Data
Systems

PHILIPS

Product Specification

Mini Flexible Disk Drive X3111
X3112
X3113
X3114

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Great care has been taken to ensure that the information contained in this handbook is accurate and complete. Should any errors or omissions be discovered, however, or should any user wish to make a suggestion for improving this handbook, he is invited to send the relevant details to:

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1 General Description

The Philips Mini Flexible Disk Drive is a member of a family of low-cost, high-performance, highly reliable, random-access storage devices. The mFD is designed to record data on one/two-sided media. The mFD is capable of operating with soft-sector formats in both single- and double-density modes with the same low error rates.

2 Functional Description

Maximum unformatted capacity of the MFD:

X3111	one-sided	-	0.25 mega byte
X3112	two-sided	-	0.5 mega bytes

Forty (40) tracks/cylinders are available for data recording on the storage medium.

X3113	one-sided	-	0.5 mega bytes
X3114	two-sided	-	1.00 mega byte

Eighty (80) tracks/cylinders are available for data recording on the storage medium.

The disk is rotated at a nominal speed of 300 rev/min. Cylinder accessing is accomplished using a high-performance stepper motor and a stainless steel band to position the read/write heads in response to commands from the controller. Ceramic heads are used for maximum head longevity. The mFD contains all read/write and control electronics necessary to move the heads, load the heads and perform the data transfer operations using only simple control commands from the host controller.

3 Physical Description

3.1 Electronics

On a single circuit board mounted on the upper side of the drive all electronic circuitry digital as well as analog is located. Logic is implemented with TTL integrated circuits.

The PCB contains:
- write/read electronics
- positioning control logic
- drive motor control
- index detector circuit
- select logic
- ready logic
- door lock/unlock logic (optional)
- track 00 logic
- head load driver (optional)
- write protect logic

3.2 Positioning Mechanism

The positioning system consists of a high-performance stepper motor and a stainless steel band.

3.3 Head Load Mechanism

The head load mechanism brings the read/write head(s) in contact with the flexible disk. Loading is accomplished by closing the front door. Optionally, loading can be accomplished by utilizing a head load solenoid.

3.4 Drive Mechanism

The spindle rotates at 300 rpm. The DC drive motor rotates the spindle through a belt drive system.

Long-term and short-term speed variation of the spindle is within + 3%.

3.5 Read/Write Head(s)

The mFD features long-life ceramic read/write tunnel erase head(s).

3.6 Door Lock (option)

For drives having this feature a mechanical door lock/unlock for the disk loading access cover is available to have the door locked/unlocked under software control.

4 Dimensions

The envelope dimensions of the mFD are (see Fig. 1):

Height: 57.5 mm
Width : 150 mm
Length: 209 mm
: 216 mm including interface connector.

In the die-cast chassis two mounting holes for metric threads M4 are available.

Optional mounting holes with diameter corresponding to UNC 6-32 are available. See Fig. 2.

Optionally, a front panel with a height of 86.5 mm and width of 150 mm or a front panel with a height of 57.5 mm and width of 150 mm can be adapted to the drive to make it compatible with major OEM dimensions. See Fig. 2.

The weight of the drive is less than 1.3 kg.

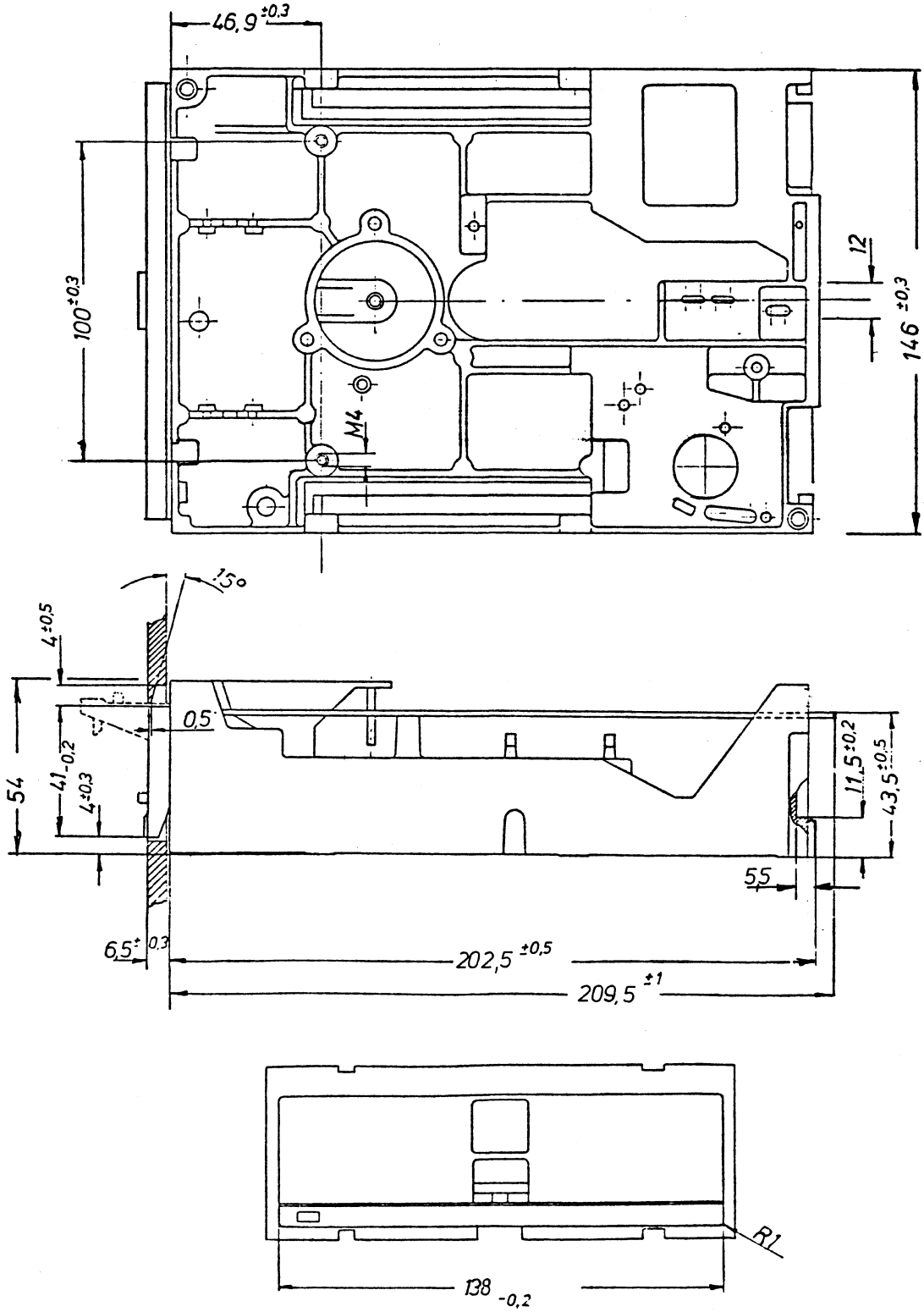

46,9 ±0,3
100 ±0,3
146 ±0,3
12
M4
15°
4 ±0,5
0,5
54
41 -0,2
4 ±0,3
11,5 ±0,2
43,5 ±0,5
55
6,5 ±0,3
202,5 ±0,5
209,5 ±1
R1
138 -0,2

Figure 1

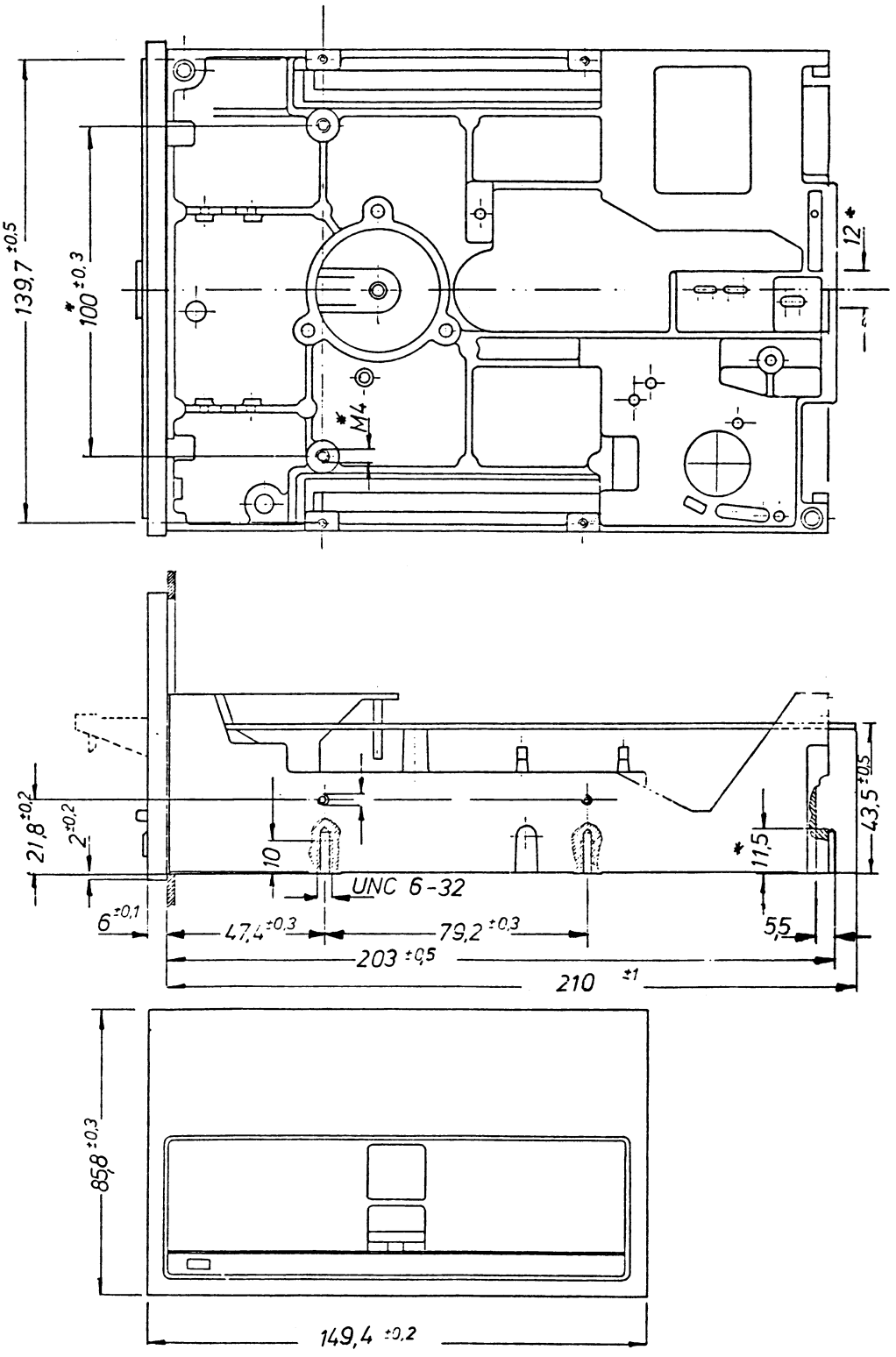

139,7 ±0,5
100 ±0,3
M4
12
21,8 ±0,2
2 ±0,2
10
UNC 6-32
11,5
43,5 ±0,5
6 ±0,1
47,4 ±0,3
79,2 ±0,3
55
203 ±0,5
210 ±1
85,8 ±0,3
149,4 ±0,2

Figure 2

5 System Configuration

As standard, up to four drives can be operated in the daisy-chain mode. See Fig. 3.

A DIP-terminator is required for connection in the last drive in the cable chain.

6 Features

The following features are available:

6.1 Activity LED

This LED on the front of the drive can be lit if the drive is selected or the function in use is active.

6.2 Disk Ejector

Optionally, a disk ejector which automatically ejects the disk when opening the front door is available. By using this feature a clearance of 4 mm between disk jacket and upper head isguaranteed.

6.3 Disk Centering

Inserting a disk into the drive starts the drive motor running, which will cause centering and clamping of the disk with a running spindle.

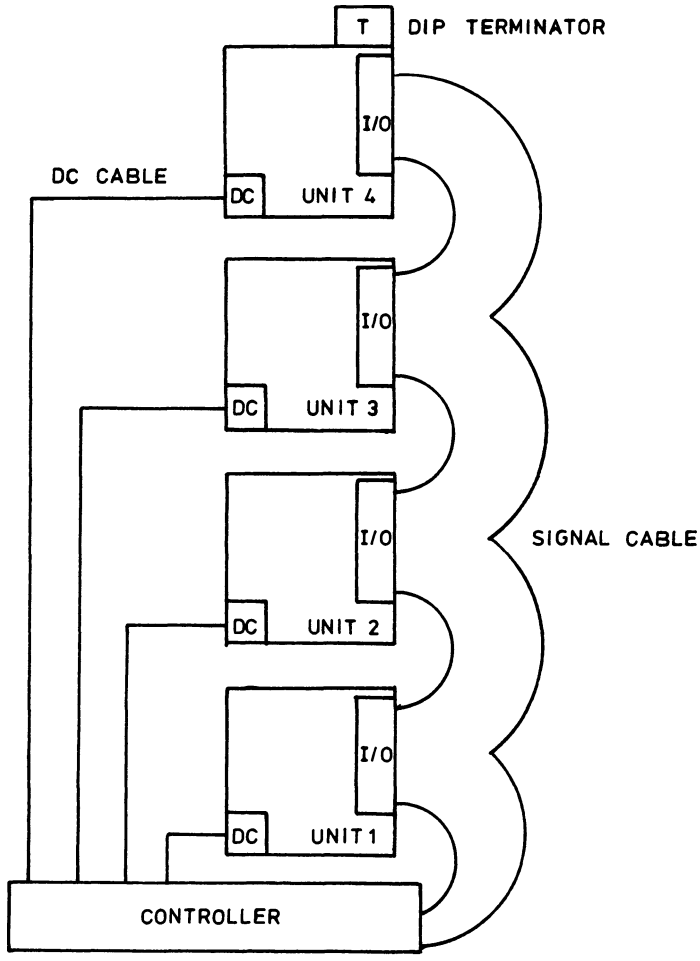


Figure 3 SYSTEM CONFIGURATION

6.4 Electromechanical Door Lock

The following specific requirements are fulfilled for this feature:

- The door is locked when power is off.
- A mechanical override is provided for the door lock mechanism to inhibit this feature when desired.
- An activity LED on the front panel should be lit when it is possible to open the access door.
- If the access door is open when the power fails it is possible to close the door.

By turning around the solenoid by 180 degrees, the lock function can be changed into unlock.

7 Workmanship

The one/two-sided Flexible Disk Drive is manufactured and processed in a careful and workmanlike manner in accordance with good engineering and production to assure fulfillment of the requirements.

7.1 Colour

In the standard configuration, the front panel and front door is black, with the structure surface type 9 - 112 New - D.249.

7.2 Product Identification-Emblem

A self-adhesive sticker can be used on the front door for drive assignments.

An equipment nameplate is located on the base assembly, containing the following information:

- equipment status number
- unit serial number

8 Reliability

8.1 Mean Time Between Failures (MTBF)

The MTBF exceeds 9000 hours, based on a 25 percent duty cycle, where MTBF = $\frac{\text{power-on hours}}{\text{Number of equipment failures}}$

Power-on hours are defined as the total time which the device has DC applied, less maintenance time. Equipment failures mean any malfunction or substandard performance of the device, due to failures within the device.

8.2 Mean Time To Repair (MTTR)

MTTR for the mFD is 30 minutes, and is defined as the average time required for an adequately trained and competent service man to diagnose and correct a malfunction on site.

8.3 Useful Lifetime

Useful lifetime exceeds 10.000 power-on hours or five years,which ever occurs first.

8.4 Preventive Maintenance

For the drives X3111/X3112/X3113/X3114 there is no special preventive maintenance needed. Only for the single-sided drive the operating time of the pressure pad for the head should not exceed 600 hours.

9 Performance Requirements

9.1 General

The unit makes use of the standardized Flexible Disk Cartridges (130 mm) one and two-sided.
As far as the Drive characteristics are concerned, medium exchangeability for the above-mentioned media between the units is guaranteed.

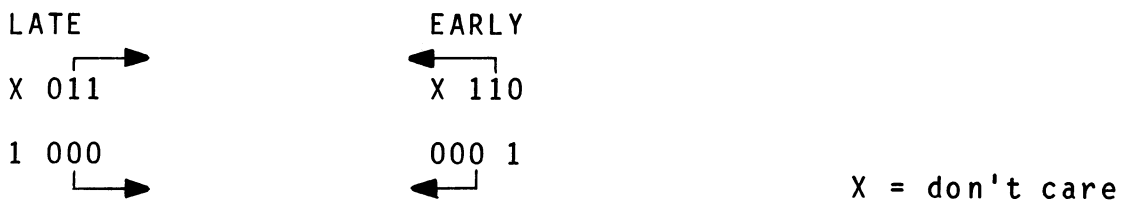
9.2 Recording

For double-density, MFM-coding technique is used.
Recording density MFM:
Inner track (39) side 1 5876 fci

9.2.1 Write nre-Compensation

For MFM, pre-compensation during the write process is incorporated to minimize the peak shift. The pre-compensation is 250 nsec, starting at track 20 for X3111/X3112 and starting at track 43 for X3113/X3114.

The following patterns have to be compensated in the direction of the arrow.



9.2.2 Disk X3111/X3112

The storage media specified for use with the mFD X3111/X3112 are specified in and Standard ECMA/70, DATA Interchange on 130 mm Flexible Disk Cartridges using MFM-Recording at 7958 ftprad ON BOTH Sides.
The envelope size is 5.25 inches by 5.25 inches.
The disk has 40 concentric recording tracks/cylinders on one/two surface(s). Track centre lines are calculated by the following equation:

$$R_m = x - \frac{n}{48} \cdot 25.4 \text{ mm} \qquad n = 00 \text{ to } 39$$

x = 57.150 mm for side 0.
x = 55.033 mm for side 1. (if applicable)

9.2.3 Disk X3113/X3114

The storage media specified for use with the mFD X3113/X3114 are specified in and Final Draft Standard ECMA/TC19/82/8, DATA Interchange on 130 mm Flexible Disk Cartridges using MFM-Recording at 7958 ftprad ON BOTH Sides.
The envelope size is 5.25 inches by 5.25 inches.
The disk has 80 concentric recording tracks/cylinders on one/two surface(s). Track centre lines are calculated by the following equation:

$$R_m = x - \frac{n}{96} \cdot 25.4 \text{ mm} \qquad n = 00 \text{ to } 79$$

x = 57.150 mm for side 0.
x = 55.033 mm for side 1. (if applicable)

10 Head

10.1 General

The read/write head for side 0 (lower head) and side 1 (upper head) is a ceramic head with single read/write gap plus a track edge erase gap.

10.2 Head Parameters/48 tpi

Track width	=	0.33 mm ± 0.0076 mm.
Read/write to erase gap	=	0.9144 mm ± 0.0521 mm.

10.3 Head Alignment/48 tpi

To establish the proper radial alignment of the read/write heads, the alignment disk Dysan 224/2A with part number 800180 or an equivalent disk shall be used. On track 16 for side 0 and for side 1, the deviation in the peak amplitude value of the cat eyes is less than 20 %, measured at the test points given the analog read signal, when performed in accordance with appropriate maintenance procedures.

10.4 Head Parameters/96 tpi

Track width	=	0.159 mm ± 0.006 mm.
Read/write to erase gap	=	0.9144 mm ± 0.025 mm.

10.5 Head Alignment/96 tpi

To establish the proper radial alignment of the read/write heads, the alignment disk Dysan 206-30 for X3114 and the alignment disk Dysan 206-10 for X3113 should be used. On track 32 for side 0 and for side 1, the deviation in the peak amplitude value of the cat eyes is less than 20 %, measured at the test points given the analog read signal, when performed in accordance with appropriate maintenance procedures.

11 Analog Read Signal 48 tpi/96 tpi

Measured at the testpoints, the resolution for the analog read signal is:

a) The ratio of ones over zeroes (resolution) on cylinder 39/79 must be greater than or equal to 60 %.

b) The disk necessary to perform these measurements is a reference disk.

12 Digital Read Signal 48 tpi/96 tpi

The digital read pulses on the interface corresponding to the peak voltage of the analog read signal is be within a window of + 600 nsec, measured on track 39/79 with an ADC-Test-System and using pre-write compensation. The window is equivalent to a margin code 06 given by the test system.

13 Write Current

48 tpi:

Write current is 8 mA ± 10 % peak to peak.

96 tpi:

Write current is 6.2 mA ± 10 % peak to peak.

13.1 Tunnel-Erase-Current

48 tpi:

The DC tunnel erase current is 80 mA ± 10 %.

96 tpi:

The DC tunnel erase current is 30 mA ± 10 %.

14 Head Life Parameter

The life of the heads is specified to be greater than 10.000 hours in contact, provided the drive and the media are not exposed to environmental conditions in excess of the specification.

14.1 Pressure Pad

For the one-sided drive, the head pressure pad has a in-contact life of at least 600 hours.

15 Disk Life

Wear, as a function of head-disk contact, results in a minimum disk life of 5×10^6 passes per track.
The pressure pad force for the one-sided Drive is 20 ± 2 g.

16 Bit Transfer Rate

Based on a rotational speed of 300 rev/min for the disk, the data transfer rate with MFM-coding is 250 kilobits/sec.

17 Data Capacity

The unformatted storage capacity of the mFD using MFM-coding is:

		48 tpi	96 tpi:
Track capacity		6.2 kilobytes	6.28 kilobytes
Surface capacity		250.0 kilobytes	500.0 kilobytes
Disk capacity	one-sided	250.0 kilobytes	500.0 kilobytes
	two-sided	500.0 kilobytes	1.0 megabyte

18 Formatting Considerations

The mFD operates with soft-sector formats. The format must account for operational parameters of the drive and necessary processing times in the host system.
Drive parameters are the speed tolerance ± 3% including long and short-term speed variation and the tunnel erase structure of the head and erase turn-on/off circuit tolerance. As an example the detailed track format using 16 sectors/track with 256 bytes/sector in MFM-recording as described in STANDARD ECMA 70 is given.

The length and content of the gaps (see Fig. 4) incorporate the drive characteristics.

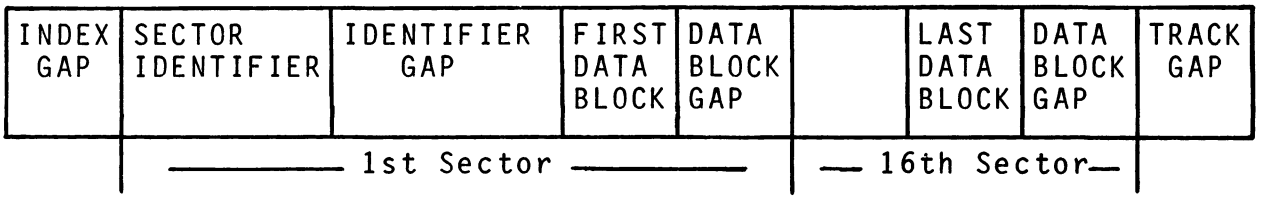


Fig. 4 TRACK LAYOUT

Index gap	: 32 bytes
Identifier gap	: 22 bytes
Data block gap	: 50 bytes
Track gap	: 362 bytes

19 Latency

With a nominal rotational speed of 300 rev/min the average latency is 100 ms.

20 Positioning Characteristics

Single track positioning is 5 ms plus 20 ms for settling time.

20.1 Average Positioning Time

Random average positioning time including settling time is 85 ms for 48 tpi and 150 ms for 96 tpi.

20.2 Maximum Positioning Time

Maximum positioning time including settling time is 215 ms for 48 tpi and 415 ms for 96 tpi.

21 Drive Start and Stop Time

Reaching operating speed of the disk as far as the status ready is concerned, requires 500 ms (see Fig. 5). The disk stops instantaneously.

22 Head Load Time

The head load time of the mFD is 30 ms maximum, if a head load solenoid is used.

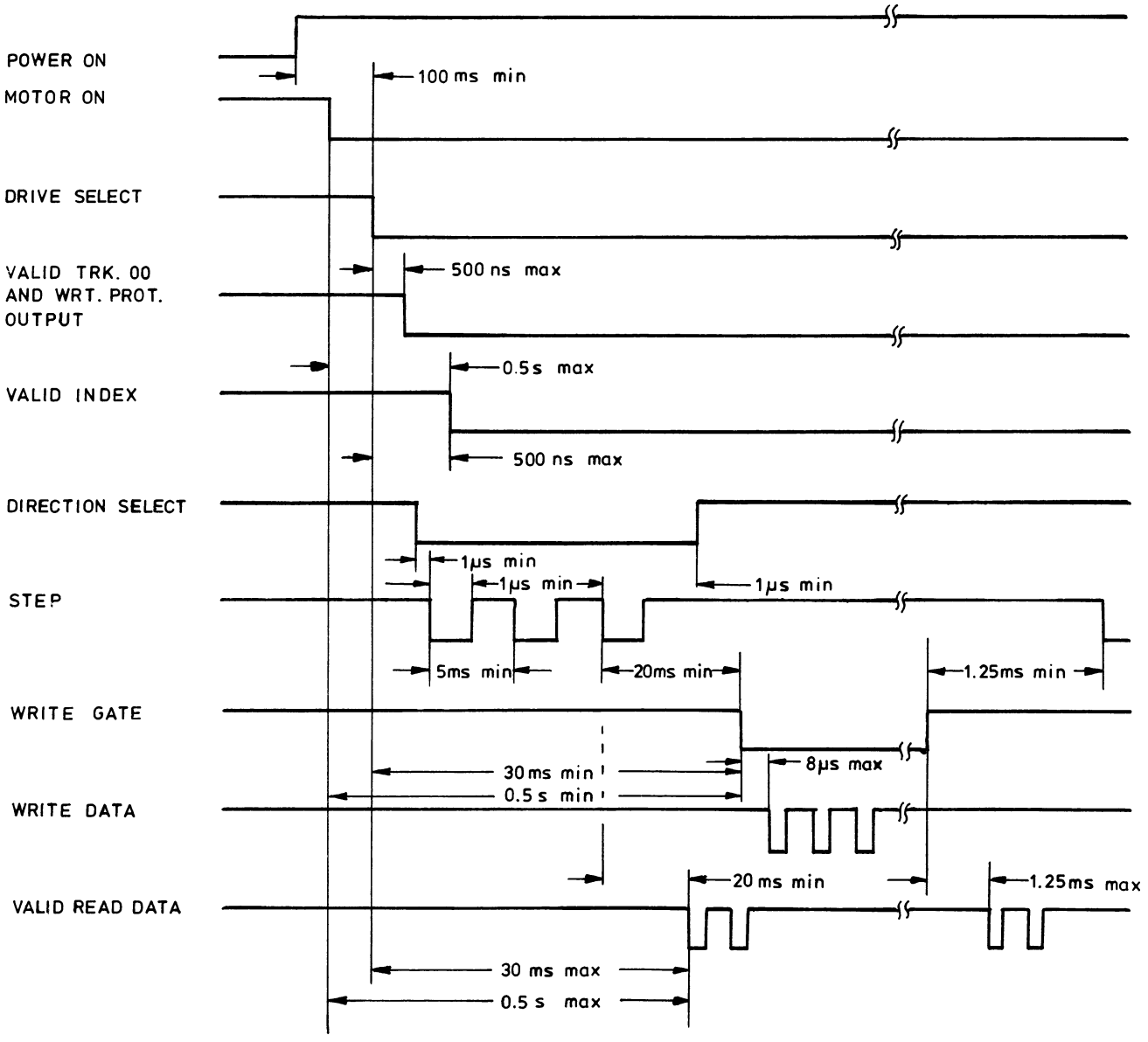


Figure 5 GENERAL CONTROL AND DATA TIMING REQUIREMENTS

23 Read Recovery Time

A period of 100 microseconds must be allowed for a stable read signal after unit and/or head selection.

24 Write-to-Read Stabilization Time

Write-to-read with the same head requires 1.25 ms for stable data to be available to the controller.

25 Error Recovery

25.1 Write errors

If the data cannot be written during 4 attempts, it is recommended that the track is labelled defective.

25.2 Recoverable Read Errors

Recoverable read errors are defined as those errors which can be recovered in less than 10 retries. However, if the read error cannot be recovered during 10 retries, step the carriage several tracks away, reposition and reread. If data cannot be recovered, the error is not recoverable.

The recoverable read error rate for the mFD is less than one read error in 10^9 bits.

25.3 Unrecoverable Read Errors

Unrecoverable read errors are defined as those errors which cannot be recovered after 10 attempts.

An unrecoverable read error is a read error that occurs less than once in 10^{12} bits.

25.4 Positioning Errors

A specified positioning error is a positioning error that occurs less than once in 10^6 positioning operations.

26 Interface

26.1 General

This section describes the interface between the one/two-sided Mini Flexible Disk Drive either 48 tpi or 96 tpi (Shugart-compatible) and its control unit. With the exception of the power units, the interface is only digital. The pin assignments for the interface concerning the different models are given in Figure 7.

26.2 Control and Data Line Characteristics

All interface signals are TTL-compatible. Logic true is at +.4 V (maximum). Logic false is at +2.4 V (minimum). Command status and data are transmitted by a 3M ribbon cable, 34 conductors with a maximum line length of 10 feet. The mFD uses the 7438-quad-2 input driver (or equivalent) to transmit data. The mFD uses standard 7404-Six-1 input inverters as a line receiver (or equivalent).

All signal lines must be terminated at the receiver with an impedance of nominal 150 ohms.

The terminator consists of a DIP-resistor module which plugs into a DIP-socket in the last unit of the daisy chain.

An equivalent terminator must be provided in the controller on each input signal line from the mFD to the controller.

26.3 Receiver/Transmitter

- Transmitters: 7438 or equivalent type
- Receivers : 7404 or equivalent type

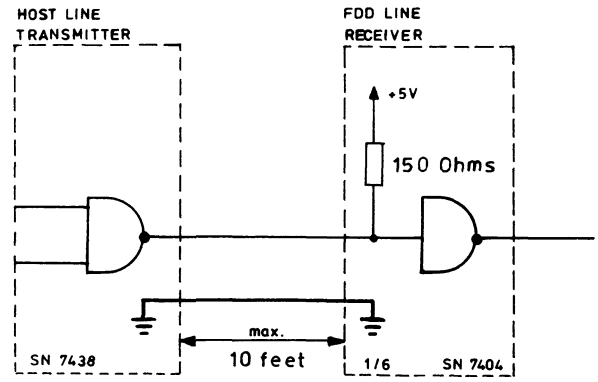


Figure 6 SCHEMATIC DIAGRAM

LINE	3M
GROUND	1
READY*	2
HEAD LOAD*	
GROUND	3
IN USE	4
GROUND	5
SELECT 4*	
READY	6
MOTOR ON*	
GROUND	7
INDEX	8
GROUND	9
SELECT 1	10
GROUND	11
SELECT 2	12
GROUND	13
SELECT 3*	14
IN USE	
GROUND	15
MOTOR ON	16
GROUND	17
DIRECTION	18
GROUND	19
STEP	20
GROUND	21
WRITE DATA	22
GROUND	23
WRITE GATE	24
GROUND	25
TRACK 00	26
GROUND	27
WRITE PROTECT	28
GROUND	29
READ DATA	30
GROUND	31
HEAD SELECT	32
GROUND	33
IN USE/DISK CHANGE* READY*	34

CONTROLLER

mFD

Fig. 7

* All these functions are selectable via jumpers. (see 14)

27 Control and Data Line Functions

27.1 Step

A 1-microsecond (minimum) and 2-millisecond (maximum) logic true level pulse on this line causes the head to move one track inward or outward from the centre of the disk, depending upon the state of the direction line.

The step is made according to the transition from logical false to logical true in the step sequence signal, see Fig. 8.

27.2 Direction

Logic true level on this line causes the head to move toward the centre of the spindle when a step signal occurs.

Logic false level defines the opposite direction, a minimum delay of 10 msec between direction change and the next step is allowed. See Fig. 8.

27.3 Unit Select 1 - 4

There are four unit select lines, each with a strap that is used to select a unit to be accessed by the controller.

A further strap allows the drive to be permanently selected.

Logic true level on this line lights the LED indicator on the front panel of the mFD.

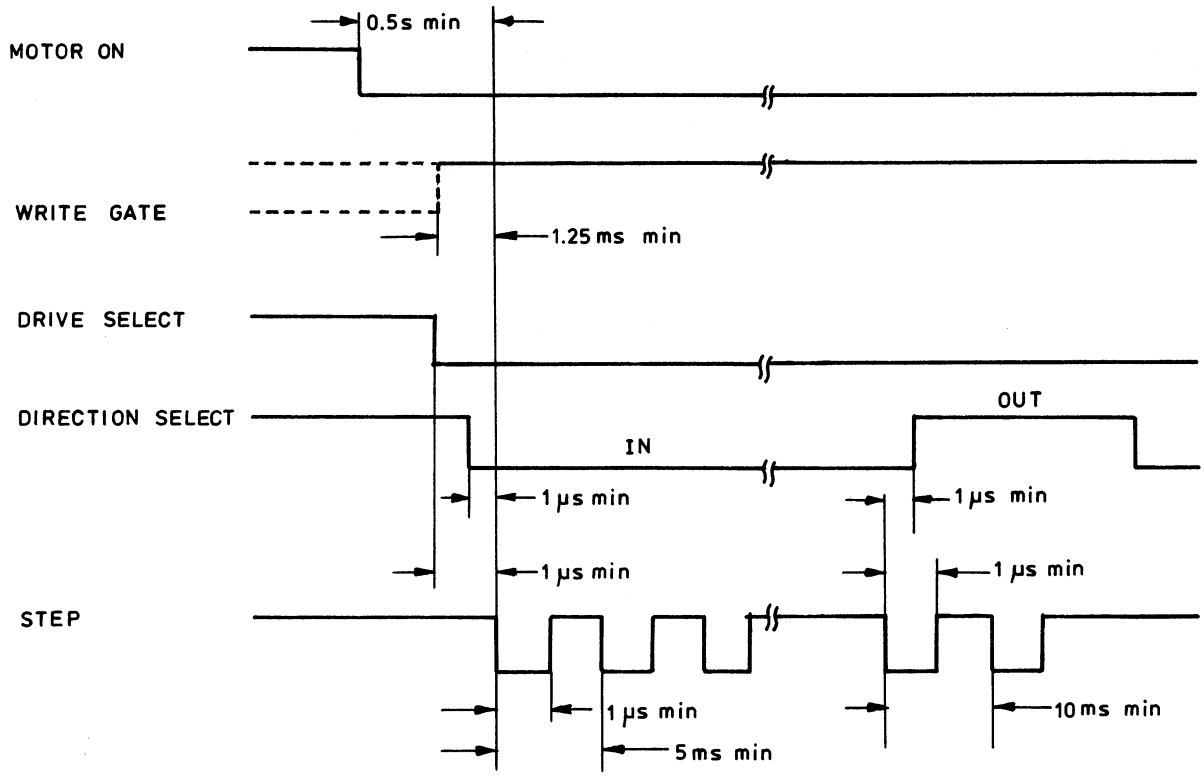


Figure 8 TRACK ADDRESS TIMING

27.4 Load Heads (Optional)

A logic true on this line causes the heads to be loaded against the disk. This line must be activated at least 30 ms prior to data transfer allowing the heads to stabilize. See Fig. 9 (Write Initiate Timing).

27.5 Head Select (only two-sided Drive)

This line is used to select the proper head. A logical true causes head 1 to be selected. A logical false causes head 0 (on bottom side) to be selected.

Head selection may be changed at any time following activation of Unit Select and Load Heads but must occur a minimum of 100 us prior to transferring data. See Fig. 10 (Read Initiate Timing).

27.6 Write Enable

A logical true on this line activates the write circuits. A logical false activates the read circuit. See Fig. 9 and Fig. 10.

Erase current is derived internally on the PC-board from Write Enable. Erase current is activated with a delay of 450 us maximum after Write Enable and is held 900 us minimum after deactivation of Write Enable.

To ensure proper erasure has occured, Unit Select (and Head Select) must be held at the active level for at least 1.25 ms following a write operation.

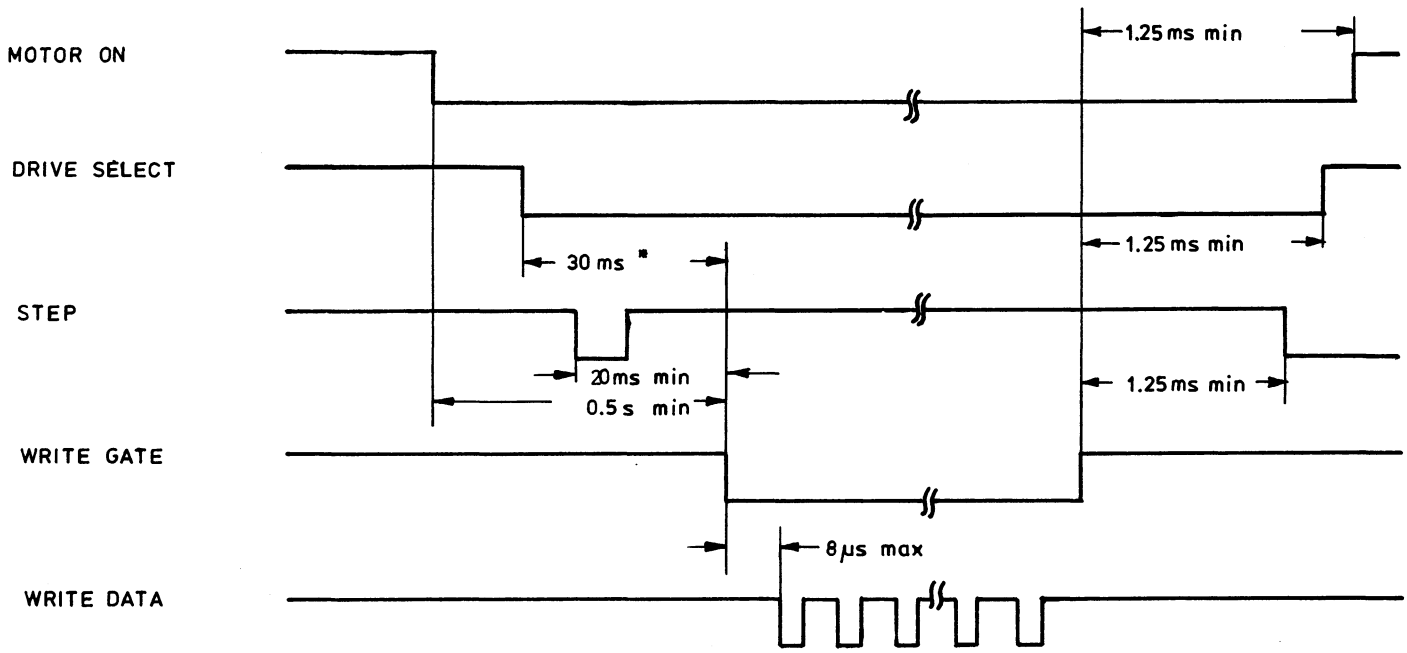


Figure 9 WRITE INITIATE TIMING

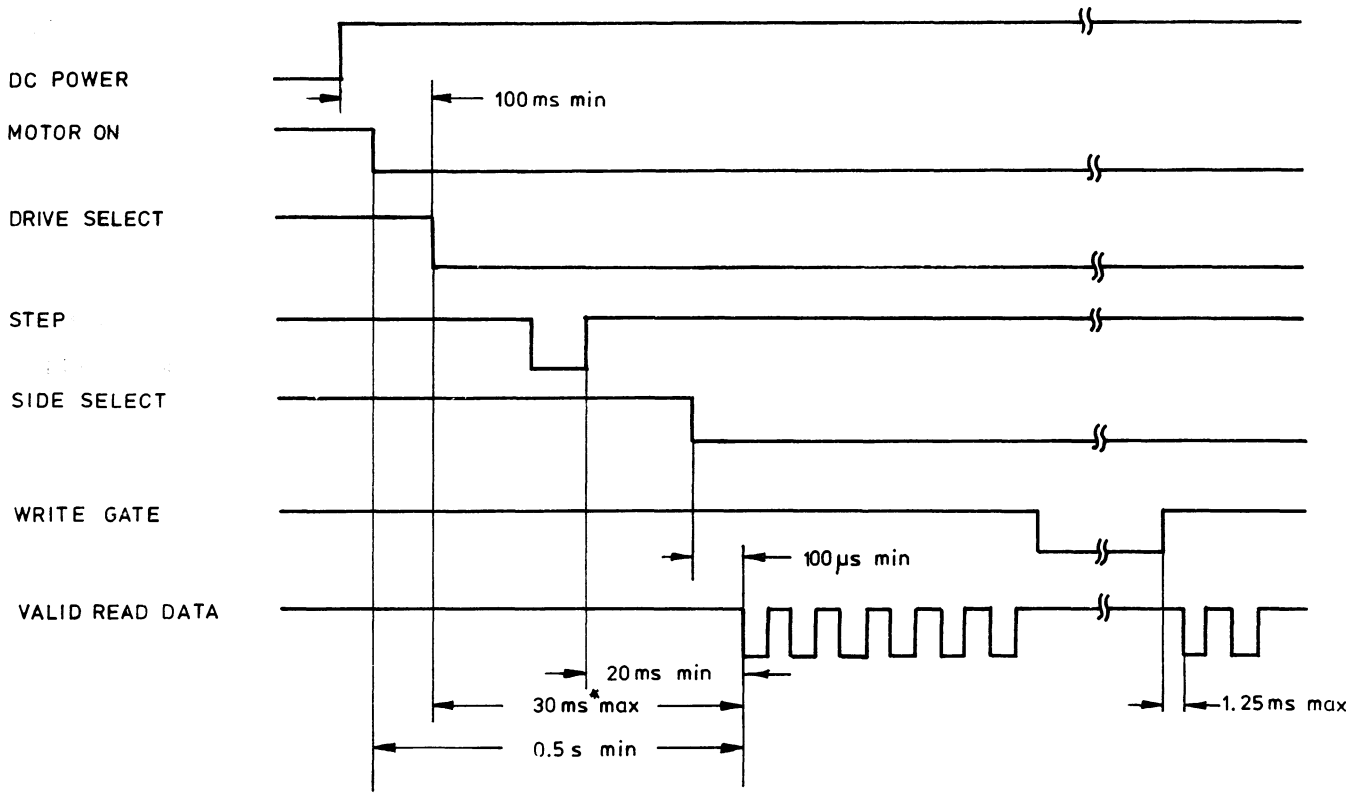


Figure 10 READ INITIATE TIMING

* From Head Load Initiate

27.7 Write Data

Data to be recorded on the flexible disk is supplied on this line. Data pulses must be 250 ± 50 nanoseconds. See Fig. 11.

The magnetic flux transition corresponds to the transition in the write data timing going from false to true.

27.8 Motor On/Off

This line controls the motor-on/off state. After the motor-on command has been given on the interface, internal timing of the drive ensures a minimum running time of about 60 sec. A minimum of 0.5 sec. is required before performing a read or write operation after the motor-on command has been given.
See Fig. 9 and Fig. 10.

27.9 Door Unlock (Option)

There are two door-unlock lines. One is used per drive to either lock or unlock the door-lock mechanism. An active low level (0.4 V max) on the door-unlock line lights an LED indicator on the front panel of the FDD and activates a solenoid which unlocks the door mechanism, permitting manual opening of the door.

Logical unit assignment is accomplished by means of select jumpers located on the circuit board.

The door-lock line is optioned gated with unit select.

27.10 Unit Ready Interrupt

A logical true on this line indicates that the unit power is on, the door is closed and the disk has reached 90 % of its nominal speed. The unit ready interrupt assignments are accomplished by setting any of the 2 jumpers located on the circuit board.

27.11 Composite Read Data

Read data pulses reproduce write data inputs. Each transition from logic false to logic true corresponds to a magnetic flux transition. Pulses are 1 μs $\pm$ 250 nsec. See Fig. 12.

27.12 Cylinder 00

A logical true on this line indicates that the heads are positioned over cylinder 00 and the correct phase of the stepper motor is activated.

27.13 Index

The index pulse is generated by sensing the index hole in the disk. Index pulses are 3.5 $\pm$ 1.5 ms at the logic true level. The relationship of index signal to other control lines is given in Fig. 13 (General Control Timing). The leading edge of the index pulse is used to adjust the burst-to-index timing.

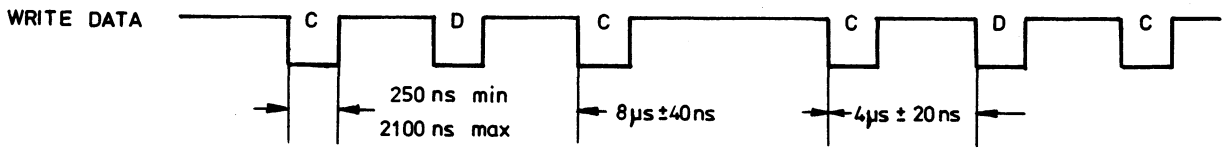


Figure 11 WRITE DATA TIMING

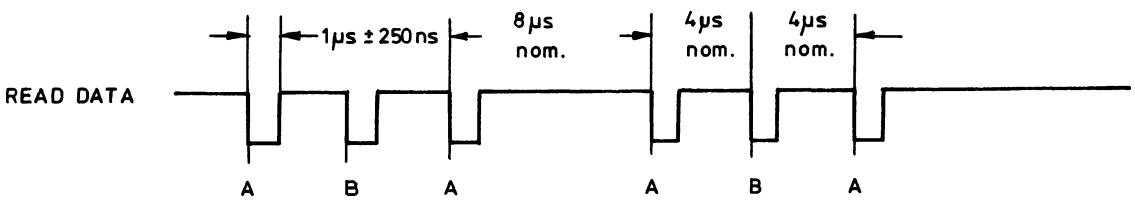
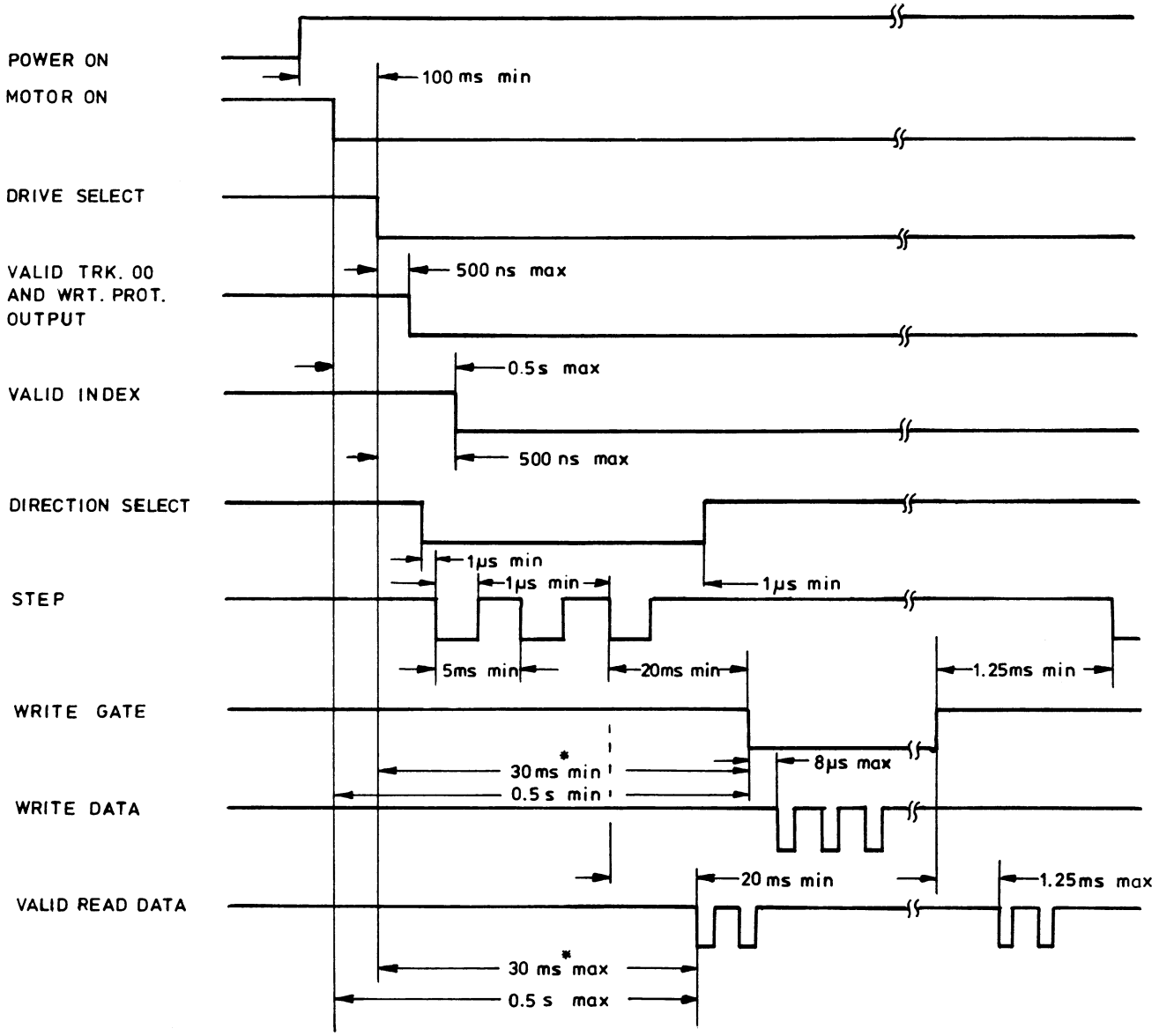


Figure 12 READ DATA TIMINING



* From Head Load Initiate

Figure 13 GENERAL CONTROL AND DATA TIMING REQUIREMENTS

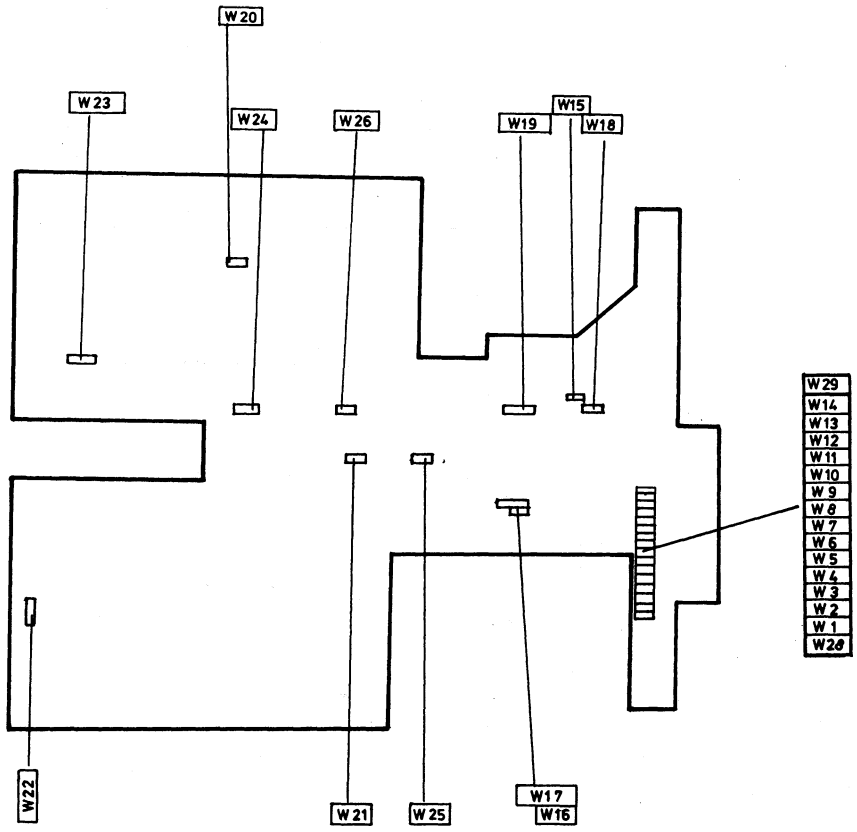


Figure 14 STRAPS ON THE PCB

Interface Jumper Assignment

Function	Interface Pin	Jumper set	Jumper not set
Select 1	10	12	6 / 8 / 13 / 14
Select 2	12	13	6 / 8 / 12 / 14
Select 3	14	8	6 / 7 / 12 / 13 / 14
Select 4	6	6	4 / 5 / 8 / 12 / 13/14
cont.Select	-	14	6 / 8 / 12 / 13
Motor On 1 Motor On 2 Motor On 3	16 6 Select	9 4 28	4/28 5/ 6/9/28 4/9
Ready 1 Ready 2 Ready 3	2 6 34	1 5 29	2/5/29 1/4 / 6/29 1/5 / 10/11
Disk-Change	34	11	10 / 29
Head Load	2	2	1
Door Lock	4	3	7 / 10 / 24
Door Lock	14	7	3 / 8 / 10 / 24
Door Lock	34	10	3 / 7 / 11 / 24/29
cont. Door Lock	-	24	3 / 7 / 10

Door Lock = Door Lock/Unlock Function and or Busy-LED

Head Load Function

Jumper W16	Jumper W15	Jumper W17 1/2	Jumper W17 2/3	Function
X	X	0	I	Head Load with Ready
X	X	I	0	Head Load with Motor On
X	0	X	X	Drive Select don't care
X	I	X	X	Head Load with Drive Select
0	X	X	X	Interface don't care
1	X	X	X	Head Load with Interface

Door Lock / Unlock and or Busy-LED

Jumper W19 1/2	Jumper W19 2/3	Jumper W18	Function
I	0	0	Function only with Interface
I	0	I	Function with Interface and Select
0	I	X	Latch between Interface and Function *

* Interface-Line are sampled with Leading edge of Drive-Select.

TABLE STRAP SETTING

27.14 Write Protect

This line will be a logical true when the write enable notch in a disk jacket is covered.

When the write enable notch is covered, the internal logic will disable the write and the internal erase current circuitry. The write protect function is gated with unit select.

27.15 In Use

A logical zero on this line activates the LED on the front and, if present, the door lock mechanism.

27.16 Disk Change

When the drive is not selected and the disk is removed from the drive the disk change flip flop is set. The status of the flip flop appears on the corresponding interface line and can be interrogated with select. The status is cleared by deselecting the drive.

28 Optional Interface Features

The following optional features are available by jumper connection: (See also Figure 14)

28.1 Electrical Head Load Option

There are several possibilities to load the head:

- HEAD LOAD and SELECT and Drive Ready
- HEAD LOAD and SELECT and MOTOR ON and Door Closed
- SELECT and Drive Ready
- SELECT and MOTOR ON and Door Closed
- HEAD LOAD and Drive Ready
- HEAD LOAD and MOTOR ON and Door Closed
- READY
- MOTOR ON and Door Closed.

The head must be loaded at least 30 ms prior to data transfer, allowing the head to stabilize.

28.2 Door Lock/Unlock Option

There are several possibilities for the door lock/unlock function, which can be selected via jumpers:

- DOOR LOCK/UNLOCK
- DOOR LOCK/UNLOCK and SELECT
- SELECT
- SELECT and DOOR LOCK/UNLOCK (latch function)

28.3 Motor On/Off functions

Besides the standard motor on/off line on pin 16 it is possible to use an additional motor on/off on pin 6.

29 Electrical Description

29.1 General

The mFD contains all circuitry necessary for reading, writing, and transport control. The logic functions are performed by TTL-circuits.

29.2 Indicators, Test points

- An activity indicator is available for operator personnel. The activity indicator in connection with the door lock/unlock is described in (activity LED).

- Test points are located on the printed circuit board for service personnel.

  Pins of the wire-wrap type are available on the PC-board, monitoring the signals.

- Differential Analog Read Data plus Ground.

- Phase A Stepper Motor and Track 00 Signal plus Ground.

- Erase Amplitude plus Ground.

29.3 Power Requirements

DC Voltage	Tolerance	P-P ripple max.	Current	Condition
+12V	± 5%	100mV	0.9 A.max	No Step DC motor on No door lock No write
+12V	-	-	0.2 A.max	Door lock
+ 5V	± 5%	50mV	0.55 A.max	-
Drive motor start (t = +10°C)	+12V		1.7 A.max	less than 50 msec

29.4 Power Dissipation

Power dissipation of the mFD is less than 12 watts.

29.5 System Ground Connections

See Figure 15.

29.6 Frame Ground

The drive frame ground is connected to the system ground by means of a plug on the mFD and can be carried in the DC cable to the system.

Plug on the Drive is of the type Faston with mating connector

29.7 DC Power Ground

Insulate the +5 volt and +12 volt DC return lines from the frame ground in the controller. They are insulated from frame ground of the drive. The DC return lines are connected at signal ground in the drive.

29.8 Signal Ground

The signal ground is insulated from frame ground.

29.9 I/O Signal Ground

Tying the controller I/O signal ground plane to the drive I/O signal grounds in the I/O cable.

30 Electrical Connections

30.1 I/O Cable and Connector

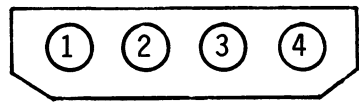
Command status and data are transmitted between the host controller and the mFD with flat ribbon cable.

I/O cable and connector is 34 Pin, 3 M connector P/N 3425-3000 with strain relief and 34 connector 3 M flat cable (see Fig. 16).

30.2 DC Cable and Connector

The mFD utilizes an AMP Mod 1, crimp-snap-in, four position header for the DC-receptacle. Pin assignments for the DC-connector are:

Pin	Use
1	+12V
2	+12V Return
3	+5V Return
4	+5V



Part numbers for the connector and contacts are:

PART	CABLE SIDE	DRIVE SIDE
Housing	1-480424-0	1-480426-0
Contact	60619-1	-
Crimp-tool	90124-2	-
Extractor tool	1-305193-2	-
Cable	AWG 18	-

The maximum length of the DC-cable is 10 feet.

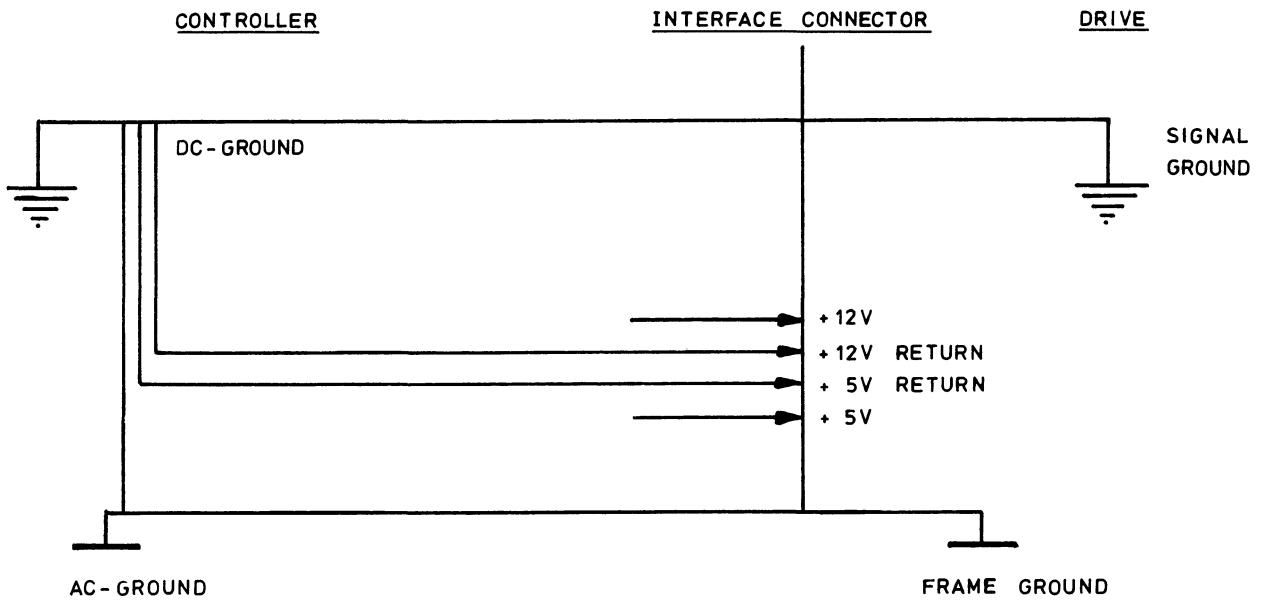


Figure 15 SYSTEM GROUNDING

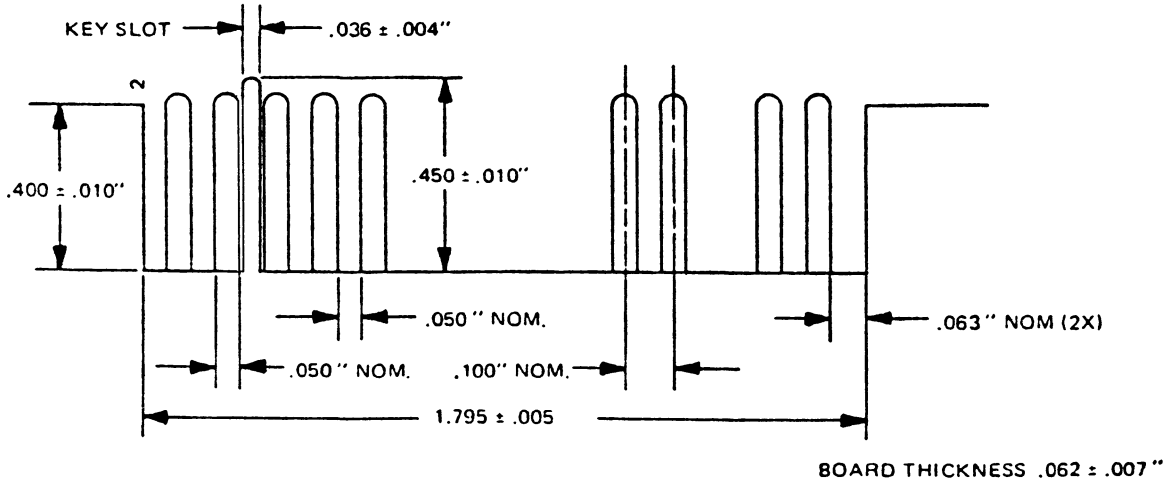


Figure 16 I/O CONNECTOR

31 Environmental Conditions

31.1 Operating Environment

The mFD X3111/X3112/X3113/X3114 will provide the specified performance values within the following temperature and humidity limits if the combined rate of temperature and humidity changes preclude condensation on any part of the unit or media.

Temperature:	+10° to +45°C
Temp. change:	10°/h
Relative humidity:	20% to 80%
Maximum dew point temperature:	28°C

31.2 Storage Environment

The mFD can withstand the following conditions if the combined rate of temperature and humidity change precludes condensation on any part of the unit.

Temperature:	-40°C to +70°C
Relative humidity:	5% to 95%
Maximum dew point temperature:	28°C

32 Vibration and Shock

32.1 Operating

When installed within a system, the mFD will operate as specified while subjected to the following shock and vibration limits:

a) Continuous vibration.
   10 - 60 Hz; 0.015 mm amplitude;
   60 - 500 Hz; 1.96 m/sec^2 (0.2g) acceleration.

b) Intermittent shocks of up to 9.8 m/sec^2 (1 g) which do not exceed 11 ms duration. No shock is to be repeated more often than twice per second.

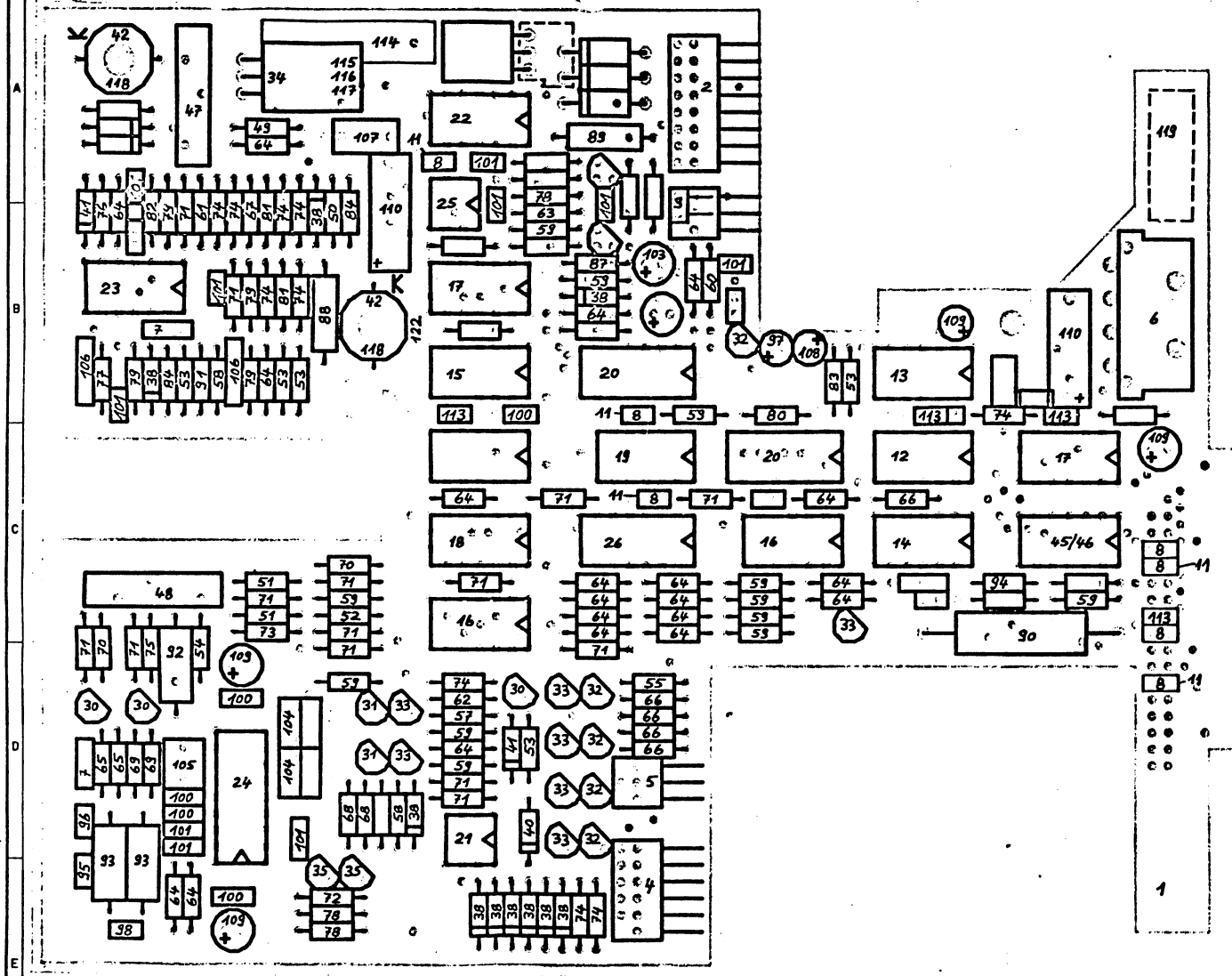
32.2 Non-operating and Transportation

When packaged for shipment, the mFD will suffer no degradation in performance when subjected to shock and vibration in the x, y and z axis.

a) Continuous vibration 10 - 60 Hz, 0.075 mm amplitude;
   60 - 500 Hz; 9.8 m/sec^2 (1 g) acceleration.

b) Intermittent shocks of up to 49 m/sec^2 (5 g) not to exceed 11 ms in duration.

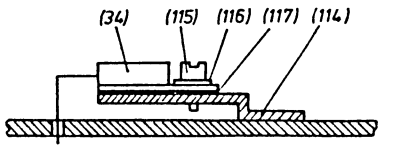
PHILIPS



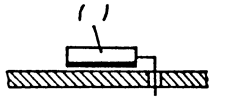
Lage beachten:

Pos. 12-26;46 — Kerbe vor Punkt
Punkt allein ≙ Kerbe

Pos. 34



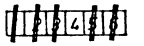
Pos. ( )



Pos. 37-41 Polarität beachten (Diode)

Pos. 42  Katode

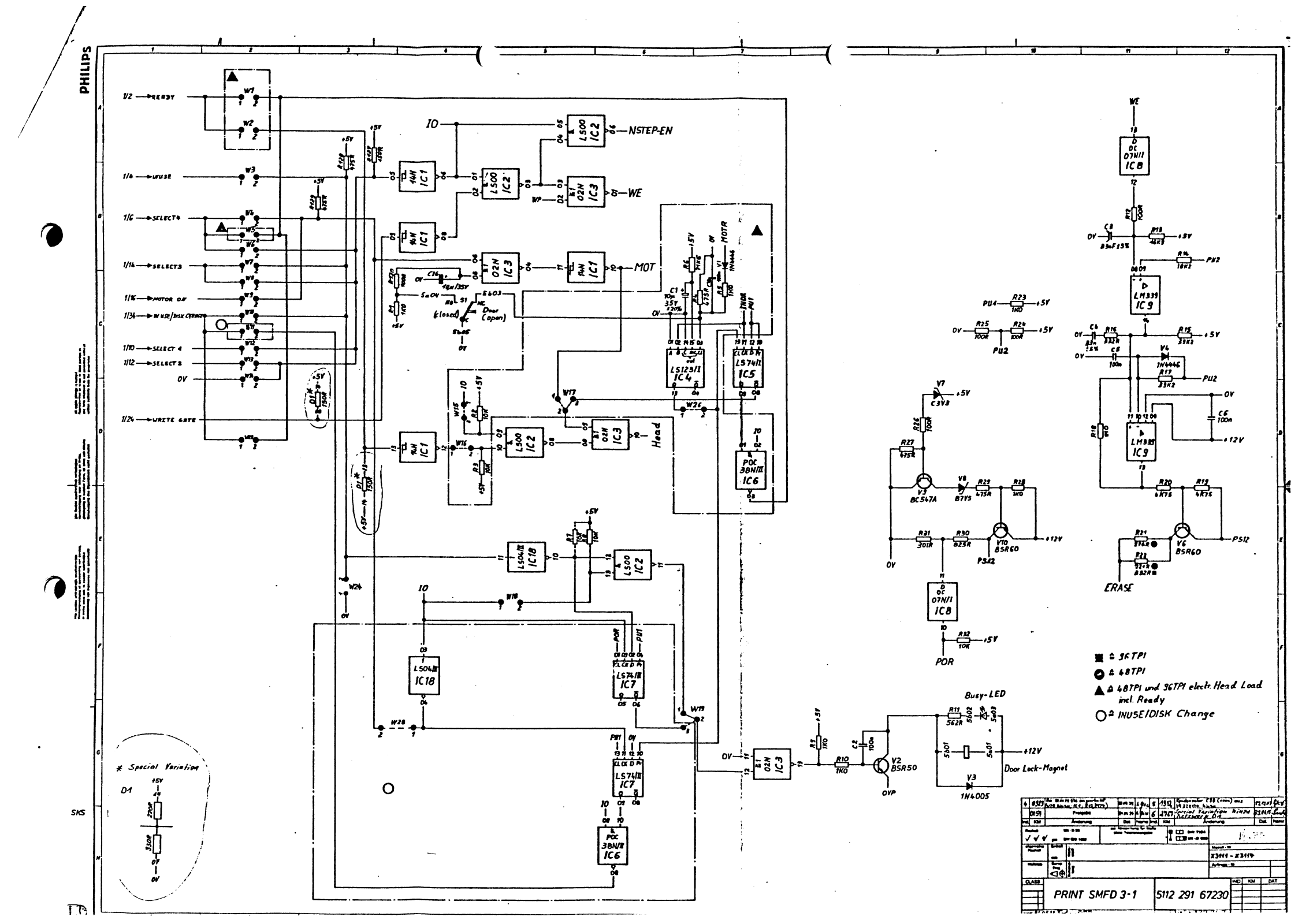
Pos. 109; 110; 112 Polarität beachten (EL-KO)

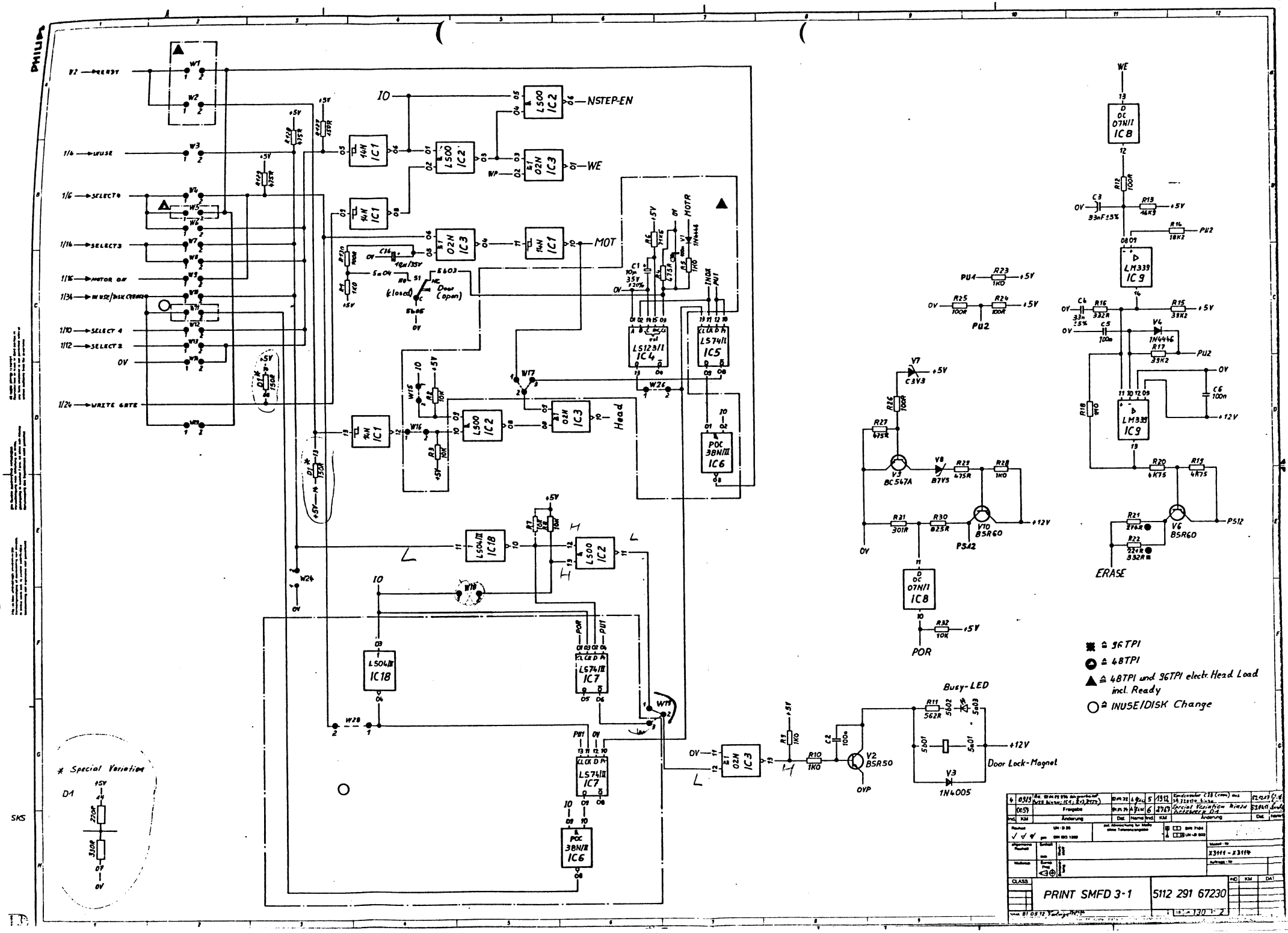
PCB-Bezeichnung entwerten: SMFD 

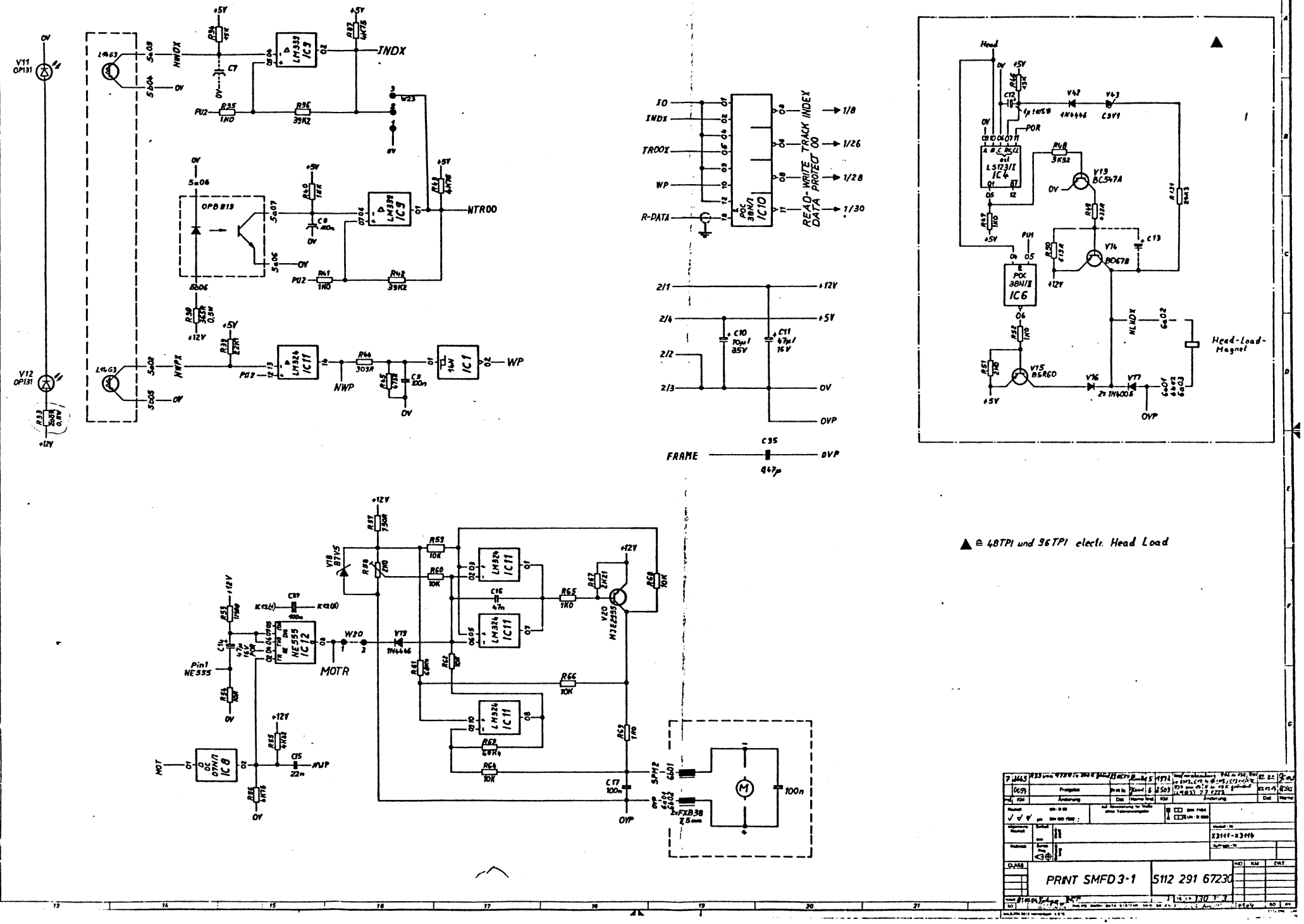
 Anschlüsse auf der Lötseite bis auf 1mm gekürzt

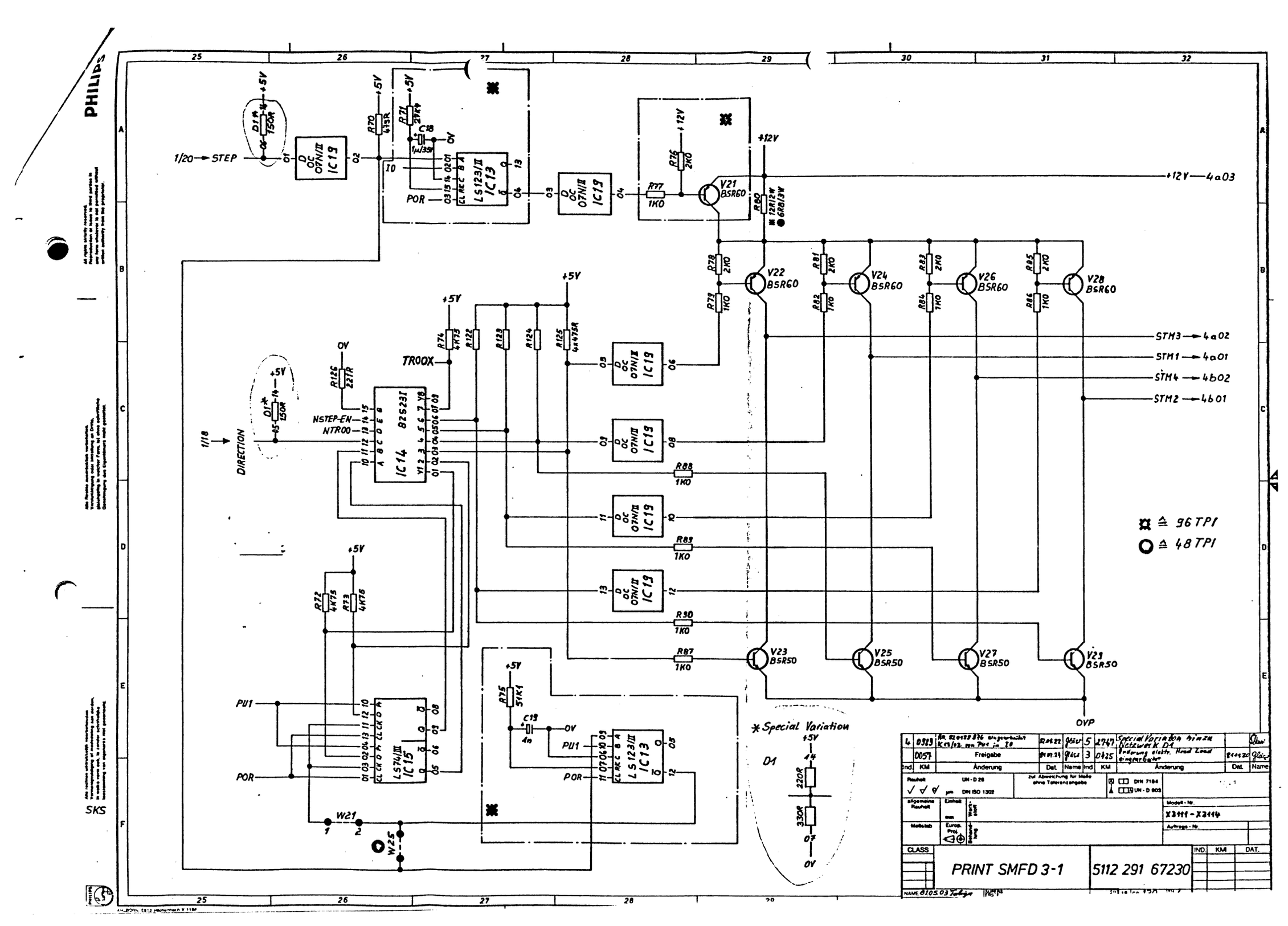
Maximale Bestückungshöhe ≦ 10 mm

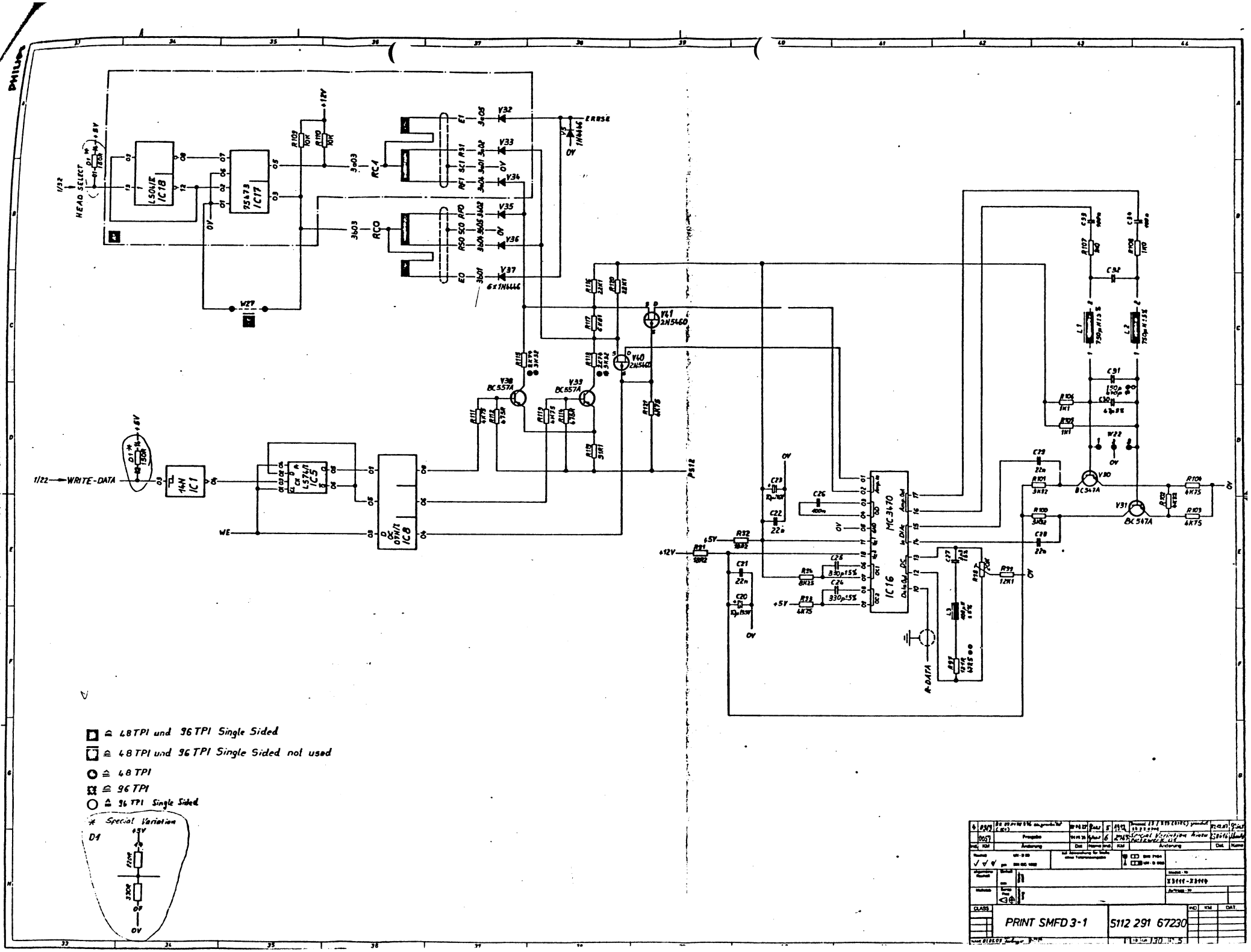
2775	Freigabe	13.06.16											
Ind.	KM	Änderung	Dat.	Name	Ind.	KM	Änderung	Dat.	Name				
Rauheit	UN - D 28	DIN ISO 1302	zul. Abweichung für Maße ohne Toleranzangabe		DIN 7184	UN - D 803							
allgemeine Rauheit	Einheit	mm	Werk-stoff										
Maßstab	Europ. Proj.		Bemer-kung										
Modell - Nr.	X3114 MHL												
Auftrags - Nr.													
CLASS	PRINT SMFD 4-4	5112 291 80851	IND	KM	DAT.								
NAME 23.06.16 U. Drost													


PHILIPS
V2 → READY
1/4 → INUSE
1/6 → SELECT 4
1/14 → SELECT 3
1/16 → MOTOR ON
1/34 → INUSE/DISK CHANGE
1/10 → SELECT 1
1/12 → SELECT 2
0V
1/24 → WRITE GATE
IO
NSTEP-EN
WE
MOT
Head
Door (closed)
Door (open)
POR
ERASE
Busy-LED
Door Lock-Magnet
* Special Variation
D1
SKS
96 TPI
48 TPI
48 TPI und 96 TPI elektr. Head Load incl. Ready
INUSE/DISK Change
PRINT SMFD 3-1
5112 291 67230


PHILIPS
1/2 READY
1/6 INUSE
1/8 SELECT 0
1/16 SELECT 3
1/14 MOTOR ON
1/34 INUSE/DISK CHANGE
1/10 SELECT 4
1/12 SELECT 2
0V
1/24 WRITE GATE
IO
NSTEP-EN
WE
MOT
Head
POR
PU1
PU2
PU4
PS12
PS42
ERASE
Busy-LED
Door Lock-Magnet
Door (open)
Door (closed)
* Special Variation
D1
SKS
* ≙ 96TPI
● ≙ 48TPI
▲ ≙ 48TPI und 96TPI electr. Head Load incl. Ready
○ ≙ INUSE/DISK Change
PRINT SMFD 3-1
5112 291 67230


INDX
NTR00
WP
MOTR
MUP
READ-WRITE TRACK INDEX DATA PROTECT 00
1/8
1/26
1/28
1/30
FRAME
Head-Load-Magnet
▲ ≙ 48TPI und 96TPI elect. Head Load
PRINT SMFD3-1
5112 291 67230


1/20 → STEP
1/18 → DIRECTION
TROOX
NSTEP-EN
NTR00
POR
PU1
W21
W25
IC19
IC14 82S231
IC15 LS74/III
IC13 LS123/II
V21 BSR60
V22 BSR60
V24 BSR60
V26 BSR60
V28 BSR60
V23 BSR50
V25 BSR50
V27 BSR50
V29 BSR50
+12V → 4a03
STM3 → 4a02
STM1 → 4a01
STM4 → 4b02
STM2 → 4b01
OVP
≙ 96 TPI
≙ 48 TPI
* Special Variation
D1
220R
330R
PRINT SMFD 3-1
5112 291 67230
X3111 - X3114



□ ≙ 48 TPI und 96 TPI Single Sided

□ ≙ 48 TPI und 96 TPI Single Sided not used

○ ≙ 48 TPI

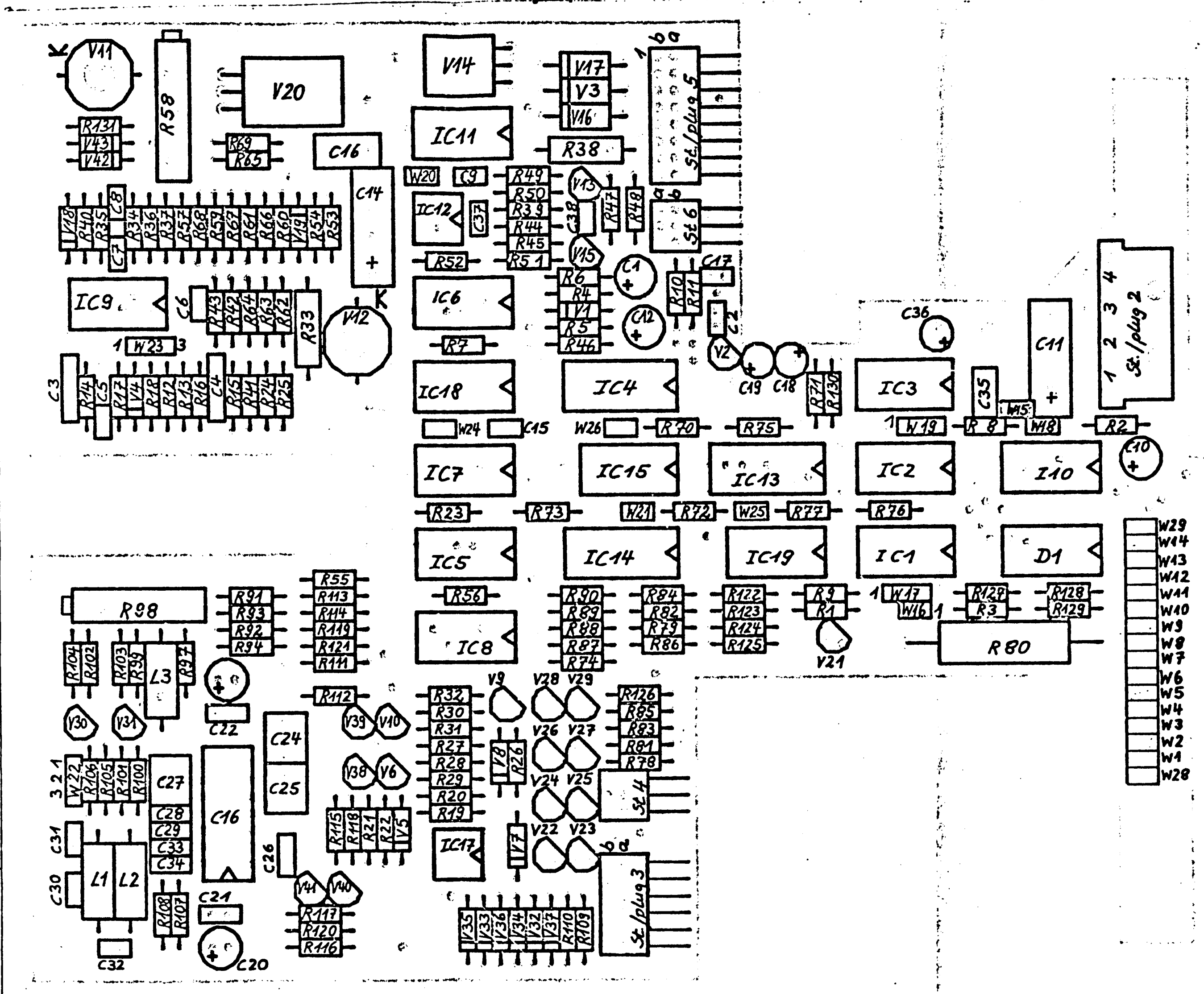
⊠ ≙ 96 TPI

○ ≙ 96 TPI Single Sided

* Special Variation

PRINT SMFD 3-1

5112 291 67230



Stecker / plug 5

	b	a
1	NDUNX	+12V
2	NLED	NWPX
3	S1-NC	+12V
4	0V	S1-NO
5	S1-C	NINDX
6	TRO	0V
7	0V	TROO
8		

Stecker / plug 6

	b	a
1	SPM2	0VP
2	0VP	NLHDX
3		0VP

	b
1	SPM2
2	SPM1 (0VP)

Stecker / plug 2

4	+5V
3	0V
2	0VP
1	+12V

Stecker / plug 1

Comp Side		Solder-Side	
34	IN USE / DISK CHANGE	33	0V
32	HEAD SELECT	31	0V
30	READ DATA	29	0V
28	WRITE PROTECT	27	0V
26	TRACK 00	25	0V
24	WRITE GATE	23	0V
22	WRITE DATA	21	0V
20	STEP	19	0V
18	DIRECTION	17	0V
16	MOTOR ON	15	0V
14	SELECT 3	13	0V
12	SELECT 2	11	0V
10	SELECT 1	9	0V
8	INDEX	7	0V
6	SELECT 4/READY	5	0V
4	IN USE	3	0V
2	READY/HEAD LOAD	1	0V

Stecker / plug 4

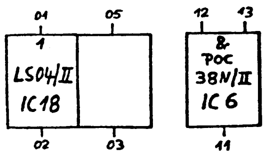
	b	a
1	STM2	STM1
2	STM4	STM3
3		+12V

Stecker / plug 3

	b	a
1	E0	SC1
2	RF0	RS1
3	RC0	RC1
4	RS0	RF0
5	SC0	E1
6		

	b
1	E0
2	RF0
3	RC0
4	RS0
5	SC0

freie Gatter / free gates



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4	1912	R4/C38 aus SA 2.2.0470 eingezeichnet	820701		5	2767	Neues Layout	930620	
	0057	Freigabe	810728		3	0919		820923	

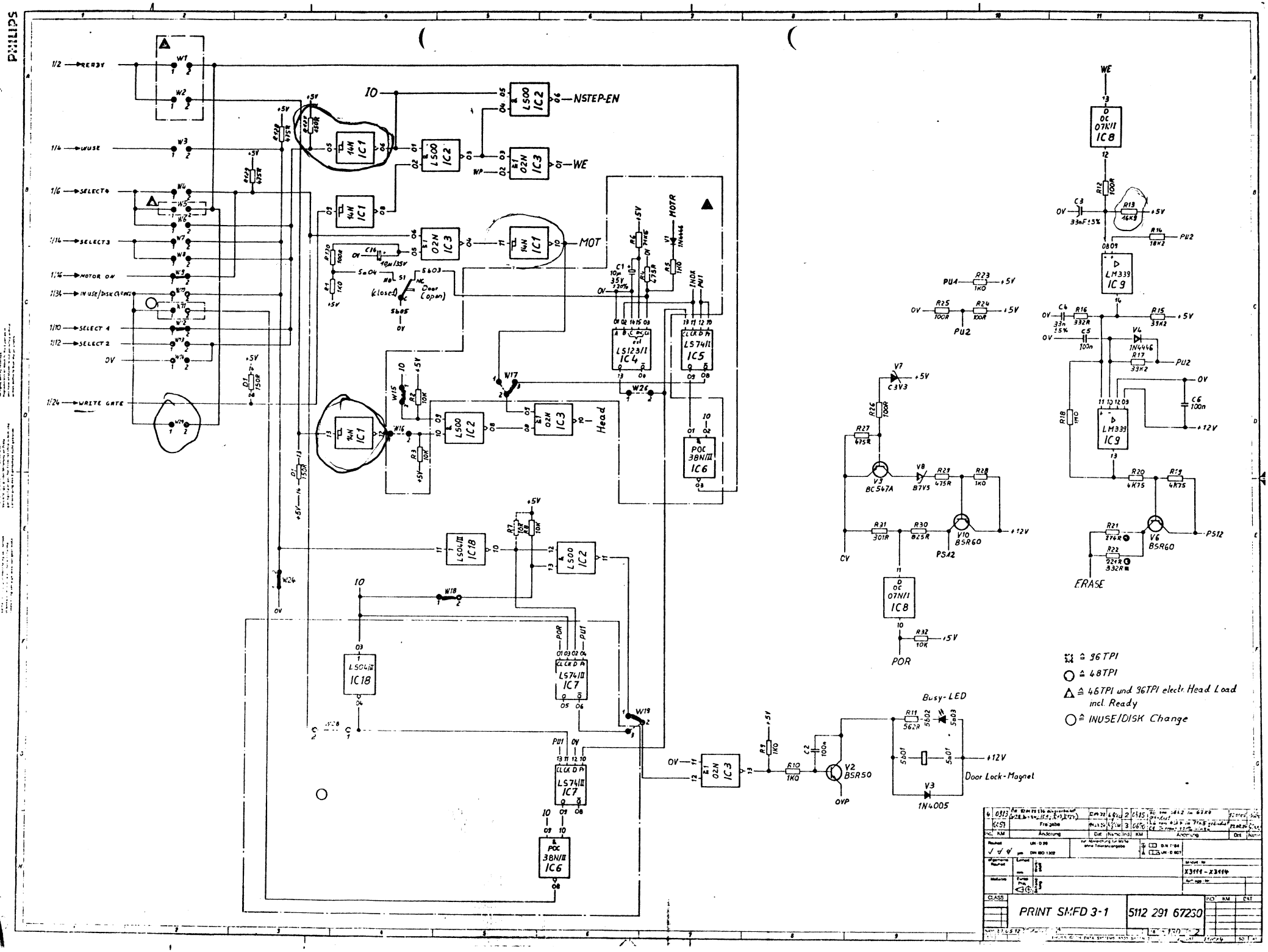
Rauheit — UN-D 28 — DIN ISO 1302

Modell-Nr. X3111-X3114

CLASS

PRINT SMFD 3-1

5112 291 67230



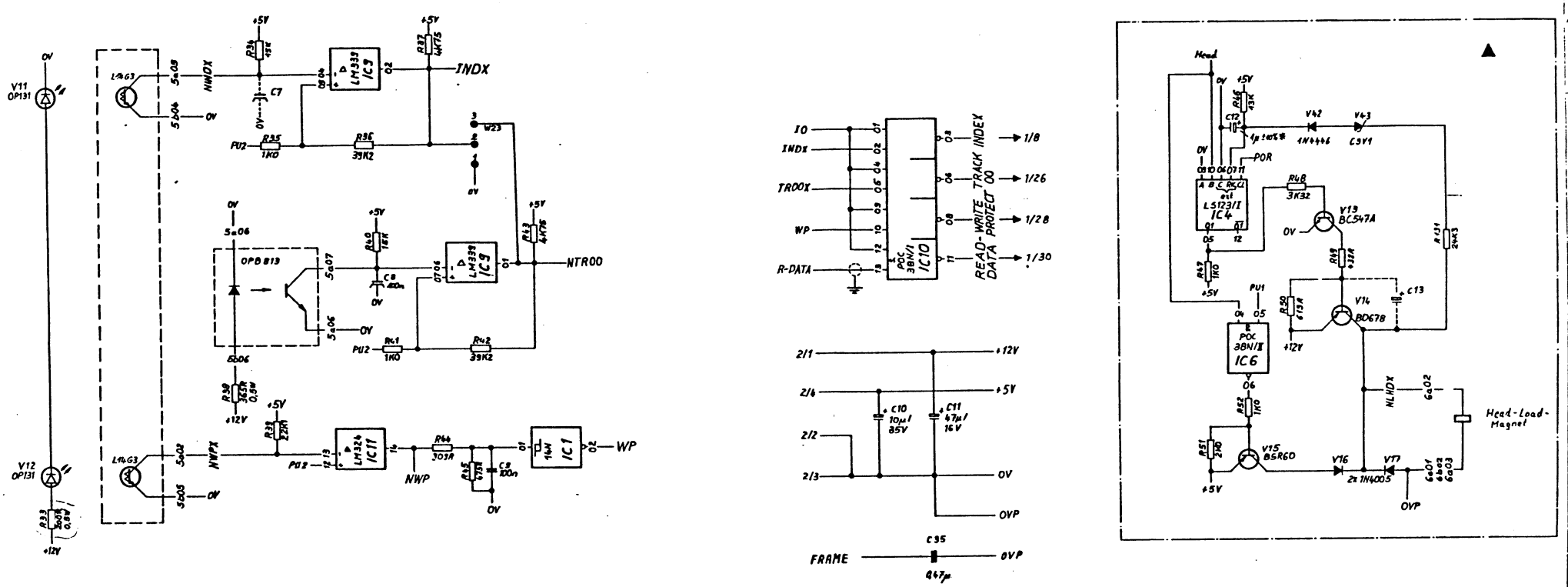
△ ≙ 96 TPI

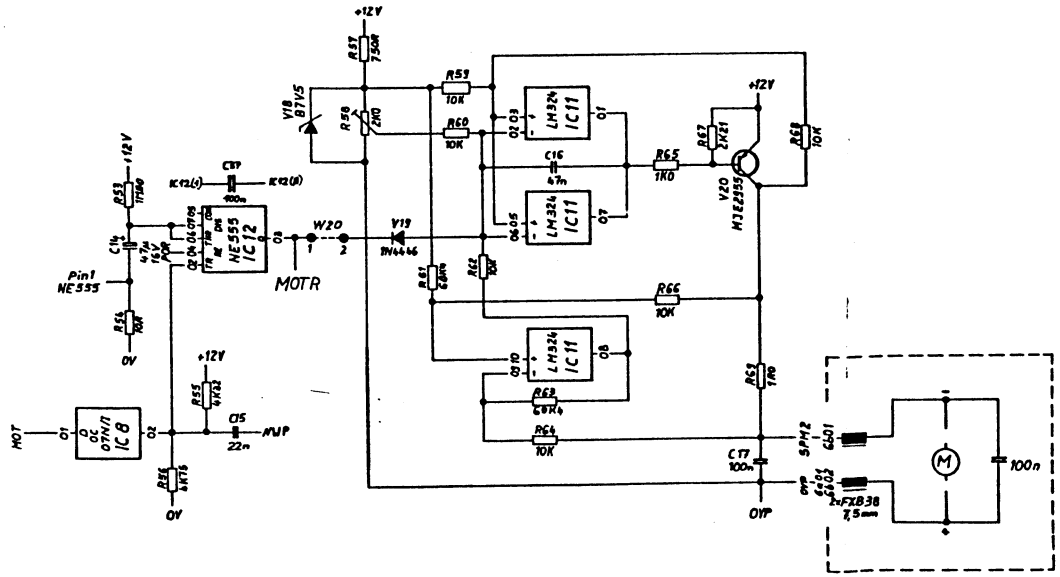
○ ≙ 48 TPI

△ ≙ 48 TPI und 96 TPI electr. Head Load incl. Ready

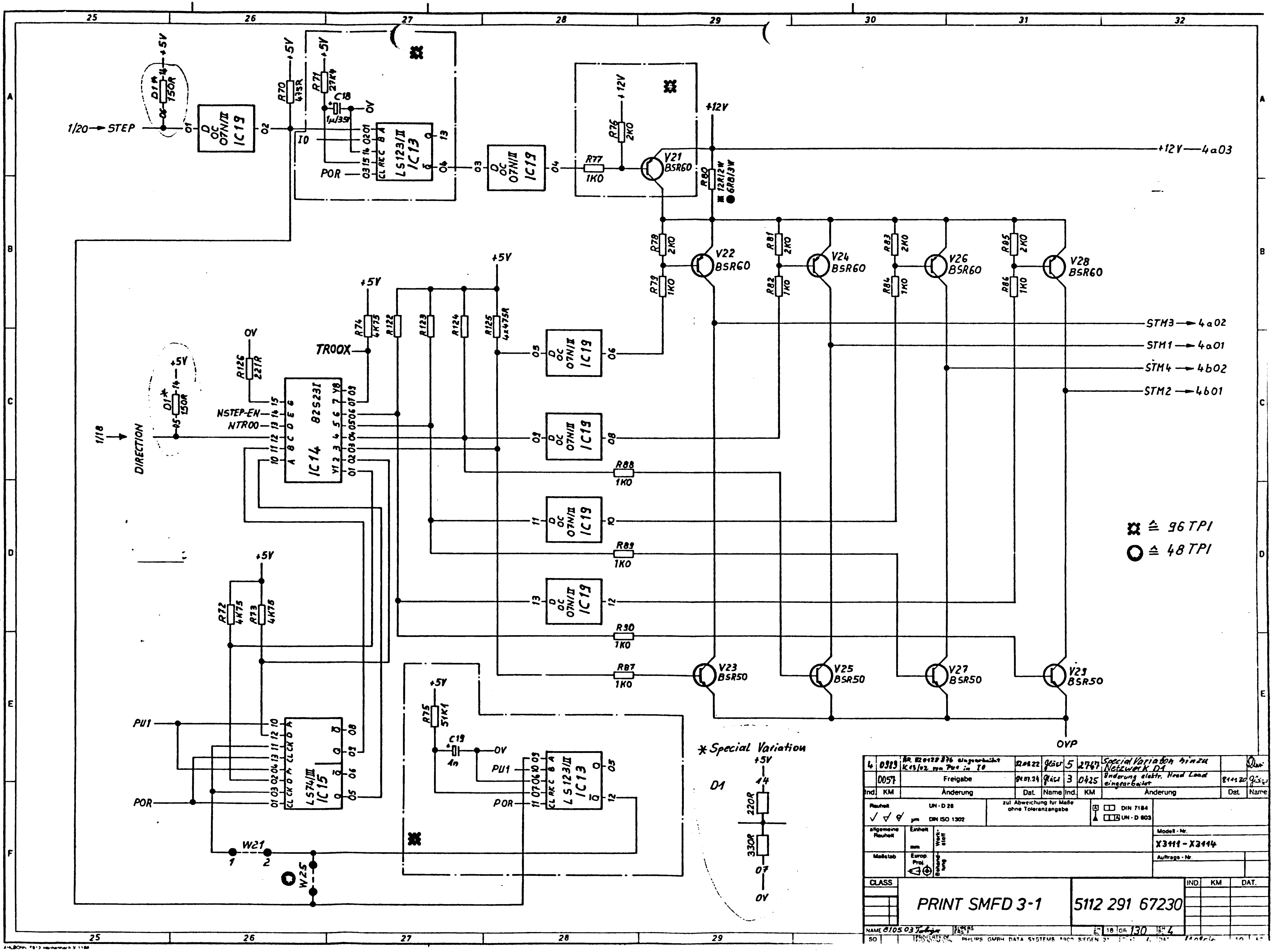
○ ≙ INUSE/DISK Change

PHILIPS





PRINT SMFD 3-1 5112 291 67230



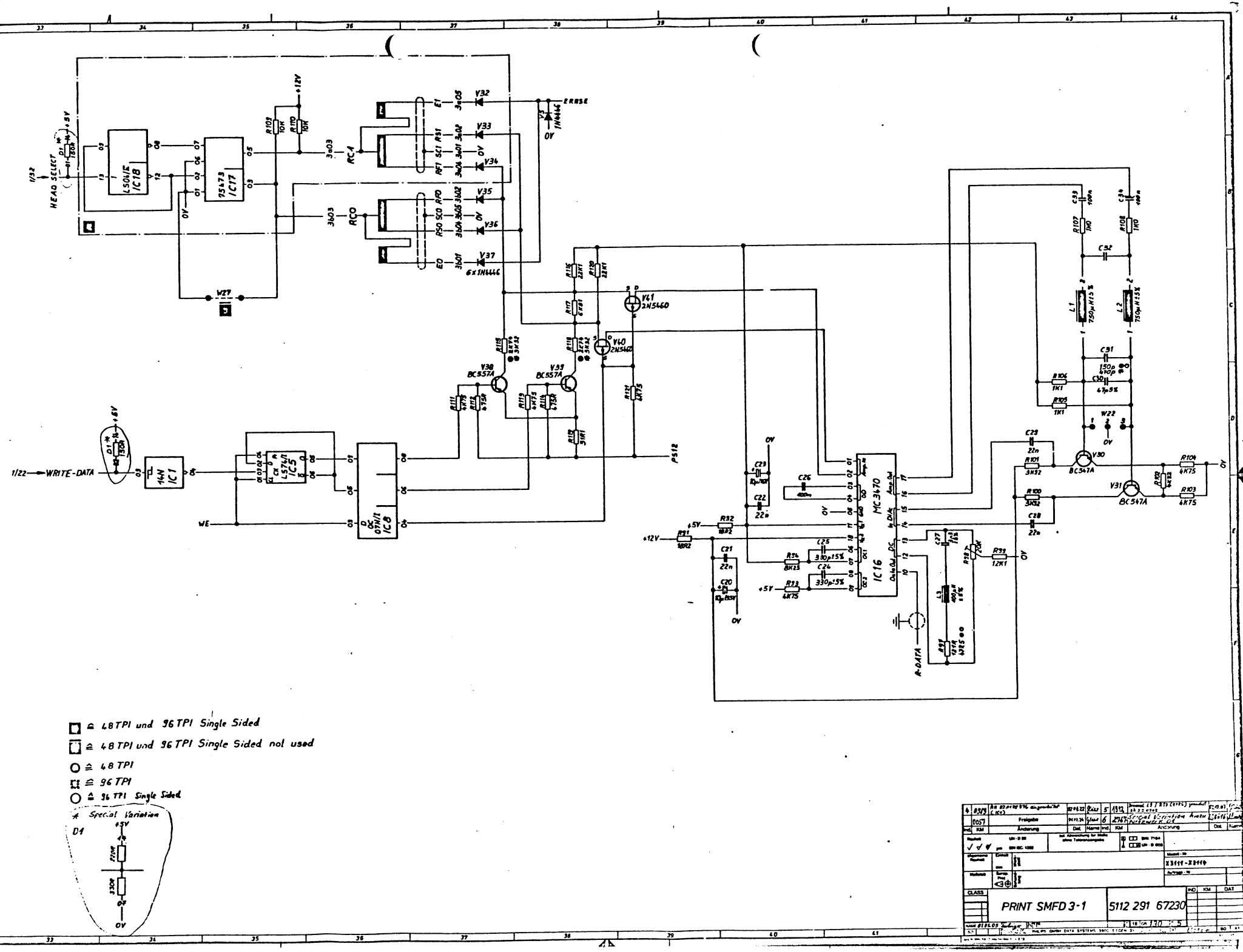
Ind.	KM	Änderung	Dat.	Name	Ind.	KM	Änderung	Dat.	Name
4	0383	NR. 820428 376 eingearbeitet K13/02 von Pu1 in I0	820622	Glüs	5	2767	Special Variation hinzu Netzwerk D1		
	0057	Freigabe	810724	Glüs	3	0425	Änderung elektr. Head Load eingearbeitet	811120	Glüs

Modell-Nr.: X3111 - X3114

PRINT SMFD 3-1

5112 291 67230

PHILIPS GMBH DATA SYSTEMS



□ ≙ 48 TPI und 96 TPI Single Sided

□ ≙ 48 TPI und 96 TPI Single Sided not used

○ ≙ 48 TPI

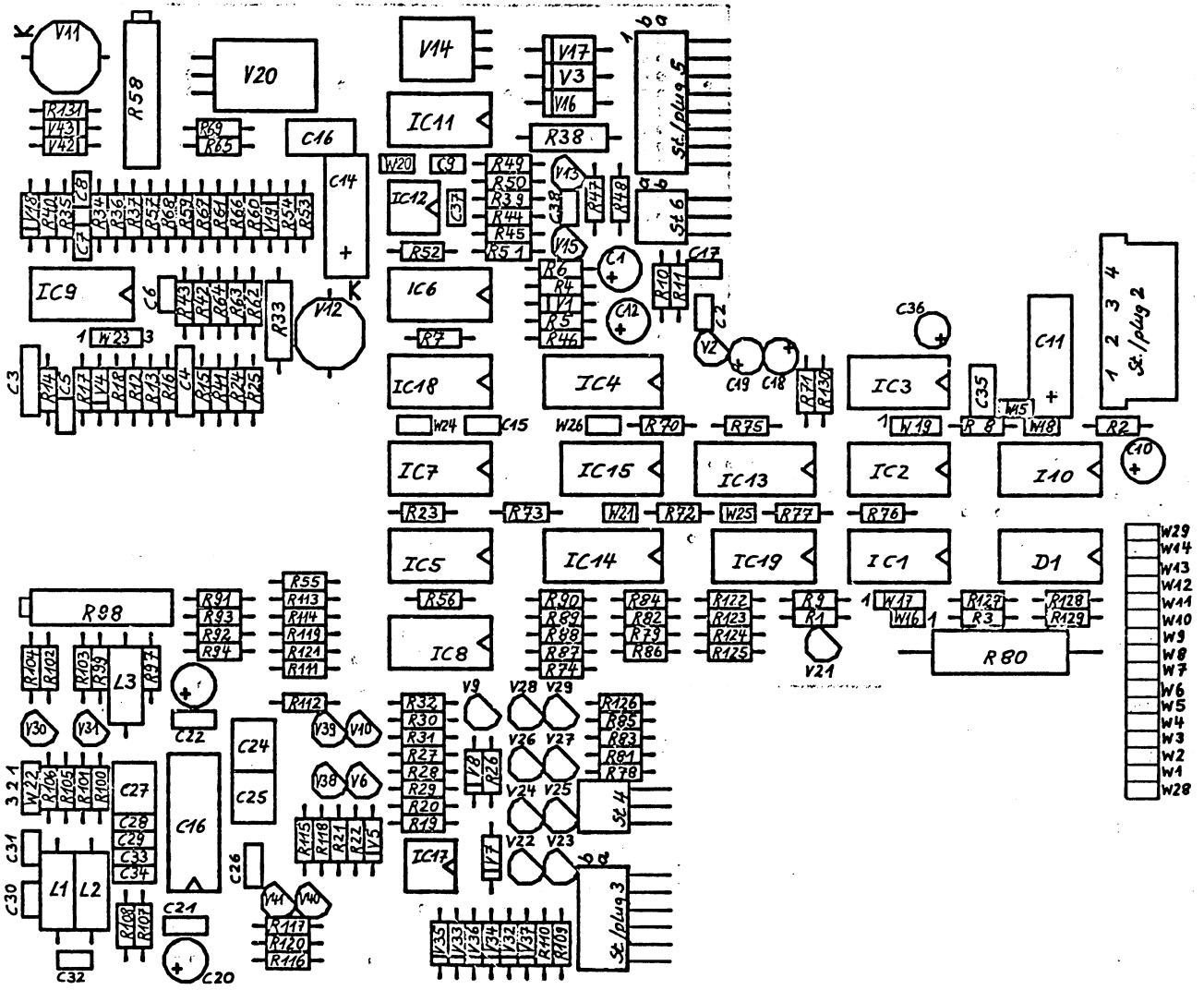
○ ≙ 96 TPI

○ ≙ 96 TPI Single Sided

* Special Variation

D1

SKS



Stecker / plug 5

	b	a
1	NDUNX	+12V
2	NLED	NWPX
3	S1-NC	+12V
4	OV	S1-NO
5	S1-C	NINDX
6	TRO	OV
7	OV	TROO
8		

Stecker / plug 6

	b	a
1	SPM2	OVP
2	OVP	NLHDX
3		OVP

	b
1	SPM2
2	SPM1 (OVP)

Stecker / plug 2

4	+5V
3	OV
2	OVP
1	+12V

Stecker / plug 1

	Comp. Side		Solder-Side
34	IN USE/DISK CHANGE	33	OV
32	HEAD SELECT	31	OV
30	READ DATA	29	OV
28	WRITE PROTECT	27	OV
26	TRACK 00	25	OV
24	WRITE GATE	23	OV
22	WRITE DATA	21	OV
20	STEP	19	OV
18	DIRECTION	17	OV
16	MOTOR ON	15	OV
14	SELECT 3	13	OV
12	SELECT 2	11	OV
10	SELECT 1	9	OV
8	INDEX	7	OV
6	SELECT 4/READY	5	OV
4	IN USE	3	OV
2	READY/HEAD LOAD	1	OV

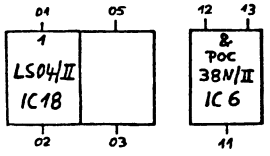
Stecker / plug 4

	b	a
1	STM2	STM1
2	STM4	STM3
3		+12V

Stecker / plug 3

	b	a
1	E0	SC1
2	R70	RS1
3	RC0	RC1
4	RS0	R70
5	SC0	E4
6		

freie Gatter / free gates



	b
1	E0
2	R70
3	RC0
4	RS0
5	SC0

4	1917	R4/C38 aus SA 7.2.0470 eingefügt	82.12.07	Gläss	5	27867	Neues Layout	83.05.20	Gläss
	0057	Freigabe	84.07.28	Gläss	3	0919	RR 82.04.26 576 eingearbeitet neuer Text u. W29 hinzu	84.09.23	Gläss
Ind.	KM	Änderung	Dat.	Name	Ind.	KM	Änderung	Dat.	Name

Rauheit: UN - D 28 / DIN ISO 1302 — zul. Abweichung für Maße ohne Toleranzangabe: DIN 7184 / UN - D 603

allgemeine Rauheit — Einheit: mm — Werkstoff — Maßstab — Europ Proj — Bearbeitung

Modell - Nr.: X3111 - X3114

Auftrags - Nr.:

CLASS

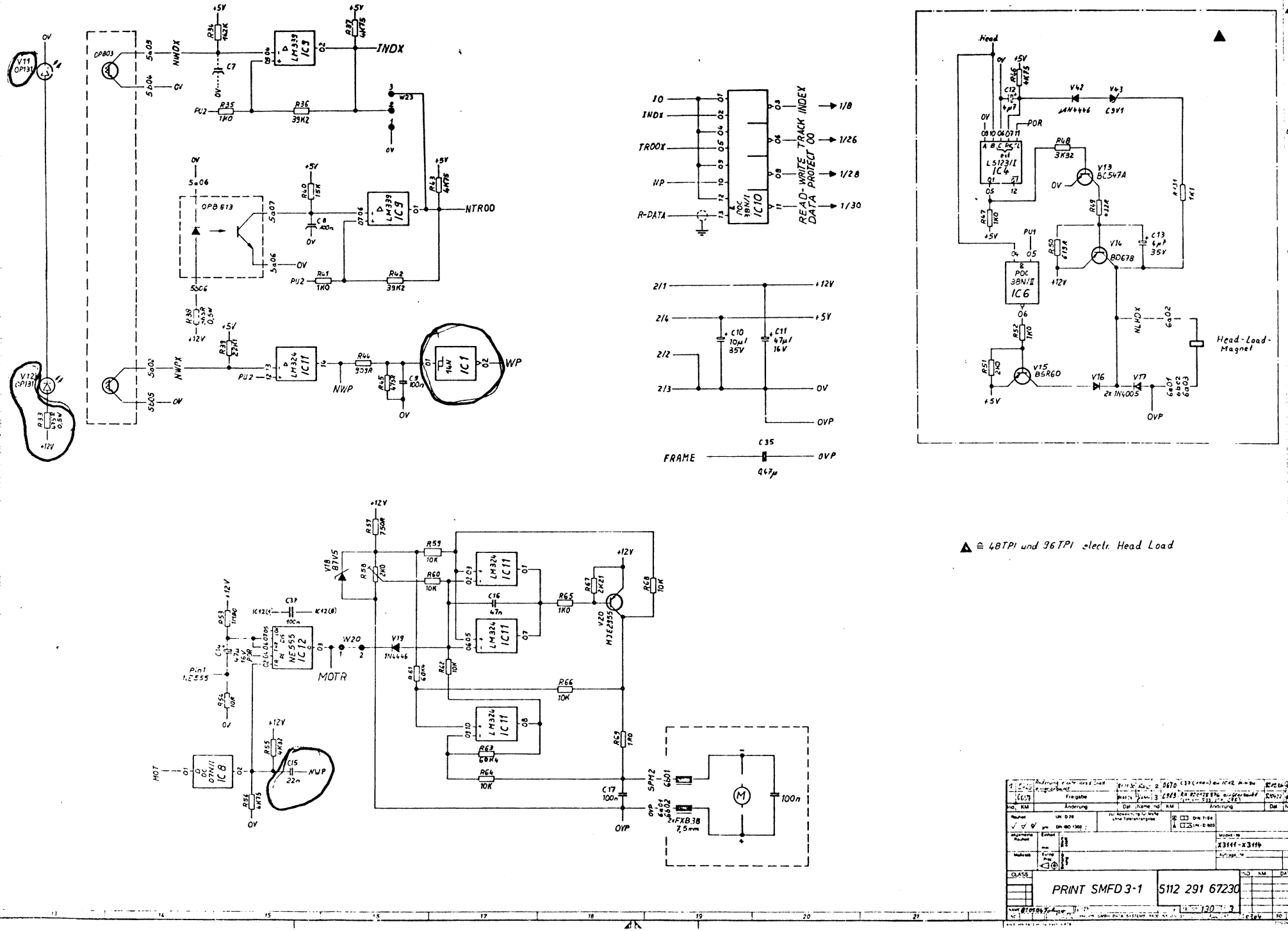
PRINT SMFD 3-1

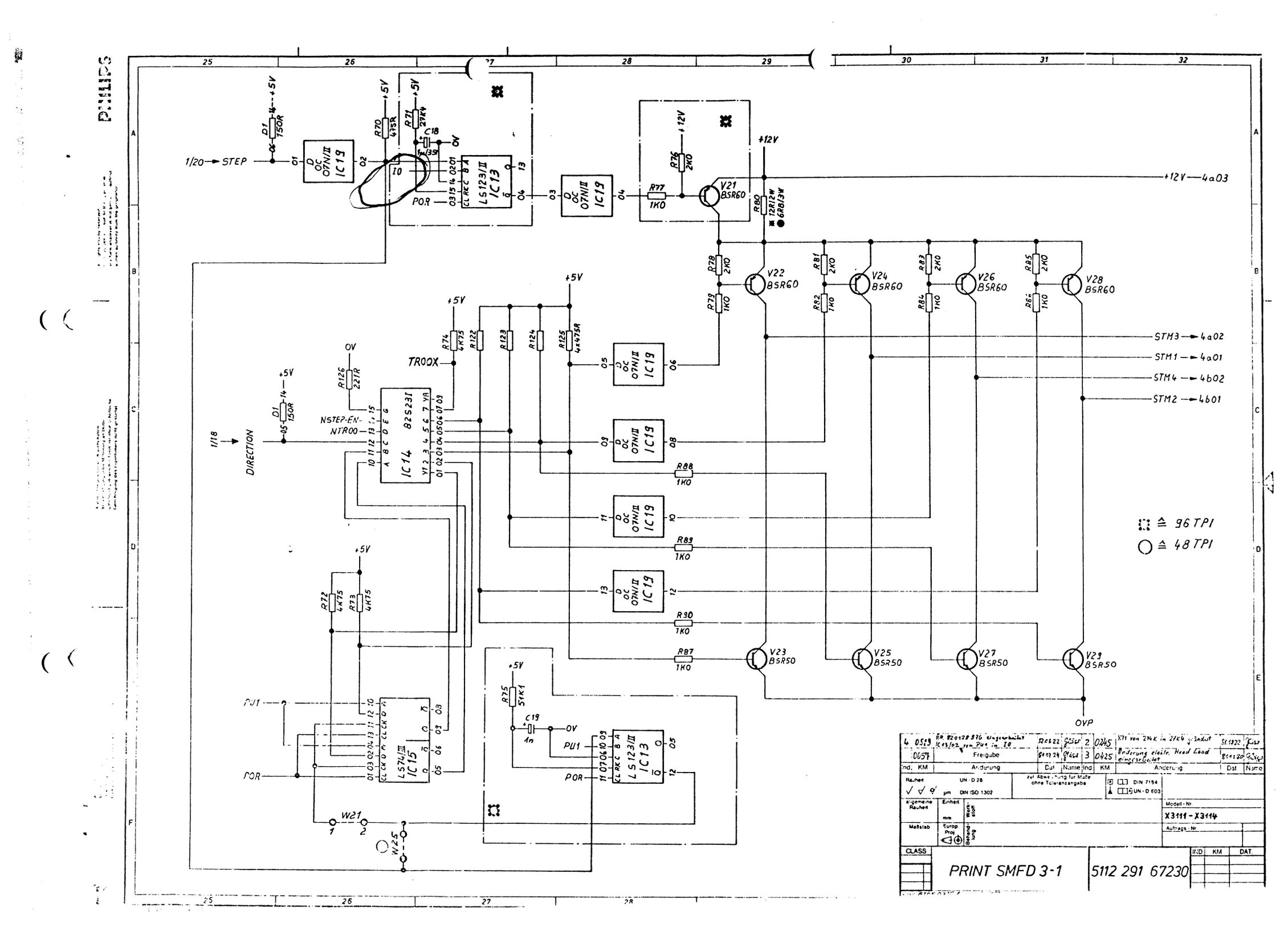
5112 291 67230

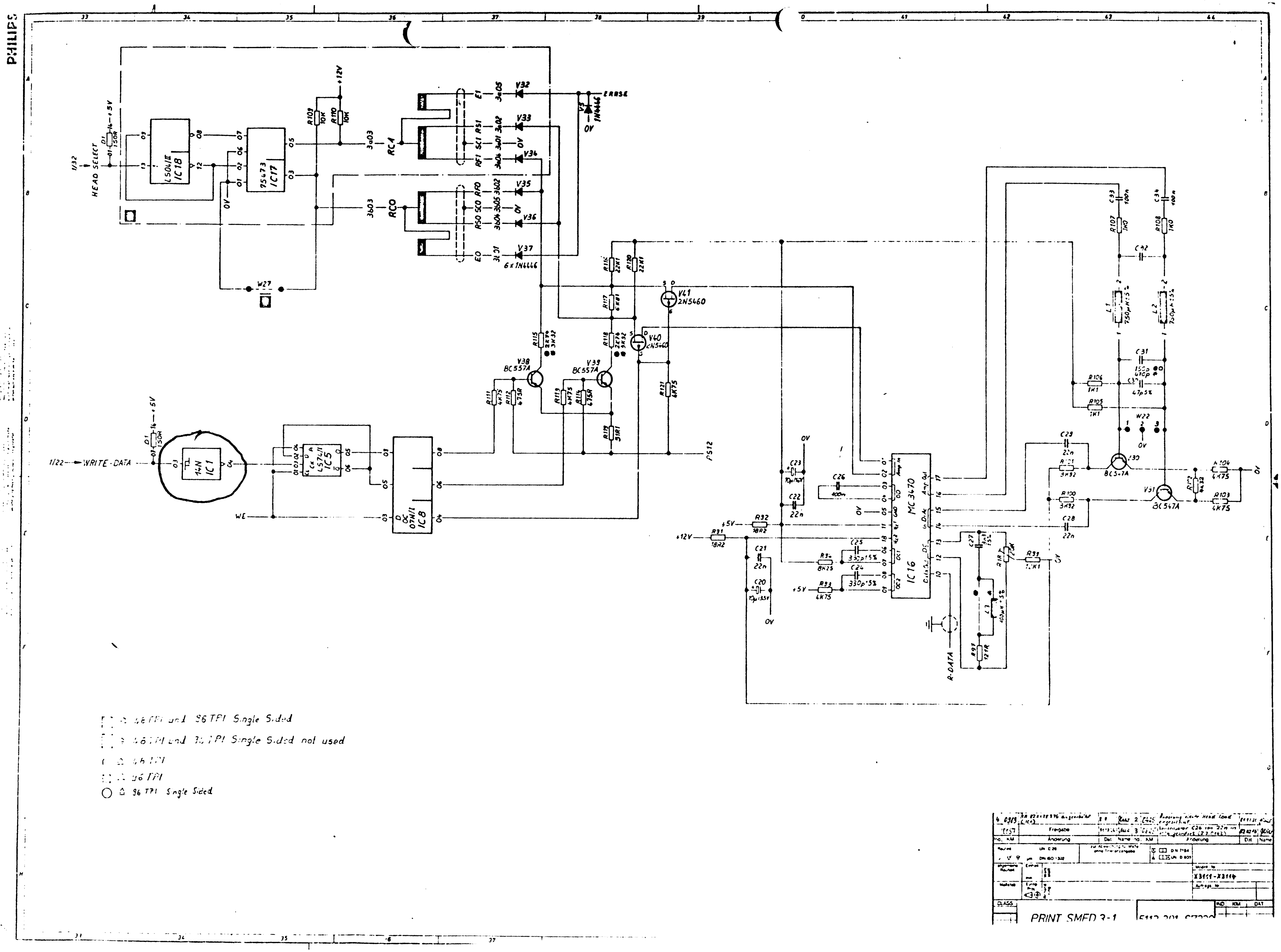
IND | KM | DAT.

NAME 84.09.21 U. Gläss

18 GF 130 6

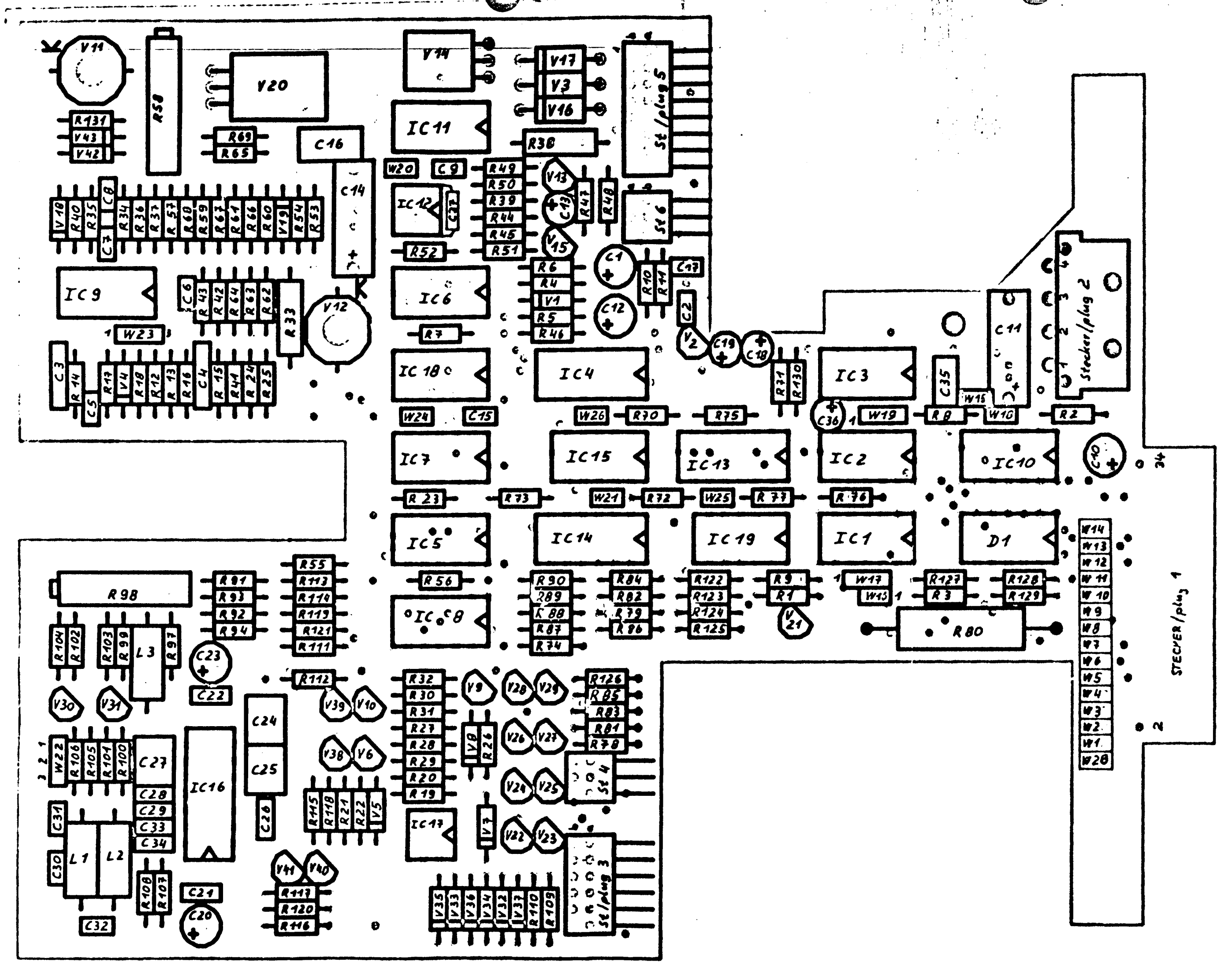

INDX
NTR00
WP
MOTR
READ-WRITE TRACK INDEX DATA PROTECT 00
1/8
1/26
1/28
1/30
FRAME
Head
Head-Load-Magnet
▲ ≙ 48TPI und 96TPI elect. Head Load
PRINT SMFD 3-1
S112 291 67230


1/20 → STEP
POR
TROOX
1/18
DIRECTION
NSTEP-EN
NTR00
PU1
POR
+5V
0V
+12V
IC19
IC14 82S231
IC15 LS74/III
IC13 LS123/II
V21 BSR60
V22 BSR60
V24 BSR60
V26 BSR60
V28 BSR60
V23 BSR50
V25 BSR50
V27 BSR50
V29 BSR50
+12V → 4a03
STM3 → 4a02
STM1 → 4a01
STM4 → 4b02
STM2 → 4b01
OVP
≙ 96 TPI
≙ 48 TPI
W21
W25
PRINT SMFD 3-1
5112 291 67230



PHILIPS
HEAD SELECT
WRITE-DATA
WE
ERASE
LS04/II IC18
75473 IC17
74N IC1
LS74/II IC5
07N/I IC8
MC3470 IC16
V32
V33
V34
V35
V36
V37
6 x 1N4446
V38 BC557A
V39 BC557A
V40 2N5460
V41 2N5460
V30 BC547A
V31 BC547A
RC1
RCO
W27
W22
R-DATA
+12V
+5V
0V
L1 750µH 5%
L2 750µH 5%
△ 48 TPI and 96 TPI Single Sided
△ 48 TPI and 96 TPI Single Sided not used
△ 48 TPI
△ 96 TPI
△ 96 TPI Single Sided
Freigabe
Änderung
PRINT SMED 3-1

PHILIPS



Stecker / plug 5

	b	a
1	NDUNX	+12V
2	NLED	NWPX
3	S1-NC	+12V
4	0V	S1-NO
5	S1-C	NINDX
6	TR0	0V
7	0V	TR00
8		

Stecker / plug 6

	b	a
1	SPM2	0VP
2	0VP	NLHDX
3		0VP

	b
1	SPM2
2	SPM1 (0VP)

Stecker / plug 2

4	+5V
3	0V
2	0VP
1	+12V

Stecker / plug 1

Comp Side		Solder - Side	
34	IN USE / DISK CHANGE	33	0V
32	HEAD SELECT	31	0V
30	READ DATA	29	0V
28	WRITE PROTECT	27	0V
26	TRACK 00	25	0V
24	WRITE GATE	23	0V
22	WRITE DATA	21	0V
20	STEP	19	0V
18	DIRECTION	17	0V
16	MOTOR ON	15	0V
14	SELECT 3	13	0V
12	SELECT 2	11	0V
10	SELECT 1	9	0V
8	INDEX	7	0V
6	SELECT 4	5	0V
4	IN USE	3	0V
2	READY	1	0V

Stecker / plug 4

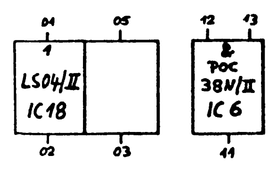
	b	a
1	STM2	STM1
2	STM4	STM3
3		+12V

Stecker / plug 3

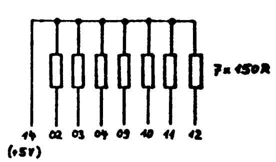
	b	a
1	E0	SC1
2	R70	R51
3	RC0	RC1
4	R50	R70
5	SC0	E1
6		

	b
1	E0
2	R70
3	RC0
4	R50
5	SC0

freie Gatter / free gates



freie Widerstände / free resistors



Ind.	KM	Änderung	Dat.	Name	Ind	KM	Änderung	Dat.	Name
1	0425	Änderung elektr. Head Load eingearbeitet (Film ausgetauscht)	81.12.02	Gläss	2	0670	C37 an IC12 hinzu	82.02.26	Gläss
	0057	Freigabe	81.07.28	Gläss					

Rauheit UN-D 26 µm DIN ISO 1302 — zul. Abweichung für Maße ohne Toleranzangabe — DIN 7184 UN-D 803

Modell-Nr.: X3111 - X3114

Auftrags-Nr

CLASS

PRINT SMFD 3-1 — **5112 291 67230**

NAME 81.07.21 U. Gläss — 18 — GR 130 — 6