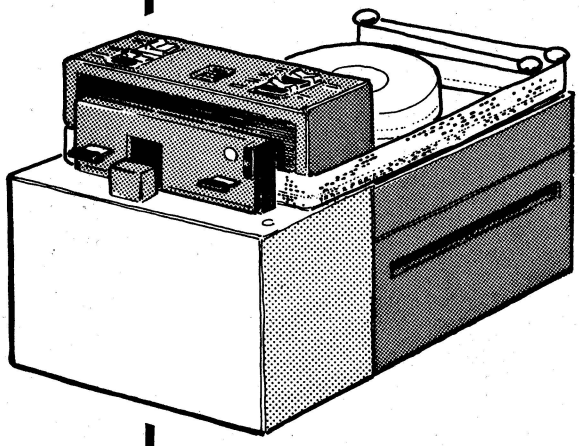
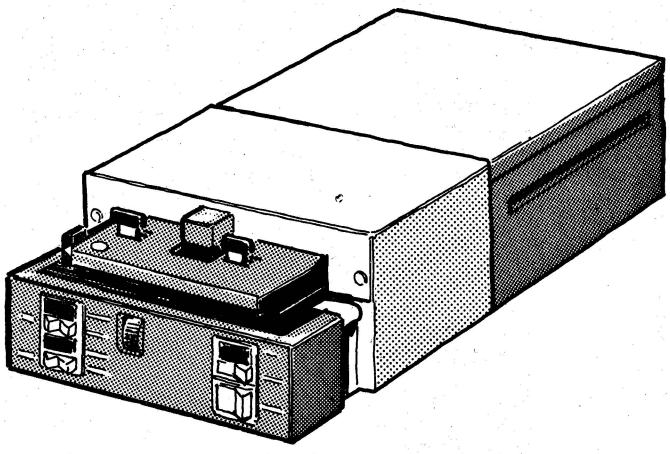
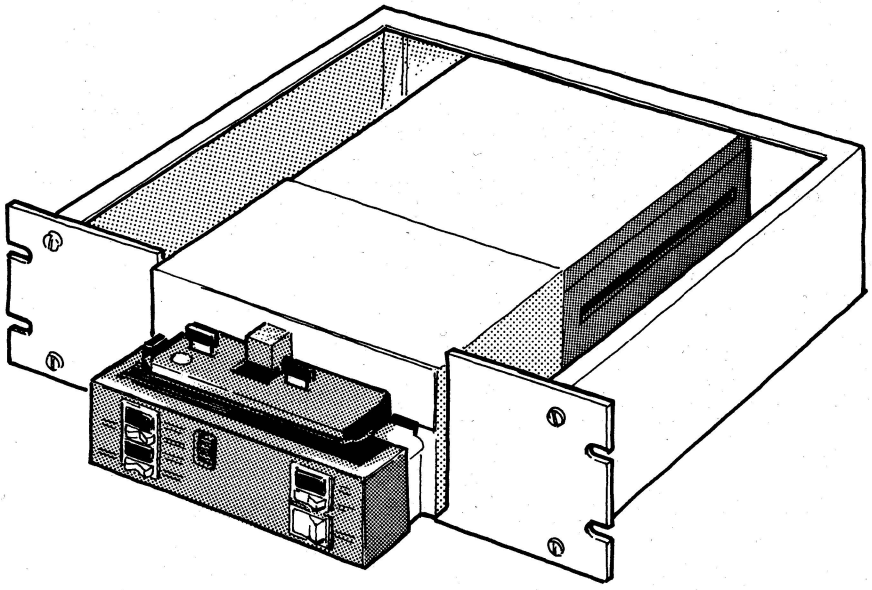
FACIT

SERVICE







SERVICE INSTRUCTION

Tape reader 4020

Group FD3

Edition 1

Publ.No. 7033-Eng

May 1974

FACIT AB • CENTRAL SERVICE DEPARTMENT • S-597 00 ÅTVIDABERG • SWEDEN

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INTRODUCTION

This service manual describes the 4020 family of tape readers. The 4021 is a top loaded, table top version for tape coils with up to 200 mm outside diameter. The 4022 is a front loaded version for short tapes and tape loops. 4022 is available both in a table top version and mounted in a standard 19" rack.

1 SPECIFICATIONS

1.1 TAPE

Type: 5-8 track standard tapes in accordance with ECMA standard
6 track typesetting (TS) tape
6 track Japanese telex tape

Width:
5 track ECMA 17.5 ± 0.1 mm (11/16")
6 track ECMA / TS / Japanese telex 22.22 ± 0.1 mm (7/8")
7 track ECMA 22.22 ± 0.1 mm (7/8")
8 track ECMA 25.4 ± 0.1 mm (1")

Thickness: 0.08 mm to 0.25 mm including splices.

Tape material: All types of punched tape material being marketed.

Light transmittance of tape: Up to 80%

Punch hole configurations:
5 track ISO standard
6 track ISO standard
7 track ISO standard
8 track ISO standard
6 track typesetting (TS)
6 track Japanese telex

Inter-character spacing: 2.54 mm ± 5% accumulative
2.54 mm ± 10 % between adjacent rows

Tape supply: Tape dispenser with supply reel for coils with max. 200 mm outside diameter (8"). Inside diameter 51-52 mm (2")
Fan-folded tape in cassettes that accomodate max. 60 meters.

1.2 TECHNICAL DATA

Reading principle: LED light source in the invisible IR range actuating a phototransistor if a hole is there.
No hole disperses and weakens the light so that only 2% reaches the phototransistor.

Reading speed: 0-300 characters per second. Tape can be read in both directions.

Tape feed: Stepping motor, rubber capstan and pinch roller. External, asynchronous control.

Ambient temperature: +5°C - +40°C in operation.
-40°C - +55°C in storage.

Relative humidity: 25 - 75%

Mains supply: 100, 115, 220, 240V AC +15% -10%
Single phase. Grounded mains inlet.

Mains frequency: 49 - 100 Hz

Power consumption: Max. 180W, min. 60W

Fuses:
100 and 115V AC 3.2 AT
220 and 240V AC 1.6 AT
+24V 5A
+5V 1A

Facit 4020 tape readers can be supplied with two interfaces:
1 Facit SP1 standard interface
2 Universal interface

1.3 ELECTRICAL DATA

Facit SP1 interface

Signals used in the Facit SP1 standard interface are described in detail in the technical description of the Facit SP1 standard interface for parallel data transfer which has document No. SP1.15.01. Eng 10M09.71.

Special for 4020, see Fig 1. Signal AM specifies reading direction. AM=0 means forward reading and AM=1 means backward reading.

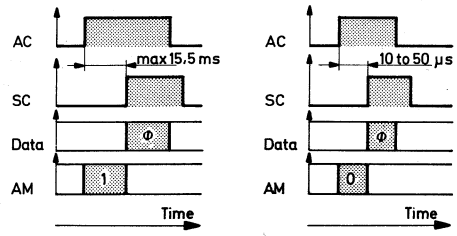


Fig 1

Signals on connector P8, see SP1.15.01

Input signals:

Acceptor operable (A0 pin C) Acceptor control (AC pin E)	Logical 1: +2.2 - +5.5V Logical 0: 0 - +0.6V Input impedance min. 6kohm
Acceptor message (AM pin H)	Backward feed: +2.0 - +5.5V Forward feed: 0 - +0.6V Input impedance min. 6kohm

Output signals:

Reader operable (S0 pin D) Reader control (SC pin F) Data (D1 - D8 pins M - V)	Logical 1: +2.4 - +5.5V impedance 6kohm Logical 0: 0 - +0.4V max current 0.2mA
Parity (P pin L)	Logical 1 when the data has even parity Logical 0 when the data has odd parity Logical 1: +2.4 - +5.5V impedance 6kohm Logical 0: 0 - +0.4V max input current 2mA

Universal interface

Input signals:
Input signals RI and SD are IC-compatible

Read instruction (RI pin N)	Logical 1: +3.5 - +12V Logical 0: +1.5 - -12V Input impedance min 22kohm
Stepping direction (SD pin L)	Forward feed: +1.5 - -12V (or floating) Backward feed: +3.5 - +12V Input impedance min 22kohm
External DC on (DC ON pin HH)	Substitute for DC ON control function Pin HH shall be connected to +24V via pin FF for 500 ms.
External start (START pin BB)	Substitute for START control function Pin BB shall be grounded via pin NN for 1 ms.

Output signals:
All output signals are IC-compatible

Reader ready (RR pin P) Data available (DA pin M) Data (D1-D6 pins A-F D7 pin H D8 pin J)	Logical 1: +5V, output impedance 2.2kohm Logical 0: max +0.4V, max output current 10mA
Error (Err pin Z)	From logical 0 to logical 1 when Err signal is generated. Logical 1: +5V, output impedance 2.2kohm Logical 0: max +0.4V, max output current 10mA.
Feed Hole (FH pin K)	+5V (internally connected to +5V DC)

Parity (P pin AA)	From logical 0 to logical 1 when P signal is generated. Logical 1: +5V, output impedance 2.2kohm Logical 0: max +0.4V, max output current 10mA
External (EXT pin CC)	0V when EXT is depressed. Floating when EXT is not depressed.

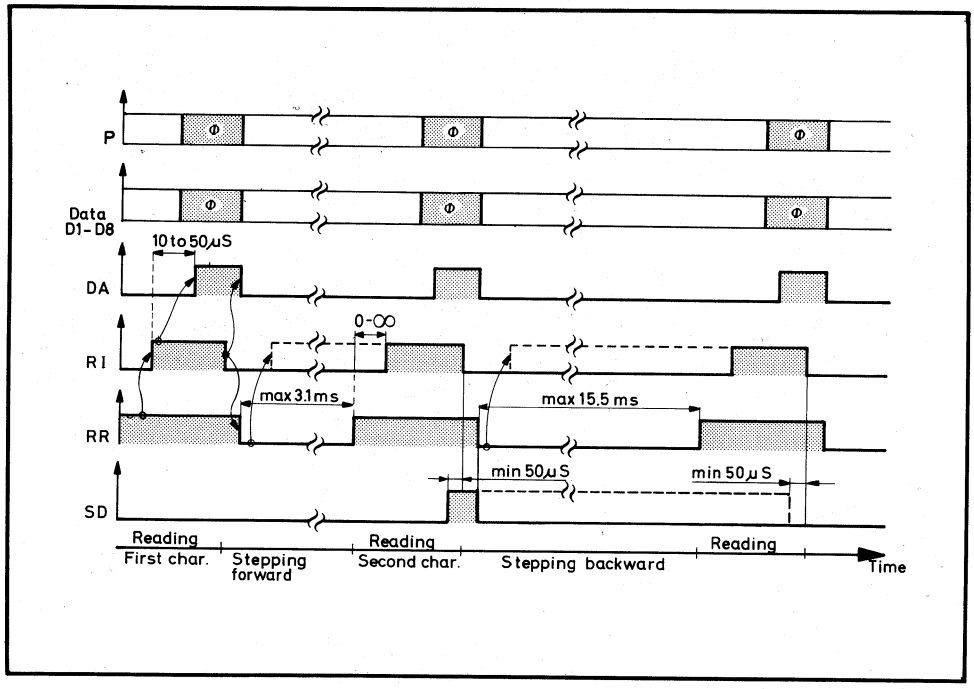


Fig 2

DC supply voltages
Available both internally and externally.

+5V ($\overset{+}{-}$ 5%) pin MM	Max current output 1A
+24V (+20 - +32V) pin FF	Max current output 1A
0V pin NN	5V return and signal ground
0V pin JJ	24V return (must not be connected to signal ground)

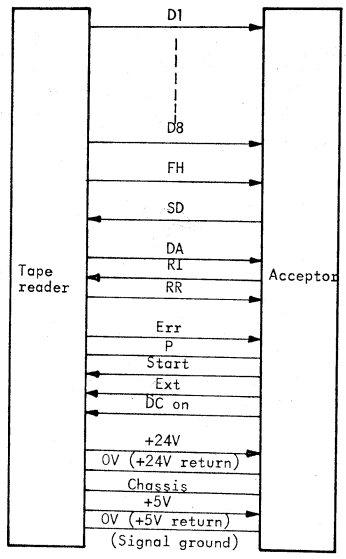
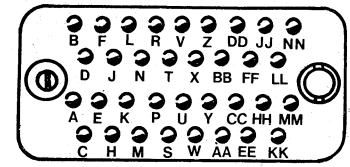


Fig 3

Receptacle viewed from socket side



Pin	Signal	Pin	Signal	Pin	Signal
A	D1 (Data)	P	RR	BB	START
B	D2 (Data)	R	reserved	CC	EXT
C	D3 (Data)	S	unused	DD	unused
D	D4 (Data)	T	unused	EE	unused
E	D5 (Data)	U	unused	FF	+24 V
F	D6 (Data)	V	unused	HH	DC ON
H	D7 (Data)	W	unused	JJ	0 V (24 V return)
J	D8 (Data)	X	unused	KK	unused
K	FH	Y	unused	LL	Ground (chassis)
L	SD	Z	Err	MM	+5 V
M	DA	AA	P	NN	0V (5V return and signal ground)
N	RI				

Fig 4

2 MECHANICAL CONSTRUCTION

The basic construction of the 4020 tape readers is divided into modules as shown in Fig 5 and Fig 6.

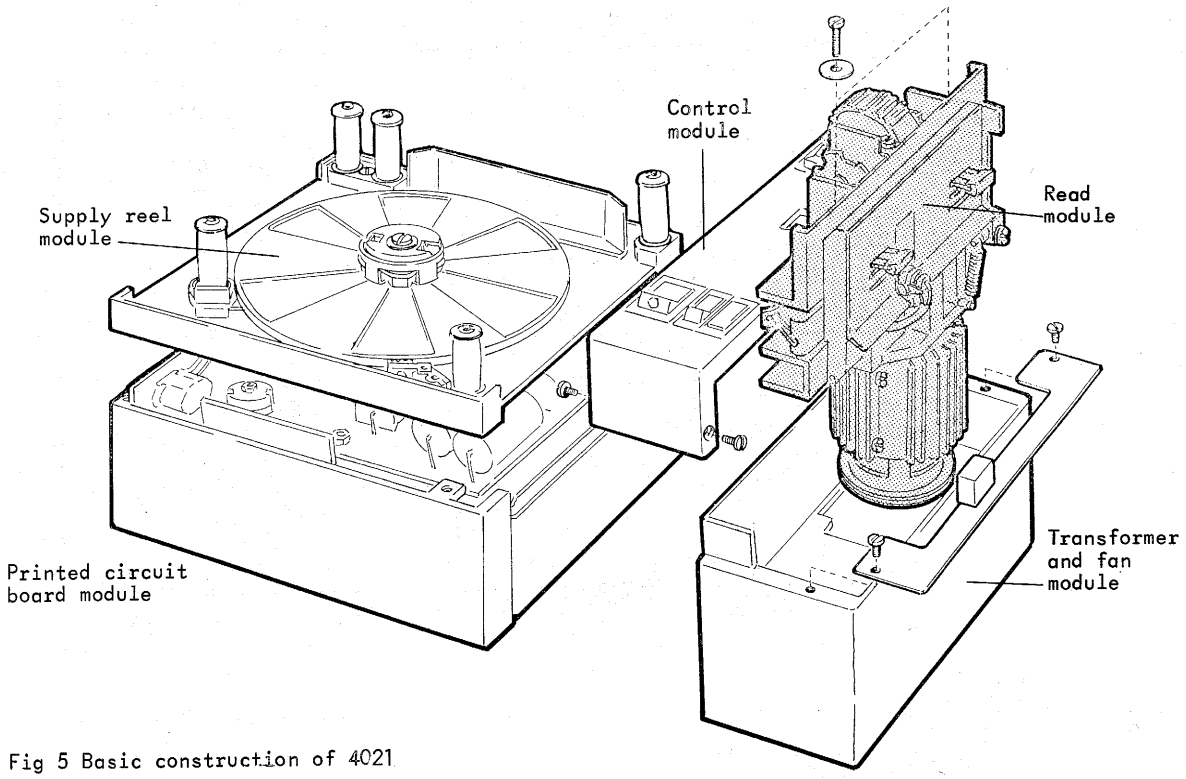


Fig 5 Basic construction of 4021

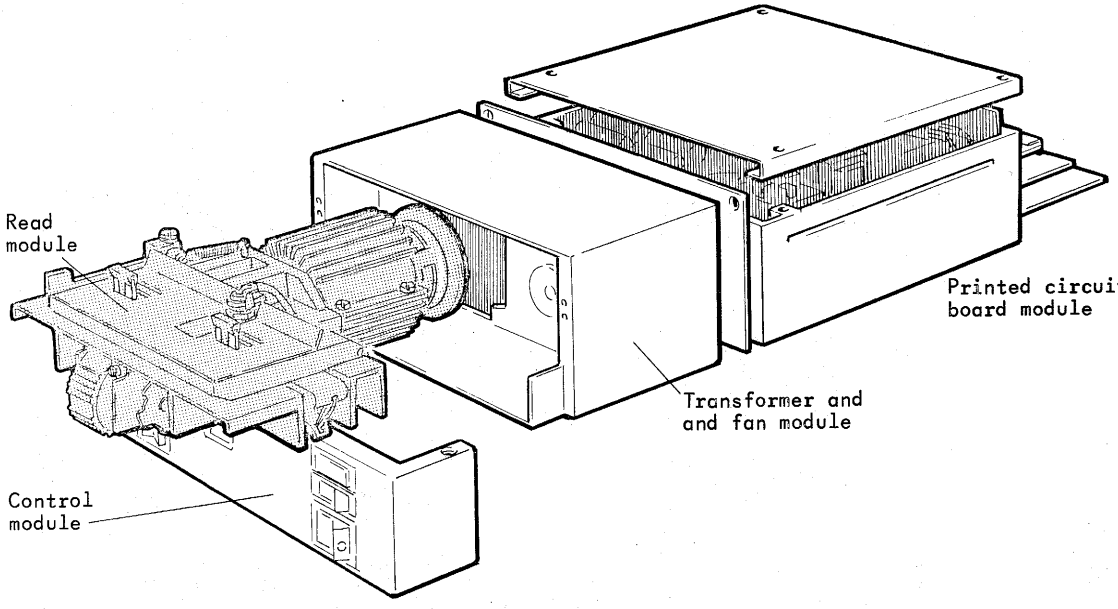


Fig 6 Basic construction of 4022

2.1 PRINTED CIRCUIT BOARD MODULE

This module accomodates the circuit boards required to operate the reader.

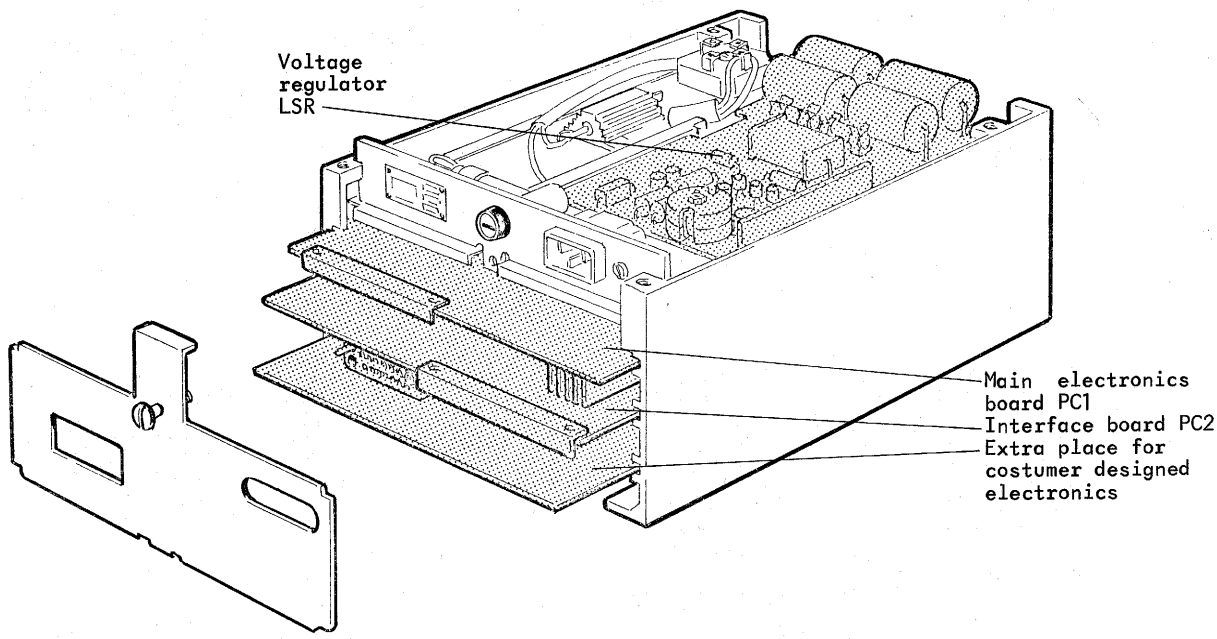


Fig 7 Printed circuit board module

2.2 CONTROL MODULE

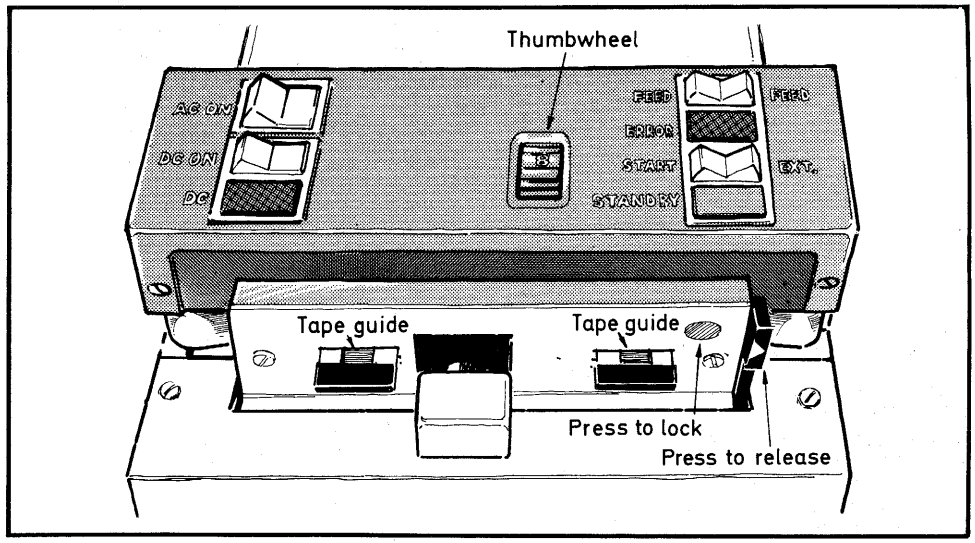


Fig 8

AC ON turns on the mains power. DC ON turns on the regulated 5V to the electronics. This also lights up the green DC lamp. The FEED switch is used to feed tape in either direction. The START switch gives condition to the electronics to start reading. By pressing the switch to the EXT. side a 0V-signal can be sent to the acceptor. The ERROR-lamp turns on when some error condition exists and the STAND BY lamp turns on when the lid is open.

2.3 READ MODULE

The read module contains the stepping motor, capstan, pinch roller, LED and the phototransistors with preamplifier.

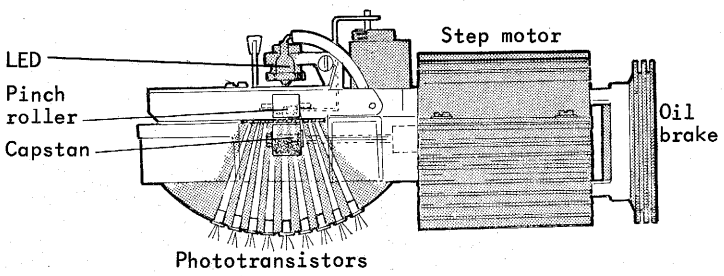


Fig 9 Read module

3 MECHANICAL OPERATION

3.1 TAPE FEED

The stepping motor has three 9-pole stators, each operating a 9-pole rotor. The three rotors are fixed to the same shaft, but turned 13.3° relative to each other. Pulses to the stator coils in sequence thus turn the shaft 13.3° for each pulse. Because of the diameter of the capstan, the tape will feed 10% more than the standard intercharacter space. This feature enables tapes with inaccurate spacing to be read properly.

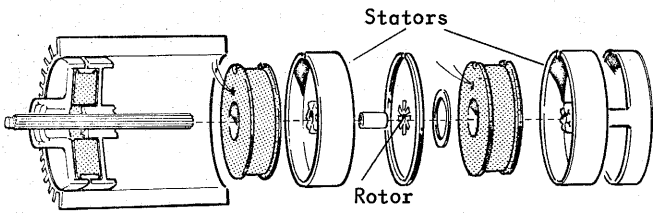
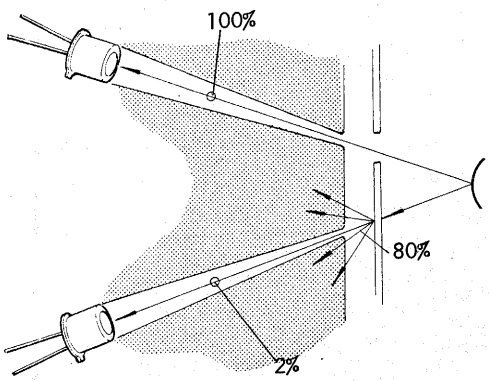


Fig 10 Step motor

The motor is equipped with an oil brake in order to reduce the amount of extra movement on the tape.

3.2 READING



When the tape passes beneath the LED, the phototransistor will be less illuminated if there is tapematerial in the path. Even if the tape is up to 80% transparent, only 2% of the light will reach the phototransistors. The whole set is mounted dust tight by use of silicone rubber and a glass window against the tape path.

Fig 11 Reading principle

4 ELECTRONIC OPERATION

4.1 GENERAL

The block diagram in Fig 12 shows the principles of the operation. The diagram is functionally orientated and does not take into account the boundaries between printed circuit boards.

The signals from the data channel phototransistors are amplified and fed into a buffer register for three characters. From there the data goes through interface circuits to the acceptor. The feed hole signal goes to a character counter which controls the buffer. There are also circuits to facilitate parity check and/or blank tape reading if required.

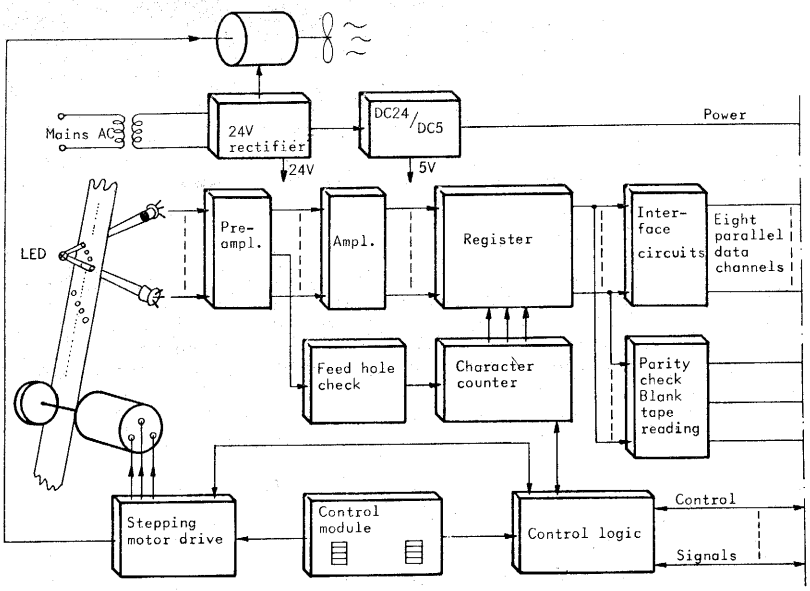


Fig 12 Block diagram

4.2 POWER SUPPLY

The DC voltage regulator generates the +5V supplied to the logic cicuitry. See schematic diagram in Fig 13. In principle the +24V supply is switched on and off at a rate that provides the desired +5V.

The regualtor comprises a level monitor made up of a differential amplifier and a Schmitt trigger together with a drive stage. The drive stage is supplied with +24V from the power supply. The level monitor controls the drive stage by sensing +5V via resistors R13 and R30. Capacitors C9 and C10 are connected up in parallel across the +5V load. When the voltage across this circuit drops just below +5V the drive stage is actuated via the level monitor. Current through the drive stage and coil L1 charges capacitors C9 and C10, and when the voltage across C9 and C10 rises to approximately +5V the drive stage is cut off. The pulse frequency of approximately 25kHz varies somewhat with the load.

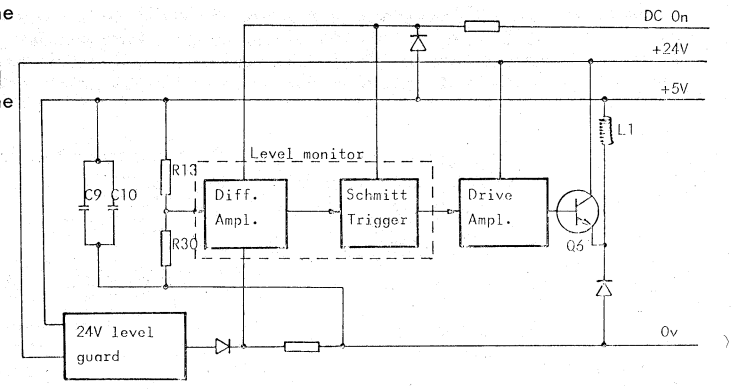


Fig 13 Block diagram of power supply

4.3 READING

The signal from the phototransistor is amplified in three transistors. Fig 14.

Note that phototransistors 4, 5 alt. 7, 8 Fig 16 can operate either as data channel or feed hole channel. In the first case the outputs of the amplifiers are coupled toghether. Since these amplifiers have one stage more, Fig 15 the signal will be inverted. This is compensated on the interface board.

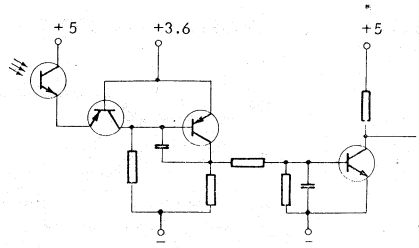


Fig 14 Data signal amplifier

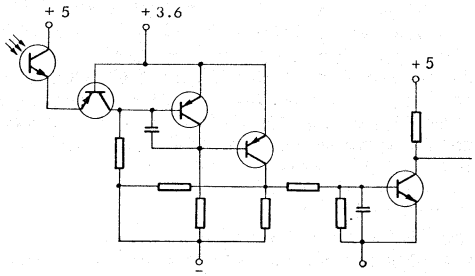


Fig 15 Feed hole signal amplifier

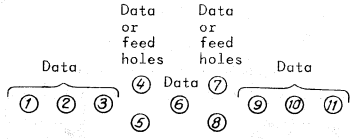


Fig 16 Phototransistor configuration

The feed hole detector generates strobe pulses to the character counter or error pulses if the tape moves in the wrong direction. The direction information comes from the interface or the FEED control. A strobe pulse is generated each time a feed hole passes the read head. The strobe is automatically clocked through the character counter which then generates the signals Reg 1, Reg 2 and Reg 3.

These signals are used to shift the data information through a 3x8 buffer. When the signal NC (next character) comes from the interface, the last flip-flop in the counter is reset. This causes the automatic clock circuit to shift the character in the second buffer register to the third register, and the first and second registers are ready to accept one or two new characters from the tape during the next step. During these operations the signal NR (not ready) signifies that data is not stable.

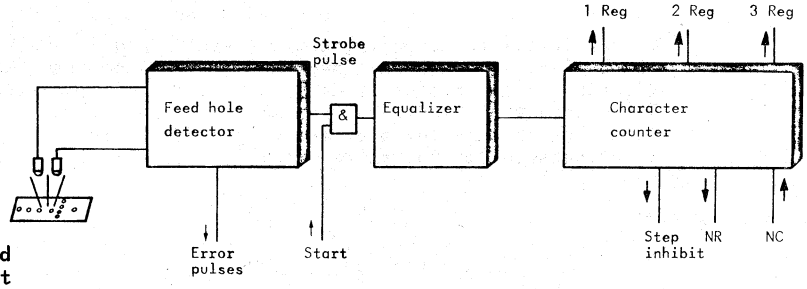


Fig 17 Character counter

4.4 STEPPING MOTOR DRIVE

In idling state the rotor is held in a stable position by reduced power on one of the stator coils. When the rotor is to be moved one step, this coil and the next initially receive full power wherewith the rotor moves one half-step. Then the power is cut off in the first powered coil thus causing the rotor to move to the next stable position.

	Idling pos	1st step		2nd step		3rd step	
L1	1	1	0	0	0	1	1
L2	0	1	1	1	0	0	0
L3	0	0	0	1	1	1	0

1 = power on

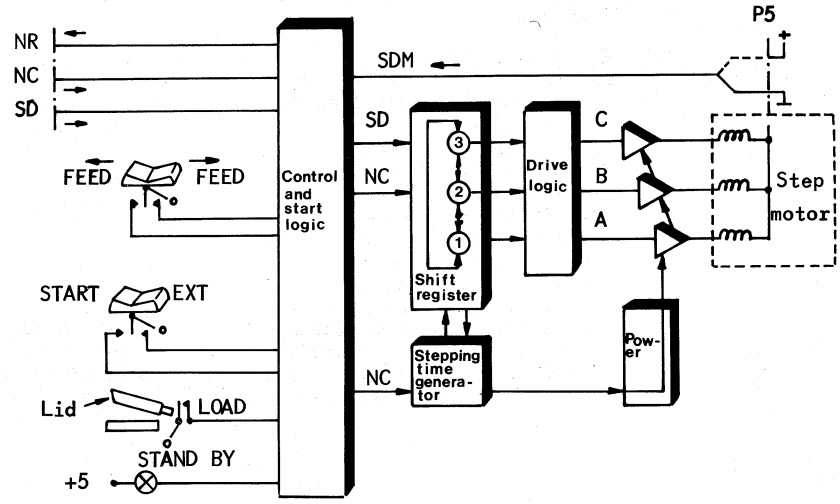


Fig 18 Step motor drive

4.5 INTERFACE ELECTRONICS

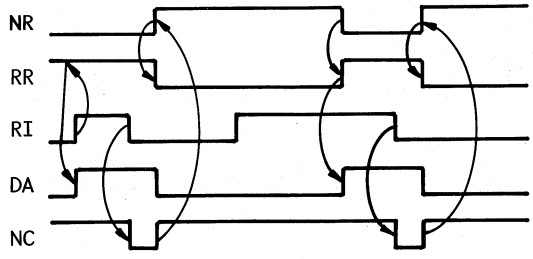


Fig 19

When the universal interface is used the signal RR (reader ready) indicates that stepping operations are finished and that data is available. RR is a result of the internal signal NR. If the acceptor now asks for data by sending RI (read instruction) this will be acknowledged by the DA (data available) signal. When the data has been received, RI will be set low. This will cause the interface to produce an internal signal, NC, which will step the reader to the next character.

The universal interface also has one circuit for stepping direction (SD) control and external start. It controls that the start sequence always steps the motor in the desired direction. If an order to change reading direction is sent during operation this signal will be gated together with RI.

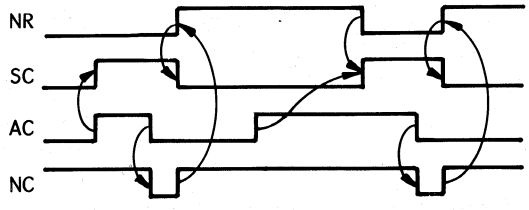


Fig 20

The SP1 interface has a very similar operation, but the signals agree with the SP1 standard. There is no external start possibilities on this interface.

4.6 READ AMPLIFIER AND REGISTER

On the interface circuit board the eight data channels are first amplified and then fed into the buffer. The signals 1 Reg, 2 Reg and 3 Reg from the character counter are used as clock signals for the buffer. 1 Reg clocks data into the first register, 2 Reg into the second and 3 Reg into the third. The data in the third register is then available on the output lines. Note that in register one, the output from data channel 5 is taken from the $\overline{Q}$ output in order to compensate for the extra amplifier stage in this channel.

4.7 FEED HOLE DETECTION

The feed hole detector is built up around a ROM (Read Only Memory), which, due to the feed back circuitry will generate a strobe pulse every time a feed hole passes the read head in the correct direction. If the tape moves in the wrong direction, the ROM is instead generating an error pulse. The direction information comes from the PEED control and interface (SD) and is decoded in the gate system before the ROM inputs.

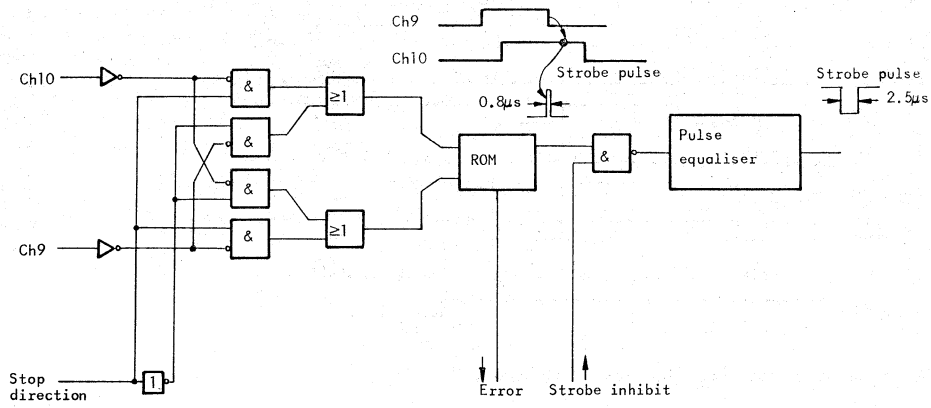


Fig 21 Feed hole detector

4.8 CHARACTER COUNTER

The main parts in the character counter is a clock and a shift register. The first flip-flop is set by the trailing edge of the strobe pulse. The gates IC7/11, IC6/11 and IC6/3 are sensing if it is possible to shift to the right. If so, the clock circuit will start to generate clock pulses until there is no reset flip-flop to the right of a set one. The NC-signal from the interface will reset the last flip-flop and step the motor one step. This will cause one of the following things to happen.

1 One strobe pulse is shifted into the register.

2 Two strobe pulses are shifted into the register. This will happen approx every tenth step because of the 10% overspacing. When this happens the buffer will be filled. NC is now blocked by IC7/8 and cannot cause the motor to space. IC16/1,2 is sensing if the register is filled.

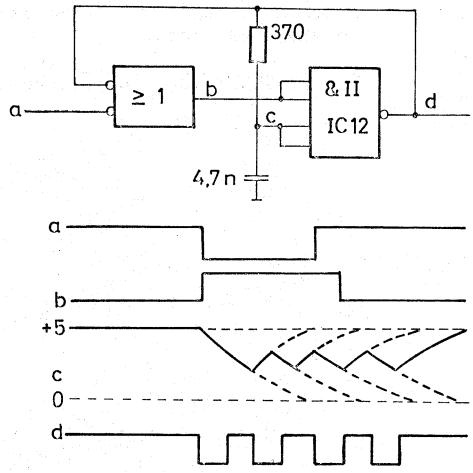


Fig 22 Clock pulse generator

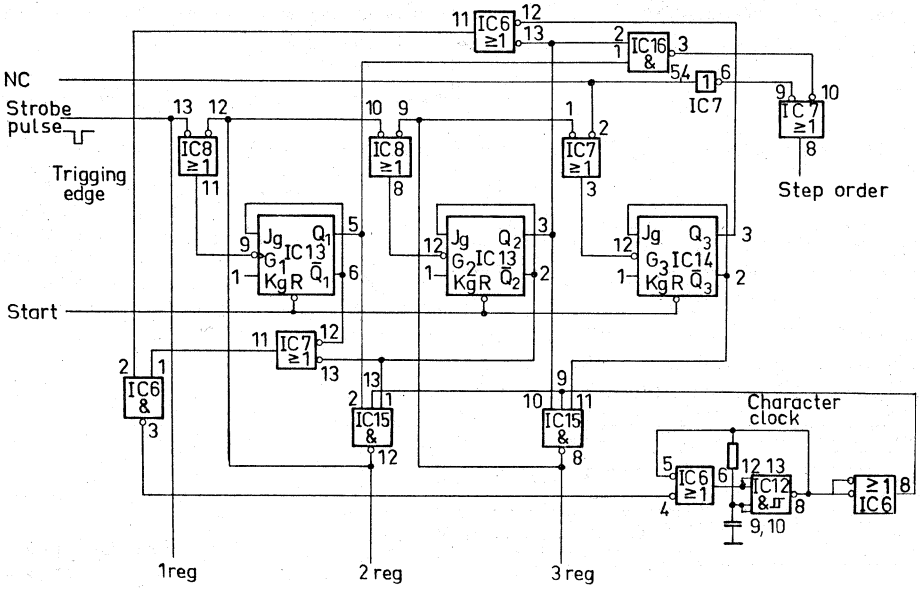


Fig 23
Character counter

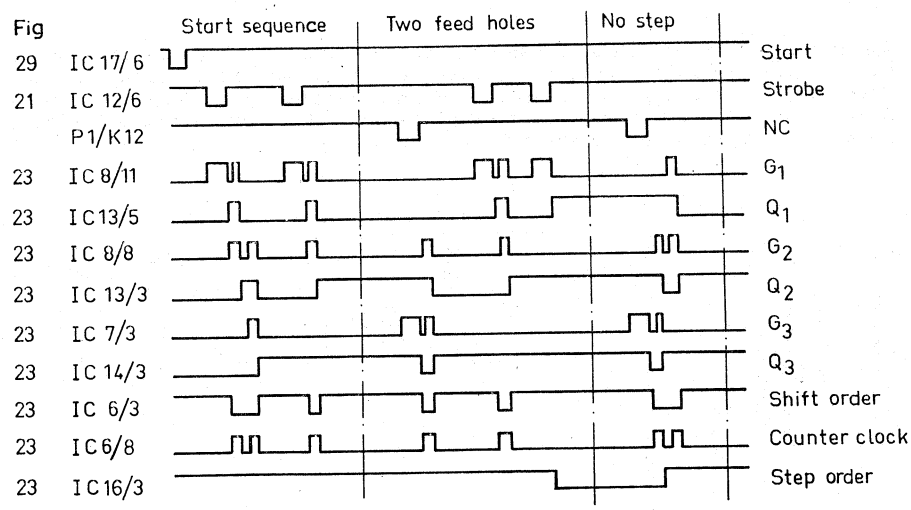


Fig 24 Time diagram for character generator

4.9 TAPE FEED

When the reader is idling, output IC14/6 is low. This is stopping the clock circuit Q20, Q21 and also signalling to the current control circuit to give reduced power to the coil concerned. When NC arrives it resets the flip-flop IC14/5,6 and shifts the step generator. This will cause two coils to receive full power and also start the clock. As long as two coils are powered, the output IC20/3 is kept low and that way keeping IC14/5,6 reset and the clock going. The next clock pulse will shift the step generator one more step and then one more will set IC14/5,6 to stop the clock.

Fig 26 shows the timing diagram for the three different alternatives mentioned in point 4.8.

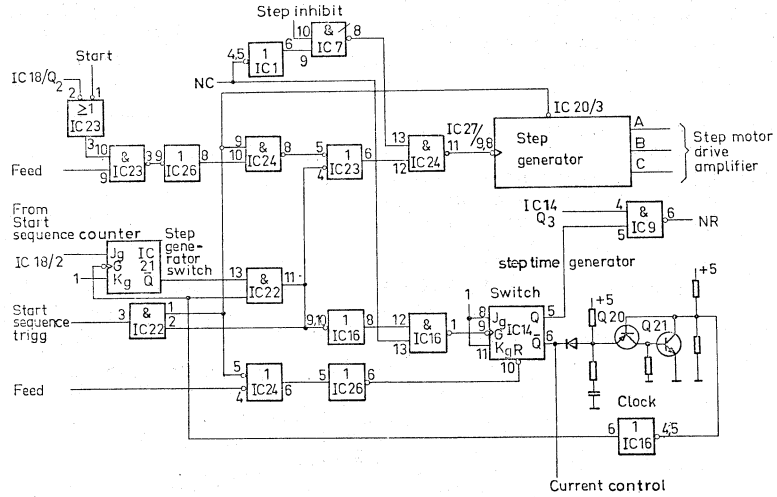


Fig 25 Step motor control

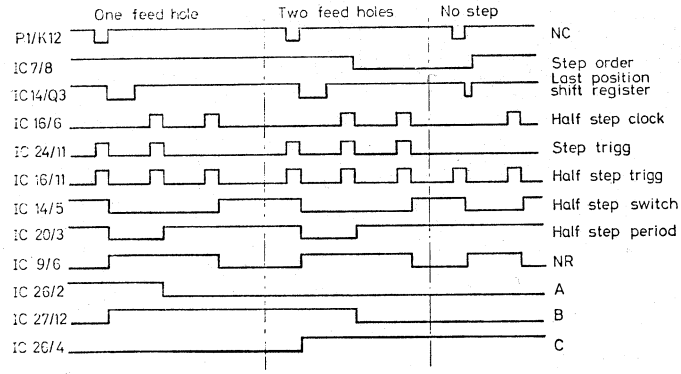


Fig 26 Pulse diagram for step motor control

4.10 START SEQUENCE

When the start button is depressed, two characters must be read into the buffer.The two flip-flops in IC18 are connected as a counter and will count the two steps the motor must make. During the time the button is depressed the character counter and IC18 are reset. IC14 is also reset via IC18/3, IC9/3, IC9/11, IC24/6 and IC26/6. This will start the clock and when the start button is released the start sequence will be made. Fig 27 shows a pulse diagram for the start sequence.

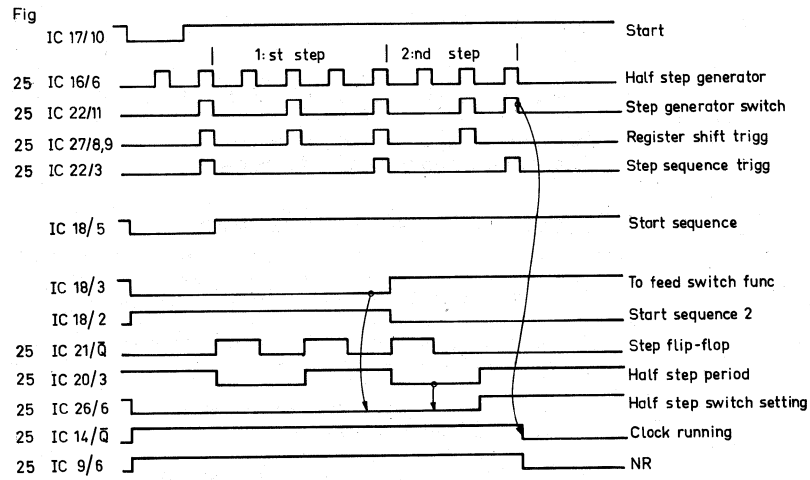


Fig 27

4.11 CONTROL SIGNALS

Signal SDM is defining the motor direction so that forward has the same meaning on both 4021 and 4022. When the FEED-control is depressed this signal is gated together with SDM to the step generator IC27. The flip-flop IC14/5,6 will also be reset to start the clock and step the motor in the desired direction. Signal SD' comes from interface and gives information to the step generator if the reading is to be done forward or backwards. Signal Load indicates whether the lid is open or closed. An open lid will block the FEED- signals and give an error condition.

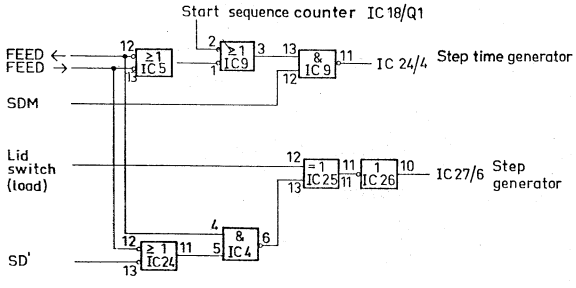


Fig 28

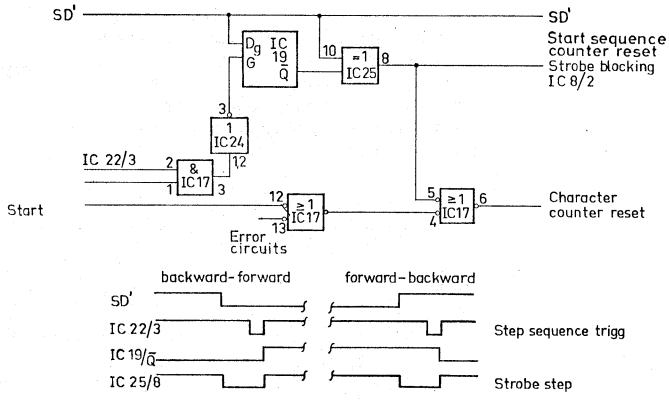


Fig 29

Fig 29 shows the pulse diagram when an SD'-change is made during operation.

4.12 ERROR CHECK

The error flip-flop IC19 is one set if one of the following error conditions should exist.

1 Power on from transistor Q3
2 FEED-control is depressed
3 Character counter empty
4 Lid open
5 Tape moving in wrong direction

5 SERVICE

The service chapter is divided into two main sections.

Mechanical checks and adjustments
Electronic checks and adjustments

5.1 MECHANICAL CHECKS AND ADJUSTMENTS

A Removing read module. Fig 30.

1 Unscrew 4 screws marked A and remove control module.

2 Unscrew 2 screws marked B and remove front cover plate.

3 Unscrew 2 screws marked C and remove control module mounting brackets.

4 Unscrew 2 screws marked D and lift out the read module.

5 Disconnect P5 and grounded wire.

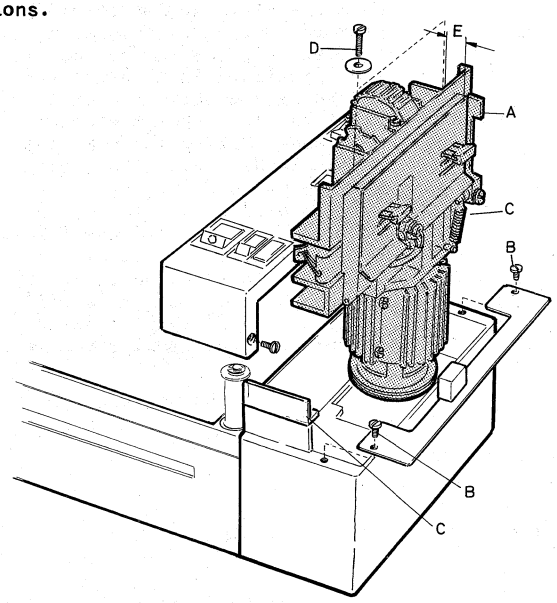


Fig 30

B Checking pinch roller. Fig 31.

1 Remove tape guides on the lid.

2 Unscrew 2 screws and remove the plate cover on the lid.

3 Loosen the screws marked A and adjust the pinch roller with the eccentric screw marked B, so that the tape is pressing lightly against the inner edge when feeding a short tape loop in both directions.

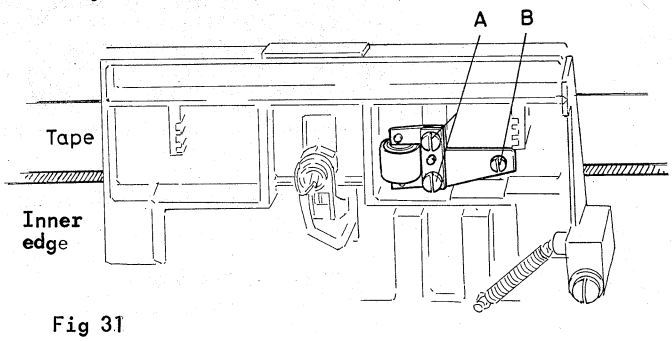


Fig 31

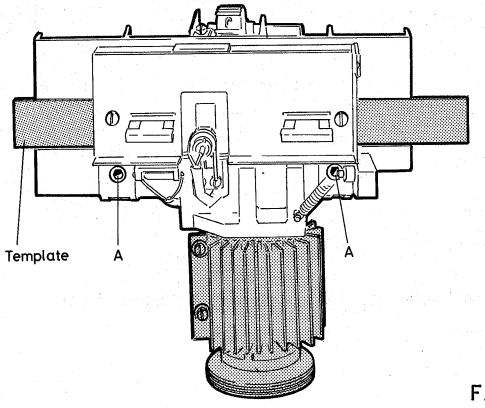


Fig 32

C Checking lid position. Fig 32.

1 Insert standard template.

2 Insert tape guides in the slots for 8 channel-tape.

3 Loosen the screws marked A, press the lid against the template and tighten the screws.

D Checking distance between lid and tape path. Fig 33.

1 Check that the template can be inserted between the lid and the tape path.

2 Adjust with eccentric screw if necessary.

E Checking stand-by switch

1 The stand-by lamp must be switched on when the distance E in Fig 30 is less than 30 mm and switched off when the distance is more than 20 mm.

2 Adjust by moving the switch up or down.

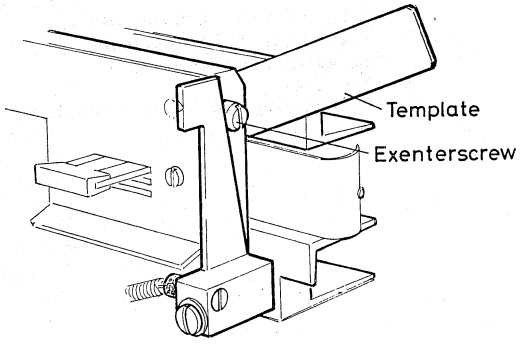
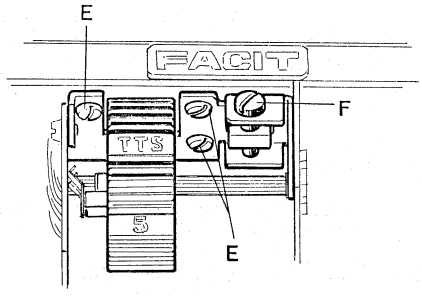


Fig 33

F Checking read head position. Fig 34.



1 Remove control module as in point A1.

2 Connect digital voltmeter between ground and the emitter on one of the feed hole phototransistors with a 100 ohm resistor in parallel.

3 Insert template in the tape path and lock the lid.

4 Loosen the screws marked E and adjust with the screw marked F until maximum value is recorded on the digital voltmeter.

Fig 34

G Replacing capstan

1 Remove read module as in points A1 - A5.

2 Remove the motorpart of the connector marked A.

3 Unscrew the step motor.

4 Remove the thumbwheel armature by unscrewing the screws marked F. Note the spring clip on screw F.

5 Remove the read head by loosening the screws marked G and removing the shafts marked H.

6 The capstan can now be removed by unscrewing the nut and pulling out the splained shaft.

7 Replace the units in opposite order and check points B1 - F4.

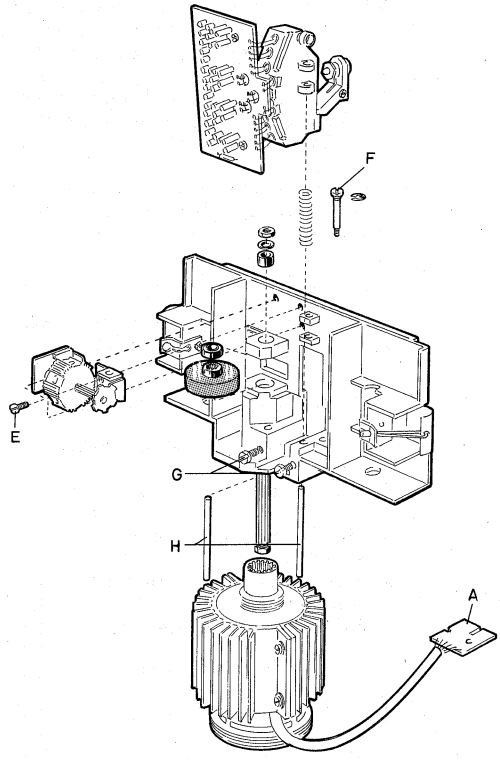


Fig 35

5.2 ELECTRONIC CHECKS AND ADJUSTMENTS

A Checking DC supply.

1 Remove the supply reel module in version 4021 or the upper cover plate in version 4022.

2 Connect the reader to a variable autotransformer and adjust to rated voltage.

3 Switch on the reader and check the following values:

Pin 15, 16	Approx 30V with circuit boards removed Approx 25V with reader operating at 300 ch/sec.
Pin 19, 20	5V ± 5% including ripple.

B Checking and adjusting read unit.

1 Warm up the read unit by one of the following methods:
By keeping the unit in +40°C for 30 min.
By having the reader switched on in room temperature for at least 2 hours.

2 With the read unit removed from the reader, connect it to a DC supply. See Fig 36.

3 Check that the voltage across LED is 1.2 - 1.9V.

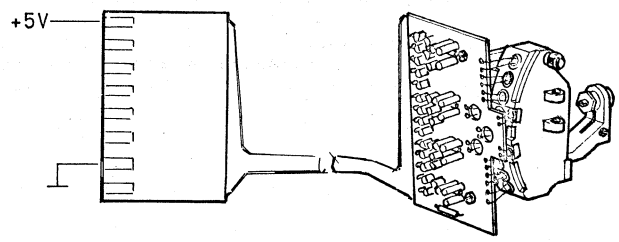


Fig 36

4 Check the voltage across a 100 ohm 1% 1/4W resistor connected between 0V and the emitter on the phototransistor under test.
It shall be as follows:

Phototransistor	1,2,3	4,5	6	7,8	9,10,11
Max	200	200	200	200	200 mV
Min	7.5	15	7.5	15	7.5 mV

5 Check all the phototransistors in this way and note the values.

6 If the values generally are below the min values, the LED current can be increased by using space "R43" for a resistor. Note that R43 must be between 33 - 200 ohms.

7 If it is impossible to get the voltage right within these limits of R43, the LED must be replaced. If only one or a couple of the phototransistors are faulty, they can be replaced.
NOTE: When replacing phototransistors, great care must be taken to avoid dust in the read head. Clean the lens on the new transistor carefully and seal with silicon rubber when the transistor is fitted.

8 When all transistors' parameters are within the limits stated, check that the trim resistors in the amplifier agree with the list in Appendix 1, if not replace the appropriate resistor with the stated value.

9 Check that the amplifiers are working by putting a piece of transparent tape in the tape path. Load the output with a 4.7kohm resistor and check that the output voltages are the following:

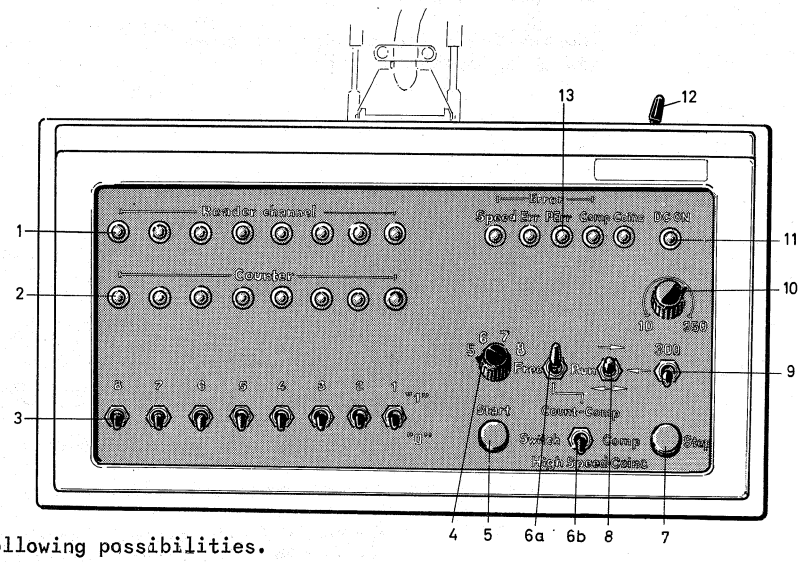
Amplifier	1,2,3	4,5	6	7,8	9,10,11
Without paper	max 0.1	min 3.0	max 0.1	min 3.0	max 0.1 V
With paper	min 3.0	max 0.1	min 3.0	max 0.1	min 3.0 V

C Function check with data generator.

When all checks and adjustments are done the reader can be checked with a data generator.

Fig 37 Data generator

1 Display showing reader output.
2 Display showing counter position.
3 Switches for comparing purpose.
4 Tape width selector.
5 Start button
6a,b Stop mode switches
7 Step button
8 Directions selector
9 Speed selector
10 Speed control
11 DC on lamp
12 Interface selector
13 Error display



The data generator has the following possibilities.

1 Load the reader with binary coded tape. Select the correct tape width (4). Set the Stop Mode (6ab) on count-comp. Select forward or reverse (8). Start the reader. When start button (5) is depressed the reader will start and a comparison will be made between the reader output and the internal counter. In case of error the reader will stop and the displays will show the position of both the tape and the counter. The error lamp Comp will also light up.

2 With Stop Mode (6a) set on free run, the reader will not stop on comp error.

3 With Stop Mode (6b) set on Switch Comp a tape with the same code punched repeatedly can be compared with the settings of the switches (3).

4 With Stop Mode (6a) set on PErr the parity circuits on the interface can be checked.

5 With speed selector (9) set on 300 the reader will operate at 307 ch/s. When the selector is in centre position the speed can be regulated with the speed control (10) and with the selector in step position, the reader can be stepped one step at the time with step button (7).

6 The direction selector can also be set in position ←→ . In this position the reader will change direction after every 128 characters.

7 When 4020 Universal Interface is used, the interface selector (12) is switched to the right. With this switch in centre, DC is off. When SP1 interface is used the switch must be to the left. Note that with SP1 interface an external 5V DC source must be used.

6 PERIODIC SERVICE

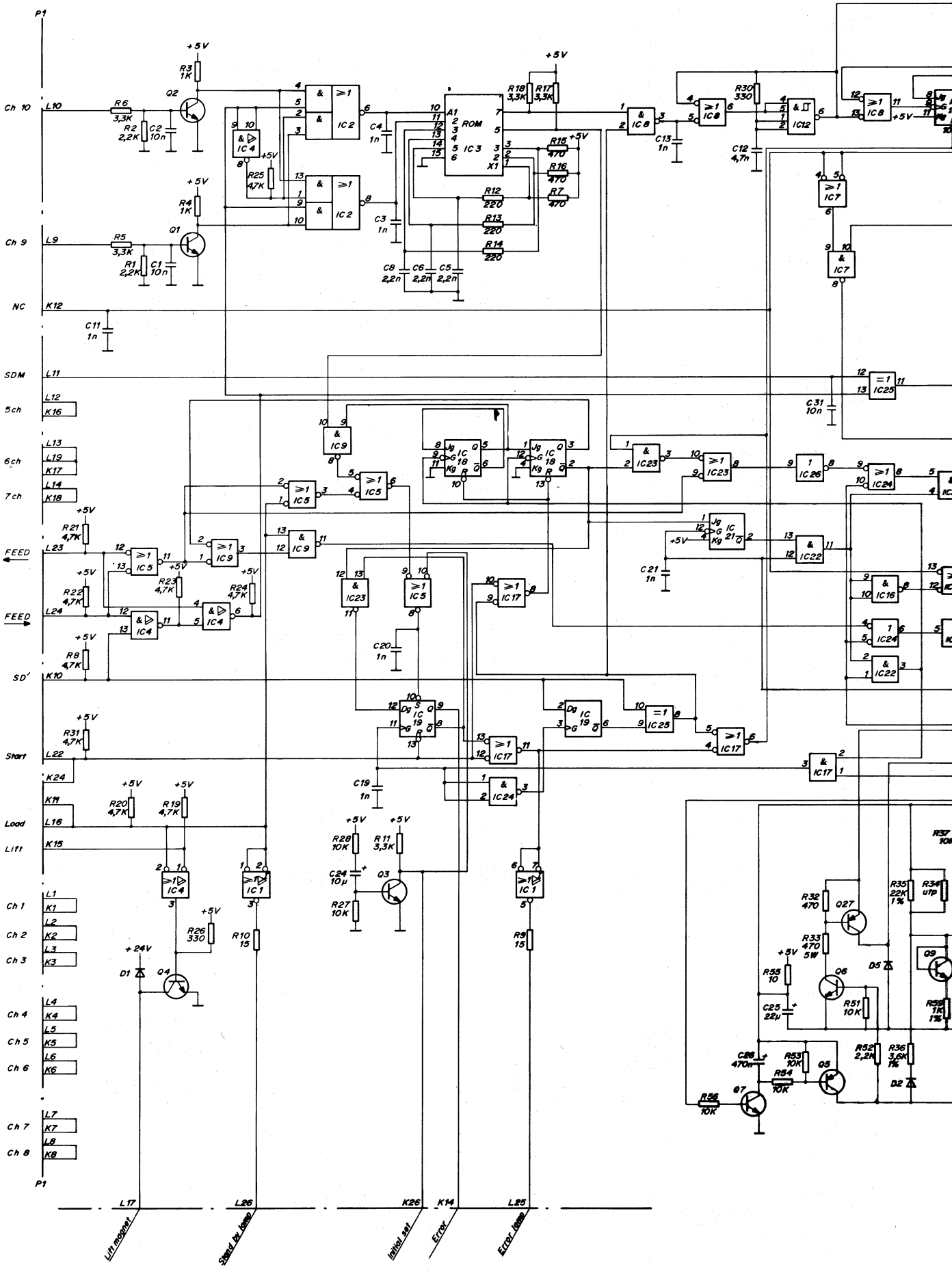
The following service intervals are recommended.

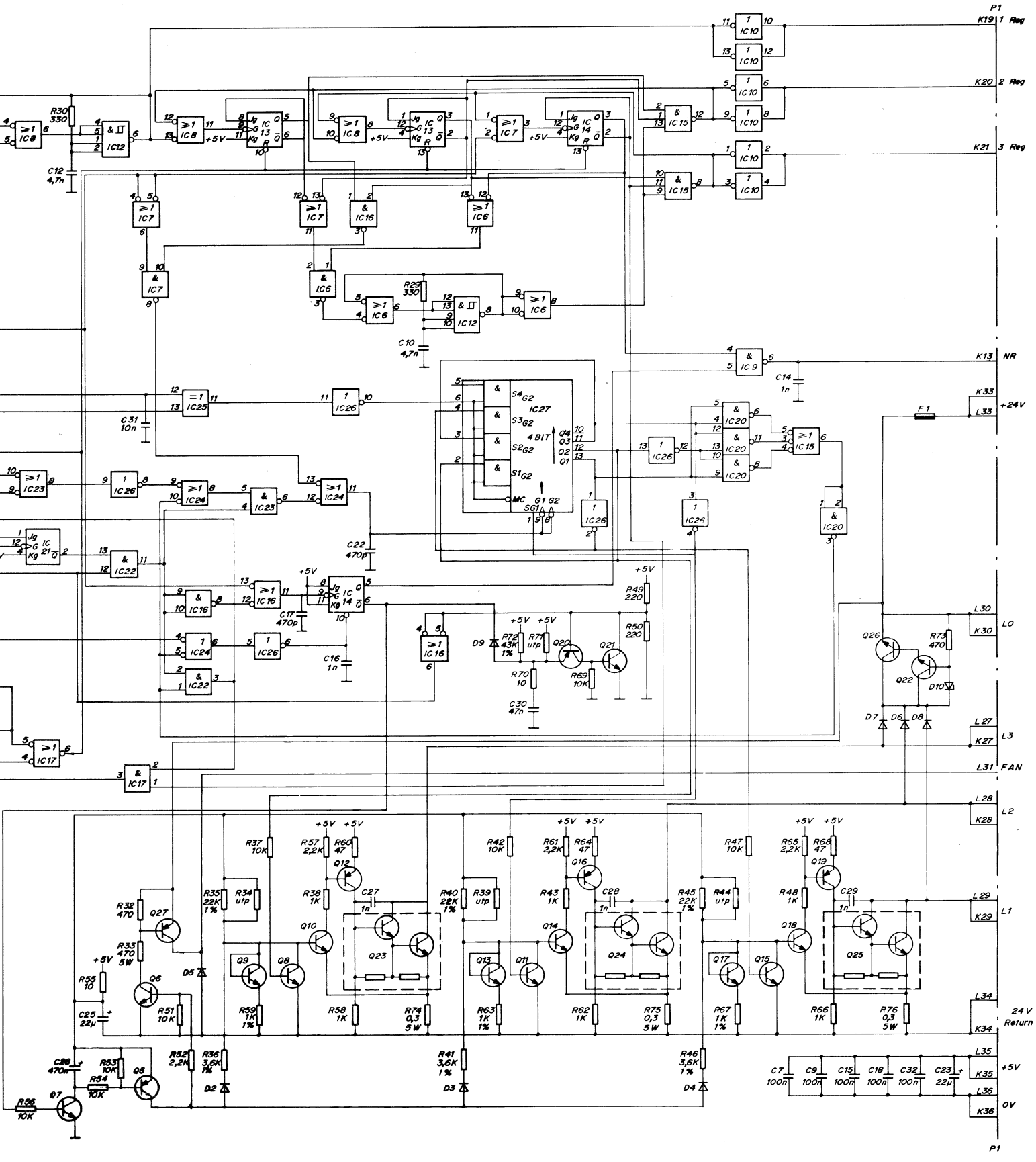
Daily: Clean dust from the tape path.

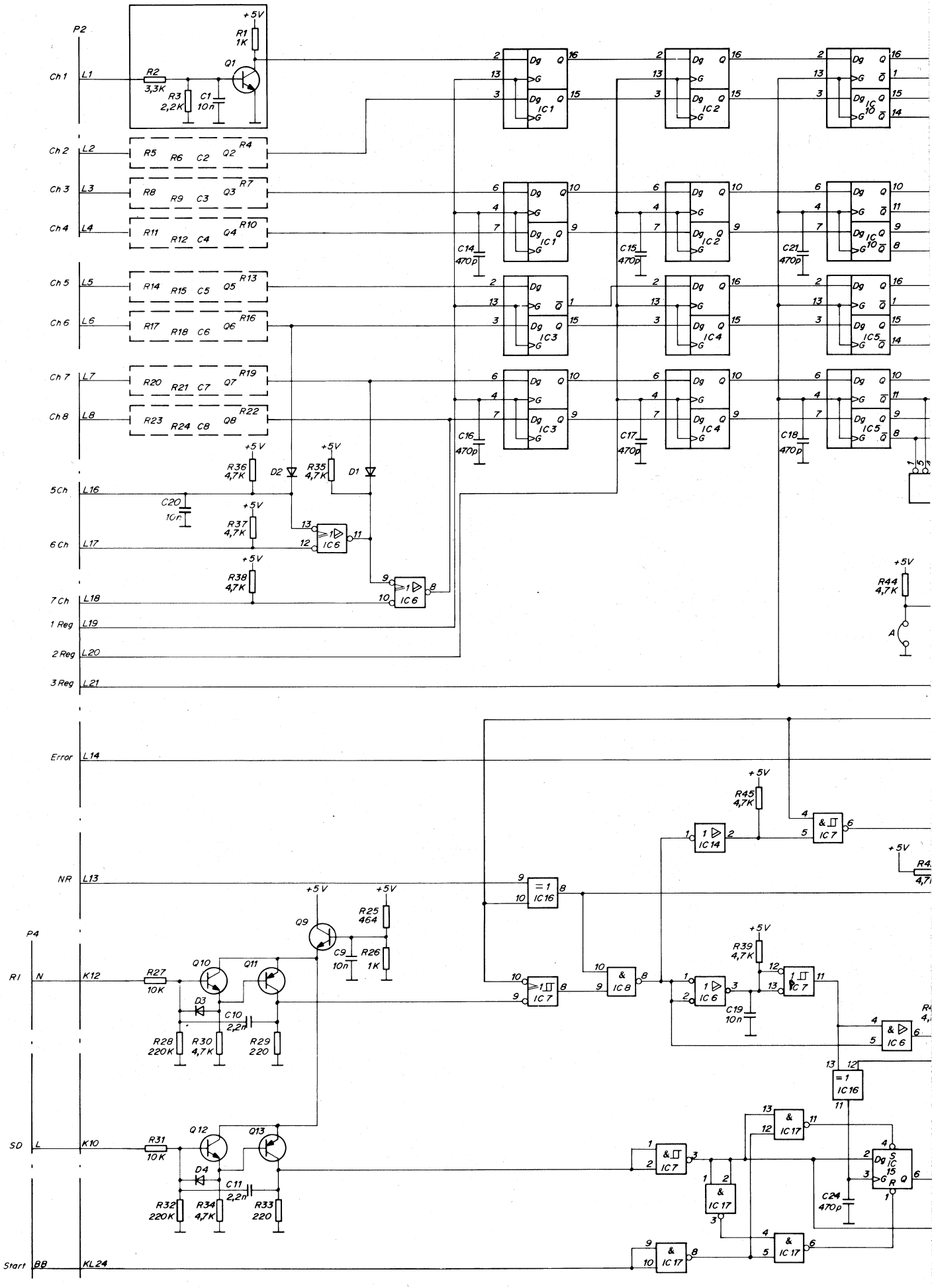
Monthly: Clean the glass window with some dissolvent. Wipe the LED-lens with a dry cloth.

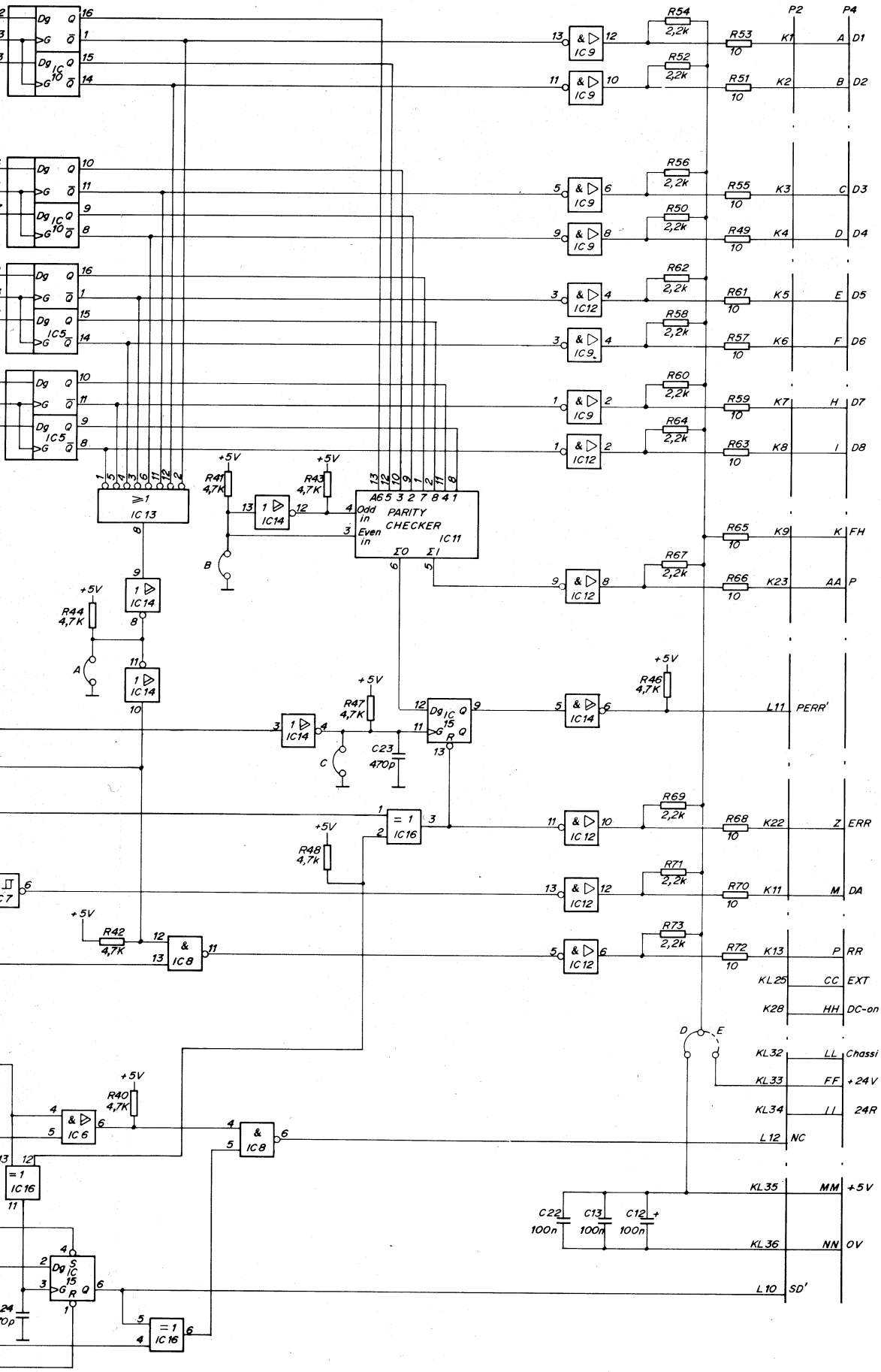
Yearly: Remove motor brake, using tool 1158 76 60-00 and check if oil has been leaking.
Check the capstan to see if it is worn or uneven.
Check the brake block 1507 31 70-00 to see if it is worn.
Check all adjustments listed in the service manual.

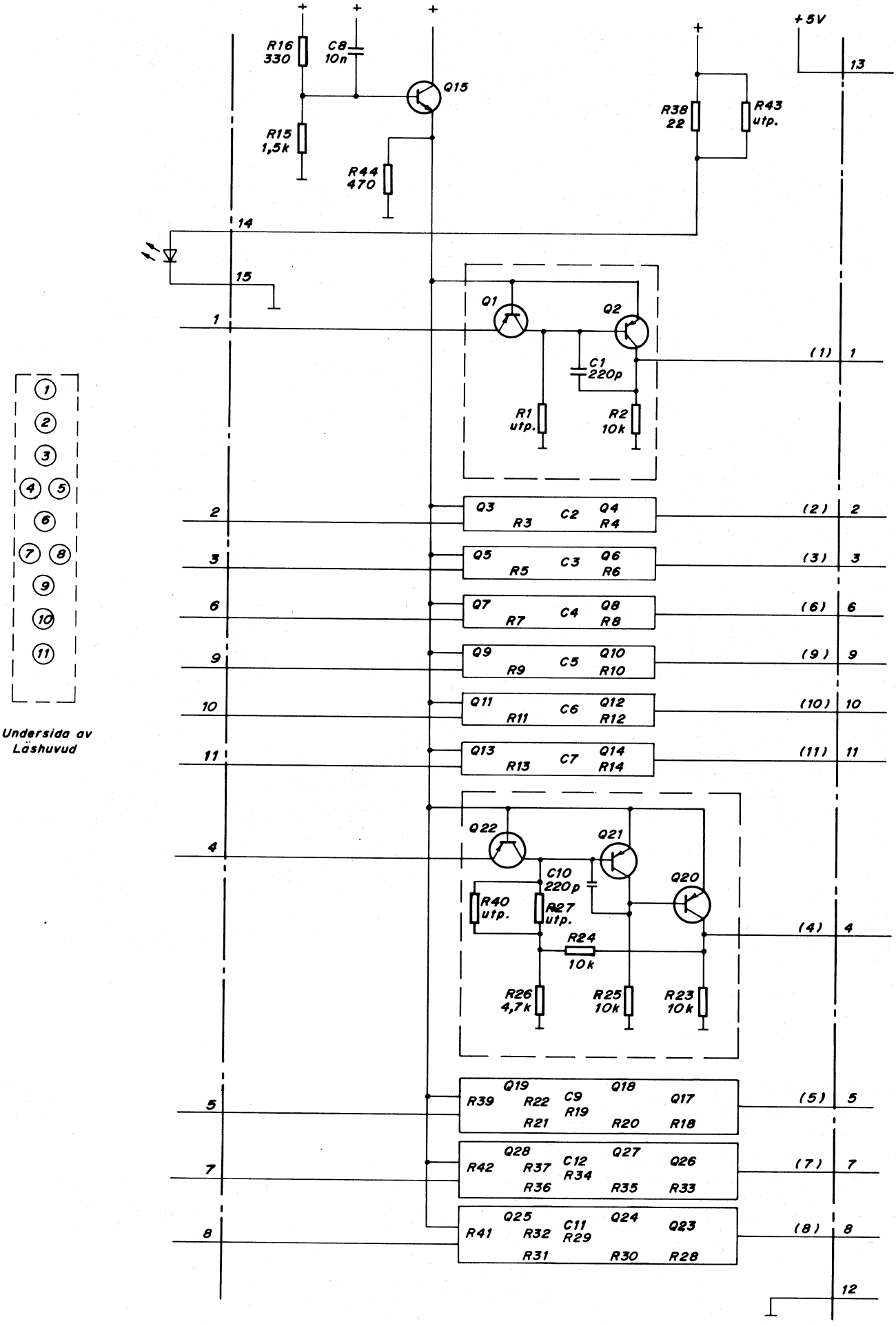
Voltage over the 100 ohm measuring resistor	Trimresistor k ohm	
	R1, R3, R5, R7 R9, R11, R13	R22 = R39, R27 = R40 R32 = R41, R37 = R42
7.5 - 8.1	180	
8.2 - 10.0	150	
10.1 - 12.3	120	
12.4 - 14.9	100	
15.0 - 18.1	82	180
18.2 - 21.9	68	150
22.0 - 26.3	56	120
16.4 - 31.6	47	100
31.7 - 37.7	39	82
37.8 - 45.4	33	68
45.5 - 55.6	27	56
55.7 - 68.2	22	47
68.3 - 82.4	18	39
82.5 - 101.2	15	33
101.3 - 123.6	12	27
123.7 - 149.7	10	22
149.8 - 181.6	6.8	15
181.7 - 219.8	5.6	12
219.9 - 264.2	4.7	10

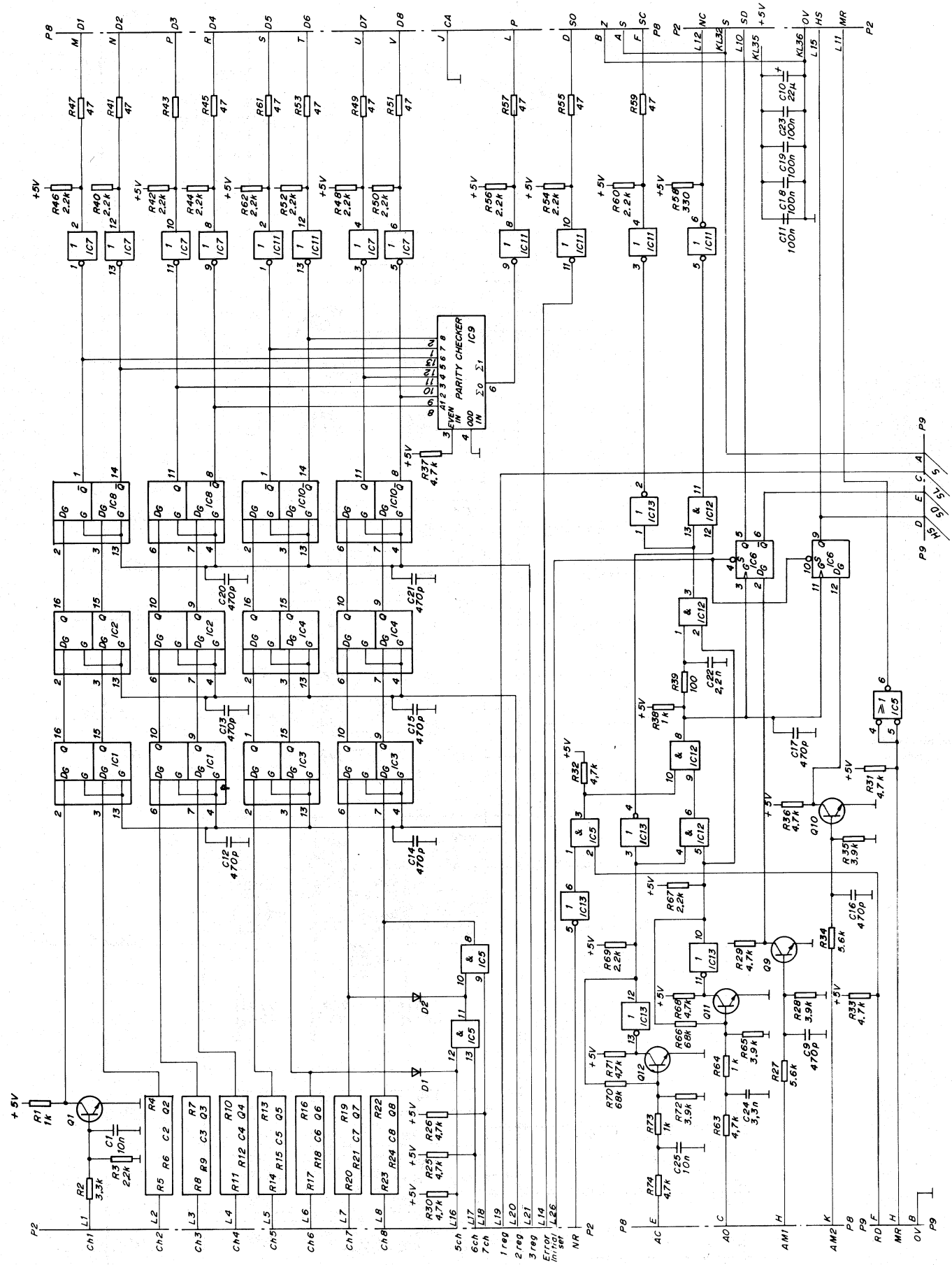

P1
Ch 10
L10
R6 3,3K
R2 2,2K
C2 10n
Q2
R3 1K
+5V
IC 2
IC 4
R25 4,7K
C4 1n
IC 3 ROM
X1
R18 3,3K
R17 3,3K
R15 470
R16 470
R7 470
R12 220
R13 220
R14 220
C3 1n
C8 2,2n
C6 2,2n
C5 2,2n
Ch 9
L9
R5 3,3K
R1 2,2K
C1 10n
Q1
R4 1K
NC
K12
C11 1n
SDM
L11
5ch
L12
K16
6ch
L13
L19
K17
7ch
L14
K18
FEED
L23
FEED
L24
SD'
K10
R21 4,7K
R22 4,7K
R23 4,7K
R24 4,7K
R8 4,7K
Start
L22
R31 4,7K
K24
Load
L16
Lift
K15
K11
R20 4,7K
R19 4,7K
IC 1
R10 15
R9 15
R26 330
Q4
D1
+24V
R28 10K
R11 3,3K
C24 10µ
Q3
R27 10K
C19 1n
C20 1n
C21 1n
IC 5
IC 9
IC 17
IC 18
IC 19
IC 21
IC 22
IC 23
IC 24
IC 25
IC 26
IC 16
IC 8
IC 12
IC 7
R30 330
C12 4,7n
C13 1n
C31 10n
R32 470
Q27
R33 470 5W
R35 22K 1%
R34 utp
R55 10
Q6
C25 22µ
R51 10K
D5
Q9
R56 10K
Q7
C26 470n
R53 10K
R54 10K
Q5
R52 2,2K
R36 3,6K 1%
D2
Ch 1
Ch 2
Ch 3
Ch 4
Ch 5
Ch 6
Ch 7
Ch 8
L1
K1
L2
K2
L3
K3
L4
K4
L5
K5
L6
K6
L7
K7
L8
K8
L17
L26
K26
K14
L25
Lift moving
Stand by lamp
Initial set
Error
Error lamp

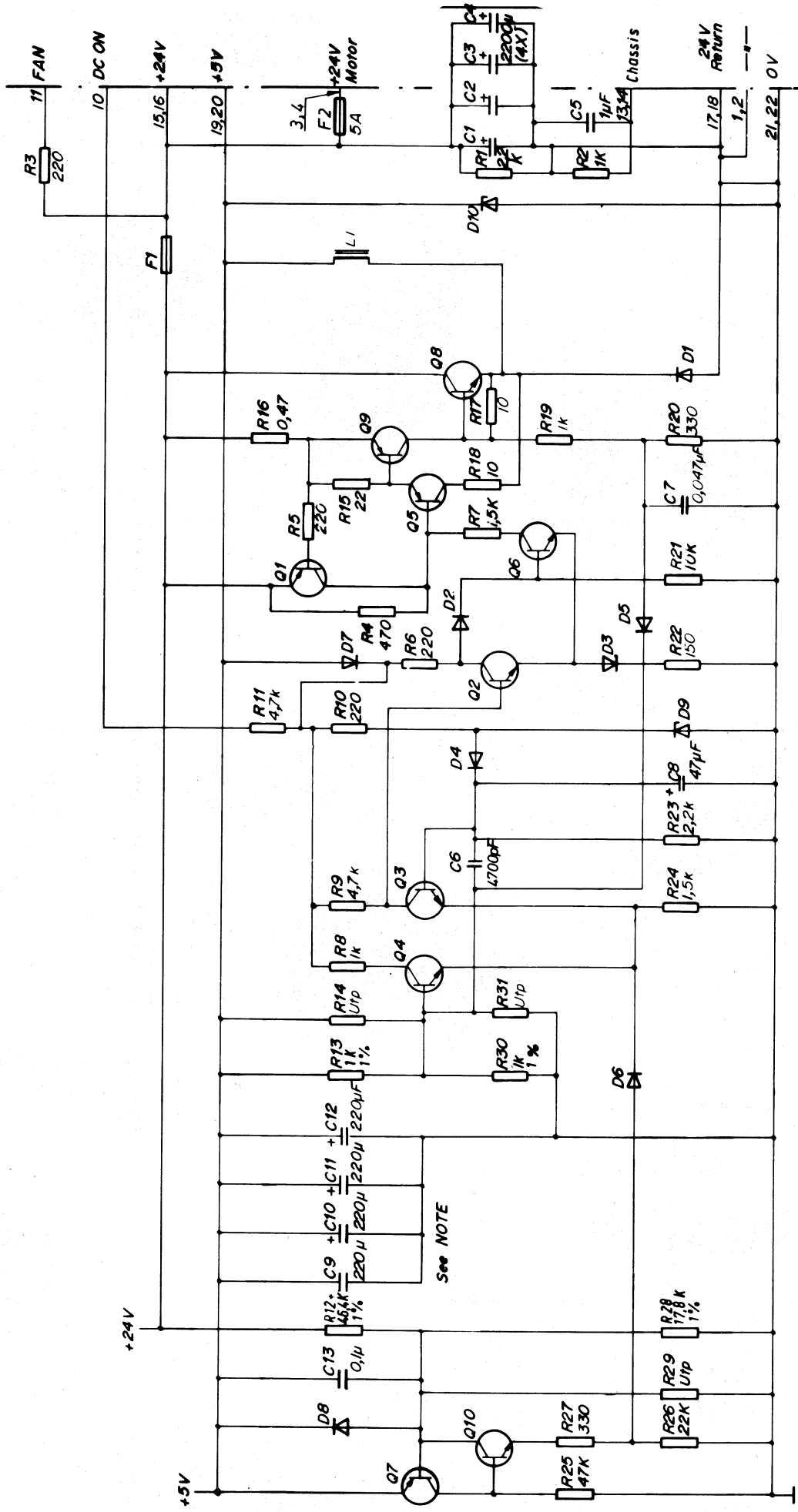

P1
K19 1 Reg
K20 2 Reg
K21 3 Reg
K13 NR
K33 +24V
L33
F1
L30
K30 LO
L27
K27 L3
L31 FAN
L28
K28 L2
L29
K29 L1
L34
K34 24V Return
L35
K35 +5V
L36
K36 0V
P1
IC 27
4 BIT
S4G2
S3G2
S2G2
S1G2
MC G1 G2 SG1
Q4 Q3 Q2 Q1
IC 12
IC 13
IC 14
IC 21
C10 4,7n
C12 4,7n
C14 1n
C16 1n
C17 470p
C22 470p
C30 47n
C31 10n
R29 330
R30 330
R32 470
R33 470 5W
R34 u!p
R35 22K 1%
R36 3,6K 1%
R37 10K
R38 1K
R39 u!p
R40 22K 1%
R41 3,6K 1%
R42 10K
R43 1K
R44 u!p
R45 22K 1%
R46 3,6K 1%
R47 10K
R48 1K
R49 220
R50 220
R51 10K
R52 2,2K
R53 10K
R54 10K
R55 10
R56 10K
R57 2,2K
R58 1K
R59 1K 1%
R60 47
R61 2,2K
R62 1K
R63 1K 1%
R64 47
R65 2,2K
R66 1K
R67 1K 1%
R68 47
R69 10K
R70 10
R71 u!p
R72 43K 1%
R73 470
R74 0,3 5W
R75 0,3 5W
R76 0,3 5W
C23 22µ
C25 22µ
C26 470n
C27 1n
C28 1n
C29 1n
C7 100n
C9 100n
C15 100n
C18 100n
C32 100n
D2
D3
D4
D5
D6
D7
D8
D9
D10
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22
Q23
Q24
Q25
Q26
Q27


P2
Ch 1
Ch 2
Ch 3
Ch 4
Ch 5
Ch 6
Ch 7
Ch 8
5 Ch
6 Ch
7 Ch
1 Reg
2 Reg
3 Reg
+5V
R1 1K
Q1
R2 3,3K
R3 2,2K
C1 10n
R4
R5
R6
C2
Q2
R7
R8
R9
C3
Q3
R10
R11
R12
C4
Q4
R13
R14
R15
C5
Q5
R16
R17
R18
C6
Q6
R19
R20
R21
C7
Q7
R22
R23
R24
C8
Q8
R36 4,7K
R35 4,7K
D2
D1
C20 10n
R37 4,7K
R38 4,7K
IC 6
IC 1
IC 2
IC 3
IC 4
IC 5
C14 470p
C15 470p
C16 470p
C17 470p
C18 470p
C21 470p
R44 4,7K
A
Error
NR
R1
SD
Start
P4
N
L
BB
K12
K10
KL24
R27 10K
R31 10K
Q9
Q10
Q11
Q12
Q13
R25 464
R26 1K
C9 10n
D3
D4
C10 2,2n
C11 2,2n
R28 220K
R30 4,7K
R29 220
R32 220K
R34 4,7K
R33 220
R45 4,7K
R39 4,7K
IC 14
IC 7
IC 16
IC 8
IC 17
C19 10n
C24 470p


P2
P4
IC 9
IC12
IC 8
IC 6
IC 13
IC14
IC 16
IC 15
IC 7
IC5
IC10
PARITY CHECKER
IC 11
R54 2,2k
R53 10
R52 2,2k
R51 10
R56 2,2k
R55 10
R50 2,2k
R49 10
R62 2,2k
R61 10
R58 2,2k
R57 10
R60 2,2k
R59 10
R64 2,2k
R63 10
R65 10
R67 2,2k
R66 10
R69 2,2k
R68 10
R71 2,2k
R70 10
R73 2,2k
R72 10
R41 4,7K
R43 4,7K
R44 4,7K
R47 4,7K
R46 4,7K
R48 4,7k
R42 4,7K
R40 4,7K
+5V
A
B
C
D
E
C23 470p
C22 100n
C13 100n
C12 100n
K1 A D1
K2 B D2
K3 C D3
K4 D D4
K5 E D5
K6 F D6
K7 H D7
K8 I D8
K9 K FH
K23 AA P
L11 PERR'
K22 Z ERR
K11 M DA
K13 P RR
KL25 CC EXT
K28 HH DC-on
KL32 LL Chassi
KL33 FF +24V
KL34 II 24R
L12 NC
KL35 MM +5V
KL36 NN 0V
L10 SD'


+5V
R16 330
C8 10n
Q15
R15 1,5k
R44 470
R38 22
R43 utp.
13
14
15
1
Q1
Q2
C1 220p
R1 utp.
R2 10k
(1) 1
2
Q3 R3 C2 Q4 R4
(2) 2
3
Q5 R5 C3 Q6 R6
(3) 3
6
Q7 R7 C4 Q8 R8
(6) 6
9
Q9 R9 C5 Q10 R10
(9) 9
10
Q11 R11 C6 Q12 R12
(10) 10
11
Q13 R13 C7 Q14 R14
(11) 11
4
Q22
Q21
Q20
C10 220p
R40 utp.
R27 utp.
R24 10k
(4) 4
R26 4,7k
R25 10k
R23 10k
5
Q19 R39 R22 C9 R19 R21 Q18 R20 Q17 R18
(5) 5
7
Q28 R42 R37 C12 R34 R36 Q27 R35 Q26 R33
(7) 7
8
Q25 R41 R32 C11 R29 R31 Q24 R30 Q23 R28
(8) 8
12
1
2
3
4 5
6
7 8
9
10
11
Undersida av Läshuvud


PARITY CHECKER IC9
EVEN
ODD
Σ0 Σ1
Ch1
Ch2
Ch3
Ch4
Ch5
Ch6
Ch7
Ch8
5ch
6ch
7ch
1 reg
2 reg
3 reg
Error initial set
+5V



NOTE : 3A & 6A versions differ as follows :

	3A	6A
C9 – C12	C9 – C10	C9,10,11,12
F1	1A	2A
Q8	T1P33A	BDY55
L1	44 turns 0,7mm	24 turns 1mm