U.D.R. 350/700
TAPE READER

TREND®

maintenance
manual

UNIDIRECTIONAL READER

U.D.R. 350/700

HANDBOOK

CONTENTS

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1.1. GENERAL DESCRIPTION

The UDR 350/700 reader is designed to fulfil a need for a high performance low cost uni-directional reader. It can be used as a free standing or rack mounted equipment.

Photo Electric sensing is employed. This permits high reading speeds and virtually eliminates failures arising from mechanical wear. The absence of mechanical sensing ensures that tape wear is kept at a minimum. A differential Photo Electric sensing system ensures reliable reading of tapes of widely differing opacities and colours and within a wide range of light source intensities. The reading station is clearly indicated. Tape loading is very simply and rapidly accomplished and does not require careful tape alignment.

Tape Transport control is uni-directional and is designed to allow fast step-by-step control as well as a high synchronous speed.

Two basic models are available, one with a reading speed of 350 characters per second, the other having a reading speed of 700 characters per second. An electro-magnetic braking system attains reliable stopping on a character, making external buffering unnecessary.

There is an integral power unit.

The reader is capable of reading the various standard tapes at speeds of 350 or 700 characters per second, dependent on model, in one direction only. Tape Transport is achieved by means of a direct drive roller, whilst control is achieved by an electro-magnetic pinch mechanism and brake. The tape is drawn between a light source and a sensing unit. Character sensing is affected by a photocell array - a monolithic array of silicon voltaic cells operated in the short circuit mode. An additional cell is included as reference to compensate for tape and light source variations.

The light source is a tungsten filament vehicle lamp which is under run by 25% of its normal voltage rating. Focusing results in an almost parallel beam. Light source cooling is achieved by forced air from the rotor of the drive motor. The flow of air also serves to inhibit the settling of dust on the optical unit.

The load bearing frame is provided by a cast member finished in black acrylic paint. An aluminium base plate, to which are fitted four plastic feet, supports the Control Printed Circuit Board, into which is plugged the Interface connection, Power Unit and Photocell Outputs. Two decoratives, an upper and a lower, are clipped to the main cast frame. The upper decorative provides a cover for the lamp and lens assembly, whilst the lower provides a cover for the drive and brake solenoids. The tape platform is exposed.

The drive motor, which is secured to the rear of the cast frame, is a constant speed induction motor. The motor is of the external/exposed rotor type in which the wound stator is encompassed by the rotor which is anchored to the shaft rotating within the stator. Moulded fins on the rotor provide forced air cooling. The motor shaft is horizontally positioned above the tape which is pinched between drive shaft and pinch roller when the drive solenoid is energised.

The Power Unit is mounted behind the cast frame, to which it is secured by four screws into the transformer housing and above the printed circuit board. Two further screws, one on either side, secure the power unit to the base plate.

The control printed circuit board is lodged between the aluminium base plate, to which it is secured by self tapping screws acting into plastic spacers, and the power unit.

A steel cover, furnished with four louvred ventilators, finished in black acrylic paint, clips into place on four studs mounted on the rear of the front casting and is secured to the base plate.

1.2. SPECIFICATIONS

1.2.1. Performance

	UDR 350	UDR 700
Synchronous Speed	350 char. per sec.	700 char. per sec.
Stepping Speed	250 char. per sec.	350 char. per sec.
Stepping Distance	0.025" (0.63 m.m.)	0.025" (0.63 m.m.)
Brake Delay	700us	350 us (from time sprocket goes light).

1.2.2. Tape Requirements

Tape Materials: Paper, Oiled Paper, Mylar.
Sandwich or Plasticised Paper (e.g. Syntosil)
Mylar or Metallised Mylar can be read reliably but with reduced transport performance.

N.B: Plasticised Paper is recommended for maximum tape life.

Tape Width: 1 inch, 7/8 inch or 11/16 inch tape may be accommodated by a simple push/pull adjustment of the outer tape guide to predetermined positions.

Tape Thickness: 0.002 ins. - 0.006 ins. Greater thicknesses may be accommodated, such as with splices, but reduced transport performance will result.

Tape Opacity: Up to 50% total light transmission, any colour, without adjustment.

Punching Tolerances: Tolerance is in excess of that specified by BS 3880.

Lateral Punching Tolerance: $\pm$ 0.010 ins. from nominal.

Longitudinal Punching Tolerance: $\pm$ 1 character/inch from 10 character/inch.

Tape Splices: Overlap and Butt splices can be accurately ready, provided that no light gaps are left in the latter case. They may cause reduced transport performance.

Tape Terminations: Approximately 5 inches minimum of 'sprocket' only or other feed codes.

1.2. SPECIFICATIONS (Contd/)

1.2.2. Tape Requirements (Contd/)

Tape Supply Tension:	8 oz. for specified transport performance. Greater tensions may be used if reduced transport performance is acceptable.

1.2.3. Environment

Operating Temperature Range:	+5°C - +40°C ambient.
Storage Temperature Range:	-10°C - +70°C ambient.

1.2.4. Reliability

M.T.B.F.:	Typically 1,000 hours (estimated)
Lamp Life:	Typically 10,000 hours in normal operating conditions.
	The reader will read accurately and without adjustment with light intensity reduced by 50% from nominal.

1.2.5. Power Supply Requirements

Mains Input Voltage:	115v/220v/240v
Supply Frequency:	50 Hz
Voltage Tolerance:	+ 10% - 15%
Power Requirements:	115 VA maximum
Fuse:	3A - 220/240v 5A - 115v

1.2.6. Dimensions

Width	253 m.m.	(10.0 in.)
Height	130 m.m.	(5.1 in.)
Depth	280 m.m.	(11.0 in.)
Weight	9.072 Kg.	(20 lbs.)
Weight when packed for transit	10.43 Kg.	(23 lbs.)

SECTION 2 - INSTALLATION

CONTENTS

2. INSTALLATION

WARNING:- THE 'UDR' MUST BE CONNECTED TO A MAINS SUPPLY OUTLET HAVING A GOOD EARTH CONNECTION.

2.1. On leaving the manufacturers, the UDR mains voltage adjustment tap will have been set to 240v or the customers' stated requirements. The site mains voltage supply should be determined and, if necessary, the mains adjustment tap on the power unit should be adjusted. Access to the adjustment tap is achieved by removing the equipment cover (refer to para. 5.1.1. and Fig. 1).

Ensure that the equipment mains fuse is of the correct rating applicable to the supply:-

220/240v - 3 Amp
115v - 5 Amp

2.2. Reader Mains Connection

Connect the UDR to the mains supply using a standard three pin plug. The equipment mains input cable should be connected as indicated below:-

UDR Mains Input Cable	Plug Pin Connections
Brown Lead	Line (L)
Blue Lead	Neutral (N)
Green/Yellow Lead	Earth (E)

The UDR is now prepared for connection to the associated equipments.

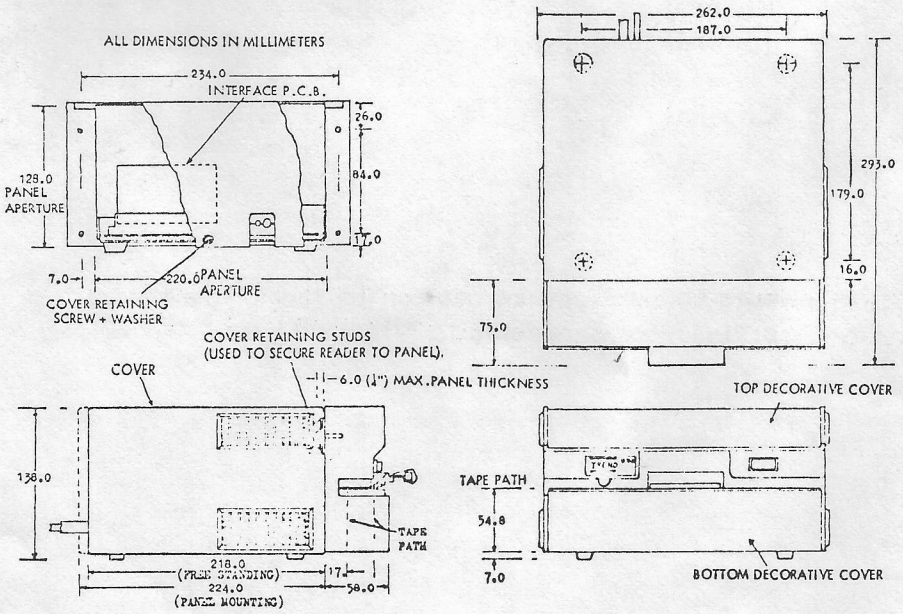

Fig. 1 - Installation.

2. INSTALLATION (Contd/)

2.3. Connector Pin Assignments

UDR Input/Output Connector

24 + 24 way Edge Connector, 0.15 Contact Pitch, 1/16 Board Thickness

Pin	Function	Pin	Function
1	V1 Switched + 9v	A	0v
2	0v	B	0v
3	Not Used	C	+30v
4	+9v	D	+9v
5	Test Point	E	Test Point
6	Channel 6	F	+9v
7	Channel 3	H	Additional facility refer to Appendix 1.
8	Channel 4	J	
9	Channel 2	K	
10	Reader Channel Enable	L	
11	Drive Left	M	
12	Drive Left	N	
13	Not Used	P	
14	Drive Left	R	
15	Transport Enable	S	
16	Reader Channel Inhibit	T	
17	Sprocket Enable	U	
18	Sprocket	V	
19	Channel 5	W	
20	Channel 1	X	
21	0v (All IC's pins 7)	Y	
22	Channel 7	Z	
23	+5v (All IC's pins 14)	AA	Rewind Mode (Not Used)
24	Channel 8	AB	0v (All IC's pin 7)

Notes:-

1. The lettered connections are nearest the rear of the reader.
2. Power Earth may be connected to either pins A, B or 2.

SECTION 3 - OPERATING INSTRUCTIONS

CONTENTS

3. OPERATING INSTRUCTIONS

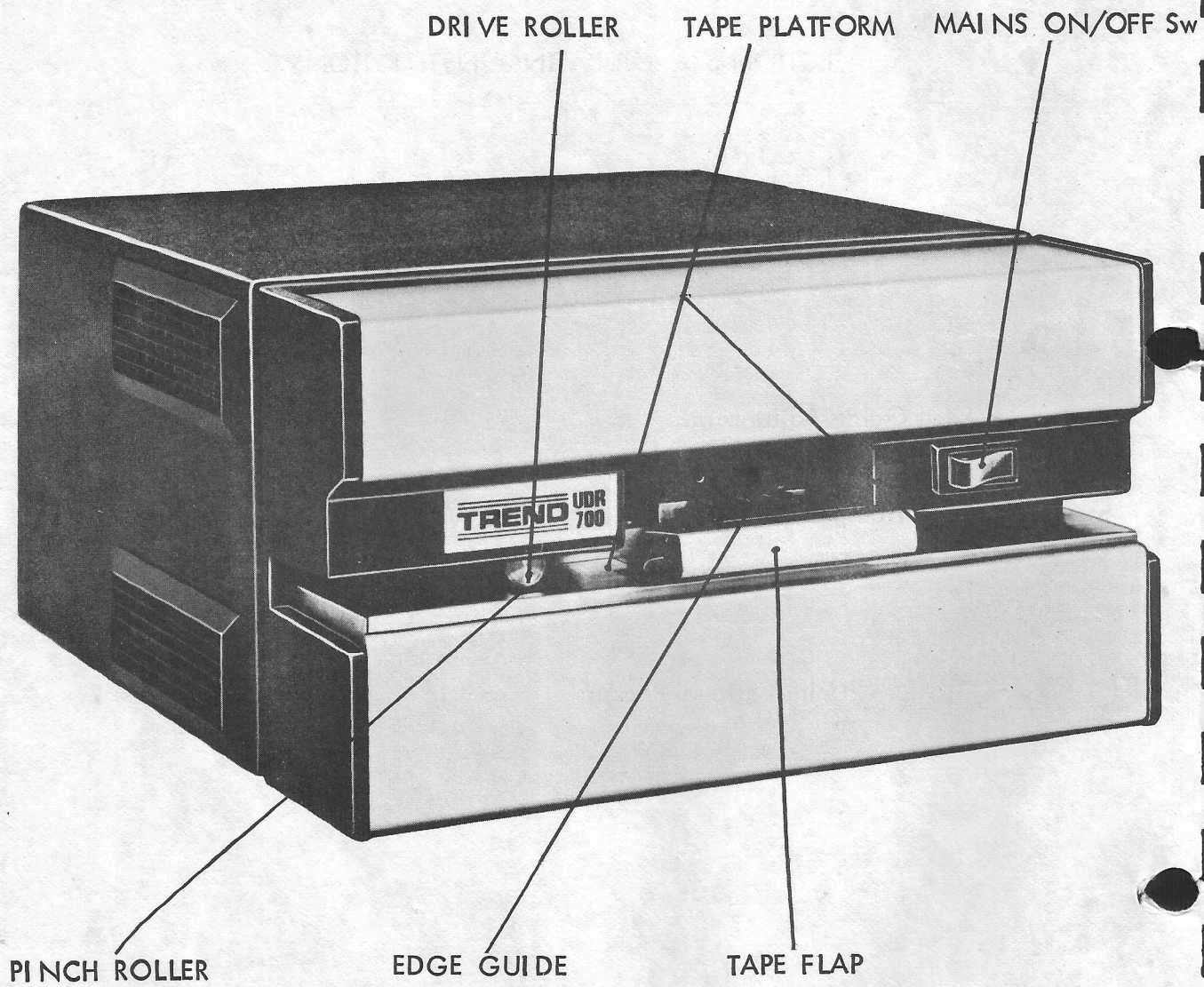

Fig. 2 - Unidirectional Reader

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3. OPERATING INSTRUCTIONS

3.1. Edge Guide Adjustment

Before loading the tape to be read, the outer edge guide must be set correctly for the nominal width of the tape, as follows:-

5 channel tapes (11/16" nominal width)
- set to Inner position.

6 channel tapes (7/8" nominal width)
- set to Middle position.

7 channel tapes (1" nominal width)
- set to Outer position.

8 channel tapes (1" nominal width)
- set to Outer position.

3.2. Tape Loading (Fig. 2)

The reader should be switched OFF.

After setting the outer edge guide as detailed in para. 3.1., open the tape flap. The flap is held in the open position by a spring detent mechanism.

The tape to be read should be placed flat on the tape platform, beneath the drive roller and tape flap, with track 1 towards the inner edge guide and the data to the right of the reader (viewed from the front). The sprocket track of the tape should then be in line with the two smaller apertures of the read head.

If it is required to start reading on a specific code on the tape, rather than on leader/trailer codes, the tape should be positioned so that the centre between this code and the sprocket preceding it is aligned with the vertically scribed mark on the edge guide at the rear of the reading station.

With the tape in position, switch the Reader ON.

WARNING:- THE 'UDR' DRIVE MOTOR SHOULD BE RUNNING PRIOR TO LOWERING THE TAPE FLAP. IT IS INADVISABLE THAT THE 'UDR' MAINS SWITCH BE SWITCHED 'ON' WITH THE TAPE FLAP DOWN AND A TAPE IN POSITION.

3.3. Tape Transport Control

Ensure that the UDR is connected to the associated equipments. Ensure that there is no 'drive' signal being passed to the reader.

3. OPERATING INSTRUCTIONS (Contd/)

3.3. Tape Transport Control (Contd/)

Gently lower the tape flap. The action of the flap is such that the tape will be pushed back against the inner edge guide as the flap is lowered. The lamp will light,and the brake will steady the tape.

NOTE:- If the Tape Flap is lowered before the UDR is connected to the associated equipments,tape transport will commence and no braking will be applied.

The quiescent braking force is such that the tape may be safely pulled gently through the reader manually, if adjustment of the reading position is required.

Reader transport may now be initiated.

3.4. Tape Unloading

When tape reading has been completed, the tape may either be run out of the reader by continuing tape transport to the end of the tape, or the tape flap may be lifted and the tape removed sideways. If the first method is used, care must be taken to disable the transport when the tape has run out, either by manually switching the reader by lifting the tape flap so de-energising lamp and solenoid circuits, or, preferably, automatically by sensing the end of the sprocket change. Care must be taken to ignore any spurious codes which may be read at the end of the tape.

SECTION 4 - TECHNICAL DESCRIPTION

CONTENTS

4. TECHNICAL DESCRIPTION

4.1. Explanation of Circuits

4.1.1. Power Lines (Fig. 3)

The requirement for the UDR is an 'ac' mains supply. The unit generates its own 'dc' requirements as follows:

+5v	+ 0.2v	-	Logic Supply
+9v	+ 0.4v	-	Lamp and Coil Supplies
+31v	$\pm$ 3v (V2)	-	Brake Primary Drive Supply

In addition, the +5v supply is capable of providing up to 800 mA current to an external load, such as interfacing logic. Maximum peak to peak ripple on this supply is 50 mV at full load.

4.1.2. Mains Input

The mains transformer has primary tappings at 115,220 and 240v selected by a tap changer. A further tapping at 140v on the primary winding is utilized for the Drive Motor Supply.

The mains LINE input is connected to the common terminal of the tap changer via a cartridge fuse (3 Amp for 220-240v supply, 5 Amp for a 115v supply) and the illuminated mains ON/OFF Switch (SW1).

The mains NEUTRAL input is connected to the 0v tapping on the transformer primary.

The EARTH lead is connected to the chassis of the power unit and to the transformer inter-winding screen.

Interference suppression components C16-19 and R82 are included in the mains input circuitry. C16 and R82 are concerned primarily in the suppression of inductive surges when the Drive Motor and main transformer are switched OFF.

For electrical safety and mains transient suppression, it is important that the earth input is connected externally to a good electrical earth.

The 'dc' output common rails are not connected to the mains earth connection.

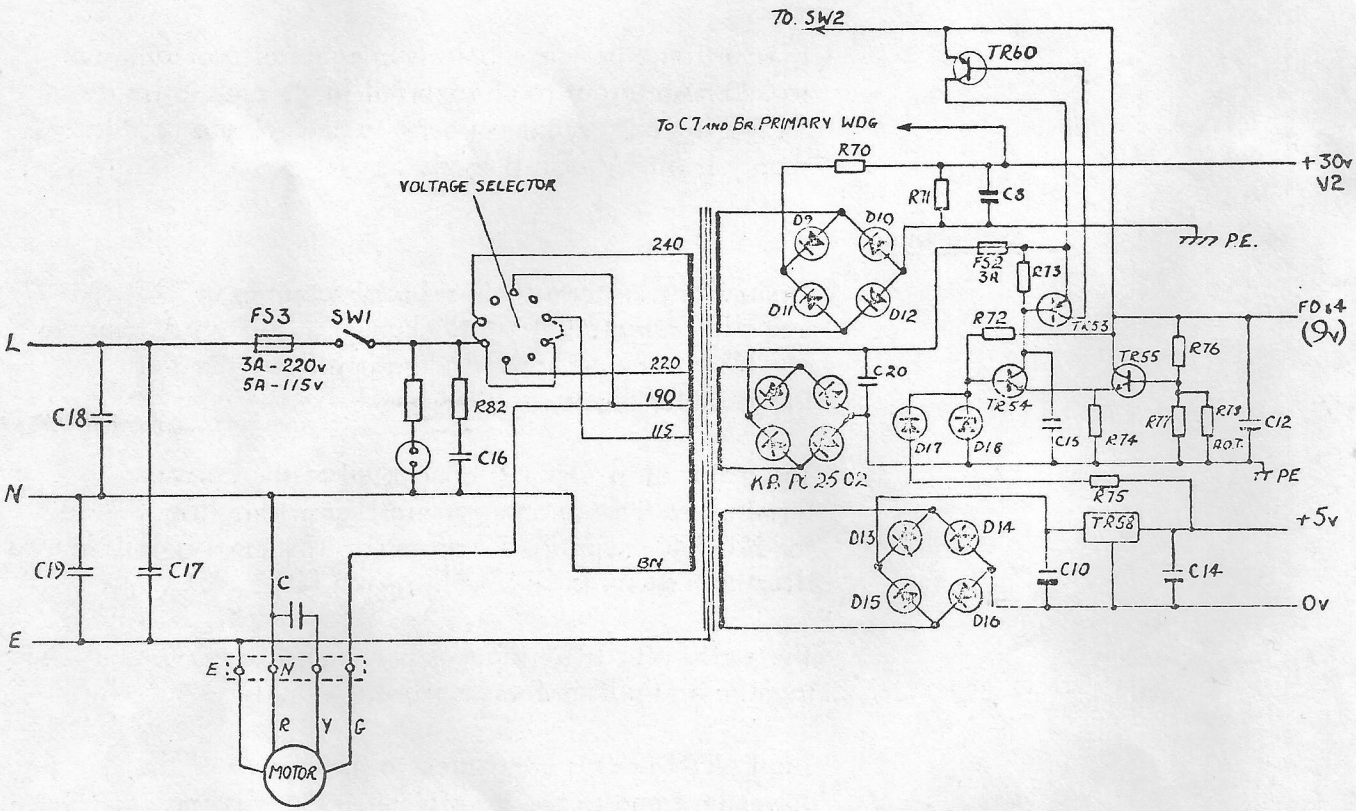


Fig. 3 - Mains Input and Power Supply Circuit.

4.1.3. V2 Unstabilized Output

This supply is used to charge the reservoir capacitor (C7) supplying the brake primary winding. A transformer secondary tapping of 24v rms nominal output is rectified by the rectifier bridge D9, D10, 11 and 12 and smoothed by R70 and C8 to provide a nominal average voltage of 30v.

4.1.4. +5v Stabilized Output

This supply is derived from the rectifier bridge D13, 14, 15 and 16 connected across an r.m.s. output of approximately 8.7v. Capacitor C10 provides ripple smoothing whilst regulation is achieved by an integrated regulator TR58 (MLM 309K). This output is capable of providing up to 800mA current to an external load, such as an interfacing logic. Maximum peak to peak ripple on this supply is 50mV at full load.

4.1.5. +9v Stabilized Output

The regulator for the +9v output is supplied by full wave rectifier KB PC 25·02 feeding into the smoothing Capacitor C20 from a secondary winding of nominally 14v rms. This smoothed 'raw' dc supply is fused by FS2 which is positioned on the printed circuit board.

The voltage regulator circuit has the series element TR60 which is a heat sink mounted power transistor, pre-amplified by the complimentary stage TR53. Control of this series element is achieved by the differential common emitter amplifier TR54 and TR55. One input, at the base of TR54 has a reference voltage provided by zener diode D18 and the other input, at the base of TR55 is a fixed proportion of the output voltage provided by the potential divider resistors R76 and R77. R77 is trimmed by a parallel connected resistor R78 which provides fine adjustment of the output voltage. Under all conditions of input voltage and output current the differential amplifier achieves a balance of current in TR54 and TR55 such that the output voltage remains constant.

4.1.5. +9v Stabilized Output (Contd/)

The arrangement of supplying the zener diode bias current through R72 which is connected to the stabilized output achieves a very stable reference voltage simply and cheaply, but this arrangement has a disadvantage in that it is not self starting.

To overcome this, a starting reference level is provided by diode D17 which is supplied through R75 from the +5v stabilized supply. At initial switch ON, D17 supplies a temporary starting reference level which enables the stabilized output to rise. This, in turn, provides a bias current for the zener reference D18 which, when fully established, is sufficient to reverse bias D17 which then has no further effect on the regulator.

The capacitor C15 provides decoupling to prevent high frequency parasitic oscillation. The output capacitor C12 provides decoupling for fast input voltage and output load transients.

All three supplies appear at the input/output connector, and the return circuits for each are internally interconnected, but are isolated from Mains Earth.

The 0v line is normally used on signal common return, in which case +5v must only be used as an output. The +5v line may be used as signal common provided that input signal limits are maintained relative to the reader 0v line.

This latter arrangement can be used to effect an interface with a logic system using a negative supply rail and positive common rail. Care must be taken to avoid connecting the reader +5v supply in parallel with any external voltage supply, even if nominally at +5v.

N.B.

The +9v and +31v lines should not be connected externally.

4.2. Tape Movement

4.2.1. General

Movement of the punched tape across the read lead is controlled by the drive and brake solenoids. In order to achieve optimum performance in respect of acceleration and deceleration of the tape, whilst minimising the power dissapation, the drive solenoid is pulsed at different drive levels at various stages of the transport cycle. In addition, the brake magnet is provided with two windings with a ratio of 3:10. The winding with the lower number of turns is referred to as the primary and the other as the secondary.

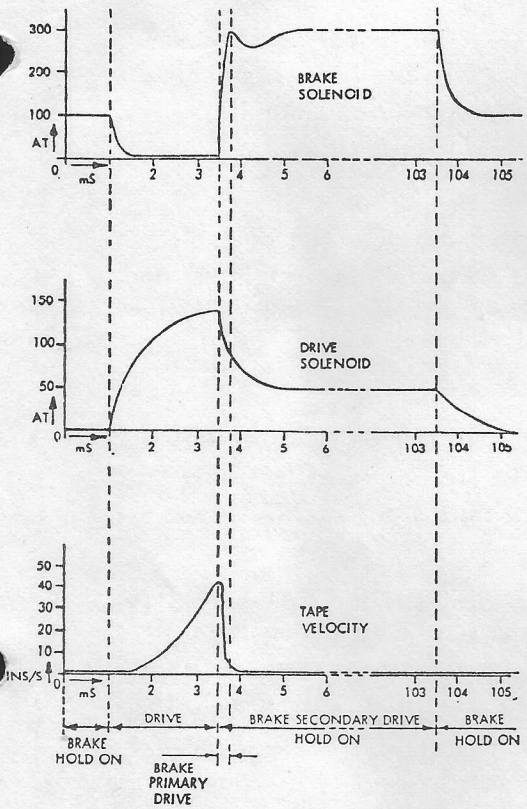


Fig 4. Transport Solenoid Waveforms

The sequence of solenoid energising levels is illustrated in Fig. 4. The quiescent state, with the tape loading flap down, the associated equipments connected and no 'drive' signal present, is the brake solenoid secondary partially energised, and the drive solenoid once brake primary de-energised. When tape transport is initiated, the current rises exponentially in the drive solenoid to a maximum value governed by the internal resistance, and decays in the brake secondary, and the tape accelerates, typically moving one code pitch in 2.5 mS.

If at this point the tape is to be stopped, the brake primary winding is energised directly. The low number of turns presents a low inductance and allows rapid current increase and thus rapid energisation of the brake solenoid and therefore, rapid deceleration of the tape. Should this build up of current continue the solenoid would overheat. However, when an adequate current-level is reached and 'flux' has been established, the primary winding is switched 'off' but the established flux is maintained by the secondary winding which requires less current and power dissapation.

Whilst the brake is energised, the drive solenoid is partially de-energised to a level termed the 'hold on level' which is sufficient to release pressure on but maintain contact with the tape for a period of up to nominally 100mS. During this period the brake is kept fully energised by the secondary winding unless a new drive cycle is initiated, when the brake is immediately de-energised and the drive solenoid is fully energised again. At the end of the 100 mS period the drive solenoid is completely de-energised and the brake secondary is reduced to partial 'hold on' energisation.

4.2.2. Transport Control Logic (Fig. 5)

Tape transport is controlled by two inputs:-

a) Transport Enable.

b) Drive.

Consider the condition with the Tape Flap (SW2) open and 'Drive' and 'Transport Enable' selected.

IC5 pins 4 and 5 will be 'high' resulting in a 'high' being applied at both TR43 (n-p-n) and TR45 (n-p-n) bases.

With SW2 (Tape Flap) open the collector circuits of TR's 43 and 45 are not made and therefore, TR's 43 and 45 are not switched ON.

TR52 - in the Brake Primary Circuit - is held switched OFF by the 'high' at IC4:13 - from IC4:8 - generating a 'low' at TR52 base.

The Brake Secondary Hold circuit is OFF due to the 'low' - derived from the 'high' at IC4:8 - on the base of TR41. The Brake Secondary 1st Stage is held OFF with a 'low' on TR47 base - from the ON condition of TR40.

Tape Flap Closing

Closing SW2 (Tape Flap) makes the collector circuits of TR43 (Drive) and TR45 (Drive Hold). TR's44 and 46 are switched ON. Current flows in the DRIVE COIL.

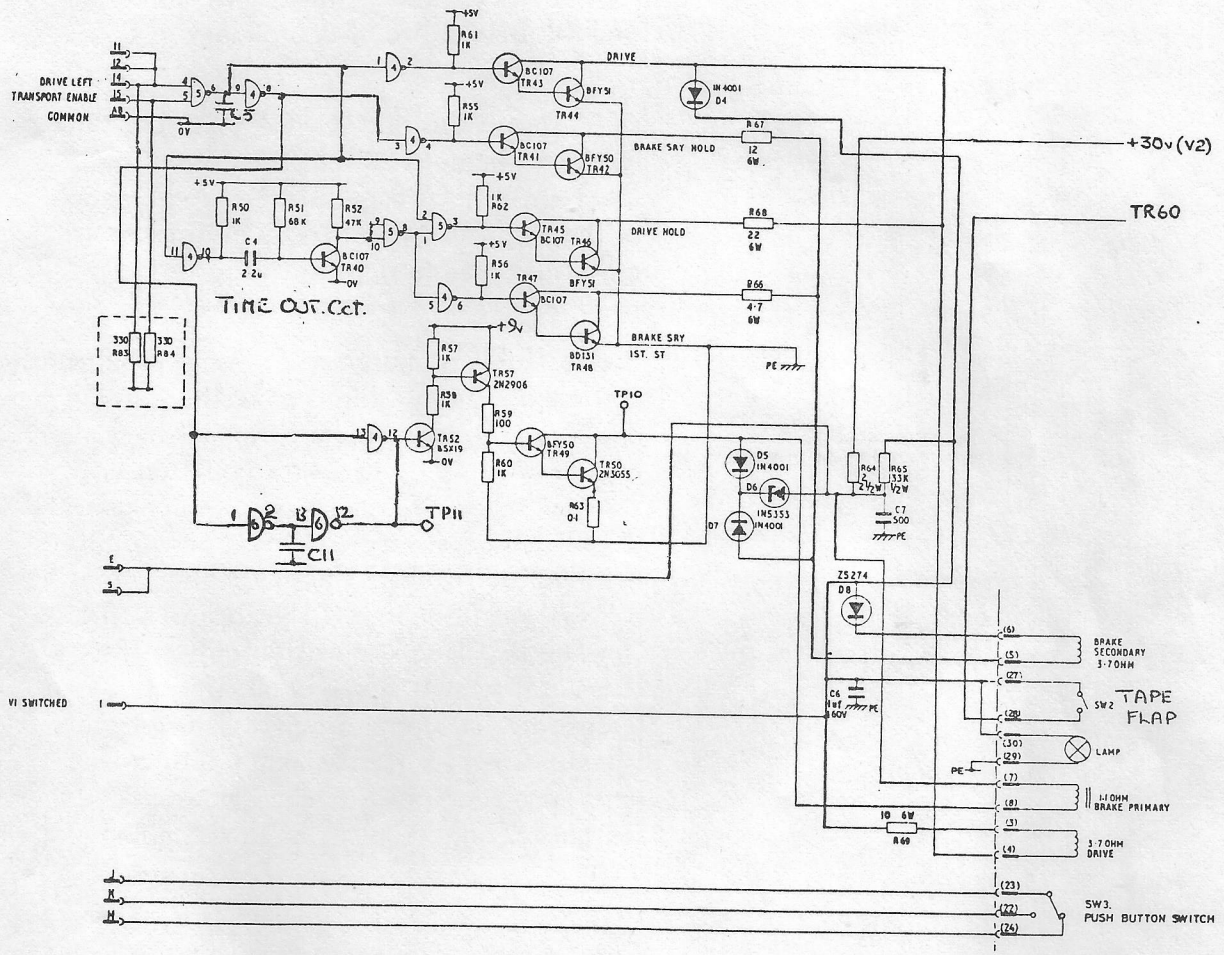


Fig. 5 - Logic Circuit (Tape Transport)

4.2.2. Transport Control Logic (Fig. 5) (Contd/)

Drive or Transport Enable Signal removed

In this condition either IC5:4 or 5 will go 'low'. IC5:6 goes 'high', generating a 'low' at TR43 base. TR43 switches OFF and the Drive Circuit is broken.

C5 delays IC5:6 and IC4:9 from going 'low' by approximately 20 usecs to ensure that the Tape is not stopped at the leading edge of the sprocket hole thereby giving rise to a possible double data reading.

'Drive Hold' is maintained - for approximately 100 msec - by the 'high' at IC4:8 being applied to IC4:11. The 'low' generated at IC4:10 is applied via C4 to TR40 base. TR40 switches OFF and the collector goes 'high' and causes a 'low' to be generated and applied to IC5:1 thereby maintaining a 'high' on TR45 base (Drive Hold). The 'low' at IC5:1 generates a 'high' on TR47 base. TR47 switches ON making the Brake Secondary 1st Stage circuit. 'Drive Hold' is maintained for approximately 100 msec. until such time as C4 is charged and TR40 switches ON generating a 'low' at TR45 base.

A 'low' is generated at IC4:8 which in turn generates a 'high' at TR41 base. TR41 switches ON and the Brake Secondary Hold circuit is made.

The 'low' at IC4:8 is also applied at the OR network IC4:13 and IC6:1. A 'high' is generated and applied to TR52 base. TR52 switches ON and in turn switches on TR57, TR49 and TR50. The Brake Primary circuit is made.

4.2.2. Transport Control Logic (Fig. 5) (Contd/)

The 'low' at IC6:1 generates a 'high' at IC6:13 - delayed by 200 usecs by C11 charging - and the resultant 'low' at IC6:12 is applied at TR52 base. TR52 switches OFF and the Brake Primary circuit is broken. The Brake Primary circuit is 'made' for only 200 usecs but since the inductance of the primary coil is low the energising current rises to approximately 7 Amps in that time establishing the flux necessary to activate the brake. The flux is thereafter maintained by the Brake Secondary Winding.

4.2.3. V1 Switched

This signal is derived from the common connection of the Lamp and Drive coil. With the Tape Flap closed 9v is applied to Pin 1 of the edge connector and can be used to provide a remote indication that the Tape Flap is closed.

N.B. The current drawn should not exceed 50mA.

WARNING: The signal derivation point is common to Lamp and Drive Coil but NO ATTEMPT should be made to utilize this fact to by-pass the loading flap switch since the fuse FS1 would also be by-passed.

4. TECHNICAL DESCRIPTION (Contd/)

4.3. Principle of Photocell Amplifiers (Fig. 6)

4.3.1. The UDR employs photo-electric sensing of the punched tape, to give reliable, accurate reading at high speeds without causing wear to the tape.

Registration of the tape, and timing of the data outputs is also accomplished by photo-electric sensing, using the 'sprocket' track of the punched tape. The absence of a drive sprocket allows rapid tape acceleration/deceleration without damage, but increases the requirements for stability of the 'sprocket' signal.

The stability of the photocell outputs of a photo-electric reader is affected by the following factors:-

a) The light source intensity.

b) The light loss in the optical path, e.g. by dust accumulation.

c) The opacity of the tape.

d) The accuracy of the punching, particularly laterally.

e) The lateral guidance of the tape.

f) The width of the tape.

g) The sensitivity of the photocells, e.g. variation through aging and temperature changes.

h) The leakage of the photocells when dark.

4.3.2. The factors listed in paragraph 4.3.1. combine to vary the amplitude of the output of each photocell as indicated in Fig. 6a. In a conventional photo-electric sensing system, a threshold level is set, above which the output is switched to the 'light' logic state, and below to the 'dark' logic state. It may be seen that for a reduced output, the duration of the 'light' state is decreased, and will disappear if reduced to one half of the ideal output.

In the UDR the threshold level is defined by the output of an 'additional' reference photocell which is in line with the 'sprocket' track but removed $1\frac{1}{2}$ code pitches (0.15 inches) from the 'sprocket' and code hole photo-cells. Fig. 6b shows that the 'sprocket' and reference outputs cross at about 1:1 light:dark ratio, and as the same factors offset both 'sprocket' and reference outputs, the switching points remain virtually unchanged with reduced output level.

4.3.2.

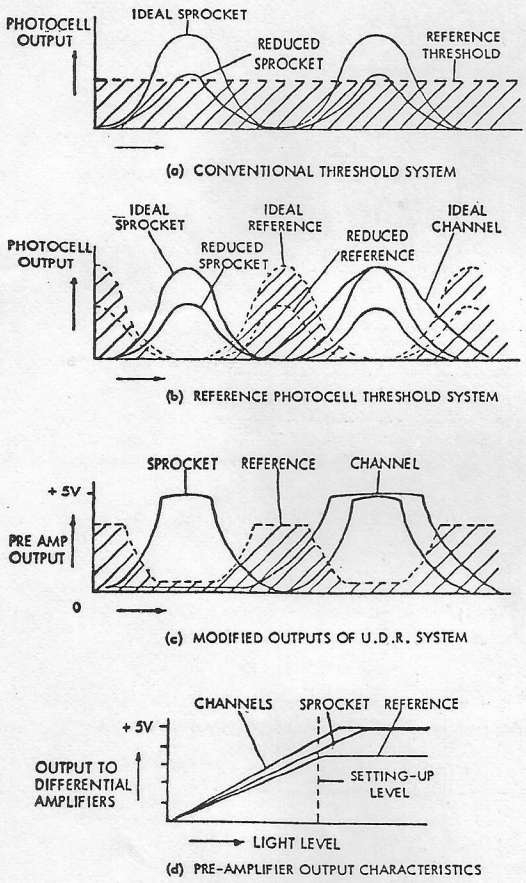


Fig. 6 - Photocell Waveforms.

The waveform obtained from the larger code holes is shown in Fig. 6b and it may be seen that the reference cell output may be used as the switching threshold for these also. However, a code hole is not necessarily punched. It may, unlike the sprocket output, be at a minimum whilst the reference output is at a minimum. Another potentially ambiguous condition is when the tape is absent from the read head, when all outputs will be at their maxima. These problems are overcome by clamping the light and dark levels of the reference amplifier outputs, as indicated in Fig. 6d. This diagram also shows that the sensitivities of the channel, sprocket and reference photocell amplifiers are set to different levels. This ensures unambiguous outputs with no tape present, and also increases the separation of channel output transitions outside the sprocket light output period.

The photocell amplifiers are set up with no tape under the read head, but with a light reducing filter between the light source and the photocells which reduces the photocell outputs by another 50%. In this condition the levels are set as indicated in Fig. 6d. With the filter removed, and punched tape moved across the read head, the actual amplifier outputs are as shown in Fig. 6c. It can be seen that the 'cross-over' switching points still occur in the linear characteristic region, giving the required compensation, whilst a large reduction in the signal levels can be accommodated.

4.3.3. <u>Photocell Amplifier Circuits (Fig. 7a)</u>

Each of the eight channel photocells is connected to similar amplifiers. Channel 1 Amplifier circuit is illustrated in Fig. 7a.

The photocell generates a current in the 'reverse' direction which is proportional to the light intensity acting on it. This current is passed into a low input impedance transistor amplifier TR1 which has near unity current gain.

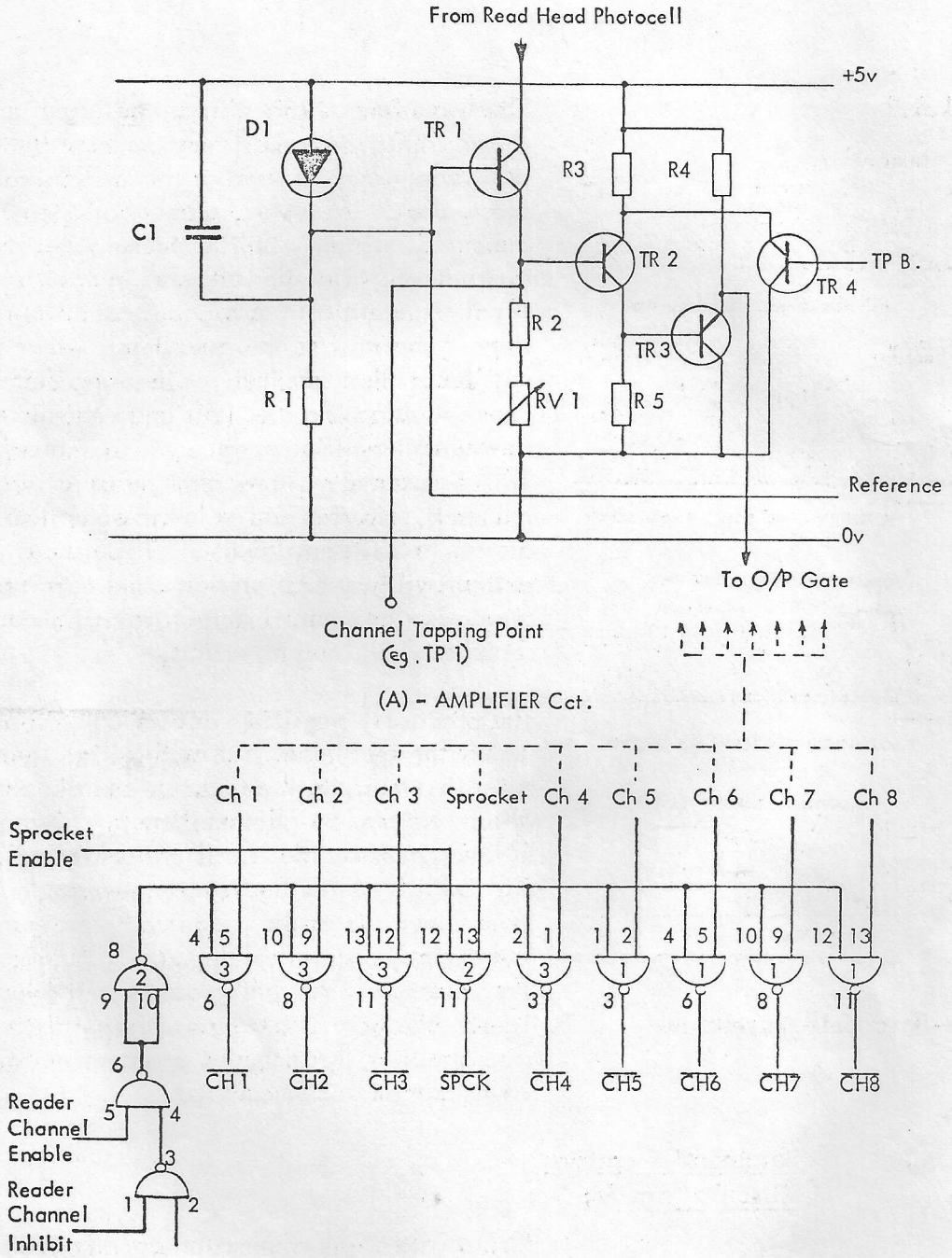


Fig. 7 - Photocell Amplifier Circuit and Output Gating

4.3.3. Photocell Amplifier Circuits (Fig. 7a) (Contd/)

The base of TR1 is biassed to the forward voltage drop of D1 (approximately 0.7v) from the +5v supply, which balances the base to emitter voltage of TR1 leaving virtually zero voltage across R2 and RV1 proportional to the current, and thus to the photocell illumination. The magnitude of the voltage for a particular light level can be adjusted by varying RV1 to compensate for differences between photocells and their intensities.

The sprocket and reference photocells (see Fig. 24) have similar input amplifier stages, except that values of the collector load resistors are increased to compensate for the reduced area of illumination of these two cells, and in order to set the different sensitivites required, as explained in para. 4.3.2. The output of the reference cell input stage TR39 is amplified by complementary common emitter stages TR38 and TR37 to give an output at the same voltage but at a lower input impedance, except that the upper and lower limits are clamped by diodes D3 and D2 respectively for reasons explained in paragraph 4.3.2. The output from TR37 (T.P.A.) is connected to one input of the differential amplifiers associated with each of the channels and the sprocket.

When the voltage at the collector of TR1 (T.P.1.) is more positive than that at T.P.A., TR2 and TR3 will be 'OFF' and TR4 'ON', and the input 3/5 will be at 'logic 1'. This corresponds to channel 1 in the light state. When the voltage at T.P.1. becomes more negative than that at T.P.A., TR2 switches 'ON' and pulls TR3 'ON', whilst TR4 switches 'OFF', and input 3/5 switches to logic 0, corresponding to channel 1 in the DARK state. It should be noted that the collector current of TR2 or TR4 when conducting is limited by the common emitter resistor R3.

The sprocket channel amplifier TR14, 15 and 16 (Fig.24) operates in the same manner, except that the additional feedback resistor R81 gives the circuit a Schmidtt Trigger characteristic.

4.3.3. Photocell Amplifier Circuits (Fig. 7a) (Contd/)

When TR14 or TR15 are 'OFF', R81 tends to pull the differential input, TP9 more positive, but as soon as TR14 and TR15 begin to switch 'ON', this positive bias is removed and then becomes reversed, accelerating the switching action. This ensures that the sprocket output switches cleanly even when the tape is moved very slowly across the read head, and allows a small amount of tape recoil after switching without reversing the output. The hysteresis imparted by this feedback has the effect of delaying the sprocket output slightly to the channel outputs.

4.3.4. Output Gating (Fig. 7b)

The output from each channel amplifier is gated by a 2 input NAND gate with a common enable line.

Consider channel 1: When the amplifier output at IC3:5 and the enable line at IC 3:4 are both at logic 1, the output at IC3:6 and hence to the interface will be at logic 0. If either the amplifier output or the enable line is at logic 0 then IC3:6 output to the interface will be logic 1. For the enable line to be at logic 1, the Reader Channel Enable input must be at logic 1 and the Reader Channel Inhibit input must be at logic 0.

Note:- The output of the Sprocket Channel Amplifier is similarly gated to that described above, with a separate enable signal from the Sprocket Enable input.

4.4. Interface

4.4.1. Interface Levels

All interface connections to the UDR are to or from 930 Series D.T.L. integrated circuit elements of the $0^{o}C$ - $75^{o}C$ specification. The only two types of element used are 936 inverter and 946 two input gates, which have similar input and output characteristics, as detailed below. Additional information may be obtained from the appropriate data sheets of any of the many manufacturers of 930 Series D.T.L.

4.4.1.1. Input Loads

Each unit input load is approximately equivalent to 4K ohm resistance to +5v in series with a diode, which allows current only out of the load.

4.4.1.2. Output Drive

Each unit output drive is sufficient to sink the current from one unit input load whilst maintaining a logic 0 output. In the logic 1 state, each output is approximately equivalent to 6K ohm to +5v.

4.4.1.3. Logic 0 Level

Inputs:	0.95v maximum
Outputs:	0.5v maximum

4.4.1.4. Logic 1 Level

Inputs:	2.0v minimum
Outputs:	2.5v minimum

4.4.1.5. Rise and Fall Times

Inputs:	Preferably 0.1us to 10us. Faster transitions are likely to cause cross-talk in long cables and slower transitions may cause instability in the receiving circuits.
Outputs:	Typically 0.1us to 10us. Dependent on load impedance, particularly capacitance.

4.4.2. Interconnecting Cables

It is recommended that generally interconnecting cables should be no longer than 20 ft. in length, and should be provided with an overall earthed screen.

4.4.3. Control Signals

4.4.3.1. Drive - 1 Unit Load
Transport Enable - 1 Unit Load

Provided that 'Transport Enable' is maintained at logic 1 the reader will drive tape. The reader brake will be applied if 'Transport Enable' is held to logic 0.

4.4.3.2. Sprocket Enable - 1 Unit Load

Logic 1 on this input gates the signal from the sprocket channel amplifier into the 'Sprocket' output. Logic 0 holds the 'Sprocket' output in the 1 state (= dark). No connection is equivalent to logic 1.

4.4.3.3. Channel Enable - 1 Unit Load

Logic 1 on this input, gates the signal from the channel amplifiers onto the corresponding 'Channel' outputs. Logic 0 holds all 'Channel' outputs in the 1 state (=dark). No connection is equivalent to logic 1.

4.4.3.4. Channel Inhibit - 1 Unit Load

Logic 0 on this input gates the signal from the channel amplifiers onto the corresponding 'Channel' outputs. A logic 1 holds all 'Channel' outputs in the 1 state. No connection is equivalent to logic 1, thus if this input is not required for control purposes, it must be connected to 0v.

4.4.3.5. Channels - each 8 Units drive

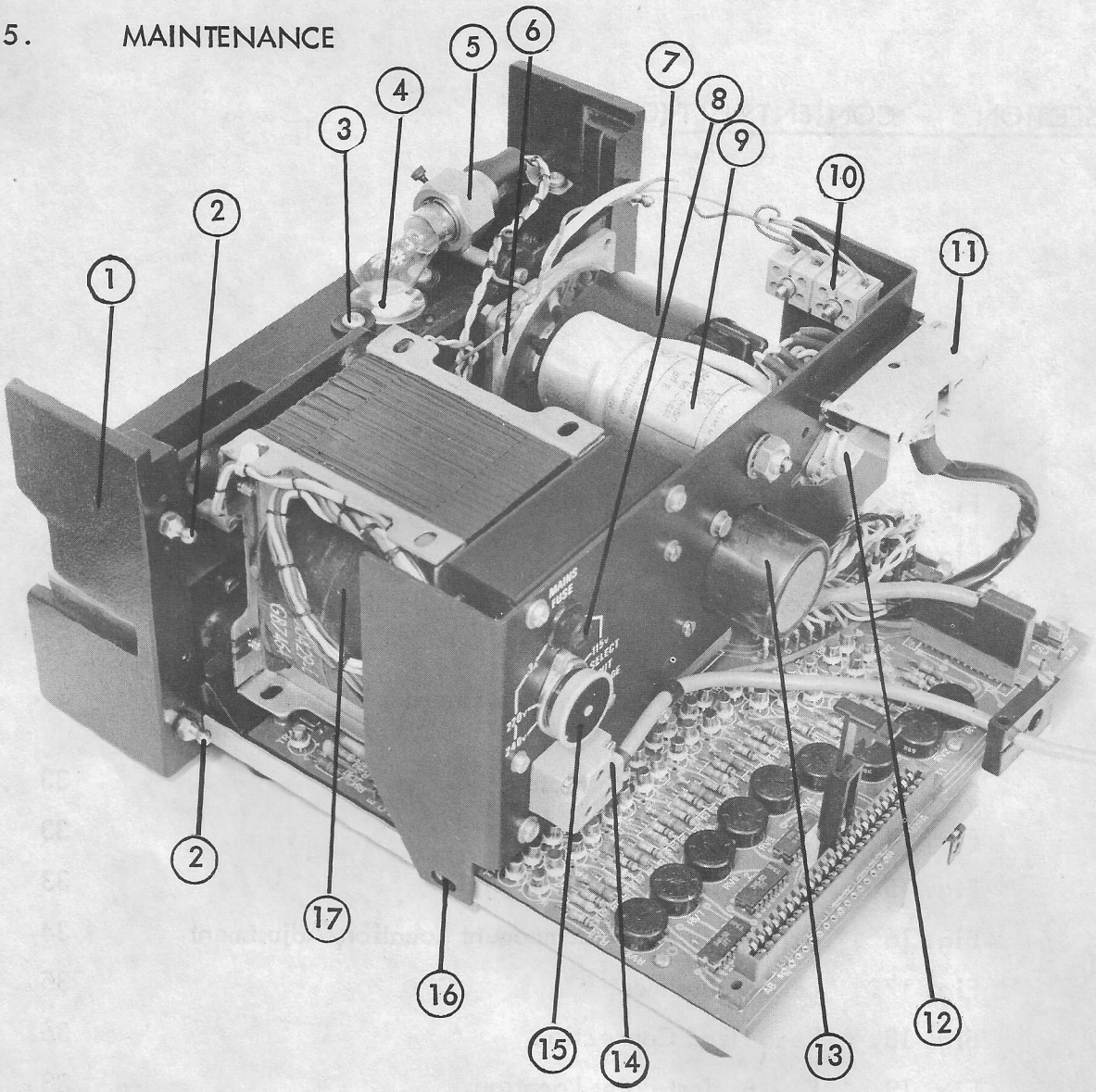
These outputs are at logic 0 when their respective data channel holes are in line with the read (light) and at logic 1 when tape obscures the read head (dark) provided that Channel Enable is at logic 1 and 'Channel Inhibit' is at logic 0. Channel signals should be stroked when 'Sprocket' is at logic 0.

SECTION 5 - MAINTENANCE

CONTENTS

SECTION 5 - CONTENTS LIST (Contd/)

SECTION 5 - CONTENTS LIST (Contd/)



1. FRONT CASING.
2. COVER RETAINING STUDS.
3. LENS RETAINING SCREW.
4. LENS.
5. LAMP ASSEMBLY.
6. MOTOR END PLATE.
7. MOTOR (EXTERNAL ROTOR).
8. EQUIPMENT 'MAINS'FUSE.
9. CAPACITOR C20.
10. MOTOR TERMINAL BLOCK.
11. SKT. 'A'.
12. TRANSISTOR TR60 (2N2055).
13. CAPACITOR - MOTOR.
14. MAINS I/P TERMINAL BLOCK.
15. VOLTAGE SELECTOR.
16. SCREW SECURING POWER UNIT/BASE
17. TRANSFORMER.

Fig. 8 - Component Location - Cover Removed

5. MAINTENANCE

5.1. Dismantling and Re-assembly

5.1.1. Removal of Equipment Cover

1. Remove the single screw situated centre bottom of the rear panel of the cover.
2. The rear of the cover should be pressed downwards to release it from the four studs (Fig. 8:2).
3. The cover may now be removed by pulling clear of the studs and by lifting up from the Base Plate.

5.1.2. Removal of the Front Upper Decorative

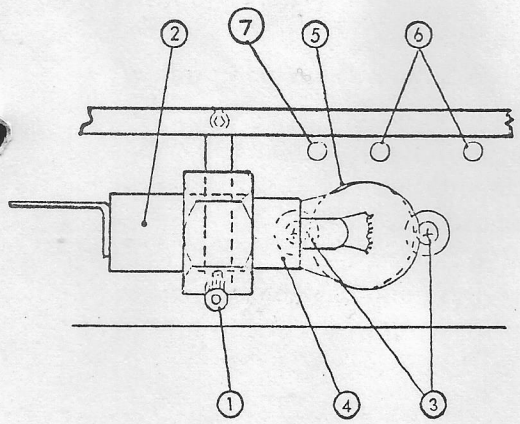
The Front Upper Decorative may be levered from its position - held by two spring clips (Fig. 10:1).

5.1.3. Removal of the Front Lower Decorative

The Front Lower Decorative may be levered from its position held by two spring clips (Fig. 10:15).

5.1.4. Removal of Lamp Assembly and Lens

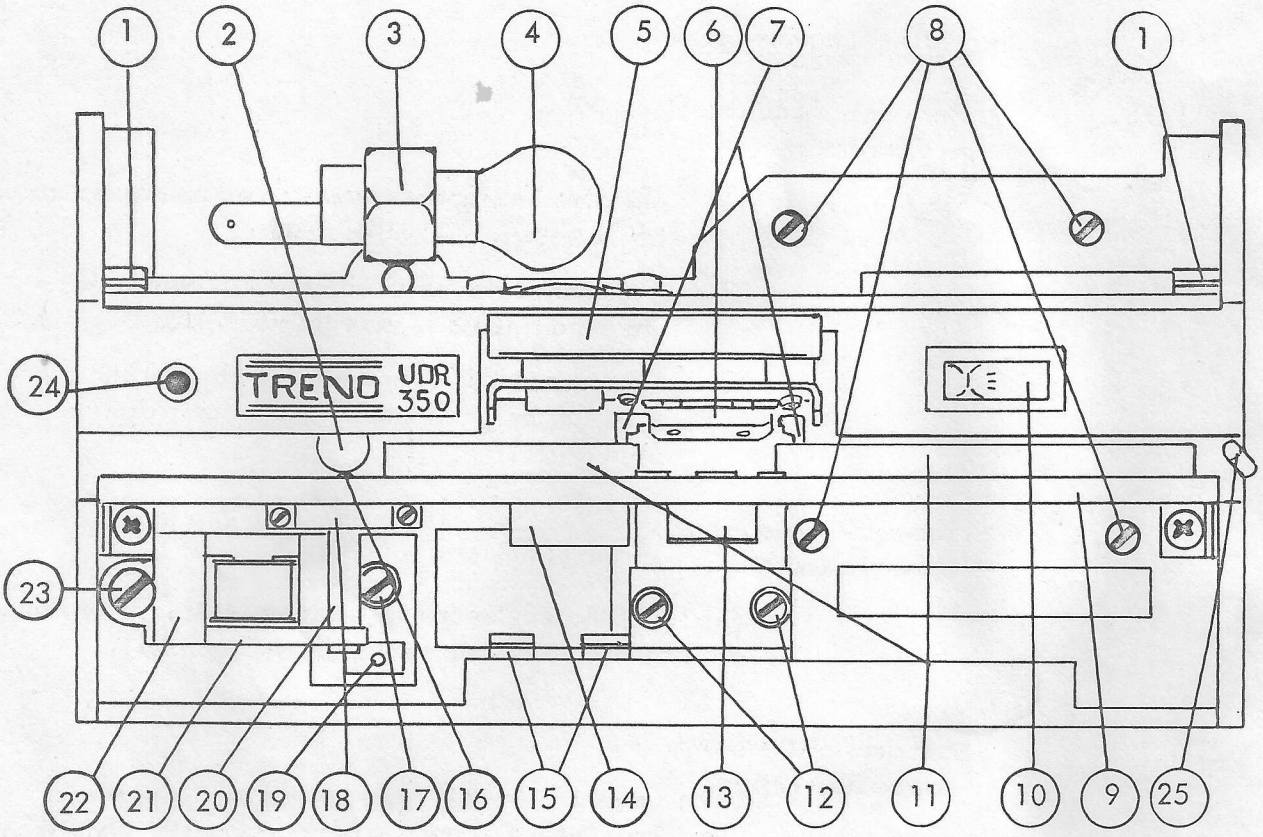
1. Remove the Equipment Cover as detailed in paragraph 5.1.1.
2. Remove the Upper Decorative as detailed in paragraph 5.1.2.
3. Disconnect the lamp supply cable from the lamp holder.
4. Loosen the horizontal Adjusting Screw (Fig. 9:1).
5. Move the lampholder (Fig. 9:2) to the right.
6. Remove the lamp (Fig. 6:4) from the lampholder.
7. To remove the lens (Fig. 9:5) from the mounting, remove two screws (Fig. 9:3) and retaining discs.



1. Adjusting Screw.
2. Lampholder.
3. Lens Retaining Screws.
4. Lamp.
5. Lens.
6. Tape Flap Securing Screw access
7. Read Head Securing Screw access

Fig. 9. Lampholder

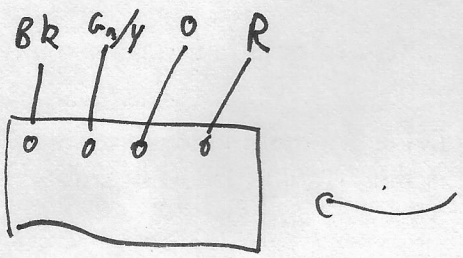
5. MAINTENANCE



1. Spring Clips - Securing Front Upper Decorative
2. Drive Roller.
3. Lamp Mounting.
4. Lamp.
5. Tape Flap.
6. Sprung Brake Shoe.
7. Tape Flap Clamp.
8. Transformer Securing Screws.
9. Tape Platform.
10. Mains On/Off Switch/Indicator.
11. Edge Guides.
12. Brake Solenoid Securing Screws.
13. Brake Solenoid.
14. Photocell Read Head.
15. Spring Clips - Securing Front Lower Decorative.
16. Pinch Roller.
17. Drive Solenoid Securing Screw.
18. Pinch Roller Block.
19. Recess for Adjusting Tool HR04.
20. Pinch Roller.
21. Armature.
22. Drive Solenoid.
23. Drive Solenoid Securing Screw.
24. Customer Option Switch.
25. Tape Guide.

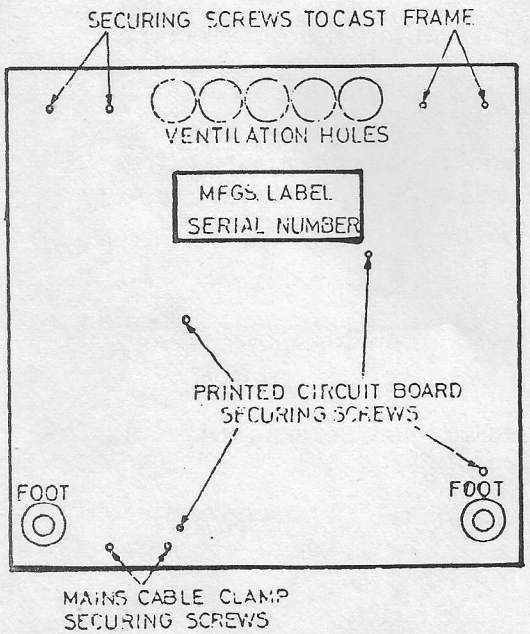
Fig.10 - Component Location - Decoratives Removed

5.1.5. Removal of the Power Unit Assembly



1. Remove the Equipment cover as detailed in paragraph 5.1.1.
2. Remove the Upper and Lower Decoratives as detailed in paras. 5.1.2. - 5.1.3.
3. Disconnect Plug from Skt. A. (Fig. 8:11).
4. Disconnect the mains input lead from the mains L/P Terminal Block (Fig. 8:14).
5. Disconnect the Drive Motor supply leads from Terminal Block (Fig. 8:10).
6. Remove the snap connectors from the Equipment ON/OFF Sw (Fig. 10:10).
7. Remove the two screws (Fig. 8:16) securing the Power Unit to the Base Plate.
8. Taking care to support the Power Unit remove the four transformer securing screws (Fig. 10:8).
9. The Power Unit can now be removed.

5.1.6. Removal of the Base Plate



1. Remove the Equipment cover as detailed in paragraph 5.1.1.
2. Remove the top screws (Fig. 8:16) securing the Base Plate to the Power Unit.
3. Free the mains input cable from the cable clamp.
4. Remove the four screws (Fig. 11) securing the Base Plate to the main casting.
5. The Base Plate with the Printed Circuit Board can now be moved to the limits of the connecting leads.

Fig. 11 - Base Plate.

5.1.7. Removal of Drive Solenoid Assembly

1. Remove the Equipment Cover as detailed in paragraph 5.1.1.
2. Remove the lower decorative as detailed in paragraph 5.1.3.
3. Remove the Base Plate as detailed in paragraph 5.1.6.
4. Disconnect the Drive Solenoid leads - twisted black pair - from the Printed Circuit Board flying leads from sockets 3 and 4.
5. Loosen the plastic cable form ties.
6. Remove the securing screws from the pinch roller block (Fig. 10:18).
7. Remove the screws securing the Drive Solenoid (Fig. 10:17,23).
8. The Drive Solenoid Assembly may now be drawn clear.

5.1.8. Removal of Brake Coil Assembly

1. Remove the Equipment Cover as detailed in paragraph 5.1.1.
2. Remove the lower decorative as detailed in paragraph 5.1.3.
3. Remove the Base Plate as detailed in paragraph 5.1.6.
4. Disconnect the Brake Solenoid leads - twisted pairs Brown/Red and Yellow/Orange from the Printed Circuit Board - flying leads from sockets 8 and 7, and 6 and 5.
5. Loosen the plastic cable form ties.
6. Remove the two brake solenoid securing screws (Fig. 10:12).
7. The Brake Solenoid can now be removed. Take care to retain the two spacers.

5.1.9. Removal of Drive Motor Assembly

1. Remove the Equipment Cover as detailed in paragraph 5.1.1.
2. Remove the upper and lower decorative as detailed in paragraphs 5.1.2. and 5.1.3.
3. Remove the Power Unit as detailed in paragraph 5.1.5.
4. Disconnect the Earth Connection from the Motor End Plate (Fig.8:6).
5. Remove the Drive Solenoid assembly as detailed in paragraph 5.1.7.
6. Remove the Lamp Assembly.
7. Taking care to support the Motor remove the four Motor Securing Screws - two from within the main frame recess below the Lamp Assembly position and two from behind the Pinch Block Assembly position.
8. The Drive Motor can now be removed.

5.1.10. Removal of Tape Flap Assembly

1. Remove the Equipment Cover as detailed in paragraph 5.1.1.
2. Remove the Upper Decorative as detailed in paragraph 5.1.2.
3. Loosen the tape flap clamps (Fig.10:7). Access to the securing screws (Fig. 9:6) is achieved through the main casting to the rear of the lens seating.
4. Withdraw the Tape flap assembly taking care not to loosen the pivot spindle.

5.1.11. Removal of Read Head

1. Remove the Equipment Cover as detailed in paragraph 5.1.1.
2. Remove both decoratives as detailed in paragraphs 5.1.2. and 5.1.3.
3. Remove the base plate as detailed in paragraph 5.1.6.

5.1.11. Removal of Read Head (Contd/)

4. Disconnect plug from Skt. 2 on the printed circuit board.

5. Loosen the plastic cable form ties.

6. Unscrew the Photo Head securing screw (Fig.9:7) Access to this screw is achieved through the main casting to the rear of the lens seating.

7. Remove the Photo Head (Fig.10:14) taking care when passing the cable through the main casting.

5.1.12. Removal of Tape Flap Microswitch Assembly

1. Remove the Equipment Cover as detailed in paragraph 5.1.1.

2. Disconnect the microswitch connections.

3. Loosen the capacitor clamp (Fig. 12a:6) and ease Capacitor C20 (Fig. 12a:5) from the position in the Power Unit Frame.

4. Access the tape flap microswitch securing screws can now be obtained through the vacated Capacitor position. Unscrew the two screws and remove the microswitch assembly.

5.1.13. Removal of Printed Circuit Board

1. Remove the Equipment Cover as detailed in paragraph 5.1.1.

2. Remove the base plate as detailed in paragraph 5.1.6.

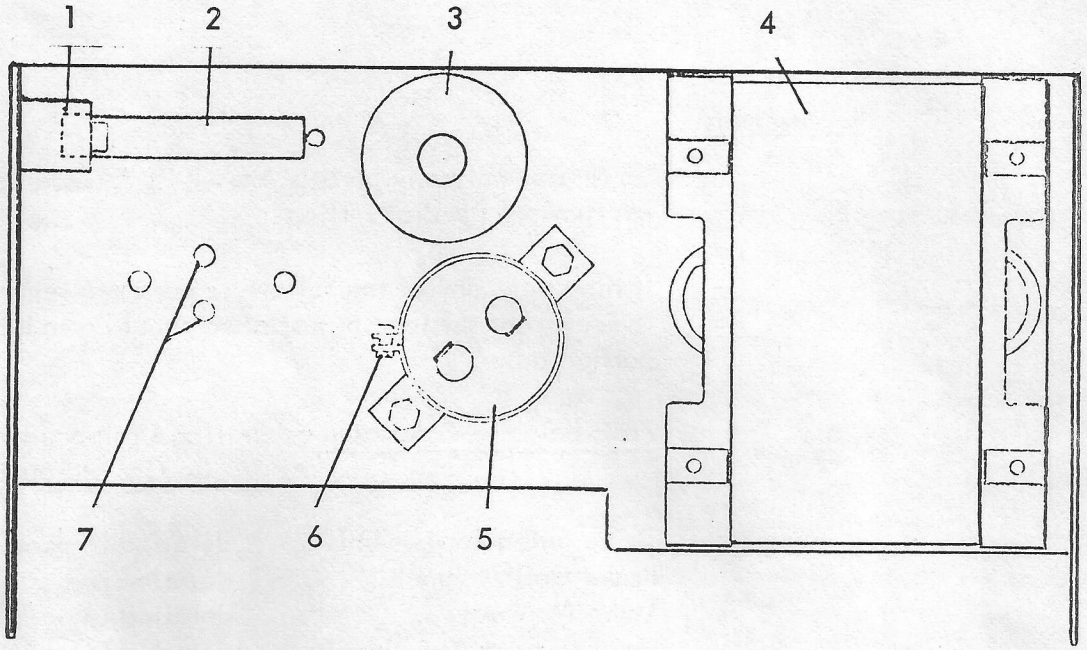
3. Disconnect SK1, SK2 and all flying leads from the printed circuit board.

4. Loosen the mains supply cable from the cable clamp.

5. Unscrew the four printed circuit board securing screws (Fig. 19:SS).

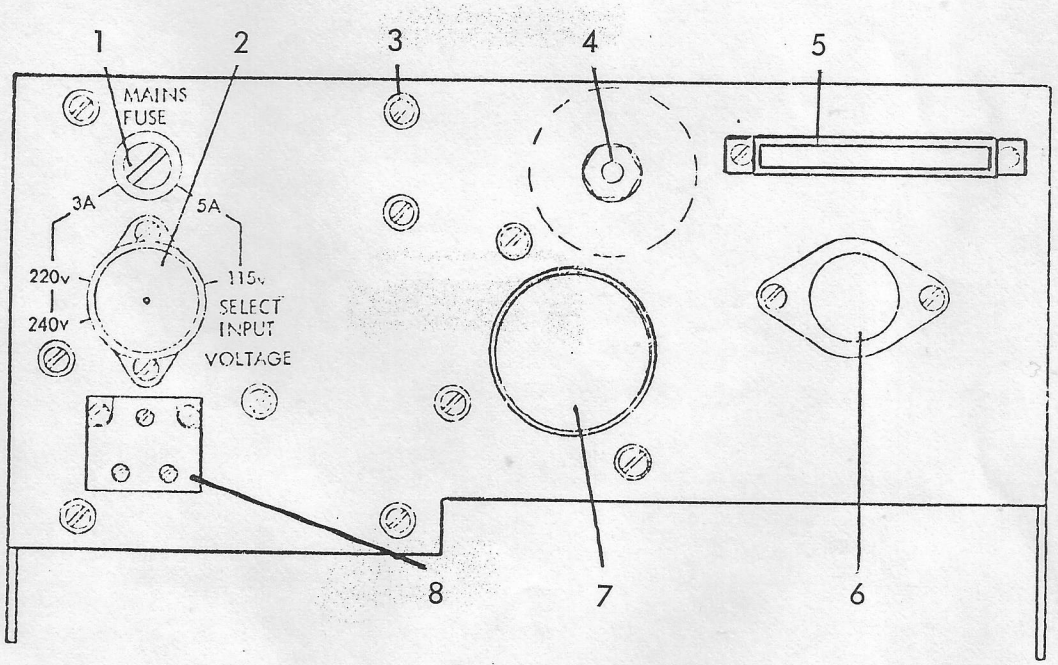
6. The printed circuit board can now be lifted clear of the Base Plate.

5. MAINTENANCE



1. Motor Terminal Block.
2. Skt. A.
3. C (Motor)
4. Transformer.
5. C20.
6. Capacitor Clamp.
7. TR 60.

Fig. 12a - Power Unit Sub-Assy. - Internal.



1. Mains Fuse.
2. Voltage Adjustment Switch.
3. Transformer Securing Screw (4 off).
4. C Securing Nut.
5. Skt. A.
6. TR 60.
7. C (Motor).
8. Main Input Terminal Block.

Fig.12b - Power Unit Sub-Assy. - External.

5.2. Re-assembly

To re-assembly any parts of the UDR, reverse the instructions for dismantling.

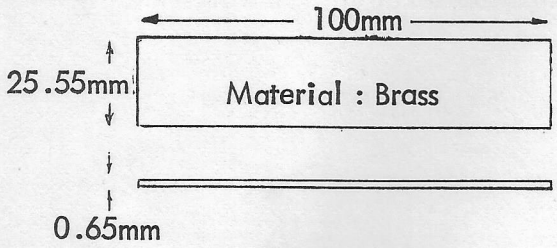
If however, any of the following parts are removed the relevant setting up procedure should also be carried out:-

Parts being re-assembled	Setting Up Procedures to be Carried out
Drive Solenoid Assembly	detailed in para. 5.3.4.
Brake Coil Assembly	detailed in para. 5.3.3.
Lamp Assembly	detailed in para. 5.4.3.
Loading Flap Assembly	detailed in para. 5.3.1.
Read Head	detailed in para. 5.5.3.

5. MAINTENANCE (Contd/)

5.3. Settings and Adjustments - Mechanical

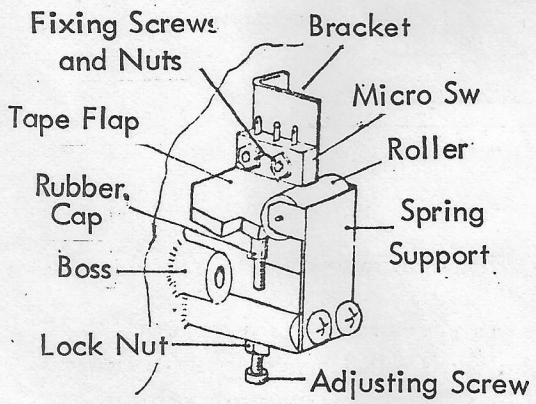
5.3.1. Loading Flap and Microswitch Bracket Positions.



To correctly set these items a Setting Plate as shown in Fig. 13 should be placed under the flap which must be placed in the 8 channel position. The loading flap should be firmly pushed against this setting plate before the clamp screws (Fig. 9:3) are tightened. With the setting plate still in position, the microswitch bracket should be brought down into contact with the flap and the bracket fixing screws should be tightened.

Fig. 13 - Tape Flap Setting Plate

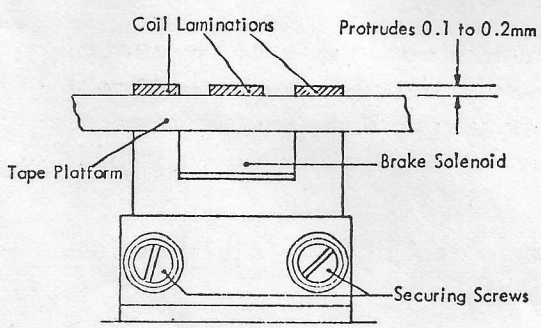
5.3.2. Micro-Switch Position



The switching point of the micro-switch should be set .05- .20 m.m.below the bottom edge of the micro-switch bracket. to check this position a .05 m.m. feeler guage should be inserted between the flap and the micro-switch bracket. Closing the flap on the feeler guage should operate the switch. With a .20 m.m. feeler guage in this position, closing the flap should not operate the switch. If the micro-switch needs re-positioning, slacken the two fixing screws, move the switch in the bracket slots and retighten the fixing screws. The tape flap open position may be adjusted by utilising the rubber capped adjuting screw and lock nut.

Fig. 14 - Micro-switch Setting

5.3.3. Brake Coil Assembly Position (Fig. 15)



The laminations of this assembly should protrude by 0.1 to 0.2 m.m. above the upper surface of the tape platform. Adjustment is made by slackening the two securing screws (Fig.15) and repositioning the assembly.

Fig. 15 - Brake Solenoid Positioning.

5.3.4. Drive Solenoid Settings
(Fig.16)

For optimum reader performance correct drive solenoid settings are essential.

Equipment Required - Special Tool HRO4.

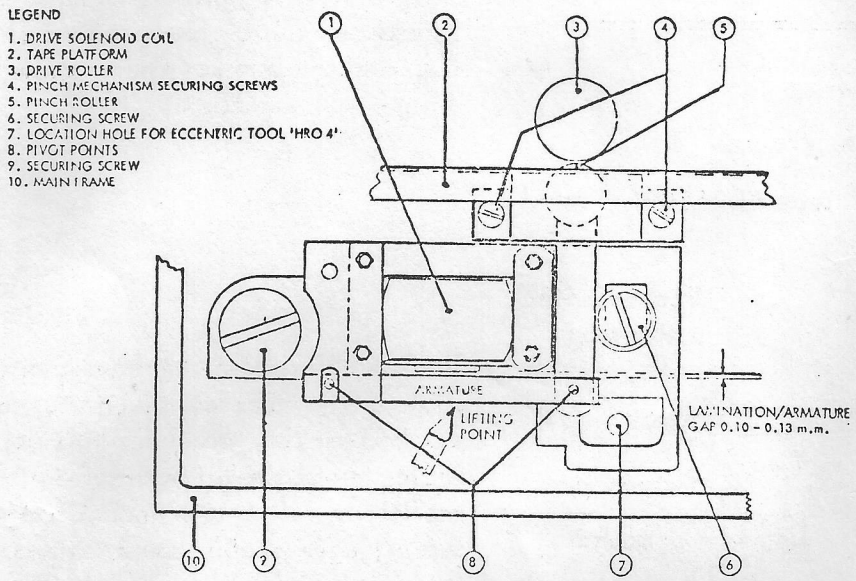


Fig. 16 - Drive Solenoid - Component Location/Adjustment

The correct gap between armature and drive coil laminations should be 0.10 - 0.13 m.m. The following procedure should be followed when adjusting the gap.

a) Slightly loosen the solenoid assembly securing screws (Fig. 16:6 and 9).

b) Load a strip of standard (0.1 m.m. thick) paper tape into the UDR.

c) Lift the Solenoid armature (Fig. 16) by centrally applied pressure (a pencil makes the ideal tool to lift the armature) until the tape is gripped between the pinch (Fig.16:5) and drive (Fig. 16:3) rollers.

d) Insert the special tool HRO4 into the location hole (Fig. 16:7).

e) Turn the tool to move the solenoid mounting, and adjust for the correct gap between the armature and coil laminations.

f) Tighten the securing screws and re-check the gap.

5. MAINTENANCE (Contd/)

5.4. Optical Settings and Adjustment

5.4.1. Equipment required:-

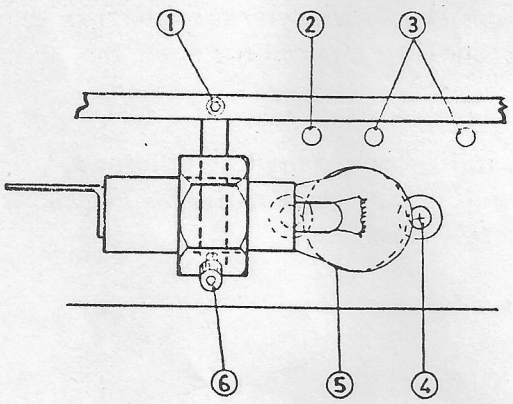
Lamp focussing pattern card - type HRO2.
Multimeter with connector clips - 250uA fsd - typically AVO Model 8.

5.4.2. Cleaning

Ensure the lamp lens and photocell head window are free of dust. Should the lamp be blackened or the filament distorted, it should be replaced.

5.4.3. Lamp Adjustment (Fig. 17)

Note:- An electronic test rig is available for the manufacturers' service engineers to carry out the Lamp Adjustments.



1. Vertical Adj. Screw.
2. Photo Head Sec Screw-Access.
3. Tape Flap Clamp Sec Screw-Access.
4. Lens Securing Screw and Washer.
5. Lens.
6. Horizontal Adj. Screw.

a) Ensure the lamp filament is horizontal. Rotation of the lamp holder by slackening the adjusting screw (Fig. 17:6) achieves this.

b) Switch the UDR 'ON'.

c) Place the lamp focussing pattern card HRO2 on the tape table and align the arrow head on the card with the scribed mark on the edge guide.

d) Lower the Tape Flap - the lamp will light.

e) Slacken the Lamp Adjusting screws (Fig. 17:1 and 6) and move the lamp until an image closely conforming to the pattern on the card is obtained.

f) Tighten the adjusting screws - re-check the image - remove the test card.

g) Remove the 12 way connector from SK2 on the printed circuit board.

h) With the multimeter set to the 250 uA dc range check between the common connection (Pin 5 of the 12 way connector) and each channel connection in turn. Pin numbers are listed overleaf:-

Fig. 17 - Lamp Adjustment.

5.4.3. Lamp Adjustment (Contd/)

Channel No.	Connector Pin No.	Colour Code
1	2	Brown
2	3	Red
3	4	Orange
4	1	Yellow
5	6	Green
6	7	Blue
7	8	Violet
8	9	Grey
Ref.	11	White
Sprocket	10	Black
Common	5	Pink

The current flow in each case should be greater than 130 uA. For the 'sprocket' and 'reference' photo-cell outputs the current flow should be greater than 50 uA.

j) Should the specified outputs not be obtained, carefully re-adjust the lamp position as in sub para. 'e' and re-check.

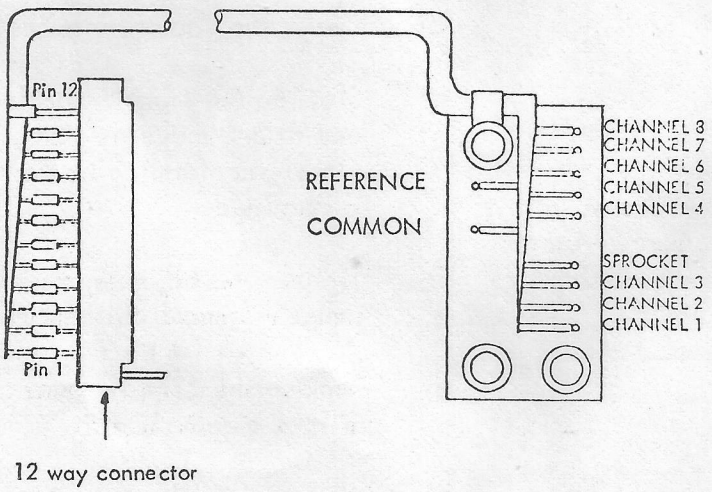


Fig. 18 - Read Head Connections.

5. MAINTENANCE (Contd/)

5.5. Electronic Settings and Adjustments

For the static electronic settings and adjustments listed in paras. 5.5.2. and 5.5.3. the drive motor should be immobilised. This is effected by:-

a) Removing the Equipment Cover as detailed in para. 5.1.1.

b) Disconnecting the drive motor supply from the terminal block (Fig. 11).

5.5.1. Equipment Required

Setting-up filter - Type HRO3.
Multimeter with connector clips - typically AVO Model 8.

5.5.2. Reference Voltage Check (Fig. 19).

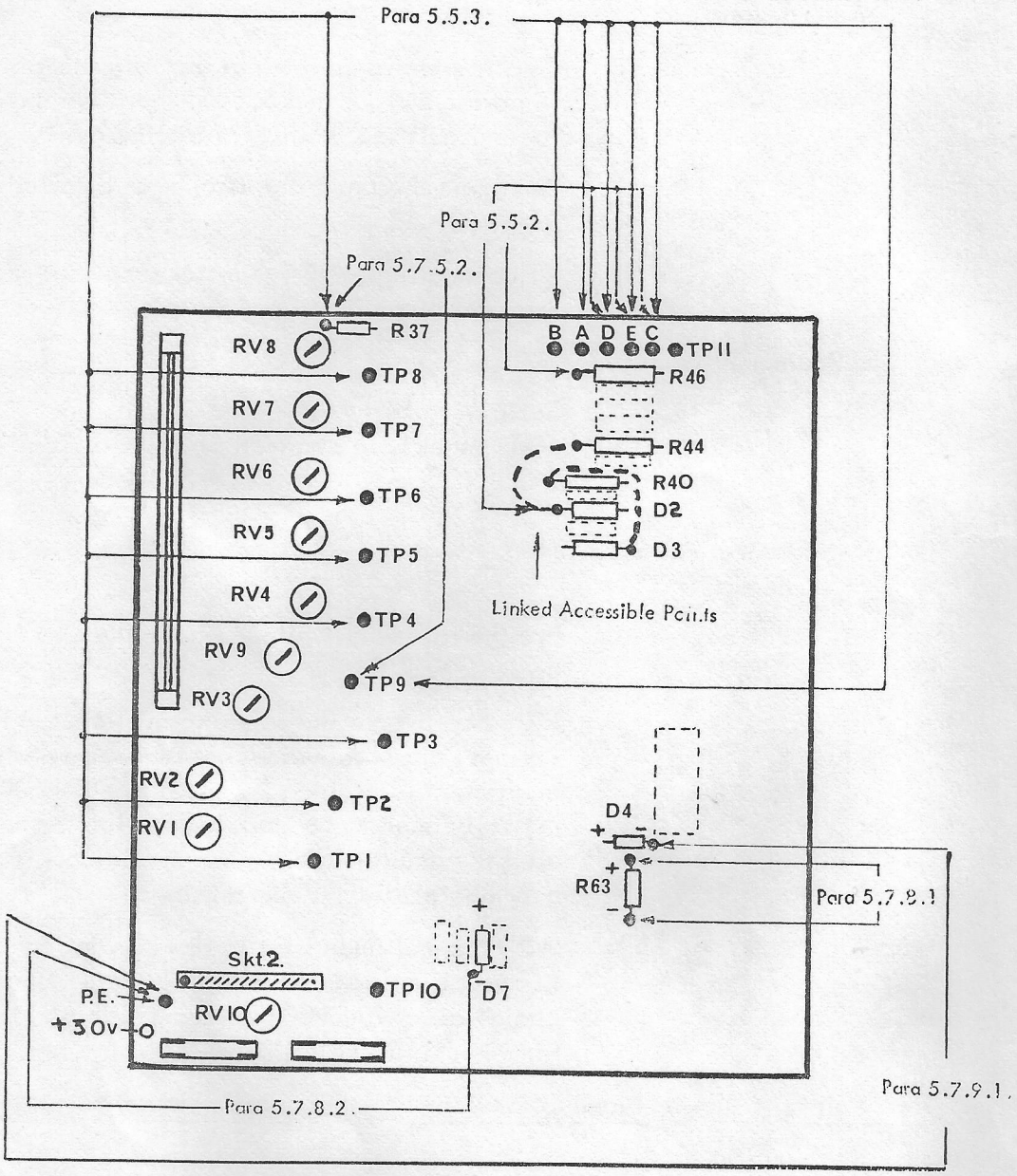
a) For the following voltage check the UDR must be switched 'ON'.

b) Listed below are the reference voltages. These voltages are obtained by use of fixed resistors and potential dividers. Adjustments should not normally need to be made. The limits quoted are provided for information should doubts arise over photocell amplifier settings.

c) With the multimeter set to the 10v dc range and the negative lead connected to the 0v line (R37 end adjacent to RV8 is an accessible point) check the voltage of the following points:-

Test Point	Nominal Voltage	Lower Limit	Upper Limit
R46 +ve end (+5v). (R51 end adjacent to TPA is common to R46 +ve)	5v	4.75v	5.25v
TPC	4.45v	4.2v	4.7v
TPD	3.92v	3.7v	4.1v
TPE	3.72v	3.5v	3.9v
D2 -ve end. (R44 -ve end is common and more accessible)	1.24v	1.2v	1.3v
D3 +ve end. (R40 -ve end is common and more accessible).	3.5v	3.3v	3.7v

Note: The limits quoted above are for a +5v line within the limits $\pm$ 0.1v. The unit will function correctly with the +5v line up to $\pm$ 0.25v from nominal. All reference voltages will change proportionally.



Note: This figure illustrates the position of those Test Points referred to in the handbook text. Other points/components are included only as a guide to the location of the required Test Points.

Fig. 19 - P.C. Board Test Point Location.

5.5.3. Photocell Amplifier Adjustment (Fig. 19)

a) For the following voltage check the UDR must be switched 'ON', the loading flap closed but NO tape inserted.

b) Place the filter MRO3 on the upper surface of the tape loading flap in the light path to the photocells.

c) Switch the Multimeter to the 50 uA d.c. range.

d) Connect the Multimeter leads as detailed in the table below and adjust the designated variable resistor to obtain zero indication on the meter.

Photocell	Meter Lead Connections	Adjust
CH1	TPC - TP1	RV1
CH2	TPC - TP2	RV2
CH3	TPC - TP3	RV3
CH4	TPC - TP4	RV4
CH5	TPC - TP5	RV5
CH6	TPC - TP6	RV6
CH7	TPC - TP7	RV7
CH8	TPC - TP8	RV8
SPROCKET	TPD - TP9	RV9
REFERENCE	TPE - TPA	RV10

e) Switch the Multimeter to the 10v d.c. range.

f) Connect the positive lead to TPB and negative lead to the 0v line (R37 - end adjacent to RV8 is an accessible point). Check that the meter indicates 3.1v - 3.5v (typically 3.3v).

g) Remove the filter HRO3. Check that the indicated volts do not vary by more than 0.1v.

h) Lift the tape loading flap. Check that the voltage indicated falls to 0.7v - 0.9v.

5.6. Maintenance Procedures

5.6.1. Recommended Frequency - after 500 hours run or three months - whichever is the shorter.

a) Remove the Equipment Cover (refer to para. 5.1.1.).

b) Remove the Upper and Lower Decoratives (refer to paras. 5.1.2. and 5.1.3.).

c) Use a clean camel hair to remove any dust from the lens and lamp.

d) Examine lamp - if blackened replace (refer to para. 5.1.4.).

e) Remove any dust from drive solenoid assembly.

f) Apply a drop of light machine oil to the pivot points of the drive solenoid armature.

g) Check the drive solenoid armature to coil lamination gap (refer to para. 5.3.3.).

h) If a new lamp has been fitted - sub para.(d) above - carry out optical checks and adjustments detailed in para. 5.4.3.

j) Carry out amplifier checks and adjustments detailed in para. 5.5.3. irrespective of whether a new lamp has been fitted or not.

5.6.2. Overhaul

Frequency - As necessary after an extended period of use.

a) Remove the Equipment Cover (refer to para. 5.1.1).

b) Remove the Upper and Lower Decoratives (refer to paras. 5.1.2. and 5.1.3.).

c) Examine the Drive Motor Mounting - if loose, tighten (refer to para. 5.1.9.).

d) Examine drive solenoid assembly for excessive wear.

e) Examine the pinch roller for wear. If the radial play is in excess of 0.1 m.m. the unit should be replaced (refer to para. 5.1.7.).

f) Examine the brake coil assembly. If the wear on the laminations is such that the adjustment detailed in para. 5.3.3. is impossible, the item must be replaced (refer to para. 5.1.8.).

5.6.2. Overhaul (Contd/)

g) Examine lens - if scratched replace. Fit new lamp (refer to para. 5.1.4.).

h) Examine all plug and flying lead connectors for secure fit.

j) Examine all securing screws for tightness.

After overhaul the mechanical, optical and electronic adjustments detailed in paras. 5.4.3. to 5.5.3. must be carried out.

5. MAINTENANCE (Contd/)

5.7. Test Procedures

Performance and waveforms illustrated are to be expected when fault finding. The use of the Trend Reader Test Set simplifies test procedures, but similar tests may be devised using the equipment to which the UDR is interfaced.

5.7.1. Equipment Required

Oscilloscope with high impedance probe at least 1MHZ band width with good Internal/External triggering facilities } Typically Telequipment D83

Multimeter - AVO Model 8
Setting up Filter HRO3
Reader Test Set Type HRO1 or programmable control equipment
Steel Rule - graduations of 1/50 inch.
Test Tapes

5.7.2. Skip Speed

a) Load a loop or long length of clean undamaged tape into the UDR.

b) Set the UDR skipping (continuous drive with no braking). Ensure that a minimum average speed given below is maintained against a moderate resistance applied to the tape.

UDR 350 - 350 characters per second
UDR 700 - 700 characters per second

5.7.3.1. Isochronous Stepping

Isochronous stepping is achieved when the reader advances one step for each start pulse received from a free running oscillator or timer. If the start pulse repetition rate is increased a rate will be reached at which the reader step will not be completed before the subsequent start pulse is received and thus the occasional pulse will be missed.

The maximum Isochronous Stepping speed of the reader is the fastest repetition rate which can be maintained without missing a pulse.

5.7.3.2. To Check Isochronous Stepping

a) Load a loop of clean undamaged tape into the UDR.

b) Apply a stepping pulse to the reader and increase the rate until such time as the reader is heard to miss a step (ignore the effect of tape splicing). The reader speed at which this 'missed step' occurs should be greater than:

UDR 350 - 250 characters per second
UDR 700 - 350 characters per second

5.7.4.1. Stopping Distance

The UDR must be capable of stopping on a specified code after skipping at least six inches of feed codes.

5.7.4.2. To Check Stopping Distance

a) Disconnect the UDR Drive Motor supply leads (refer to para. 5.1.5.).

b) Set the test set or controller to transmit a stop pulse to the reader after allowing at least six inches of feed codes to skip through.

c) Load the start of the tape into the reader and close the tape flap.

d) Start the test set or controller.

e) Move the tape slowly through the tape transport guide until the magnetic brake is heard to operate on receipt of the 'stop' code.

f) Rest the steel rule on the tape, such that its end is in contact with, and parallel to, the rear tape guide, and its side is in contact with the protrusion on the left hand side, and carefully draw a line on the tape.

g) Move the tape back to the start point.

h) Reconnect the Drive Motor supply.

j) Initiate the drive signal. The tape will drive and stop on receipt of the 'stop' code.

k) Draw another line on the tape as described in sub para.(f) above.

5.7.4.2. (Contd/)

l) The stopping distance between the two lines drawn on the tape. This distance must not exceed:-

0.025 in. (0.63 m.m.).

5.7.5.1. Stopping Time

The UDR must be able to stop from skipping speed in a maximum time of:-

For the UDR 350 - 700 uS
For the UDR 700 - 350 uS

5.7.5.2. To Check Stopping Time

a) Set the test set or controller to initiate a pause on a specified code repeated at intervals of approximately six inches of feed coded tape loop which is to be skipped. The pause should be of approximately 5 ms duration.

b) Load a clean undamaged test loop into the UDR.

c) Place the setting up filter HRO3 on the tape loading flap in the light path.

d) With the oscilloscope controls set as follows:-

Sensitivity - 0.5v/cm
Time Base - 250 us/cm
Trigger - EXT (On Drive Magnet Fuse)

connect the high impedance to TP9 (sprocket test point) and the earth clip to the 0v line (R37 - end adjacent to RV8 is an accessible point).

Note:- Triggering is initiated from the negative edges at I.C. 6 Pin 11 (or I.C.4 Pin 13) (Brake).

e) Initiate tape transport.

f) The displayed waveform should conform to Fig. 20a.

5.7.5.2.(Contd/)

g) Measure the stopping time - illustrated in Fig.19a.

For UDR 350 - 700 us
For UDR 700 - 350 us

h) Switch the oscilloscope time base to 1 ms/cm. Check that the flat 'stop' period of the waveform occurs before the peak of that cycle as illustrated in Fig. 20b.

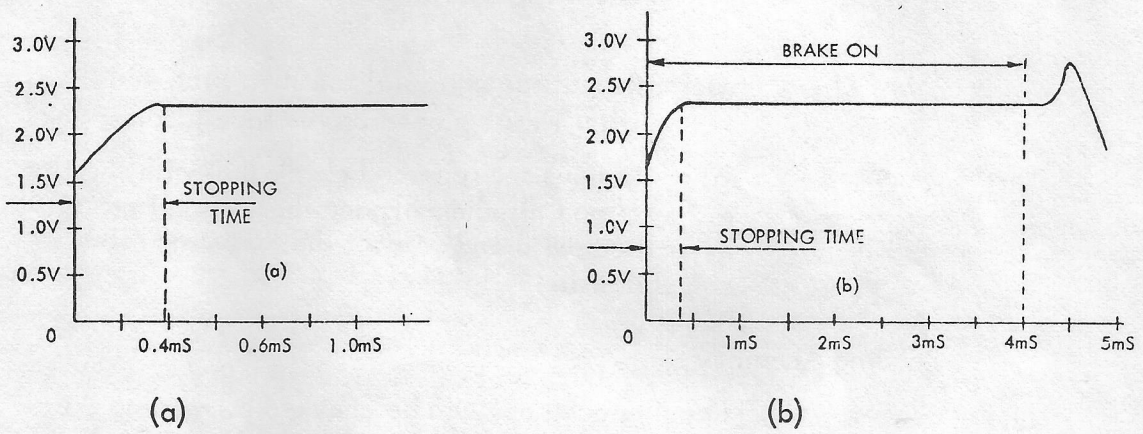


Fig. 20 - Stopping Time Waveforms

5.7.6. Amplifier Settings

Note:- In the following check it is important that the tape is kept in contact with the rear edge guide.

a) Ensure a NO DRIVE signal is presented to the UDR.

b) Load the test tape into the UDR (the test tape has a delete code - all channels punched - inserted between the feed codes - no channel punched - with the feed code in line with the reading position) and close the tape flap.

5.7.6.

c) Pull the tape very slowly against the resistance of the brake to bring the delete code into the reading position. Check that all channels switch from 'OFF' to 'ON' before the Sprocket switches 'ON'.

d) Move the tape further. Check that all channels are still 'ON' when the sprocket switches 'OFF'.

e) Continue the tape movement until the next 'feed' code is reached. Check that all channels have turned 'OFF' before the sprocket is turned 'ON' and that they remain 'OFF' whilst the sprocket is 'ON'.

f) Repeat sub paras.(b) to(e) with the Reducing Filter HRO3 placed on the tape loading flap.

g) Remove the tape and check that with the flap closed all channels and the sprocket are 'ON' both with and without the Reducing Filter in position.

5.7.7. Reading Accuracy

Reading accuracy can be checked by reading a tape consisting of alternately, all 'even' channels and all 'odd' channels. Checking for even parity whilst the sprocket is 'ON' will detect any mis-reading of the sprocket. This may be checked by comparing the data read with a stored data pattern corresponding to the tape being read, and detecting any mis-matching whilst the sprocket is 'ON', or by punching or printing out the data either directly or via buffer storage, and examining the output.

These checks should be carried out over the full range of operating speeds, both with and without the Light Reducing Filter HRO3 in position.

5.7.8. Drive Amplifier Waveforms

In order to carry out the waveform checks, the equipment Base Plate and Printed Circuit Board must be released from the equipment, brought to the side and the reader operated on its side (refer to para. 5.1.6.).

5.7.8.1. Brake Primary Drive

a) Set the oscilloscope as follows:-

Sensitivity	-	0.2v/cm
Time Base	-	50 us/cm
Trigger	-	Internal pos.

b) Connect the high impedance probe to the positive end of R63 (refer to Fig. 19) and the earth clip to the negative end.

c) Load a long length or loop of tape into the UDR.

d) Cause the reader to step at approximately 100 ch/sec.

e) Check that the displayed waveform conforms to that illustrated in Fig. 21a.

f) Check that the voltage rises to between:-

UDR 350 - between 0.6v and 0.8v in period of 250us.

UDR 700 - between 0.6v and 0.8v in period of 250 - 350us.

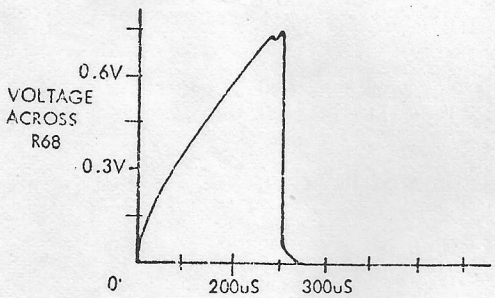


Fig. 21a - Brake Waveform.

5.7.8.2. Brake Secondary Drive - Fast Stepping

a) Set the oscilloscope as follows:-

Sensitivity	-	10v/cm
Time Base	-	2ms/cm
Trigger	-	Internal neg.

b) Connect the oscilloscope high impedance probe to the negative end of D7 on the printed circuit board (refer to Fig. 19) and the earth connection to Power Earth.

c) With a long length of loop or tape loaded, set the UDR fast stepping at approximately 100 ch/sec.

d) Check that the displayed waveform conforms to that illustrated in Fig. 21b.

Note:- If the brake coil is correctly connected and the primary drive is functioning the voltage should be 0v as illustrated.

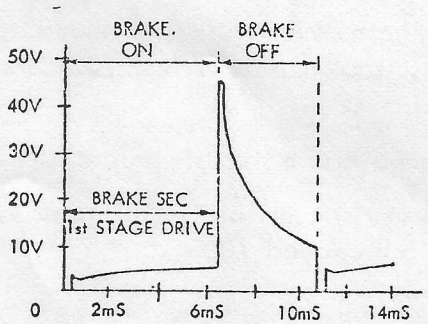


Fig. 21b - Brake Waveform.

5.7.8.3. Brake Secondary Drive - Single Stepping

a) Set the oscilloscope as follows:-

Sensitivity - 10v/cm
Time Base - 20ms/cm
Trigger - Internal neg.

b) Connect the oscilloscope as in para.5.7.8.2.(b)

c) Load tape into the UDR as in para.5.7.8.2.(c)

d) Step the UDR one character at a time along the tape.

e) The displayed waveform should conform to Fig. 21c.

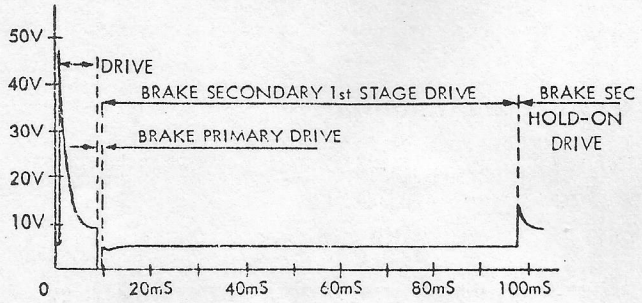


Fig. 21c - Brake Waveform.

Note:- The Brake Secondary First stage should persist for:

75 - 160mS at level of 3.8v - 4.6v.

The Brake Secondary Hold should assume a level of:-

6 - 6.8v.

5.7.8.4. Pinch Roller Drive Fast Stepping

a) Set the oscilloscope as follows:-

Sensitivity - 2v/cm
Time Base - 2ms/cm
Trigger - Internal neg.

b) Connect the oscilloscope between the PE test point and the negative end of D4. (Fig. 19).

c) With a long length of loop of tape loaded cause the reader to step at approximately 100 ch/sec. along the tape.

d) The displayed waveform should conform to Fig.22a.

e) Check that the maximum voltage as the drive is removed does not exceed 10.5v.

5.7.8.5. Pinch Roller Drive - Single Stepping

a) Set the oscilloscope as follows:-

Sensitivity - 2v/cm
Time Base - 20ms/cm
Trigger - Internal neg.

b) Connect the oscilloscope as in para. 5.7.8.4.(b)

c) With a long length of loop of tape loaded cause the reader to step one character at a time along the tape.

d) The displayed waveform should conform to Fig.22(b).

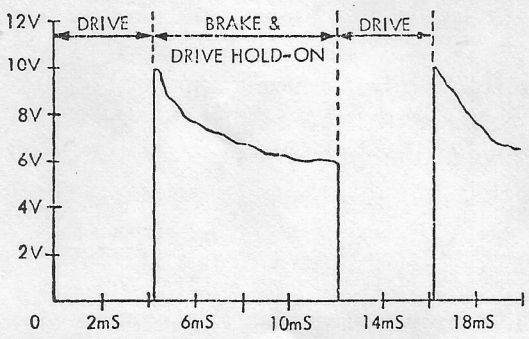
e) Check that the Drive Hold-on persists for:

75 - 160mS.

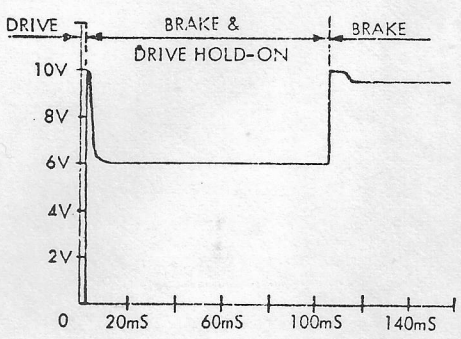
and is identical to the Brake Secondary First Stage drive duration in the test detailed in para. 5.7.8.3.

Note:- The voltage level should stabilise to:-

5 - 6.5v.



a - 100 Ch/s



b - Single Step

Fig. 22 - Drive Waveforms.

5. MAINTENANCE (Contd/)

5.8. Test Procedures - Power Supply

5.8.1. Equipment Required

Multimeter with - d.c. ranges to 50v. a.c.(r.m.s)ranges to 250v. } Typically AVO Model 8

Oscilloscope - Sensitivity 50mv/cm as coupled } Typically Telequipment D83

Variable Transformer - Variac

Load Unit - connected by a 24 T24 way, edge connector mating with SK1 of the printed circuit board wired as detailed below.

Connect the following load resistors through independent switches to the specified pins using short, low resistance leads.

Supply	From	To	Load	Rating
5v	23	2	22	1.5w
9v	4	2	No load	-
30v	C	2	100	10w

5.8.2. Mains Connection

a) Set the tap changer to the nominal local supply voltage.

b) Using the Variac as the supply source, adjust the voltage to that selected by the tap changer (to within $\pm$ 2%).

c) With no dc load connected measure the r.m.s. voltages on the unselected tappings on the UDR mains socket, with respect to neutral. Check that the voltages are within $\pm$10% of the nominal voltages.

Note:- For the following test a Variac must be utilised as the power source and the load unit must be connected to the power unit output socket.

5.8.3. 5v Output

a) Monitor the 5v supply across C14.

b) Vary the source voltage at the Variac by up to 10% greater than that selected by the voltage tap.

c) Check that the 5v line does not rise above 5.2v.

5.8.3. 5v Output (Contd/)

d) Vary the input up to 15% lower than that selected by the voltage tap.

e) Check that the 5v line does not fall below 4.8v.

f) Connect the oscilloscope across the 5v output. Check that the peak to peak voltage ripple does not exceed 50mv.

5.8.4. 9v Output

a) Monitor the 9v supply across C12 with tape flap closed.

b) Vary the input voltage to 10% greater than that selected by the voltage tap.

c) Check that the voltage does not rise over 9.4v.

d) Vary the input voltage to 15% less than that selected by the voltage tap.

e) Check that the voltage does not fall below 8.4v.

f) Connect the oscilloscope across the 9v output. Check that the peak to peak ripple does not exceed 50mv.

5.8.5. 30v Output

a) Monitor the 30v line across C8.

b) Ensure that the input voltage is within $\pm$ 2% of the selected voltage.

c) Switch 'Out' all load resistors.

d) Check that the output does not rise over 34v.

e) Switch 'In' all load resistors.

f) Check that the output voltage does not fall below 28v.

g) Connect the oscilloscope across the load. Check that the peak to peak ripple does not exceed 7v.

5.9. Fault Finding

5.9.1. Preliminary Checks

If the UDR fails to operate correctly, the preliminary checks listed below should be carried out:-

a) Mains supply switched 'ON'.

b) UDR switched 'ON'.

c) Equipment Mains fuse intact.

d) Printed circuit board located fuses FS1 and FS2 intact.

e) SKT 1 and SKT plugs firmly 'home' on printed circuit board.

f) All flying lead connectors to the printed circuit board firmly home.

g) Tape Flap Micro-switch secure and operative.

h) Lamp is secure and lights.

j) Optical system is clean and light pattern is correct (refer to para. 5.4.3.).

k) The Drive Motor rotates when the UDR ON/OFF switch is in the 'ON' position.

l) The pinch roller is correctly adjusted (refer to para. 5.3.4.).

m) Photocell Amplifiers are correctly set (refer to para. 5.5.3.).

5.9.2. Procedure for Repairs

If all the above preliminary checks appear to be satisfactory, the reader should be replaced by a known working reader or connected to a known working equipment, such as a Trend Reader Test Set, in order to establish that the fault lies in the UDR. A faulty UDR should be returned to Trend Communications Limited or their appointed Agent, or, alternatively, the user of his maintenance agents may attempt to repair at their own risk.

It should be noted that any repair work carried out on the UDR other than by Trend Communications Limited or their appointed Agents will invalidate any warranty claim.

5. MAINTENANCE (Contd/)

5.10. Recommended Spares Holding

5.10.1. For First Line Servicing

Item	Qty.	Part No.
PCB Assembly	1	360200
Spring Roller Assembly	1	360105
Drive Roller	1	360418
Bobbin Assembly Drive	1	5206
Bobbin Assembly Brake	1	4787
Pinch Roller	2	360412
Washer	2	360413
Photocell	1	X79/0049
Photocell with C/F	1	5747
Solenoid Adj. Tool	1	HR04
Light Filter	1	HR03
Lamp Cord.	1	HR02
Lamp 12v 21W Type 382	2	
Microswitch V4T6	2	
Rectifier MDA 980/1	1	
Fuselink 20 x 5 m.m. 3A.	5	
Fuselink 20 x 5 m.m. 2A. A/S	5	

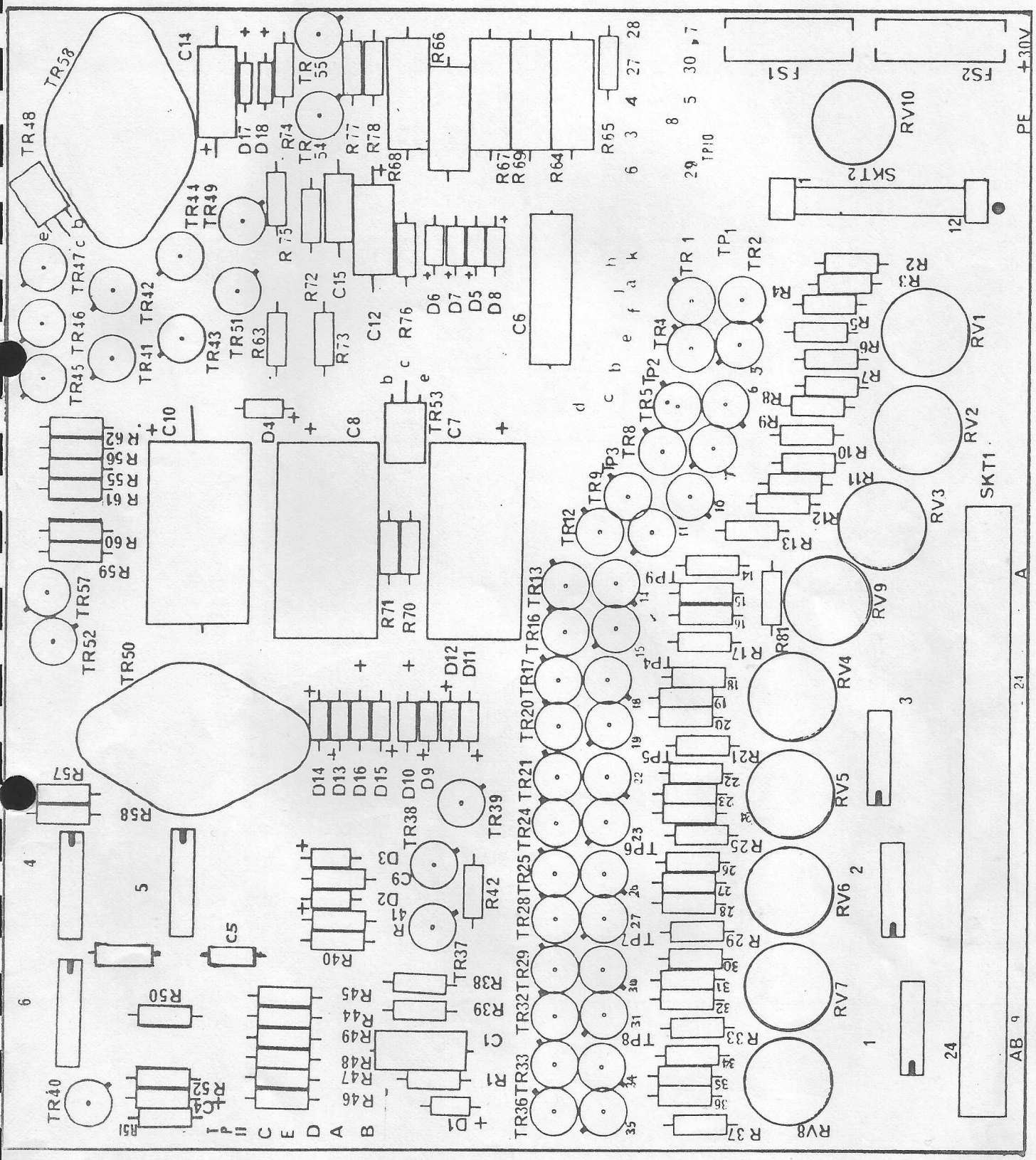
5.10.2. Service Centre Covering up to 20 Readers

		Quantity
UDR 350		
Motor - KLZ-32-50-4-350D-B171 Badge - Trend 360431-A (or customer special)		1 ea.
UDR 700		
Motor - KLZ-32-50-2-210D-B170 Badge - Trend 361400-A (or customer special)		1 ea.
BOTH VERSIONS		
Ball Race NMB, SSR-620 ZZY 32R-A3-P35-L654		4
Lamp, Lucas 12v 21w Type 382		5
Fuse links, Beswick TDC 211 - 3A		10
TDC 211 - 5A (115v working only)		5
TDC 123 - 2A A/S		5
Plug Cambion 460-3308-1-03		10
Drive Roller	Trend 360418-A	1
Spring Clip	Trend 360404-A	2
Read Head Assy.	Trend ATR 5832	1
Brake Solenoid Assy.	Trend ATR 2638	1
Detent Roller Assy.	Trend 360105	1
Lampholder Assy.	Trend 360106	1
Drive Solenoid Assy.	Trend 360107	1
Bracket & M/Switch Assy.	Trend 360109	1
Click Stop Assy.	Trend 360110	1
P.C.B. Assy.	Trend 360200	1
Bridge Rectifier	Motorola MDA 980/1	2
Transistor	Any 2N3055	4
Capacitor	Rifa 5uF 250v a.c. (700)	2
Capacitor	Rifa 3uF 250v a.c. (350)	
Capacitor	Advance Filmcap 0.47uF 250v a.c.	2
Capacitor	Erie 4700pF K800011/811/101	5
Resistor	Electrosil 220 ohm TR6	2

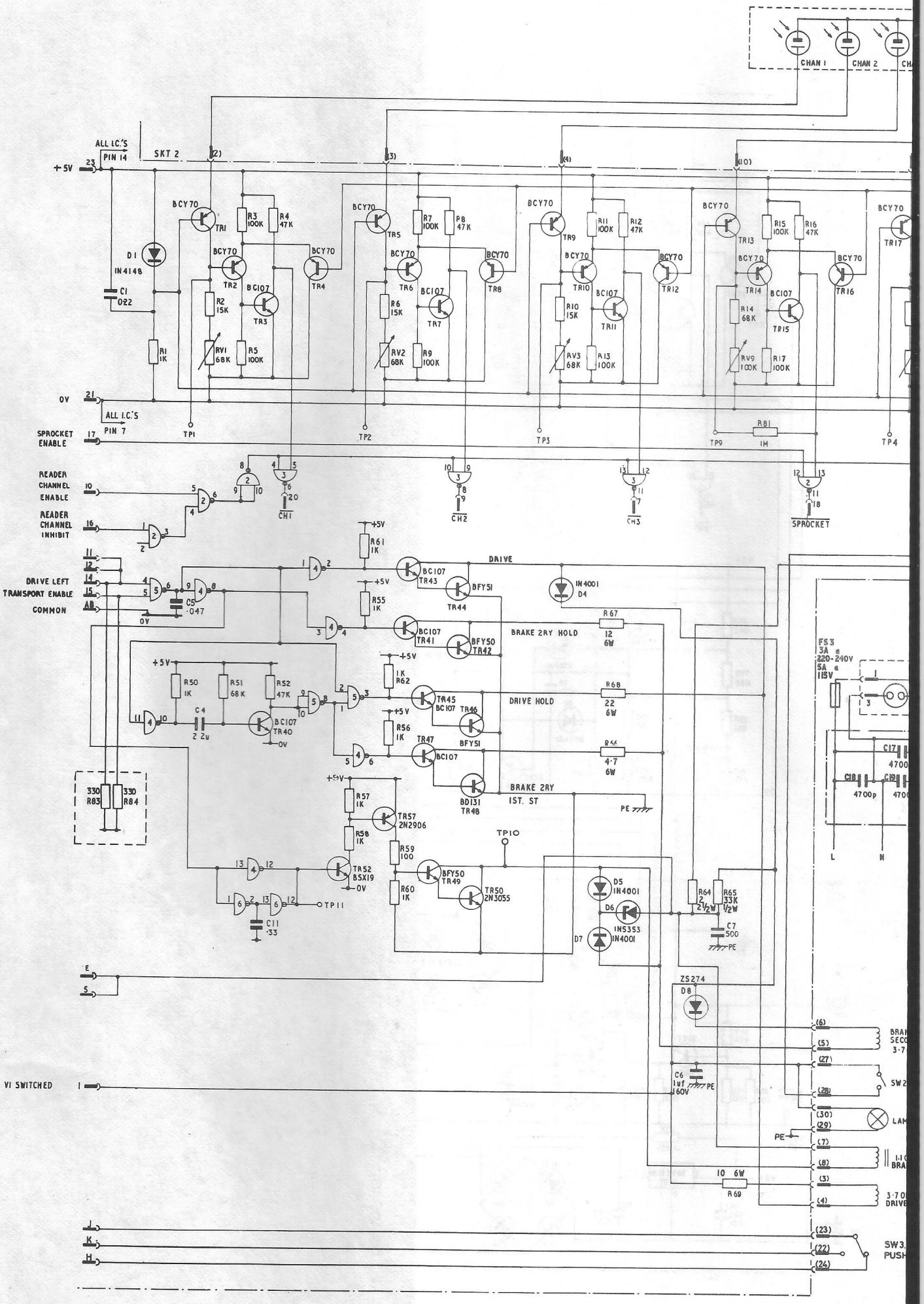
5.10.2. Service Centre Covering up to 20 Readers (Contd/)

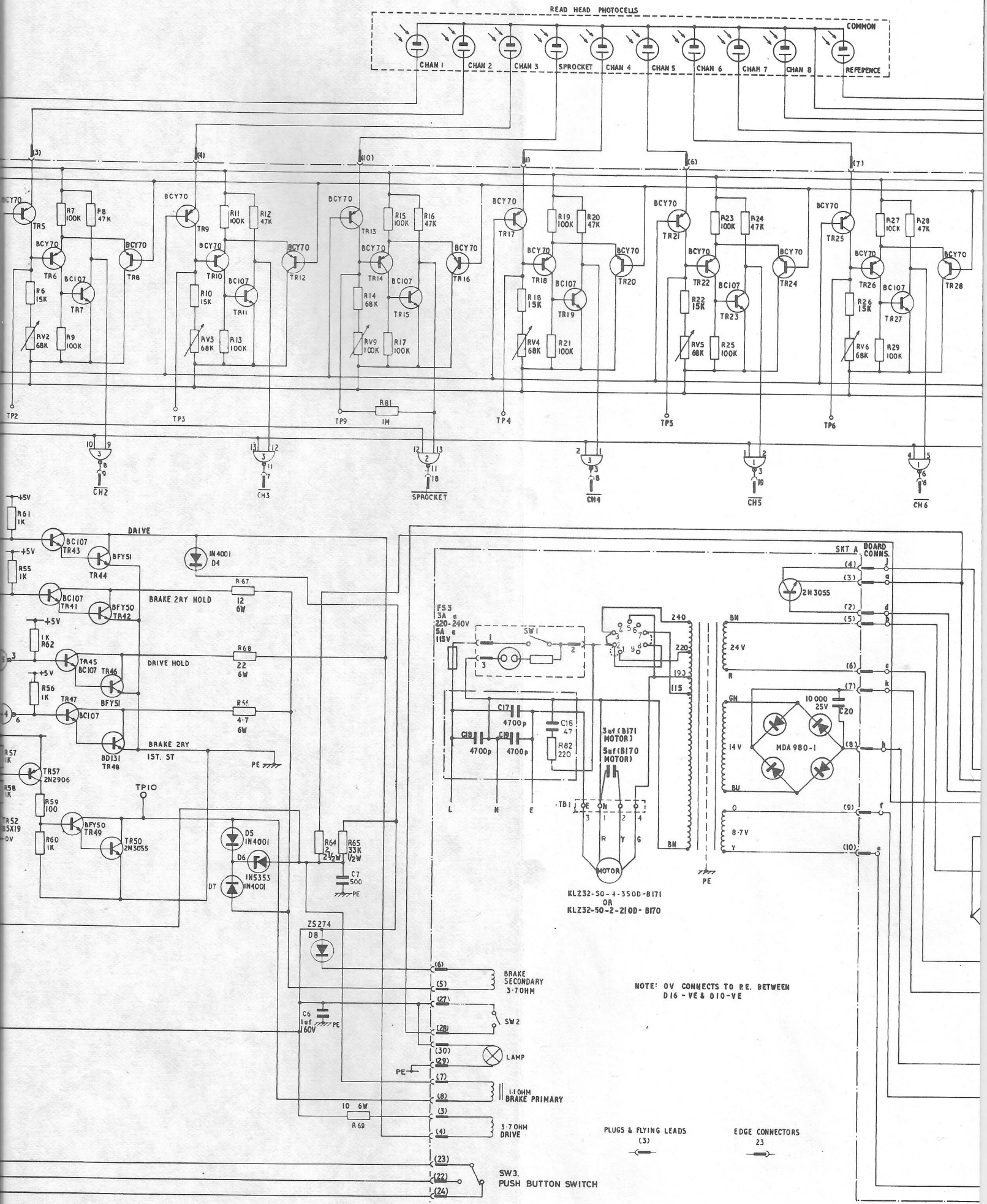
BOTH VERSIONS (Contd/)

		Quantity
Transistor	Any BCY70	10
Transistor	Any BC107	10
Transistor	Any BFY50	5
Transistor	Any BFY51	5
Transistor	Mullard BD131	2
Transistor	Any BSX19	5
Transistor	Motorola 2N4918	2
Transistor	Any 2N2906	2
Integrated Circuit	Motorola MLM 309K	2
Integrated Circuit	Any 936	2
Integrated Circuit	Any 946	10
Diode	Any IN4148	10
Diode	Any IN4001	20
Diode	Any IN5353	2
Diode	Any BZY88C6V2	2
Variable Resistor	Davall 81P 68K	2
Variable Resistor	Davall 81P 100K	2
Resistor	Any 1K $\frac{1}{2}$w	2
Resistor	Any 1K2 $\frac{1}{2}$w	2
Resistor	Any 1K5 $\frac{1}{2}$w	2
Resistor	Any 1K8 $\frac{1}{2}$w	2
Resistor	Any 2K2 $\frac{1}{2}$w	2
Resistor	Any 2K7 $\frac{1}{2}$w	2
Resistor	Any 3K3 $\frac{1}{2}$w	2
Capacitor	Daly 500uF 50v. D261/4	2
Capacitor	Erie 1000uF 25v.	2
Capacitor	Erie 10000uF 25v.	2
Capacitor	Wima 100uF 10v.	2
Capacitor	Tag 2.2uF 35v.	2

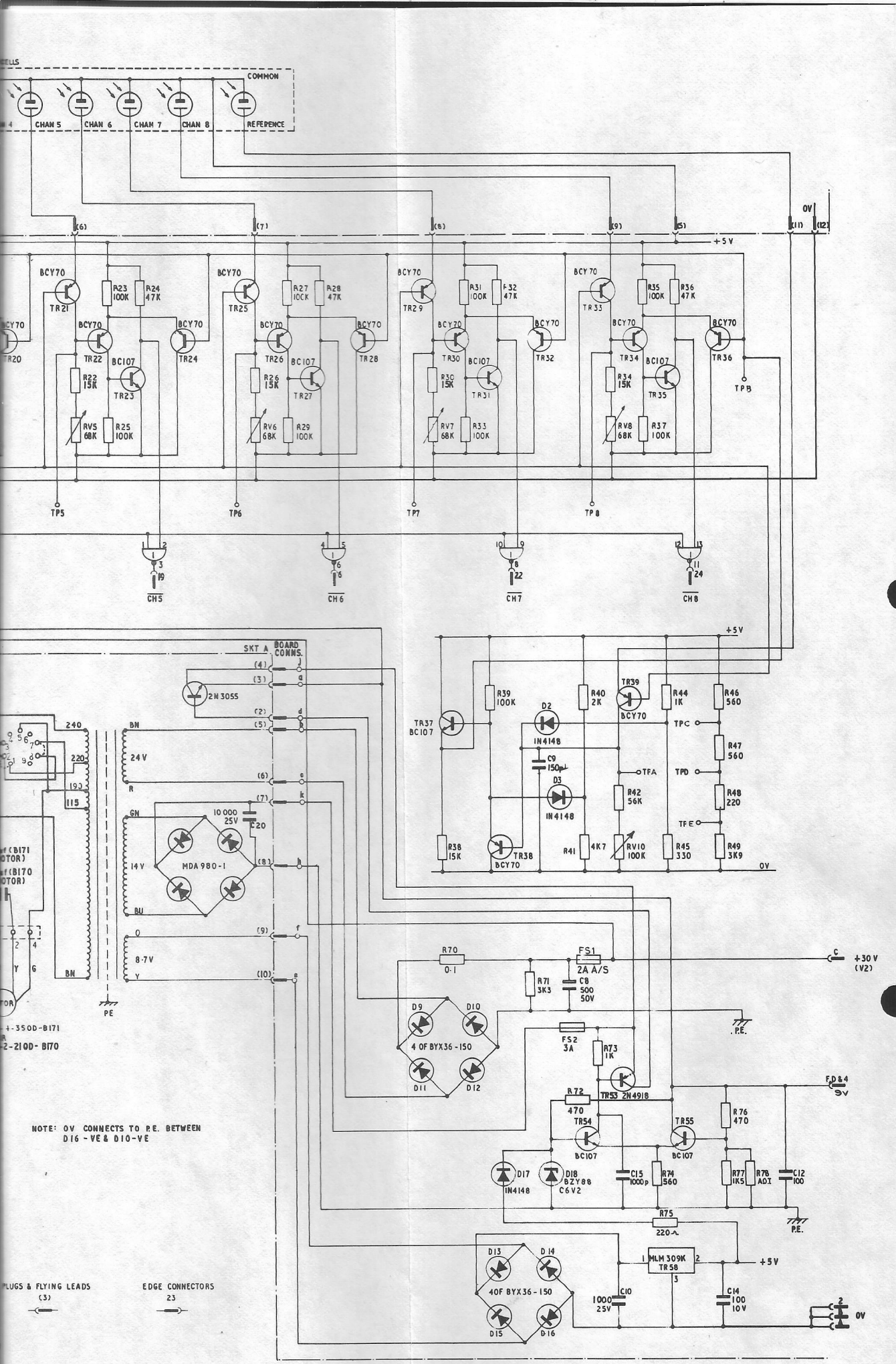


COMPONENTS LOCATION - PRINTED CIRCUIT BOARD


CHAN 1
CHAN 2
ALL I.C.'S
PIN 14
SKT 2
+5V
0V
ALL I.C.'S
PIN 7
SPROCKET ENABLE
READER CHANNEL ENABLE
READER CHANNEL INHIBIT
DRIVE LEFT
TRANSPORT ENABLE
COMMON
VI SWITCHED
BCY70
BC107
BFY51
BFY50
IN4001
BD131
2N2906
2N3055
BSX19
ZS274
DRIVE
BRAKE 2RY HOLD
DRIVE HOLD
BRAKE 2RY
IST. ST
CH1
CH2
CH3
SPROCKET
TP1
TP2
TP3
TP4
TP9
TP10
TP11
PE
FS3
3A @ 220-240V
5A @ 115V
L
N



UDR 350/700 - CIRCUIT DIAGRAM



CUIT DIAGRAM

SECTION 6 - COMPONENTS LIST

INDEX TO U.D.R. 350/700 PARTS LIST

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº ATR 2634-A PL 2.pc

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	2633MD-8	Bobbin	1	
2	WIR 000714	.32mm (30 S.W.G.) Dia.enamel covered Copper Wire	A/R	
3	Not numbered	Wire equip. 7/.0076 P.V.C. covered Wire, Black.	600 mm	

ISSUE	1	2.	3	
DATE	27.5.76	12-7-77.	8.2.78	
C.N. Nº		3353.	3568	
CHECKED		TITLE SUB-ASSY OF BOBBIN	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº ATR 4789-A PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	2633MD-8	Bobbin	1	
2	WIR 000779	.27mm (32 swg) Dia. Enamel covered Copper wire	A/R	Coil 'A'
3			A/R	Coil 'B'
4	"	Wire Equip 7/.0076 PVC Covered Red	300 mm	
5	"	" Orange	300mm	
6	"	" Yellow	300mm	
7	"	" Brown	300mm	

ISSUE	1/A			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE SUB-ASSY BOBBIN BRAKE	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº ATR 52[illegible] PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	2634PL-9	Sub-Assy. - Bobbin.	1	
2				
3				
4				
5				
6	CON 000138	Plug 460-3308-1-03 - Cambion.	2	
7	CON 001466	Sleeve 508-1974-06-0010 - Cambion	2	
8	WIR 001504	Ident. Sleeve 2 m.m. Orange - Helvin P20.	1	
9	WIR 001505	Ident. Sleeve 2 m.m. Yellow - Helvin P20.	1	

ISSUE	1.m			
DATE	26.10.76.			
E.N. Nº				
CHECKED		TITLE	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE		BOBBIN - ASSY.		

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº ATR 5747-B PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	CON 002568	Mini. Conn. 8129-012-603-003 - Varelco	1	
2	WIR 002140	Cable Min. Mult 15 way - Radiospares	½M	To be prepared to ATR 5747.B Sheet 2 before moulding.
3	WIR 001316	'P' Clip NX1 - Insuloid	1	
4	OPT 000244	Special Photocell Array X79/0049 - Plessey	1	
5	WIR 001460	Sleeve H20 x 20 - Helsyn.	1	
6	Not Numbered	Masking Tape 1".	4"	

ISSUE	1.	2.	3.
DATE	27.5.76	4-11-77.	9-12-77.
C.N. Nº	3466.	3509.	

CHECKED		TITLE PHOTOCELL AND CONNECTOR ASSY.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº ATR 7411-A PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	7415MD-9	Armature	1	
2	7447MD-9	Spindle - Armature	1	
3				
4				
5	SPR 001547	Expansion Spring 501 - Entex	1	

ISSUE	1			
DATE	27.5.76			
CN. Nº				
CHECKED		TITLE	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE		ARMATURE ASSY		

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360000-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360001-6	Final Assy.	1	
2	360100-8	Cover Assy.	1	
3	360108	Despatch Items	1	
4				
5				
6	3454MD-8	I/F P.C.B.	1	
7	360433-8	Bot . Decorative	1	
8	360434-8	Top. Decorative	1	
9				
10				
11				
12	FIX 001271	'Spire' Screw No.6 x 3/8"	1	
13				
14				
15				
16	FIX 001825	Washer 4BA Plain Chrome	1	

ISSUE	1M			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE G.A. OF UNIDIRECTIONAL READER U.D.R. 350	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360001-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360101-8	Base & P.C.B. Assy.	1	
2	360102-7	Comp. Panel & T/F Assy.	1	
3	360104-6	Main Casting Assy.	1	
4				
5				
6	2750MD-9	Cable Clamps	2	
7	360432-9	Manf. Label	1	
8	360439-9	Mod. to Foot	2	(Item 12 modified)
9				
10	360457-4	Tape Guide Rod	1	
11	360456-4	Lamp Adjustment Label	1	
12	MOU 001487	Foot Plastic 426A - Eng. Ent.	2	(Mod. to 360439-A Item 8)
13				
14				
15	FIX 001271	'Spire' Screw No.6 x 3/8"	2	
16	FIX 001266	'Spire' Screw No.6 x 1".	4	
17				
18				
19				
20	FIX 001445	'Taptite' Screw M4 x 10 Pan.Hd.	4	
21	FIX 001123	Hex. Socket Set Screw (Grub Screw) M3 x 3	1	
22				
23	FIX 001134	Washer M4 Plain Cd.Pl.	6	
24				
25				
26	FIX 001186	Screw M3 x 25 Ch.Hd.Sl.Cd.Pl.	2	

ISSUE	1	2.		
DATE	27.5.76	5.4.77.		
DN. Nº	3156.			
CHECKED		TITLE FINAL ASSY. U.D.R. 350	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG NO 360100-B PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATIC
1				
2				
3				
4				
5	360426-6	Cover	1	
6				
7				
8				
9				
10	MOU 001823	Grille Plastic 813 - Eng. Ent.	4	
11				
12				
13				
14				
15				
16	FIX 001824	'Spire' Spring Latch SRV 1762	4	
17				
18				
19				
20	FIX 001296	'Avex' Rivet 1601-0410 - Avdel	8	

ISSUE	1			
DATE	27.5.76			
C.N. No				
CHECKED		TITLE COVER ASSY. - U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISS. DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360101 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360200-8	P.C.B. Assy.	1	
2				
3				
4	360423-7	Base	1	
5	360424-9	Support	1	
6				
7	360439-9	Mod. to Foot	2	(Item 10 modified)
8				
9				
10	MOU 001487	Foot Plastic 426A - Eng. Ent.	2	(Mod to 360439-A Item 7)
11				
12				
13				
14	FIX 001380	'Spire' Captive Nut No.6 SNU2811-17-00	3	
15				
16	FIX 001173	M3 Banc-Loc. Insert MV3B-M3 - PSM	2	Use on Item 5
17				
18	FIX 001333	'Pop' Rivet AD510 - Tucker	2	
19				
20	FIX 001134	Washer M4 Plain Cd.Pl.	2	
21				
22	FIX 001196	Self.Tap.Screw No.4 x $\frac{1}{4}$ Pan.Hd. Sl.Cd.Pl.	6	

ISSUE	1			
DATE	27.5.76			
A.N. Nº				
CHECKED		TITLE BASE & P.C.B. ASSY U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG. No. 360102-C PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY.	CIRCUIT LOCATION
1	360103-9	Mains Supp. Board Assy.	1	
2	360301-9	Cableform.	1	
3	360111-8	Transformer Assy.	1	
4	360421-7	Panel.	1	
5	360422-8	Bracket.	1	
6	360305-4	Earth Link.	1	
7	8009-MD-4	Danger Label.	1	
8				
9	HOL 000082	Fuseholder F296 - Bulgin.	1	FS3.
10	CON 001826	Term. Block 4 way Mk. 3/4 - Klippon.	1	TB1.
11	CON 000211	Conn. Block Mk. 1/3 - Klippon.	1	
12	CON 002778	Voltage Selector MP44-McMurdo .	1	
13	DIO 002243 DIO 002241 DIO 000311 DIO 001222	Bridge Rectifier KB PC 25-02 - Gen. Instr.) Alt. Bridge Rectifier KB PC 10-02 -) Gen. Instr.) Alt. Bridge Rectifier KBH 25-005 -) Gen.Instr.) Alt. Bridge Rectifier KB PC 10-0005 -) Gen.Instr.)	1	BR1.
14	CAP 000919	Cap. 10,000uF 25v. - Erie 321.	1	C20.
15	ACC 001028	Capacitor Clamp 1.3/8" Vert. - Mullard.	1	
16				
17	TRA 000223	Transistor 2N 3055 - R.C.A.	1	+ Insul.Kit. TR60.
18	CAP 000882	Cap. 3uF. 250v. A.C. Rifa 5016-3.	1	
19	FUS 001284	Fuse 3.15 Amp. TDC 211 - Beswick.	2	
20	FUS 001285	Fuse 2 Amp. TDC 123 - Beswick.	1	
21	FUS 001294	Fuse 5 Amp. TDC 211 - Beswick.	1	
22	HOL 001828	Fuseholder L2005 - Belling Lee.	1	3 Way cut from 12 way
23	MIS 002705	Mains Lead Coding Label	A/R	
24	FIX 001271	'Spire' Screw No. 6 x 3/8".	9	
25	FIX 001380	'Spire' Captive Nut No. 6 SNU2811-17-00.	5	
26	WIR 001530	Mains Cable Mini RS377/726.	4M	(.6M only for P.P.U. Version).

ISSUE	1.	2.	3.	4	5	6
DATE	27.5.76.	5.4.77.	2.9.77.	8.3.78	17.4.78	8 8.78
C.N. No.	3195.	3328.	3594	3579	3773	

CHECKED		TITLE COMPONENT PANEL & T/F ASSY. U.D.R. 350.	SHEET 1 OF SHEETS 2	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG. No. 360102-C PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY.	CIRCUIT LOCATION
27	WIR 001460	Sleeve H20 x 20 - Hellermann.	9	
28	WIR 001326	'Insulok' Cable Tie T18R.	5	
29	WIR 001316	'P' Clip NX1 - Insuloid.	1	
30	FIX 001146	Screw M3 x 8 Ch.Hd.Sl.Cd.Pl.	3	
31				
32	FIX 001184	Screw M3 x 12 Ch.Hd.Sl.Cd.Pl.	2	
33	FIX 001185	Screw M3 x 16 Ch.Hd.Sl.Cd.Pl.	5	
34	FIX 001149	Screw M3 x 20 Ch.Hd.Sl.Cd.Pl.	2	
35	FIX 001186	Screw M3 x 25 Ch.Hd.Sl.Cd.Pl.	2	
36				
37	FIX 001152	Screw M4 x 12 Ch.Hd.Sl.Cd.Pl.	3	
38				
39	FIX 001306	Washer M3 Shakeproof Steel Blk.	12	
40	FIX 001307	Washer M4 Shakeproof Steel Blk.	3	
41				
42	FIX 001133	Washer M3 Plain Cd.Pl.	9	
43	FIX 001134	Washer M4 Plain Cd.Pl.	7	
44				
45	FIX 001210	Washer M3 Crinkle Berym.Cu.	2	
46				
47				
48				
49	FIX 001304	Nut M3 Cd.Pl.	18	
50	FIX 001305	Nut M4 Cd.Pl.	3	

ISSUE	1.	2.	3.	5	6
DATE	27.5.76.	5.4.77.	18.5.77.	17.4.78.	8.8.78.
C.N. No.			3292.	3579	3773

CHECKED		TITLE COMPONENT PANEL & T/F ASSY. U.D.R. 350.	SHEET 2 OF SHEETS 2	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360103-A PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360300-8	Mains Cableform	1	
2				
3				
4	CAP 001168	Cap. 0.47uF 250v. PME 271M 647 - Rifa.	1	C16
5	CAP 001829	Cap. 4,700pF +80% -20%. Erie 811	3	C17,18,19
6	RES 000476	Res. 220 ohms 5% 1w - Electrosil TR6	1	R82

ISSUE	1.	2.
DATE	27.5.76	14.4.77.
C.N. Nº	3219.	

CHECKED		TITLE	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE		MAINS SUPPRESSION BOARD ASSY. U.D.R.		

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360104-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360113-8	Brake Solenoid Assy.	1	
2	360114-8	Read Head Assy.	1	
3	360105-9	Detent Roller Assy	1	
4	360106-9	Lampholder Assy	1	
5	360107-8	Solenoid Assy., Drive	1	
6	360109-9	Bracket & M/Switch Assy	1	
7	360110-8	Click Stop Guide Assy	1	
8	360112-9	Push Switch Unit	1	
9				
10	2615MD-9	Spacer	2	
11	7435MD-9	Screw	1	
12	360400-6	Casting	1	
13	360404-9	Clips	4	
14	360405-8	Table	1	
15	360406-9	Guide, Right	1	
16	360408-9	Clamps	2	
17	360409-9	Pin	1	
18	360410-9	Support	1	
19	360418-9	Roller	1	
20	360419-9	Plug	1	
21	360427-9	Stud	4	
22	360431-9	Badge	1	
23	360435-9	Retainer	2	
24	360437-9	Stud	1	
25	360438-9	Plug	1	
26	360443-9	Push Button	1	
27	360407-9	Guide, Centre	1	
28				
29	MOT 000247	Motor Papst 1350 r.p.m. B171	1	
30	OPT 000004	Lens Convex F23.3 - English Glass	1	
31	SWI 000673	Switch C403 - Arcoelectric	1	

ISSUE	1			
DATE	27.5.76			
E.N. Nº				
CHECKED		TITLE MAIN CASTING ASSY. U.D.R. 350	SHEET 1 OF SHEETS 3	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360104 - D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
32				
33	MOU 001457	Rubber Cap. P.V. 1410 - Reevite	1	
34				
35	WIR 001325	'Fastex' Wire Tie 232 GD 0789 000	2	
36	WIR 001461	Sleeve H30 x 25 - Hellermann.	2	
37				
38				
39	FIX 001183	Screw M3 x 10 Ch.Hd.Sl.Cd.Pl.	3	
40	FIX 001184	Screw M3 x 12 Ch.Hd.Sl.Cd.Pl.	4	
41				
42	FIX.001188	Screw M4 x 16 Ch.Hd. Sl.Cd.Pl.	3	
43	FIX 001154	Screw M4 x 30 Ch.Hd.Sl.Cd.Pl.	1	
44	FIX 001516	Screw M3 x 12 Hex.Hd.Cd.Pl.	1	
45	FIX 001189	Screw M4 x 10 Hex.Hd.Cd.Pl.	1	
46				
47	FIX 001114	Screw M3 x 6 Hex.Skt.Cap.Hd.Blk	1	
48	FIX 001821	Screw M3 x 10 Hex.Skt.Cap.Hd.Blk	5	
49				
50				
51	FIX 001119	Screw M4 x 10 Hex.Skt.Cap.Hd.Blk	2	
52	FIX 001822	Screw M4 x 16 Hex.Skt.Cap.Hd.Blk	2	
53				
54				
55	FIX 001123	Hex. Socket Set Screw (Grub Screw) M3 x 3	3	
56	FIX 001133	Washer M3 Plain Cd.Pl.	2	
57	FIX 001134	Washer M4 Plain Cd.Pl.	12	
58	FIX 001136	Washer M4 Lg.Dia Plain Cd.Pl.	1	
59				
60				
61	FIX 001306	Washer M3 Shakeproof Steel Blk	10	

ISSUE	1.	2.	3.
DATE	27.5.76	17.6.77.	5.9.77.
C.N. Nº		3327.	3328.

CHECKED		TITLE MAIN CASTING ASSY. U.D.R. 350	SHEET 2 OF SHEETS 3	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360104-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
62	FIX 001307	Washer M4 Shakeproof Steel Blk	4	
63				
64				
65	FIX 001213	Washer M4 Single Coil Spr. Blk	3	
66	FIX 001214	Washer M5 Single Coil Spr. Blk.	4	
67				
68	FIX 001304	Nut M3 Cd.Pl.	1	
69	FIX 001305	Nut M4 Cd.Pl.	4	
70				
71				
72				
73				
74	FIX 001445	'Taptite' Screw M4 x 10 Pan.Hd.	12	
75				
76				
77	ADH 000502	Loctite 241 - Douglas Kane.	A/R	
78				
79				
80				
81				
82	FIX 001177	Anchor Rivet Bush M3/16/A - P.S.M.	1	

ISSUE	1	2.		
DATE	27.5.76	17.6.77.		
D.N Nº	3327			
CHECKED		TITLE MAIN CASTING ASSY U.D.R. 350	SHEET 3 OF SHEETS 3	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360105-A PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1				
2				
3				
4				
5	360414-9	Carrier	1	
6	360415-9	Roller	1	
7	360416-9	Pivot Pin	1	
8				
9				
10	FIX 001384	Circlip 1440-2 - Anderton	2	

ISSUE	1			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE DETENT ROLLER ASSY	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360106-A PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360302-8	Lamp Cableform	1	
2				
3				
4				
5	360425-9	Lampholder	1	
6	360447-9	Sleeve	1	
7				
8				
9				
10	IND 001820	Lamp 12v 21w Type 382 - Lucas	1	
11				
12				
13				
14				
15	FIX 001115	Screw M3 x 8 Hex.Skt.Cap.Hd.Blk	1	
16				
17				
18	ADH 000506	I.S. 12 Douglas Kane.	A/R	

ISSUE	1			
DATE	27.5.76			
E.N. Nº				
CHECKED		TITLE LAMPHOLDER ASSY - U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360107-3 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	5206PL	Bobbin Assy	1	
2	7411PL-9	Armature Assy	1	
3				
4	8171MD-4	Lamination	1 approx	
5	2601MD-	Lamination	13 approx	
6	2603MD-9	End Plate	1	
7	2695MD-9	Link	1	
8	2724MD-9	Spindle - Link	1	
9	4455MD-8	Solenoid Carrier L.H.	1	
10	7412MD-9	Armature Locator	2	
11	7413MD-8	Roller Guide Block	1	
12	7414MD-9	Spindle - Cranked	1	
13				
14	360412-9	Pinch Roller	2	
15	360413-9	Washer	4	
16	360440-9	Spindle - Roller	1	
17				
18	BEA 001818	Ballrace 6 o.d. x 2 i.d. - N.M.B.	4	
19				
20	ADH 000502	Loctite 241	A/R	
21				
22	FIX 001303	Nut M2.5 Cd.Pl.	4	
23				
24	FIX 001207	Washer M2.5 Shakeproof Blk.Steel	4	
25				
26	FIX 001182	Screw M2.5 x 20 Ch.Hd.Sl.Cd.Pl.	4	Moulded into Item 9
27				
28	FIX 001384	Circlip 1440-2 - Anderton	3	

ISSUE	1 2			
DATE	27.5.76 19.4.78			
C.N. Nº	3647			
CHECKED		TITLE SOLENOID ASSY., DRIVE U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360108 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1				
2				
3				
4				
5	360442- 3	Packing Box 13" x 12" x 8".	1	
6				
7	MIS 002189.	Aircap D120 - Sealed Air Int.	A/R	
8	Not numbered	Handbook U.D.R.	1	
9				
10				
11	MIS 001819	Selvyt Cloth (127mm sq.)	1	)
12	OPT 000084	Filter M.E. (38mm sq.) - Enterprise Glass	1	) Supply in plastic bag.
13	3974MD-4	Lamp Align. Card	1	)

ISSUE	1			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE DESPA TCH ITEMS - U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360109-A PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360303-8	M/Switch Cableform	1	
2				
3				
4				
5	360417-9	Bracket	1	
6				
7				
8				
9				
10	SWI 000215	Microswitch V4T6 - Burgess	1	SW2
11				
12	FIX 001139	Screw M2 x 12 Ch.Hd.Sl.Cd.Pl.	2	
13				
14	FIX 001131	Washer M2 Plain Cd.Pl.	2	
15				
16	FIX 001206	Washer M2 Shakeproof Blk.Steel	2	
17				
18	FIX 001128	Nut M2 Cd.Pl.	2	

ISSUE	1			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE BRACKET & M/SWITCH ASSY U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360110-B PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1				
2				
3	2639MD-9	Special Bush	2	
4	2737MD-9	Spring - Br.Arm	2	
5	5915MD-9	Location Pin	1	
6	7087MD-8	Cover Plate	1	
7				
8	7258MD-9	Brake Armature	1	
9	7531MD-9	Handle	1	
10	8091MD-9	Adjustable Guide	1	
11	360411-9	Carrier	1	
12	360441-9	Shim	2	
13	SPR 001539	Compression Spring 460200 - Terry	2	
14	BEA 001815	1/8" dia. Ball Class IV - Fag	2	
15				
16				
17				
18	FIX 001176	M3 Sonic-Loc Insert - P.S.M.	2	Moulded into Item 6
19				
20	FIX 001816	Screw 8BA x 3/16" Brass Ch.Hd.Sl.	2	
21	FIX 001817	Washer 8BA Shakeproof Blk	2	
22				
23	FIX 001144	Screw M3 x 5 Ch.Hd.Sl.Cd.Pl.	2	
24	FIX 001133	Washer M3 Plain Cd.Pl.	2	
25				
26	ADH 000502	Loctite 241	A/R	
27	FIX 001502	Pin 1/16" x $\frac{1}{4}$" LDK - Spirol	1	

ISSUE	1			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE CLICK STOP GUIDE ASSY. U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUE DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360111-B PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1				
2				
3				
4				
5	360429-7	Transformer	1	
6				
7				
8				
9				
10	FIX 001380	'Spire' Captive Nut No.6 SNU2811-17-00	8	
11				
12				
13				
14	WIR 001227	Sleeve LVR 64 - Hellermann	.25M	
15				
16	WIR 001510	Lacing Cord 1.0mm	.25M	

ISSUE	1. 2.			
DATE	27.5.76 6.4.77.			
C.N. Nº	3235.			
CHECKED		TITLE TRANSFORMER ASSY. U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360112-A PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360444-9	Micro-Switch Bracket	1	
2				
3	SWI 000677	Microswitch 2LML-C - Unimax	1	
4				
5	FIX 001139	Screw M2 x 12 Ch.Hd.Sl.Cd.Pl.	2	
6				
7	FIX 001131	Washer M2 Plain Cd.Pl.	2	
8				
9	FIX 001206	Washer M2 Shakeproof Blk.Steel	2	
10				
11	FIX 001128	Nut M2 Cd.Pl.	2	
12				
13	CON 000138	Plug 460-3308-1-03 - Cambion	3	
14				
15	CON 001466	Sleeve 508-1974-06-0010 - Cambion	3	
16				
17	Not numbered	16/0.2 PVC Covered Wire: Red	.5M	
18	"	" Brown	.5M	
19	"	" Blue	.5M	
20	WIR 001503	Ident Sleeve 2mm Red - Helvin P20	4	
21	WIR 001504	Ident Sleeve 2mm Orange-HelvinP20	1	
22	WIR 001505	Ident Sleeve 2mm Yellow-Helvin P20	1	

ISSUE	1			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE PUSH SWITCH UNIT	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360113-B PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360446-9	Brake Mtg. Plate	1	
2	2616MD-9	Spacer	4	
3	2603MD-9	End Plate	2	
4	2601MD-	Solenoid Lamination	13	approx
5	8171MD-4	Solenoid Lamination	1	approx
6	4789PL-9	Sub-Assy Bobbin Brake	1	
7	FIX 001303	Nut M2.5 Cd.Pl.	4	
8	FIX 001182	Screw M2.5 x 20 Ch.Hd.Sl.Cd.Pl.	4	
9				
10	FIX 001132	Washer M2.5 Plain Cd.Pl.	4	
11	CON 000138	Plug 460-3308-1-03 - Cambion	4	
12	CON 001466	Sleeve 508-1974-06-0010 - Cambion	4	
13				
14	WIR 001506	Ident Sleeve 2mm Green - Helvin P.20	1	
15	WIR 001507	Ident Sleeve 2mm Blue - Helvin P20	1	
16	WIR 001508	Ident Sleeve 2mm Violet - Helvin P20	1	
17	WIR 001509	Ident Sleeve 2mm Grey - Helvin P20	1	
18	ADH 000502	Loctite 241	A/R	

ISSUE	2			
DATE	27.5.76 19.4.78			
C.N. Nº	3647			
CHECKED		TITLE SUB ASSY BRAKE SOLENOID	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360114-8 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	5747PL-8	Photocell & Connector Assy	1	
2				
3				
4				
5	360448-8	Read Head - Inner Moulding	1	
6	360449-8	Read Head - Outer Moulding	1	
7	360450-9	Window	1	
8				
9				
10				
11	FIX 001142	Screw M2.5 x 10 Ch.Hd.Sl.Cd.Pl.	3	) Moulded into Item 5
12	FIX 001176	M3 Sonic-Loc Insert - P.S.M.	1	)
13	FIX 001173	M3 Banc-Loc. Insert MV3B-M3-P.S,M	1	Pressed into Item 6
14				
15				
16	FIX 001209	Washer M2.5 Crinkle Berym.Cu.	3	
17				
18	FIX 001303	Nut M2.5 Cd.Pl.	3	
19				
20	FIX 001338	Pin 1/16" x 3/8" L.D.K. - Spirol	2	
21				
22	ADH 000527	Silicone Rubber Bathtub Caulk - Dow Corning.	A/R	

ISSUE	1			
DATE	27.5.76			
M.N. Nº				
CHECKED		TITLE READ HEAD ASSY. U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360200 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360201-6	P.C.B. Issue 11	1	
2	360304-8	Cableform	1	
3	4785MD-8	Retainer	1	
4	360436-9	Base	1	
5	360430-9	Support	4	
6	TRA 000228 TRA 001564 TRA 001565	Transistor BCY 70 - Mullard) Alt. Transistor BCY 70 - Texas) Alt. Transistor BCY 70 - National)	29	TR1,2,4,5,6,8,9,10,12, 13,14,16,17,18,20,21, 22,24,25,26,28,29,30, 32,33,34,36,38,39
7	TRA 000229 TRA 001551 TRA 001552 TRA 001553 TRA 001554	Transistor BC 107 - Mullard) Alt. Transistor BC 107 - Texas) Alt. Transistor BC,107 - S.G.S.) Alt. Transistor BC 107 - Motorola) Alt. Transistor BC 107 - National)	17	TR3,7,11,15,19,23,27, 31,35,37,40,41,43,45, 47,54,55
8	TRA 001832	Transistor BFY 50 - Mullard	2	TR42,49
9	TRA 000654 TRA C01573 TRA 001574 TRA 001575	Transistor BFY 51 - Mullard) Alt. Transistor BFY 51 - National) Alt. Transistor BFY 51 - S.G.S.) Alt. Transistor BFY 51 - Motorola)	2	TR 44,46
10	TRA 001833 TRA 000233	Transistor BD 131 - Mullard) Alt. Transistor 2N 5191 - Motorola)	1	TR48
11	TRA 000223 TRA 001556 TRA 001557 TRA 001558 TRA 001559 TRA 001560 TRA 001561	Transistor 2N 3055 - R.C.A.) Alt. Transistor 2N 3055 - Silicon) Alt. Transistor 2N 3055 - Mullard) Alt. Transistor 2N 3055 - Motorola) Alt. Transistor 2N 3055 - Ferranti) Alt. Transistor 2N 3055 - S.G.S.) Alt. Transistor 2N 3055 - Fairchild)	1	TR50 + Ins. Kit
12	TRA 000227	Transistor BSX 19 - Mullard	1	TR52.
13	TRA 000221	Transistor 2N 4918 - Motorola	1	TR53
14	TRA 000225 TRA 001562	Transistor 2N 2906 - Mullard) Alt. Transistor 2N 2906 - Motorola)	1	TR 57
15				

ISSUE	Previous C/Notes 14			
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C.N. Nº	3313 3326 3548 3615 3695 3798 3767			
CHECKED		TITLE P.C.B. ASSY. U.D. READER	SHEET 1 OF SHEETS 5	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360200 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
16	ICE 001834 ICE 001791 ICE 001788 ICE 000210 ICE 001790 ICE 001789	Volt Regulator MLM 309K - Motorola) Alt. Volt.Reg. LM 7805KC - National) Alt. Volt.Reg. LM 340K-National) Alt. Volt.Reg. LM 309K-National) Alt. Volt.Reg. MC7805CK-Motorda) Alt. Volt.Reg. uA 7805KC-Fairchild)	1	TR58
17				
18				
19	ICE 000274 ICE 001747 ICE 001748	Integrated Circuit 936 DC - Fairchild) Alt. I.C. U6A 9936 - S.G.S.) Alt. I.C. MIC 936 - I.T.T.)	2	IC4,6.
20	ICE 000273 ICE 001745 ICE 001746	Integrated Circuit 946 DC - Fairchild) Alt. I.C. U6A 9946 59X- S.G.S.) Alt. I.C. MIC 946 - I.T.T.)	4	IC1,2,3,5.
22				
23	ACC 002608	Transistor Pad TO5-001-Jermyn	4	
24	ACC 002609	Transistor Pad TO518-002-Jermyn	49	
25	DIO 000235 DIO 001810 DIO 001811	Diode IN 4148 - Mullard) Alt. Diode IN 4148 - Fairchild) Alt. Diode IN 4148 - I.T.T.)	4	D1,2,3,17
26	DIO 001850 DIO 001851	Diode BYX 36-150 - Mullard) Alt. Diode IN 4001 - Motorola)	11	D4,5,7,9,10,11,12,13 14,15,16
27	DIO 000594 DIO 001852	Zener Diode PL4004 Gen. Ins) Alt. Diode ZS 274 Ferranti)	1	D8
28				
29	DIO 000236	Zener Diode IN 5353B - Motorola.	1	D6
30	DIO 001835	Zener Diode BZY88C6V2-Mullard	1	D18
31				
32				
33				
34	RES 000319	Res. 100 ohms 5% ½w - Erie 122	1	R59
35				
36	RES 000314	Res. 220 ohms 5% ½w - Erie 122	2	R48,75
37	RES 000444	Res. 330 ohms 2% ½w - Electrosil TR5	1	R45

ISSUE	Previous C/Notes 14			
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CHECKED		TITLE P.C.B. ASSY. U.D. READER	SHEET 2 OF SHEETS 5	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360200 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
38	RES 000345	Res. 470 ohms 5% ½w - Erie 122	3	R76,72,50
39	RES 000343	Res. 560 ohms 5% ½w - Erie 122	3	R46,47,74
40	RES 000339	Res. 1K 5% ½w - Erie 122	17	R1,2,6,10,18,22,26,30 34,55,56,57,58,60,61, 62,73.
41	RES 000434	Res. 1K 2% ½w - Electrosil TR5	1	R44
42	RES 000388	Res. 1K5 5% ½w - Erie 122	1	R77
43	RES 000386	Res. 2K 5% ½w - Erie 122	1	R40
44				
45	RES 000382	Res. 3K3 5% ½w - Erie 122	1	R71
46	RES 000381	Res. 3K9 5% ½w - Erie 122	1	R49
47	RES 000380	Res. 4K7 5% ½w - Erie 122.	1	R41.
48	RES 000377	Res. 15K 5% ½w - Erie 122	1	R38
49	RES 000373	Res. 33K 5% ½w - Erie 122	1	R65
50	RES 000371	Res. 47K 5% ½w - Erie 122	10	R4.8,12,16,20,24,28, 32,36,52
51	RES 000370	Res. 56K 5% ½w - Erie 122	1	R42
52	RES 000369	Res. 68K 5% ½w - Erie 122	2	R14,51
53	RES 000366	Res. 100K 5% ½w - Erie 122	19	R3,5,7,9,11,13,15,17, 19,21,23,25,27,29,31, 33,35,37,39
54	RES 000338	Res. 1M 5% ½w - Erie 122	1	R81
55				
56	RES 000519	Res. 0.1 ohms 2½w 5% - Welwyn W21	1	R70,
57				
58	RES 000516	Res.2ohms 2½w 5% - Welwyn W21	1	R64
59	RES 000497	Res. 4.7 ohms 6w 5% - Welwyn W22	1	R66
60	RES 000496	Res. 10 ohms 6w 5% - Welwyn W22	1	R69
61	RES 000495	Res. 12 ohms 6w 5% - Welwyn W22	1	R67
62	RES 000494	Res. 22 ohms 6w 5% - Welwyn W22	1	R68
63		A.O.T.	1	R78
64				
65				

ISSUE	Previous C/Notes						
DATE	3274	3363	3492	3569	3642	3703	
C.N. Nº	3313	3326	3548	3615	3695	3798	3767

CHECKED		TITLE	SHEET 3 OF SHEETS 5	PRINT ISSUED DATE
DATE		P.C.B. ASSY. U.D. READER		

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360200 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
66	CAP 000196	Cap. 0.22uF 160v.10%. Wima TFM	1	C1
67	CAP 000872	Cap. 1.0uF 160v.10%.Wima TFM.	1	C6
68	CAP 001784	Cap. 0.047uF 160v.20%.Wima TFM.	1	C5
69	CAP 002359	Cap. 150pF 750v. 20%. Erie 61013.	1	C9
70	CAP 002362	Cap. 1,000pF 750v. 20%. Erie 61013	1	C15
71				
72				
73	CAP 000981	Cap. 2.2uF 35v. I.T.T.	1	C4.
74	CAP 000879	Cap. 100uF 16v. Wima Printilyt	2	C12,14.
75	CAP 000916	Cap. 1,000uF 25v. Erie 211	1	C10
	CAP 000197	Cap. 500uF 50v. Daly S2614	2	C7,8
77	CAP 002400	Cap. 0.33uF 35v. Tag.Tant. - I.T.T.	1	C11.
78				
79	HOL 000083	Fuseholder L1426 - Belling Lee	2	
80	FUS 001285	Fuse 2 Amp. TDC 123 - Beswick	1	FS1
81	FUS 001284	Fuse 3.15 Amp. TDC 211 - Beswick	1	FS2
82				
83				
84	POT 002871	Variable Resistor 100K- 64w -104 Spectrol Reliance	10	RV1 - 10
85				
86	CON 000294	Socket 450-3704-1-03 - Cambion	18	
	WIR 000312	Avlug 1/16" 1107-0208	39	
88	CON 000297	Edge Conn. EWD 24/24/FS - Ferranti	1	SKT1
89	CON 001831	Polarising Key A4115/01308-Ferranti	1	For Item 88
90	WIR 001316	'P' Clip NX1 - Insuloid	1	
91				
92	CON 001830	Mini.Conn.8129-012-603-002- Varelco	1	SKT2
93				
94	FIX 001126	Screw M3 x 8 Nylon Ch.Hd.Sl.	3	
95				

ISSUE	Previous C/Notes 14			
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EN. Nº	3313 3326 3548 3615 3695 3798 3767			
CHECKED		TITLE P.C.B. ASSY. U.D. READER	SHEET 4 OF SHEETS 5	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360200 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
96	FIX 001146	Screw M3 x 8 Ch.Hd.Sl.Cd.Pl.	4	
97	FIX 001183	Screw M3 x 10 Ch.Hd.Sl.Cd.Pl.	1	
98	FIX 001186	Screw M3 x 25 Ch.Hd.Sl.Cd.Pl.	1	
99				
100	FIX 001210	Washer M3 Crinkle Berym.Cu.	5	
101	FIX 001216	Washer M3 Fibre	7	
102	FIX 001133	Washer M3 Plain Cd.Pl.	1	
103	FIX 001304	Nut M3 Cd.Pl.	9	
104				
105	FIX 001196	Self.Tap. Screw No.4 x $\frac{1}{4}$ Pan.Hd. Sl.Cd.Pl.	4	
106				

ISSUE	Previous C/Notes 14			
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C.N. Nº	3313 3326 3548 3615 3695 3798 3767			
CHECKED		TITLE P.C.B. ASSY. U.D. READER	SHEET 5 OF SHEETS 5	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360300-3 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360420-9	Board	1	
2				
3	WIR 001467	Avlug 3/32" 1107-0312	9	
4	FIX 001838	Solder Tag M3	1	
5	CON 000920	Faston Receptacle 42599-2 - A.M.P.	3	
6	MOU 001422	Insulating Boot for 41729 - AMP	3	
7				
8				
9				
10	Not numbered	16/0.2 PVC Covered Wire: Brown	.3M	
11	"	" Red	.3M	
12	"	" Orange	.3M	
13	"	" Yellow	.1M	
14	"	" Blue	.3M	
15	"	" Red/Brown	.3M	
16	"	" Red/Black	.1M	
17	"	" Green/Yellow	.3M	
18				
19				
20				
21				
22	WIR 000608	20 SWG Tinned Copper Wire	.2M	
23	WIR 002141	Sleeve 1mm Bore Blk. PVC	.2M	
24				
25	WIR 001510	Lacing Cord 1.0mm	.5M	
26				
27	WIR 001839	Ident Sleeve 3mm Brown - Helvin P30	1	
28	WIR 001840	Ident Sleeve 3mm Red - Helvin P30	1	
29	WIR 001841	Ident Sleeve 3mm Orange - Helvin P30	1	

ISSUE	1 2. 3			
DATE	27.5.76 5.4.77. 25.8.78.			
C.N. Nº	3162. 3654			
CHECKED		TITLE MAINS CABLEFORM U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360301-A PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	CON 001842	Socket PS10 – McMurdo	1	
2				
3	FIX 001838	Solder Tag M3.	1	
4				
5	CON 001382	Flag Conn .3000H4A – Ripault Arkles	2	
6				
7				
8				
9				
10	Not numbered	24/0.2 PVC Covered Wire: Blue	.3M	
11	"	" Violet	.1M	
12	"	" Grey	.3M	
13	"	" White	.1M	
14	"	" Pink	.1M	

ISSUE	1	2.
DATE	27.5.76	6.4.77.
C.N. Nº	3235.	

CHECKED		TITLE CABLEFORM U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360302-3 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1				
2				
3				
4				
5	HOL 001843	Lampholder SCC 15 - Bulgin	1	
6				
7				
8				
9	CON 000138	Plug 460-3308-1-03 - Cambion	2	
10	CON 001466	Sleeve 508-1974-06-0010 - Cambion	2	
11				
13	FIX 001838	Solder Tag M3	1	
14	FIX 001414	Solder Tag M4	1	
15	WIR 001460	Sleeve H20 x 20 - Hellermann	1	
16	WIR 001464	Sleeve H100 x 25 - Hellermann	1	
17				
18	Not numbered	16/0.2 PVC Covered Wire: Red	.4M	
19	"	" Orange	.4M	
20	"	" Green/Yellow	.4M	
21				
22				
23				
24	WIR 001844	Ident Sleeve 2mm Black - Helvin P20	1	
25	WIR 001503	Ident Sleeve 2mm Red - Helvin P20	1	
26	WIR 001504	Ident Sleeve 2mm Orange - HelvinP20	1	
27	WIR 001845	Ident Sleeve 2mm White - Helvin P20	1	

ISSUE	1			
DATE	27.5.76			
E.N. Nº				
CHECKED		TITLE LAMP CABLEFORM U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD. | PARTS LIST | DRG Nº 360303-3 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1				
2				
3				
4				
5	CON 000138	Plug 460-3303-1-03 - Cambion	2	
6	CON 001466	Sleeve 508-1974-06-0010 - Cambion	4	
7	CON 001419	Flag Conn. 150205-2 - AMP	2	
8				
9				
10	Not numbered	16/0.2 PVC Covered Wire: Brown	.4M	
11	"	" Orange	.4M	
12				
13				
14				
15	WIR 001846	Ident Sleeve 2mm Brown - Helvin P20	1	
16	WIR 001503	Ident Sleeve 2mm Red - Helvin P20	2	
17	WIR 001504	Ident Sleeve 2mm Orange - HelvinP20	1	
18	WIR 001508	Ident Sleeve 2mm Violet - Helvin P20	1	
19	WIR 001509	Ident Sleeve 2mm Grey - Helvin P20	1	

ISSUE	1 M			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE MICROSWITCH CABLEFORM U.D.R	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360304-B PL

ITEM	COMPUTER CODE	DESCRIPTION		QTY	CIRCUIT LOCATION
1					
2					
3					
4					
5	CON 001496	Plug PP10 - McMurdo		1	
6	CON 001849	Cover PPC10 - McMurdo		1	
7					
8					
9					
10	Not numbered	16/0.2 PVC Covered Wire:	Brown	.25M	
11	"	"	Red	.25M	
12	"	"	Orange	.25M	
13	"	"	Yellow	.25M	
14	"	"	Violet	.25M	
15	"	"	Grey	.25M	
16	"	"	White	.25M	
17	"	"	Pink	.25M	
18	"	"	Blue	.25M	
19					
20					
21					
22					
23	WIR 001227	Sleeve LVR 64 - Hellermann		.15M	
24	WIR 001463	Sleeve H75 x 25 - Hellermann		1	
25	WIR 001460	Sleeve H20 x 20 - Hellermann		9	

ISSUE	1 M			
DATE	27.5.76			
E.N. Nº				
CHECKED		TITLE P.C.B. CABLEFORM U.D.R.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 361000-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	361001-6	Final Assy.	1	
2	360100-8	Cover Assy.	1	
3	360108	Despatch Items	1	
4				
5				
6	3454MD-8	I/F P.C.B.	1	
7	360433-8	Bot. Decorative	1	
8	360434-8	Top Decorative	1	
9				
10				
11				
12	FIX 001271	'Spire' Screw No. 6 x 3/8"	1	
13				
14				
15				
16	FIX 001825	Washer 4BA Plain Chrome	1	

ISSUE	1			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE G.A. OF UNIDIRECTIONAL READER U.D.R. 700	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 361001-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360101-8	Base & P.C.B. Assy.	1	
2	361102-7	Comp. Panel & T/F Assy.	1	
3	361104-6	Main Casting Assy.	1	
4				
5				
6	2750MD-9	Cable Clamps	2	
7				
8	360439-9	Mod. to Foot	2	Item 12 modified
9	361401-9	Manf. Label	1	
10	360457-4	Tape Guide Rod	1	
11	360456-4	Lamp Adjustment Label	1	
12	MOU 001487	Foot Plastic 426A - Eng. Ent.	2	Mod. to 360439-A, Item 8
13				
14				
15	FIX 001271	'Spire' Screw No.6 x 3/8"	2	
16	FIX 001266	'Spire' Screw No.6 x 1".	4	
17				
18				
19				
20	FIX 001445	'Taptite' Screw M4 x 10 Pan.Hd.	4	
21	FIX 001123	Hex. Socket Set Screw (Grub Screw) M3 x 3	1	
22				
23	FIX 001134	Washer M4 Plain Cd.Pl.	6	
24				
25				
26	FIX 001186	Screw M3 x 25 Ch.Hd.Sl.Cd.Pl.	2	

ISSUE	1M. 2.			
DATE	27.5.76 5.4.77.			
C.N. Nº	3156.			
CHECKED		TITLE FINAL ASSY. U.D.R. 700	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
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TREND COMMUNICATIONS LTD.	PARTS LIST	DRG. No. 361102-C P1

ITEM	COMPUTER CODE	DESCRIPTION	QTY.	CIRCUIT LOCATION
1	360103-9	Mains Supp. Board Assy.	1	
2	360301-9	Cableform.	1	
3	360111-8	Transformer Assy.	1	
4	360421-7	Panel.	1	
5	360422-8	Bracket.	1	
6				
7				
8				
9	HOL 000082	Fuseholder F296 - Bulgin.	1	FS3.
10	CON 001826	Term. Block 4 way Mk. 3/4 - Klippon.	1	TB1.
11	CON 000211	Conn. Block Mk. 1/3 - Klippon.	1	
12	CON 002778	Voltage Selector MP44-McMurdo	1	
13	DIO 002243 DIO 002241 DIO 000311 DIO 001222	Bridge Rectifier KB PC 25-02 - Gen. Instr.) Alt. Bridge Rectifier KB PC 10-02 - Gen. Instr.) 1 Alt. Bridge Rectifier KBH 25-005 - Gen. Instr.) Alt. Bridge Rectifier KB PC 10-005 - Gen. Instr.)		BR1.
14	CAP 000919	Cap. 10,000uF 25v. - Erie 321.	1	C20.
15	ACC 001028	Capacitor Clamp 1.3/8" Vert. - Mullard.	1	
16				
17	TRA 000223	Transistor 2N 3055 - R.C.A.	1	+ Insul.Kit. TR60.
18	CAP 000883	Cap. 5uF 250v. A.C. Rifa 5016-5.	1	
19	FUS 001284	Fuse 3.15 Amp. TDC 211 - Beswick.	2	
20	FUS 001285	Fuse 2 Amp. TDC 123 - Beswick.	1	
21	FUS 001294	Fuse 5 Amp. TDC 211 - Beswick.	1	
22	HOL 001828	Fuseholder L2005 - Belling Lee.	1	3 way Holder cut from 12 way.
23	MIS 002705	Mains Lead Coding Label	A/R	
24	FIX 001271	'Spire' Screw No. 6 x 3/8".	8	
25	FIX 001380	'Spire' Captive Nut No. 6 SNU2811-17-00.	4	
26	WIR 001530	Mains Cable Mini RS 377/726.	4 m.	

ISSUE	1.	2.	3	4
DATE	27.5.76.	14.4.77.	8.3.78	17.4.78
C.N. No.		3195. 3594	3579	

CHECKED		TITLE	SHEET 1 OF SHEETS 2	PRINT ISSUED DATE
DATE		COMPONENT PANEL & T/F ASSY. U.D.R. 700.		

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG. No. 361102-C PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY.	CIRCUIT LOCATION
27	WIR 001460	Sleeve H20 x 20 - Hellermann.	9	
28	WIR 001326	'Insulok' Cable Tie T18R.	5	
29	WIR 001316	'P' Clip NX1 - Insuloid.	1	
30	FIX 001146	Screw M3 x 8 Ch.Hd.Sl.Cd.Pl.	3	
31				
32	FIX 001184	Screw M3 x 12 Ch.Hd.Sl.Cd.Pl.	2	
33	FIX 001185	Screw M3 x 16 Ch.Hd.Sl.Cd.Pl.	4	
34	FIX 001149	Screw M3 x 20 Ch.Hd.Sl.Cd.Pl.	3	
35	FIX 001186	Screw M3 x 25 Ch.Hd.Sl.Cd.Pl.	2	
36				
37	FIX 001152	Screw M4 x 12 Ch.Hd.Sl.Cd.Pl.	3	
38				
39	FIX 001306	Washer M3 Shakeproof Steel Blk.	12	
40	FIX 001307	Washer M4 Shakeproof Steel Blk.	3	
41				
42	FIX 001133	Washer M3 Plain Cd.Pl.	10	
43	FIX 001134	Washer M4 Plain Cd.Pl.	7	
44				
45	FIX 001210	Washer M3 Crinkle Berym.Cu.	2	
46				
47				
48				
49	FIX 001304	Nut M3 Cd.Pl.	18	
50	FIX 001305	Nut M4 Cd.Pl.	3	

ISSUE	1.	2.	3.	4
DATE	27.5.76.	18.5.77.	16.11.77.	17.4.78
C.N. No.		3292	3472.	3579

CHECKED		TITLE COMPONENT PANEL & T/F ASSY. U.D.R. 700.	SHEET 2 OF SHEETS 2	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 361104-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360113-8	Brake Solenoid Assy.	1	
2	360114-8	Read Head Assy.	1	
3	360105-9	Detent Roller Assy.	1	
4	360106-9	Lampholder Assy.	1	
5	360107-8	Solenoid Assy., Drive	1	
6	360109-9	Bracket & M/Switch Assy.	1	
7	360110-8	Click Stop Guide Assy.	1	
8	360112-9	Push Switch Unit	1	
9				
10	2615MD-9	Spacer	2	
11	7435MD-9	Screw	1	
12	360400-6	Casting	1	
13	360404-9	Clips	4	
14	360405-8	Table	1	
15	360406-9	Guide, Right	1	
16	360408-9	Clamps	2	
17	360409-9	Pin	1	
18	360410-9	Support	1	
19	360418-9	Roller	1	
20	360419-9	Plug	1	
21	360427-9	Stud	4	
22	361400-9	Badge	1	
23	360435-9	Retainer	2	
24	360437-9	Stud	1	
25	360438-9	Plug	1	
26	360443-9	Push Button	1	
27	360407-9	Guide, Centre	1	
28				
29	MOT 000246	Motor Pabst 2800 r.p.m. B170	1	
30	OPT 000004	Lens Convex F23.3 - English Glass	1	
31	SWI 000673	Switch C403 - Arcoelectric	1	

ISSUE	1m.			
DATE	27.5.76			
C.N. Nº				
CHECKED		TITLE MAIN CASTING ASSY. U.D.R. 700	SHEET 1 OF SHEETS 3	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 361104-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
32				
33	MOU 001457	Rubber Cap P.V. 1410 - Reevite	1	
34				
35	WIR 001325	'Fastex' Wire Tie 232 GD 0789 000	2	
36	WIR 001461	Sleeve H30 x 25 - Hellermann.	2	
37				
38	FIX 001146	Screw M3 x 8 Ch.Hd.Sl.Cd.Pl.	2	
39	FIX 001183	Screw M3 x 10 Ch.Hd.Sl.Cd.Pl.	3	
40	FIX 001184	Screw M3 x 12 Ch.Hd.Sl.Cd.Pl.	4	
41				
42	FIX 001188	Screw M4 x 16 Ch.Hd.Sl.Cd.Pl.	3	
43	FIX 001154	Screw M4 x 30 Ch.Hd.Sl.Cd.Pl.	1	
	FIX 001516	Screw M3 x 12 Hex.Hd.Cd.Pl.	1	
45	FIX 001189	Screw M4 x 10 Hex.Hd.Cd.Pl.	1	
46				
47	FIX 001114	Screw M3 x 6 Hex.Skt.Cap.Hd.Blk	1	
48	FIX 001821	Screw M3 x 10 Hex.Skt.Cap.Hd.Blk	3	
49				
50				
51	FIX 001119	Screw M4 x 10 Hex.Skt.Cap.Hd.Blk	2	
52	FIX 001822	Screw M4 x 16 Hex.Skt.Cap.Hd.Blk	2	
53				
54				
	FIX 001123	Hex. Socket Set Screw (Grub Screw) M3 x 3	3	
56				
57	FIX 001134	Washer M4 Plain Cd.Pl.	12	
58	FIX 001136	Washer M4 Lg.Dia.Plain Cd.Pl.	1	
59				
60				
61	FIX 001306	Washer M3 Shakeproof Steel Blk	10	
62	FIX 001307	Washer M4 Shakeproof Steel Blk	4	

ISSUE	1.	2.	3.
DATE	27.5.76	17.6.77.	5.9.77.
C.N. Nº		3327.	3328.

CHECKED		TITLE	SHEET 2 OF SHEETS 3	PRINT ISSUED DATE
DATE		MAIN CASTING ASSY. U.D.R. 700		

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 361104-D PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
63				
64				
65	FIX 001213	Washer M4 Single Coil Spr.Blk	3	
66	FIX 001214	Washer M5 Single Coil Spr.Blk	4	
67				
68	FIX 001304	Nut M3 Cd.Pl.	1	
69	FIX 001305	Nut M4 Cd.Pl.	4	
70				
71				
72				
73				
74	FIX 001445	'Taptite' Screw M4 x 10 Pan.Hd.	12	
75				
76				
77	ADH 000502	Loctite 241 - Douglas Kane.	A/R	
78				
79				
80				
81				
82	FIX 001177	Anchor Rivet Bush M3/16/A - P.S.M.	1	

ISSUE	1.	2.		
DATE	27.5.76	17.6.77.		
C.N. Nº	3327.			
CHECKED		TITLE MAIN CASTING ASSY.	SHEET 3 OF SHEETS 3	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 360012-A4 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	360000-6	UDR 350.	1	
2				
3				
4				
5	360452-8	Bot. Decorative.	1	
6	360453-8	Knob.	1	
7	360454-9	Spigot.	1	
8				
9				
10	FIX 001123	Hex. Socket Set Screw (Grub Screw) M3 x 3.	1	
11				
	ADH 000502	Loctite 241 - Douglas Kane.	A/R	

ISSUE	1.m			
DATE	24.8.76.			
E.N. Nº				
CHECKED		TITLE S.R. SPEC. UDR 350 WITH DUAL STD. HD.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 361012-A4 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
1	361000-6	U.D.R. 700.	1	
2				
3				
4				
5	360452-8	Bot. Decorative.	1	
6	360453-8	Knob.	1	
7	360454-9	Spigot.	1	
8				
9				
10	FIX 001123	Hex. Socket Set Screw (Grub Screw) M3 x 3.	1	
11				
12	ADH 000502	Loctite 241.- Douglas Kane.	A/R	

ISSUE	1m.			
DATE	24.8.76.			
C.N. Nº				
CHECKED		TITLE S.R. SPEC. U.D.R. 700 WITH DUAL STD. HEAD.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG Nº 361013-A4 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY	CIRCUIT LOCATION
	361000-6	U.D.R. 700.	1	(Cover finished Cossack Brown).
2				
4	360455-8	Top Decorative 'Solartron'.	1	(360434 screened).

ISSUE	1.m			
DATE	24.8.76.			
CN. Nº				
CHECKED		TITLE S.R. SPEC. SOLARTRON UDR 700.	SHEET 1 OF SHEETS 1	PRINT ISSUED DATE
DATE				

TREND COMMUNICATIONS LTD.	PARTS LIST	DRG. No. A2 361014 PL

ITEM	COMPUTER CODE	DESCRIPTION	QTY.	CIRCUIT LOCATION
1	361000-D PL	G.A. of UDR 700.	1	
2				
3	740000PL	Interface P.C.B. & C'FM Assy.	1	
4				
5	740101-4	Re-work of Cable Outlet L 653/C3	1	Rework of Item 14.
6				
7	CON 000117	Plug Retainer L 653/R3 Belling Lee	1	
8	CON 000136	Unitor Plug L653/P " "	1	
9				
10	FIX 001970	Screw 6BA x $\frac{3}{8}$" CH.HD. STL. CAD. PL.	2	Use in place of existing screws on item 5.
11	WIR 001461	Sleeve H30 x 25 - Hellermann.	1	
12	WIR 001463	Sleeve H 75 x 25 Hellerman	1	
13	WIR 001459	Sleeve H15 x 20 - Hellermann.	3	
14	CON 000137	Cable Outlet L653/C3 - Belling Lee.	1	Used on Item 5.
15				
16	CONOOO 137	Cable Outlet L653/C3 Belling Lee	1	) These items
17	CONOOO 104	Unitor Socket L653/S " "	1	) to be put
18	CONOOO 159	Cable Outlet L657/C3 " "	1	) in plastic
19	CONOOO 103	Unitor Socket L1328/S " "	1	) bag and despatched with unit.
20	MIS 002062	Plastic Bag 205 x 130.	1	

ISSUE	1 2. 3			
DATE	3.11.77 20-12-77. 1.6.78			
C.N. No.	3521. 3712			
CHECKED		TITLE UDR 700 with	SHEET 1 OF 1 SHEETS	PRINT ISSUED DATE
DATE		Ferranti Interface Kit		

Additional Facility (Refer to Main Circuit Diagram)

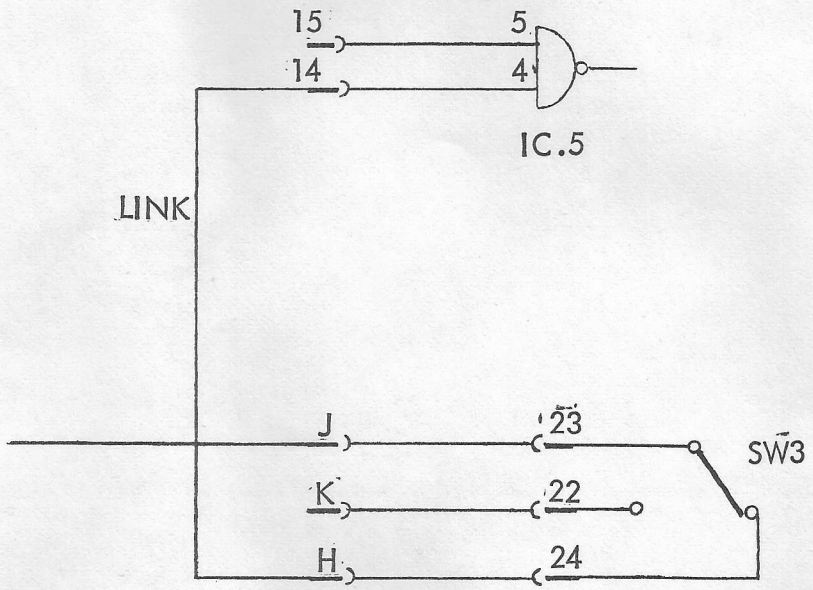
Push Button switch SW3 (Fig.10 : 24) is provided for the users convenience as an extra switch to be used in conjunction with the other equipment or as an aid in incorporating additional facilities in the Reader.

Switch connections 22 - normally open, 23 - Common and 24 - normally closed - are taken to Edge Connector pins K, J and H respectively.

Example of Use

A Tape 'RUN OUT' facility might be required and in cases where the 'Transport Enable' signal line to Edge Connector pin 15 is not utilized, this RUN OUT facility can be obtained by removing the Drive input from pin 14 and connecting it to pin J, Link Pins H and 14. This connection ensures that the Drive signal passes through the normally closed condition of SW3.

When SW3 is pressed the DRIVE line is open circuited and the input at IC5 : 4 goes high, DRIVE commences and the Tape 'RUNS OUT'.



Connection Diagram.

EXTENDED INTERFACE

CONTENTS LIST

FIGURES

EXTENDED INTERFACE Part No. 5039

1. Description

The Extended Interface Unit is a small printed circuit component board to which is wired a multi-way cable terminated in a 'D' type sub-miniature 37-way socket. The circuit board is designed to plug directly into the input/output connector (SKT 2) of the reader inside the back cover, and the cable leaves the reader via the cable clamp provided. The cable length is approximately 1 metre.

The Extended Interface provides the following facilities:

(a) Brake Delay of 0.2ms from time of Sprocket going light;
(b) Tape flap open or power fail alarm signal;
(c) Tape out or tape tight time out alarm signal;
(d) Manually switchable drive direction control.

Each of these facilities may be independently disabled and (d) is optional.

This interface is standard on Trend Paper Tape Stations, and is used with many of the Trend special interfaces.

2. Control Signals

The control signals of the Extended Interface are identical to those for the basic interface, described in Equipment Handbook except as follows:-

(i) Drive Right: This input is held to logic '0' if the optional direction switch SW1 is put in the 'L' position. Provided that the Drive Left input is left at logic 1 or open circuit, this will allow the reader to drive left under control of the Transport Enable input.

(ii) Drive Left: This input is held to logic '0' if the optional direction switch SW1 is put in the 'R' position. Provided that the Drive Right input is left at logic '1' or open circuit, this will allow the reader to drive right under control of the Transport Enable input.

(iii) Transport Enable: This input is 2 unit loads. This signal is over-ridden for nominally 0.2ms from the time of the sprocket output going to logic 0 (light), for which period the Transport Enable input to the reader standard interface is held to logic 1. This prevents the brake from being applied when the decision time for proceeding to the next character is less than 0.2ms, whilst still allowing stopping with the Sprocket light if the Transport Enable input is taken to logic 0 during this period.

2. Continued

(iii) The brake delay is only effective if the Drive Right and Drive Left input remain unchanged. It may be disabled by breaking Link 1. The Transport Enable input is also over-ridden when a tape out/tape tight alarm condition occurs. In this stage, the transport enable input to the basic interface is held to logic 0 irrespective of the input to the extended interface.

(iv) Reader Tape Alarm Reset: This input is 1 unit load. This input should normally be held to logic 1. When taken to logic 0 it resets the tape out/tape tight alarm latch. The reset condition must be maintained for at least 20 microseconds in order to reset the alarm latch. If this input is held to logic 0, the tape out/tape tight facility is disabled.

3. Output Signals

The output signals of the Extended Interface are identical to those for the basic interface, described in the Equipment Handbook, except for the following additions and changes. The microswitch signals and the switched lamp supply are not provided at the 37-way socket.

(i) Sprocket: Output is unchanged, but drive capability is reduced to 7 units drive.

(ii) Sprocket Pulse: This additional output has 7 units drive capability. The output switches from logic 0 to logic 1 for a period of 0.2ms $\pm$ 0.05ms from each dark to light transition of the Sprocket output (logic 1 to logic 0).

This signal is linked via Link 1 to provide a 'brake delay' as described in Section 3 (iii).

(iii) Reader Tape Alarm: This additional output has 8 unit drive capability. The output is normally at logic 0. It switches to logic 1 under the following conditions:

(a) When Link 2 is completed and the tape loading flap is open;
(b) When Link 2 is completed and the lamp supply is switched off or has failed;
(c) When a Sprocket Pulse has not been generated in any period of nominally 25ms whilst the Transport Enable input is at logic '1'. This will occur if either there is no tape over the read head, or if tape is present but has stalled.

3. Continued

The output is latched to logic 1, and may be returned to logic 0 by either of the following methods:

(a) Restore the lamp supply if failed and open then close the tape loading flap. The time-out latch is reset when the loading flap is open, but the Tape Alarm output does not recover to logic 0 until the flap is next closed if Link 2 is in circuit.

(b) If the lamp supply is present and the tape loading flap is closed, take the Reader Tape Alarm Reset input to logic 0 for at least 20 microseconds.

In both cases, it is necessary to first or simultaneously take the Transport Enable input to logic 0 in order to avoid an immediate drive condition.

It may be noted that the time-out period is sufficient to allow at least 1 inch of sprocketless tape through the read head, thus tapes may be butt spliced by unpunched apoque tape up to 1 inch long on sections of 'Feed' codes (no code holes punched). Also, the time-out period will not be sufficient to allow 3 inches or more of sprocketless tape through the read head, and this may be used as a means of stopping tapes without the need to recognise a 'stop' code. In particular it may be used to prevent the end of a tape being read as a spurious code.

4. Power Connections

The Extended Interface has the power supplies connected internally to the input socket of the reader. The +5v supply is available at the 37-way socket, and a maximum current of 0.5A may be drawn.

The +9v supply is also available at the 37-way socket (V1) and a maximum current of 0.1A may be drawn. Care must be taken to decouple this supply from excessive external load transients.

5. Circuit Explanation (See Fig. 1 Ap)

(i) Sprocket Pulse Generator

The Sprocket signal from the reader is connected through inverters 3/3,4 and 3/11, 10 to capacitor C2. When the sprocket is dark 3/10 is at logic 1, TR3 is held ON by base current from R4 and C2 is charged to approximately 4.3v. The sprocket pulse output is then at logic 0. When the sprocket goes light (logic 0), 3/10 switches from +5v to approximately +0.5v, and through C2 instantaneously takes the base of TR3 through a similar negative voltage transition which switches the collector current off and so causes a step to logic 1 at the sprocket pulse output.

5. Continued

This output state continues until C2 discharges through resistor R4 sufficiently to cut TR3 ON again. This discharge, governed by the time constant of C2 and R4, takes nominally 0.2 ms, thus a positive output pulse of this duration is formed.

When the sprocket next goes dark, C2 is recharged by the collector resistor of output 3/10 but TR3 remains ON, and the output is not affected.

(ii) Tape Flap Open Detector
Refer to Equipment Handbook for V1 Derivation.

V1 SWITCHED from Lamp Supply(9v) after the supply fuse and switch 2 which is operated by the tape loading flap. Whilst the loading flap is closed with the supply V1 present and the fuse intact, TR1 is held ON by base current supplied through R1. This takes inverter input 3/13 to logic 0 and output 3/12 to logic 1. When the flap is opened, or the supply fails, current ceases to flow through R1 and C1 discharges through R2 and TR1 base until insufficient base current flows to hold TR1 ON. C1 prevents TR1 from changing state until the short switch bounce period is over. TR1 switching OFF causes 3/12 to switch to logic 0 and if Link 2 is in circuit the Reader Tape Alarm output is switched to logic 1. When the flap is closed, switch 2 will close with switch bounce lasting a few milliseconds, or longer if the flap itself is caused to bounce. During this period, C1 is progressively charged through R1 whenever the switch is conducting, and then TR1 is switched ON, taking 3/13 to logic 0 and 3/12 to logic 1, thus allowing the Reader Tape Alarm output to switch to logic 0.

(iii) Time-out Circuit

When the supplies are first switched on, C3 is uncharged so that 2/13 is at logic 0 and 2/11 and 2/9 are at logic 1. As long as Transport Enable input remains at logic 0, 2/3 is held to logic 1, thus 2/10 is also at logic 1 and 2/8 at logic 0. This holds TR2 ON through inverter 3/9, 8, maintaining C3 in the uncharged state. As soon as Transport Enable input is taken high, 2/3 switches to logic 0, because the sprocket pulse output is normally at logic 0. This causes 2/8 to switch to logic 1, provided that the tape flap is closed and the lamp supply is present, and assuming that the R.T.A. Reset input is normally at logic 1. This in turn, causes TR2 to switch OFF and C3 begins to charge through the input circuit of 2/13 (approximately 4K ohm). If the conditions remain unaltered, C3 will charge to the logic 1 threshold of 2/13 after nominally 25 ms, which will cause 2/11 to switch to logic 0, which through 2/9 latches the circuit in this state. C2 will not charge appreciably above the input threshold voltage of 2/13 (approximately 1.5v) because the leakage resistor R6 will hold the input diode slightly forward biassed. Normally, however, Transport Enable will cause a Sprocket Pulse well within the 25 ms period, and this will take 2/1 to logic 0 through inverter 3/5, 6 which will cause 2/8 to pulse to logic 0 and TR2 to switch ON and rapidly discharge C3.

5. Continued

When a sprocket pulse does not occur within 25 ms, causing the time-out circuit to latch on with 2/11 at logic 0, the Reader Tape Alarm output is taken to logic 1 because 1/12 is held to logic 0 through diode D1. This diode is included to ensure that the Tape Alarm output is not switched until the alarm has latched through 2/9, so that the Transport Enable input may be taken to logic 0 immediately. The latch is reset either by raising the tape loading flap to cause 2/4 to go to logic 0, or by taking R.T.A. Reset input to logic 0. In either case 3/2 is taken to logic 0 which causes TR2 to switch ON and discharge C3 which in turn allows 2/11 to return to logic 1 and unlatch the circuit provided that the Transport Enable input has been taken to logic 0. The Reader Tape Alarm output returns to logic 0 after a short delay from the start of the reset. The reset condition must be maintained for at least 20 micro-seconds in order to ensure unlatching of the time-out circuit.

(iv) Brake Delay

If link 1 is in circuit, each Sprocket Pulse takes 1/5 to logic 0 through inverter 3/5, 6 and thus the Reader Transport Enable input is held to logic 1 for the duration of the sprocket pulse (0.2 ms from Sprocket going Light) irrespective of the state of the Transport Enable input to the Extended Interface. This prevents unnecessary brake operation yet still allows stopping on a character.

6. Connector Pin Assignment

Socket: Cinch 37-way sub-miniature 'D' type with die-cast cover and retainer clip.
Cable Length: Approximately 1 metre.

PIN	SIGNAL	WIRE COLOUR
1	Channel 1	Brown
2	Channel 2	Red
3	Channel 3	Orange
4	Channel 4	Yellow
5	Channel 5	Green
6	Channel 6	Blue
7	Channel 7	Violet
8	Channel 8	Grey
9	Sprocket	White
10	Drive Right	Black
11	Drive Left	Pink
12	Transport Enable	White/Red
13	Channels Enable	White/Green
14	Sprocket Enable	White/Blue
15	Channels Inhibit	Yellow/Blue
16	V1	Blue/Black
17	Power Earth	Yellow/Green
18	+5v Output	Red/Black and Red/Brown
19	0v Signal Common	Red/Blue and Red/Green and Screen
20	R.T.A. Reset	Orange/Green
21	Sprocket Pulse	Orange/Blue
22	Reader Tape Alarm	Yellow/Red
23	Not Used	
24	"	
25	"	
26	"	
27	"	
28	"	
29	"	
30	"	
31	"	
32	"	
33	"	
34	"	
35	"	
36	"	
37	"	

NOTE: Each wire rated at 0.25A maximum.

7. EXTENDED INTERFACE UNIT COMPONENTS

Complete Unit - Part No. 5039.

1. Resistors

Circuit Ref.	Resistance ohms	Tolerance ± %	Rating W	Maker	Type
R1	100K	5	¼	Electrosil	TR5
R2	27K	5	¼	Electrosil	TR5
R3	5.6K	5	¼	Electrosil	TR5
R4	27K	5	¼	Electrosil	TR5
R5	390	5	¼	Electrosil	TR5
R6	22K	5	¼	Electrosil	TR5

2. Capacitors

Circuit Ref.	Capacitance Micro-farads	Tolerance %	Rating volts	Maker	Type
C1	0.1	± 20	160	Wima	Tropyfol M
C2	0.01	± 10	100	Wima	Tropyfol M
C3	22	-20/+80	63	Erie	20101-100-0220-0Z-0630

3. Transistors and Diodes

Circuit Ref.	Type	Case	Maker	Type No.
D1	Silicon Signal Diode		Various	IN 4148
TR1,3	N.P.N.	TO-18	S.G.S.	BC 113
TR2	N.P.N.	TO-18	S.G.S.	U19353/1

4. Integrated Circuits

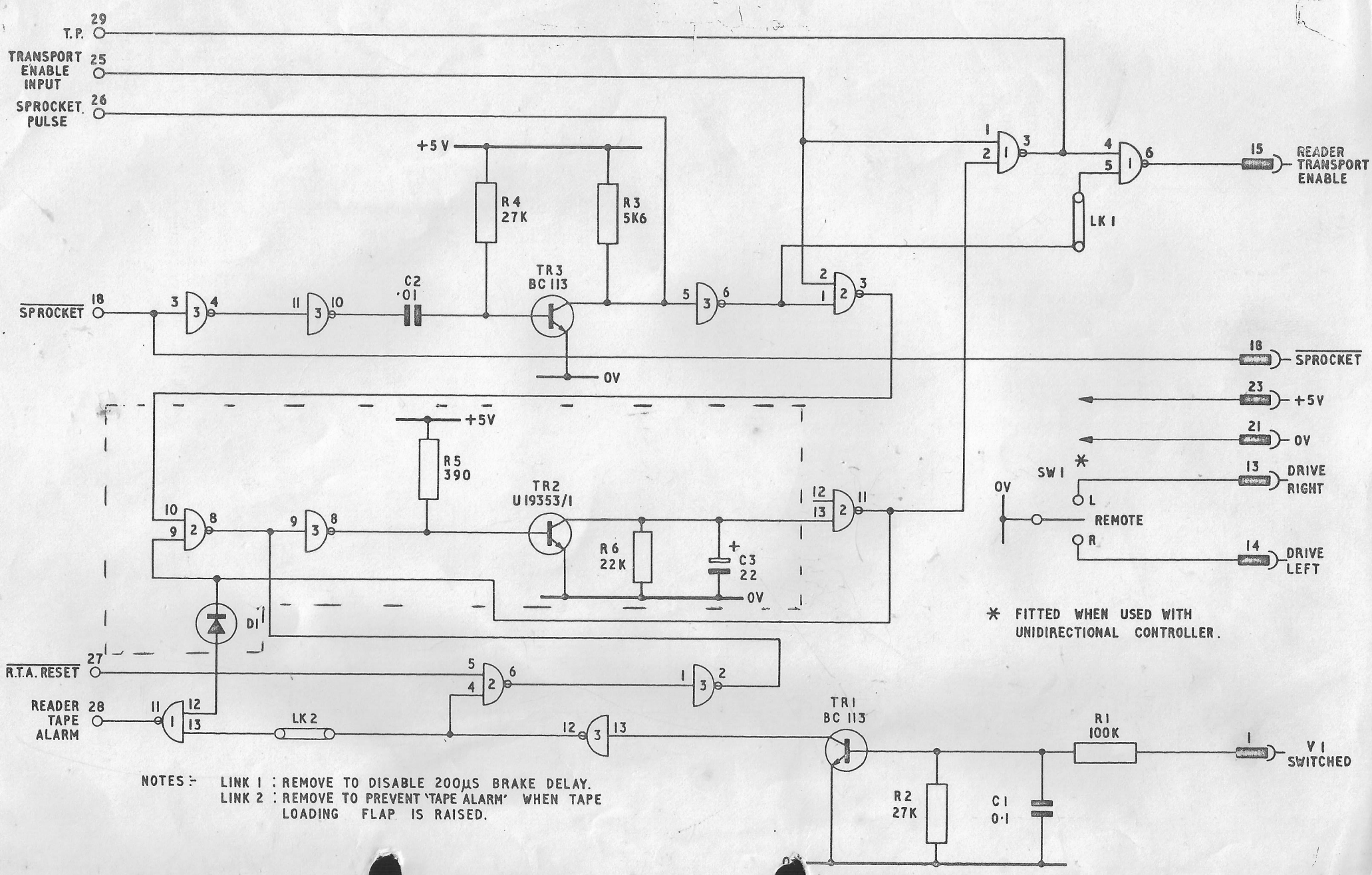
Circuit Ref.	Function	Grade	Maker	Type No.
1,2	Quad 2 I/P NAND Gate	Commercial	S.G.S.	946
3	Hex Inverter	Commercial	S.G.S.	936

5. Miscellaneous

Component Type	Circuit Ref.	Maker	Type No.
37 way Socket		Carr Fastener	43/81/050
Socket Cover		Carr Fastener	43/81/966
Socket Base and Clip		Carr Fastener	43/81/967
Cable		R-S Components	25 way Min. Multicable
Switch	SW1	Egen	522/O.C.

AHB 5901/1

EXTENDED INTERFACE CIRCUIT

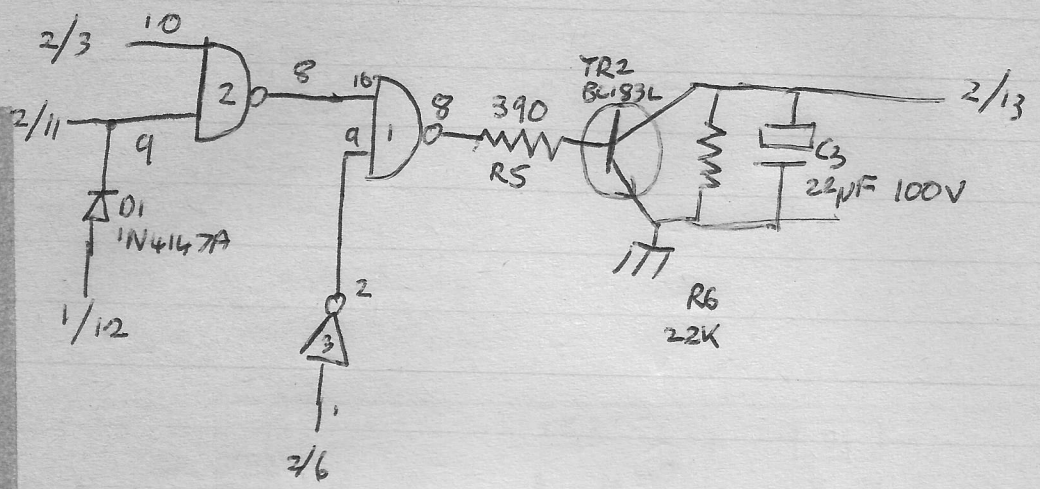


* FITTED WHEN USED WITH UNIDIRECTIONAL CONTROLLER.

NOTES :- LINK 1 : REMOVE TO DISABLE 200μS BRAKE DELAY.
LINK 2 : REMOVE TO PREVENT 'TAPE ALARM' WHEN TAPE LOADING FLAP IS RAISED.

FIG 1 Ap

TREND DATA SYSTEMS
EXTENDED INTERFACE



Mod to wire.

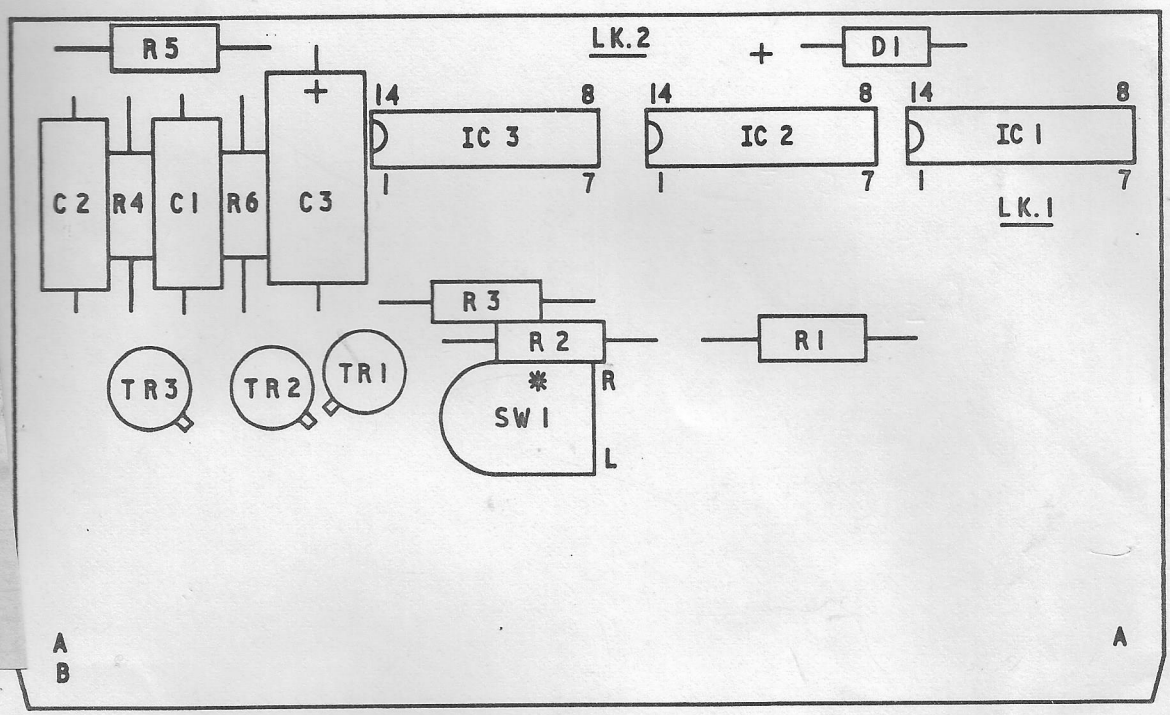
IC1 = 7400
IC2 = 7400
IC3 = 7404
TR1 = TR2 = TR3 = BC183L.

Fit DIL switch for LK1, LK2

B

* NOT NORMALLY FITTED

EXTENDED INTERFACE COMPONENT LAYOUT



* NOT NORMALLY FITTED

EXTENDED INTERFACE COMPONENT LAYOUT