

EMCO
COMPACT 5 CNC
SOFTWARE
A6C 114 004

Edition 86-9
Ref. No. EN2 024

Neue Software
Compact 5 CNC
86-9 EN2 024

Preface

Software A6C 114 004

In the first chapter you find surveys concerning the new features of the Compact 5 CNC Software A6C 114 004.

In the chapter "Programming" also the G-Functions which have not been changed are described in a clear and short way.

The new codes are described detailed. Attached to the descriptions you find examples.

How to Use this Book

For users who know the Compact 5 CNC with software version A6C 114 003 this book has all information to program and operate the machine. For CNC-beginners the very detailed instructions of the books "BASIS" resp. "INSTRUCTOR" are valid. The contents of these books must be a little bit extended. Look for it the chapter "Old Programs new Software" in this book.

To the Programming Exercises

With machines with control serial number below 5350 the functions M03 and M05 are not activated. In the programming exercises M03 and M05 are written in brackets.

If you have a machine with control serial number below 5350 program an empty line so that you must not renumber the program.

Operation

With serial control numbers from 5350 upwards M03 and M05 is activated by the control.

In this case the main spindle switch must be in CNC-position (or position 2).

Extensions in operating see chapter "Operating".

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2. G-Codes/M-Codes:

G-Codes:







- Description of Formats 2/1
- G00-Rapid Traverse 2/G00/1
- G01-Linear-Interpolation 2/G01/1
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Circular Interpolation Counterclockwise. 2/G02/G03/1-21
- G04-Dwell 2/G04/1
- G21-Empty Line 2/G21/1
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- G91-Incremental Value Programming 2/G91/1
- G92-Set Register 2/G92/1
- G94-Feed in mm/min 2/G94/1
- G95-Feed in mm/rev (Inch/rev) 2/G95/1

M-Codes:

- M00-Programmed Stop/M03-Main Spindle in Clock-
wise Rotation/M05-Main Spindle STOP..... 2/M00-M05/1
- M06-Tool length Compensation/Tool Change 2/M06/1
- M08, M09, M22, M2E-Switch Output/M17-Return
Command 2/M08-M26/1
- M30 End of Program/M99 Circle Parameter 2/M30-M99/1
- M98-Automatic Play Compensation 2/M98/1-3

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RS 232-Interface

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Software A6C 114 004 for Compact 5 CNC

The new Software A6C 114 004 was developed for the Compact 5 CNC.

It has a number of new features as compared with the old software A6C 114 003. The chart on the following pages give you an overview.

Short Summary of Extensions and New Features

General:

- * Permanent read-out in manual mode.
- * Increased block numbers: N00 to N209
- * Additional addresses H,I,K,L,T,M;

Extensions of G-Codes:

- * Circle programming G02,G03:
all partial arcs can be programmed in steps of 0,01 mm. Programming via center point coordinates I,K; sizes of arcs up to parameter values X⁺59,99 mm, Z⁺327,60 mm, I 59,99 mm, K 327,60 mm.
- * Dwell can be programmed
- * Subroutines - fivefold, jump instructions.
- * New canned cycles with automatic division of cut:
G78 Threading
G84 Longitudinal turning
G86 Grooving
G88 Facing
- * Drilling cycles - new

Introduction of M-Codes

Compare Survey M-Codes

- * With machines delivered ex-works, M03 and M05 can be activated via program. The machines delivered ex-works are equipped with a main switch (0-HAND-CNC).
With machines already in use the functions M03 and M05 cannot be activated.
- * Using M98 an automatic compensation of play can be programmed for X- and Z-slides.

Extension to the Programm Sequence:

- * Single block operation
- * Test-run: no slide movement is executed, the program is checked for syntax mistakes.
- * Enlarged DNC-interface

New Software Compact 5 CNC A6C 114 004

Machines with CPU A6C 114 004 ex works

With these machines you will find activated

M03 (main spindle ON)

M05 (main spindle OFF)

M30 (end of program, main spindle OFF)

These machines have a different main switch built in;

it shows - Zero position

- Manual mode

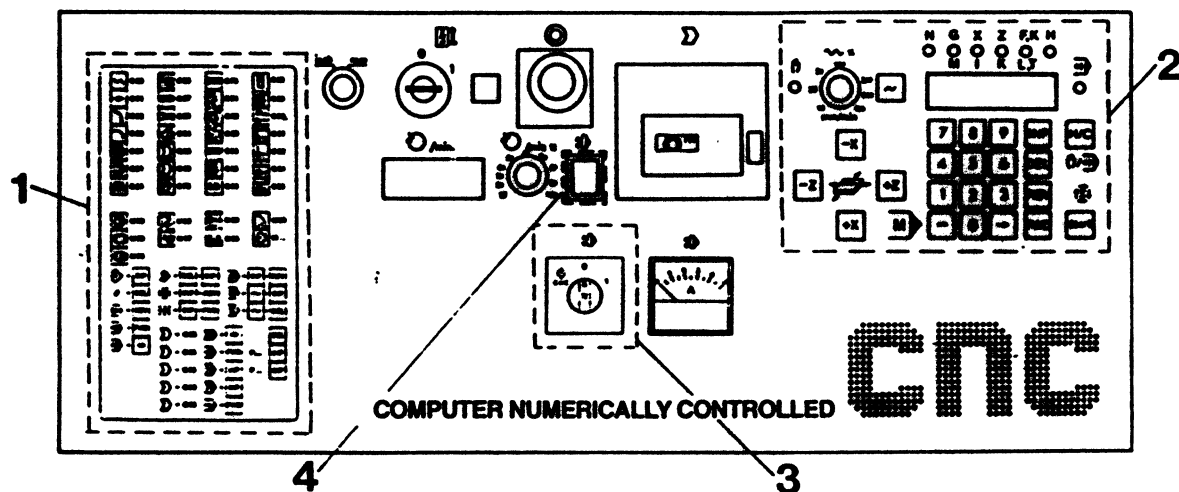
- CNC-mode

Re-mounted Machines

M03 }
M05 } not activated

The main spindle has to be switched on by hand.

M30: M30 means end of program but not main spindle OFF.

Modification of Front Panel

1. Front chart 1
2. Front chart 2 showing new addresses
 M-symbol and feeds.
3. Main spindle switch (CNC-0-1)
 Installed with machines with
 control serial number 5350
 and higher.
4. Switch for the main spindle.
 Not installed with machines with
 control serial number 5350 or
 higher any more.

Max. Main Spindle R.P.M.
when Threading
(SW-A6C 114 004)

Thread pitch		max. r.p.m.
metric [mm]	inch ["]	
0,02 - 0,5	0,002 - 0,02	950
0,5 - 1	0,02 - 0,04	500
1 - 1,5	0,04 - 0,06	320
1,5 - 2	0,06 - 0,08	250
2 - 3	0,08 - 0,12	170
3 - 4	0,12 - 0,16	120
4 - 4,99	0,16 - 0,199	100

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

4. DNC-Interface RS 232-Interface

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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

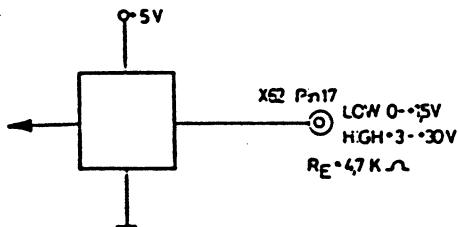
PIN 23:

PIN 24: GND

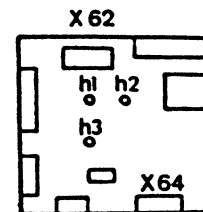
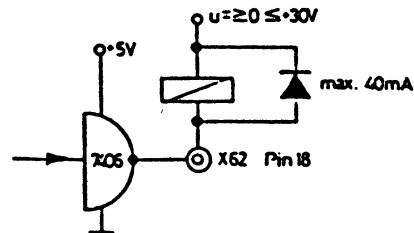
PIN 25:

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

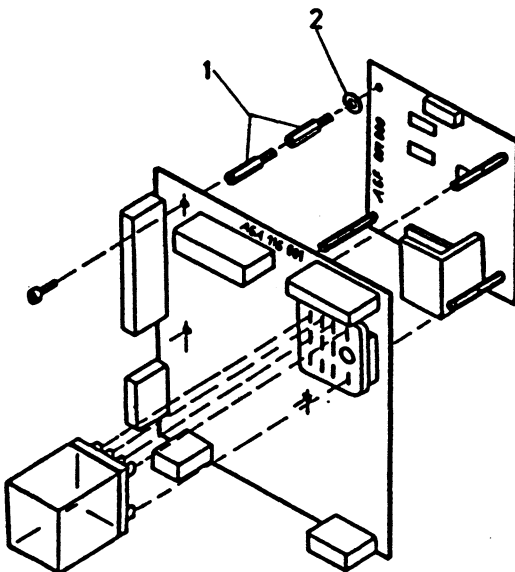
1. PC-board
2. Cable 16 - 12-pole
3. Cable 5-pole
4. Cable 2-pole
5. Spacer bolt with washers
6. Cable clips
7. Relay

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

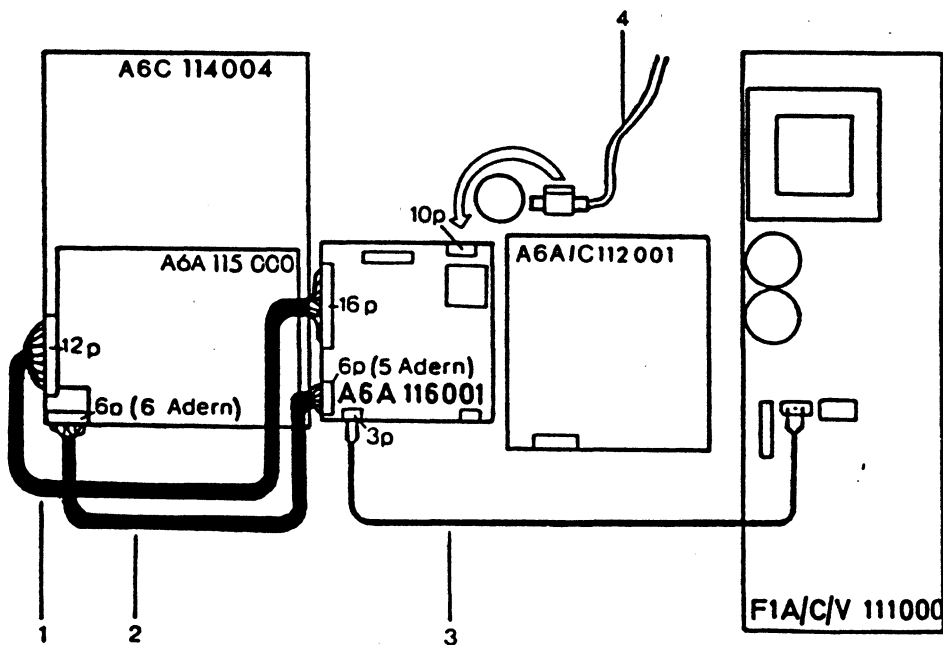
- Replace the cylinder bolts on the cassette board with spacer bolts (1). Ensure that the plastic washers (2) are fitted.
- Fasten the DNC-board with cylinder bolts.
- Plug-in the relay.

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).

G66 RS 232 Operation (V24/20mA - Operation)

G66 function is like G64, G65 a pure switch function for the operation of the interface RS 232. RS 232 is an internationally standardised interface.

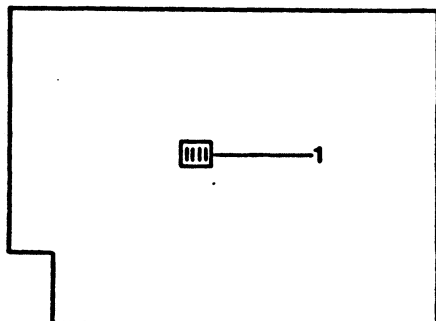
It is an output/input for information. Via this interface information (data) can be transferred into an unit which has the same interface RS 232 C.

The data are sent via a connecting cable. This connecting cable has to be produced by a specialist for the respective unit. The information for the manufacture are to be found in the wiring diagrams of the manufacturer of these units.

Examples Using RS 232:

- Connection of a computer system
- Connection of a printer
- Connection of the EMCO-TRAINER
- Connection of a perforated tape reader and a perforated tape pincer.

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"

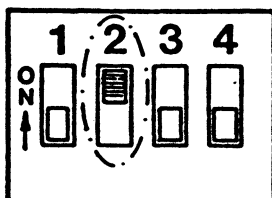
Illustration shows position for 50 Hz

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

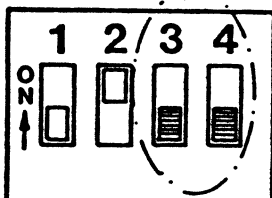


Illustration shows switch positions for German.

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 devices you must know the PINNING!

RS 232 Connection / Some TipsConnection with tape readers, punchers, computers, etc.

Pinning and cable type of COMPACT 5 CNC see page 4/5.

The plug for the RS 232 Interface of the COMPACT 5 CNC is delivered with the Videoprint.

Connection:

Either the producer of the tape reader, puncher, computer, etc. makes the connection or he tells you the pinning of the device so that you yourself can make the connection.

Examples:Possibility 1:

You send to the producer X the RS 232 plug of the EMCO COMPACT 5 CNC and the pinning description (page 4/5). The producer X makes the cable to plug the COMPACT 5 CNC with the tape reader, puncher, computer, etc.

Possibility 2:

You ask the producer of the paper tape reader, puncher, computer, etc. for the pinning of his device and mount the plugs yourself.

Activating RS 232:

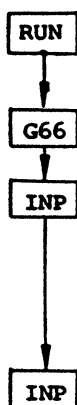
RS 232 is activated via G66. G66 does not enter the memory, it is a switching function.

Examples:

● Transmission from paper tape to memory of COMPACT 5 CNC

(With "Request to send" signal)

- Switch to CNC-mode (memory must be empty)
- Insert paper tape
- Start paper tape reader



1. Program G66

2. Press **INP**

On the display appears A

(A is the abbreviation for ASCII = American Standard Code for Information Interchange)

3. Press **INP**

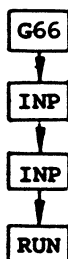
The display shows A L O

(LO = LOAD)

The program is transferred. At the end of the transfer the display shows N OO

● Transmission from paper tape to COMPACT 5 CNC (without "Request to send" signal)

- Insert paper tape
- Switch to CNC-mode



1. Program G66

2. Press **INP**

The display shows A

3. Press **INP**

The display shows A L O

4. Start paper tape reader (transmission begins)

Transmission from COMPACT 5 CNC to paper tape
 (with or without "Request to send" signal)

- Switch to CNC-mode
- Insert paper tape
- Start paper tape puncher



1. Program G66

2. Press **INP** Display shows

A					
---	--	--	--	--	--

3. Press **FWD** Display shows

A		S	A		
---	--	---	---	--	--

 (SA = SAVE)

The paper tape is punched.

Data formats COMPACT 5 CNC Software A6C 114 004

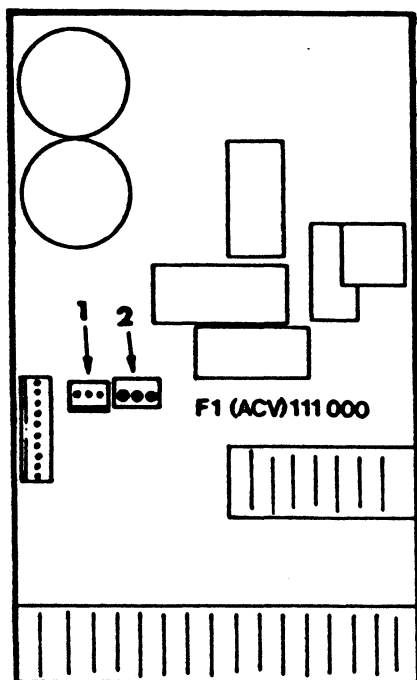
123456789012345678901234567890 31 32

```
% CR LF
....N'.G'...X:'....Z.'...F'...H. CR LF
....00.24..... CR LF
....01.00.-5999..32760..... CR LF
....02.01....01.....12.499.... CR LF
....03.02.-1000.-.1000..09.... CR LF
....04.03...200....200.199.... CR LF
....05M99.I..00.K..200..... CR LF
....06.04....10..... CR LF
....07.21..... CR LF
....08M06..1222.-10000T.01.... CR LF
....09.78...100.-.2000K120..20 CR LF
....10.73.....-.100.100.... CR LF
....11.81.....02.400.... CR LF
....12.82.....-10200.100.... CR LF
....13.83.....30..09.... CR LF
....14.85.....2000.120.... CR LF
....15.89.....2300.200.... CR LF
....16.85.-.100...3000..50.100 CR LF
....17.88...200...300.200..05 CR LF
....18.84.-1000.-.2000.499..26 CR LF
....19.90..... CR LF
....20.91..... CR LF
....21.92...100....200..... CR LF
....22.94..... CR LF
....23.95..... CR LF
....24.33.....-.5000K100.... CR LF
....25M00..... CR LF
....26.27.....L.02.... CR LF
....27.25.....L.98.... CR LF
....28M03..... CR LF
....29M05..... CR LF
....30M08..... CR LF
....31M09..... CR LF
....32M17..... CR LF
....33M22..... CR LF
....34M23..... CR LF
....35M98....02....03..... CR LF
....36M30..... CR LF
...M
```

	Space	ASCII 32
		ASCII 96
CR	Carriage return	ASCII 13
LF	Line feed	ASCII 10

When programs are received, the data format must be fully retained, otherwise the programs will not be correctly stored.

You can also obtain the data format by printout of a punched tape.

Service Information Turret Toolpost

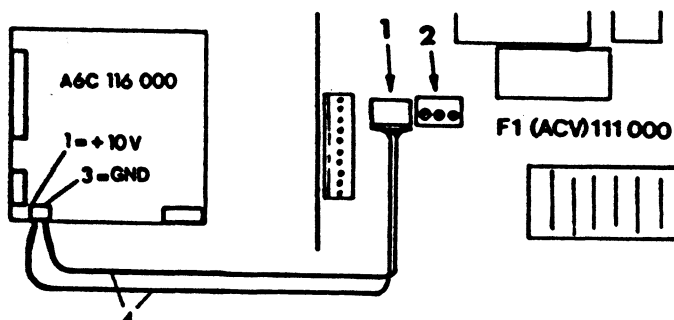
1. For better mounting the turret board connection, the power supply board has been redesigned: F1A(V,C) 111 000
2. The two-pole cable for power supply board has been modified.

Point 1Power supply board F1A(V,C) 111 000

On the power supply board you find a plug contact (1) and a clamping strip.

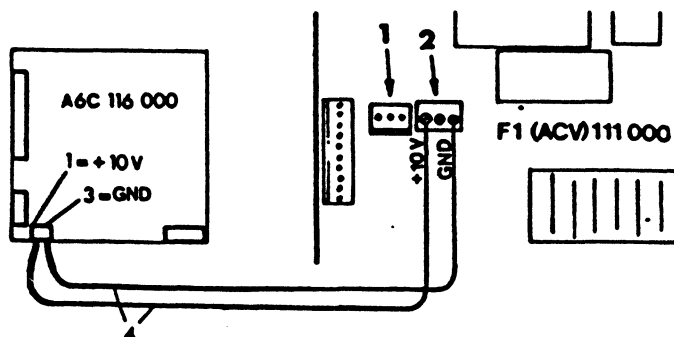
Point 2Turret toolpost

The two-pole cable supplied with the turret toolpost has a plug.

Connection1. Power supply board F1A(V,C) 111 000

It is mounted in the machine.
Cable with plugs

Plug the two-pole cable to plug (1).

2. Power supply board F1A(V,C) 111 000

Your cable has no plug.

Clamp the cable to connecting strip (2).

3. Power supply board old version, but new cable

Remove plug and make connections as described in the instructions provided with the turret toolpost.