

7. NOTES FOR THE SOFTWARE COMPILATION

Design:

The power supply unit and the stepping motor control of the Compact 5 PC are accommodated in a smaller control cabinet. These components are identical to those of the Compact 5 PC and therefore the same spare parts can be employed.

The Compact 5 PC must be controlled by an external computer. The Compact 5 PC is to be connected to this computer like a peripheral, such as a printer, plotter or a paper tape reader / puncher. The computer must be fitted with a Centronics interface for connection to the Compact 5-PC. This interface is a parallel interface, i.e. data is transmitted on eight lines simultaneously (Centronics is the company name of an American printer manufacturer and the definition of this printer interface has become a quasi-standard worldwide).

The connector provided on the Compact 5 PC is a 25-pin D subminiature jack connector with the following pin assignment:

Pin No.	Signal designation
1	STROBE
2	data bit 0
3	data bit 1
4	data bit 2
5	data bit 3
6	data bit 4
7	data bit 5
8	data bit 6
9	data bit 7
10	speed pulse light barrier (100 p/rev.)
11	emergency-off and chip protection door
12	synchronous pulse light barrier
18 - 25	earth

This interface is connected via a small interface pc board directly to the stepping motor card and the light barrier. This interface board accommodates a 4-fold DIP switch with which the user can set various modes of operation.

Signal description:

The signal inputs only process TTL signals and the signal outputs offer TTL signals.

The strobe input serves for the synchronisation of the data lines. If a pulse is transmitted on this line, the data which are offered at this time to the data lines bit 0 - bit 7 are accepted as being valid. On many computers this signal is automatically produced by the hardware, on other computers the programmer has to generate this signal in the software.

The signal emergency-off and chip protection door is a signal output and is set to "Low" when the emergency-off button is pressed or if the chip protection door is open. (The limit switch for the chip guard is not installed as a standard feature. Merely the connection for it is provided!).

The signal speed pulse is a signal output and provides 100 pulses per revolution of the main spindle. The pulse duty factor is not defined and also depends on the speed.

The signal synchronous pulse is a signal output and provides one pulse per revolution of the main spindle. The length of the pulse depends on the speed and the pulse is not synchronised with the slopes of the speed pulses.

The meaning of the data signals depends on the setting of the 4-fold DIP switch. These signals, however, always serve to trigger the stepping motors.

In order to picture the operation of the stepping motor, it is a good idea to imagine a coordinate system with the four cardinal points. These points correspond to the directions of the magnetic fields in the stepping motor and one magnetic field can be produced with one winding (when an electric current is allowed to pass through the winding). If more than one winding is switched on at the same time, the direction and strength of the magnetic field are derived by vectorial addition. An example: If the windings "North" and "South" are activated at the same time, the two magnetic fields cancel each other out and the resultant magnetic field has zero strength and the direction is undefined. However, if the windings "South" and "West" are switched on simultaneously, the direction of the resultant magnetic field is "South-West" and the strength is 1.41 times that of a single field. (Diagonal of a square).

The rotor of a stepping motor is designed so that it always tries to align itself in the direction of the magnetic field produced by the stator. Therefore, if the current is suitably switched on and off in the windings of the motor, the rotor rotates about a certain angle and it thus moves stepwise from one set magnetic field direction to the next.

There are two ways in which the windings can be triggered:

1) Full-step mode	1st step	S-W
	2nd step	W-N
	3rd step	N-E
	4th step	E-S
2) Half-step mode	1st step	S-W
	2nd step	W
	3rd step	W-N
	4th step	N
	5th step	N-E
	6th step	E
	7th step	E-S
	8th step	S

Edition 90-7
Ref. No. EN2 031

The direction of rotation depends on whether one controls from 1 to 2 etc., or, for example, from 1 to 8, from 8 to 7 etc.

The advantages of the half-step mode of operation lie in the double resolution with the same motor design, the disadvantage is a loss of torque because only one winding is active at each intermediate step and only about 70% of the maximum torque is available. Moreover, more stringent demands have to be placed on the computing speed owing to the higher resolution.

The Centronics interface has eight data lines. As four windings per motor have to be triggered, the windings can be directly controlled by two motors.

If the sequence of winding control no longer has to be performed directly by the connected computer, two lines per axis drive are, in principle, sufficient, i.e. one line where the direction of rotation is determined and a second line where the steps are output. (One pulse on the second line means that the stepping motor is to move one step in the direction or rotation specified on line one.)

Abbreviations:

VS ... full step
HS ... half step
T/R ... step/direction signal
dir ... direct winding control
RL ... cw
LL ... ccw

Table for the 4-fold DIP switch:

Mode	1	2	3	4
VS T/R RL RL	on	on	on	on
VS T/R LL RL	on	off	on	on
VS T/R RL LL	on	on	off	on
VS T/R LL LL	on	off	off	on
VS dir RL RL	off	on	on	on
VS dir LL RL	off	off	on	on
VS dir RL LL	off	on	off	on
VS dir LL LL	off	off	off	on
HS dir RL RL	off	on	on	off
HS dir LL RL	off	off	on	off
HS dir RL LL	off	on	off	off
HS dir LL LL	off	off	off	off
HS T/R RL RL	on	on	on	off
HS T/R LL RL	on	off	on	off
HS T/R RL LL	on	on	off	off
HS T/R LL LL	on	off	off	off

Characteristics of the axis drives for the Compact 5 PC:

The specified values relate to full-step control and are to be converted for half-step control accordingly.

The given values relate to the slide movements.

Resolution:

One step corresponds to 1000/72 micrometre.

Speed:

100 Hz correspond to 83.33 mm/min feed rate

Maximum speed:

840 Hz corresp. to 770 mm/min rapid motion

Start-stop frequency:

598 Hz corresp. to 499 mm/min feed rate

Acceleration time:

from 0 to 598 Hz 0 sec

from 598 to 840 Hz 1 sec (linear acceleration)

"dir" mode:

The data lines D0 to D3 are assigned to the stepping motor in the X-axis (cross slide). The sequence of the windings is "E", "S", "W", "N". The data lines D4 to D7 are assigned to the stepping motor in the Z-axis (longitudinal slide). The sequence of the windings is the same as for the X-axis.

"T/R" mode:

The data lines

D0 is direction motor X
D1 is steps motor X
D2 is direction motor Z
D3 is steps motor Z

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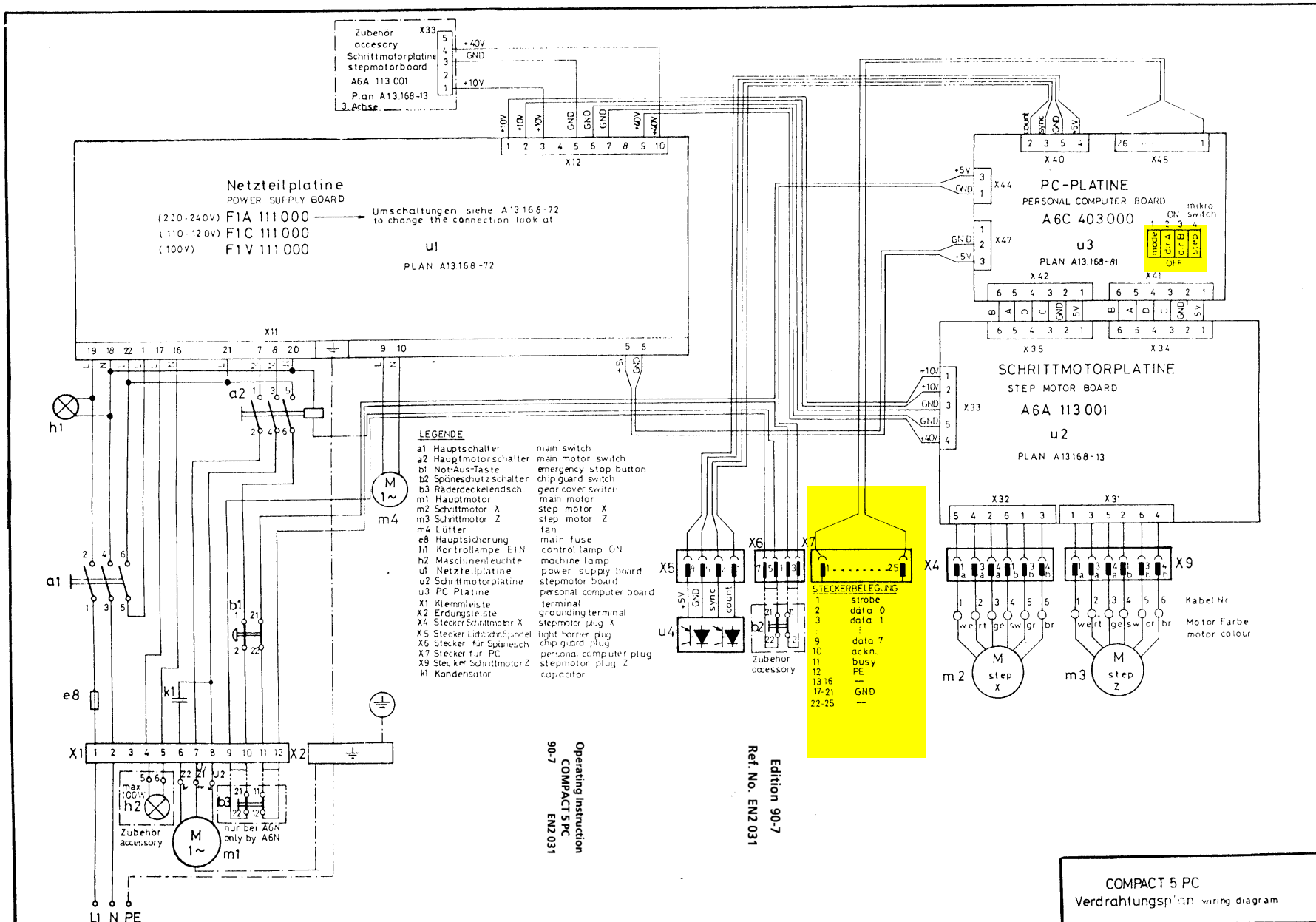
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Operating Instruction

COMPACT 5 PC

90-7

EN2 031



DNC-Interface

(Compact 5 CNC)

The DNC-interface is an accessory which can be built in at later stage on request. The DNC-interface allows to send instructions with the help of a CNC-program.

Attention:

If you use the DNC-interface together with external voltage sources you have to obey the maximum power and voltage values. Also differences in the potential between the devices have to be taken into account. An excessive voltage at an DNC-input or output can destroy the complete electronics of the Compact 5 CNC.

DNC-Interface**PIN - Coverage**

X62/PIN	1	A	Status hand
	2	E	Turret - hand operation
	3	E	Instruction G66 + INP
	4	-	-
	5	-	-
	6	E	Instruction G66 + FWD
	7	A	Status program running
	8	A	Status intermediate stop
	9	E	Instruction switch hand /CNC
	10	-	-
	11	-	-
	12	-	-
	13	-	-
	14	-	-
	15	A	Output set with M8, M9
	16	-	-
	17	E	Instruction start
	18	A	Output set with M22, M23
	19	A	Status main motor ON/OFF
	20	A	Output impulse set with M26
	21	E	Instruction blockage-turret
	22	V	+10V not controlled
	23	V	} GND
	24	V	
	25	V	
	26	V	+5V controlled

E = Input
 A = Output
 V = Power

Function of the DNC-board:

1.

- The main spindle can be switched on with M03 and switched off with M05 (set main spindle switch to CNC).
- A main spindle switched on with M03, can be switched off manually during the intermediate stop, by actuating the M-switch (e.g. for measuring processes). Where the intermediate stop is interrupted by a start, the main spindle is automatically switched on again, and after a 2 second start delay, the program continues to operate.
- The program end command M30, automatically produces a switching off of the main spindle (additional programming of M05 is not necessary).

2.

In and output possibilities of the DNC-interface via the 26-pole plug X62:

A) Outputs:

PIN 1: Status Hand

The machine reports whether it is in Hand or CNC-operation:

PIN 1 with CNC-operationLO

PIN 1 with Hand-operation ...HI

PIN 7: Status program running.

The machine reports, whether a program is worked off at the moment.

Program runningHI

Program not runningLO

PIN 8: Status intermediate stop

The machine reports whether it is in intermediate stop or not.

Intermediate stopHI

No intermediate stopLO

PIN 15 - Output set M08, M09

PIN 18 - Output set M08, M09

Input of	produces at switch output / Pin	the condition	initial condition
M08 M09	X 62 / 15 X 62 / 15	HI LO	LO
M22 M23	X 62 / 18 X 62 / 18	HI' LO	LO'

These 3 switch outputs can also be manually actuated.

Lighting the WEG-LED	and actuating the pushbutton	produces at switch output / Pin	the condition
X X	FWD REV	X 62 / 15 X 62 / 15	HI LO
Z Z	FWD REV	X 62 / 18 X 62 / 18	HI LO

With Pin 19, the main motor is switched on and off.

M03 - HI

M05 - LO

Initial condition - LO

Pin 20: Pulse output

Format M 26 N3/M26/H3

At Pin 20, with a frequency of 100 Hz, the number of pulses given with H is issued (HI-LO).

Initial condition: LO

Maximum H-input: 0-221

The program is interrupted during the output time, and is then subsequently continued.

B) Inputs:

Where a voltage of 3 - 30 V is applied to the following pins, the following functions are executed by the machine:

Pin 2: Turret - HAND operation

Pin 3: Set the machine to RS-232 operation (received as with G66 + INP)

Pin 6: Set the machine to RS-232 operation (transmit as G66 + FWD)

Pin 9: Change machine from manual operation to CNC operation, or vice versa.

PIN 17: Through voltage at PIN 17 a start instruction is effected.
PIN 17 is not cabled to the CPU board.
Compare also notes with cabling.

PIN 21: Instruction turret blockage.

C) Power:

PIN 22: + 10V not controlled

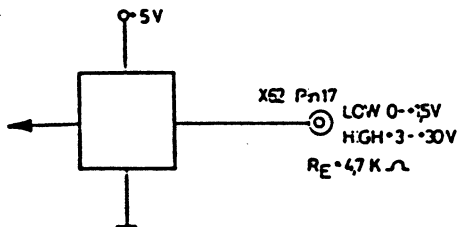
PIN 23:

PIN 24: GND

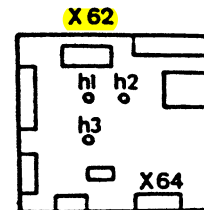
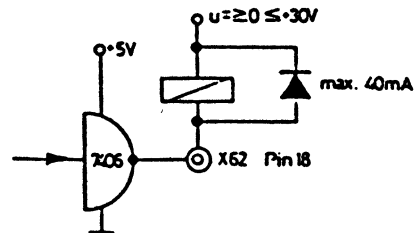
PIN 25:

PIN 26: + 5 V controlled

Example entrance:



Example exit:



3. To plug X64/PIN 5,6 an opener contact can be connected, with same function as X62/PIN 10 (e.g. function end guard of door).
h3 lights up when door is open (J4).

Mounting of the DNC-Interface:Scope of supply

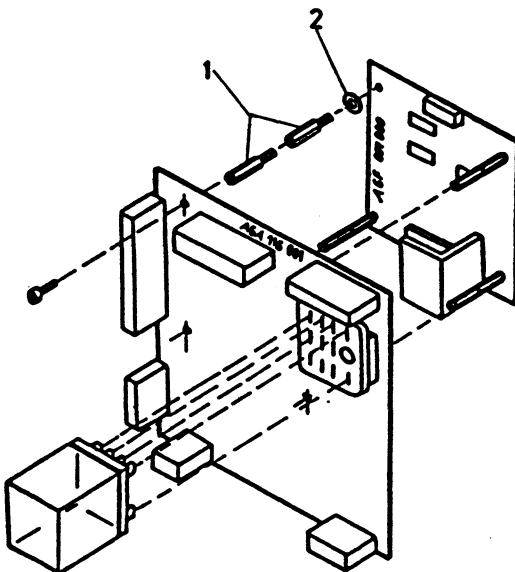
1. PC-board
2. Cable 16 - 12-pole
3. Cable 5-pole
4. Cable 2-pole
5. Spacer bolt with washers
6. Cable clips
7. Relay

Work to be carried out:

- Assemble DNC-board
- Connect all cables

Attention:

- Disconnect the mains plug prior to carrying out all assembly work. Otherwise there is not only the danger of accident, but also the danger of electronic components on the boards being destroyed.
- Never connect and switch on the machine, when all the plug connections are not fitted and the printed circuit boards are not fastened. Loose cables and printed circuit boards cause short-circuits, when they come into contact with the housing or other pc-boards.

Assembly of the DNC-board

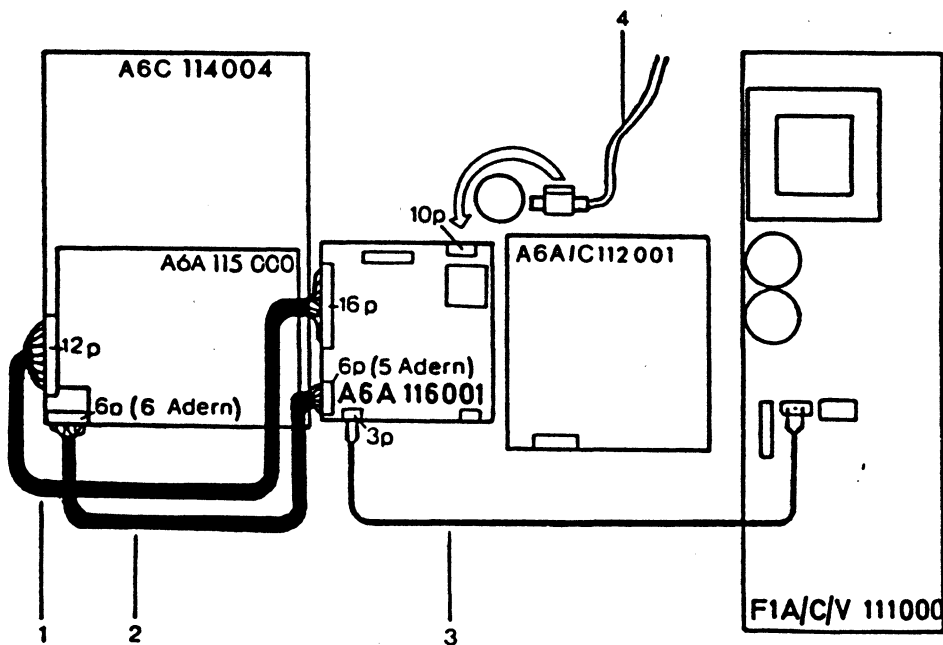
- Replace the cylinder bolts on the cassette board with spacer bolts (1). Ensure that the plastic washers (2) are fitted.
- Fasten the DNC-board with cylinder bolts.
- Plug-in the relay.

Assembly simplification:

First plug-in all cables, then screw the pc-board tight.

Cable:

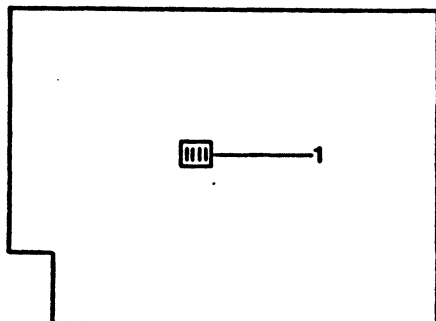
1. Attach 16 - 12-pole cable (1) to CPU and DNC-board.
2. Attach 5-pole cable (2) to CPU and DNC-board.
3. Attach 2-pole cable (3) from mains board to DNC-board.
4. Remove the 2-pole cable (4) from the cable clip and attach to the DNC-board.

Note:

On 5-pole cable, the side with the 6 cores on the plug must be attached to the CPU, and the side with the 5 cores on the plug must be attached to the DNC-board.

Pin 3 of this cable may not be wired (Pin 3 is connected with Pin 1, as standard, for this reason, the CPU side has 6 cores). Via Pin 3, the "Start" pulse for the main spindle is transmitted, that comes with the programming of M06/T/O after the issuance of the intermediate stop (danger of injury during manual tool change).

5. Setting language and frequency on the video board



Language and frequency are set with the code switch (1).

5.1. Frequency setting:

50 Hz: switch 2 "ON"

60 Hz: switch 2 "OFF"

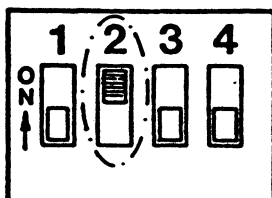
Illustration shows position for 50 Hz

5.2. Languages are set with switch 3 and 4.

Combinations

Language	Switch 3	Switch 4
German	OFF	OFF
English	OFF	ON
French	ON	OFF
Spanish	ON	ON

5.1



5.2

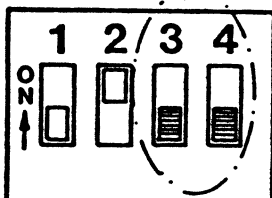


Illustration shows switch positions for German.

Note:

The first switch is without function.
The change of language appears when the machine is switched off and on.

TV-Characteristic

UHF receiving unit : frequency between
500 and 700 Megahertz
Transmitter frequency must be adjusted.

Monitor-Characteristic

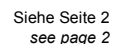
Equipped for receiving BAS resp. COMPO-
SIT signals.

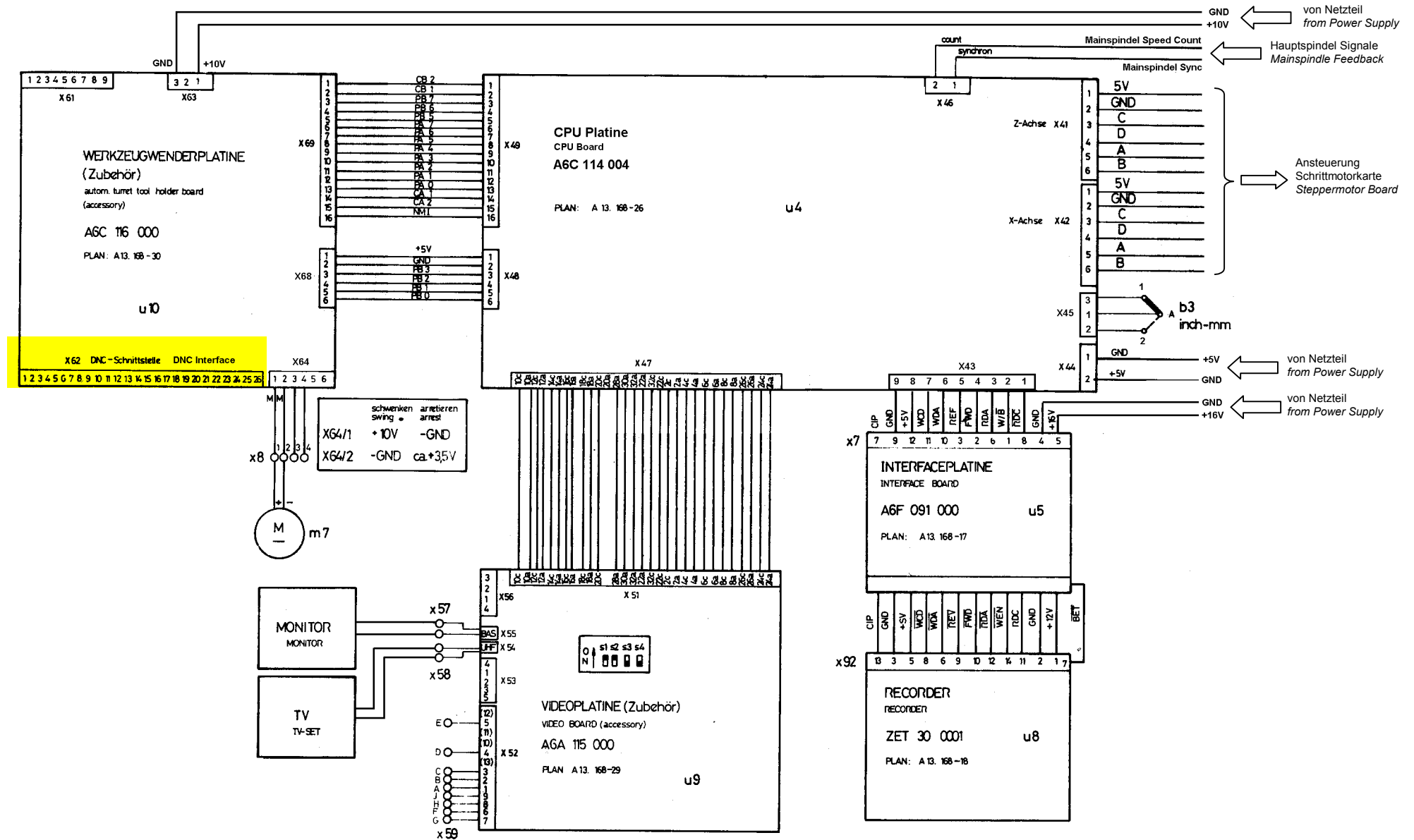
6. Interface RS 232

For connection of paper tape punchers,
paper tape readers, printers, computer
systems, etc.

For the connection of the several devi-
ces you must know the PINNING!

Electrical Wiring Diagram





7.4 Removal **DNC** - Interface of the Compact 5 CNC

The DNC interface permits the external input of commands to the machine, enquiry of machine conditions or the transmission of switch functions with the CNC program. For this reason, the DNC interface is divided into outputs, inputs and supply voltages.

ATTENTION:

When using the DNC interface with external voltage sources, the maximum admissible currents and voltages must be noted. In addition, possible potential differences between the devices must be observed. An excessive voltage at a DNC input or output can destroy the complete electronics of the COMPACT 5 CNC (spread of the voltage throughout the 5 V network).

All functions are carried via plug X62 to the tool reverser pc-board.

Input and output possibilities

7.4.1. Outputs

Pin 1: Manual operation status (the machine reports whether it is in manual or CNC operation).

In CNC operation, Pin 1 is LO

In manual operation, Pin 1 is HI

Pin 7: Status program operates (the machine reports whether a program is being processed).

Program runs HI

Program does not run LO

Pin 8: Intermediate stop status (the machine reports whether or not it is in an intermediate stop).

No intermediate stop LO

Intermediate stop HI

Pin 15: Alarm status (the machine reports whether or not it is in an alarm).

No alarm LO

Alarm HI

Output switch functions:

The following functions can be switched through the input of

G23/X⁼⁰/_{≠0}/Z⁼⁰/_{≠0}/F⁼⁰/_{≠0}

Input of	Causes on switch output/pin	The condition	Initial condition
G23 X=0 G23 X≠0	X62/19 X62/19	LO HI	LO
G23 Z=0 G23 Z≠0	X62/18 X62/18	LO HI	LO

These 2 switch outputs can also be manually actuated (by manual operation).

The path LED lights up	and pressing the pushbutton	produces at switch output/pin	the condition
X	REV	X62/19	LO
Z	FWD	X62/18	HI
Z	REV	X62/18	LO

Note:

The function X-FWD (X62/19 HI) is suppressed (i.e. is not possible).

Where X62/19 is set at HI by the program (G23/X=0), this output can be set at LO with REV during the intermediate stop. Where the program continues with Start, X62/19 becomes HI. 2 seconds later, the program then starts with the set following the intermediate stop.

Compare the function of the X output X62/19 with the F1-CNC output M03/M05. It would be used for the OFF-ON switching of the main spindle. However, this function is not included in the hardware.

Considerable wiring requirement: The motor switch of the F1-CNC would have to be fitted (ZEL 22 0010; ZEL 22 0020). See the circuit diagrams A13.168-22 and A13.168-71. In addition, the power relay (ZER 82 6033) must be inserted on the tool reverser pc-board.

Pin 20: Pulse output

With a frequency of 100 Hz, the number of pulses specified with G23/F (HI-LO) are input at Pin 10.

Initial condition: LO

Maximum F-input: 0-499

The program is interrupted during the output time of the pulses, and is then continued.
(For this reason, one can also use G23/F as dwell time = between 0.01 and 4.99 seconds)

Input format for G23:

N.../G23/X.... /Z...../F...

i.e. simultaneous input of all 3 functions is possible.

7.4.2. Inputs

Where a voltage of 3-30 V is applied to the following inputs, the following function is executed by the machine:

X62/Pin 3: Bring machine into RS-232 operation (receive as G66 + INP).

X62/Pin 4: Break off program (function as INP/REV).

X62/Pin 5: Intermediate stop (function as INP/FWD).

X62/Pin 6: Bring machine into RS-232 operation (receive as G66 + FWD).

X62/Pin 9: Bring machine from manual to CNC operation, or vice versa.

X62/Pin 10: When voltage is applied to Pin 10, the machine changes to intermediate stop. In addition, there is a start interlock (e.g. function protective cover).

Note: This function is also on plug X64/Pin 6. This is where one can obtain the + 5 V from plug X64/Pin 5, and thus connect a limit switch (as an opener).

ATTENTION:

Pin 10 only functions, where the wire bridge J4 is removed from the tool reverser pc-board.

X62/Pin 11: Manual traverse X/Z

X62/Pin 12: Manual traverse +/-

X62/Pin 13: Manual traverse command

With voltage on Pin 13, the COMPACT 5 CNC traverses with the set feed (potentiometer), with the axis (Pin 11) and direction (Pin 12) which were preselected.

X62/Pin 17: A start command is actuated by voltage at Pin 17.

X62/Pin 2: The tool reverser indexes, as long as there is voltage at Pin 2 (J2 must be removed).

X62/Pin 21: When the wire bridge J1 is open, the tool reverser is blocked. When a voltage is applied to Pin 21, one can again index. This function is also on X64/3.
Function, e.g. tool reverser cover.

7.4.3. Supply:

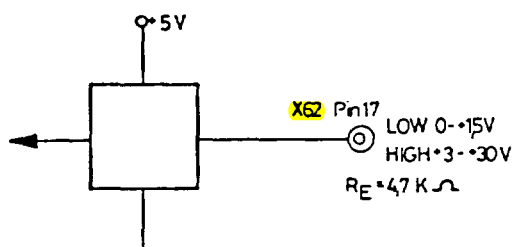
X62/Pin 22: + 10 V uncontrolled

X62/Pin 23 }
24 } — GND
25 }

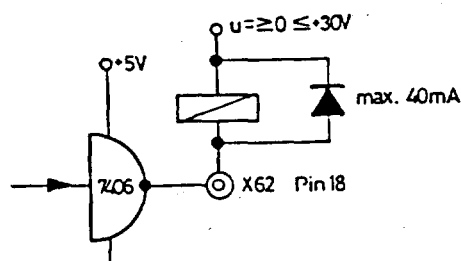
X62/Pin 26: + 5 V controlled

7.4.4. Examples for the wiring

Example Input

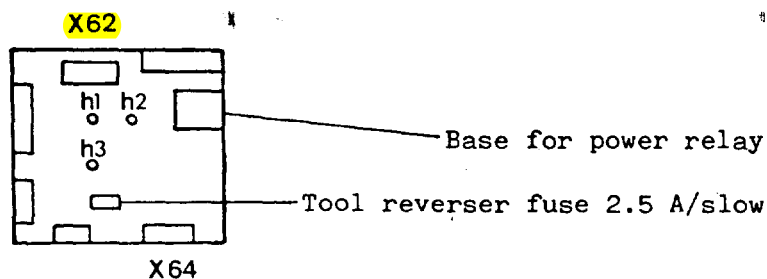


Example Output



7.4.5. Notes on the tool reverser pc-board

- Where wire bridge J3 is removed, indexing can proceed during intermediate stop and manual operation.
- There are 3 LED's on the tool reverser pc-board.
h1 is alight when the tool reverser lock is open (J1)
h2 is alight when the tool reverser swivel is blocked (J2)
h3 is alight when the chip protection cover is open (J4)



Chapter 8

Generations, retrofitment of old machines

8.1 Generations of the Compact 5 CNC

Serial No.:

1-49	1st Generation: Yellow main motor with old main spindle pc-board, interface pc-board fitted in cassette deck, computer pc-board not suitable for extensions, weak power pack, old step motor pc-board, old step motor wiring.
50-299	2nd Generation: Not suitable for extension video and RS-232. Weak power pack, old step motor pc-board, old step motor wiring.
300-618	3rd Generation: Not suitable for extension video and RS-232. Similar in design to the new machines.
619-1499	4th Generation: Suitable for extension video and RS-232. Similar in design to the new machines.
1500-2499	5th Generation: Suitable for extension video.
2500-3539	6th Generation: Suitable for video and tool reverser extension. Absolute value programming, RS-232 and DNC interface software fitted.
3540-	7th Generation: Software as in 5th Generation, TUV tested, design change internally.

5.2.8. Tool reverser and DNC pc-board

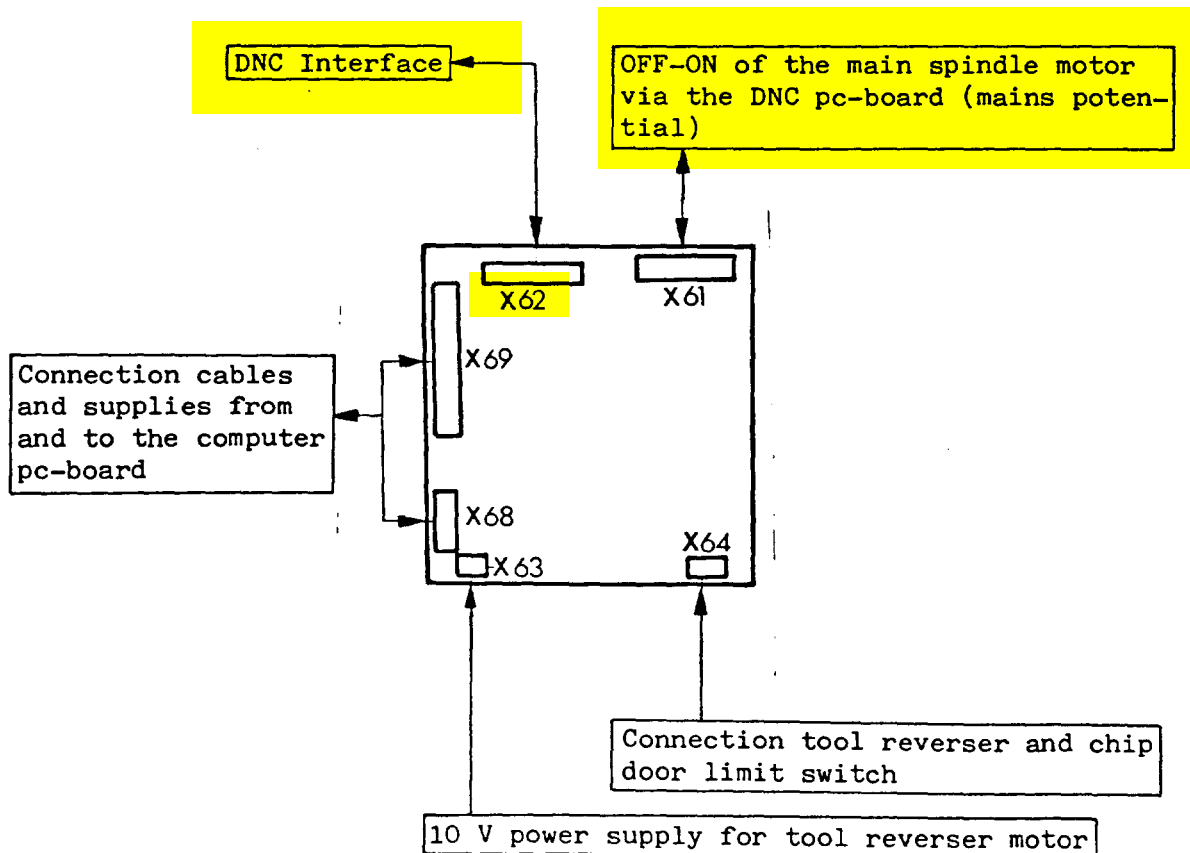
A) Function with COMPACT 5 CNC:

- Triggering the tool reverser
- DNC interface
- Switching the main motor off and on with the so-called X-output is not wired in the works, although it is functional. The same applies for the input chip protection limit switch.

B) Functions with F1-CNC:

- DNC interface
- SWITCHING the main motor OFF and ON
- Tool reverser triggering is not used for the F1-CNC.
- Input chip door limit switch

More comprehensive information in the chapter DNC interface



Measuring points:

X61, Pin 2 and 9 Switch function mains potential MP39

X62, Pin 25 and 26 5 V
X62, Pin 22 and 26 10 V } MP40

X63, Pin 1 and 3 10 V MP18

X64, Pin 1 and 2 Voltage tool reverser motor
See details in chapter 5.1.4. } MP16
X64, Pin 5 and X63, Pin 3 (GND) 5 V

X68, Pin 1 and 2 5 V MP17

7.4 Removal **DNC** - Interface of the Compact 5 CNC

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All functions are carried via plug X62 to the tool reverser pc-board.

Input and output possibilities

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In manual operation, Pin 1 is HI

Pin 7: Status program operates (the machine reports whether a program is being processed).

Program runs HI

Program does not run LO

Pin 8: Intermediate stop status (the machine reports whether or not it is in an intermediate stop).

No intermediate stop LO

Intermediate stop HI

Pin 15: Alarm status (the machine reports whether or not it is in an alarm).

No alarm LO

Alarm HI

Output switch functions:

The following functions can be switched through the input of

G23/X⁼⁰/_{≠0}/Z⁼⁰/_{≠0}/F⁼⁰/_{≠0}

Input of	Causes on switch output/ pin	The condition	Initial condition
G23 X=0 G23 X≠0	X62/19 X62/19	LO HI	LO
G23 Z=0 G23 Z≠0	X62/18 X62/18	LO HI	LO

These 2 switch outputs can also be manually actuated (by manual operation).

The path LED lights up	and pressing the pushbutton	produces at switch output/ pin	the condition
X	REV	X62/19	LO
Z	FWD	X62/18	HI
Z	REV	X62/18	LO

Note:

The function X-FWD (X62/19 HI) is suppressed (i.e. is not possible).

Where X62/19 is set at HI by the program (G23/X=0), this output can be set at LO with REV during the intermediate stop. Where the program continues with Start, X62/19 becomes HI. 2 seconds later, the program then starts with the set following the intermediate stop.

Compare the function of the X output X62/19 with the F1-CNC output M03/M05. It would be used for the OFF-ON switching of the main spindle. However, this function is not included in the hardware.

Considerable wiring requirement: The motor switch of the F1-CNC would have to be fitted (ZEL 22 0010; ZEL 22 0020). See the circuit diagrams A13.168-22 and A13.168-71. In addition, the power relay (ZER 82 6033) must be inserted on the tool reverser pc-board.

Pin 20: Pulse output

With a frequency of 100 Hz, the number of pulses specified with G23/F (HI-LO) are input at Pin 10.

Initial condition: LO

Maximum F-input: 0-499

The program is interrupted during the output time of the pulses, and is then continued.
(For this reason, one can also use G23/F as dwell time = between 0.01 and 4.99 seconds)

Input format for G23:

N.../G23/X.... /Z...../F...

i.e. simultaneous input of all 3 functions is possible.

7.4.2. Inputs

Where a voltage of 3-30 V is applied to the following inputs, the following function is executed by the machine:

X62/Pin 3: Bring machine into RS-232 operation (receive as G66 + INP).

X62/Pin 4: Break off program (function as INP/REV).

X62/Pin 5: Intermediate stop (function as INP/FWD).

X62/Pin 6: Bring machine into RS-232 operation (receive as G66 + FWD).

X62/Pin 9: Bring machine from manual to CNC operation, or vice versa.

X62/Pin 10: When voltage is applied to Pin 10, the machine changes to intermediate stop. In addition, there is a start interlock (e.g. function protective cover).

Note: This function is also on plug X64/Pin 6. This is where one can obtain the + 5 V from plug X64/Pin 5, and thus connect a limit switch (as an opener).

ATTENTION:

Pin 10 only functions, where the wire bridge J4 is removed from the tool reverser pc-board.

X62/Pin 11: Manual traverse X/Z

X62/Pin 12: Manual traverse +/-

X62/Pin 13: Manual traverse command

With voltage on Pin 13, the COMPACT 5 CNC traverses with the set feed (potentiometer), with the axis (Pin 11) and direction (Pin 12) which were preselected.

X62/Pin 17: A start command is actuated by voltage at Pin 17.

X62/Pin 2: The tool reverser indexes, as long as there is voltage at Pin 2 (J2 must be removed).

X62/Pin 21: When the wire bridge J1 is open, the tool reverser is blocked. When a voltage is applied to Pin 21, one can again index. This function is also on X64/3.
Function, e.g. tool reverser cover.

7.4.3. Supply:

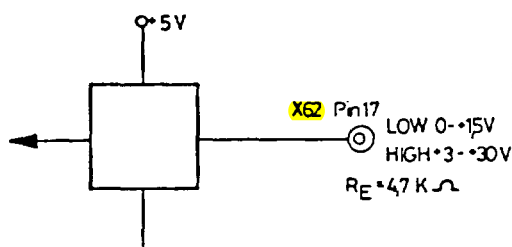
X62/Pin 22: + 10 V uncontrolled

X62/Pin 23 }
24 } — GND
25 }

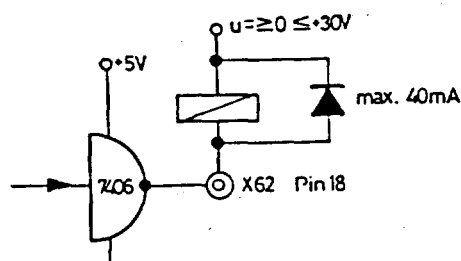
X62/Pin 26: + 5 V controlled

7.4.4. Examples for the wiring

Example Input



Example Output



7.4.5. Notes on the tool reverser pc-board

- Where wire bridge J3 is removed, indexing can proceed during intermediate stop and manual operation.
- There are 3 LED's on the tool reverser pc-board.
h1 is alight when the tool reverser lock is open (J1)
h2 is alight when the tool reverser swivel is blocked (J2)
h3 is alight when the chip protection cover is open (J4)

