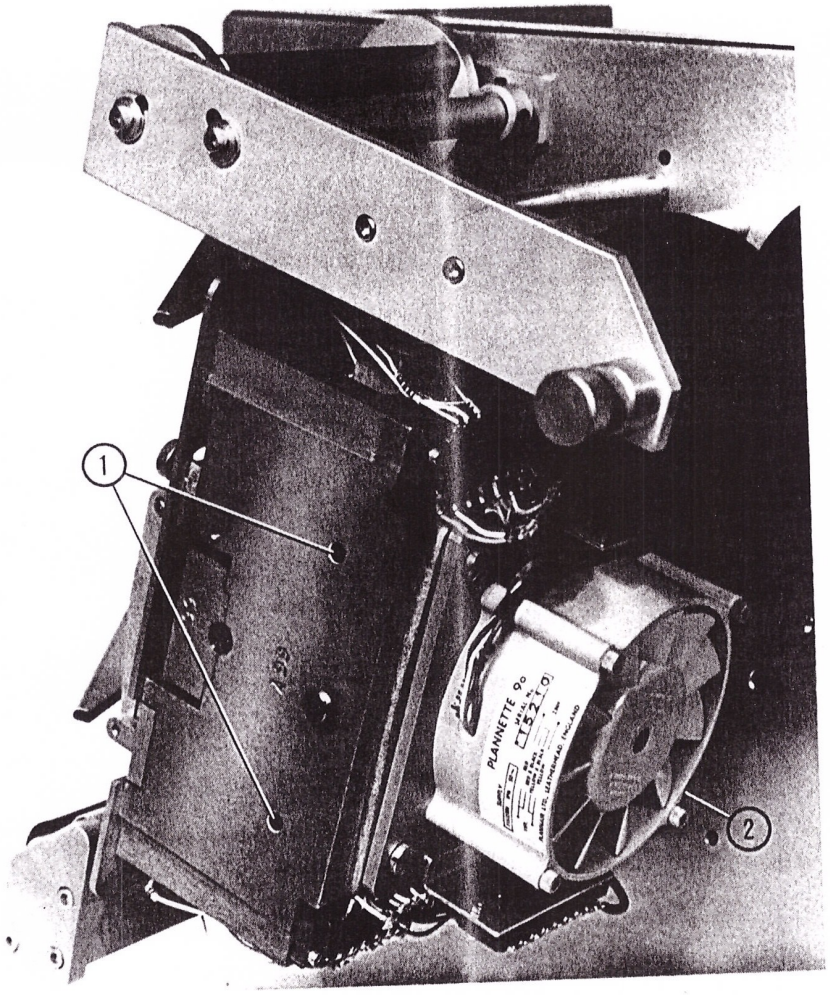
3 Modified gate latch

4 Modified hinge position

FIG A2.2 MODIFICATION OF HINGED GATE ASSEMBLY

Modified mounting of punch gate

The pivots supporting the lower edge of the punch gate have been mounted directly onto the main casting instead of onto the front plate as previously, thus affording increased strength to the hinged gate assembly (Fig A2.2). The gate latch is modified also and is released by an upward pressure instead of downward as in earlier models.



1 Positions of recessed thrust pins

2 Fan

FIG A2.3 MODIFICATIONS TO SOLENOID BLOCK MOUNTING

Modified solenoid mounting

Improved mounting arrangements for the solenoid block involve thrust against the inner wall of the unit exerted by Allen screws which are accessible from the left-hand side (viewed from the rear) and the top of the punch drive unit as shown in the illustration Fig A2.3. To obtain access to the solenoid block,these screws must be slackened by using a 1.98mm (5/64in) Allen key and the fan assembly mounted on the rear of the unit must be removed.

Removal of solenoid blocks

The T-piece locator and guide of the earlier models are no longer used. To remove the solenoid blocks, it is necessary to remove the two screws which secure the upper and lower blocks to the casting. The blocks can then be removed in the normal manner.

CIRCUIT BOARDS

EDGE CONN.	DRG N°	MFG N°
30	125/47	54269-
31	125/48	54275-
32	125/48	
33	125/48	
34	125/49	54276-1
35	125/49	
36	125/50	54277-1
37	125/51	54440-1

XB E PERFORATOR

DISPLAY UNIT FRONT PANEL WIRING DIAGRAM

XB 125/80

THE MONOTYPE CORPORATION LIMITED

SCALE 1/2 · DRN 25 · DATE 17.2.68 · APP

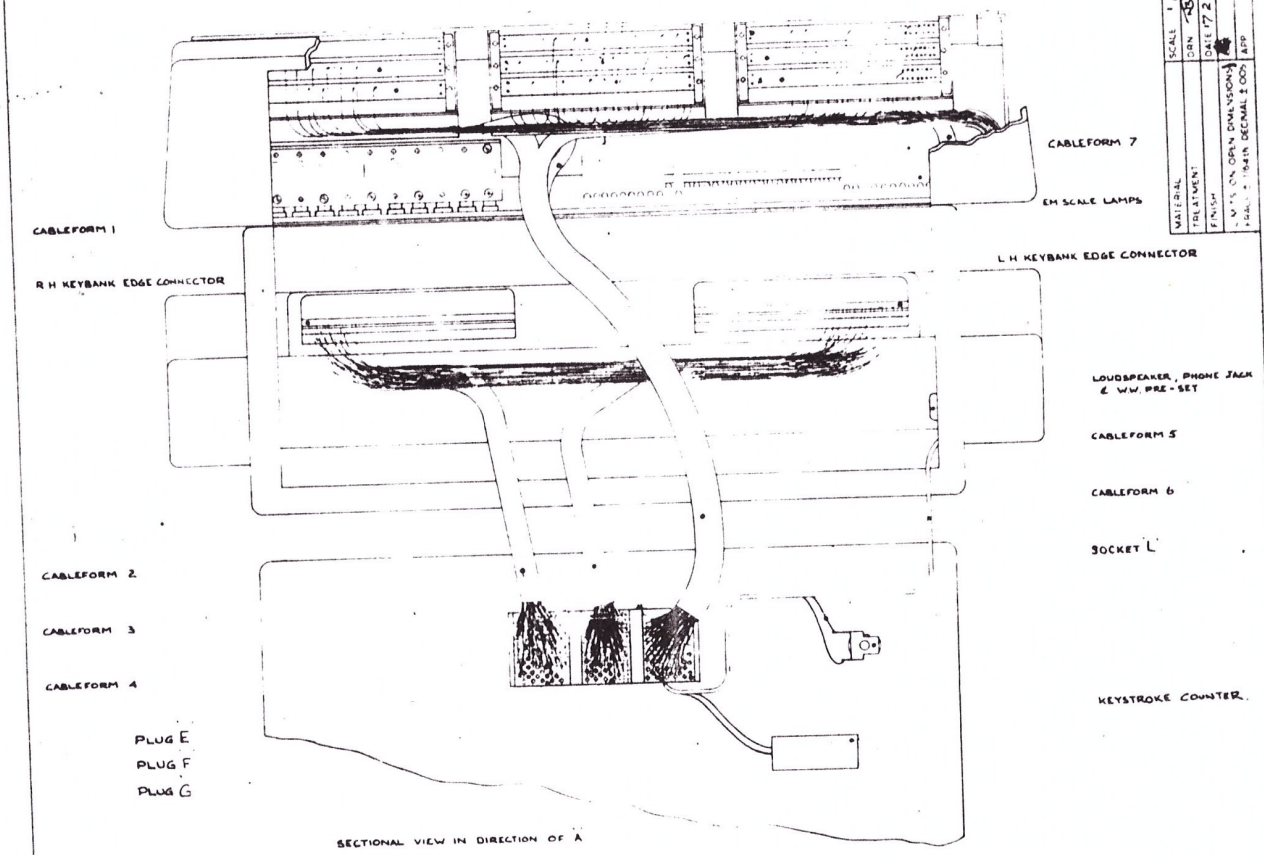
MATERIAL · TREATMENT · FINISH

UNLESS OTHERWISE STATED ALL DIMENSIONS ARE IN DECIMAL & ARE IN INCHES

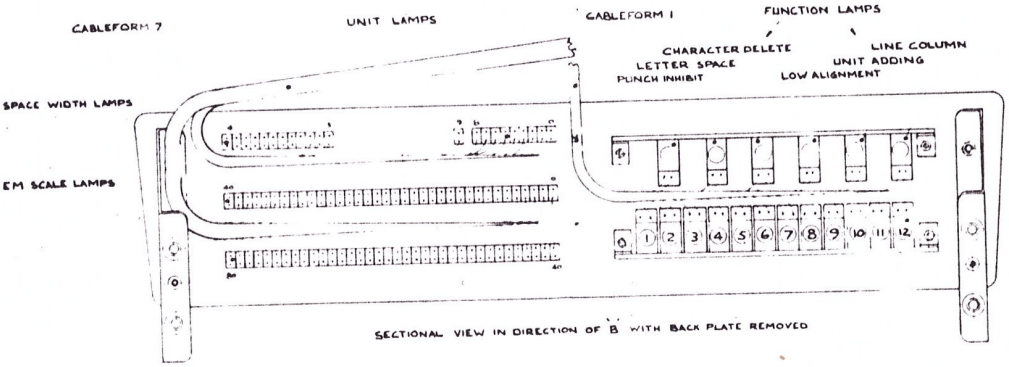
BOARD 37
BOARD 30

BOARD 31
BOARD 32
BOARD 33

BOARD 34
BOARD 35
BOARD 36



SECTIONAL VIEW IN DIRECTION OF A



SECTIONAL VIEW IN DIRECTION OF B WITH BACK PLATE REMOVED

WIRING SCHEDULE FOR	DESCRIPTION	DRG N°
CABLEFORM 1	TABULATOR LIGHT SWITCHES	A125/74
	FUNCTION LIGHT SWITCHES	A125/75
CABLEFORM 2	PLUG G & BOARD CONNECTIONS	B125/76
CABLEFORM 3	PLUG E	125/17
CABLEFORM 4	PLUG F	125/18
CABLEFORM 5&6	SOCKET L - LOUDSPEAKER & KEYSTROKE COUNTER	A125/77
CABLEFORM 7	EM SCALE LAMPS	A125/78
	UNITS & SPACE WIDTH LAMPS	A125/79

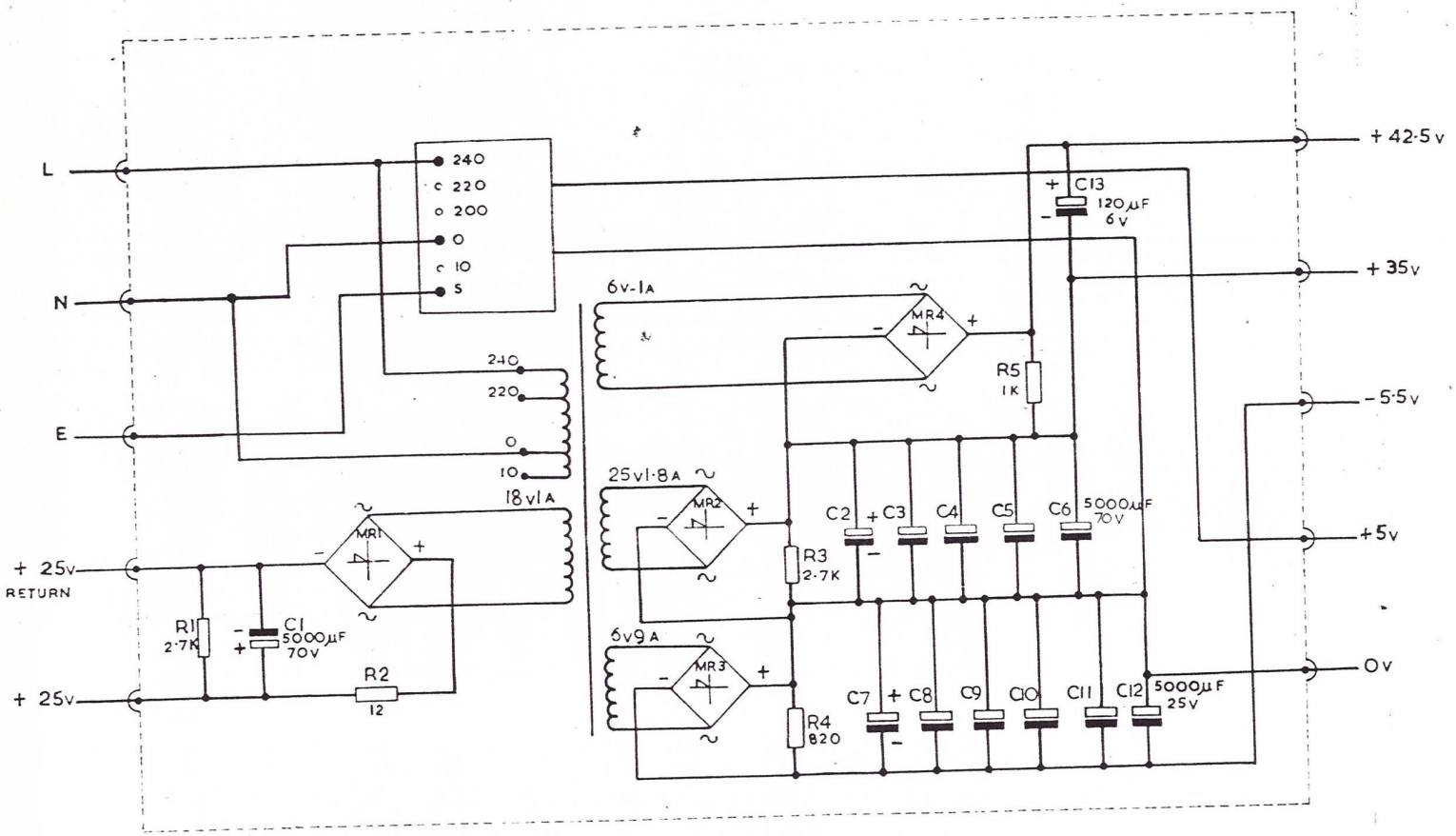
ISSUE No 2 · DATE 17.2.68 · DETAILS R.E. DRAWN

APP

THIRD ANGLE PROJECTION
DIMENSIONS IN INCHES
DO NOT SCALE

HONEYWELL

MATERIAL	31 CHANNEL TAPE PUNCH - POWER SUPPLY SECTION
DRG XA 128/12	WA 2600, 2790, 2821 SYM
DATE 14.10.1968	THE MONOTYPE CORP LTD
	MFG. No 54005
	SHEET 16
SPARES ONLY	MFG. No 54200
	SHEET 4 OF 4



MFG. No. 54015

SHEET 2 OF

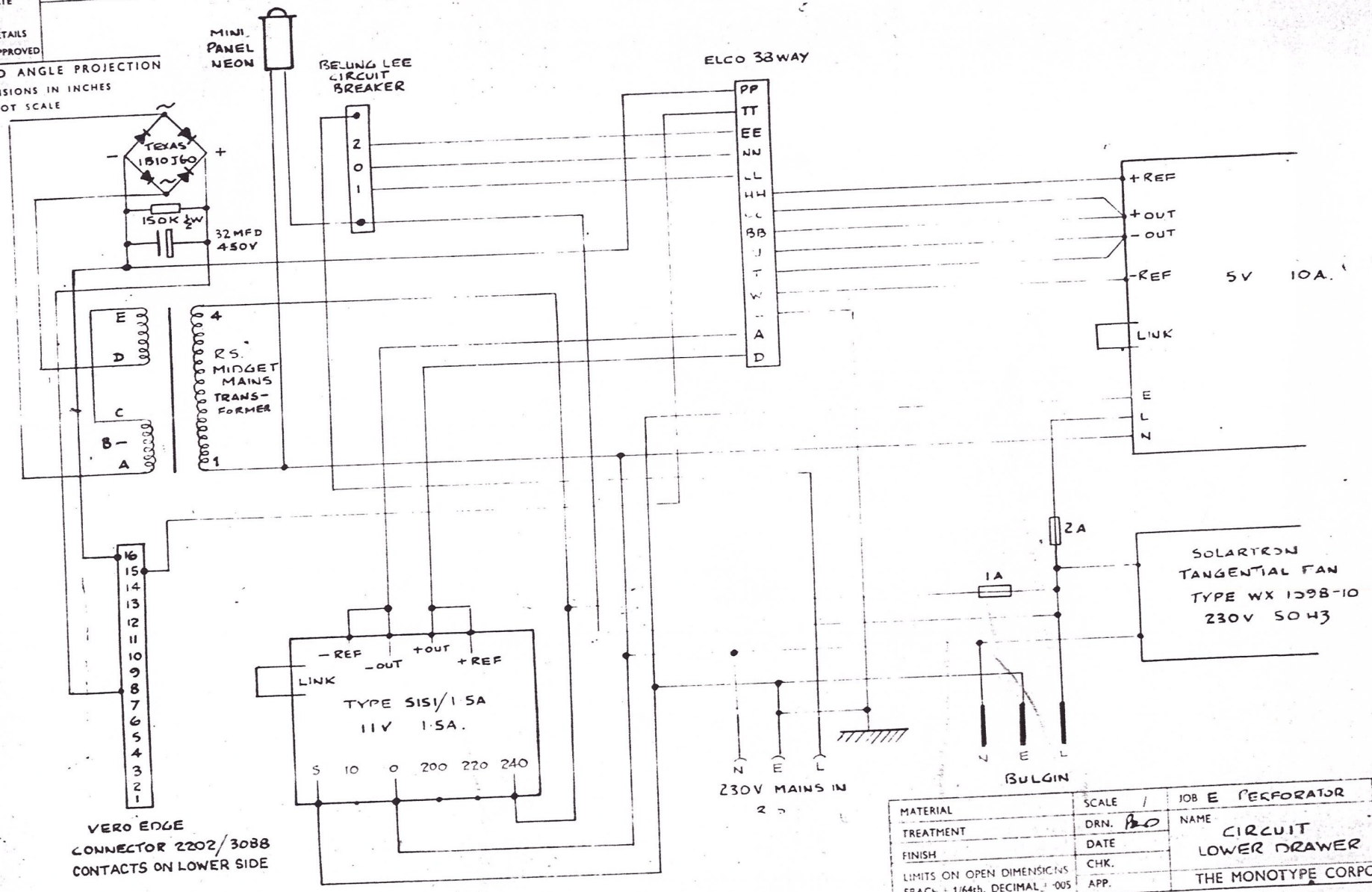
REVISIONS

ISSUE No.	
D.A. No.	
DATE	
DETAILS	
APPROVED	

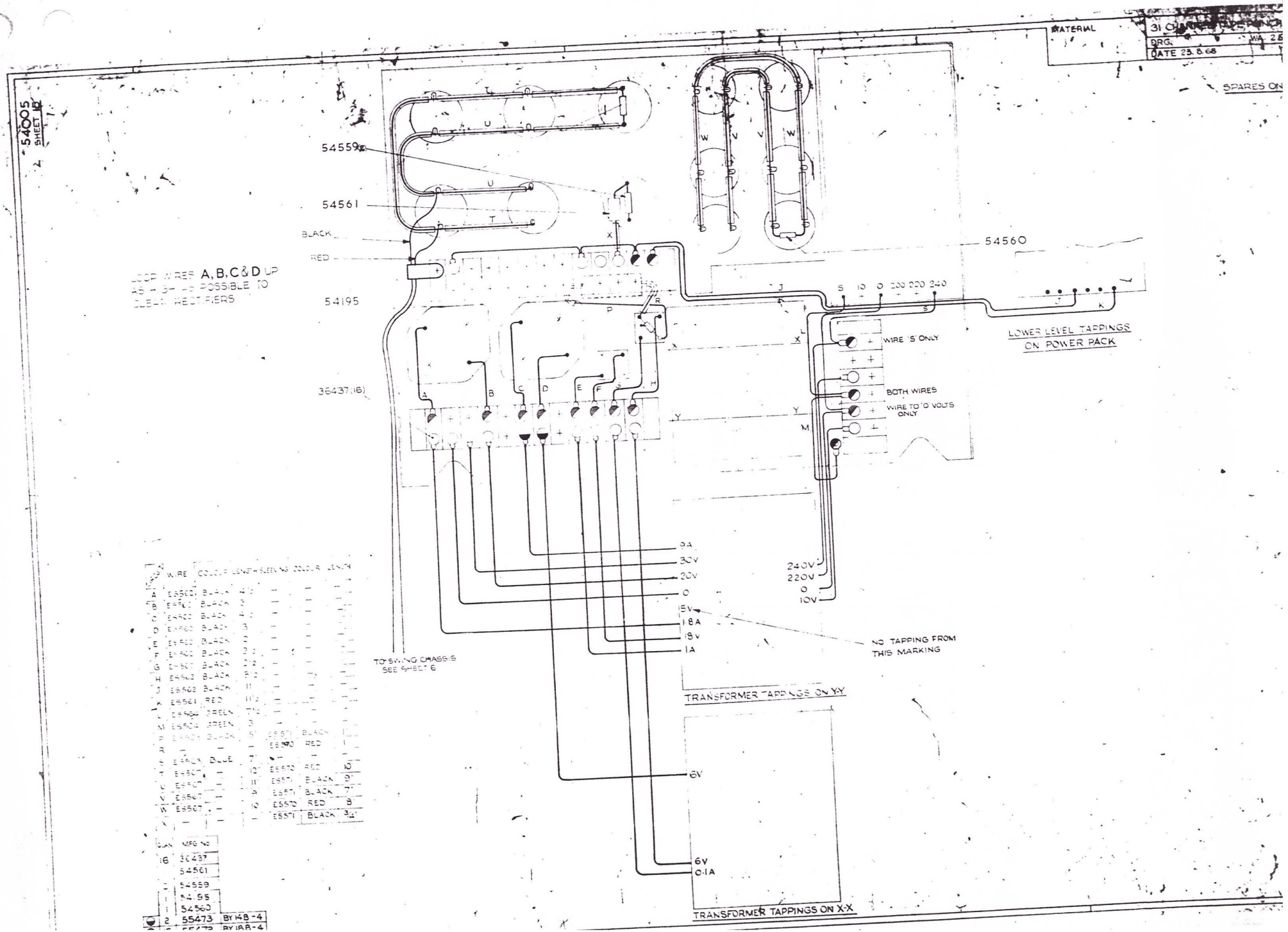
THIRD ANGLE PROJECTION

DIMENSIONS IN INCHES

DO NOT SCALE

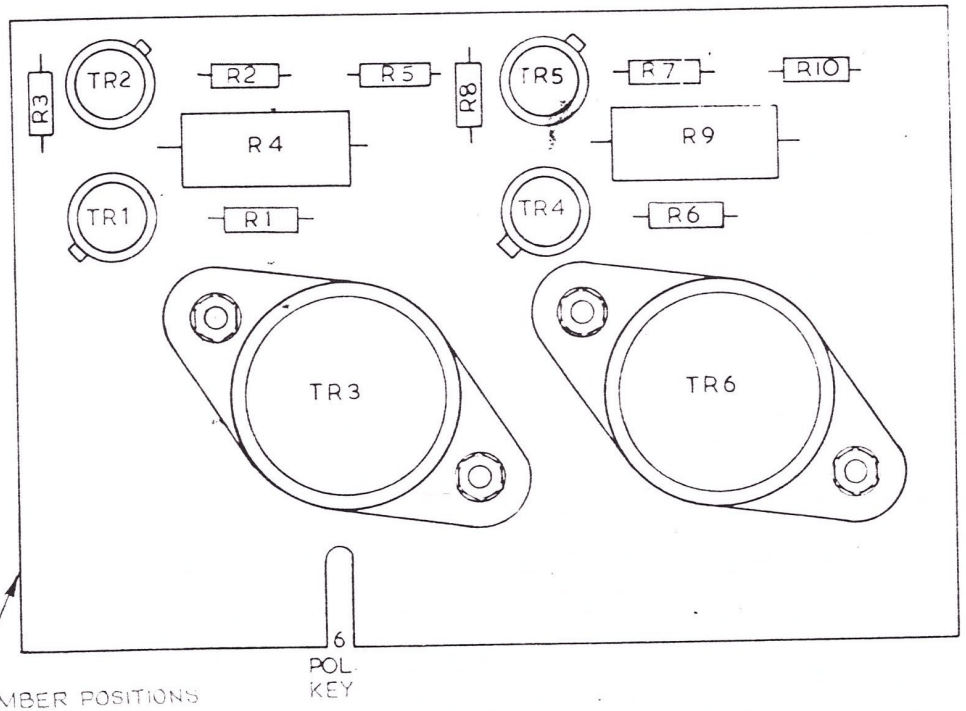


MATERIAL	SCALE 1	JOB E PERFORATOR	ASSY. No.
TREATMENT	DRN. BO	NAME CIRCUIT LOWER DRAWER	XA.
FINISH	DATE		
LIMITS ON OPEN DIMENSIONS FRACT ± 1/64th. DECIMAL ± .005	CHK.	THE MONOTYPE CORPORATION	
	APP.		


54005
SHEET 10
MATERIAL
31 CHANGE
DRG.
DATE 23.8.68
SPARES ON
54559
54561
BLACK
RED
54560
54195
36437(16)
LOOP WIRES A, B, C & D UP AS HIGH AS POSSIBLE TO CLEAR RECTIFIERS
WIRE 'S' ONLY
BOTH WIRES
WIRE TO '0' VOLTS ONLY
LOWER LEVEL TAPPINGS ON POWER PACK
9A
30V
20V
0
5V
1·8A
18V
1A
240V
220V
0
10V
NO TAPPING FROM THIS MARKING
TO SWING CHASSIS SEE SHEET 6
TRANSFORMER TAPPINGS ON Y-Y
6V
6V
0·1A
TRANSFORMER TAPPINGS ON X-X
WIRE
COLOUR
LENGTH
SLEEVING
COLOUR
LENGTH
A ES602 BLACK 4½
B ES602 BLACK 3
C ES602 BLACK 4½
D ES602 BLACK 3
E ES602 BLACK 2
F ES602 BLACK 2½
G ES602 BLACK 2½
H ES602 BLACK 2½
J ES602 BLACK 11
K ES561 RED 11½
L ES604 GREEN 7½
M ES604 GREEN 9
P ES601 BLACK 16 ES670 BLACK 1
R — — — ES670 RED 1
S ES601 BLUE 7 — — —
T ES567 — — 10 ES670 RED 10
U ES567 — — 11 ES571 BLACK 9
V ES567 — — 9 ES571 BLACK 7
W ES567 — — 10 ES670 RED 8
X — — — ES571 BLACK 34
QUAN
MFG No
16 36437
54561
2 54559
1 54195
1 54560
2 55473 BY 14B-4

MATERIAL:-

31 CHANNEL TAPE PUNCH	PUNCH AMPL CIRCUIT BOAR
DRG. XA 128/15	WA.2600.2726.2840
DATE 14.10.1968	THE MONOTYPE
	MFG. Nº 5
	SHEET



NOTE - MFG Nº 54099
ALLOW 1/16 CLEARANCE BETWEEN RESISTOR AND BOARD

CIRCUIT REF.	MFG. OR DWG No.	DESCRIPTION
		PUNCH AMPLIFIER BOARD
	54062	CIRCUIT BOARD
	36443	RESISTOR SUB RES 10K
R2, R7	36442	RESISTOR SUB RES 1K
R3, R8 R5, R10	54098	RESISTOR SUB RES. 2·7K
R1, R6	54099	RESISTOR V pF 4 100 Ω 5%
R4, R9	54193	TRANSISTOR BFY 51
TR1, TR2 TR4 TR5	54096 OR 55386	TRANSISTOR MP 1612B OR MP 1612A.
TR3, TR6	36607	TRANSISTOR PAD TYPE TH4
	18916	SCREW 6BA x 3/8 LG. BRASS CH
	1131	WASHER 6BA
	36799	LOCK WASHER 6BA
	1125	NUT 6BA BRASS

D/T BD 294 02 C

LR. 5679.

MOTOR DRIVE

MATERIAL	SIZE	SHEET	PUNCH	CIRC BOARD	ASS'Y
				WA. 2600	SYM

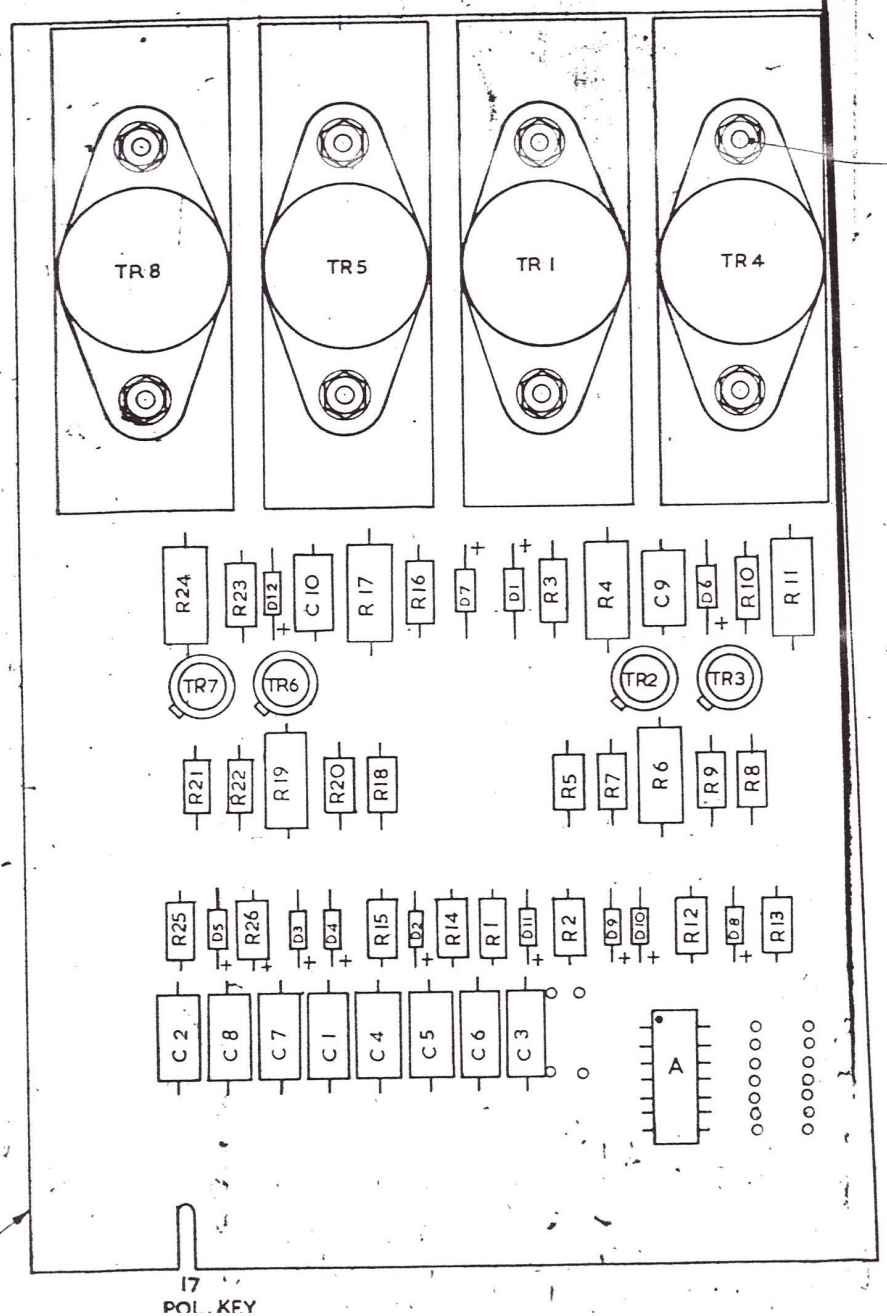
DRG. X A 128/11

DATE 14.10.1968

THE MONOTYPE CORP

MFG. No. 54183-1

SHEET 1 OF 2



18911
22944
1121

NOTE: MFG. Nos. 54218 AND 54213 ALLOW 1/16 CLEARANCE BETWEEN RESISTOR AND BOARD (TO PREVENT SCORCHING OF BOARD)

	1121	NUT 4 BA
	22944	LOCKWASHER 4 BA
	18911	SCREW 4BA x 1/2 BRASS CHEESE HD.
	36607	TRANSISTOR PAD TYPE TH4
	54192	HEATSINK
A	54254	D.T.L ST 659A
TR1, 4, 5, 8	54254	TRANSISTOR 2N3614
TR 2, 3, 6, 7	54193 OR 54980	TRANSISTOR BFY51 OR BY52
C1, 2, 3, 4, 5, 6, 7, 8, 9, 10	54220	CONDENSER 0·01 MFD TYPE 700
D1, 6, 7, 12	54219	DIODE IN 4001
D2, 3, 4, 5, 8, 9, 10, 11 OR	55326 OR 36445	DIODE CG 821H OR OA91
R1, 2, 12, 13, 14, 15, 25, 26	54196	RESISTOR 1/2 W 22K
R7, 9, 20, 22	54197	RESISTOR 1/2 W 2·2K
R3, 10, 16, 23	54780	RESISTOR 1/2 W 330 Ω
	54198	RESISTOR 1/2 W 470 Ω

MATERIAL

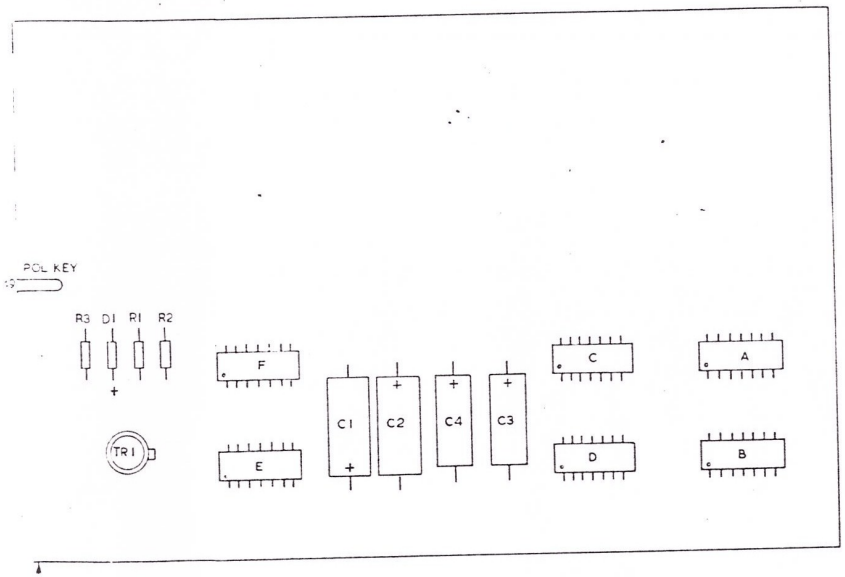
31 CHANNEL TAPE PUNCH — INDICATOR FUNCTIO
CIRCUIT BOARD ASS

DRG. W.A. SYM

DATE 19 THE MONOTYPE CORP L

MFG. No 54100-1

SHEET 1 OF 2



NUMBER POSITIONS FROM THIS EDGE

CIRCUIT REF.	MFG. OR DWG. No.	DESCRIPTION	No. OFF
	36607	TRANSISTOR PAD TYPE TH.1	1
D1	36622	DIODE OA 202	1
R3	36442	RESISTOR ¼ W 1K	1
R1	54253	RESISTOR ¼ W 4.7K	1
R2	54252	RESISTOR ¼ W 470 Ω	1
C3,C4	54786	CAPACITOR 16 MF 10V	2
C1,C2	54060	CAPACITOR 80 MF 6·4V	2
TR1	54250	TRANSISTOR ACY 19	1
E,F	54234	ST 659A	2
D	54589	SN 7410 N	1
A,B,C	54588	SN 7400N	3
	54100	CIRCUIT BOARD	1