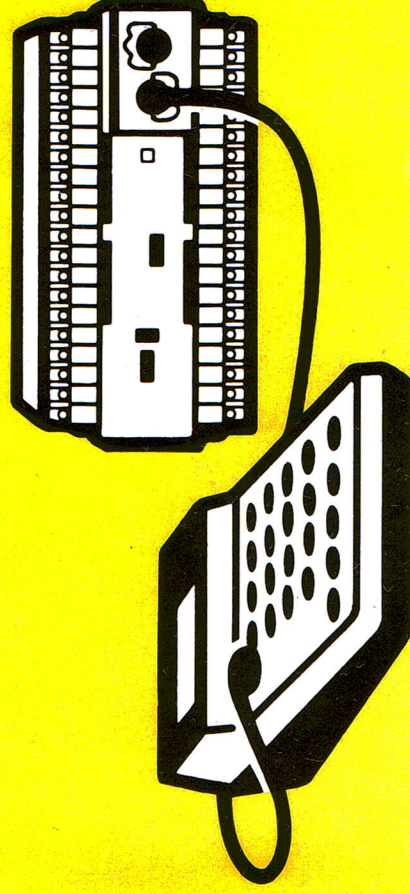


## Operating Manual

**PS 3 Programming  
in Instruction Set (IS)  
with PRG 3, PRG 3 S, PRG 300**



# PS 3 Programming with PRG 3/PRG 3 S/PRG 300

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## The First Step with the PS 3

Congratulations on deciding on the SUCOS PS 3 system. You have chosen a modern compact programmable controller which leaves all your options open for further extension – up to connection to a data network.

The PS 3 is the smallest unit in the SUCOS PS 30 series. Programs you create for the PS 3 can also be run on the larger SUCOS PS 316 and PS 32 controllers.

The following short introduction shows you just how simple it is to programme the SUCOS PS 3 (and therefore the whole PS 30 series). The extensive manuals on the PS 3 controller and the appropriate programmers give you all the ins and outs of programming (with the PRG 3 and PRG 3 S hand-held programmers, the PRG 300 light-pen programmer and programming with the personal computer).

- PS 3 Programming in Ladder Diagram (LD) with PRG 300 Light-pen Programmer (In preparation) Ref. No. AWA 27-801 GB
- SUCOSOFT S 30-... Programming Software Installation Instructions (In preparation) Ref. No. AWA 27-806 GB
- SUCOSOFT S 30-S 3 Programming Software Handling (In preparation) Ref. No. AWA 27-816 GB
- SUCOS PS 3 System Manual Part 1 Hardware and Design Engineering Part 2 Programming Language Part 3 Examples of Programs Ref. No. DOK 9006 GB (For price, see Main Catalogue)

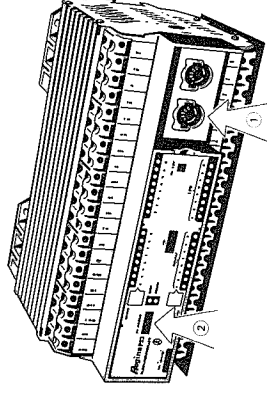
### Equipping the programming station

To start with, your practice station requires the following units:

- PS 3-AC PS 3 controller with 220/240 V connection
- PRG 3 PS 3 programmer
- KPG 2-PS 3 Connecting cable between controller and programmer
- SIM 1-PS 3 Simulation board for digital inputs

Place the controller in front of you on the table so that the two round sockets on the front of the unit are on the right.

The socket on the left, ①, is for connecting the programmer, the one on the right for connecting further PS 3 controllers. At the moment, you do not need the latter socket.



### Coding of units

On the left side of the PS 3 you will see a row of coding switches, ②. These are wire bridges, with which you determine the way the PS 3 unit functions. The numbers of the coding switches are printed above them. The coding determines the unit's position if several PS 3 units are connected to one another. At first, you will operate the PS 3 as a stand-alone unit. The basic position of the coding switches is thus: Switch 0: unhinged, Switches 1-4: hinged  
In the recess under the row of switches, you will find a coding pin, which will make it easier for you to operate the wire bridges.

**Back-up batteries**

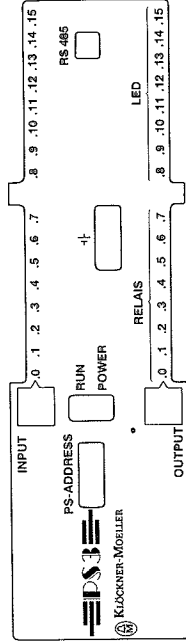
On the right, next to the coding switches, is the recess for the back-up batteries. These supply the "mind" (the program memory) of the PS 3 when the power supply is switched off. Thus, all the information is stored in the program memory, even when the PS 3 power supply is interrupted.

Please insert the back-up batteries in accordance with the symbols.

There is another row of coding switches on the right, next to the battery compartment. It is labelled "5" and "6". You only need these switches if you want to connect several PS 3 units to one another. For the moment, both switches remain hinged.

**Front panel**

Now take the front panel appropriate to your needs out of the packing, remove the recesses and fix it to the front of the PS 3 controller. Then take the protective foil from the transparent cover and push it from right to left over the front panel.



**Labelling the terminals**

Now it only remains for the PS 3 terminals to be labelled. The input terminals are located on the top of the PS 3 unit. Voltage is applied to these via a control device, position switch, etc.

**Inputs**

The power supply for the inputs is 24 V d.c. A 24 V/160 mA signal can be tapped off the terminals on the top left of the PS 3 unit.

The controller queries, while processing a program, whether voltage is present at an input terminal or not. For this purpose, each terminal has a unique identification mark.

For example, the label for one input could, in a program, be "I 0.5".

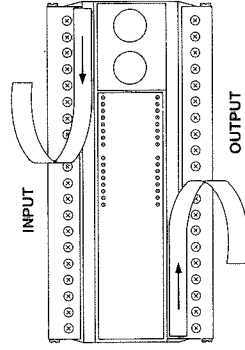
"I" stands for input.

"0" is the PS 3 unit (0-3) reference from which the input comes.

"5" is the 5th input of the PS 3 unit.

It is possible to use up to 16 inputs on one controller. These are numbered from "0" to "15".

A sheet of adhesive labels is enclosed with the PS 3 for labelling terminals. For inputs, please take the blue strip with the numbers "I 0.0 to I 0.15". The identification strip is stuck on the PS 3 so that the terminal label "24 V" is on the left.



**Outputs**

The terminals on the bottom of the PS 3 unit are for the power supply and for the outputs. The power supply for the PS 3-AC is 220/240 V a.c. and for the PS 3-DC 24 V d.c.

**PS 3-DC** The PS 3-DC has 16 transistor outputs: Q 0.0 to Q 0.15.

**PS 3-AC** The outputs are numbered like the inputs, to facilitate a clear assignment. The labelling of one output is, for example, "Q 0.5".

"Q" stands for output.

"0" is the PS 3 unit (0-3) reference from which the output comes.

"5" is the 5th output of the PS 3 unit.

On the PS 3-AC, two neighbouring terminals are assigned to one output relay. The power is passed into the left terminal and comes out again through the right terminal via a relay output. Thus, there is room on the output side of the PS 3-AC for 8 outputs (Q 0.0 to Q 0.7), each with two terminals:

e.g. Terminal 0 = input to relay No. 0

Terminal Q 0.0 = output from relay No. 0

For the PS 3-AC, take the red adhesive labels with the numbers "Q 0.0 to Q 0.15" for labelling the output terminals.

Stick the identification strip above the lower row of terminals, so that the descriptions "L1, N, PE" are on the left (above the red power supply terminals).

**Simulation board**

Now the SIM 1-PS 3 simulation board is fixed into the row of input terminals.

**PRG 3 programmer**

Finally, connect the PRG 3 programmer to the PS 3. Use the KPG 2-PS 3 data cable for this. Connect one of the plugs to the left socket, ①, on the PS 3 and the other to the socket on the programmer.

After connecting the PS 3 power supply, the controller is ready to be programmed.

While in the run mode, the PS 3 constantly checks the signal status of all the inputs. The program determines the rules according to which the input signals are to be "linked". The result of the process is given to the PS 3 outputs at the end of a monitoring and processing cycle.

The program is first entered in the programmer via the keyboard. It can be modified there at any time. The modification, or program, only comes into effect, however, when the program is transferred from the programmer into the PS 3 controller.

Thus, there are two program memories, one in the programmer, the other in the controller where the program is being processed.

**To prepare the program memory**  
Before you start programming, make sure the program memories in the programmer and the controller are empty:

a) In the programmer	Key sequence	Display	Meaning
1.	ROLL ↓	PRG VER. 1.1.	Software version in the PRG
2.	MENUE	PS VER. 1.6	Software version in the PS 3
3.	ENTER/YES	MENUE (1-7)	
4.	ENTER/YES	DELETE	
5.	ENTER/YES	DELETE ALL	
6.	ENTER/YES	ARE YOU SURE?	
7.	ENTER/YES	MENUE (1-7)	

b) In the controller

Now the memory deleted from the programmer is transferred into the controller:

Key sequence	Display	Meaning
1. MENUE	MENUE (1-7)	
2. 2	TRANSFER/VERIFY	
3. ENTER/YES	TRANS:	TRANSFER from PRG into the PS
4. ENTER/YES	3676 BYTES FREE	Available memory
5. ENTER/YES	MENUE (1-7)	

## The First Program

### Instruction Set

A program consists of a series of individual instructions. There are three types of instructions:

1. Input information
2. Process information
3. Output information

All the instructions in a program have a consecutive address, starting at 000.

A group of instructions, from an input via one or several processing instructions through to an output, is called a sequence. For example, a sequence looks like this:

000 L I 0.0 Load the status of input 0.0

001 A I 0.1 AND sequence the status of input 0.1

002 = Q 0.0 According to the result, switch output 0.0 on or off.

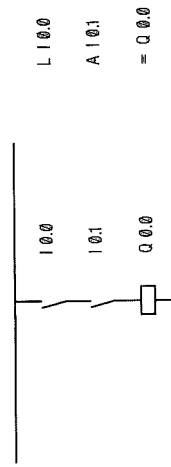
A sequence always begins with a "Load" instruction. Logic functions such as AND or OR or others can follow that. At the end of a sequence there is always an output command such as, for example, the equals sign:

= (Output)

or S (Set)

or R (Reset)

The small program above corresponds to the following circuit diagram:



**Program input** Enter this sample program into the programmer as follows:

Key sequence	Display
1. MENU	MENUE (1-7)
2. 1	PROGRAM
3. ENTER/YES	ADDRESS
4. 0	ADDRESS 0
5. ENTER/YES	000 -
6. L (via key K)	000 L -
7. I (via key 7)	000 L I -
8. 0	000 L I 0 -
9. .	000 L I 0 .
10. 0	000 L I 0 . 0
11. ENTER/YES	001
12. A (via key B)	001 A -
13. I	001 A I -
14. 0	001 A I 0 -
15. .	001 A I 0 .
16. 1	001 A I 0 . 1
17. ENTER/YES	002 -
18. =	002 = -
19. Q (via key 8)	002 = Q -
20. 0	002 = Q 0 -
21. .	002 = Q 0 .
22. 0	002 = Q 0 . 0
23. ENTER/YES	003

### Transfer of program into the PS 3

The program is now entered into the memory of the programmer. It still has to be transferred into the controller.

Key sequence	Display
1. MENU	MENUE (1-7)
2. 2	TRANSFER/VERIFY
3. ENTER/YES	TRANS: PRG-PS
4. ENTER/YES	MENUE (1-7)
or:	
3670 BYTES FREE	

## The First Program

**Starting the program**

The program has been transferred from the memory of the programmer into the memory of the PS 3. All that is now required is for it to be started.

**Key sequence**

1. MENU
2. 3
3. ENTER/YES
4. ENTER/YES

**Display**

- MENU (1-7)  
RUN/HALT  
START?  
MENU (1-7)

The PS 3 now scans the program.

**Program test**

If you now press the two keys labelled 0 (= I 0.0) and 1 (= I 0.1) on the simulation board, the output LED .0 (= Q 0.0) lights up. The output Q 0.0 is therefore activated.

In accordance with our program:

If voltage is applied to

- Input 0.0 (I 0.0)  
Input 0.1 (I 0.1)  
then Output 0.0 (Q 0.0) switches on

Both keys have to be pressed to get an output signal. If this condition is not fulfilled, the output is not activated.

**Extending the program**

We now want to make an additional extension to our small program around input I 0.2. If voltage is present at I 0.2, the output should not be activated – regardless of the signal status at inputs I 0.0 and I 0.1.

- ```
000 L I 0.0
001 A I 0.1
002 AN I 0.2
003 = Q 0.0
```

So that the whole program does not have to be keyed in again, the command

AN I 0.2 "AND NOT" Input 0.2

should be inserted later. This is done by calling up menu 1 (Program).

**Key sequence**

1. MENU
2. 1
3. ENTER/YES
4. 0
5. ENTER/YES

**Display**

- MENU (1-7)  
PROGRAM  
ADDRESS  
ADDRESS: 0  
000 L I 0.0

You can easily make the program roll upwards or downwards on the display unit by using the "ROLL ↑" and "ROLL ↓" keys. Now, by using these two keys, go to the address 002 which contains the command "= Q 0.0". Press the "INSERT" key. The command "= Q 0.0" is shifted by one address to 003. You can now input the new command "AN I 0.2" in the free address. (The "N" key corresponds to the 0 key.)

**Correcting inputs**

If you have pressed a wrong key by mistake, you can erase the last input by pressing the "RUBOUT" key.

When you are ready, finish the entry by pressing "ENTER/YES" and look at the new program with the two "ROLL" keys.

Now load the modified program into the memory of the controller as you did with the original program and test the new program.

You have now learned some basic things about using the SUCOS PS 3 programmable controller and hand-held programmer. You will find all further details in the extensive PRG Operating Manual.

You can now try out the same exercise using the PRG 3 S and PRG 300 programmers.

**PRG 3 S** The PRG 3 S programmer has, in addition, connections for a printer and a tape recorder to store programs.

**PRG 300** The PRG 300 programmer is, in addition, equipped with a light-pen, by means of which you can create programs graphically in ladder diagram technique on a monitor.

**Programming with personal computers** If, one day, you should decide on PS 3 programming with a personal computer, you can make further use of what you have just learned. The same programming rules apply for programming with personal computers and operation is considerably more convenient.



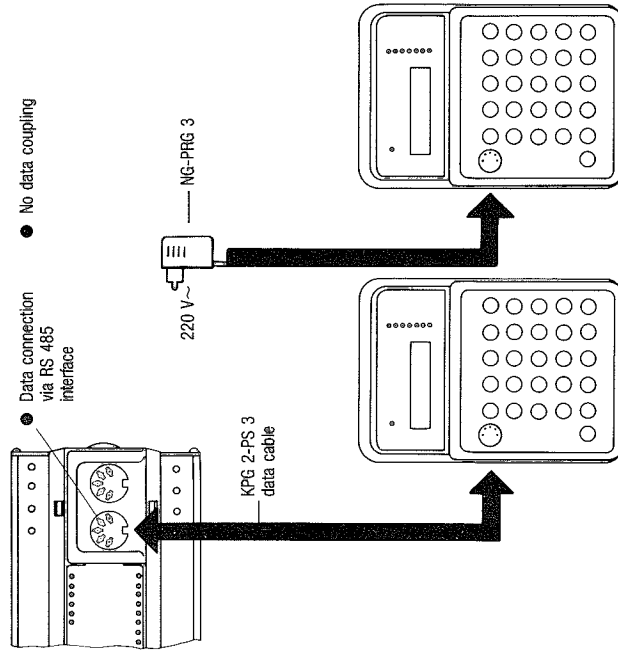
# Initial Commissioning of the PRG 3/PRG 3 S Hand-held Programmers

The PRG 3 and PRG 3 S are hand-held programmers in robust, compact enclosures. These characteristics favour their use in an industrial environment. The operator can programme, test and commission the SUCOS PS 3 programmable controller with the PRG 3 and PRG 3 S. Program generation is in the easily understood Instruction Set (IS).

## Operating modes

1.) PS 3 coupling  $\geq$  PRG 3/3 S      2.) PRG 3/3 S stand-alone

- Power supply from PS 3
- Data connection via RS 485 interface
- Power supply via NG-PRG 3
- No data coupling



- Equipment supplied**
- 1 PRG 3/3 S
  - 1 KPG 2-PS 3 data cable
  - 1 manual

# Initial Commissioning of the PRG 3/PRG 3 S Hand-held Programmers

## PRG version number

If either the PRG 3 or PRG 3 S is connected to the supply, the following is displayed:

the PRG 3: PRG 3 VER. 1.1 -

the PRG 3 S: PRG 3 VER. 1.2 -

These version numbers are a reasonable way of making future software updates easily comprehensible to the user.

## PS 3 version number

If you activate one of the roll keys ROLL  $\downarrow$  or  $\uparrow$  once, the version number of the current hardware and software in the PS 3 appears.

PS 3 VER. 1.2 -

Scanning is only possible with the PS 3 connected. If you repeatedly activate the  $\downarrow$  or  $\uparrow$  roll key, you find yourself in the main menu.

MENUE (1-7) -

If, after connection to the supply, you activate the "MENUE" key, or any key other than ROLL  $\downarrow$  or  $\uparrow$ , you are in the main menu.

## Initial Commissioning of the PRG 300 Light-pen Programmer

The mechanical structure is identical to the PRG 3 S. In addition, the PRG 300 offers two interfaces, one for the video connection for the monitor and another for the connection for the light-pen.

The cinch box for connection with the monitor gives out a Composite-Video signal, the brightness of which can be varied by using the potentiometer on the back. The impedance is  $75 \Omega$ .

The light-pen basically consists of a light wave conductor, the electronics of which are integrated in the PRG 300. The transfer of light can be evaluated by positioning on the screen.

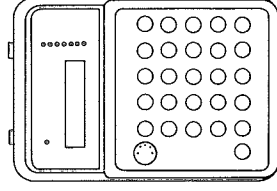
The PRG 300, like the PRG 3 and PRG 3 S, can be directly supplied with 9 V d.c. and data via the PS 3 interface. Stand-alone operation is also possible, via the NG-PRG 3 power supply unit. The PRG 300 can be used in two operating modes:

- Programming in Instruction Set (IS) with the aid of the keyboard and LCD display.
- Programming in Ladder Diagram (LD) to DIN 19239 with the aid of a light-pen on a monitor.

### Equipment supplied

- 1 PRG 300
- 1 KPG 2-PS 3 data cable
- 1 light-pen
- 1 manual

### Operating modes a) IS programming via keyboard and LCD display

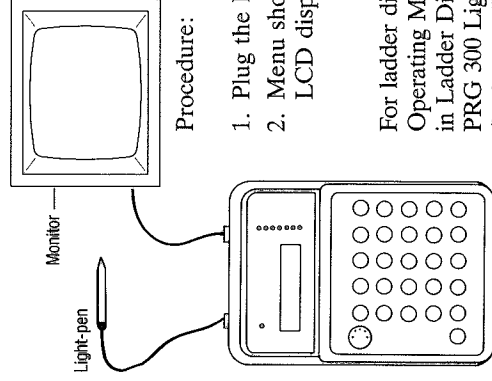


Procedure:

1. Activate **and** hold desired key.
2. Switch on power supply.
3. Release key again.

In this operating mode, the PRG 300 functions like the PRG 3 S (Initial commissioning of the PRG 3/3 S)

### b) LD programming with light-pen and monitor



Procedure:

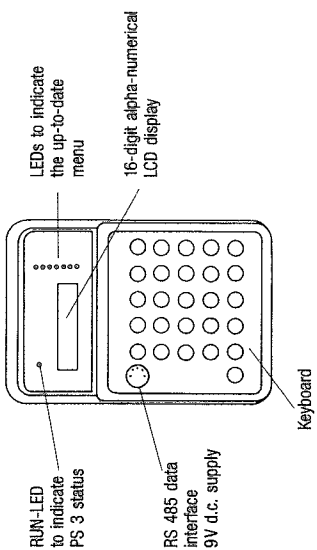
1. Plug the PRG 300 into the supply.
2. Menu shown on the monitor.  
LCD display stays blank.

For ladder diagram programming, see Operating Manual "PS 3 Programming in Ladder Diagram (LD) with PRG 300 Light-pen Programmer" (Ref. No. AWA 27-801 GB)

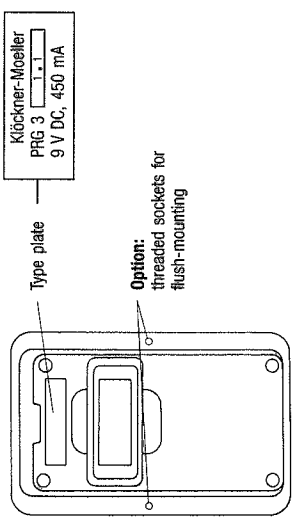
## Operating Modes for the PRG 300 Light-pen Programmer

# Construction of the PRG 3

Front view:

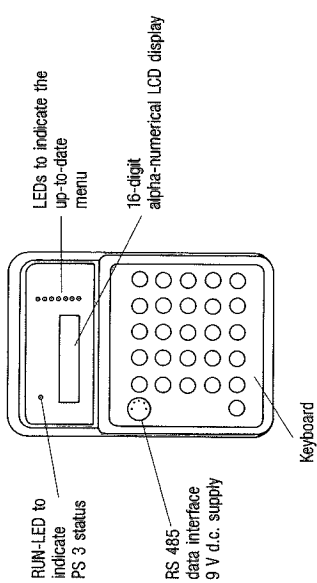


Rear view:

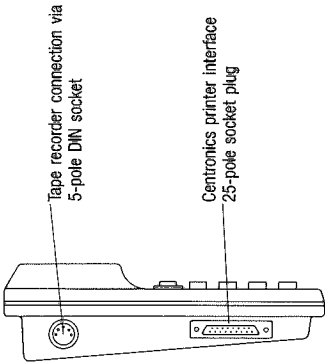


# Construction of the PRG 3 S

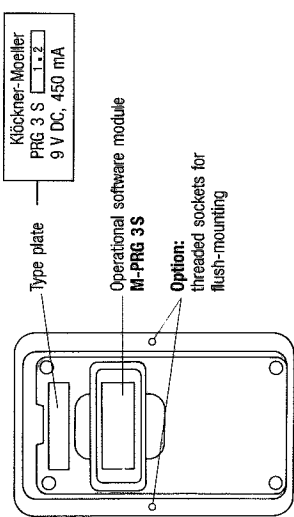
Front view:



Side view:

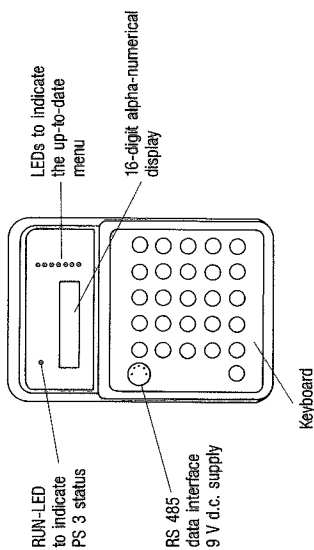


Rear view:

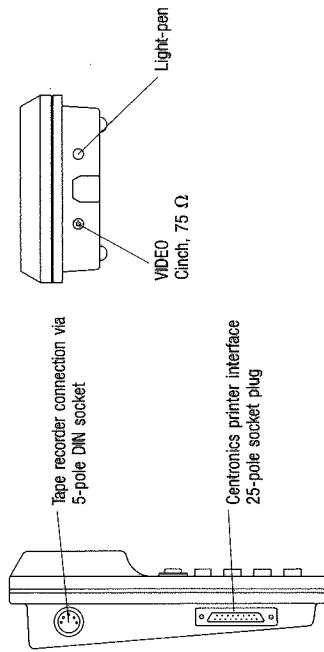


# Construction of the PRG 300

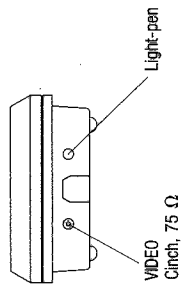
Front view:



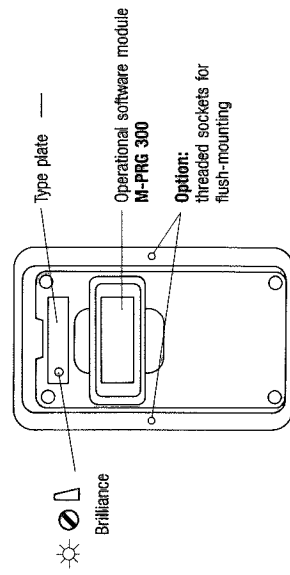
Side view:



Top view:



Rear view:

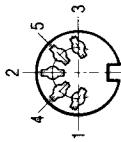


# Interfaces on the PRG

**PRG 3**  
**PRG 3S**  
**PRG 300**

Interface: **PRG** ← → **PS3...**  
5-pole socket

Mechanical: DIN  
Electrical: RS 485  
Protocol: SUCONET

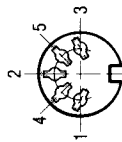


PIN 1, 4: = RS 485 data cable  
PIN 2 : = Screen, leading to the PS 3-... enclosure ⊕  
PIN 3 : = 0V  
PIN 5 : = +9 V d.c. Supply

**PRG 3S**  
**PRG 300**

Interface: **PRG** ← → **Tape recorder connection**  
5-pole socket

Mechanical: DIN 41524  
Electrical: C.C.I.T.T.

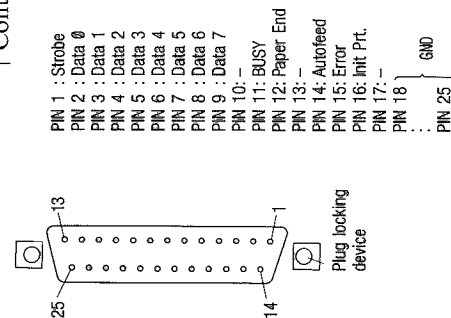


PIN 1: Recording  
PIN 2: Screen  
PIN 3: Playback  
PIN 4: -  
PIN 5: -

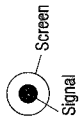
Data cable: PRG 3 S/PRG 300 → Tape recorder  
KPG 4-PS 3

Interface: **PRG** → **Printer connection**

25-pole subminiature socket | Electrical: Centronics  
PIN utilisation: IBM compatible  
Control signal: EPSON compatible



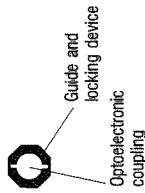
**PRG 300 Interface: PRG** ←  
Cinch socket



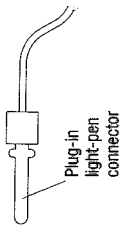
→ **Monitor**

Mechanical: Cinch  
Electrical: Composite-Video, 75 Ω  
60 Hz

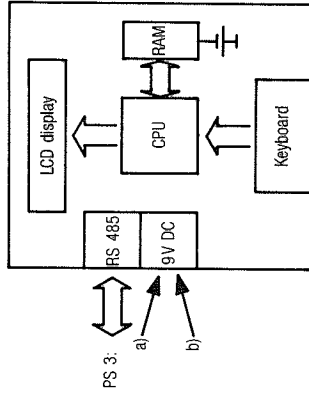
**PRG 300 Interface: PRG** ←



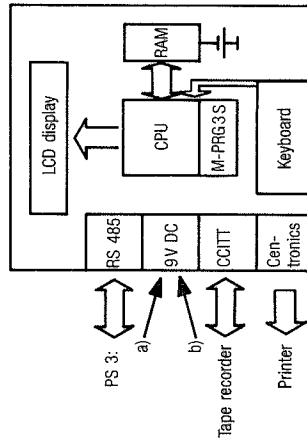
→ **Light-pen**



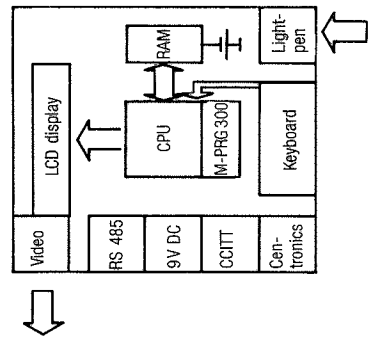
**PRG 3**



**PRG 3S**



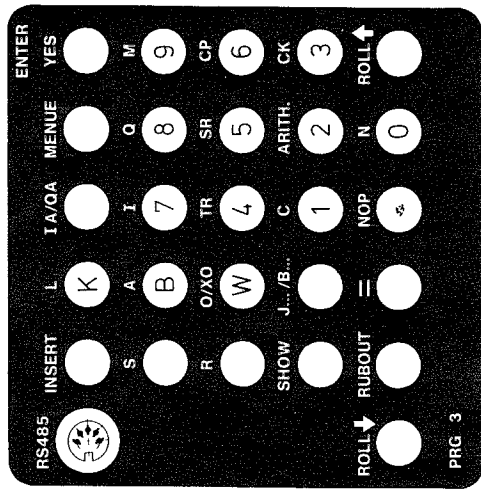
**PRG 300**



a) Supply via the data cable from the PS 3...  
b) Supply from the NG-PRG 3 plug-in power supply

The PRG 3, PRG 3 S and PRG 300 hand-held programmers have multi-function keys. The various functions are selected via the software. Some keys have "roll functions". The keys are interlocked in such a way that only those keys corresponding to the input sequence are active. A malfunction caused by pressing more than one key is thus excluded. Erroneous inputs are indicated by the message "Syntax Error". The error is acknowledged by pressing the "Enter/Yes" key again.

On the PRG 300, the keys only become active if a chosen key is activated **and held down** as the power is connected. If the display then lights up with the PRG version number, the key can be released. The PRG 300 now operates like the PRG 3 S.



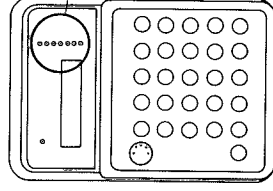
↑  
or  
PRG 3 S  
or  
PRG 300

### Explanation of keys

| Key                   | Significance                                  | Comment                                                                                                                                                            |
|-----------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INSERT<br>○           | Insertion of instructions and modules:        | In the menu: "PROGRAM"                                                                                                                                             |
| L<br>(K)              | L = Loading:                                  | Start of an instruction chain (sequence)                                                                                                                           |
| K                     | K = Constant:                                 | Input of set values:<br>0...65535                                                                                                                                  |
| IA/OA<br>○            | IA = Analogue input:<br>OA = Analogue output: | ROLL<br>Can be selected via roll ↑ ↓                                                                                                                               |
| MENUE<br>(blue)       | Menu = Main menu:                             | Return to basic position of the PRG 3                                                                                                                              |
| ENTER/YES<br>(yellow) | ENTER/YES = Acknowledgement                   | The key must be pressed after every completed instruction. A syntax check is carried out. If an erroneous input has been made, the message "Syntax Error" appears. |
| S<br>○                | S = Set:                                      | Setting of outputs and markers                                                                                                                                     |
| A<br>(B)              | A = And:<br>B = Byte:                         | Sequencing in series<br>Processing of 8-bit wide operands (8 bit = 1 byte)                                                                                         |
| I<br>(7)              | I = Input:<br>7 = Figure 7                    | Binary inputs or menu 7                                                                                                                                            |
| Q<br>(8)              | Q = Output:<br>8 = Figure 8                   | Binary outputs                                                                                                                                                     |
| M<br>(9)              | M = Marker:<br>9 = Figure 9                   | Marker                                                                                                                                                             |
| R<br>○                | R = Reset:                                    | Resetting of outputs and markers                                                                                                                                   |
| O/XO<br>(W)           | O/XO = OR/Exclusive OR:<br>W = Word           | OR/Exclusive OR<br>ROLL<br>Can be selected via roll ↑ ↓<br>function<br>Processing of 16-bit wide operands (16 bit = 1 word)                                        |
| TR<br>(4)             | TR = TIMER:<br>4 = Figure 4                   | Timer modules or menu 4                                                                                                                                            |
| SR<br>(5)             | SR = Shift register:<br>5 = Figure 5          | Shift register modules or menu 5                                                                                                                                   |
| CP<br>(6)             | CP = Compare:<br>6 = Figure 6                 | Comparator modules or menu 6                                                                                                                                       |
| SHOW<br>○             | SHOW = Display:                               | Status indication of actual values of timers and counters as well as intermediate output register of address contents                                              |

Explanation of keys

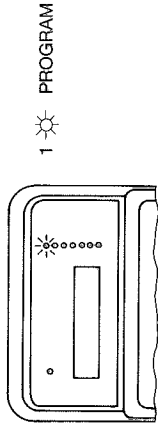
| Key                       | Significance                                                    | Comment                                                                                                          |
|---------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| J.../B...<br>○            | J.../B... = Jump/Branch:                                        | Jump commands: JP, JC, JCN<br>Branching commands: BC, BNC, BZ, BNZ<br>Can be selected via roll function ROLL ↑ ↓ |
| C<br>①                    | C = Counter:<br>1 = Figure 1                                    | Counter modules<br>or menu 1                                                                                     |
| Arith.<br>②               | Arith. = Arithmetic:<br>2 = Figure 2                            | 4 basic arithmetic operations +, -, x, ÷,<br>GOR, NOT, "Roll function", or menu 2                                |
| CK<br>③                   | CK = Clock:<br>3 = Figure 3                                     | Clock modules<br>or menu 3                                                                                       |
| ROLL ↑<br>○               | ROLL ↑ = Roll up:                                               | Roll up to 999 or functions                                                                                      |
| RUB OUT<br>● (red)<br>= ○ | RUB OUT<br>= Allocation:                                        | Symbol by symbol deletion from right to left<br>Allocation of outputs and markers                                |
| NOP<br>○                  | NOP = No operation:<br>.<br>= Point<br>N = NOT:<br>∅ = Figure ∅ | "No operation" means setting an intentional gap in the IS program<br>Negation of inputs, outputs and markers     |
| ROLL ↓<br>○               | ROLL ↓ = Roll down:                                             | Roll backwards to 000 or functions                                                                               |



- 1 ⊗ PROGRAM
- 2 ⊗ TRANSFER/VERIFY
- 3 ⊗ RUN/HALT
- 4 ⊗ DELETE
- 5 ⊗ SEARCH
- 6 ⊗ TIME/DATE
- 7 ⊗ STATUS/RESTART

| Menu | Functions in PRG 3 and PRG 3 S/PRG 300                                                                                                                            | Additional functions in PRG 3 S/PRG 300                                                                                                         |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | PROGRAM<br>Generate, read out or modify program in IS                                                                                                             |                                                                                                                                                 |
| 2    | TRANSFER/VERIFY<br>Transfer program from or to the PS 3-...<br>Comparison of programs.<br>Tracing of space in bytes still vacant in memory                        | Transfer of programs to and from tape recorders.<br>Transfer of programs to printer.<br>Comparison of programs between PRG 3 S/PRG 300 and tape |
| 3    | RUN/HALT<br>Activate program in the PS 3-... (Program counter)                                                                                                    |                                                                                                                                                 |
| 4    | DELETE<br>Deletion of programs or program segments in the PRG...                                                                                                  |                                                                                                                                                 |
| 5    | SEARCH<br>Searching for operands, modules in the PRG... user program                                                                                              |                                                                                                                                                 |
| 6    | TIME/DATE<br>Input and read-out of date, time, version No.                                                                                                        |                                                                                                                                                 |
| 7    | STATUS/RESTART<br>Status indications of the PS 3 units, restart conditions, battery running time registration and deletion. Locking and unlocking of the PS 3-... |                                                                                                                                                 |

Menu 1: PROGRAM (Programming, modifying)



In this menu, programs can be generated, read out and modified in the PRG 3, PRG 3 S and PRG 300 (OFF line) or in conjunction with the PS 3 (ON line). In ON line operation, the PS 3 can be in the HALT or RUN status.

Call-up on the PRG 3/3 S

Display MENU ( 1 - 7 ) -

Input 1 or 0 or ROLL ↑ (1x) or ROLL ↑ (7x)

Display PROGRAM -

Input ENTER/YES

Display ADDRESS : -

Input of the starting address  
ENTER/YES  
e.g. „0” +

(If ENTER/YES is keyed in on its own, there is a jump to the end of the program)

Display 0 0 0 -

Cursor  
↓  
Start of the program input (see example)

Notes:

- 1) When the PRG memory is erased, the start address is always 000.
- 2) The new program is automatically appended, immediately following the existing program.
- 3) Gaps in the program can be achieved only through the “NOP” instruction.

Menu 1: PROGRAM (Programming, modifying)

Example:  
Program input

Input L + 0 + 0 + 0 + 0 + 0  
Display 0 0 0  
Input ENTER/YES  
Display 0 0 1 -  
Input 0 + 0 + 0 + 0 + 0  
Display 0 0 1 = 0 0 . 0 -  
Input ENTER/YES  
Display 0 0 2 -

The cursor shows the point at which entry is to be made on the display. The unit checks whether there are any form errors (syntax errors). If an erroneous input is made, the address is not clocked forward until the input is correct.

Error indication:

SYNTAX ERROR

Acknowledge with

↓  
etc.  
Interrupt the programming mode by pressing the “MENU” key

ENTER/YES

0

Example: After the address has been entered, the memory location, with contents, appears.

e.g. 0 0 0 L I 0 . 0

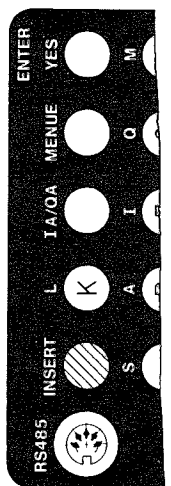
The cursor is now below the first entry in the line.

The display is deleted by entering a new operation. The instruction must be completely rewritten and concluded with ENTER/YES.

0



Menu 1: PROGRAM (Programming, modifying)



**The command: INSERT**  
 In the menu "PROGRAM", the insert command can be carried out at any time.

**Example:** One or more instructions are to be inserted in an existing program.

```

010 LI 1.10
011 AM 3.14
012 ANM 1.1
013 OM 0.7
014 = Q 3.0
    
```

Insert >

Call-up of line: 013

Display 0 1 3 O M 0 . 7

Input INSERT

Display 0 1 3 \_

Input of new instruction, e.g.: AM 3.3

Display 0 1 3 A M 3 . 3

Input ENTER/YES

Display 0 1 4 O M 0 . 7

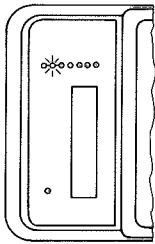
The contents of address 013 are now shifted to address 014.

```

010 LI 1.10
011 AM 3.14
012 ANM 1.1
013 AM 3.3
014 OM 0.7
015 = Q 3.0
    
```

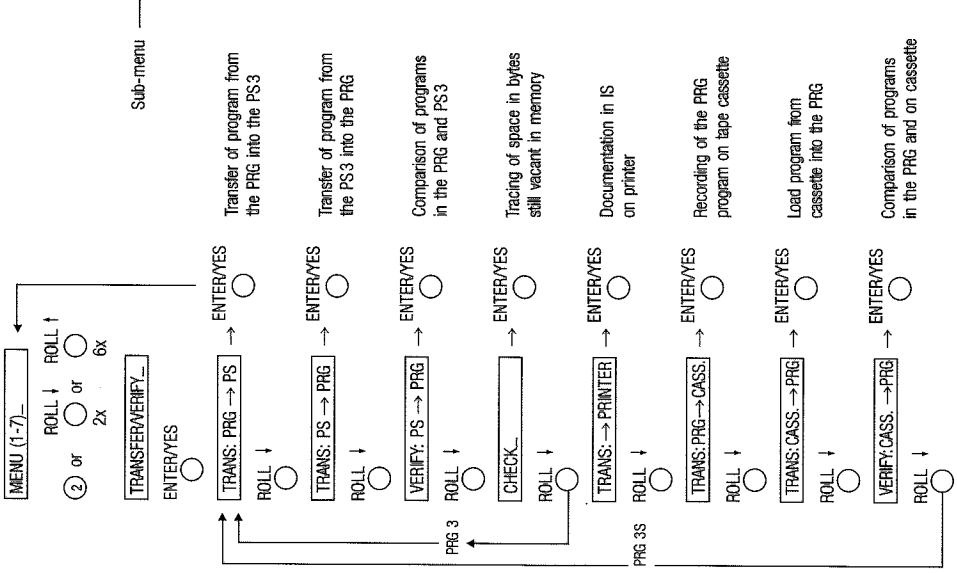
**Note:**  
 After an "Insert" command has been completed, the target addresses for jumps (J...) and branches (B...) are automatically adjusted.

Menu 2: TRANSFER/VERIFY



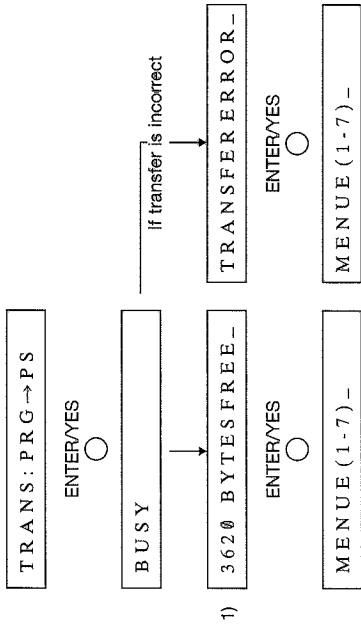
In this menu, the user can transfer the program which has just been processed in the PRG 3 and PRG 3 S into the memory of the PS 3, or transfer an existing program from the controller into the programmer. With the PRG 3 S/300, it is possible in addition to keep a record on an external tape recorder and documentation in IS/LD on a printer (Centronics).

Call-up of the menu:



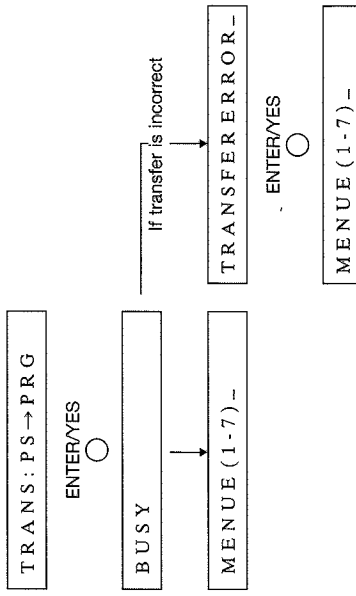
Menu 2: TRANSFER/VERIFY

Sub-menu A



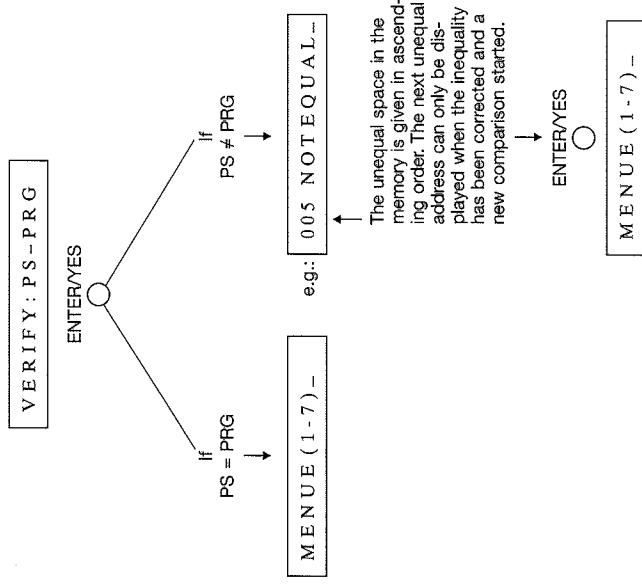
1) See Sub-menu D

Sub-menu B

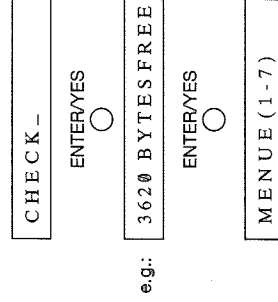


Menu 2: TRANSFER/VERIFY

Sub-menu C



Sub-menu D



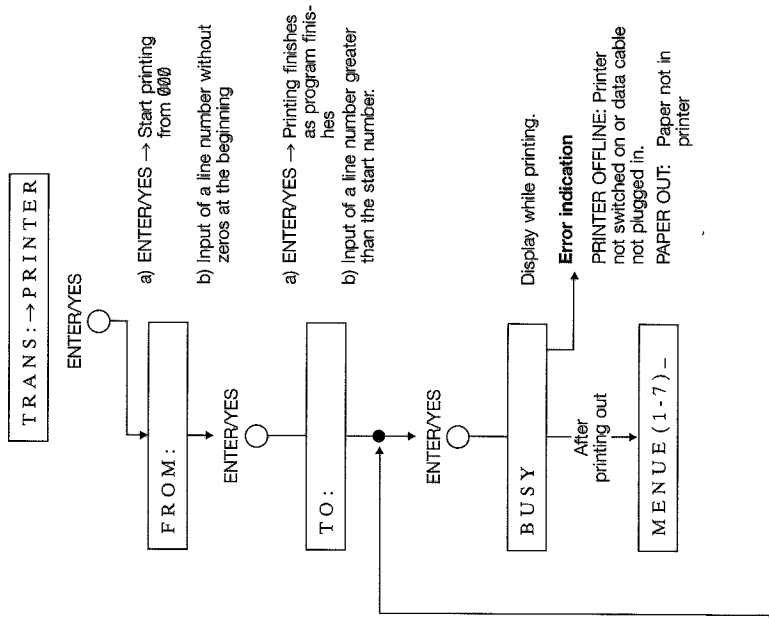
The memory is determined as follows:

Maximum memory in the PS 3-...: 3680 bytes  
 Amount of memory still free e.g.: 3620 bytes  
 Amount of memory used: 60 bytes

Menu 2: TRANSFER/VERIFY

The following sub-menus are only possible with the PRG 3 S.

Sub-menu E



With a perforated roll of continuous paper, the top of the sheet must be inserted correctly, with the perforation about 5-10 mm above the writing head.

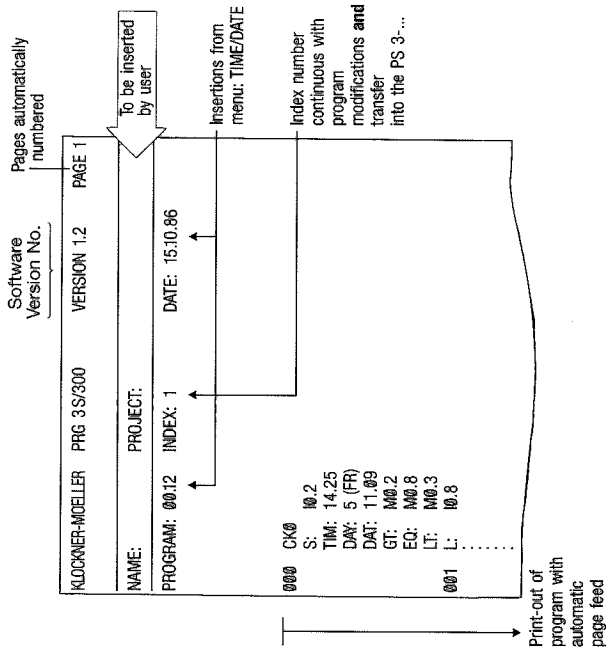
Notes:

If the PRG 3 S program memory is deleted, a printing procedure cannot be started.

The page feed corresponds to A4 size.

Menu 2: TRANSFER/VERIFY

Print-out

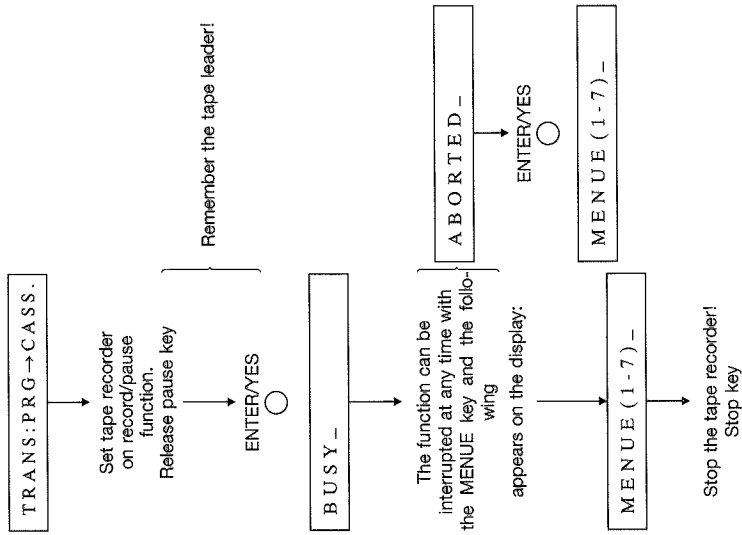


Note:

If a partial print-out, e.g. from 280 to 500 is started, the page numbering starts from "1".

Menu 2: TRANSFER/VERIFY

Sub-menu F

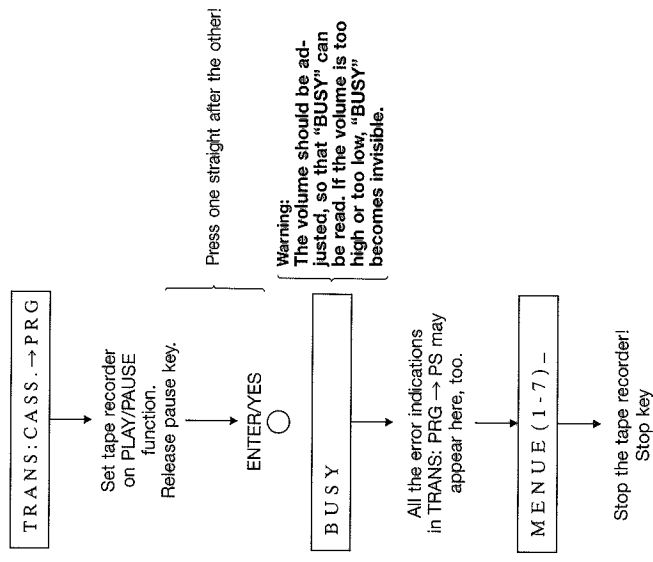


Notes:

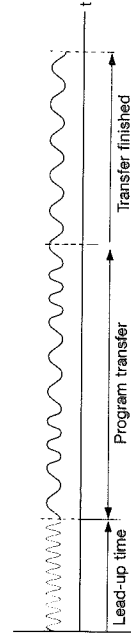
All commercially available cassette tapes can be used. If the tape recorder has a counter, several programs can be stored on each side of each tape. Sufficient distance should be maintained between individual programs.

Menu 2: TRANSFER/VERIFY

Sub-menu G

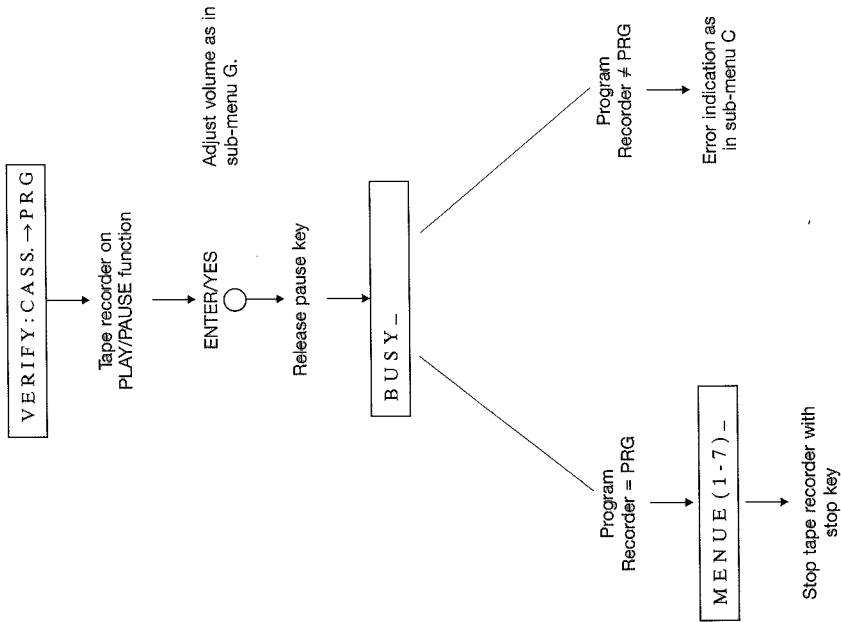


Sound during data transfer:

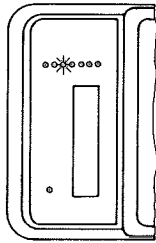


Menu 2: TRANSFER/VERIFY

Sub-menu H

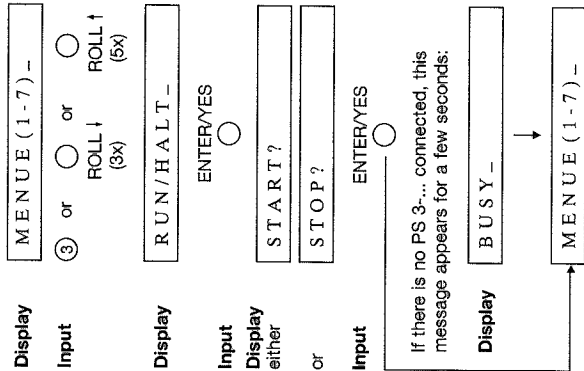


Menu 3: RUN/HALT



3 ☀ RUN/HALT

In this menu, the user can start and stop the PS 3 with the programmer, irrespective of the set STATUS of the PS 3. One exception: The PS 3 is locked (Menu 7). The user program can only be started from address 0000.



If the PS 3-... is stopped, the PRG asks whether it should start the controller.  
If the PS 3-... is running, the PRG asks whether it should stop the controller.

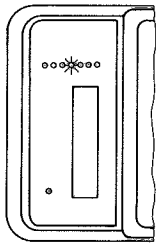
If there is no PS 3-... connected, this message appears for a few seconds:

Display BUSY -



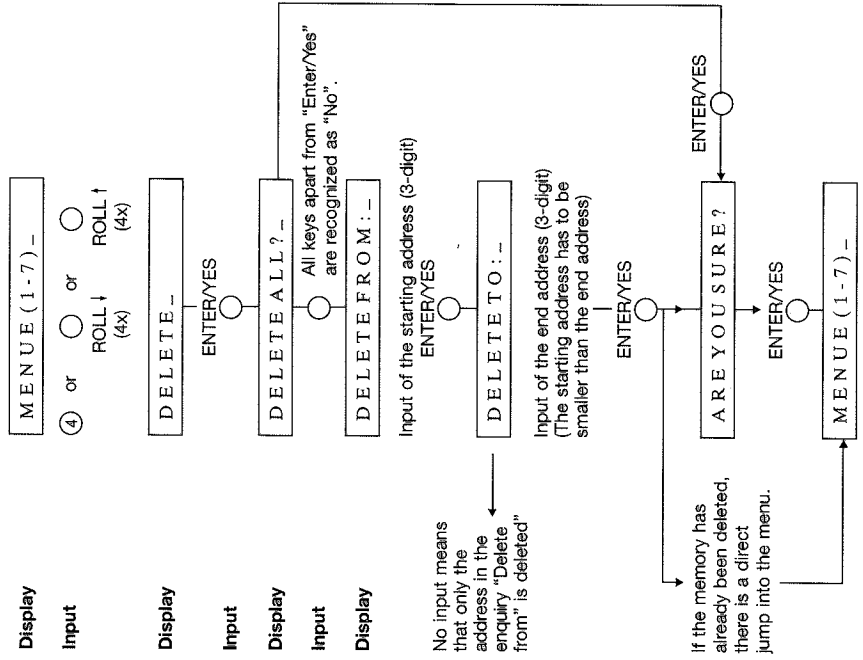
MENU (1-7) -

Menu 4: DELETE

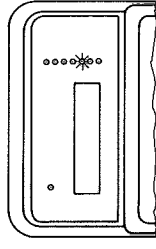


4 ☀ DELETE

In this menu, the contents of the user memory in the PRG can be deleted either entirely or in part.



Menu 5: SEARCH



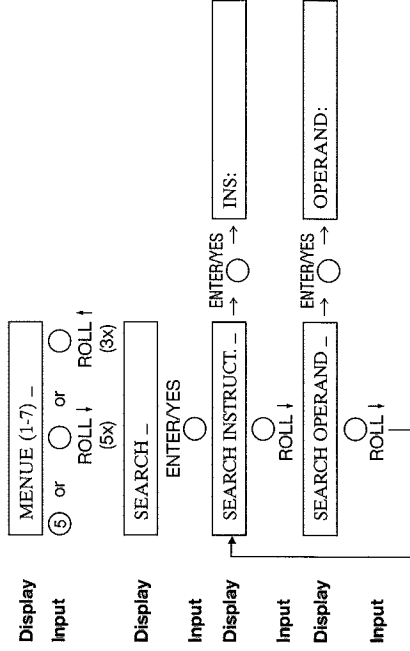
5 ☀ SEARCH

In the menu "Search", the user can find the following operands in the program (PRG):

- I = Inputs
- Q = Outputs
- M = Markers
- K = Constants
- IA = Analogue inputs
- QA = Analogue outputs

Modules

- Bit, byte, word



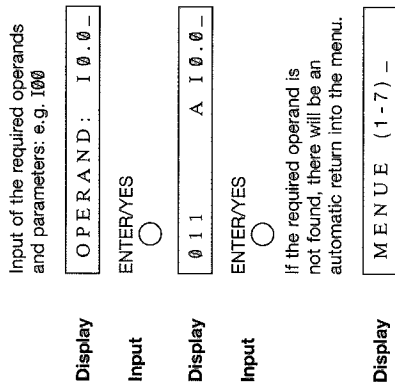
**INS:** Searching of instructions, operand and operation, as well as modules. (Sequencing results)  
**Example:** INS: = M 25.7

**OPERAND:** Searching of operands without operation. (Individual scan)  
**Example:** OPERAND: M 25.7

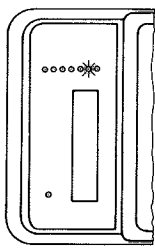
**Note:** If, after finding the first operand or instruction, you key in "ENTER/YES", the next required operand or instruction appears.

Menu 5: SEARCH

**Example:**



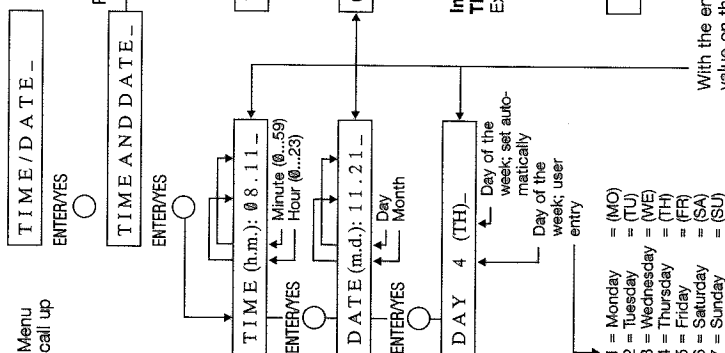
Menu 6: TIME/DATE



6 ☼ TIME/DATE

This menu contains several functions:

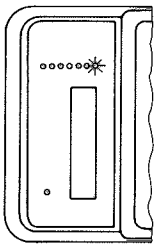
- a) Time
- b) Date
- c) Version No. with date



With the entry of the new figures, the old value on the display is deleted. The new value is transferred into the memory of the PRG only if no "SYNTAX ERROR" is recognized after pressing the "ENTER/YES" key.

- 1) This version number has nothing to do with the software version number of the PRG or the PS 3 respectively. It can be freely selected by the user.
- 2) This data is printed on every page of the documentation.

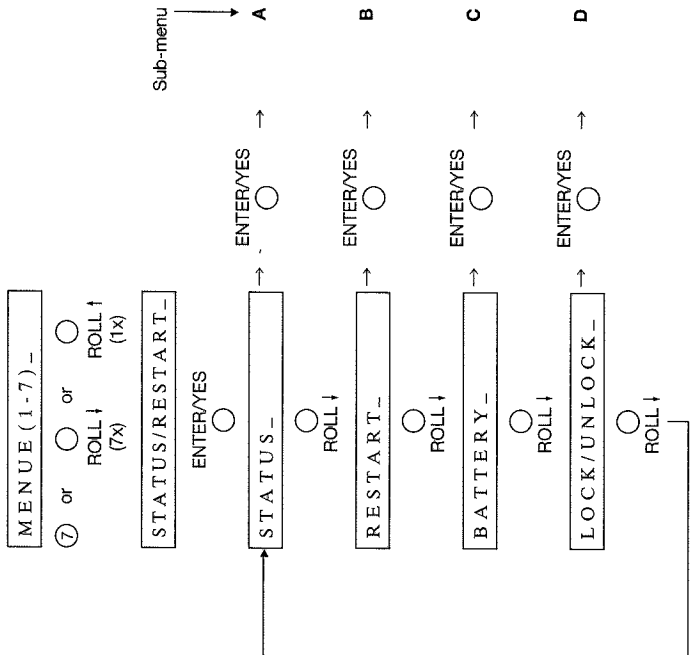
**Menu 7: STATUS/RESTART**  
(Status of the PS 3-.../restart conditions etc.)



7 STATUS/RESTART

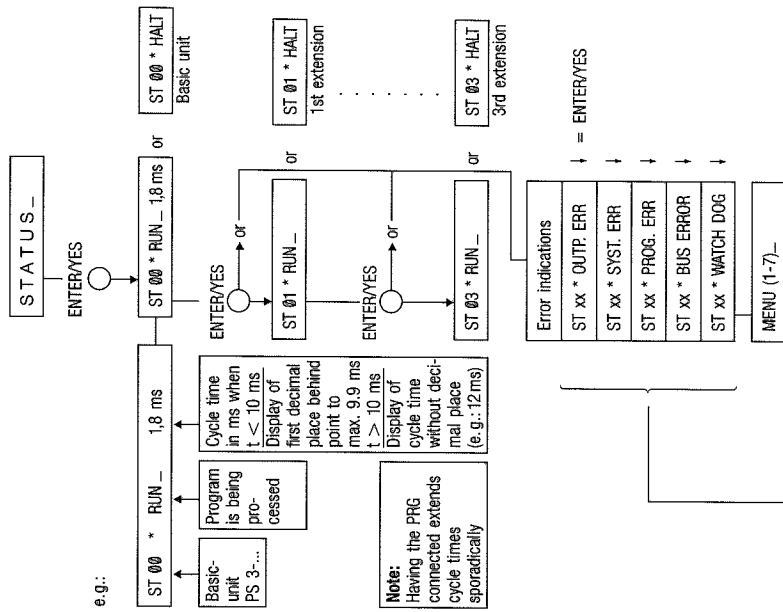
This menu, too, contains several functions:

- Status = Status recognition of the individual PS 3 units with error indication.
- Restart = Restarting condition in the event of a loss and return of power.
- Battery = Battery running time with resetting facility.
- Lock/Unlock = "Locking" and "unlocking" the PS 3-...



**Menu 7: STATUS/RESTART**

**Sub-menu A**

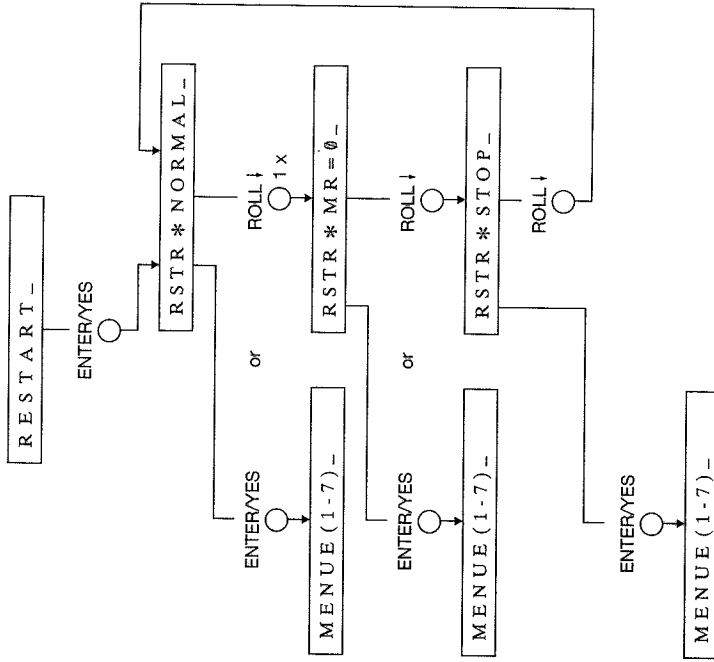


| Error indications |                                                                                                              |
|-------------------|--------------------------------------------------------------------------------------------------------------|
| WATCH DOG         | Cycle time monitoring reacts, for example, if an absolute jump is programmed after address 0 (Endless loop). |
| OUTP. ERR         | Short-circuit at one or more of the PS 3-DC outputs.                                                         |
| SYST. ERR         | Hardware error in the PS 3-...                                                                               |
| PROG. ERR         | For example, stack register not locked in program. Error in check sums.                                      |
| BUS ERR           | Error in transmission, e.g. if parameters for PS 3s which are not available are in the program.              |



Menu 7: STATUS/RESTART

Sub-menu B



Restart conditions (always valid for basic unit)

**Normal:**

PS 3-... starts automatically as soon as the power is switched on; markers are reset. Remanent markers and modules retain their information.

**MR = 0:**

PS 3-... starts automatically as soon as the power is switched on; all markers and modules are set to "0".

**Stop:**

No automatic starting of the PS 3-... Starting via the PRG 3. Markers behave as under "Normal".

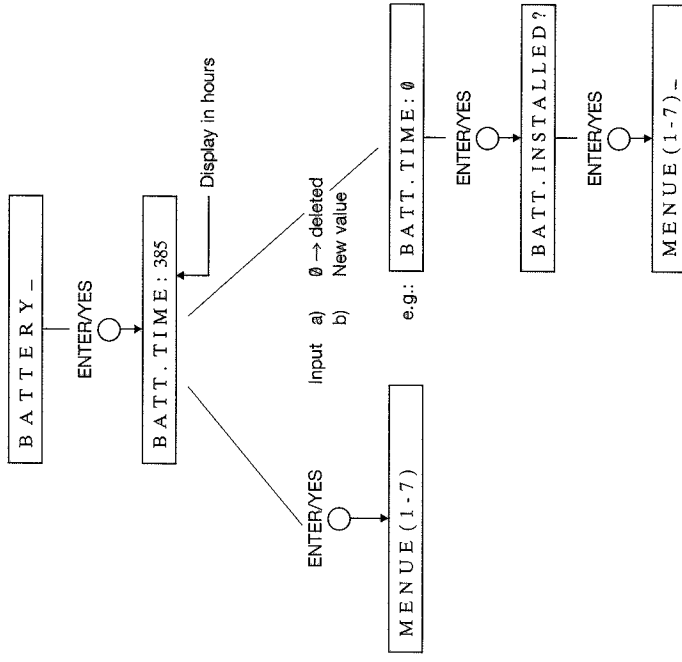
**Notes:**

If the user program is deleted, or replaced by a new one, the RESTART condition is not automatically changed.

If the user program is loaded into the EE1-PS 3 memory module, the RESTART condition is also stored in the module. This is also true in the transfer from the EE1-PS 3 to the PS 3.

Menu 7: STATUS/RESTART

Sub-menu C



**Notes:**

The battery hour counter becomes active when the unit is switched off from the mains and the batteries are put in. The number of hours (0...65535) is stored in the MW 35 marker word. Thus, the number of hours can be further processed in the user program.

Menu 7: STATUS/RESTART

Sub-menu D

LOCK/UNLOCK\_

The user can "lock" the PS 3-... in order to stop changes being made to the program within the PS 3, although viewing of the program within the PS 3 is still possible. Locking and unlocking is achieved via the PRG software. Locking is possible at any time. Unlocking, however, is only possible by way of a 4-figure code number. If the user uses a PC (Personal Computer), the PS 3-... is unlocked by the SUCOSOFT S 30-S 3.

LOCK/UNLOCK\_

After pressing the ENTER/YES key, the following appear, depending on whether or not the unit is locked

LOCK ?

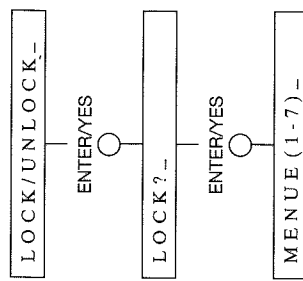
→ if the PS 3-... is not locked

or

UNLOCK ?

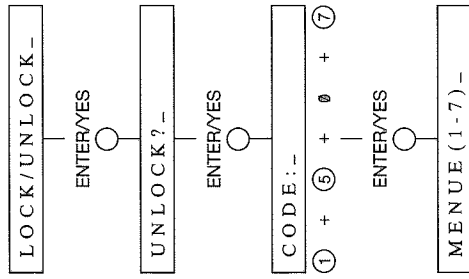
→ if the PS 3-... is locked

The PS 3-... is **locked** as follows:



Menu 7: STATUS/RESTART

Sub-menu D The PS 3-... can be **unlocked** again in the following way:



Key

The code numbers are same on all controllers.

Notes:

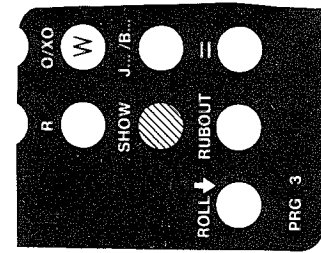
If you are using a PRG 3 version 1.1 or earlier, then you are unable to lock/unlock a program within a PS 3 from version 1.4 onwards. The PS 3 remains unlocked.

If you are using a PRG 3 version 1.1 or later or a PRG 3 S/300 version 1.2 or later, then you are unable to lock/unlock a program within a PS 3 version 1.3 or earlier. The PS 3 remains unlocked.

You can only lock/unlock a program within the controller if the PS 3 is from version 1.4 onwards and the programmer is a PRG 3 version 1.1 onwards or a PRG 3 S/300 version 1.2 onwards.

## Function Key: SHOW

## Function Key: SHOW



or PRG 3 S  
or PRG 300

The SHOW function key enables the user to recognise status while the controller is in operation. The status monitoring covers **all**

Inputs: I, IA  
Outputs: Q, QA  
Markers: M  
and Modules: TR, SR, CP, C

The formats of I, Q and M can have bit, byte and word formats.

The user can choose how he would like to see the byte and word instructions, either in **decimal** or **binary** mode.

M E N U E ( 1 - 7 ) \_  
SHOW ○

D E C I M A L M O D E \_

B I N A R Y M O D E \_

The display is set up according to the last form of presentation fed in. With the ROLL ↓ or ↑ key, the other form of presentation can be selected.

**Decimal Mode**  
Decimal presentation of byte and word instructions

Bit → L/H  
Byte → 000 → 255  
Word → 000000 → 65535

**Example:**  
001 = QB 0.8 : 016

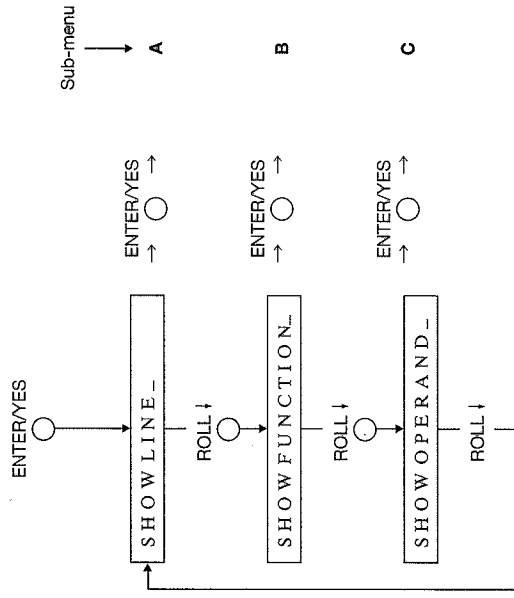
**Binary-Mode**  
Binary presentation of byte and word instructions

Bit → L/H  
Byte → I . . . I I I . . .  
Word → I . . . I I I . . . I I I I I . . .

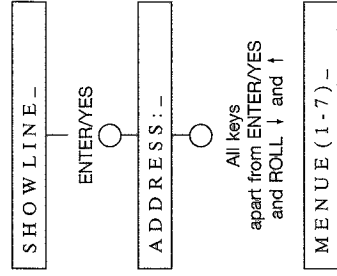
High = 1    Low = 0  
↑            ↓

**Example:**  
001 = QB 0.8 : . . . I . . . . .  
which corresponds to: L L L H L L L L L  
Valency:            | | | | | | | |  
                  2<sup>7</sup> 2<sup>6</sup> 2<sup>5</sup> 2<sup>4</sup> 2<sup>3</sup> 2<sup>2</sup> 2<sup>1</sup> 2<sup>0</sup>

After the form of presentation has been selected:



**Sub-menu A** Status monitoring **with** display of sequencing result is possible in bit, byte and word sequences from PS 3 version 1.3.



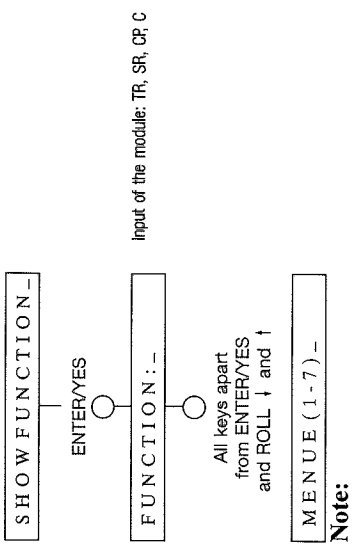
Address entered without zeros at start. If you are in the SHOW-LINE menu, you can read off the status of the other addresses by pressing the ROLL ↑ and ↓ key

All keys apart from ENTER/YES and ROLL ↑ and ↓

## Function Key: SHOW

### Sub-menu B

Status monitoring of modules. **All** inputs and outputs, as well as actual values, can be read off. From version 1.3 of the PS 3.

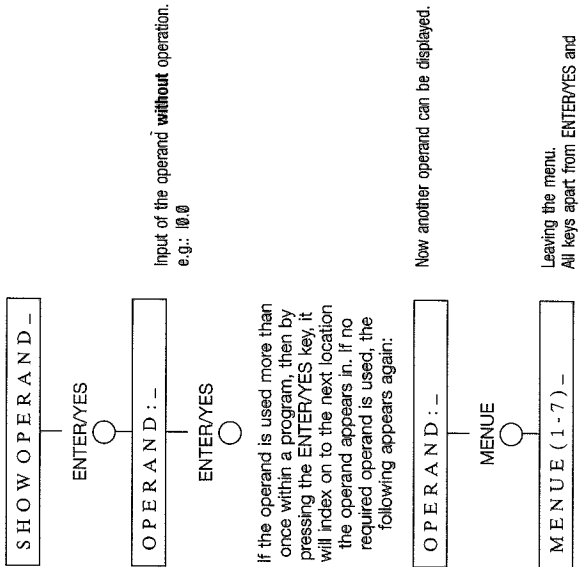


### Note:

The actual value display on the TR 0...31 timer modules has to be multiplied by 0.1. This produces the numerical value in seconds.

### Sub-menu C

Status monitoring of operands **irrespective** of the sequencing. Possible from version 1.2 of the PS 3 onwards.

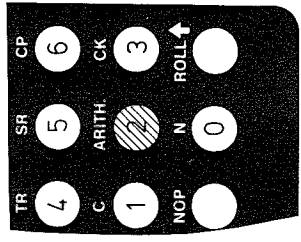


If the operand is used more than once within a program, then by pressing the ENTER/YES key, it will index on to the next location the operand appears in. If no required operand is used, the following appears again:

Now another operand can be displayed.

Leaving the menu. All keys apart from ENTER/YES and the ROLL ↑ ↑ keys may be used.

## The ARITH Key (Arithmetic)

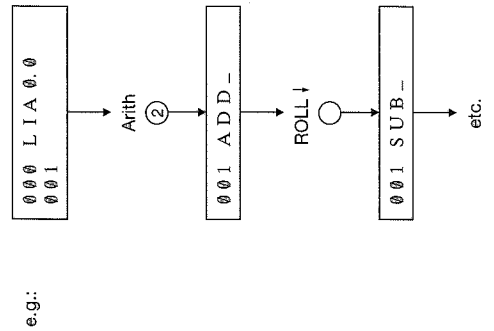


The ARITH key is a multi-function key containing the following arithmetical functions:

- ADD = Addition
- SUB = Subtraction
- MUL = Multiplication
- DIV = Division
- GOR = Processing of residual values
- NOT = Inversion of byte instructions

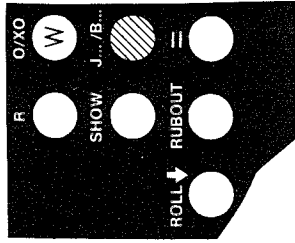
All these functions are only acceptable in byte sequences. Decimal numbers from 0 to 255 can be processed. Further details are given in the PS 3 System Manual, in the chapter headed "Arithmetic".

In Menu 1 (PROGRAM) the key functions as an arithmetic key.



e.g.:

## The J.../B... Key (J... = Jump/B... = Branch)



This key contains several jumping and branching facilities. Jumps are acceptable in bit sequences. Branchings are only permitted in byte sequences.

**The jump target or branching target must always be the beginning of a sequence in the PRG.**

There are the following possibilities for jumps:

JP = Absolute jump  
 JC = Conditional jump when working register content = 1  
 JCN = Conditional jump when working register content = 0

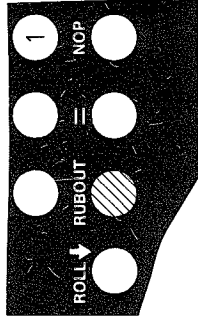
The following branchings are possible:

BC = Branch, when carry bit = 1  
 BNC = Branch, when carry bit = 0  
 BZ = Branch, when zero bit = 1  
 BNZ = Branch, when zero bit = 0

The jump commands are explained in further detail in the PS 3 System Manual, in the chapter headed "Jumps". The branchings are dealt with in detail in the PS 3 System Manual, in the chapter headed "Arithmetic".

Like the ARITH key, the J.../B... key is active in menu 1 (PROGRAM). The individual commands can be selected via the ROLL ↓ or RUBOUT ↑ key.

## The RUB OUT Key



The role of this key is to give the user the opportunity to correct inputting errors immediately. If the ENTER/YES key has already been pressed after an instruction, this key operates as follows:

**The whole instruction is deleted** and the memory is compressed again. This also happens within the modules, with one exception. In this case, the module is not compressed by RUB OUT, but the display unit displays the next step in the module.

The program in the PRG is stored in a battery-backed RAM (write-read memory). A fully charged battery is sufficient to secure the program for at least 30 days. The battery is charged automatically during operation, a complete re-charge requiring some 150 hours operation.

**PRG 3**

|                           |                                                        |
|---------------------------|--------------------------------------------------------|
| Supply voltage            | 9 V d.c., 450 mA (max.)                                |
| Display                   | 16-digit LCD                                           |
| Keyboard                  | Short-stroke keys with function selection via software |
| <b>Interface PRG ↔ PS</b> |                                                        |
| Mechanical                | 5-pole                                                 |
| Electrical                | RS 485                                                 |
| Data protocol             | SUCONET                                                |
| Data transfer rate        | 187.5 kBit/s                                           |
| Data security             | Via battery                                            |
| Back-up time              | Approximately 30 days                                  |
| Weight                    | 0.5 kg                                                 |
| Dimensions W x H x D      | 145 x 215 x 80 mm                                      |

**PRG 3 S**

|                                      |                                                        |
|--------------------------------------|--------------------------------------------------------|
| Supply voltage                       | 9 V d.c., 450 mA (max.)                                |
| Display                              | 16-digit LCD                                           |
| Keyboard                             | Short-stroke keys with function selection via software |
| <b>Interface PRG ↔ PS</b>            |                                                        |
| Mechanical                           | 5-pole                                                 |
| Electrical                           | RS 485                                                 |
| Data protocol                        | SUCONET                                                |
| Data transfer rate                   | 187.5 kBit/s                                           |
| <b>Interface PRG ↔ Tape recorder</b> |                                                        |
| Mechanical                           | 5-pole, DIN 41524                                      |
| Electrical                           | CCITT                                                  |
| Data transfer                        | Frequency modulated                                    |
| <b>Interface PRG ↔ Printer</b>       |                                                        |
| Mechanical                           | 25-pole subminiature socket                            |
| Electrical                           | Centronics                                             |
| PIN utilisation                      | IBM standard                                           |
| Control signal                       | EPSON standard                                         |
| System software module               |                                                        |
| M-PRG 3 S                            | Plug-in                                                |
| Data security                        | Via battery                                            |
| Back-up time                         | Approximately 30 days                                  |
| Weight                               | 0.6 kg                                                 |
| Dimensions W x H x D                 | 145 x 215 x 80 mm                                      |

PRG 300

|                                      |                                                                                                     |
|--------------------------------------|-----------------------------------------------------------------------------------------------------|
| Supply voltage                       | 9 V d.c., 500 mA                                                                                    |
| Display                              | a) 16-digit LCD<br>b) Monitor                                                                       |
| Input                                | a) Keyboard, short-stroke keys with function selection via software<br>b) Opto-electronic light-pen |
| <b>Interface PRG ↔ PS</b>            |                                                                                                     |
| Electrical                           | RS 485<br>SUCONET                                                                                   |
| Data transfer rate                   | 187.5 kBit/s                                                                                        |
| <b>Interface PRG ↔ Tape recorder</b> |                                                                                                     |
| Mechanical                           | 5-pole, DIN 41 524                                                                                  |
| Electrical                           | CCITT                                                                                               |
| Data transfer                        | Frequency modulated                                                                                 |
| <b>Interface PRG ↔ Printer</b>       |                                                                                                     |
| Mechanical                           | 25-pole subminiature socket                                                                         |
| Electrical                           | Centronics                                                                                          |
| PIN utilisation                      | IBM standard                                                                                        |
| Control signal                       | EPSON standard                                                                                      |
| <b>Interface PRG ↔ Monitor</b>       |                                                                                                     |
| Mechanical                           | Cinch                                                                                               |
| Electrical                           | Composite-Video, 75 Ω                                                                               |
| Brilliance                           | Adjustable                                                                                          |
| <b>Interface PRG ↔ Light-pen</b>     |                                                                                                     |
| Mechanical                           | Plug-in                                                                                             |
| Electrical                           | Opto-electronic                                                                                     |
| Sensitivity                          | Adjustable via monitor brilliance                                                                   |
| System software module               |                                                                                                     |
| M-PRG 300                            | Plug-in                                                                                             |
| Data security                        | Via battery                                                                                         |
| Back-up time                         | Approximately 30 days                                                                               |
| Weight                               | 0.7 kg                                                                                              |
| Dimensions W x H x D                 | 145 x 215 x 80 mm                                                                                   |

In the following table, all error indications which the PRG from version 1.1. onwards can display are shown. If the translator is shown as the source, then the error indication can appear at TRANSFER (PRG-PS), CHECK and CASSETTE SAVE. If the retranslator is given as the source, the indication can appear at TRANSFER (PS-PRG), VERIFY, CASSETTE LOAD und CASSETTE VERIFY.

| Indication                                    | Source                                                   | Remarks                                                                        |
|-----------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------|
| STACK ERROR                                   | Translator                                               | Erroneous operation of the stacking register                                   |
| ILLEGAL JUMP                                  | Translator                                               | Jump command in a sequence                                                     |
| MEM OVERFL.                                   | PROGRAM                                                  | The text of the program will not fit in the PRG 3 text memory                  |
|                                               | Translator                                               | The program will not fit in the PS                                             |
| ILLEGAL OP.                                   | Translator                                               | Conflict between data types e.g. LI0,0- = QB0,0                                |
| STACK OVERFL.                                 | Translator                                               | Overflow in stacking register                                                  |
| CANNOT READ PR.                               | Retranslator                                             | Program in the PS is damaged or contains commands unfamiliar to the PRG in use |
| NOT EQUAL                                     | SHOW LINE, VERIFY                                        | The programs in the PS and PRG are not equal                                   |
| TRANSFER ERROR                                | TRANSFER/VERIFY                                          | Interrupted or flawed connection to PS                                         |
| PS 3 LOCKED                                   | Transfer (PRG-PS), RUN/HALT, TIME/DATE, RESTART, BATTERY | PS is locked, the requested function cannot be carried out                     |
| NOT EXECUTED (PROGR. NOT EXEC.) <sup>1)</sup> | TRANSFER (PRG-PS)                                        | The PS cannot carry out the transferred program                                |
| SYNTAX ERROR                                  | PROGRAM                                                  | Error in syntax (e.g. invalid marker number)                                   |
| MULTIPLE FUNC.                                | PROGRAM                                                  | Multiple occupancy of one function module                                      |

<sup>1)</sup> Indications in PRG 3 version 1.0

Error Indications in the PRG...

| Indication                               | Source                          | Remarks                                                                                                                    |
|------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| BAD JUMP<br>UNRES. JUMP(S) <sup>1)</sup> | PROGRAM, DELETE                 | In the line indicated, there is a jump into the area to be deleted. Thus the area is <b>not</b> deleted (From version 1.1) |
| PAPER OUT                                | PRINT                           | No paper in the printer                                                                                                    |
| PRINTER OFF LINE                         | PRINT                           | Printer not connected or not ready                                                                                         |
| ABORTED                                  | CASSETTE LOAD/<br>CASSETTE VERI | Loading function interrupted by menu key                                                                                   |
| CASSETTE ERROR                           | CASSETTE LOAD/<br>CASSETTE VERI | Invalid data read from cassette                                                                                            |

<sup>1)</sup> Indications in PRG 3 version 1.0

L I  $\emptyset$   $\emptyset$  READ INPUT  $\emptyset$   $\emptyset$  AND  
 = Q  $\emptyset$   $\emptyset$  SEND TO OUTPUT  $\emptyset$   $\emptyset$ .

L I W  $\emptyset$   $\emptyset$  READ ALL INPUTS AND  
 = Q W  $\emptyset$   $\emptyset$  SEND TO OUTPUTS.

L IA  $\emptyset$   $\emptyset$  READ ANALOG INPUT  $\emptyset$   $\emptyset$   
 = QA  $\emptyset$   $\emptyset$  AND SEND TO ANALOG  
 OUTPUT  $\emptyset$   $\emptyset$