FACTORY AUTOMATION

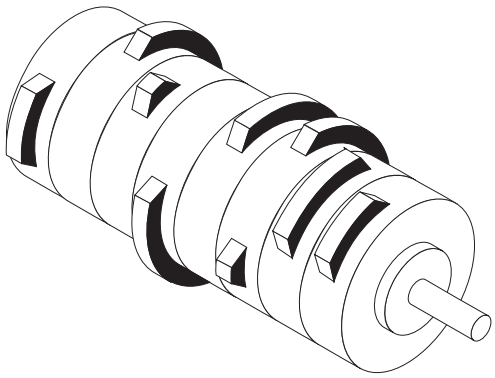
MANUAL

ABSOLUTE ENCODER AND CAM SWITCH FC-21-V

EDITION '99

PEPPERL+FUCHS

Programmable cam switch FC-21-V



The programmable cam switch FC-21-V corresponds to a mechanical cam switch with 24 cam circuits. 180 (256, 360, 512) cams are possible on each of these circuits.

Every cam circuit corresponds to a cam output port at the main unit FC-21-V. If a cam is placed, then the applied voltage is +24V, if no cam is placed, then the applied voltage is 0 V.

The position of the machine to be controlled is given by an absolute encoder.

Depending on the type of the used absolute encoder 360, 512, 720 or 1024 positions may be solvable.

Start and end of a cam must be programmed with the programmer FC-20P. The programming of up to 24 cam circuits with up to 512 cams represents a pattern. For distinction all pattern are numbered.

Up to 10 pattern may be stored (in an EEPROM) in the main unit FC-21-V. External storage of pattern is possible with a cassette data recorder and commercial cassettes.

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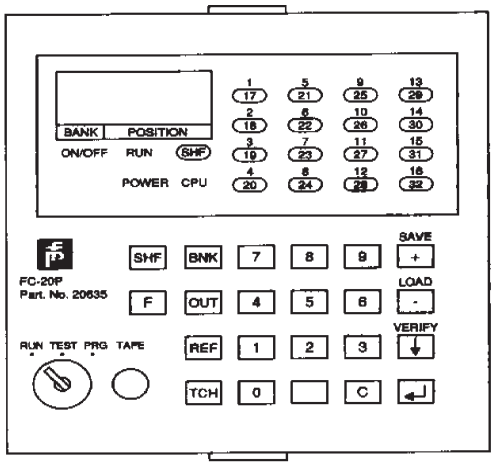

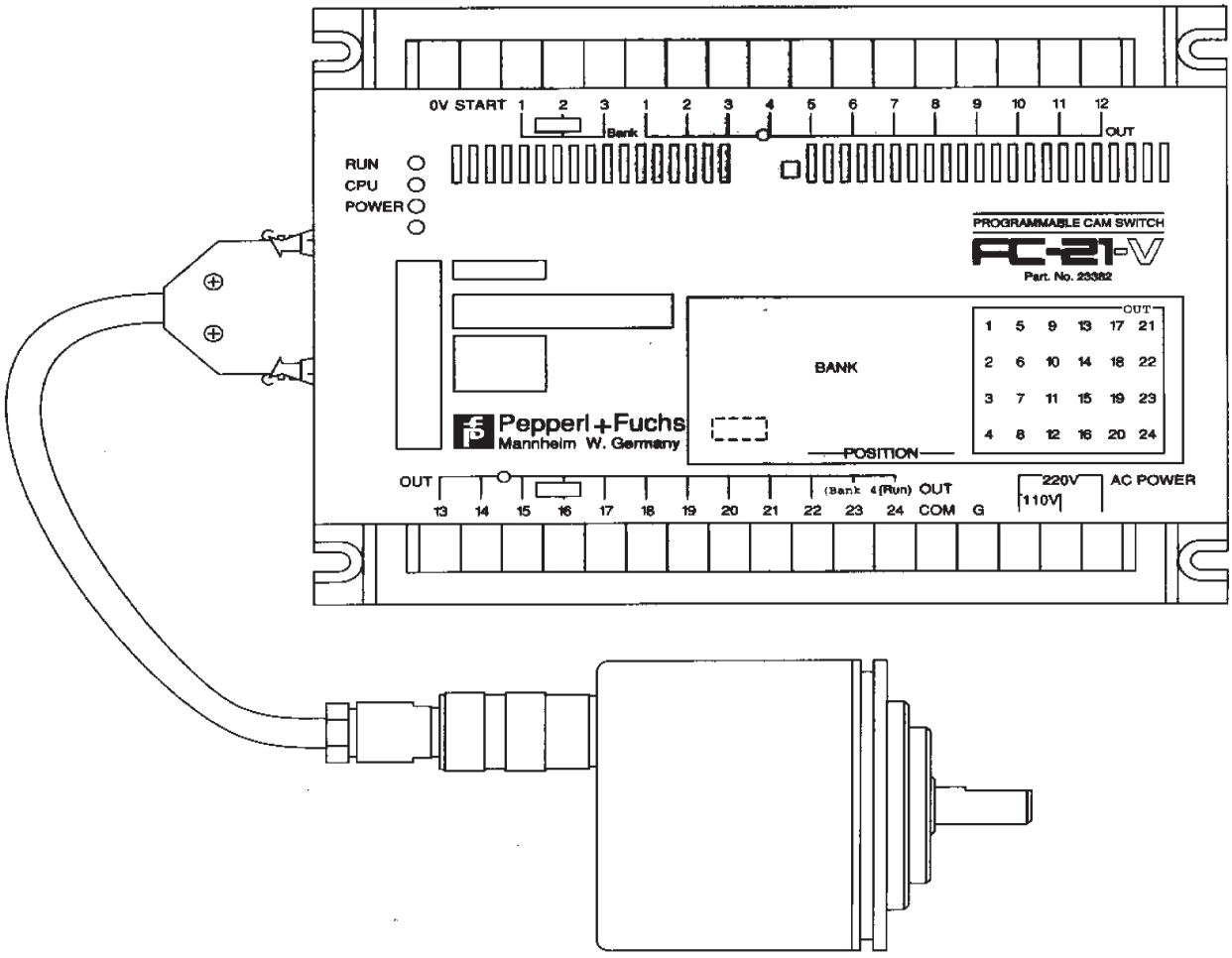

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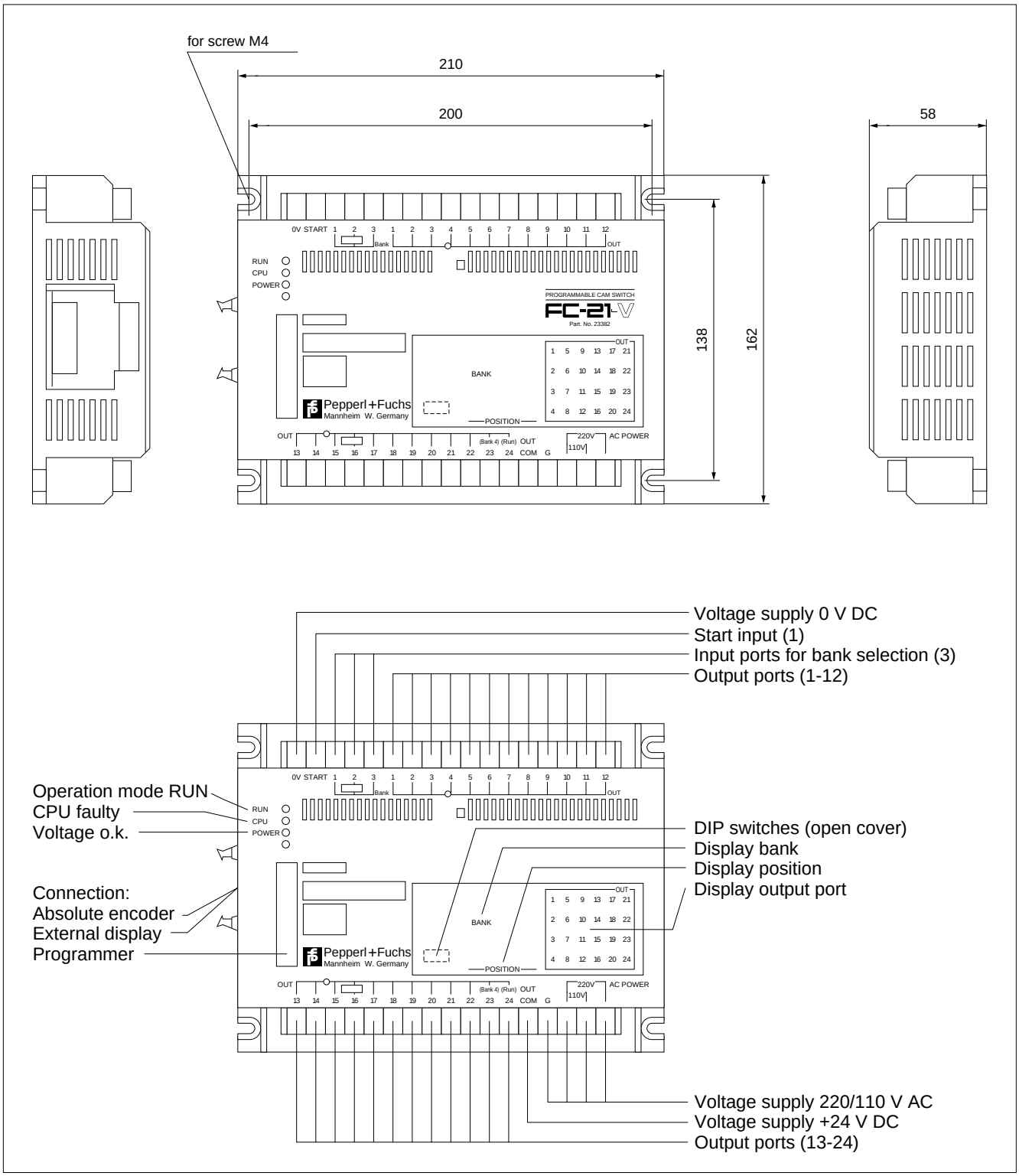
Absolute encoder and cam switch FC-21-V

System-componets

Main unit FC-21-V



Accessorries: Mounting screws with nuts
Plug for connecting absolute encoder

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Main unit FC-21-V
Ratings 1
(general specifications)

Item	Rating	
Power source voltage:	FC-21-V: 93...126/195...264 V AC voltage 50/60 Hz and 24 V DC to supply cam output ports	
Power consumption:	30 VA	
Operating temperature range:	0°...50°C	
Storing temperature:	-20°...-70°C	
Withstanding humidity:	45%...85% (No condensing)	
Dielectric power:	2 kV, 1 minute	between AC input, output terminals and housing
Insulation resistance:	> 20 MW, 500 V DC	
Vibration resistance:	stable against vibrations with shifting amplitude of 0.3 mm,. 10...55 Hz in 3 axis directions	
Shock resistance:	10 G in 3 axis directions	
Noise immunity:	between AC-terminals: 1 kV (pulse width: 1µs, leading edge pulse time / 1 ms, polarity ±, synchronous to voltage supply, 0°... 360° phase)	
Weight:	2 kg	

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Main unit FC-21-V
Ratings 2
(proper specifications)

Item	Specification
Control input:	1 Start-input; 4 bank change input
Absolute encoder input:	Gray-binary code (10 bit), Connection by the special connector
Resolution:	360; 512; 720 or 1024 positions (DIP switch)
Output ports:	16 or 24 (DIP switch)
Output port RUN:	Output port 24 to control peripherical apparatus (DIP switch)
Number of output ON/OFF:	max. (resolution/2) for every output port
Maximum responding revolutions:	Resolution: 360 512 720 1024 revolutions per minute: 3600 2520 1800 1260 > 3° of interval 2400 1680 1200 840 > 2° of interval 1200 840 600 420 > 1° of interval Min.distance of set points
Maximum number of banks:	Number of programs / Revolutions / Number of output ports 10 / 360 / 16 7 / 360 / 24 7 / 512 / 16 4 / 512 / 24 5 / 720 / 16 3 / 720 / 24 3 / 1024 / 16 2 / 1024 / 24
Switching direction (clockwise and counterclockwise):	clockwise: increase of the current value by the clockwise rotation when the encoder is observed form the shaft side. Counterclockwise; increase of the current value by the counterclockwise rotation when the encoder is observed form the shaft side (DIP switch changing 1)
Write protection:	ON: inhibition of program writing, correction, and deletion (DIP switch changing 6)
Value of zero point compensation:	Possible to compensate for whole range: 0...(resolution - 1)
Storage memory:	EEPROM
Display set points	Programmer: 16 LEDs (changing from 1...16 and 17...24) Haupteinheit: 24 LED
Display bank: Display position:	7-segment display LED 4-digit 7-segment display LED Height of character Programmer: 8 mm Main unit: 14,2 mm

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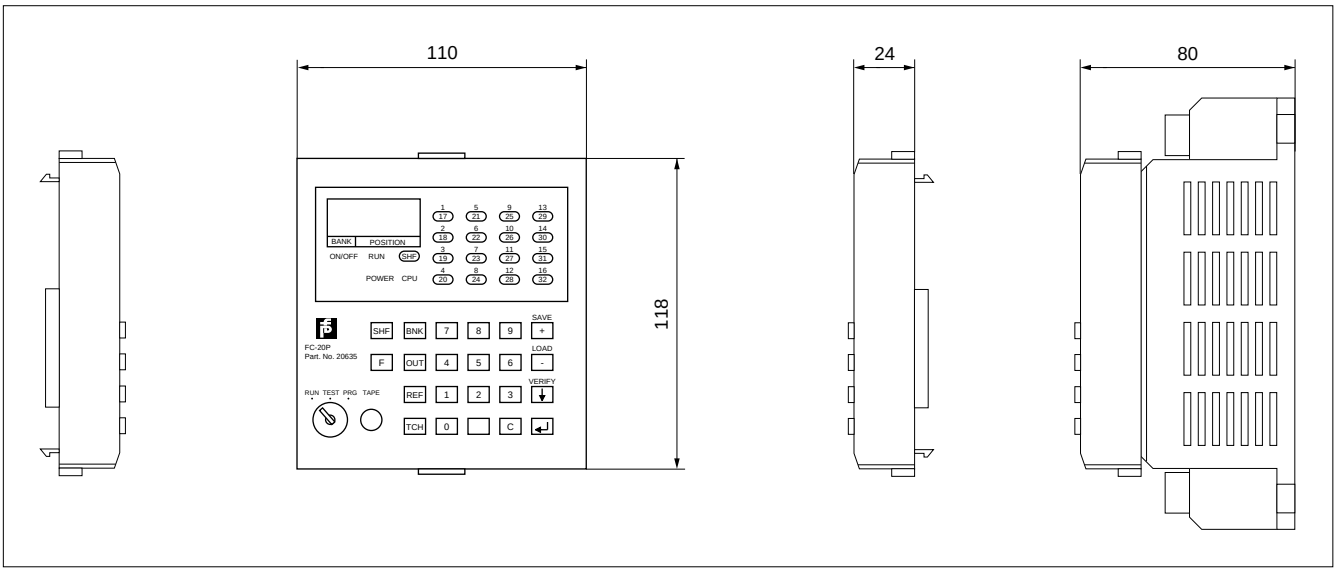
Programmer FC-20P



Accessories:

Connecting cable for cassette data recorder C-08J
2 keys form program selection switch

Installation:

Connecting and removing programmer - see page 26

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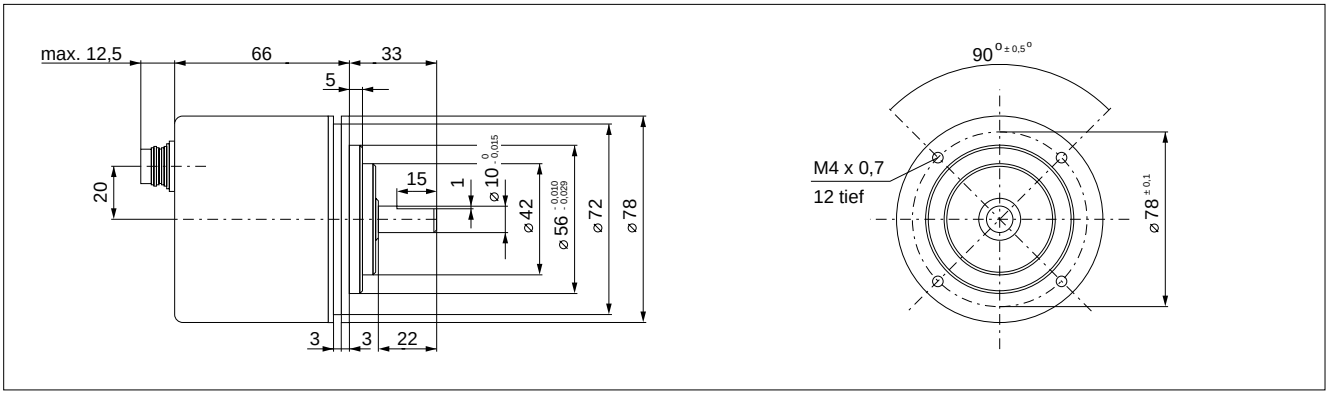
Absolute encoder **TRD-AK360-GC**
TRD-AK512-GC
TRD-AK720-GC
TRD-AK1024-GC

(corresponding to resolutions of 360, 512, 720 or 1024 positions)



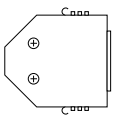
Accessories:

Servo mounting support, hexagon socket head bolts

Operation:

The absolute encoder shaft is supported by precision ball bearings. Do not apply a load exceeding the allowable limit (radial load 100 N, thrust load 50 N). The excess load will seriously reduce the service life of the shaft.

Plug MR16-L connecting cable between main unit FC-21-V and absolute encoder



Connecting cable (complete) between absolute encoder and main unit FC-21-V is an optional accessory and can be ordered - see page 21.

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Absolute encoder
Ratings

Item	Rating
Starting torque:	4 N cm (20°C)
Shaft inertia moment:	1 N cm^2
Allowable shaft load:	Radial: 100 N; Thrust: 50 N
Allowable number of maximum rotations:	5000 rpm
Connection:	Connector (Fabr. BINDER, Serie 723, 12 pol.)
Weight:	Approx. 0.7 kg
Operation temperature range:	-10 °C...+50 °C
Withstanding humidity:	35%...85% (No condensing)
Storing temperature:	-25 °C...+80 °C
Dielectric strength:	500 V AC, 50/60 Hz, 1 min. (between the whole terminal and the housing)
Insulation resistance:	More than 10 MΩ (at 500 V AC)
Vibration resistance:	Displacement amplitude: 0.75 mm, 10...55 Hz for 3 axis directions
Shock resistance:	100 G, 11 ms for 3 axis directions
Preventive construction:	IEC-standard IP65

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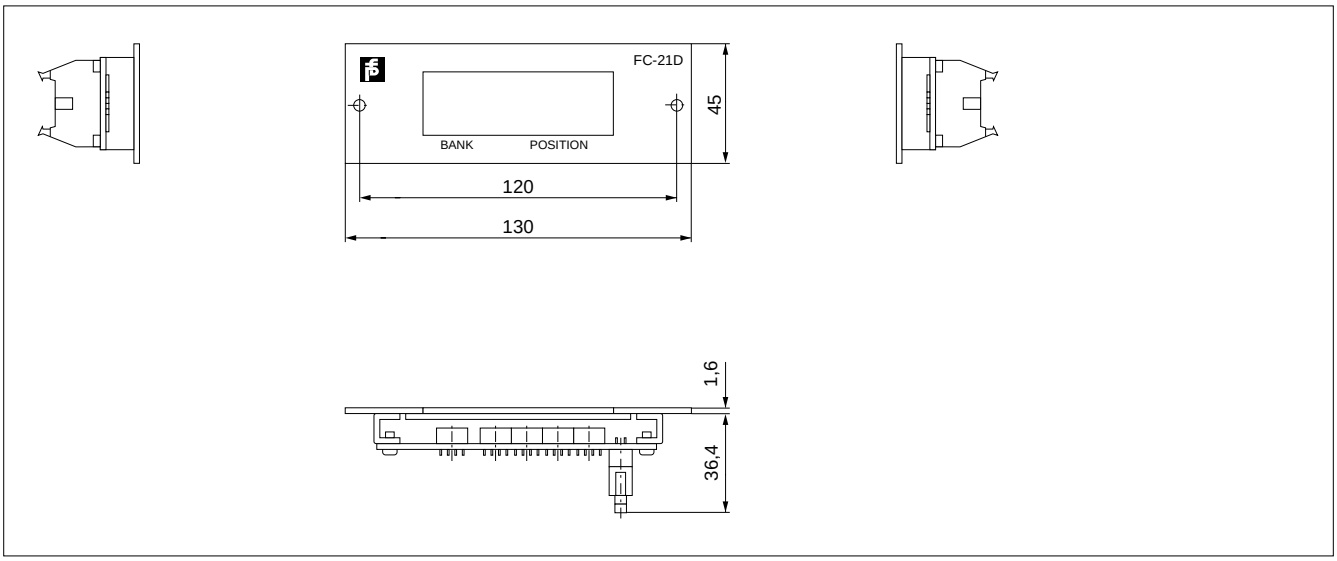
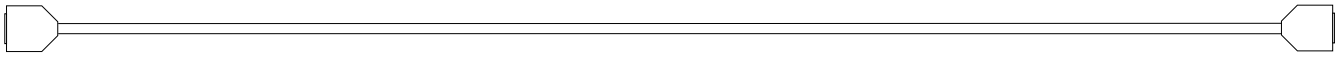
System-extensions

External display unit FC-21D



Accessory:
Connecting cable with standard length 2 m, max. 10 m



Item	Rating
Operating temperature range:	0°C...+50°C
Withstanding humidity:	45%...85% (No condensing)
Storing temperature:	-10°C...+70°C
Vibration resistance:	Displacement amplitude 0.3 mm, 10...55 Hz for 3 axis directions
Shock resistance:	10 G for 3 axis directions
Weight:	0.2 kg
Functions:	Bank and position display Red LEDs, Letter height: 14.2 mm

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Connecting cable E-15PJ for programmer

Length: 1.5 m

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Cassette data recorder

Use a commercial cassette data recorder for a personal computer, capable of adjusting the recording level.
Radio-cassette recorders are mostly not suitable as the recording level is not compatible

Item	Rating
Recording terminal:	Microphone input
Reproduction terminal:	Earphone output: Output power 300 mW min. / 4...16Ω
Frequency characteristic:	300 Hz...4000 Hz ± 6 dB
Transfer rate:	830 baud
Modulation method:	FSK „1": 2 kHz / „0": 1 kHz
Head mark/End mark	2 kHz
File No.:	0...999 as desired

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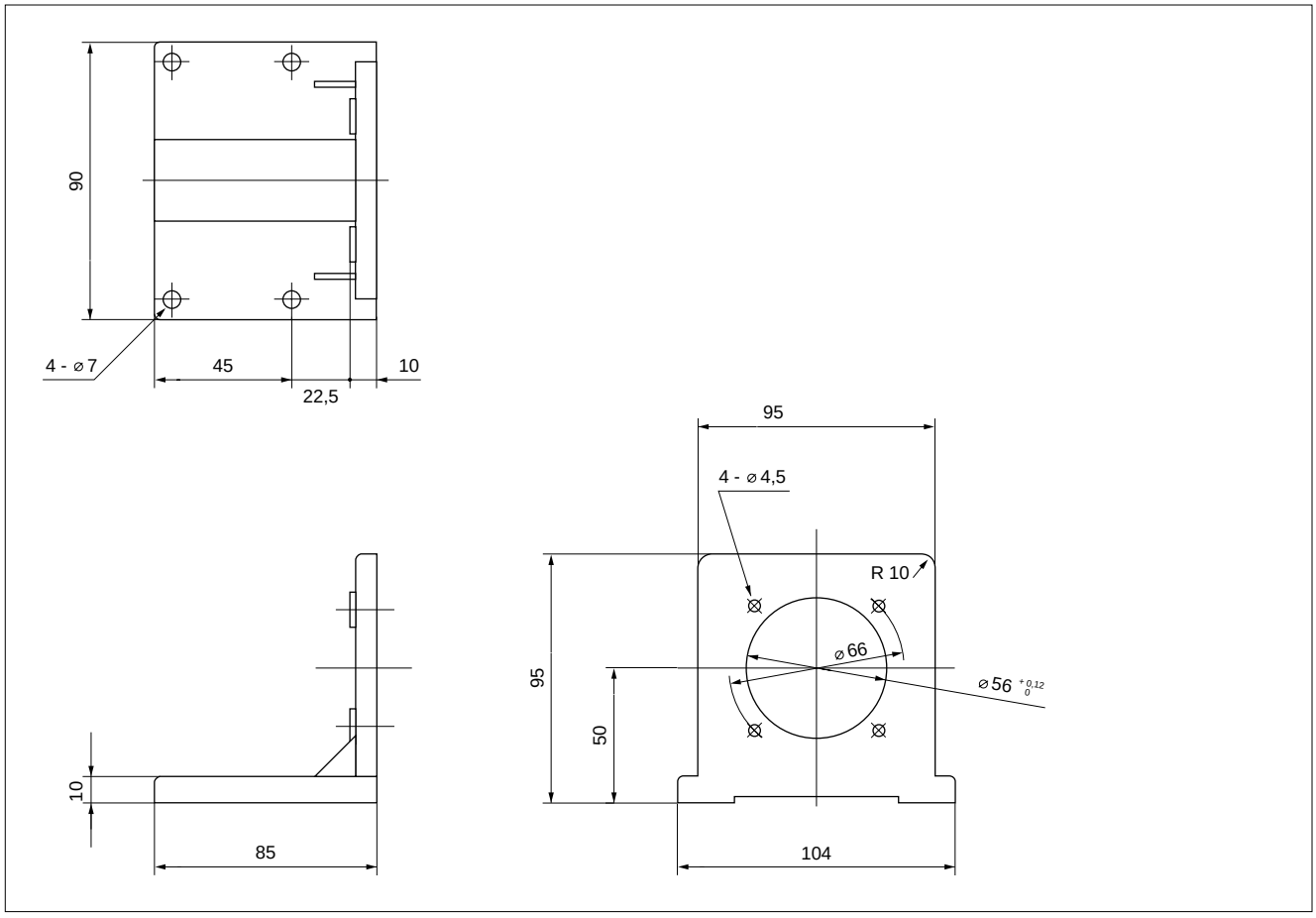
Mounting support RT11 for absolute encoder



Accessory screw:

Bolt with the hexagonal screw hole on the head
M6x20(4ea)

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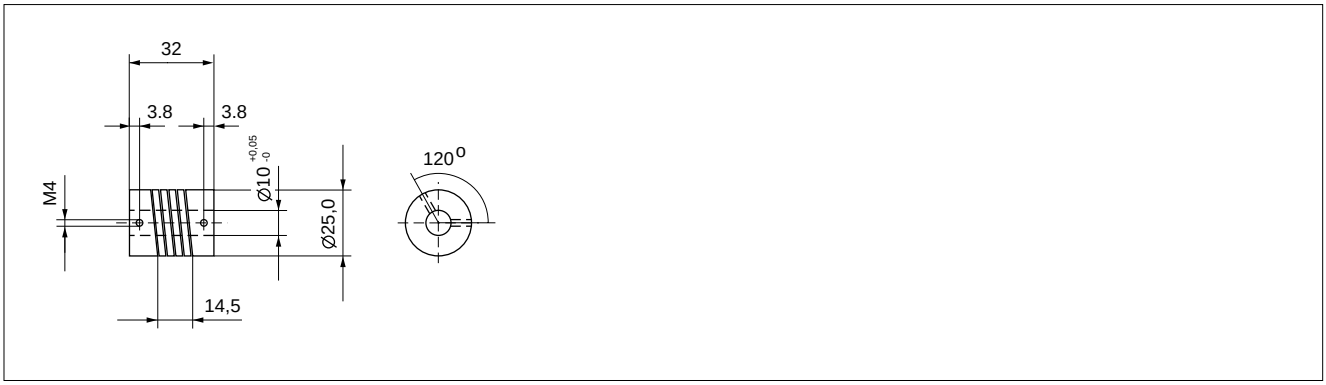
Coupling RU-03 for absolute encoder



Material: Aluminum
Weight: 35g

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Connecting cable for absolute encoder

Binder-Serie 723 12-pol (straight or right angle plug)
Cable 12-conductor + shield, max. length 30 m, cross section 0.25 mm^2,
Order plug and cable separately

Plug MR16-L is delivered (without cable) as an accessory to the FC-21-V

Pin assignment

Connection	Function	Colour of wire
A	+ 12 V DC	red
B	2^0	brown
C	2^1	orange
D	2^2	yellow
E	2^3	green
F	2^4	dark-blue
G	2^5	violet
H	2^6	grey
J	2^7	white
K	2^8	pink
L	2^9	light-blue
M	0 V DC	black

Shield is not connected

Pin assignment

Connection	Function	Colour of wire
1	2^5	violet
2	2^4	dark-blue
3	2^3	green
4	2^2	yellow
5	2^1	orange
6	2^0	brown
7	2^9	light-blue
8	2^8	pink
9	2^7	white
10	2^6	grey
11	free	-
12	+ 12 V DC	red
13	free	-
14	free	-
15	0 V DC	black
16	Shield	-

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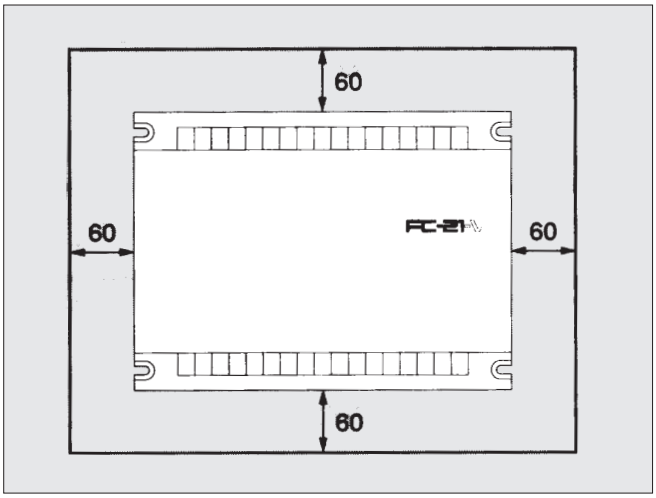
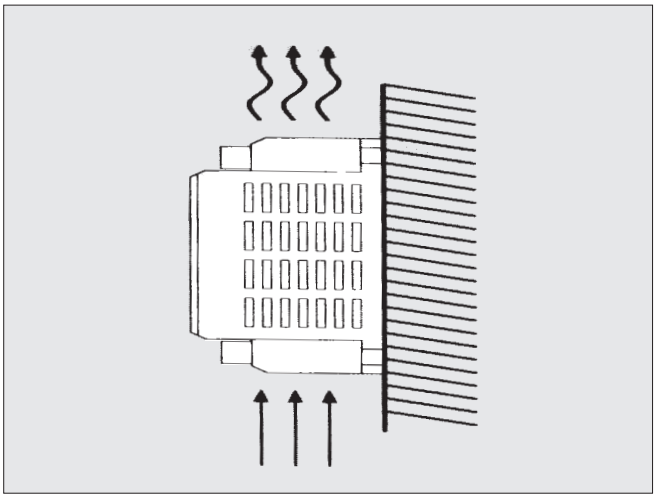
Installation

Mechanical mounting of main unit FC-21-V

1. Provide a space of at least 60 mm around the cam switch for ventilation and maintenance.



2. Install the main unit on a vertical wall as illustrated on the opposite side for dissipating heat effectively.
   The side panels of the main unit and extension base are provided with vents for releasing generated heat.



3. Avoid installing the main unit in the following places:
- where panel temperature exceeds the range of 0°C...50°C
- where ambient humidity exceeds 90% or moisture condenses because of rapid temperature change.
- where there is a considerable amount of dust, iron particles, or corrossive gases.
- where the main unit is exposed to the direct sunlight.

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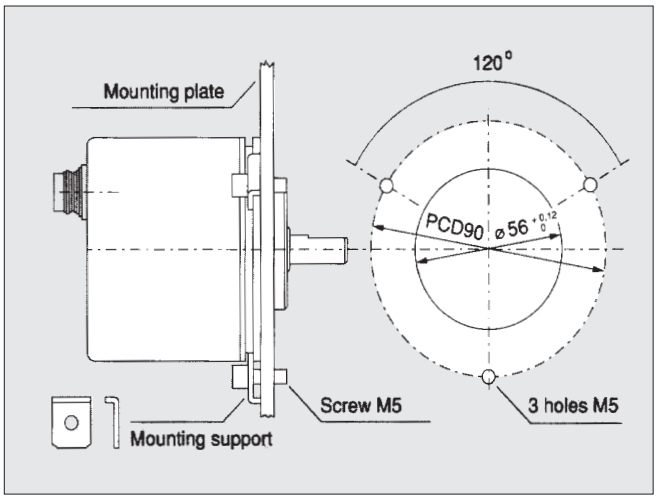
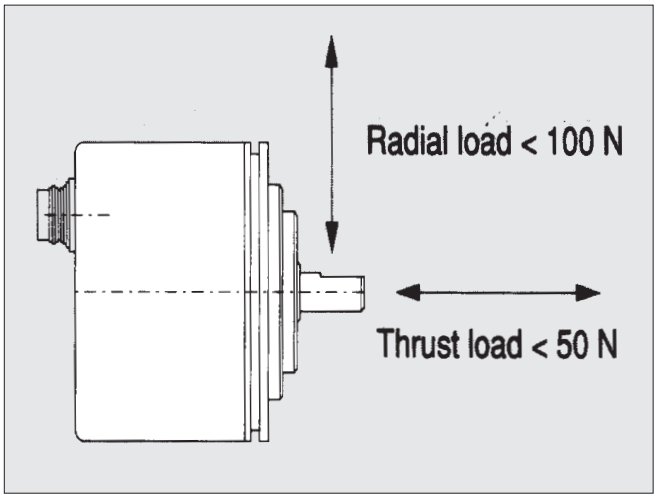
Mechanical mounting of absolute encoder TRD-AK...-GC

1. Install absolute encoder to a mounting plate - see illustration or use the mounting support RT11 (optional available)



2. Pay attention to maximum shaft load.

Loads which exceed the allowable limits lead to decrease in accuracy and service life.



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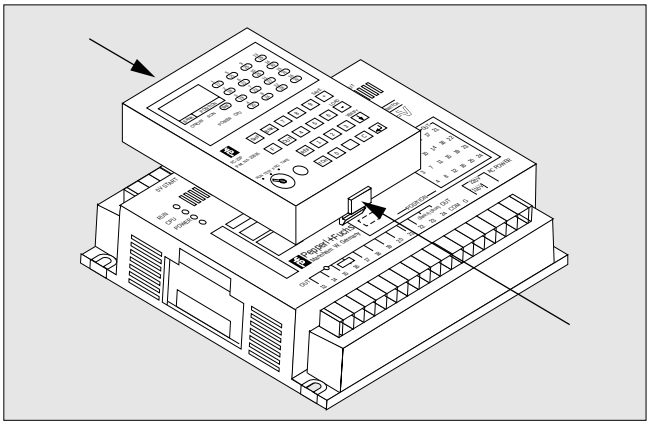
Mechanical mounting of programmer FC-20P

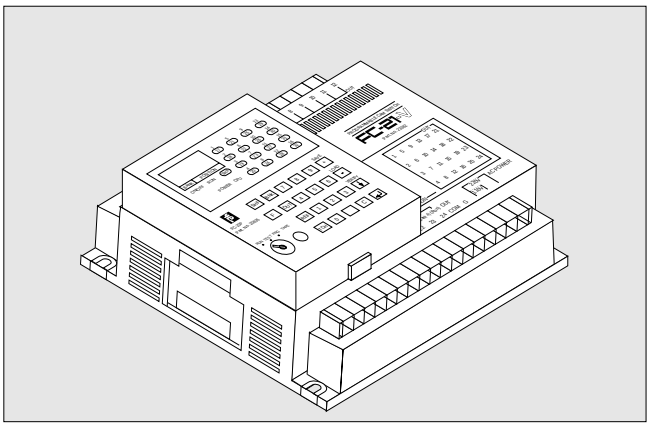
1. Mount programmer
- Switch key switch to RUN or TEST*
- Match the hook on the programmer to the opening in the main unit.
- Rock the programmer lightly up and down to connect it

It is also possible to connect programmer to main unit using connecting cable E-15PJ

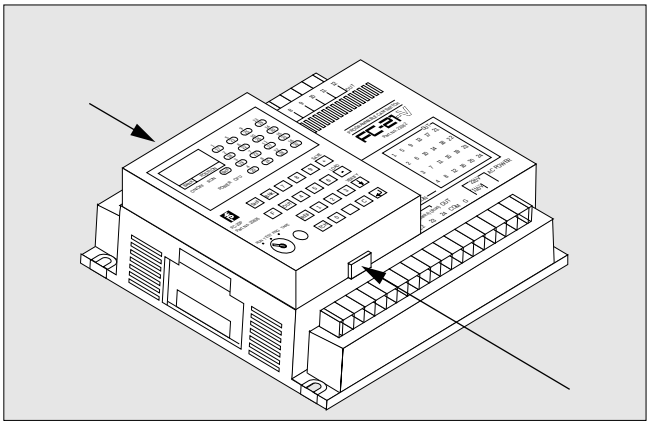
* If key switch is switched to PRG, main unit switches to PRG.



2. Pay attention to the following operation conditions:
- Control operation mode of main unit with key switch of programmer
- The choosen operation mode is stored, also if the programmer is removed.
- If voltage supply is switched off and then on, the main unit is in RUN-mode.



3. Remove programmer
- At the end of programming switch key to RUN.
- If LED RUN at programmer lights up, remove programmer (press both keys on the programmer side panel)
- If LED RUN at programmer is dark, remove programmer, switch off and then on voltage supply.



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Carry out electrical installation like this:

Find the block diagram of the main unit FC-21-V on page 28..
Find specifications of terminals on page 29.
Realize all electrical circuits outside the frame »FC-21-V« yourself.

Install electrical cable like this:

Lay the input, output, and power supply cables in isolation from eath other.
Ensure that they do not pass over the main unit.
Isolate also the connection cables of the external display unit and the absolute encoder from the power cables and the power supply cables.

Connect voltage supply to FC-21-V like this:

Connect a filter to the power supply line if there are many induction loads such as motors and AC solenoids which may generate considerable interference.
Connect terminal 31 (G) to earth.
Use terminals 31, 32 and 34 for 220 V supply.
Use terminals 31, 32 and 33 for 110 V supply.
No particular precautions against interference from the power supply is required.

Connect absolute encoder like this:

Lay the absolute encoder connection cable separately from power cables such as the motor and clutch cables.
Ground the absolute encoder to the earth.
Connect absolute encoder and main unit with a cable with a nominal cross section area of 2.5 mm^2.

Connect the shield of the abolute encoder cable to 0 V terminal of the FC-21-V since the shield wire is not connected to the grounding circuit or the housing of the absolute encoder.

Connect power source voltage to input and output terminals:

Terminal 1 (0 V) to 0 V DC
Terminal 30 (OUT COM) to +24 V DC
of an external supply.

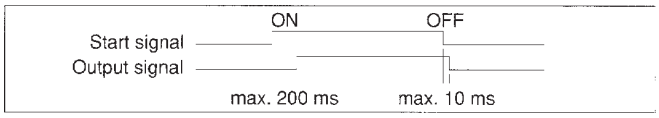
Pay attention to the following interrelationships:

Absolute encoder:

Set points depend on rotation direction

Start signal:

If start signal is switched off (terminal 2: 0 V DC) all output terminals are closed.
If start signal is switched on (terminal 2: +24 V DC), the main unit will run the selected program depending on the position returned from the absolute encoder.
Switch off voltage supply and start signal to change program.

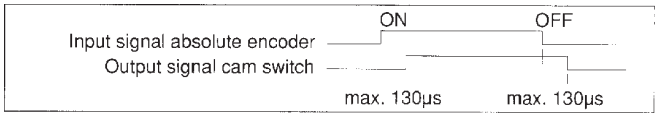


Signal for program selection:

The signal for program selection (terminal 3...5 and 28) must be given 10 ms before start signal.
Choose your program as written on page 33.

Output ON/OFF terminals:

The number of output ports (16 or 24) is selected with DIP switch 4 - see page 36.
The time delay between input signal from absolute encoder and switching off outputs is max. 130 µs.



RUN output port (terminal 24):

Use RUN-signal to control peripherical apparatus.
Therefore switch DIP switch 5 to ON.
The maximum number of output ports is then 23.
The RUN output port is switch to ON only for nomal operation (ON for operation mode PRG, TEST and RUN), otherwise it is switched to OFF (OFF for CPU faulty, changing storage and voltage decrease).
The time delay between switching from PRG to RUN (or TEST) and switching on peripherical apparatus is max. 35 ms.

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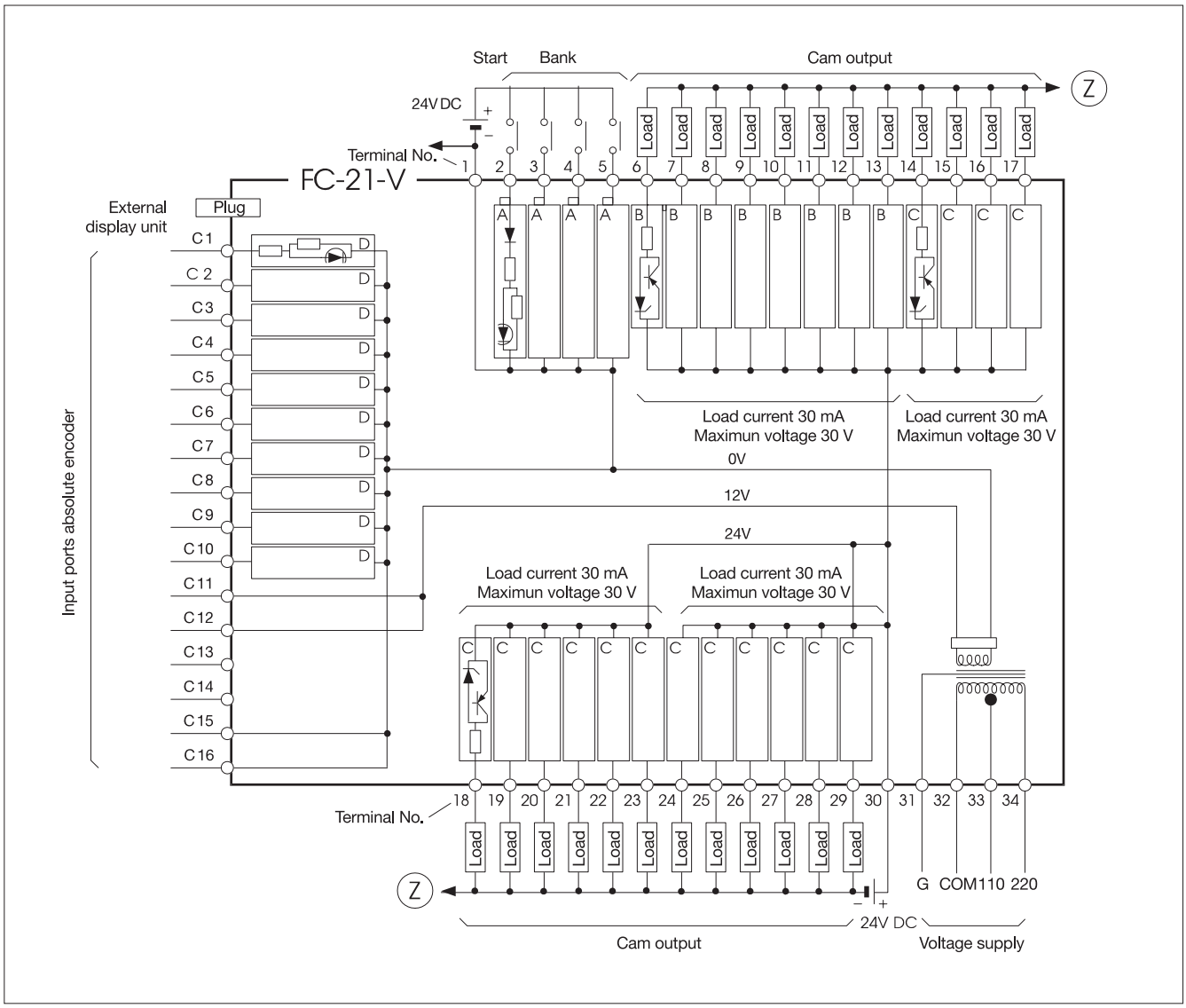
Block diagram
Input and output ports
of cam switch FC-21-V



24 V DC = EXTERNAL voltage supply!

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Specifications terminals

Terminal No.	Symbol	Description
1	0 V	Negative common terminal of each input and output
2	START	Switching this terminal to +24 V the selected pattern (terminal 3...5, 28) is started and the cam outputs are open ON: 16...30 V, 12 mA max OFF: 0...6 V, 2 mA max
3 4 5	Bank 1 = 1 (BCD) Bank 2 = 2 (BCD) Bank 3 = 4 (BCD)	Terminals for program selection: BCD-coded ON: 16...30 V, 12 mA max OFF: 0...6 V, 2 mA max
6...29	OUT 1...OUT 24	Output ports: PNP - open collector U_{max}: U_B - 3 V; I_{max}: 30 mA short circuit-proof
28	OUT 23 or Bank 4 = 8 (BCD)	Output terminal 23 or bank 4 = 8 BCD for program selection with resolution - 360 and if only 16 ouput ports are selected. (DIP switch 4 to ON)
29	OUT 24 or RUN	Output terminal 24, if DIP switch 5 is set to OFF, otherwise RUN-output to control peripherical apparatus.
30	OUT COM	Power supply for output ports + 24 V DC (U_B) 30 V max
31	G	Earth: Grounding terminal of chassis and trans-shield
32	N	In circuit with terminal 33 or 34
33	110 V (L)	Connecting with terminal 32: voltage supply 110 V AC
34	220 V (L)	Connecting with terminal 32: voltage supply 220 V AC
C1...C10	2^0...2^9	Input signals of absolute encoder: ON: 10...13.8 V, 3 mA OFF: 0...2 V, 1 mA max
C11, C12 C15, C16	+ 12 V 0 V	Voltage supply of absolute encoder: 10.8...13.2 V DC; 70 mA max

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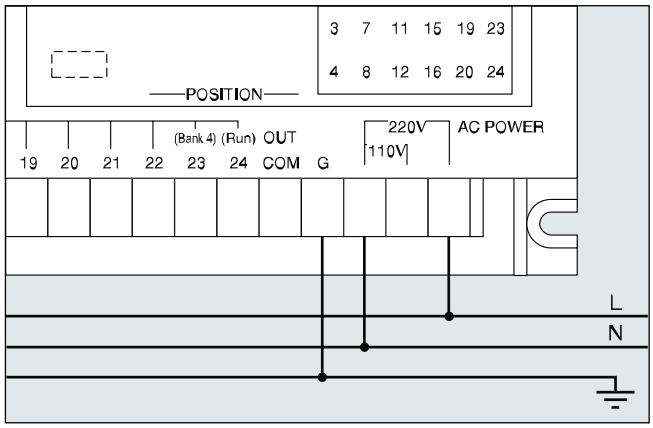
Operation

Starting FC-21-V

1. Switch on voltage supply

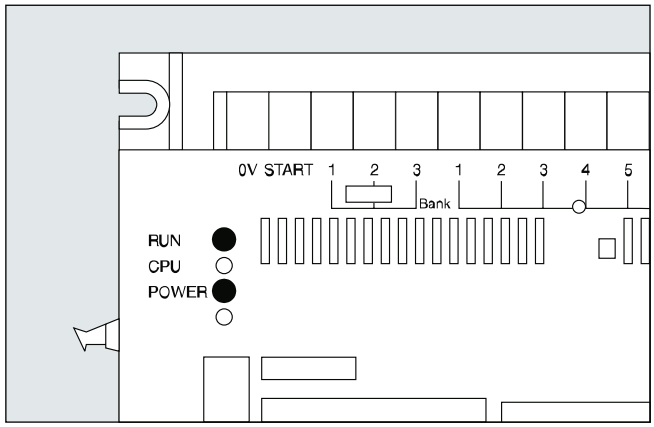
Voltage supply is switched on by:
(Write down here how to do this with your apparatus, e.g. switch on main switch of switch cupboard)



2. Check for correct operation mode

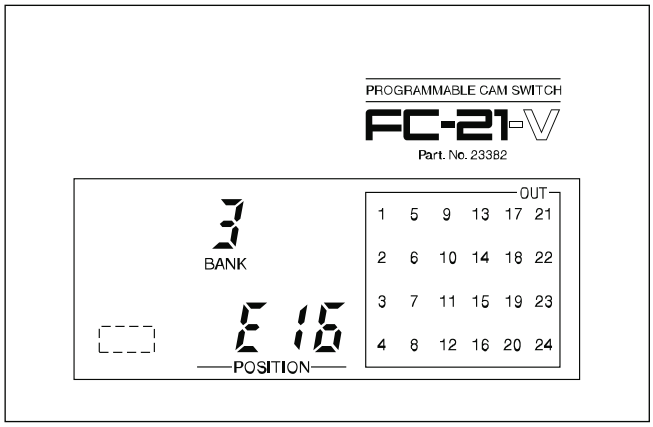
The FC-21-V operates correctly, if
- both LEDs RUN and POWER light up
- program number lights up on BANK
- position number lights up on POSITION

If LEDs RUN or POWER are dark
- go to trouble detection - page 59



3. Clear errors (if E... is displayed)

If an error is displayed on POSITION (e.g. here E16):
- go to trouble detection - page 60



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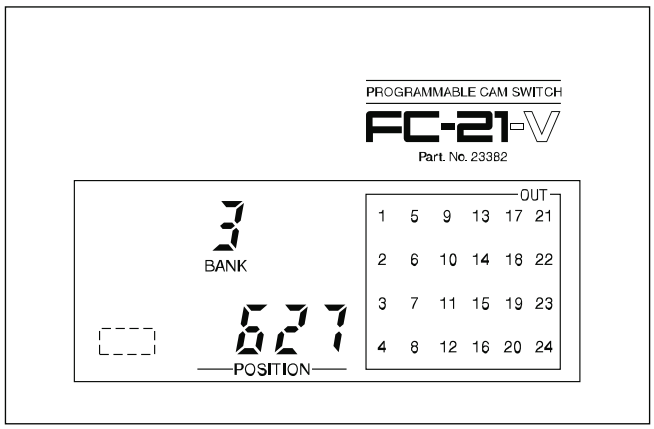
Changing program

4. Change program

If you like to run another program, but not the displayed one, change program like this:
- Select another program from the EEPROM - see step 5.
- Read another program from cassette - see page 52
- Write a new program - see page 42 and 43



5. Select another program from the EEPROM

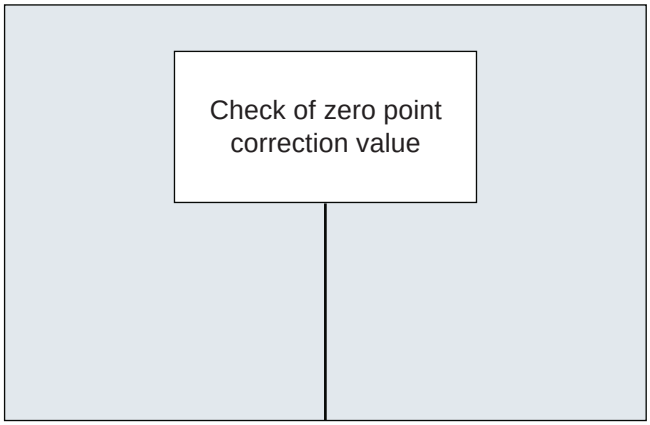
Look into your application form to know the program number.
Switch off voltage supply or start signal (terminal 2 = OFF)
Switch terminal 3...5 and 28 (BANK 1...4) according to the opposite chart (Write down here the position of an optional switch, if mounted)

Switch on voltage supply

Number of program	Inputs for program selection			
	BANK 1 Terminal 3	BANK 2 Terminal 4	BANK 3 Terminal 5	BANK 4 Terminal 28
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON

6. Check program

You can check following parts of the program:
- Value of zero point compensation - see page 44
- Set points of cam circuits - see page 46 and 47



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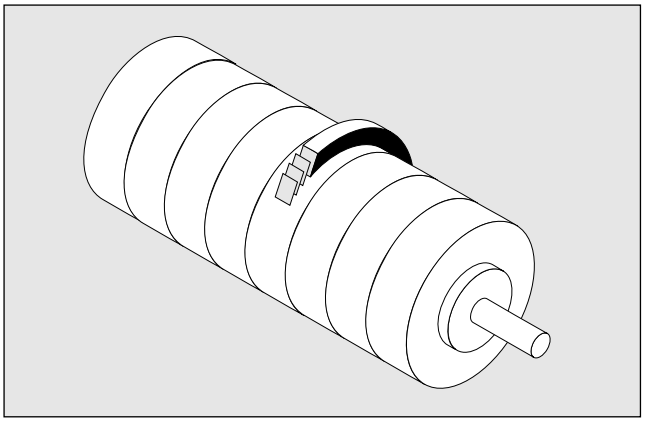
Adjusting cams

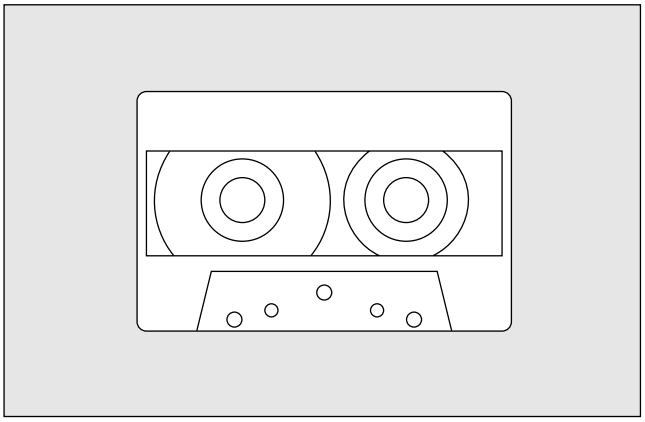
7. Adjust set points

You can change set points of every cam circuit:
- during operation mode - see page 50
- with machine position during writing by teaching method
- see page 43



8. Save program on cassette

You can save the memory of the EEPROM to a commercial cassette
- Write to tape (SAVE) - see page 51



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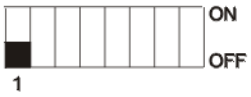
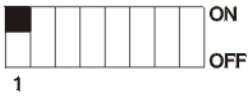
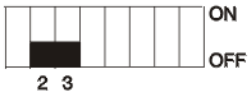
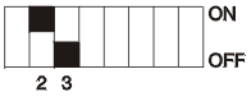
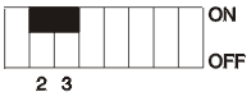
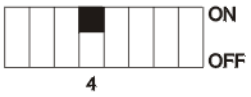
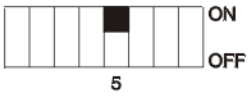
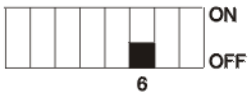
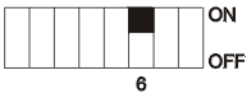
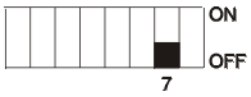
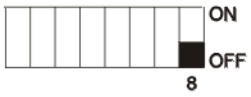
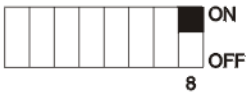
Programming

Set DIP switches

Previously switch off voltage supply!

Rotation direction of absolute encoder	Clockwise 	Counterclockwise 
Resolution of one rotation of the absolute encoder	360 positions 	512 positions 
	720 postions 	1024 positions 
Number of used cam circuits	16 output ports 	24 output ports 
24 cam circuits necessary or control of peripherical apparatus (RUN-output)	24 output ports 	Peripherical apparatus 
Write protection	Protection OFF 	Protection ON 
Using absolute encoder with 720 positions: Programming in steps of 0.5° (0...359.5) or Programming of positions (0...719)	0...719 	0...359.5° 
Reserve (no function)		

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short instruction programming
Switch key at programmer to PRG.
Switch voltage supply.

	Function	Operating procedure	Operating mode RUN	TEST	PRG
1	Select operation mode RUN	Key switch to RUN	●		
2	Select operation mode TEST	Key switch to TEST		●	
3	Select programming mode PRG	Key switch PRG			●
4	Select program	BNK [ ] ↵ Number of program (0...9)	●		●
5	Delete program	C 3 4 8 ↵ All set points will be deleted, but not the zero point correction value			●
6	Delete zero point correction value of one program	REF ↓ ↵			●
7	Delete all programs and all zero pint corrections values	F 9 4 2 ↵ All set points will be deleted, the zero point correction values also			●
8	Display of selected set points for one cam output port	OUT [ ] [ ] ↵ [ ] [ ] [ ] ↓ output port (1...24) Enter position The next position in positive direction close to the entered position will be displayed. If there is no position entered, the first set point will be displayed. If the ↓ - key is pressed continuously, all set points will be displayed	●	●	●
9	Delete set point	Display set point like 8 (either ON- of OFF-position) Then press C ↵ The set point will be deleted			●
10	Programming of a set point	OUT [ ] [ ] ↵ ↓ Output (1...24) [ ] [ ] [ ] ↵ [ ] [ ] [ ] ↵ ON-position OFF-position			●

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Short instruction programming
Switch key at programmer to PRG.
Switch voltage supply.

	Function	Operating procedure	Operation mode RUN	TEST	PRG
11	Change set point	If a set point is displayed like 8, it can be changed with SHF OUT ☐ ☐ ☐ ↵ New set point			●
12	Display of cam output ports status Increase position Decrease position	OUT ↵ ☐ ☐ ☐ ↓ Position (not necessary) Cam output port status of all outputs are displayed for the entered position. If no position is entered, the display starts at zero. Press + - key Press - - key	●	●	●
13	Writing a set point by teaching method	OUT ☐ ☐ ↵ ↓ Output port (1...24) TCH Machine travel ↵ Display instantaneous ON-position TCH Machine travel ↵ Display instantaneous OFF-position Enter more positions			●
14	Enter zero point correction value with keyboard or using teaching method	REF TCH ☐ ☐ ☐ ↵ Enter desired position (not necessary) or drive machine to zero position If no value is entered, zero is written			●
15	Writing set point during operation mode	Display set point like 8 + to increase position by 1 - to decrease position by 1		●	
16	Write all pattern to tape (using a file number)	SHF + ☐ ☐ ☐ ↵ File number (not necessary) All 10 programs including zero point correction values will be stored.			●

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Short instruction programming

Switch key at programmer to PRG.
Switch voltage supply.

	Function	Operating procedure	Operation mode RUN	TEST	PRG
17	Read out of tape (LOAD) (all programs 0...9 of one file)	SHF - ☐☐☐ ↵ File number (not necessary)			●
18	Verify all programs 0...9 of the EEPROM with those on tape	SHF ↓ ☐☐☐ ↵ File number (not necessary)			●
19	Saving, loading and verifying of a single program (0 or 1 or 2 or ... 9) of the EEPROM with one of the tape (like 16, 17, 18, additionally enter program number)	+ / SHF / - / ↓ ☐☐☐ BNK ☐ ↵ File number (not necessary) Program number			●
20	Switch display of POSITION between position and number of revolutions	F 1 ↵ Display position F 2 ↵ Display number of revolutions rpm of the absolute encoder	●	●	●
21	Display program number on programmer display (Using absolute encoder with 1024 positions the display of the program number is on the 4. digit of the position display.)	F BNK Display of program number C Display of position	●	●	●
22	Copy program inside of EEPROM	BNK ☐ ↵ Number of program to be copied F 3 ☐ ↵ Program number for copy Previous program number is displayed			●

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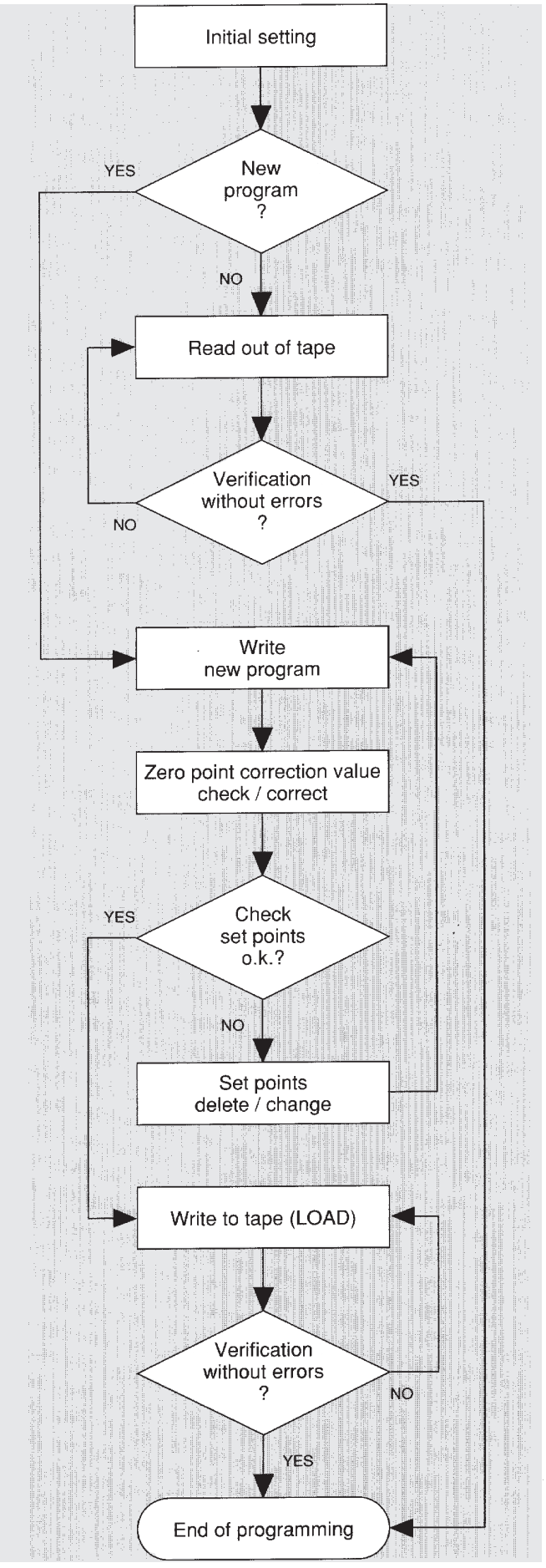

Schema for programming

The steps for programming ON- and OFF-positions are displayed in the opposite flow chart.

Find more details to particular steps on the indicated pages.

Initial setup for preparing of programming
- see page 41

Read program out of tape (LOAD)
- see page 42

Verify program on tape
- see page 54

Writing program by keying in - see page 42
Writing program by teaching method - see page 43

Check zero point correction value - see page 44
Change zero point correction value - see page 45

Display set points - see page 46
Read out of cam output port setting - see page 47

Delete one set point - see page 48
Change one set point - see page 49

Write to tape (SAVE)
- see page 51

Verification with tape
- see page 54

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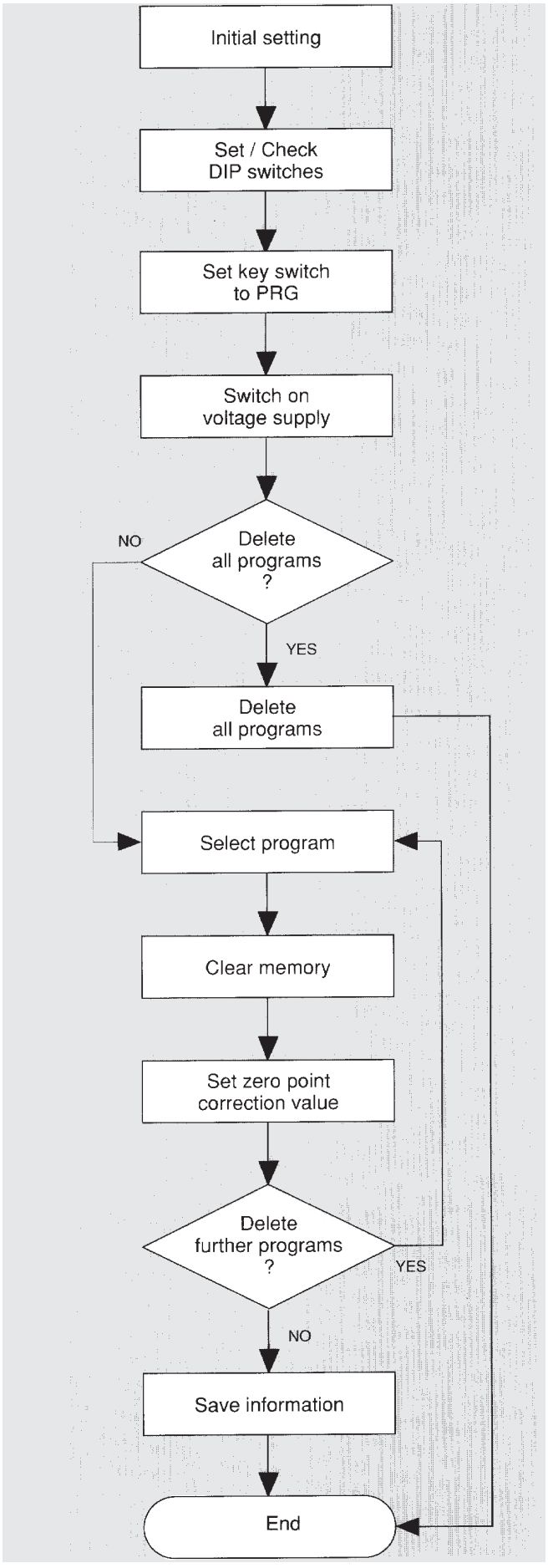


Initial setting

Switch off voltage supply, then set DIP switches
- see page 36

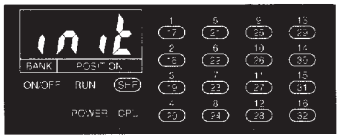
Find more details to the particular steps on the indicated pages

PRG: Cam switch stops RUN-mode
Programming is possible
TEST: Set points are changeable during machine operation
RUN: Cam switch ready for work
programs are not changeable

Every program which should be new programmed, must be cleared previously

Press keys

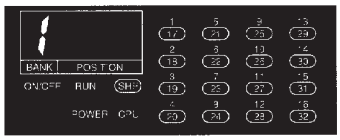
F 9 4 2 ↵



Press keys

BNK 1 ↵

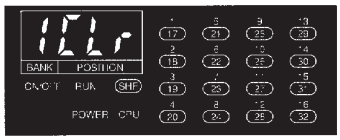
(here e.g. program 1)



Press keys

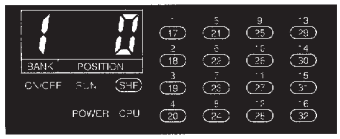
C 3 4 8 ↵

If End is displayed, press C key



Press key

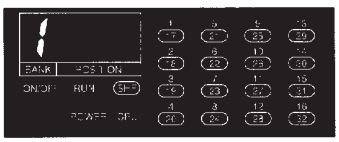
REF TCH 0 ↵



After pressing REF-key the actual angle of the absolute encoder will be displayed.
After pressing TCH-key the programmed angle of the absolute encoder will be displayed.

Press key

BNK 1 ↵



This is to transfer data from RAM to EEPROM
Programs will be saved, if voltage supply is switched off.

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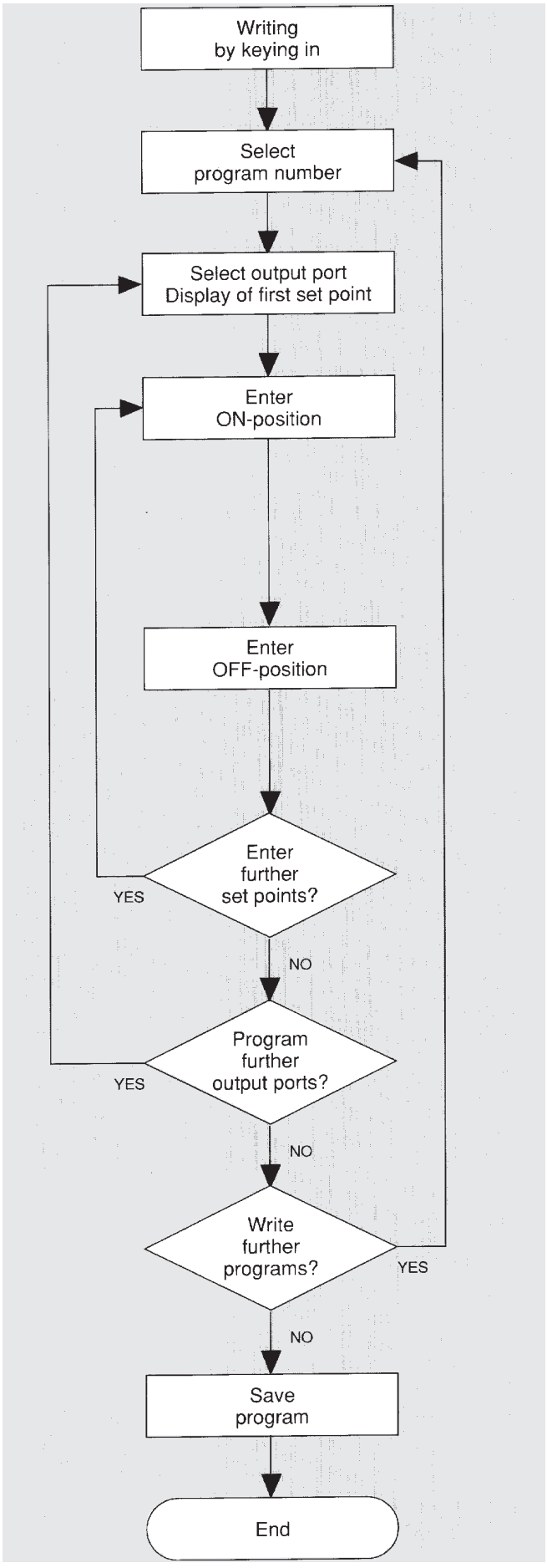
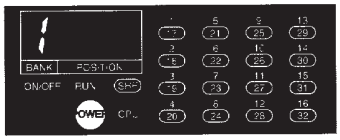


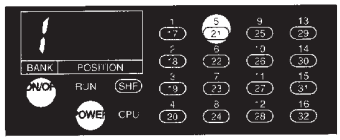
Writing by keying in

Clear old program of program number
- see initial setting page 41

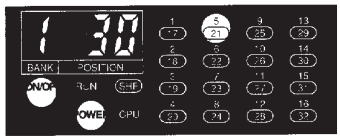
Press keys:
BNK 1 ↵
(here e.g. program 1)



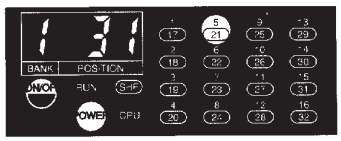
Press keys:
OUT 5 ↵ ↓
(here e.g. output port 5;
no set point existing)



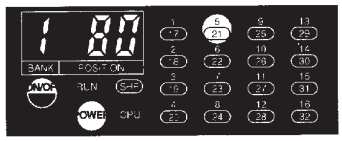
Press keys:
3 0
(here e.g. position 30)



Press key:
←
Increases set point by 1

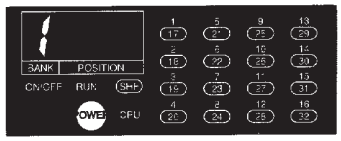


Press keys:
8 0
(here e.g. position 80)



Press key:
↵

Press keys:
BNK 1 ↵



This is to transfer data from RAM to EEPROM.
Programs will be saved, if voltage supply is switched off.

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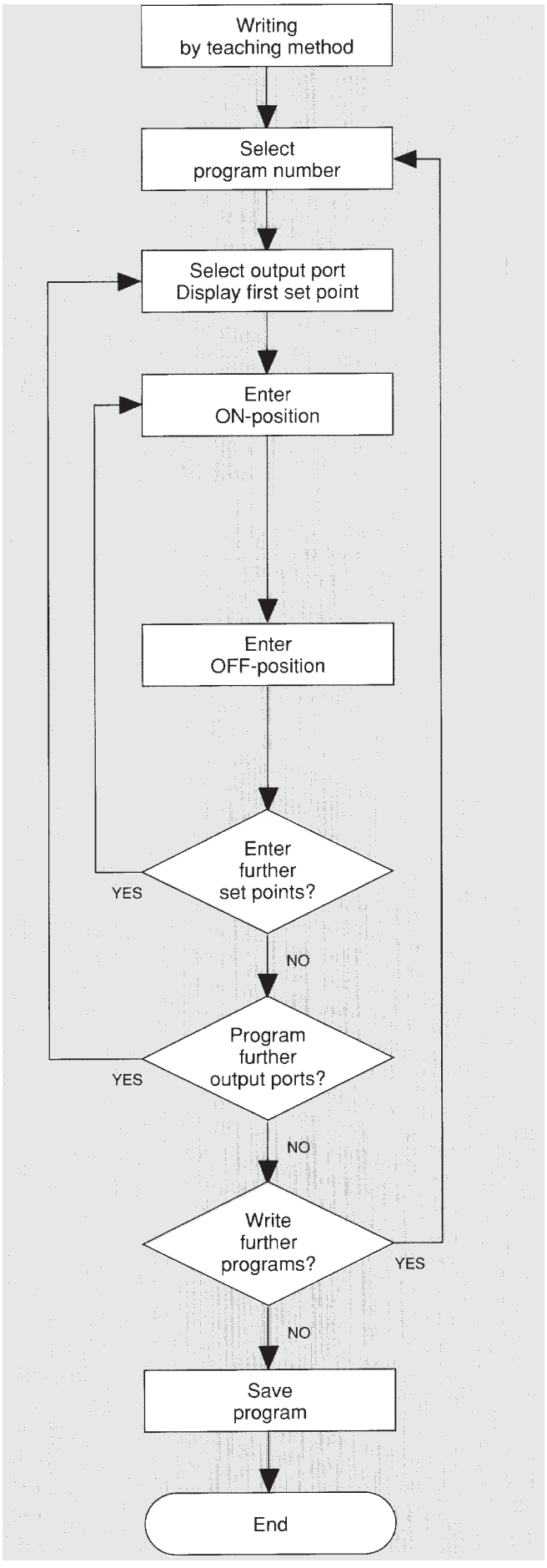


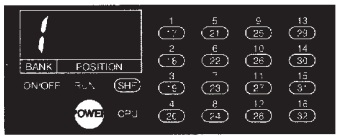
Writing by teaching method

Enter set points using the position of the machine.
Clear old program of program number previously
- see initial setting page 41

Press keys:

BNK | 1 | ↵

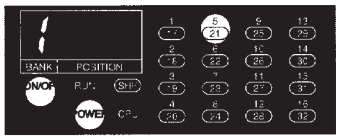
(here e.g. program 1)



Press keys:

OUT | 5 | ↵ | ↓

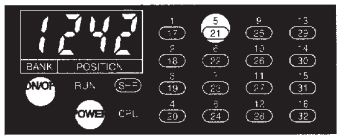
(here e.g. output port 5;
no set point existing)



Press key:

TCH

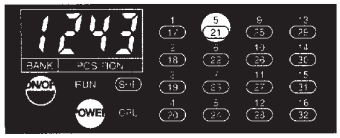
Drive machine to desired position



Press key:

↵

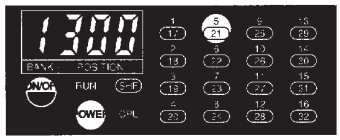
Increases set point by 1



Press key:

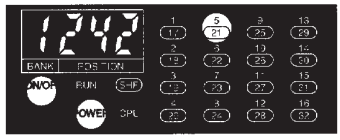
TCH

Drive machine to desired position



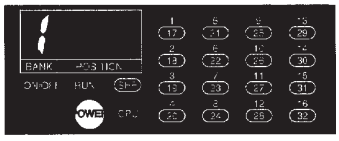
Press key:

↵



Press keys:

BNK | 1 | ↵



This is to transfer data from RAM to EEPROM.
Programs will be saved, if voltage supply is switched off.

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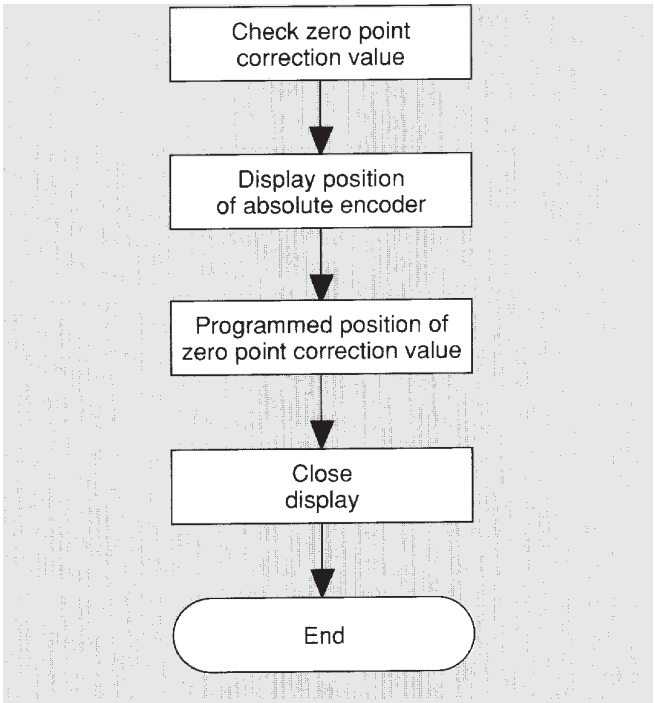


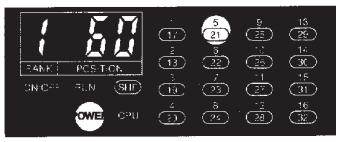
Check zero point correction value

Press key:

REF

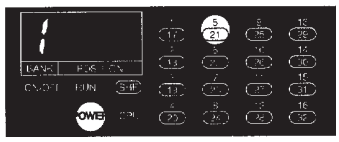
Press key:

TCH



Press key:

C



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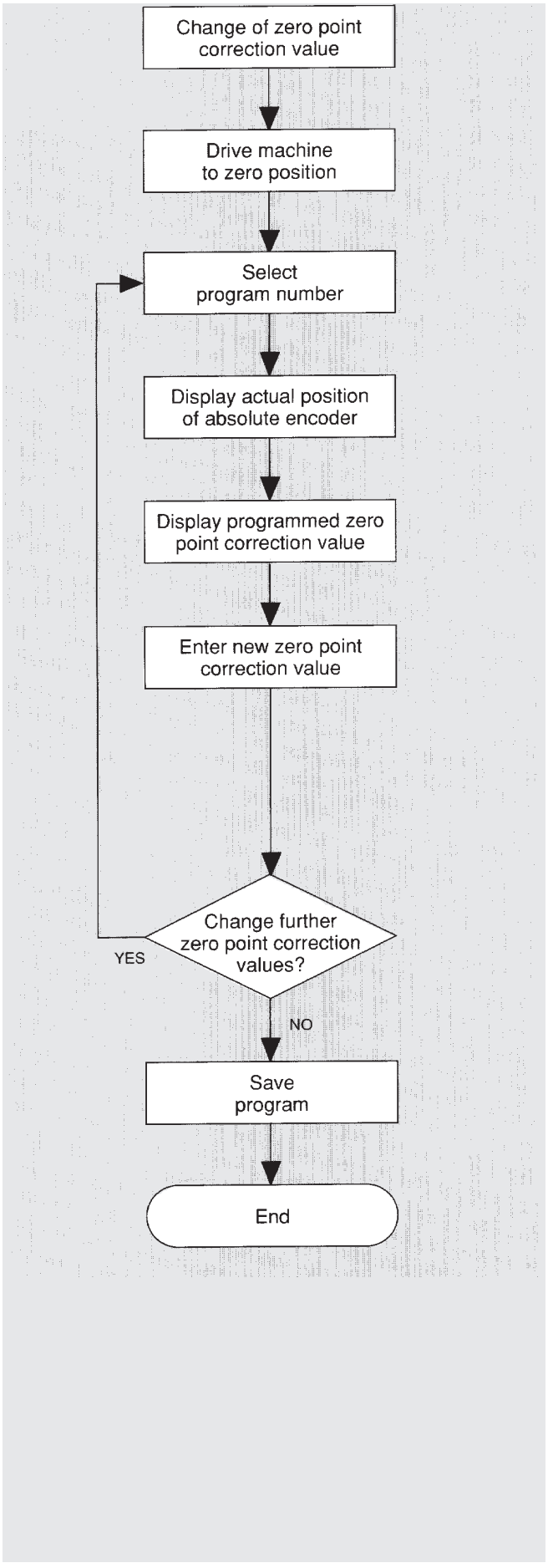
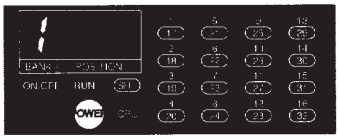
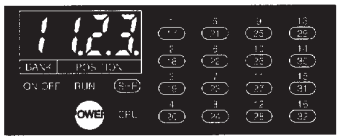


Change zero point correction value

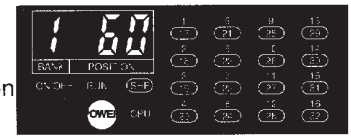
Press keys:
BNK 1 ↵
(here e.g. program 1)



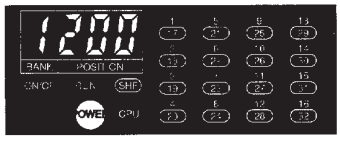
Press key:
REF



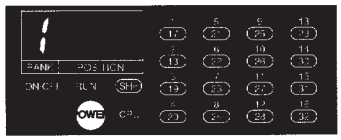
Press key:
TCH
Existing zero point correction value is displayed



Press keys:
2 0 0
(here e.g. position 200)

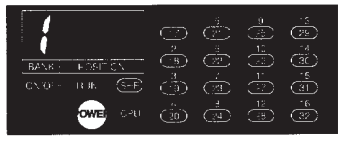


Press key:
↵



The instantaneous position - 123 - of absolute encoder will be changed to - 200 -. If no value is entered, zero point correction value will be set to zero. Enter values between 0 and 360 (512; 720; 1024)

Press keys:
BNK 1 ↵



This is to transfer data from RAM to EEPROM.
Programs will be saved, if voltage supply is switched off.

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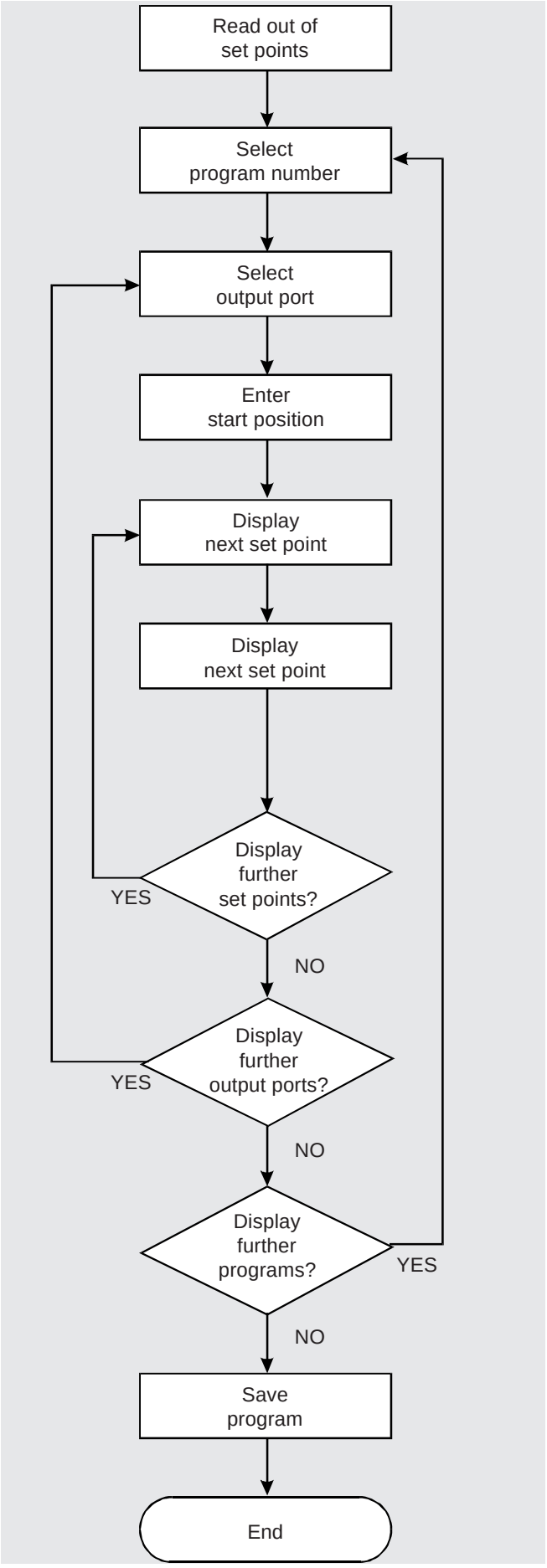


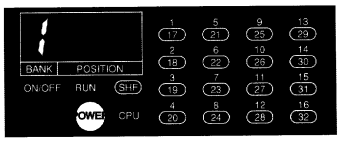
Read out of set points

ON- and OFF-positions of one output port are displayed. In TEST- and RUN-mode the main unit displays only positions of absolute encoder and status of output ports only, if start input signal is set to ON.

Press keys:

BNK 1 ↵

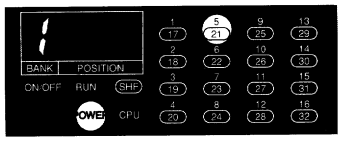
(here e.g. program 1)



Press keys:

OUT 5 ↵

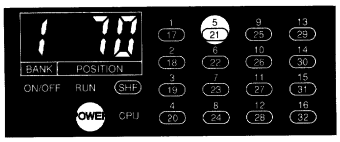
(here e.g. output port 5)



Press keys:

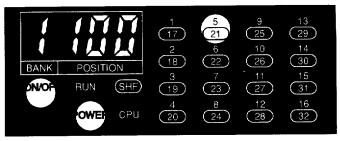
7 0

(here e.g. position 70)



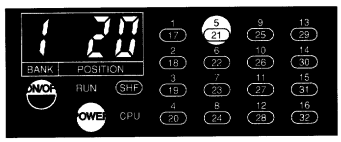
Press key:

↓



Press key:

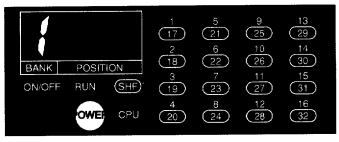
↓



The set point close to the entered start position will be displayed. If no start position is entered, the first ON-position in positive direction will be displayed.

Press keys:

C



In TEST- and RUN-mode only the programmer will display the actual data.

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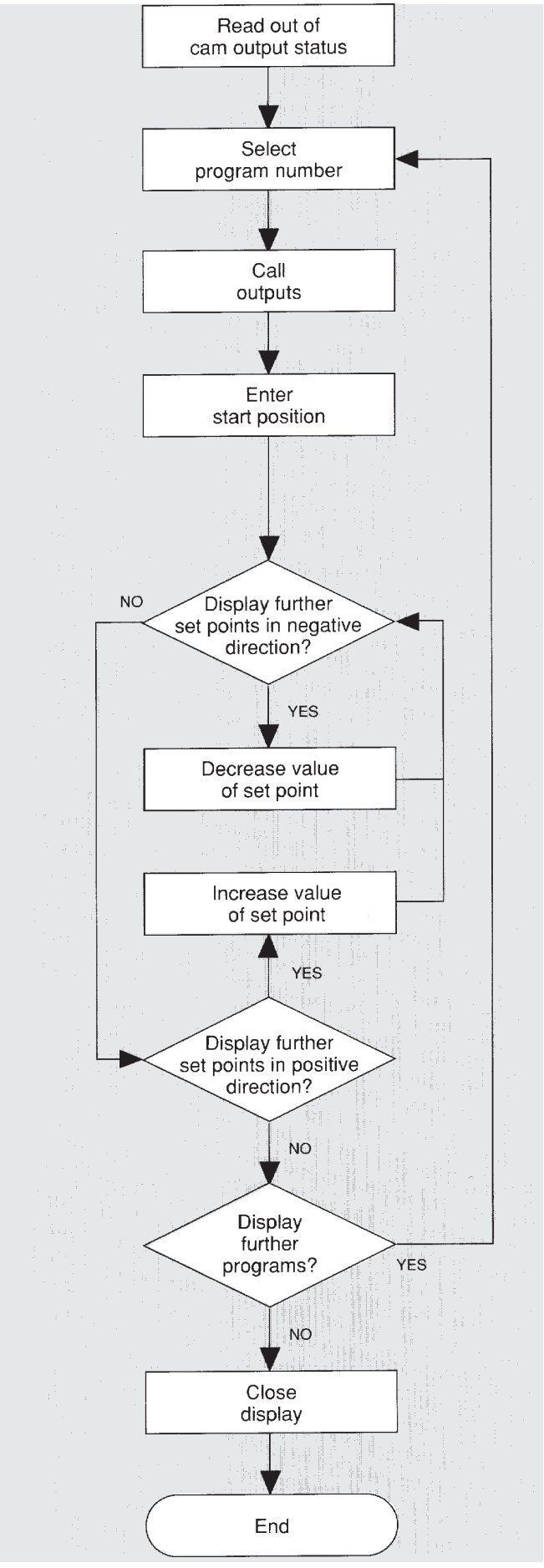


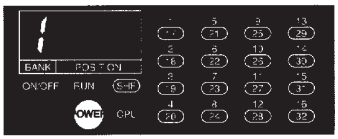
Read out of cam output status

ON- and OFF-positions of all output ports are displayed. In TEST-mode programs can only be called using external input terminals for program selection.

Press keys:

BNK 1 ↵

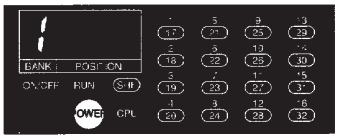
(here e.g. program 1)



Press keys:

OUT ↵

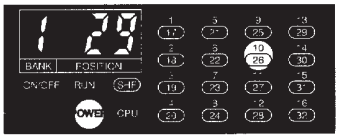
Status of all output ports are displayed



Press keys:

2 9 ↓

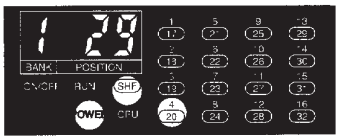
(here e.g. position 29)



Press key:

SHF

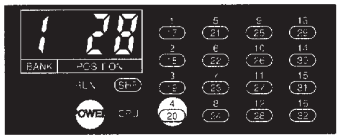
to display output port with number greater than 16



The programmer only displays output port with number 1...16, after pressing the SHF-key the output ports with number 17...24 will be displayed. On the main unit all output ports are displayed.

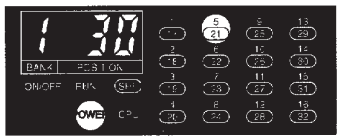
Press key:

-



Press key:

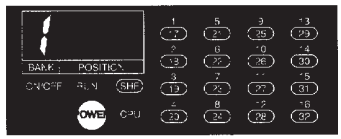
+



Pressing + or - key will change position by 1 and all status of output ports will be displayed for this position.

Press key:

C



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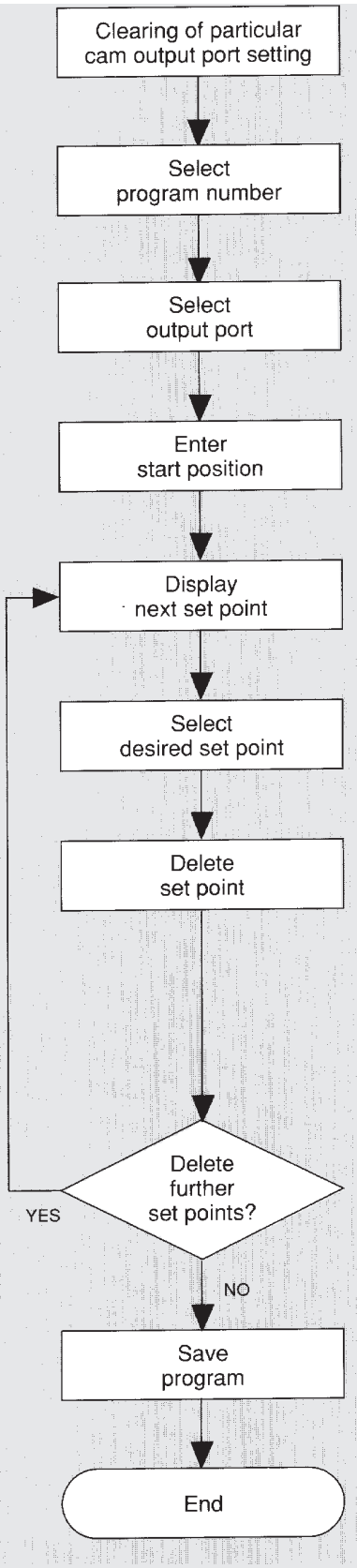
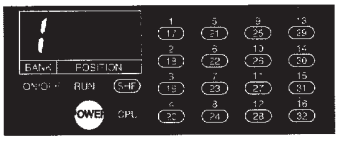
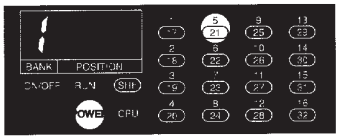


Clearing of particular cam output port setting

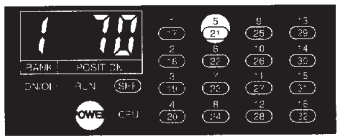
Press keys:
BNK 1 ↵
(here e.g. program 1)



Press keys:
OUT 5 ↵
(here e.g. output port 5)

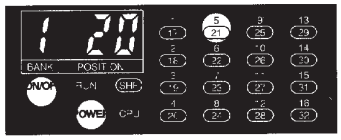


Press keys:
7 0
(here e.g. position 70)

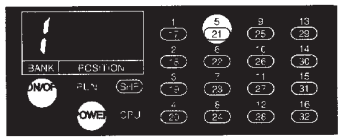


Press key:
↓

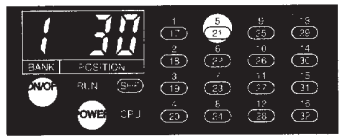
Press key:
↓
Press key quite often, up to desired position is displayed



Press key:
C

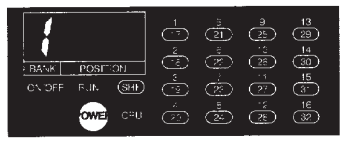


Press key:
↵



The ON- and OFF-position will be cleared and the next ON-position will be displayed.

Press keys:
BNK 1 ↵



This is to transfer the new program from RAM to EEPROM.

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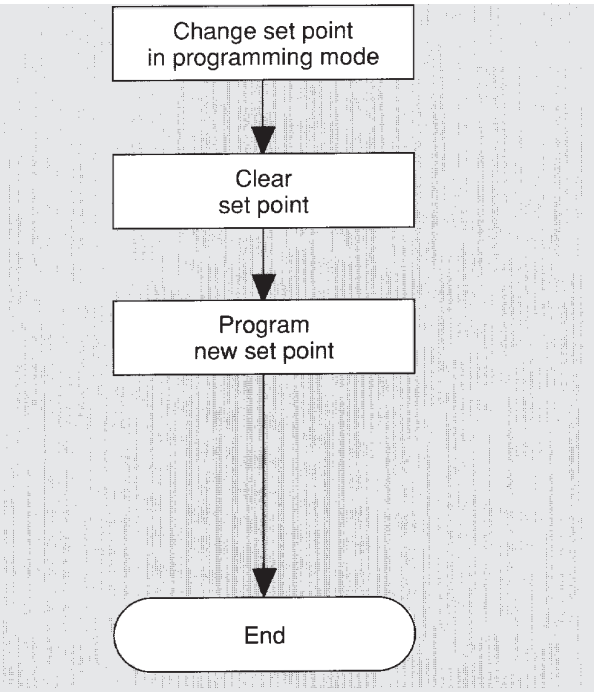
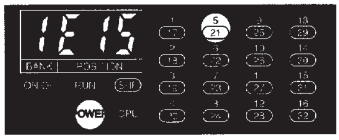


Change set point in programming mode

Change set point:
Clear existing set point
- see Clearing of particular cam output setting page 48

Writing of a set point:
- see writing by keying in - page 52
- see writing by teaching method - page 53
If the new set point overlaps an existing set point, the error message will be displayed:

Error message E15:
Double set point
(here for program 1, output port 5)



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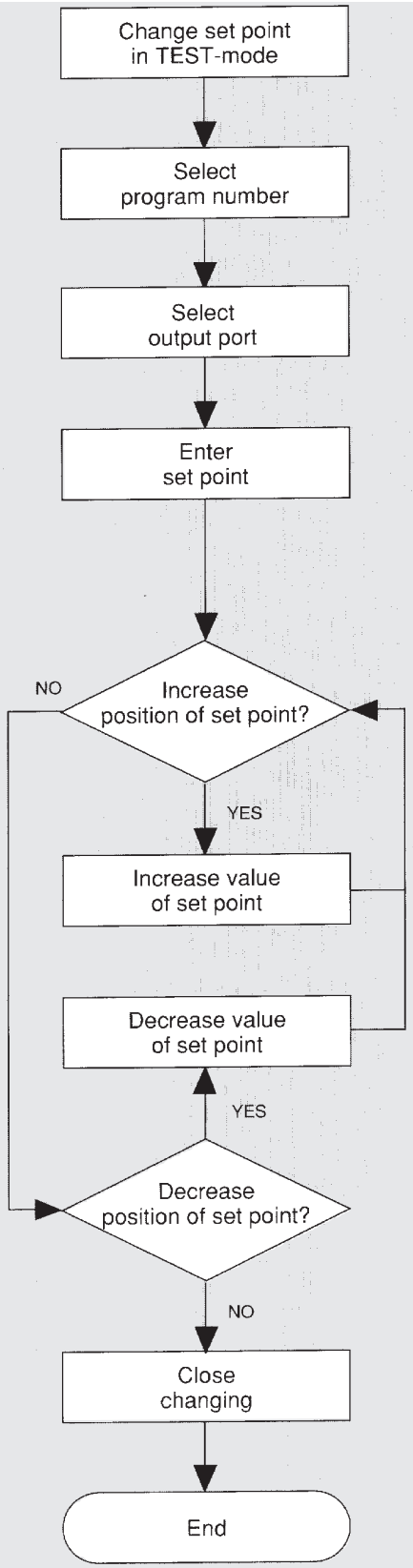
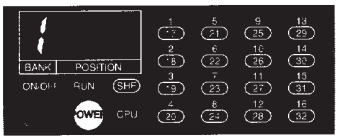


Change set point in TEST-mode

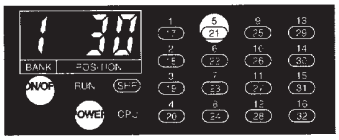
Start signal (terminal 2) must be switched on.

Switch on desired program using input and output ports for program selection: terminal 3...5, 28
(here e.g. program 1)

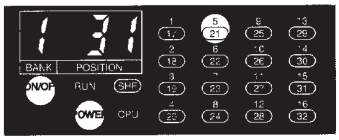
Press keys:
OUT 5 ↵
(here e.g. output port 5)



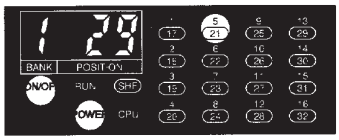
Press keys:
3 0 ▼
(here e.g. position 30)



Press key:
+

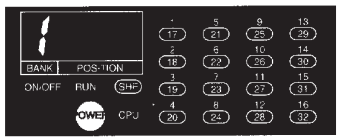


Press key:
-



After pressing + oder - key the position will be changed by 1 and status of output ports will be displayed for this position.

Press keys:
OUT C



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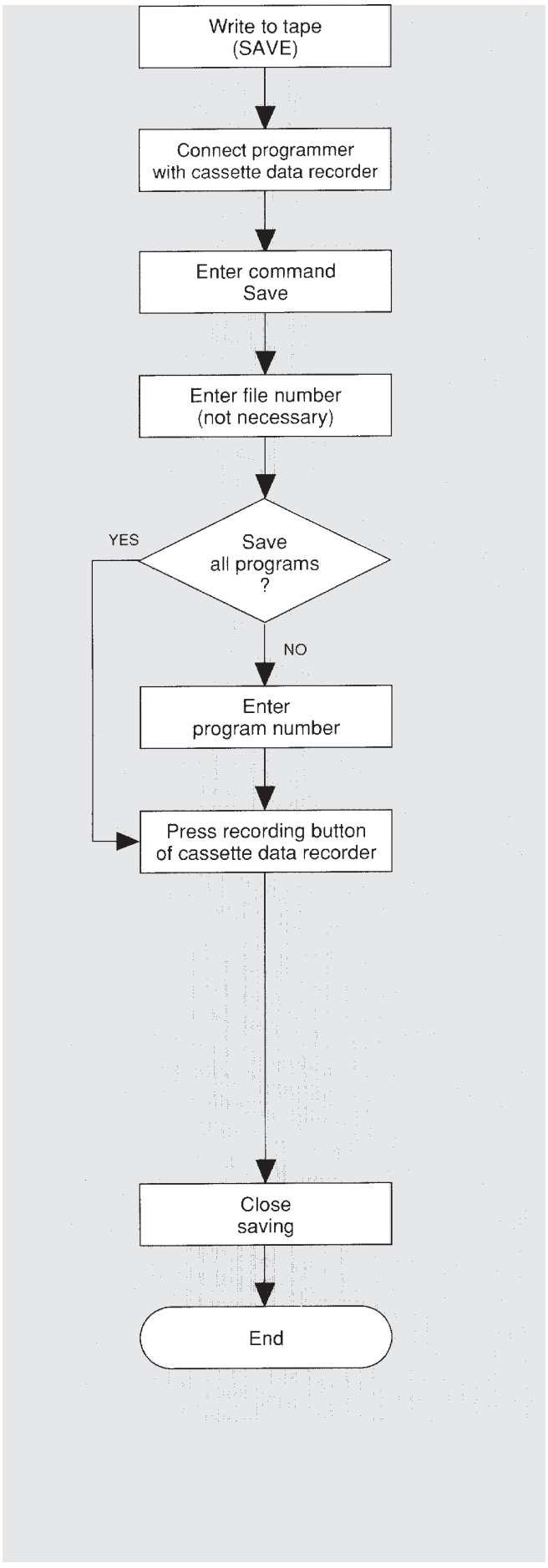


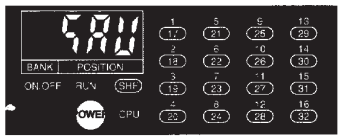
Write to tape (SAVE)

You can indicate up to 1000 programs

Connect cassette jack of the cam switch with recording socket (microphone input) of cassette data recorder using cable C-08RJ.

Press keys:

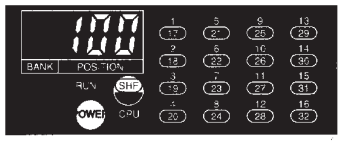
SHF +



Press keys:

1 0 0

(here e.g. file number 100)

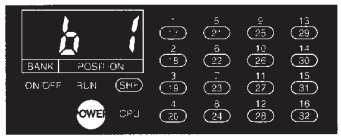


You can enter a value between 0 and 999 inclusive.
If no value is entered, the file is indicated as - 0 -.

Press keys:

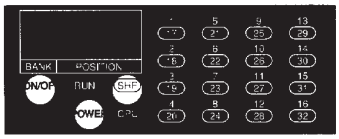
BNK 1

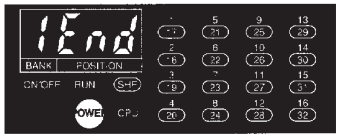
Enter program number between 0...9



Press key:

↵

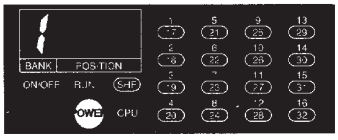




The program number will be displayed, if a single program is transferred; - 0 - will be displayed, if the whole contents of the memory will be transferred.

Press key:

C



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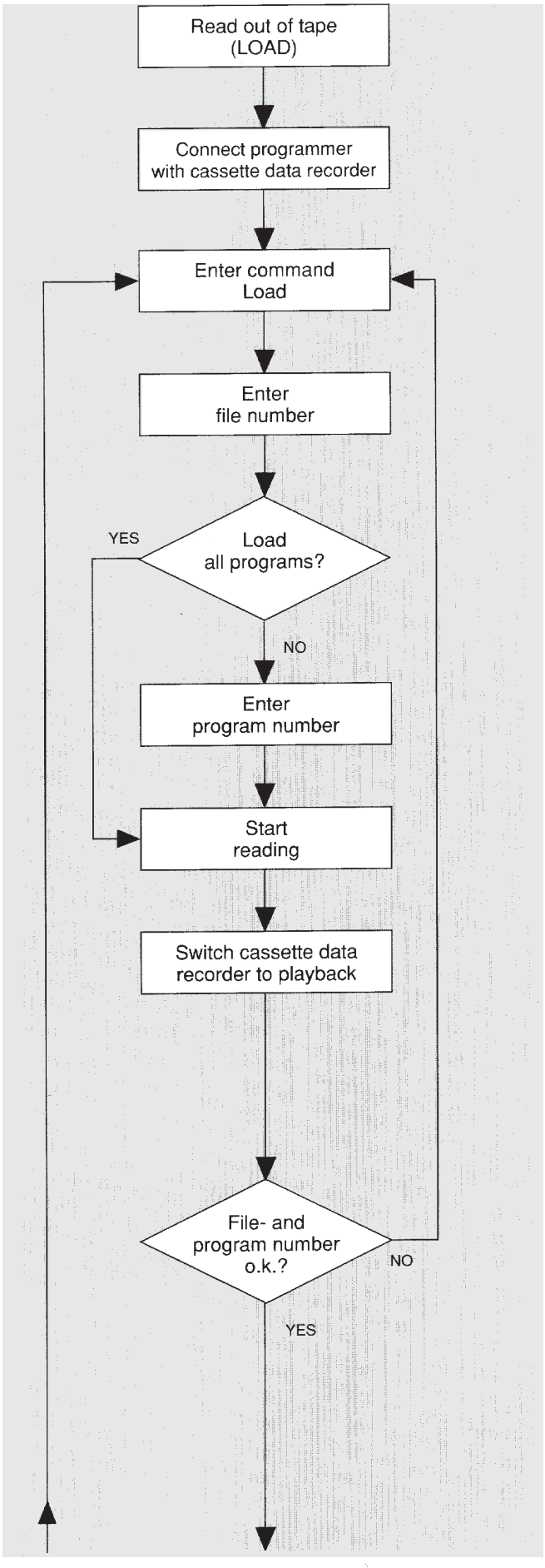
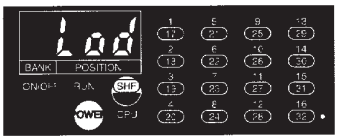


Read out of tape (LOAD)

Connect cassette jack of cam switch with earphone jack of cassette data recorder using cable C-08RJ.

Press keys:

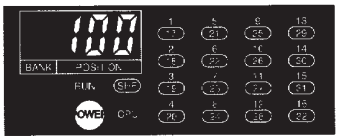
SHF -



Press keys:

1 0 0

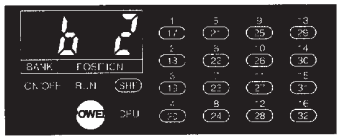
(here e.g. file number 100)



Press keys:

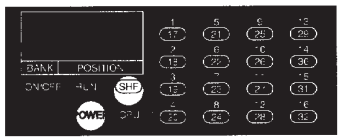
BNK 2

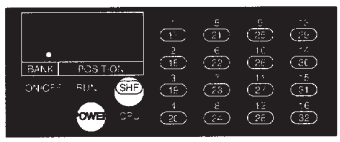
Enter program number between 0...9



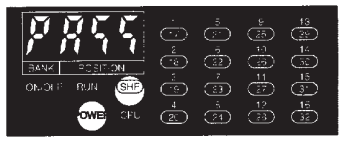
Press keys:

↵





The white spot at BANK is the level display. Adjust volume control button at cassette data recorder so that level display lights up continuously.



If PASS is displayed, the entered file- and program number don´t correspond to those on the tape:
Enter command loading again

Con´t next page

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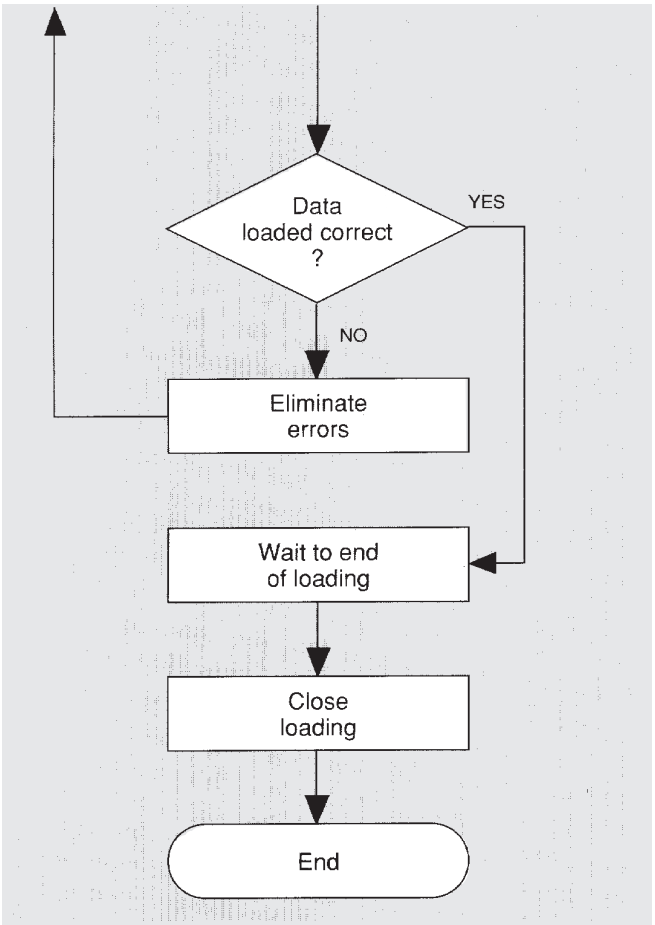
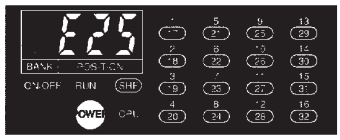


Read out of tape (LOAD)
(con´t from previous page)

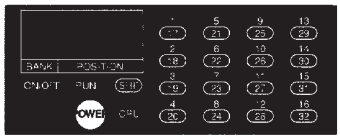
If error message is displayed:
- see trouble detection page 58



Press keys:

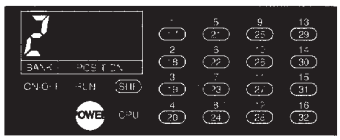
C

if error is eliminated



Press key:

C



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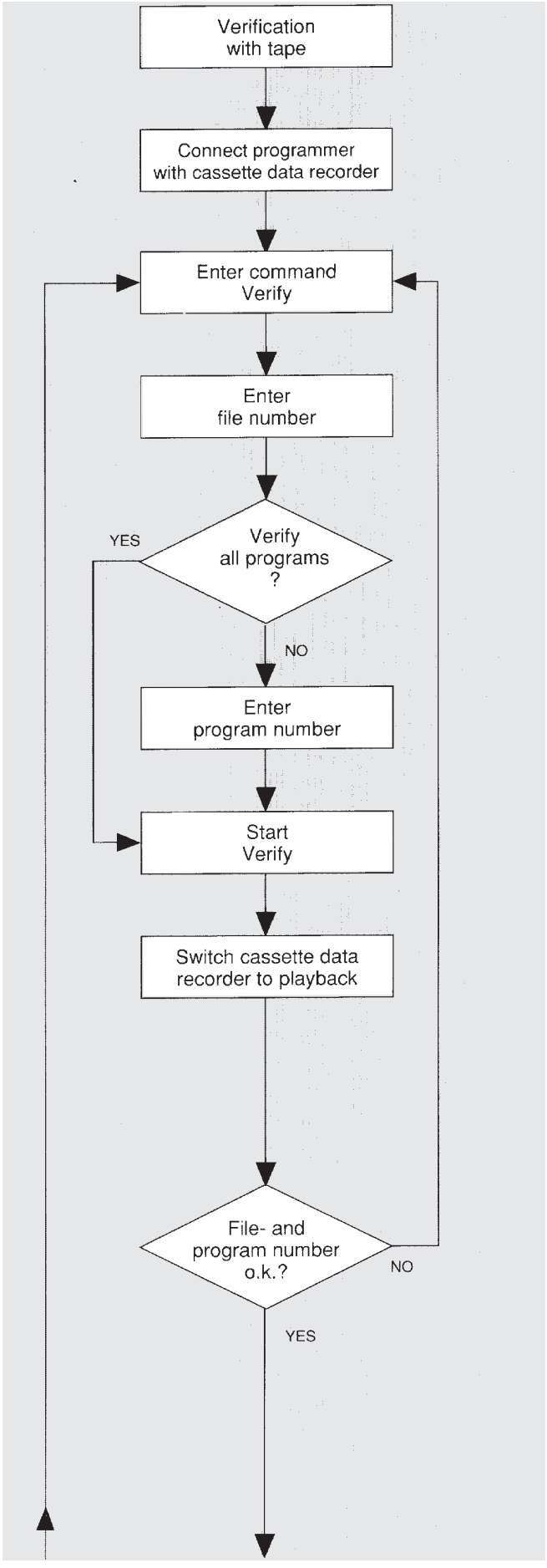
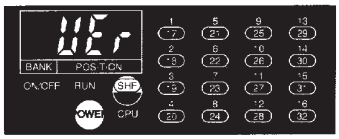


Verification with tape

Connect cassette jack of cam switch with earphone jack of cassette recorder using cable C-08RJ.

Press keys:

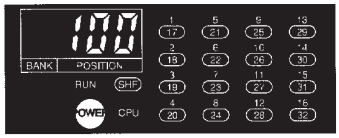
SHF ↓



Press keys:

1 0 0

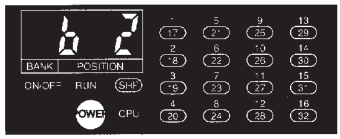
(here e.g. file number 100)



Press keys:

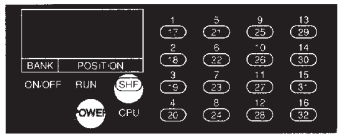
BNK 2

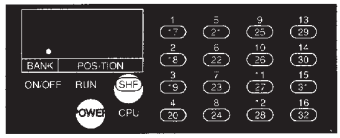
Enter program number between 0...9



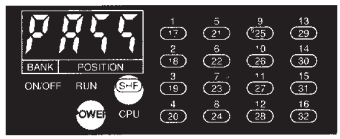
Press key:

↵





The white spot at BANK is the level display. Adjust volume control button at cassette recorder so that the level display lights up continuously.



If PASS is displayed, the entered file- and program number don´t correspond to those on the tape:
Enter command Verify again.

Con´t next page

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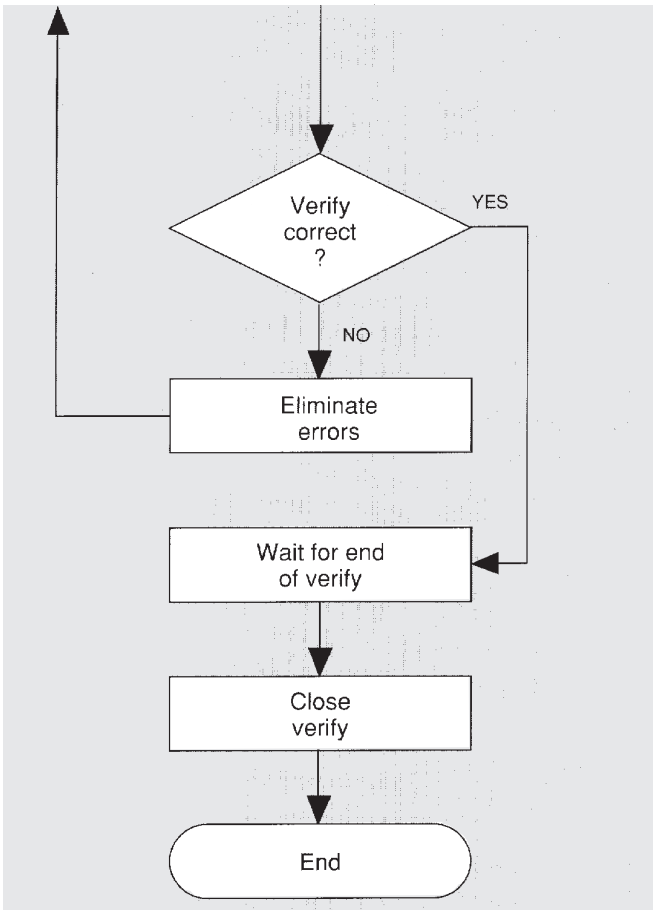
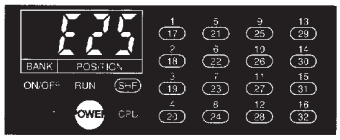


Verification with tape (con´t from previous page)

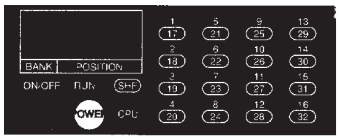
If error message is displayed:
- see trouble detection page 58

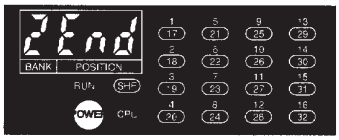


Press key:

C

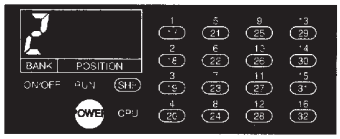
if error is eliminated





Press key:

C



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Trouble detection

List of error codes
(Clear display of error meassage by pressing key C)

Error code	Error	Description	Remedy
E01	Input error	Input keys were pressed in wrong sequence	Pay attention to correct sequence
E11	Bank No. error	False bank is specified	Check of bank number (DIP switch 2...4)
E12	Cam No. error	False cam No. is specified	Check of output port numbers (DIP switch 2...4)
E13	Position setting error	False position is set	Check of resolutin (DIP switch 2...4)
E14	Writr protection error	Written in write protection condition	Switch OFF power supply and set DIP switch 6 to OFF position for writing
E15	Overlapped position setting	A position is set in a range already set	Clear previous setting before updating. Refer to operating procedure table on page 37 and 38 (No. 10...12)
E16	DIP switch error	Setting of DIP switch change	Switch OFF power supply, reset DIP switch, and switch ON power supply in PRG mode
E17	Bank input error	False bank is entered	Check number of banks (DIP switch 2...4). Check bank selection signal
E18	Encoder signal error	Input of false encoder data or wrong model	Check of resolution (DIP switch 2, 3). Check of encoder input circuit
E21	Memory change error	User memory content changes	Switch OFF power supply and check DIP switch. Switch ON power supply in PRG mode
E22	Memory error	Parity-Check of RAM memory is negative	Switch OFF power supply and check DIP switch. Switch ON power supply in PRG mode
E25	Cassette tape verification error	Memory contents are different from information recorded on tape	Re-record or re-load
E26	Program load error	False set of DIP switch	Switch OFF power supply and check DIP switch. Switch ON power supply in PRG mode

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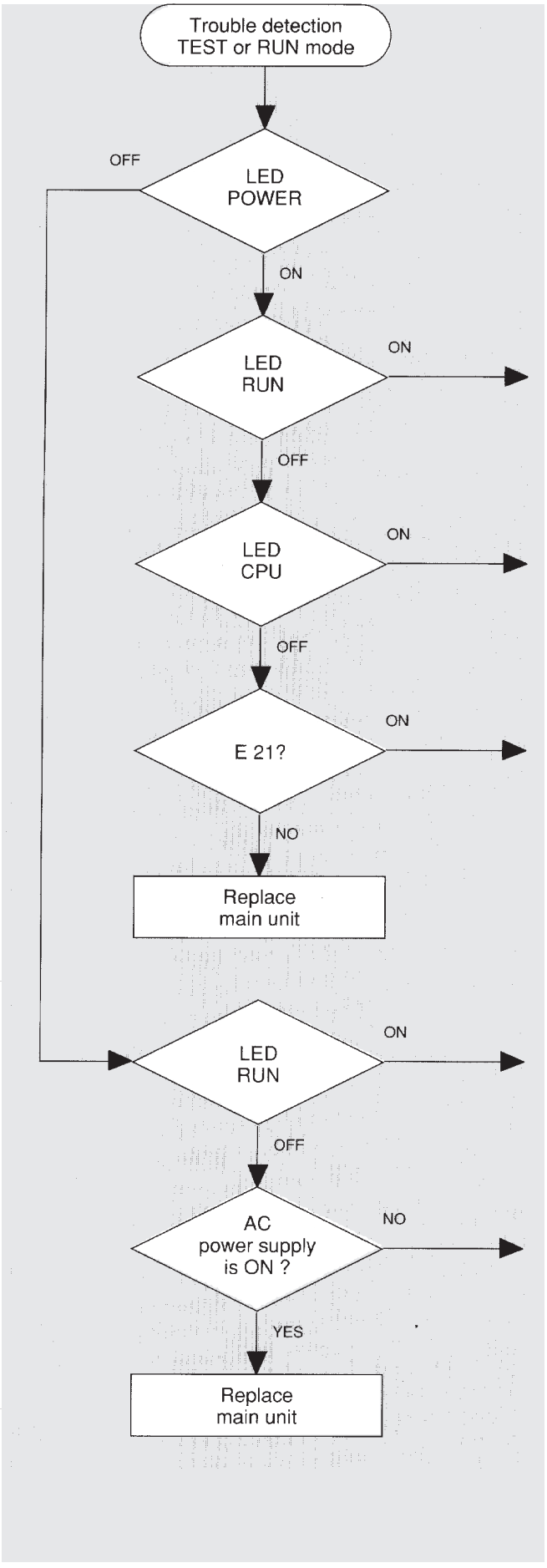
General trouble detection



Check input/output circuit
- see page 60

Check central processing unit (CPU)
- see page 62

Check memory contents (EEPROM)
- see page 63

If no operation is recognizable, the main unit is faulty.

Power supply LED faulty

Switch ON voltage supply.

Power supply section faulty

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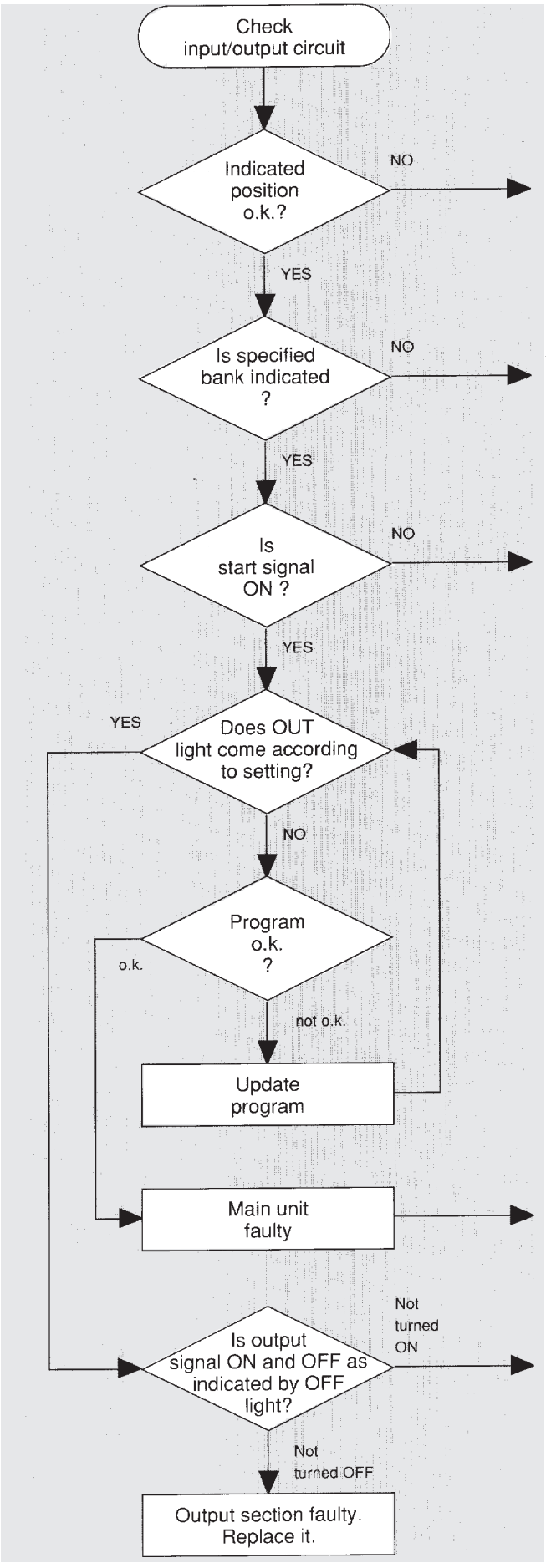
Check input and output circuits



Check position display:
- Check absolute encoder wiring
- Check absolute encoder
- Check DIP switch

Check signal for program selection:
- Check bank input circuit

Check start signal:
- Check start signal circuit

Check output signal

Replace main unit

Check output circuit:
- Check output wiring
- Check load

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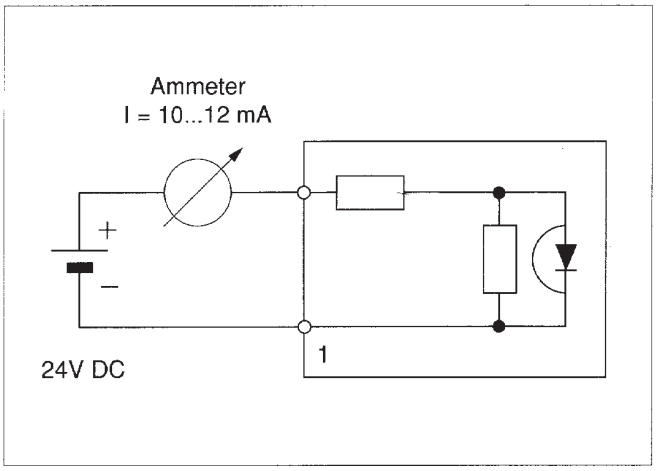
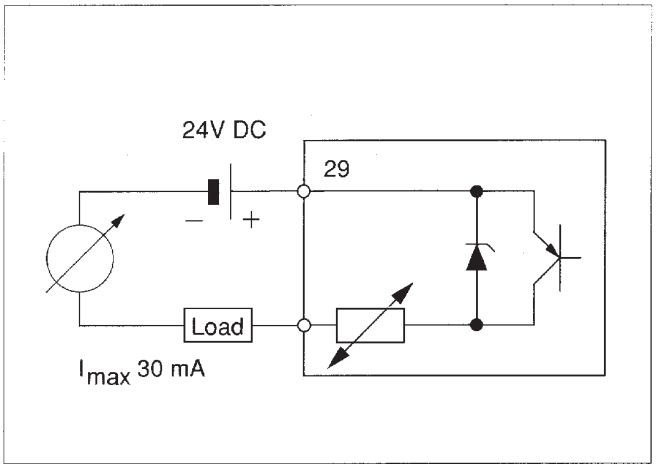
Check input and output ports

Input ports: (Start, Bank 1...4)



Output ports: (1...24)



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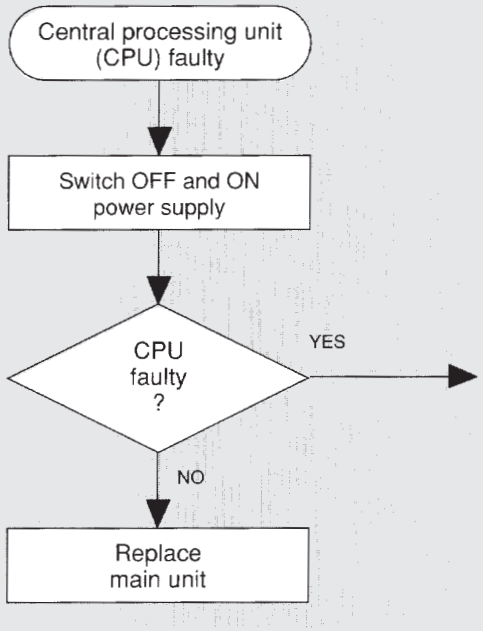

Check central processing unit (CPU)

If CPU is faulty,
- the program doesn´t run
- the LED RUN is dark
- CPU stops within 100 ms

At programmer
- only LED POWER
- and LED CPU light up

Take precautions against electrical interference as CPU may be disrupted.

Central processing unit is faulty.

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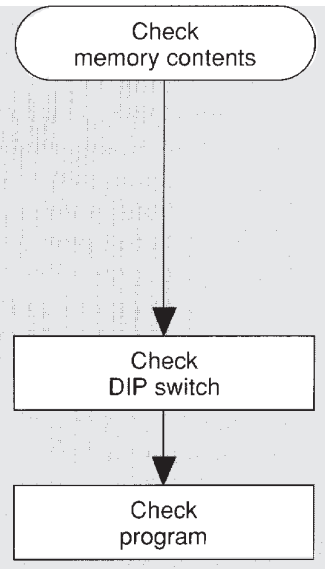

Check memory contents (EEPROM) (Memory change error)

A Parity-Check of memory contents is carried out:
- during switch ON voltage supply
- during switch to RUN-mode

If an error is detected,
- the program doesn´t run
- the error message E21 is displayed

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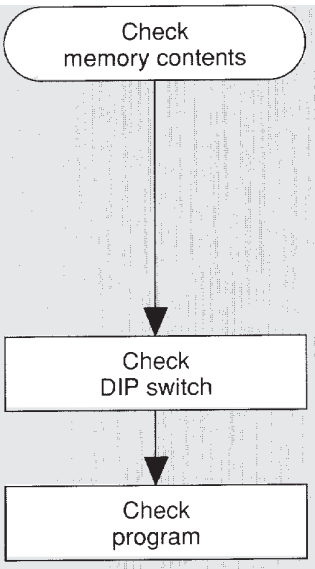

Check memory contents (RAM) (Memory change error)

A Parity-Check of memory contents is carried out:
- during switch ON voltage supply
- during switch to RUN-mode

If an error is detected,
- the program doesn´t run
- the error message E22 is displayed

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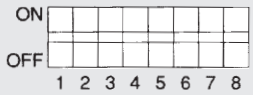
Appliction



Application form
for Pepperl+Fuchs FC-21-V

Controlling for machine

File on cassette (file number / cassette number)

Program number in EEPROM

DIP switches

	1	2	3	4	5	6	7	8
ON								
OFF								

Number of output port	Connected function	Programmed set points									
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
		ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF

One Company, Two Divisions.

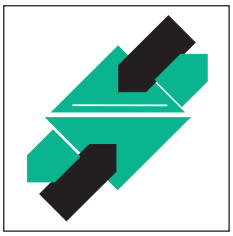
Factory Automation Division

Product Range

- Binary and analog sensors
- in different technologies
  - Inductive and capacitive sensors
  - Magnetic sensors
  - Ultrasonic sensors
  - Photoelectric sensors
- Incremental and absolute rotary encoders
- Counters and control equipment
- ID systems
- AS-Interface

Areas of Application

- Machine engineering
- Conveyor or transport
- Packaging and bottling
- Automobile industry



Process Automation Division

Product Range

- Signal conditioners
- Intrinsically safe interface modules
- Remote process interface
- Intrinsically safe field bus solutions
- Level control sensors
- Process measuring and control systems engineering at the interface level
- Intrinsic safety training

Areas of Application

- Chemical industry
- Industrial and community sewage
- Oil, gas and petrochemical industry
- PLC and process control systems
- Engineering companies for process systems

Service Area

Worldwide sales, customer service and consultation via competent and reliable Pepperl+Fuchs associates ensure that you can contact us wherever or whenever you need us. We have subsidiaries worldwide for your convenience.

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