SIEMENS

SIMATIC S5
OP 396 Operator Panel

Operating Instructions Order No.: EWA4NEB 810 1288-02a

Edition

| 1 | 2 | ☒ | 4 | 5 |

Figure 1-1. OP 396 Operator Panel

Contents

1   Introduction

1.1   General

The OP 396 is an intelligent operator panel for SIMATIC S5 programmable controller systems in the lower and medium performance ranges.

It can be used for
- observing processes via an LCD display with a matrix of 8 x 20 characters,
- operator-process communication over a membrane keyboard with 30 keys.

The OP 396 can be connected to the programmer ports of the following programmable controllers:

Programmable controller   Adapter required: (see Sections 2.2, 12 and 13)

Programmable controller	Adapter required
S5-90U	Yes
S5-95U	No
S5-100U	No
S5-101U	No
S5-115U	No
S5-135U, S and R processors and CPU 928	Yes
S5-150U	Yes
S5-155U (operating system submodule)	Yes

The panel is designed for use in hostile industrial environments. It can be held in the hand, placed on a table top or flush-mounted in a panel (Section 2.1).

The OP 396 can be configured by the user to suit his particular automation problem. The associated configuration data can be generated on a programmer using the COM 396 software package and stored in an EPROM or EEPROM. The latter is plugged into receptacle 2 of the OP 396 (Figure 2-1).

Note:
From version V2.0 onwards, the OP 396 operating system cannot execute with user submodules that have been developed using version V1.0 of the COM 396 software package. Version V1.0 of the OP 396 operating system, on the other hand, will reject user submodules that have been configured using the COM 396 software package from version V2.0 onwards.
From version V2.0 of the COM 396 software package, records generated with the COM 396 version V1.0 can be converted into records of version V2.0 (see COM 396 Instructions).
The number of the OP 396 operating system version is shown in the first screen form on power-up.

1.2   Functions and Performance Capability

- Operator manipulation and observation (entry/display) of up to 1080 values in 30 displays of 18 lines each

- Display of input/output values in selected formats

- Conversion of input/output values in the OP 396 (scaling) with factor and offset

- Operator manipulation and observation of up to 128 timers

- Operator manipulation and observation of up to 128 counters

- Limit monitoring of data entered in the OP 396

- Flashing of actual values when the tolerance ranges in the programmable controller are violated

- Display of up to 120 process status messages

- Display of up to 120 fault messages

- Sequencer diagnostics for up to 50 steps

- Printout of daily and shift logs (manually, process-event and/or time-driven)

- Data dump (machine setting parameters, recipes etc.) on EEPROM submodules and diskettes

- Adjustable hardware clock; can be synchronized from the PLC

- Cyclic transfer of date and time of day to the programmable controller

- Six programmable function keys

- Access code for locking data entries, time of day, data dump, operation of the function keys and the deleting of fault messages.

2 Description

2.1 Mechanical Construction

Submodule **receptacle 1**

Interface port 1   **Interface port 2**

LCD display

Contrast knob

Function keys

Special keys

Input keys

Cursor control keys

Sub module receptacle 2
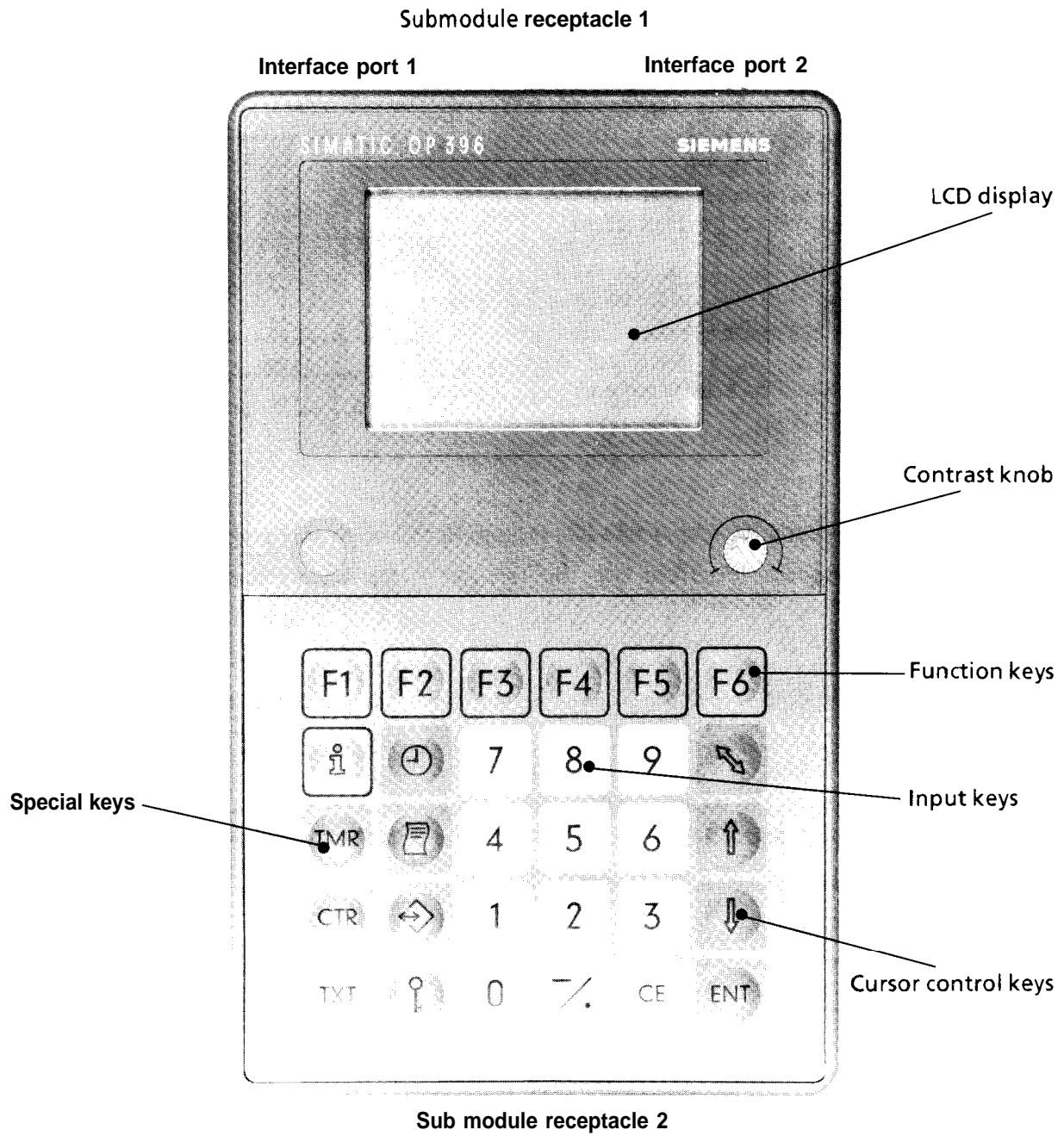
Figure 2-1. Display and Operator Controls of the OP 396

The physical operator interface consists of the following:
- A 160-character LCD display with 8 lines and 20 columns, including contrast knob (Section 4.1)
- A membrane keypad with 5 rows of 6 keys (Section 4.2)
- Two serial ports (Section 2.2)
- Two submodule receptacles (Section 2.3).

The plastics casing measures 250 mm x 150 mm x 63 mm (9.8 in. x 5.9 in. x 2.5 in.) and is thus the same size as the PG 615 programmer. A wire bracket can be swung out at the back for placing the panel on a table top.

The unit can be flush-mounted in control panels in two ways:

- Without mounting kit
  For frontplate cutout see sketch
  M4 fixing screws, max. thread depth 8 mm
  Degree of protection IP 40/ (no protection
  against water)

- With mounting kit
  Frontplate cutout 259 mm x 163 mm
  (10.2 in. x 6.4 in.)
  Degree of protection IP 54 (dustproof and
  splashproof).
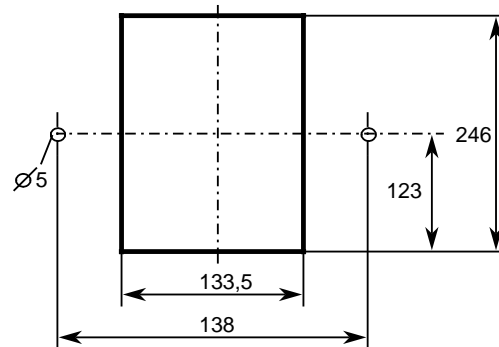
2.2 Interfaces

The two serial ports permit the connection of a programmable controller and a printer.

There is a 15-pin connector (interface 1) on the left and a 25-pin connector (interface 2) on the right at the display end of the unit.

Interface 1 (PLC port)

- For interchanging data with a programmable controller and for power supply of the OP 396 from the PLC,

- Current loop (TTY/20 mA), transmission speed 9600 baud,

- AS511 protocol for direct connection to S5-95U, S5-100U, S5-101U and S5-115U programmable controllers; connection to S5-90U, S5-135U, S5-150U and S5-155U with power supply adapter.

Interface 2 (port for printer and diskette drive)

- Current loop (TTY/20 mA), passive
- Variable, programmable baud rate
- With adapter (option), alternatively
  - TTY active/passive
  - RS 232 C (V.24).
  This adapter provides all the necessary operating voltages
  Adapter order no.:   for 230 V AC ... 6ES5 984-2UA11
                            for 115 V AC ... 6ES5 984-2UB11

Both interfaces operate asynchronously in series; the current loop (TTY) signals are floating.

2.3 Memory Submodules

Only the operating system submodules listed below may be plugged into submodule receptacle 1 at the top end of the operator panel as seen in Figure 2-1.

NOTE CAREFULLY :
These memory submodules must not be withdrawn during operation!

Table 2-1. Memory Submodules

Order No.	Character Set	Can be plugged into PLCs
6ES5 816-0AA11	ASCII	S5-90U; S5-95U; S5-100U; S5-101U; S5-115U; S5-135U,S and R processors and CPU 928; S5-150U
6ES5 816-0AA01	Cyrillic	
6ES5 816-0AB11	ASCII	S5-90U; S5-95U; S5-100U; S5-115U; S5-135U, R processor and CPU 928; S5-150U; S5-155U

Note:
The 6ES5 816-0AA01 memory submodule contains both Cyrillic and Latin character fonts. The OP 396 displays the Cyrillic character set when all texts configured with COM 396 are entered in **lowercase** Latin letters.
The table below shows the allocation of Latin to Cyrillic characters:

Latin	Cyrillic	Latin	Cyrillic	Latin	Cyrillic	Latin	Cyrillic
@		H		P		X	
A		I		Q		Y	
B		J		R		Z	3
C		K		S		[	
D		L		T		\	
E		M		U		]	
F		N		V		^	
G		O		W			

The following types of user EPROMs or EEPROMs can be plugged into submodule receptacle 2 at the bottom end of the operator panel as seen in Figure 2-1:

User submodules configured by COM 396:

8 Kbytes:	EPROM	Order No.: 6ES5 375-0LA15
	EEPROM	Order No.: 6ES5 375-0LC31
16 Kbytes:	EPROM	Order No.: 6ES5 375-0LA21
	EEPROM	Order No.: 6ES5 375-0LC41
32 Kbytes:	EPROM	Order No.: 6ES5 375-0LA41

Data dump submodules:

2 Kbytes:	EEPROM	Order No.: 6ES5 375-0LC11
8 Kbytes:	EEPROM	Order No.: 6ES5 375-0LC31
16 Kbytes:	EEPROM	Order No.: 6ES5 375-0LC41

Note:
The user submodule with the Order No. 6ES5 375-0LA11 can be converted to the user submodule with the Order No. 6ES5 375-0LA15 by removing jumper 2 and inserting jumper 3, and can then be read by the OP 396.
In order to avoid confusion when this has been done, please also change the order no. on the user submodule.

2.4   **Technical Specifications**

• Processor	SAB 8032
• Type of operating system memory	64 Kbytes of EPROM; submodule for plugging into receptacle 1
• Type of user memory for configuration data	Up to 32 Kbytes of EPROM; Up to 16 Kbytes of EEPROM submodule for plugging into receptacle 2)
• Type of memory for data dump	EEPROM submodule with 16 Kbytes max. (submodule receptacle 2) and diskettes
• Power supply	Power supply from programmable controller or through plug-on adapter Lithium backup battery (3.4 V) 6ES5 980-0AE11 for CMOS real-time clock
• Display	LCD display (8 lines/20 characters) with contrast adjustment knob

• Keypad	Membrane keypad with tactile-touch keys
	- 30 keys
	- Key dimensions 17 mm x 17 mm
	  (0.7 in. x 0.7 in.)
	- Material: polyester (resistant to petrol, oil,
	  spirit, sweat, soap)
	- Life > 500,000 operations

• Environmental conditions	- Degree of protection:
	  IP 40 as handheld unit
	  IP 54 if flushmounted in cabinet with
	  mounting frame:
	  Without adapter installation kit:
	  6ES5 982-3UB11
	  With adapter installation kit:
	  6ES5 983-0UA11
	- Ambient temperature
	  -20 to +55°C (transport and storage
	  temperature)
	- 0 to +45°C (during operation)

• Dimensions in mm (in.) (WxHxD)	148 mm x 250 mm x 60 mm (5.8 in. x 9.8 in. x 2.4 in.)
• Approx. weight	1.5 kg (3.3 lbs.)

• Length of connecting cable	- Standard: 3 m (10 feet)
	- Maximum with adapter:
	  1000 m (3300 ft.) with max. loop resistance
	  of 250 ohms (double cable length).

3 Getting Started

- First make sure that the operating system EPROM is plugged into receptacle 1.

- All the messages, data, flags etc. the user wishes to have must be configured with the COM 396 software package on a PG 635, PG 675, PG 685, PG 695, PG 730 or PG 750 programmer and written into a permissible EPROM or EEPROM submodule (Section 2.3).

- This user submodule must then be plugged into receptacle 2.

- If a printer is to be connected to interface 2, the device and baud rate settings must be defined via COM 396. For the interface configuration please refer to Section 14.

- If the hardware real-time clock is to keep running when no power supply (PLC or adapter) is connected, insert the battery in its compartment. The battery has a life of at least 1 year.

- Finally, connect the OP 396 with the cable supplied to the programmable controller via interface 1.

The OP 396 now shows the basic display, checks the user submodule and switches to the access code display (Section 6.8) if the correct submodule is plugged in.

The remaining functions are described in Section 6 and the ERROR messages in Section 9.

> **Note:**
> When working with memory submodules (EPROM/EEPROM), the safety measures for MOS devices must be observed. Avoid electrostatic discharges!
> The OP 396 operating system submodules are fitted with plastics covers as an additional measure to protect them against electrostatic charges.
> EPROMs can be completely erased using a UV eraser.

4   Keypad and Display

4.1   Display

The OP 396 has an LCD display with 8 lines of 20 characters each; a character field consists of a 5x7 dot matrix. All the characters of the ASCII and the Cyrillic character set, including special characters, can be displayed. For reasons of poor legibility, however, no lowercase letters are displayed. These are converted automatically into uppercase on output.

The display is divided into the following areas:

```
                              10                    20
            1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8
           ┌────────────────────────────────────┐
                                                        Columns
         1 │ A A    B B B B B B B B B B B B B
           │
         2 │    C
           │
         3 │ E E E E E E E E E E E E E E E E E
           │
         4 │ E E E
           │
         5 │ E E E E E E E E E E E E E E E E E
           │
         6 │ E E E
           │
         7 │ E E E E E E E E E E E E E E E E E
           │
 Lines   8 │ E E E
           └────────────────────────────────────┘
```
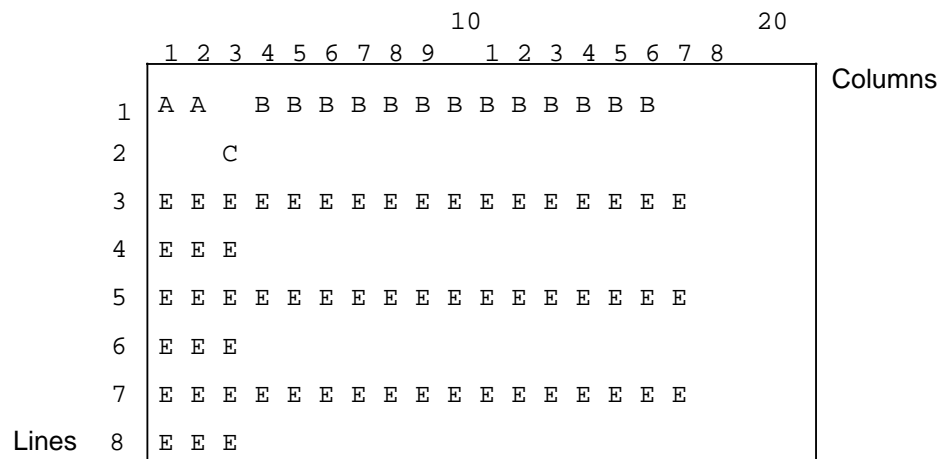
Figure 4-1. Display Layout

(A) Two-character entry field for selection:
     At this point, you can enter the number prefixed to each line in the directory.

(B) Display field for heading (13 characters):
     Each display is accompanied by a heading indicating the current function of the OP 396.

(C) Two single-character fields reserved for the special symbols "Arrow up/Arrow down".

(D) This tells whether there are still lines above or below the display in front of you at a particular moment.

(E) Six lines with 20 characters each in which the actual process data are displayed. The line formats depend on the display type and can be configured using the COM 396 software.

     Generally, a line starts with a text part of varying length, followed by data fields or status information (0/1); the text part or data fields may also be omitted.

(F) Status of function keys
This field is always six characters long and indicates the status or assignments of the function keys.

(G) Status of the access code

(H) Field for an eight-character error message
Error messages configured by the user with COM 396 or the fixed text "ERROR" with a number appears here.

The display contrast can be varied by turning the knob at the bottom right of the display.

4.2 Keypad

You can use the keypad of the OP 396 to select various functions, enter, erase and terminate process data with the cursor control keys and input key, or initiate preprogrammed activities with the function keys.

To simplify matters, the keypad can be broken down into a number of blocks.
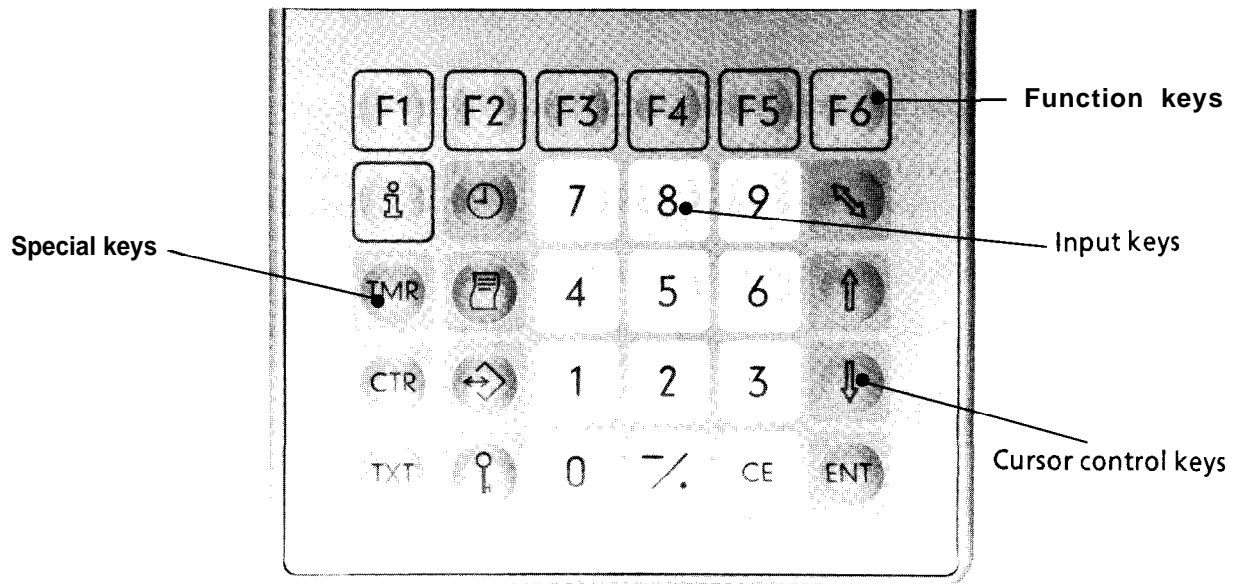
Figure 4-2. Keypad

- **8 Special Keys**

  These keys enable you to select a new function at any time.

ĩ	Directory of process displays
⊕	Entry of time of day or prompter interval
TMR	"Timers" display
▤	Printer select
CTR	"Counters" display
⬌	Data dump
TXT	Process status messages, fault messages and diagnostics
⚿	Access code display for entering and erasing code numbers and activating display test, keypad test and SYSID display.

- **6 Function Keys**

  Function keys F1 to F6 can be used to force preconfigured flags or to select a display direct; the assignment and status of these keys can be seen in the display field above the keys.

- **13 Input Keys**

  These keys are labelled 0 to 9 and also include the "-/." and "CE" keys, which enable you to enter data together with sign and decimal point and to delete entries you have already made.

  The "ENT" key can be used to confirm data that has been entered, or initiate control action.

- **3 Cursor Control Keys**

  The three keys, "Cursor up   ", "Cursor down   " and "Cursor home   " enable you to position the cursor and page/scroll the display.

4.3   Operator Procedures

To simplify operation of the operator panel, the display assumes the following initial state:

*   The cursor appears in the 1st line/1st column or in the 1st line/2nd column if this display permits the entry of a line number,

*   The relevant display heading begins in line 1/column 5,

*   The current display contents appear in lines 2 to 7, and

*   System information in line 8.

Basically, a distinction must be made between two states:

State 1 Cursor in home position

*   **Scrolling** (up/down) with the cursor control keys.

    The arrows appearing in the right-hand margin of the display and pointing up or down indicate whether there is additional data above or below the on-screen data.

    Scrolling is not possible beyond the end of the display.

    Process displays are an **exception** to this. In this case, you can scroll beyond the end/beginning of the display to the next/previous process display in the directory.

*   Entering **line numbers**
    (if possible in this type of display).

*   The "**Cursor Home**" key brings the cursor into the display (state 2); the cursor positions itself to the beginning on the first display line.

State 2 Cursor in the display

*   The cursor can be moved within the display with the **cursor control keys** until it reaches line 1 or line 8. The display then scrolls up/down until the beginning/end of the display is reached.

*   In the case of a data item that can be varied by operator input, the cursor is set in the units position of the entry field; otherwise, it is in front of that field.

*   The **entry** of setpoints, flags and time of day etc. is described in detail in connection with the relevant functions.

*   Return to state 1 by pressing the "**Cursor Home**" key.

5 Overview of Functions

The OP 396 operator panel implements the following functions:

- Selection of process displays (positions, temperatures, velocities etc.), using the directory.

- Entry of process data (e.g. setpoints, controller parameters etc.) via the decimal keypad and cursor control keys, and the display of process data (actual values).

  The process data is displayed in numerical form.

- Selection of timers and counters with special keys.

- Display of process states (e.g. "Oil pressure reached")

- Display and listing of fault and return-to-normal messages with specification of the time of day (resolution: 1 minute)

- Simplified sequencer diagnostics.

- Listing of current process data, including date and time of day, over the TTY/V.24 (RS 323 C) printer port.

- Data dump on plug-in EEPROM submodule and diskette.

- Setting of time of day and entry of up to six prompter intervals.

- Cyclic transfer of data and time of day to the programmable controller at one-minute intervals.

- Access codes for enabling access to the following functions:
    - Data input
    - Data dump
    - Set time of day
    - Function keys and/or
    - Delete fault messages.

- Function keys F1 - F6 can be used for selecting process displays or for user-specific control functions.

6   Functional Description

6.1   Selection of Process Display

Process displays are selected with special key "i". When this key is pressed, the directory of all configured displays appears. If only one display has been implemented, it will immediately appear after pressing the "i" key

```
                              10                    20
          1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                        Colu
       1 | 0 0    P R O C E S S   D I S P L A Y S
       2 | 0 1  T E M P E R A T U R E S
       3 | 0 2  C O O L A N T   P U M P S
       4 | 0 3  L E V E L S
       5 | 0 4  C H A R G I N G
       6 | 0 5  M O T O R   C O N T R O L
       7 | 0 6  H Y D R A U L I C   S Y S T E M      ⇓
Lines  8 | - - - - - -  |
```
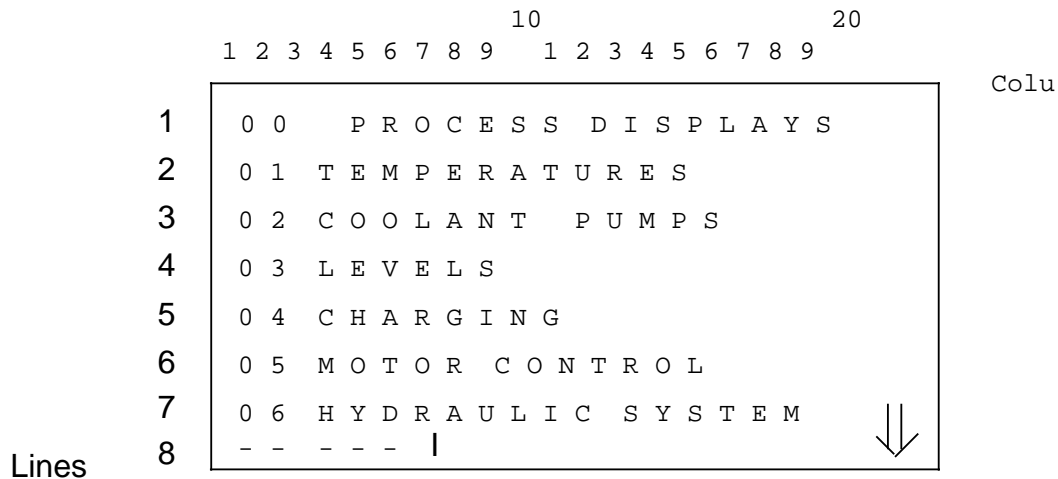
Figure 6-1. Directory

A line of the directory consists of a two-digit display number and a description comprising up to 13 characters (heading from the process display).

Blank lines configured with COM 396 are also displayed in this case.

If there are more than six displays, an arrow appears at the bottom right (Figure 6-1) and you can scroll down by pressing the cursor key (Figure 6-2).

```
                              10                    20
          1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                        Colu
       1 | 0 0    P R O C E S S   D I S P L A Y S
       2 | 0 7  I N T E R N A L   P R E S S .
       3 | 0 8  C L O S I N G   F O R C E
       4 |
       5 | 0 9  P R O D .   D A T A
       6 |
       7 |
Lines  8 | - - - - - -  |
```
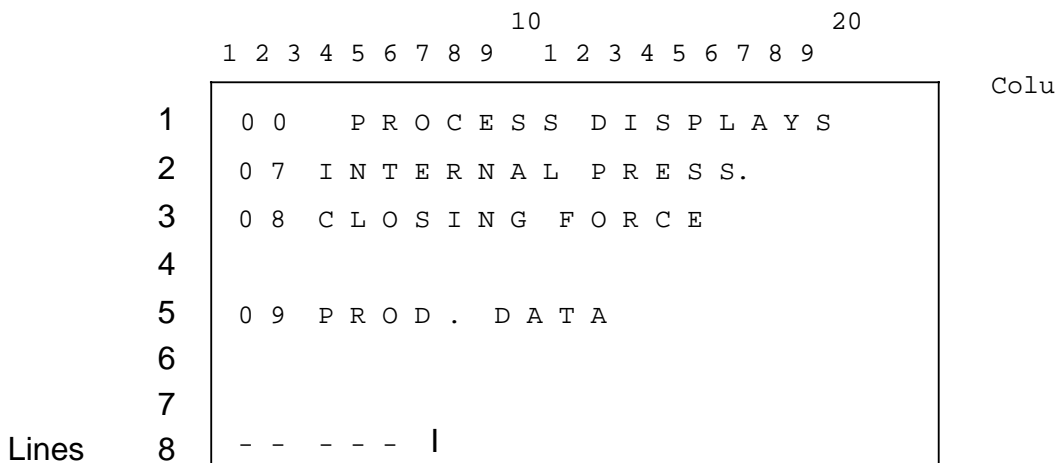
Figure 6-2. Directory (cont.)

During this operation, the cursor is always in the first line/second column and the required process display can be invoked by entering the corresponding display number and then acknowledging by pressing the "ENT" key.

An erronous entry can be deleted by pressing the "CE" key.

If an attempt is made to select a nonexistent process display, error text No. 1 "Wrong entry format" configured by the customer with COM 396 appears to report the error.

6.2 Process Displays

6.2.1 General

Process data or process states can be observed and controlled in the programmable controller by means of process displays.

Using COM 396, three different types of process display and a display type for "Force flags" can be configured. These are described in detail in Sections 6.2.2 to 6.2.5.

There are also two different data groups and two different data formats. These are described in detail below.

Data groups

1. **Setpoints**
   The setpoints of process parameters can be entered with the OP 396. The setpoints appear in the first column immediately after an explanatory text (optional) in the case of a two-column breakdown of the numbers in the display. The entering of a setpoint is described under "Setpoint entry".

2. **Actual Values**
   Actual values are only displayed for the purpose of observing process data and cannot be changed with the OP 396.

   In the configuring phase (COM 396), each actual value can be assigned a communication flag, which causes this actual value to flash in the display when it is set by the PLC program. The PLC program can thus inform the operator when the limit values of process data are exceeded.

Data Formats

- Leading zeros are suppressed

- Numbers are right-justified in the display

- If there is not enough room for the number, only the most significant digits are displayed

- Only the minus sign is displayed; the plus sign is suppressed.

1. 4 Decades

In this format, four positions are reserved in the display for each number, including sign and decimal point. The resultant notations then appear as follows:

1	-	1	1.2
12	-	12	1.23
123	-	123	
1234	-	1.2	

2. 5 Decades

In this case, there are five positions available plus sign and decimal point.
Examples:

12345	-	12345
1.2345	-	1.2345
0.12	-	0.12

Setpoint Entry

To enter a setpoint, position the cursor to the relevant input field. When the cursor is at the units position, you can enter a new value, delete it with "CE" or forward it to the PLC by pressing the "ENT" key. The original value is always displayed after pressing "CE".

The input mode begins with the first digit entered or the "-/." key. If this key is pressed first, it is interpreted as a minus; if pressed after a digit, it is interpreted as a decimal point.

If an attempt is made to enter more digits than there is room for in the field, the inputs first made are pushed out of the field to the left.

In input mode, the cursor control keys have no effect on the operator panel. To exit this mode, it is necessary either to terminate a valid entry by pressing the "ENT" key or delete the entry by pressing "CE".

If the cursor does not appear at the units position, but is positioned to a blank column in front of the input field, this means that this field is locked by the access code and the relevant number has not yet been entered.

In such a case, first select the code form and enter the code number (Section 6.8.2: Access code display/code number).

When the entry has been terminated by pressing the "ENT" key, the value entered is checked for format errors and for violation of the high and low limits configured with COM 396. If there is an error, error message No. 1 "Wrong input format" appears, alternately showing the upper and lower limits.

Due to internal format conversion procedures (rounding), this error message may appear even if the limit entered is correct. The value is rejected.

Transfer Error

If an error occurs when transferring data from the PLC, a string of question marks appears in the display instead of the wrong value: ???????

In the case of numbers lying outside the range that can be displayed by the OP, a string of asterisks is displayed instead of these numbers: ****

6.2.2 Input/Output - 4 Decades

```
                        10                    20
          1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
```
```
   1 |      T E M P E R A T U R E S
   2 |  S U P P L Y  L I N E 1     1 2 5     1
   3 | 1 7
   4 |  R E T U R N  L I N E 1      6 5      6
   5 | 1
   6 |  F U R N.  C U P.      1 7 4 3  1 8
   7 | 7 5
   8 |  C O N V E Y O R            9 0      7
```
Colum

Lines

Figure 6-3. Complete Display

```
                        10                    20
          1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
```
```
   1 |      T E M P E R A T U R E S
   2 |  S U P P L Y  L I N E 1      1 2 5    1
   3 | 1 7
   4 |  R E T U R N  L I N E 1      6 5
   5 | 6 1
   6 |
   7 |  F U R N.  C U P.                1 8
   8 | 7 5
```
Colum

Lines

Figure 6-4. Partial Display

Line format:

```
                          10              20
          1 2 3 4 5 6 7 8 9  1 2 3 4 5 6 7 8 9
         | F U R N. C U P.   1 7 4 3   1 8 7 5 |
```

        4-digit actual value
        4-digit setpoint
        10-character text

6.2.3 Input - 4 Decades

```
                         10                  20
        1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                        Colum
    1 |     L E V E L S
    2 | L E E S   T A N K               1 4 7 2
    3 | W A T E R   B A S I N             7 5
    4 | 5
    5 |  G R A N U L A T E S (M 3)       2 .
    6 | 3 4
    7 |  S T O R A G E   (0 - 1 0 0 %) 6 7 .
Lines 8 | 4
```

Figure 6-5. Input with 4-Decade Numbers

Line format:

```
                         10                  20
        1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8
      9
        L E E S   T A N K               1 4 7
      2
```

4-digit setpoint

15-character text
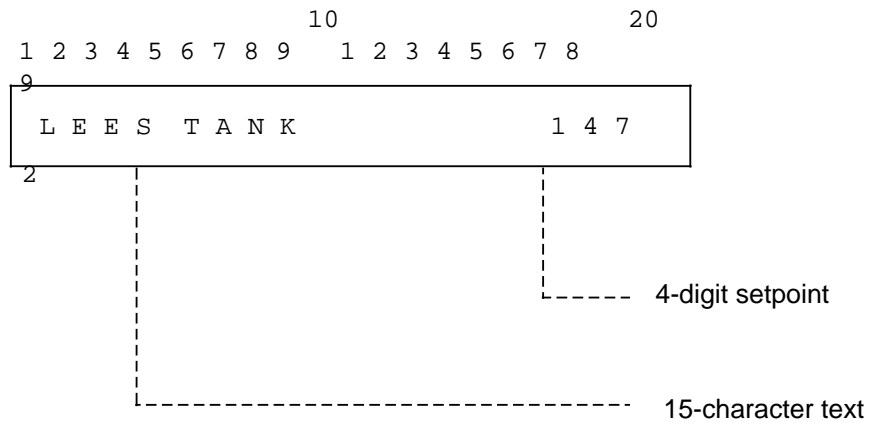
6.2.4 Input/Output - 5 Decades

```
                          10                    20
      1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
    ┌──────────────────────────────────────────┐                    Colum
  1 │      C H A R G I N G                       │
  2 │ C O N V E Y O R       1       1 3 . 4      │
  3 │ 6 2                                        │
  4 │ D E V I A T I O N   %     . - 0 . 8 4      │
  5 │ 5                                          │
  6 │ C O N V E Y O R       2         2 3 5      │
  7 │ 9 3                                        │
  8 │ D E V I A T I O N   %       2 3 . 1 8      │
    └──────────────────────────────────────────┘
  Lines
```

Fig. 6-6. Input/Output with 5-Decade Numbers

Line format:

```
                       10                      20
      1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8
    9
    ┌──────────────────────────────────────────┐
    │ D E V I A T I O N     %   .     - 0 . 8    │
    └──────────────────────────────────────────┘
    4 5
```

Setpoint or actual value
5-digit without decimal point
6-digit with decimal point

Fixed position for minus sign

12-character text

6.2.5 Forcing Flags

Each programmable controller has a bit-addressable area - communication flag field - to which both the PLC program and the OP 396 have access. Process states, fault messages and control commands etc. are transferred via these communication flags.

The control commands mentioned above are transferred from the "Force flags" process display.

```
                        10                  20
      1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                              Colu
   1 |   M O T O R   C O N T R O L
   2 | O V E R A L L   E N A B L E
   3 | 1
   4 | G E A R   C L U T C H
   5 | 0
   6 | B E A R I N G   C O O L.   R I G H T
   7 |    1
   8 | B E A R I N G   C O O L.   L E F T
Lines
```

Figure 6-7. Forcing Flags

Figure 6-7 shows a display form of this type with the following line format:

```
                        10                  20
      1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8
                                          9
   | B E A R I N G   C O O L.   R I G H T
      1
```

Identifier for flag state

12-character text

The last column indicates the logical state of the communication flag.

The above example (Figure 6-7) would therefore mean the following:

Overall enable	Yes
Gear clutch	Not engaged
Bearing cooling right	In operation
Bearing cooling left	In operation
Reversing possible	No reversing mode
Interlock free	Yes

Note:

The "Force flags" display is not updated. In order to be able to force a flag, the relevant line has to be selected again with the cursor.

If the cursor then flashes in the second-to-last column and not in the last column, a code number is required again for this entry (Section 6.8.2: Access code display form/code number).
Only the two digits "0" and "1" are accepted by the OP 396 as entries,

where

> "0" always means "off, closed, passive, standstill,..."
> "1" always means "on, open, active, run, ...".

The entry is confirmed by pressing the "ENT" key or deleted again by pressing the "CE" key.

6.3 Timers and Counters

The process displays for timers and counters are generally identical to the Input/Output with Four Decades format. The only exception with respect to normal process displays is that setpoints are stored in normal data blocks as before, but actual values are read from the internal PLC timers or counters.

It is only possible to configure one display at a time for timers and one for counters. 128 lines are possible in each of these two displays.

The two displays can be selected by pressing special keys (TMR, CTR)

```
                           10                    20
           1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                        Colum
         ┌─────────────────────────────────────────┐
      1  │        C Y C L E  T I M E S              │
      2  │ L O A D I N G 1      1 2 . 5    1 3 . 0   │
      3  │ T R A N S P O R T    1 6 . 0    1 6 . 5   │
      4  │ L O A D I N G 2      1 4 . 5    1 5 . 0   │
      5  │ T R A N S P O R T    1 6 . 0    1 6 . 5   │
      6  │ S T O P              1 0 . 0    1 0 . 0   │
      7  │                                          │
Lines 8  │ *  - - + - -    | |                       │
         └─────────────────────────────────────────┘
```

Figure 6-8. Timers

```
                              10                    20
            1 2 3 4 5 6 7 8 9  1 2 3 4 5 6 7 8 9
          ┌─────────────────────────────────────┐              Colum
        1 │       P R O D.  Q U A N T I T I E S  │
        2 │  I N G O T S          9 8 8    8 6 7 │
        3 │  R O D S              6 8 0    7 7 0 │
        4 │  W I R E              5 5 0    5 7 4 │
        5 │  S H E E T S          2 8 0    3 1 5 │
        6 │                                      │
        7 │  W A G G O N / D A Y    1 2      1 1 │
 Lines  8 │  * – – + – –   | |                   │
          └─────────────────────────────────────┘
```

Figure 6-9. Counters

The following data formats must be observed when making entries on the OP 396:

Times in seconds:	0.00 - 9.99	depending on time
	0.0 - 99.9	base configured by COM 396.
	0 - 999	The smallest time base is
	0 - 9990	10 ms
Counts:	0 - 999	

6.4 Messages

6.4.1 Message Directory

The directory of all configured messages appears on the OP 396 display when the special "TXT" key is pressed. If only one display has been implemented, it will immediately appear after pressing the "TXT" key.

Up to three different types of messages can be selected.

```
                          10                  20
      1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                        Colum
    1 │ 0 0   M E S S A G E   D I R.
    2 │ 0 1   P R O C E S S   S T A T U S
    3 │ 0 2   F A U L T S
    4 │ 0 3   D I A G N O S T I C S
    5 │
    6 │
    7 │
Lines 8 │ *  –  –  +  –  –    │ │
```
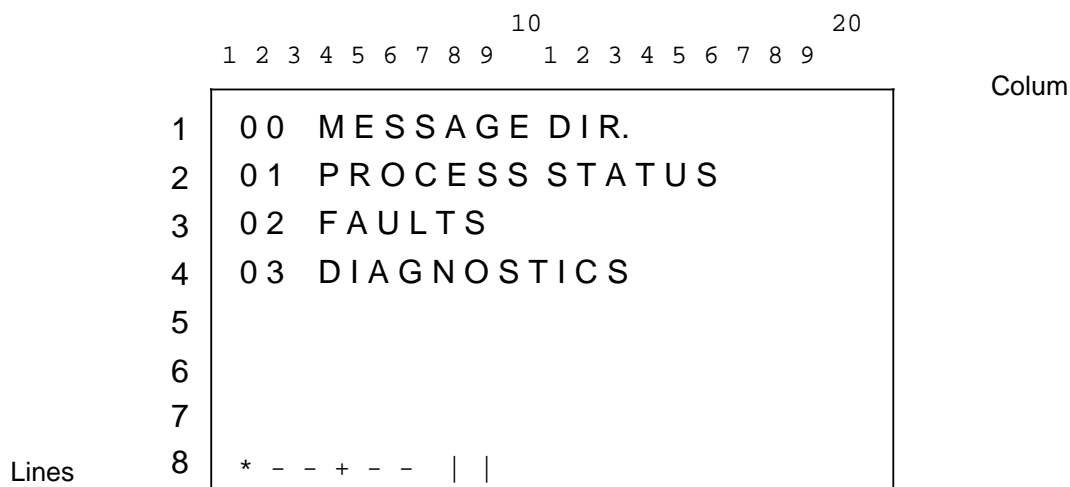
Figure 6.-10. Message Directory

In the directory the texts have a fixed assignment to a definite line with the result that, if one message group is missing, a blank line appears on the display.

The desired function can be selected by entering the corresponding line number (Section 6.1).

6.4.2 Process Status Messages

Like the "Force flags" display, all process parameters that can be described by two logical states and for whose status the PLC program sets the associated communication flag can be processed with this function.

For this purpose, a text is assigned to each status in the configuring phase with COM 396. For each display line there are therefore two texts which vary depending on the state of the communication flag.

```
                          10                    20
      1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                        Colum
    1 |       P R O C E S S   S T A T U S
    2 | V A L V E  V 5  O P E N
    3 | C O N V E Y O R  I N  O P E R A T I O N
    4 | C O A L  M I L L  R U N N I N G
    5 | E M E R G .  U N I T  R E A D Y
    6 | M O T O R   F 3 4  O N
    7 | M O T O R   F 4 4  O F F
Lines  8 | * – – + – –   | |
```
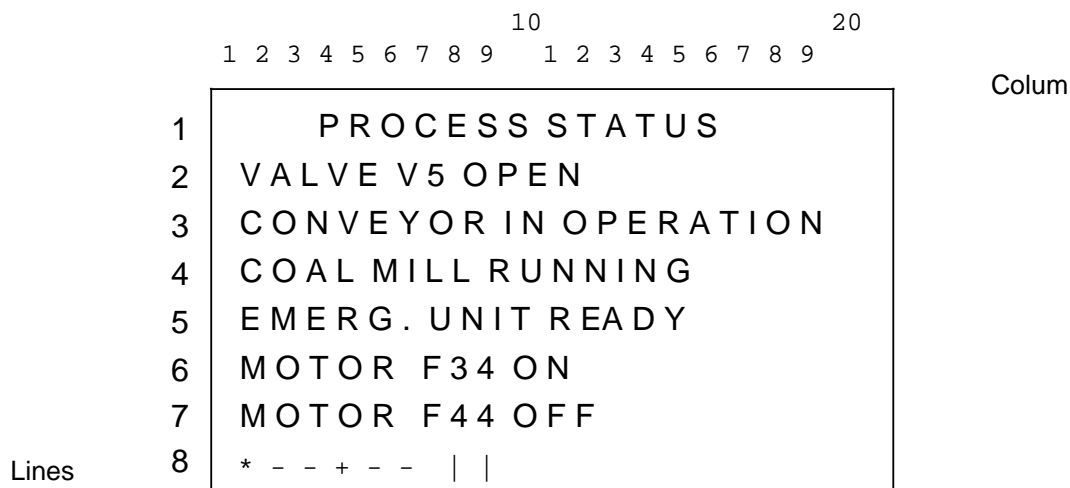
Figure 6-11.   Process Status Messages

The two states are described by means of the two associated texts:

Status 1 - Communication flag set

```
                        10                    20
    1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8
    9
   | C O N V E Y O R   R U N N I N G
```
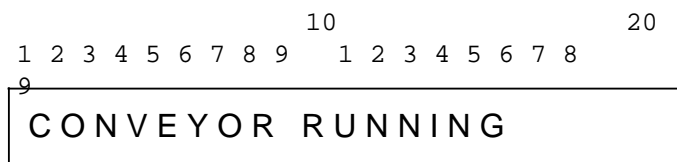
Status 2 - Communication flag reset

```
                        10                    20
    1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8
    9
   | C O N V E Y O R   S T O P P E D
```

6.4.3 Fault Messages

No matter which display you currently have on your operator panel, your attention will be drawn to a fault by means of error message No. 4 "Process fault".

```
        . . . . . . . . . . . . . . . . . . . . . . .
    . .┌──────────────────────────────────────┐
  6 │  REVERSING  POSS.              0  │
  7 │  INTERLOCK ENABLED             1  │
Lines  8 │ * – – + + –   | |  P R O C E S S !   │
      └──────────────────────────────────────┘
```

Figure 6-12.   Process Fault Display

The OP 396 can store up to 99 fault messages together with the time at which they occur.

This "buffer" can be selected, using the message directory and entering line number 2.

```
                        10                    20
              1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                          Colum
            ┌──────────────────────────────────────┐
  1 │      PROCESS FAULTS            │
  2 │ 10:15    +OIL PRESSURE        │
  3 │ 10:20    +BEARING TEMP.       │
  4 │ 10:21    +MOTOR FAILURE       │
  5 │ 10:35    -OIL PRESSURE        │
  6 │ 10:40    -BEARING TEMP.       │
  7 │ 10:40    -MOTOR FAILURE       │
Lines  8 │ * – – + – –  | |  P R O C E S S     │
            └──────────────────────────────────────┘
```

Figure 6-13. Fault message display

The display has the following line format:

```
                          10                  20
      1 2 3 4 5 6 7 8 9    1 2 3 4 5 6 7 8
      9
    ┌─────────────────────────────────────────┐
    │  1 0 : 2 1      + M O T O R   F A I L U R E  │
    └─────────────────────────────────────────┘
```

13-character fault description

+ Fault has occurred

   - Fault has been eliminated

Time (hours/ minutes)
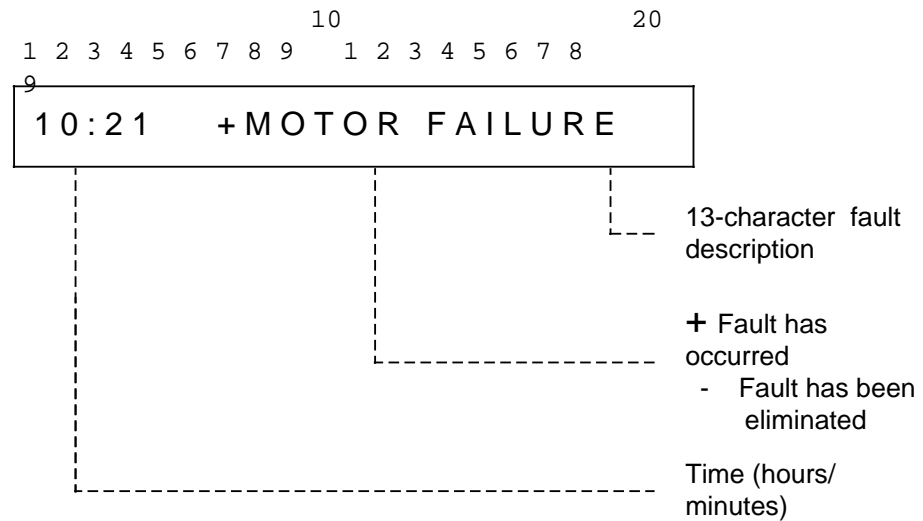
Fault messages can be deleted in two ways:

- **Individually** by positioning the cursor to the corresponding line and pressing the "CE" key
- **Collectively** by positioning the cursor to the "Home" position and pressing the "CE" and "ENT" keys.

If you have configured an access code for deleting fault messages, you must first enter the code number in the access code form you can delete any fault messages.

The "Process fault" message does not disappear until the entire buffer has been cleared or printed out (which also clears it).

> **Note:**
> Fault messages cannot be deleted while they are being printed out.

The printing out of fault messages is described in more detail in Sections 6.6.1 and 6.6.2.

6.4.4 Diagnostics

The following are displayed for diagnosing sequencers in the programmable controllers:

- The current step number of the sequencer
- The associated time setpoints and actual values
- The last seven step numbers.

The display consists of both static and dynamic texts.

The static texts can also be configured with COM 396 and are restricted to the following lines:

```
                          10                    20
        1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                      Colum
      ┌─────────────────────────────────────┐
    1 │       D I A G N O S T I C S          │
    2 │ C O N T R O L   S T E P   N O .      │
    3 │ 0 3     3 4     1 2     1 3     1 4     1 6     1 9 │
    4 │                     2 0              │
    5 │ M O N I T O R I N G   T I M E        │
    6 │ 2 0   D E E P - D R A W       P L . 0 3 │
    7 │ S E T / A C T U A L     3 4 . 4     2 3 . 1 │
    8 │ * – – + – –  | |                     │
      └─────────────────────────────────────┘
Lines
```

Figure 6-14.   Static Texts for Diagnostics Functions

Lines 3, 4, 6 and 7 are provided for the dynamic display.

In Line 3 you can see the last seven control steps and, in Line 4, the current step.

The system configurer can specify an explanatory text with a total of 17 characters with COM 396 for each step. This text is then displayed together with the step number in Line 6.

Setpoint and actual times appear after the text in Line 7.

```
                          10                    20
        1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                      Colum
      ┌─────────────────────────────────────┐
    1 │       D I A G N O S T I C S          │
    2 │ C O N T R O L   S T E P   N O .      │
    3 │ 0 3     3 4     1 2     1 3     1 4     1 6     1 9 │
    4 │                     2 0              │
    5 │ M O N I T O R I N G   T I M E        │
    6 │ 2 0   D E E P - D R A W       P L . 0 3 │
    7 │ S E T / A C T U A L     3 4 . 4     2 3 . 1 │
    8 │ * – – + – –  | |                     │
      └─────────────────────────────────────┘
Lines
```

Figure 6-15. Dynamic Texts for Diagnostics Functions

The OP 396 can represent the two-digit step numbers in the display in three ways:

- Normal display: Control step is within the specified set time;
- Flashing display: Time of relevant control step has been exceeded;
- Reverse-video display: The number specified by the PLC program is not in the internal OP step number list (unknown control step).

6.5 Time of Day

6.5.1 Setting the Time of Day

The OP 396 has an integral battery-backed hardware real-time clock with display for hours, minutes, seconds and date. The sequence in which the display appears and the type of delimiters can be defined with COM 396.

Pressing the "REAL-TIME CLOCK" special key takes you into an overview form in which you can set the time of day and date or which allows you to branch to the corresponding forms for entering prompter   intervals.

```
                         10                 20
           1 2 3 4 5 6 7 8 9  1 2 3 4 5 6 7 8 9
                                                         Colum
      1  | C M O S   R E A L - T I M E   C L O C K
      2  | A C T U A L   T I M E   S E T T I N G :
      3  | H R / M I N / S E C       1 4 : 2 3 : 0 7
      4  | D A Y / M O N / Y E A R     2 1 : 0 2 : 8 6
      5  | L I S T I N G   I N T E R V A L
      6  | U S E R   P R O M P T E R   T I M E
      7  |
Lines 8  | * - - + - - | |
```

Figure 6-16.   Real-Time Clock Overview Form

Before making any settings, the cursor must be brought into the display by pressing the "HOME" key and then positioned to the respective line. If you have not entered any code number, the cursor will move to the position in front of the first entry field and error message No. 5 "INAVLID ENTRY" will appear. However, you can still position the cursor to the lines below in order to branch to the "LISTING INTERVAL " and "USER PROMPTER TIME" forms.

In the case of the two fields for entering the time and date, the cursor remains positioned to the left of this field and you can begin making your entries immediately. Each entry is checked for syntax errors; if it is accepted, the cursor jumps to the next field on the right.

When all the data on a particular line has been entered, the OP 396 waits for the "ENT" key to be pressed to transfer the entry. The set time can then begin.

Each entry can be aborted at any point by pressing the "CE" key. The original value is   then displayed again.

Note:
Without a backup battery, the time of day, date and prompter time or interval values are lost if the power supply is disconnected or fails. When the OP 396 operating system is then restarted, all prompter times are cancelled, and the time of day and date reset to 00.00.00 and 01.01.87, respectively.

6.5.2 Prompter Times - Daily/Shift Log

This form allows you to specify four prompter times for printing out a log. For the sake of simplicity, a common heading can be used for three prompter times. A separate heading is available (in our example: shift log/daily log) for the fourth prompter time.

The entry can be made in the same way as the setting of the time of day (Section 6.5.1); however, no seconds can be entered.

The prompter times are lost when the power supply is removed from the OP 396, and must be entered after each restart of the unit.

A deleted prompter time is indicated by blank characters. Only the delimiter appears.

```
                      10                    20
         1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                    Colum
     1 |      L O G   P R O M P T E R   T I M E .
     2 | S H I F T L O G          H R / M I N
     3 | E A R L Y S H I F T      1 4 : 0 0
     4 | L A T E S H I F T        2 2 : 0 0
     5 | N I G H T S H I F T      0 6 : 0 0
     6 | D A I L Y L O G          H R / M I N
     7 | A C C O U N T S          2 3 : 5 9
Lines 8 | * – – + – – | |
```

Figure 6-17. Log Prompter Times

A log is printed out when a prompter time has elapsed.

6.5.3 User Prompter Times

The user can set four flags at definite times in the communication flag fields of the programmable controller (reset by the PLC program).

A date with day, month and year can be specified for two of these prompter times. The first two times activate the respective flags daily, whereas the last two are only activated on the day specified.

```
                          10                  20
      1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                        Colum
   1  |      USER  PROMPTER  TIME           |
   2  | INT.1 LOADING              6:00      |
   3  | INT.2 UNLOADING          21:30       |
   4  | INT.3 CLEANING           10:15       |
   5  | DATE                   13:05:86      |
   6  | INT.4 MAINTENANCE    06:00           |
   7  | DATE                   30:07:86      |
   8  | * – – + – –  | |                     |
Lines
```

Figure 6-18. User Prompter Times

6.6 Printer

6.6.1 Printer Functions

When the special "Printer select " key is pressed, the menu for the printer functions appears on the OP 396. Before starting the printout ,the desired data must be selected.

```
                          10                    20
      1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
                                                        Colum
   1  |      = = > PRINTER                   |
   2  | ALL DISPLAYS                         |
   3  | INDIV. DISPLAYS                      |
   4  | TIMERS/COUNTERS                      |
   5  | FAULT MESSAGES                       |
   6  | LOG                                  |
   7  |                                      |
   8  | * – – + – –  | |                     |
Lines
```

Figure 6-19.   Printer Functions

The header line shows the designation for "Printer" defined by COM 396 (marked by an arrow).

```
1 |   ==>PRINTER
2 | ALL DISPLAYS                   0
  . . . . . . . . . . . . . . . . . . . . .
```

The required function is selected by positioning the cursor to the respective line, entering a "1", and confirming by pressing the "ENT" key.

Special features of the individual functions selected:

- ALL DISPLAYS or TIMERS/COUNTERS

  You can observe all the process displays on the OP 396 as they are printed out. A premature abort is not possible

- INDIVIDUAL DISPLAYS

  This takes you into the directory for the process displays; printout as described under "ALL DISPLAYS".

- FAULT MESSAGES

  The printout can be initiated or aborted not only via the OP, but also by the PLC program. Once all fault messages have been printed out, the fault message printout is not terminated, but remains active and passes every new fault message on to the printer.

  The fault message printout can be aborted by entering a "0" in the "Fault messages" line or by the PLC.

- LOG

  Switches off automatically on termination of the printout, but can also be aborted by entering a "0".

  This function can also be initiated by the programmable controller program.

6.6.2 Individual Display Selection

If you select a printout of individual displays, the OP offers you a directory of all existing process displays.

Scrolling and cursor positioning takes place in the normal manner.

The last position in each line is used for selecting the respective process display.

The following applies:

"0" ... No printout
"1" ... Selected for printout

```
                        10                     20
         1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
      ┌─────────────────────────────────────────┐
   1  │        = => P R I N T E R                │
   2  │  0 1   T E M P E R A T U R E          0  │
   3  │  0 2   C O O L A N T   P U M P S      1  │
   4  │  0 3   L E V E L S                    0  │
   5  │  0 4   C H A R G I N G                0  │
   6  │  0 5   M O T O R   C O N T R O L      0  │
   7  │  0 6   H Y D R A U L . S Y S.         1  │
Lines 8  │  – – – – – –   |                         │
      └─────────────────────────────────────────┘
```

Figure 6-20.   Individual Display Selection

The printout of all process displays labeled as above is initiated by pressing the "ENT" key with the cursor in the "Home" position.

6.7 Data Dumping

6.7.1 General

The "Data dump" function has been implemented to write data blocks from the PLC to a non-volatile storage medium and reload the data into the PLC memory.

Data dumping is possible on two different storage media:

• EEPROM submodule:

Do not plug the submodules into receptacle 2 until prompted to do so by the program. At present, submodules of up to 16 Kbytes storage capacity are available. You may also dump data on several submodules successively, i.e. the quantity of data to be dumped may exceed the capacity of an individual EEPROM submodule.

• Diskette:

The OP 396 dumps data in files named "OP 396 xxx", xxx having to be entered as identifier by the user.

The date and time of day relevant to the data dumps are also stored.

6.7.2 Data Dump Directory

Press the special "⬥" key to initiate dumping. If data dumping on both EEPROM and diskette have been implemented, the data dump directory will appear on the OP display. Otherwise, this key will immediately take you to one of the displays described below.

```
                              10                    20
           1 2 3 4 5 6 7 8 9  1 2 3 4 5 6 7 8 9

       1 | 0 0      D A T A  D U M P
       2 | 0 1      E E P R O M
       3 | 0 2      D I S K E T T E   D R I V E
       4 |
       5 |
       6 |
       7 |
Lines  8 | * – – + – –   | |
```
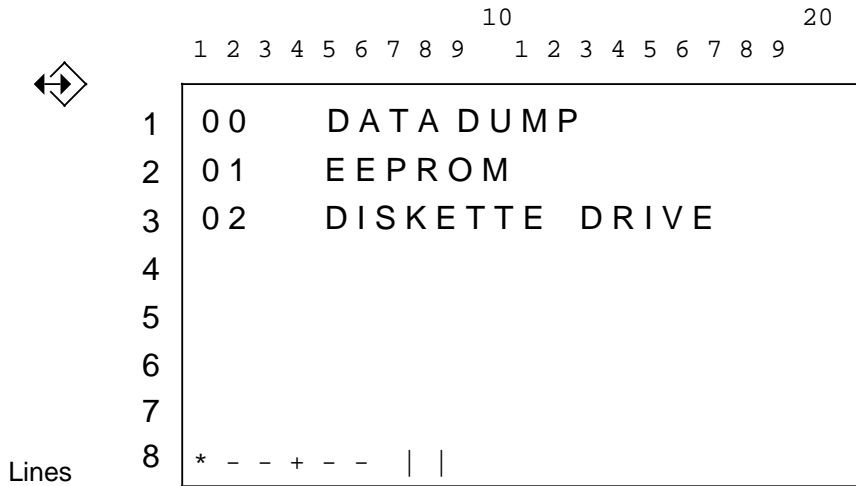
Figure 6-21. Selection of Data Dump Medium

Enter the respective line number to select the desired function (see Section 6.1).

After selecting a function, the actual data dump menu (Figure 6-22) appears: line 1 contains the heading, line 2 specifies the data dump medium selected, and lines 3 and 4 describe the direction of data transfer.

```
                               10                    20
           1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9

       1 |       D A T A  D U M P
       2 | D D :  E E P R O M
       3 | P C => E P R O M
       4 | E P R O M = > P C
       5 |
       6 |
       7 |
Lines  8 | * – – + – – –   | |
```
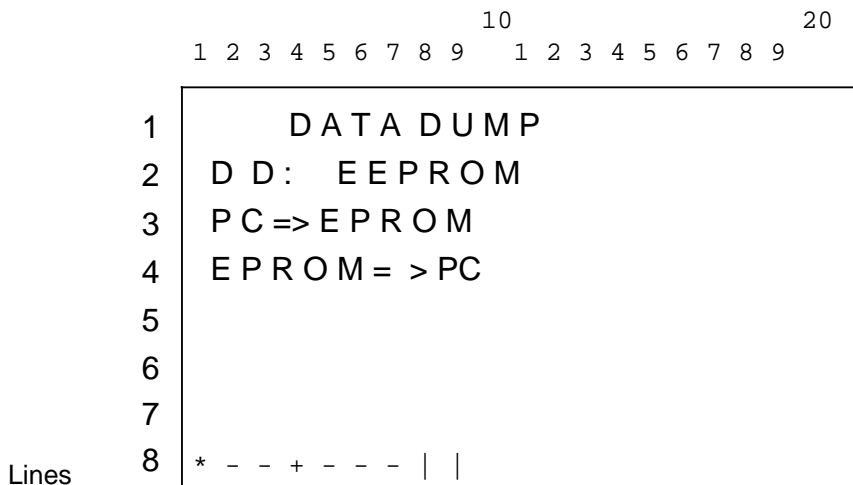
Figure 6-22.   Data Dump Menu

Press the "**Cursor-Home**" key to position the cursor to line 3. Select the direction of data transfer by entering a number of up to three digits as the data identifier and terminating the entry with the "ENT" key.

Note:
- Data identifiers entered in line 3 are always associated with a data transfer from the PLC to a storage medium and entries in line 4 with a data transfer from the storage medium to the PLC.
- When reloading data into the PLC, make sure you specify the same identifiers that were used for dumping the data blocks in the storage medium. This is not connected with their implementation in COM 396.

6.7.3 Data Dump to EEPROM

When dumping data to an EEPROM (Figure 6-23), the selected direction is displayed in line 4. The flashing prompt to plug the EEPROM in appears in line 3. The text for "Set number" and "Actual number", as well as the associated data identifiers, appear in lines 6 and 7.
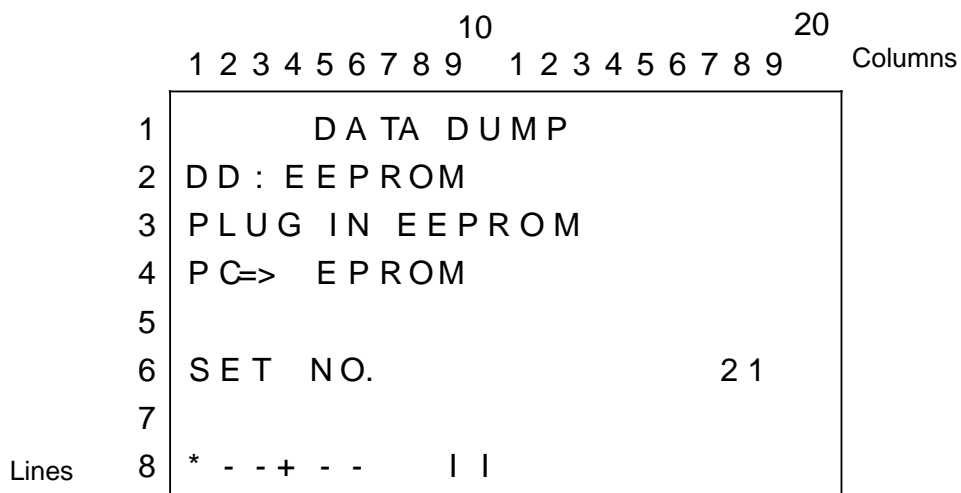
```
                                  10                        20
                 1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9    Columns
               ┌─────────────────────────────────────┐
            1  │         D A TA   D U M P              │
            2  │ D D :  E E P R O M                    │
            3  │ P L U G   I N   E E P R O M           │
            4  │ P C=>   E P R O M                     │
            5  │                                       │
            6  │ S E T   N O.                    2 1   │
            7  │                                       │
   Lines    8  │ *  -  - +  -  -        | |            │
               └─────────────────────────────────────┘
```
Figure 6-23. Data Dump on EEPROM

Now take the user submodule out of receptacle 2 and plug in the EEPROM for data dumping.

The dump begins immediately. This is indicated by two alterately flashing asterisks at the end of the fourth line.

```
     .  │ . . . . . . . . . . . . . . . . . . . . . . . . │ . .
     4  │ P L C => P R O M                        * *     │
     .  │ . . . . . . . . . . . . . . . . . . . . . . . . │ . .
```
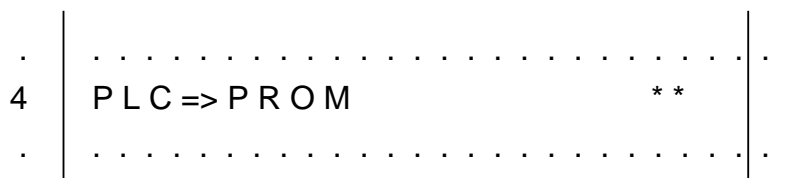
If further EEPROM submodules are necessary, the following message prompts you to plug the next submodule in:

```
.  | . . . . . . . . . . . . . . . . . . . . . . . . . | . .
3  | N E X T  E E P R O M  S U B M.          I I |
4  | P L C => E P R O M                           |
.  | . . . . . . . . . . . . . . . . . . . . . . . . . | . .
```

At the end of data transmission, you are prompted to reinsert the user submodule. This submodule is then checked. If no errors are found, you can select any of the functions by means of the special keys.

```
.  | . . . . . . . . . . . . . . . . . . . . . . . . . | . .
3  | U S E R  E P R O M                    I I |
4  | P L C => E P R O M                           |
.  | . . . . . . . . . . . . . . . . . . . . . . . . . | . .
```

If an error occurs during transfer or if you have made a mistake, an error message appears in line 4. The error code appears in line 8 to help you determine the cause of the error (Section 9).

Note:

- EEPROMS need not be erased before dumping data on them. The OP 396 operating system rejects only OP 396 user EEPROMs. The contents of all other EEPROMs, even submodules on which data blocks have already been stored, can be overwritten.

- If the data block you selected for dumping on EEPROM does not exist in the PLC, programming of the EEPROM is still continued ("ERROR 12" appears). When writing the EEPROM contents back to the PLC memory, no error message pointing to the missing data block appears.

- The "Data dump" function can be aborted by pressing a special key while the prompt "PLUG IN EEPROM" or "NEXT EEPROM" is flashing.

- When dumping data from EEPROM to the PLC, the EEPROMs are processed one after the other. For dumping a record extending over several EEPROMs, the "Data dump" function must be selected for each individual submodule. The order in which the submodules are selected is irrelevant.

- Data dumping is not possible during printout. While a printout is taking place in the background, entry of a data identifier will be rejected by error message "ERROR 20". You may now select another function by pressing a special function key or wait until the printout is terminated. Only then will the prompt " PLUG IN EEPROM" appear.

6.7.4 Data Dump on Diskette

The diskette drive is connected via port 2 (see Section 12.4).

The selection procedure is as for data dumping on EEPROM (see Section 6.7.2).

```
                         10                    20
            1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9    Columns

        1 |        D A T A   D U M P
        2 | D D : D I S K E T T E   D R I V E
        3 | PL C=>  D I S K
        4 | D I S K=>   PL C
        5 |
        6 |
        7 |
Lines   8 | *  - - + - -       | |
```

Figure 6-24. Data Dump *on* Diskette

Note:

• Unformatted diskettes and diskettes from other systems are automatically formatted before any data is written on them.

• When dumping data on diskette, an existing file will be erased and replaced by the new file if the latter bears the same name.

• Both the printer and the diskette drive are connected to the same port. Make sure that the peripheral device connected corresponds to the selected function, as otherwise data intended for printout could be lost or invalid characters printed out.

6.8   Access Code Display

6.8.1 Power-Up

Once you have connected the OP 396 to the power supply (connection to the PLC established or adapter connected), the system logo and the software release appear briefly in the display.

```
                          10                    20
       1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
     ┌─────────────────────────────────────────┐
   1 │                                         │
   2 │                                         │
   3 │        S I M A T I C  S 5               │
   4 │                                         │
   5 │        O P  3 9 6  V 2 . 3              │
   6 │                                         │
   7 │                                         │
   8 │                                         │
Lines└─────────────────────────────────────────┘
```
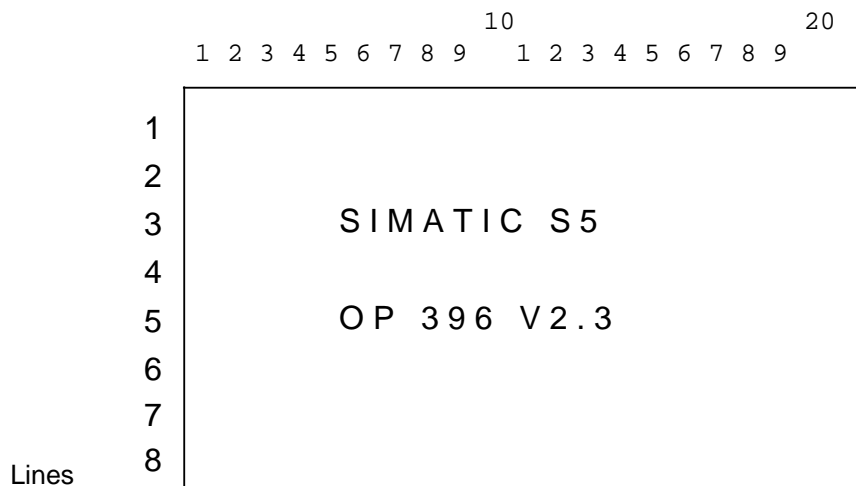
Figure 6-25.   Power-Up Display

Parts of the hardware and the user EPROM are checked during this power-up phase and, if an error is detected, normal program execution is prevented and the corresponding error message displayed.

On completion of the test, the following appears:

```
                          10                    20
       1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
     ┌─────────────────────────────────────────┐
   1 │        A C C E S S  C O D E             │
   2 │ E N T E R C O D E  N U M B E R          │
   3 │ D E L E T E C O D E  N U M B E R        │
   4 │ D I S P L A Y  T E S T                  │
   5 │ K E Y P A D  T E S T                    │
   6 │ S Y S I D  D I S P L A Y                │
   7 │                                         │
   8 │ * - - + - -                             │
Lines└─────────────────────────────────────────┘
```
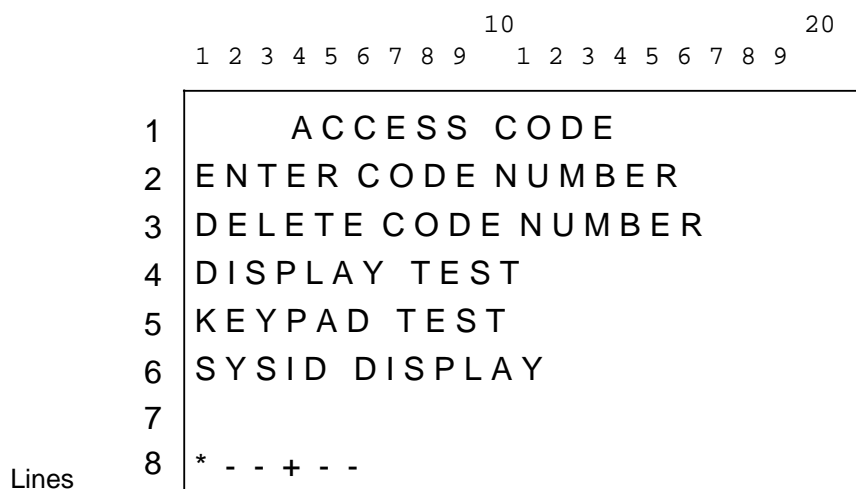
Figure 6-26.   Access Code Display

You can also access this form by pressing the special ⌀ key.

6.8.2 Code Number

You can enter the code number for the access code in Line 2 of the access code display and delete it again in Line 3.

This access code permits you to use functions that are protected against unauthorized access in the COM 396 system configuring phase and functions that are generally protected.

This includes the following functions:

- Function keys
- Setpoint entry for process displays
- Forcing flags
- Timers/counters
- Deleting of fault messages
- Time-of-day and prompter time display (generally protected)
- Data dumping (generally protected)

The current status appears in the middle of the eighth line for displaying

I ...	Function disabled
II ...	Operator input possible

```
8   ┌──────────────────────────────────┐
    │ * – – + – –                        │
    └──────────────────────────────────┘

8   ┌──────────────────────────────────┐
    │ * – – + – –                        │
    └──────────────────────────────────┘
```

Input

Following power-up, the cursor is already positioned in Line 2/last column. You can now enter the code number defined with COM 396 and terminate your entry by pressing the "ENT" key. The digits entered are not displayed, so that unauthorized persons cannot read the code number.

If you strike the wrong key, you can repeat your entry without first having to delete what you have already entered; only the last four digits entered are used for checking.

If your entry is accepted, a "II" appears in the last line. This authorizes you to access even protected functions.

Deletion

In order to delete a code number that has already been entered, simply move the cursor into the third line and press the "ENT" key.

6.8.3 Display/Keypad Test

Display test

Once you have selected the Display Test in the access code display, the display is erased but for the header in the first line.

With the exception of the first entry, the OP 396 accepts only input from three keys in this phase:

- Move cursor down

  A checkerboard pattern is displayed and is inverted each time this key is pressed:

```
    *     *     *                    *        *
       *     *                    *     *        *
    *     *     *                    *        *
       *     *                    *     *        *
    *     *     *                    *        *
       *     *                    *     *        *
    *     *     *                    *        *
```

- Move cursor up

  All matrix dots required for character representation are activated:

```
    *   *   *   *   *
    *   *   *   *   *
    *   *   *   *   *
    *   *   *   *   *
    *   *   *   *   *
    *   *   *   *   *
    *   *   *   *   *
```

- ENT key

  This key enables you to exit the Display Test and, when pressed a second time, returns you to the access code display.

Keypad Test

In the Keypad Test you are prompted to press a particular key.

The labelling of the keys should be regarded as a matrix of lines and columns starting at the top left and ending at the bottom right.

Key labeling:

```
                              a  .  b

                              |     |
                              |     └--------- Column
                              |
                              └--------------- Line
```
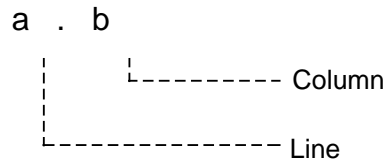
```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│                                                     │
│     1.1        1.2        1.3       1.4      1.5      1.6     │
│                                                     │
│     2.1        2.2        2.3       .................      │
│                                                     │
│     3.1        3.2       .................            │
│                                                     │
│     4.1       .................                      │
│                                                     │
│                                                5.6   │
│                                                     │
│     6.1       .................           6.5    6.6   │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```

Figure 6-27.   Key Matrix

When prompted by the OP 396 (Figure 6-28), press the corresponding key. You then receive confirmation as to whether the key you have pressed corresponds to the one requested (Figure 6-29) or whether an error has been made (Figure 6-30).

```
                            10                    20
       1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9
      ┌─────────────────────────────────────┐
   1  │ K E Y P A D   T E S T                │
   2  │                                      │
   3  │ E N T E R   K E Y : 1 . 2            │
   4  │                                      │
   5  │                                      │
   6  │                                      │
   7  │ *   T E S T   A C T I V E            │
   8  │                                      │
      └─────────────────────────────────────┘
Lines
```
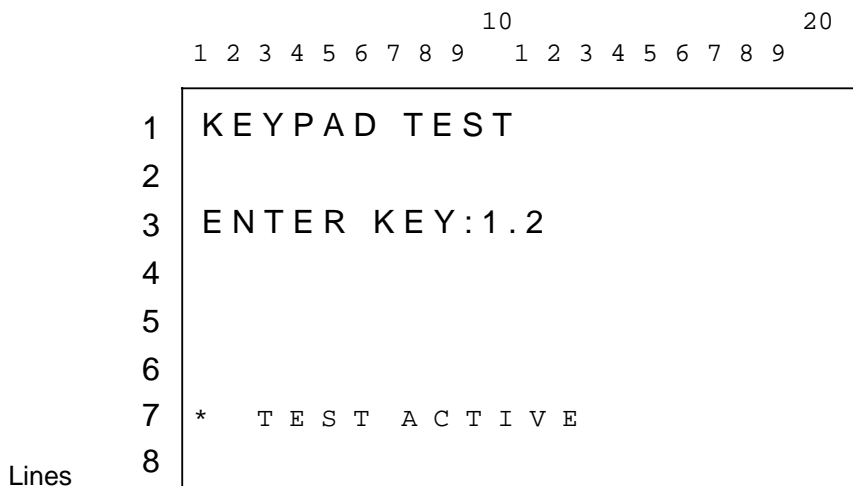
Figure 6-28.   Keypad Test

```
. . . . . . . . . . . . . . . . . . . . . . .
3 | E N T E R K E Y :  1 . 2     1 . 2        |
4 |                      O . K.               |
. . . . . . . . . . . . . . . . . . . . . . .
```

Figure 6-29.   Test O.K.

```
. . . . . . . . . . . . . . . . . . . . . . .
3 | E N T E R K E Y :  1 . 2     2 . 4        |
4 |                     E R R O R             |
. . . . . . . . . . . . . . . . . . . . . . .
```

Figure 6-30. Test Error

This test cannot be aborted, i.e. all keys must be pressed when prompted for and the number of recognized errors is then displayed. (Figure 6-31).

```
                         10                   20
         1 2 3 4 5 6 7 8 9  1 2 3 4 5 6 7 8 9
       ┌──────────────────────────────────────┐
     1 │ K E Y P A D   T E S T                  │
     2 │                                        │
     3 │                                        │
     4 │                                        │
     5 │ 0 2   E R R O R ( S )                   │
     6 │                                        │
     7 │ *   T E S T   F I N I S H E D          │
     8 │                                        │
Lines  └──────────────────────────────────────┘
```

Figure 6-31. Result of the Keypad Test

Press the "ENT" key to return to the access code display.

6.8.4 SYSID Display

SYSID stands for **SYS**tem **ID**entification and describes a record that is present in all CPUs, CPs, and intelligent I/O modules and memory submodules.

This record contains parameters that are suitable for the following:

- The unique identification of an intelligent I/O module within the system
- Providing this I/O module with parameters that result in a definite behaviour
- Providing information on the functions of the module
- Providing information on the firmware and software release of the module.

It is therefore possible to identify memory submodules (including those of other manufacture) using this SYSID record.

However, before going into this in more detail, an overview is given below of the SYSID parameters and their significance.

Table 6-1. SYSID Parameters

Field	Definitions	Data (examples)
0	Submodule identifier	6ES 375-0LA21
1	Module identifier	OP 396-2
(2)	(Firmware version identifier)	(V 2.3)
3	Plant designation	SINTER FURNACE, SHOP A
4	Generation date	28.02.86
5	Symbolic address in system	ANTON
6	Industrial LAN address	0800 0601 A124
7	Slave No. on Programmer/ SINEC L1 LAN	10-8/-4
8	Password	-------
9	Reserve	-------
10	Reserve	-------

As can be seen from the above list, parameters 0 - 10 are permanently assigned. All parameters greater than 10, if any, are system-specific parameters and can only be explained along with a description of the particular module.

The OP 396 displays the first eleven parameters 0 to 10 (with the exception of the parameter 2) and reports the existence of any other parameters. Missing parameters do not leave a blank line (i.e. the existing parameters are displayed in compressed form).

Once you have selected the SYSID display, you are prompted to plug in the EPROM (EEPROM) submodule from which the SYSID is to be read.

```
                              10                    20
          1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9

      1 │ S Y S I D   D I S P L A Y
      2 │
      3 │   O P   3 9 6   V 2 . 3
      4 │
      5 │   * S E L E C T   S U B M O D U L E
      6 │   * P R E S S   E N T
      7 │
Lines 8 │ * – – +   – – | |
```

Figure 6-32. SYSID Display

The parameters are displayed by pressing the "ENT" key (Figure 6-33):

```
                              10                    20
          1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9

      1 │ S Y S I D   D I S P L A Y
      2 │ 0   S U B M   I D :   6 E S 5
      3 │                       3 7 5 - O L A 2 1
      4 │ 1   M O D   I D :     OP 396
      5 │ 3   P L N T   D E S : S I N T E R   F U R N A C E
      6 │                       S H O P   A
      7 │ 4   G E N   D A T :   2 8 . 0 2 . 8 6
Lines 8 │ * – – +   – – | |
```

Figure 6-33. SYSID Display

If the arrow appears at the bottom right, you can now scroll the display or read out the next SYSID by exchanging the submodule (no keystrokes required).

If the OP 396 recognizes its own EEPROM submodule, you can also have the system-specific parameters 11 and 12 displayed.

Table 6-2. System-Specific Parameters

Field	Definitions	Data (examples)
11	Data identifier	2 1
12	Consecutive number	0 2

Parameter 11 contains the data identifier specified for data dumping and
Parameter 12 the sequence number of the submodules used for data dumping.

```
                               10                    20
              1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9

        1    SYSID DISPLAY
        2    11 DAT ID:   21
        3    12 SEQ. NO: 2

         . . . . . . . . . . . . . . . . . . . . . . . . .
```

The SYSID display can be exited again by pressing the "ENT" key. You are then prompted to plug
the original OP 396 user submodule back in again, and can return to the access code display by
pressing the "ENT" key again.

```
          . . . . . . . . . . . . . . . . . . . . . . . . . .
        3    *    REPLACE
        4         OP 396 SUBMODULE
        5
        6    *    PRESS ENT

          . . . . . . . . . . . . . . . . . . . . . . . . . .
```

7   Background Functions

At definite intervals, the OP 396 sets and reads three types of flags from the PLC's flag area, evaluates them, and transfers date and time of day to the PLC at one-minute intervals, provided this function is implemented (this is transparent for the operator).

7.1   Special Flags

The following three special flags are available, but not all three need to be configured with COM 396.

*   Initiation of fault message printout

*   Initiation of printout of shift and daily logs

*   Master clock synchronization

The flag for log printouts is reset automatically by the OP 396. The flag for fault message printout remains set in order to guarantee the printout of incoming fault messages.

When the flag for timing synchronization is recognized, the real-time clock in the OP 396 is corrected to the next full hour.

The clock synchronization flag is evaluated only when a positive-going edge is detected. The PLC program should therefore reset this flag after a reasonable time, but at the earliest after two seconds.

7.2   Fault Flags

Each programmable controller serviced via the OP 396 may have one or more fault flags in its flag area to report faults to the OP.

When such a flag is encountered, the OP 396 logs the time, the nature and the pulse edge of the fault signal. The log clearly shows the beginning and end of a fault condition.

7.3   Ready Flag

When configuring the user submodule with COM 396, you are prompted to define a Ready flag.

This flag is located in the PLC's flag area, and is set cyclically by the OP in order to inform the PLC that an OP is on-line.

The OP also recognizes whether the PLC is ready to receive or whether it has been replaced.

The STEP 5 program executing in the PLC must also reset this flag cyclically and scan it at the earliest after 2 s in order to be able to evaluate it.

7.4 Cyclic Transfer of Date and Time of Day

If this function was configured with COM 396, the OP 396 transfers the date and time of day to the PLC at one-minute intervals.

The values are dumped in BCD code in the following sequence:

DW   X   : Min/hrs
DW   X + 1   : Day/Mon
DW   X + 2   : Year/00

Example: Configured data word: 20
                  Time of day: 16.45 hrs
                  Date: 12.04.87

The following values are entered in data words 20 to 22:

DW20   :   4516H
DW21   :   1204H
DW22   :   8700H   (H:hexadecimal notation)

8 Function Keys

The status display on the OP 396 for the function keys provides you at all times with information on the current status or assignment of these keys.

Basically, the function keys can perform two activities:
- Force flags in the communication flag area of a PLC;
- Direct selection of a process display.

The first six positions of the eighth display line are reserved for the status display.

```
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

6  | M O T O R   F 3 4   O
7  | M O T O R   F 3 4   O F F
8  | * - - + - -
```

Figure 8-1.   Status Display

The characters displayed have the following meaning:

- +   Forcing of communication flags - this flag is currently set
- -   Forcing of communication flags - this flag is currently reset
- *   Direct selection of a process display is possible
- Blank character   This function key is unassigned

When forcing communication flags, the response of the display to the actuation of a function key may be appreciably delayed. The reason for this is that the display is not updated until the flag is really transferred to the PLC.

The communication flags assigned to function keys are read into the OP 396 on power-up.
- Pressing of the function key changes the status of the respective communication flag
- The PLC program must not change the communication flag (no acknowledgement to the OP 396).

A number of typical displays:

```
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

8  | + + + + - +


. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

8  | + -+* *


. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
```

9 Error Messages

The OP 396 knows two groups of error messages. These are described below, and appear as an eight-character message in the eighth line:

```
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

8 │ * - - + - -      F U N C T I O N
```

```
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

8 │ * - - + - -      E R R O R 9 9
```
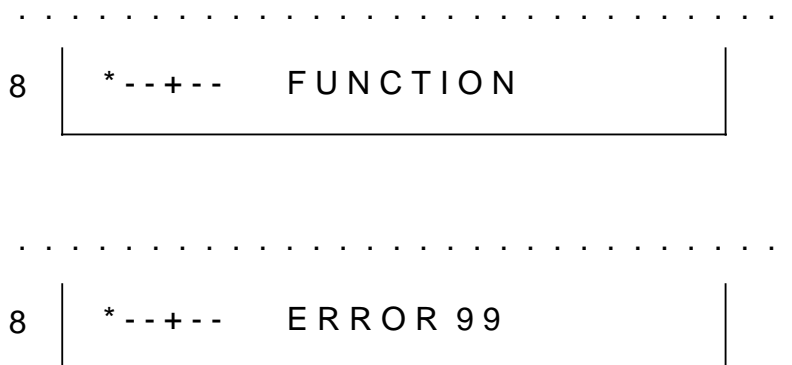
Figure 9-1. Error Display Field

9.1 Configurable Error Messages

The text of the error messages listed below can be configured with COM 396. In the table below, therefore, it is replaced by a suitable, abbreviated text and the COM 396 default:

Table 9-1. Configurable Error Messages

Error No.	Error	Default	Error Description
1	Wrong input format	FORMAT	Please refer to the respective section for the correct format
2	Wrong time base	BASE	Wrong SIMATIC S5 time base for timer input
3	Wrong key	KEY	This key may not be pressed at present
4	Process fault	PLC FAULT	Group message for PLC fault
5	Illegal operator access	ACCESS	This entry is disabled by the access code. First enter the code number or select a line that is not in the directory (e.g. a process display that has not been configured)
6	I/O device not connected	V.24(RS232C) /TTY	The printer is not ready. This message is output three times at short intervals (20s). The printout is aborted
7	Function non-existent	FUNCTION	The selected function has not been configured with COM 396

9.2 Nonconfigurable Error Messages

The text of the following error messages cannot be influenced by the user and appear as follows:

```
                            10                    20
        1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8
        9
        ┌──────────────────────────────────────────┐
        │                                           │
        │                     E R R O R   9 9       │
        │                                           │
        └──────────────────────────────────────────┘
                                   ┊         ┊
                                   ┊         └ ─ ─ ─   Error code
                                   ┊
                                   └ ─ ─ ─ ─ ─ ─ ─   Fixed text
```

Table 9-2.   Nonconfigurable Error Messages

Error Code	Error Description
ERROR 01	**Error in internal RAM** Hardware fault that can only be eliminated at the factory.
ERROR 02	**Error in external RAM** Hardware fault that can only be eliminated at the factory.
ERROR 03	**User EPROM defective or wrong** Try another EPROM submodule programmed with COM 396.
ERROR 04	**User EPROM missing** Plug a submodule programmed with COM 396 into receptacle 2.
ERROR 05	**Further SYSID parameters exist** The OP 396 only displays the first eleven parameters and draws the operator's attention to any further parameters.
ERROR 06	**Too many fault flags configured** The number of flag bytes in which fault flags have been configured is greater than 1 Kbytes (1024).
ERROR 09	**Diagnostic step nonexistent** The diagnostic step number transferred from the PLC to the OP 396 is not in the step number list in the user submodule.
ERROR 10	**Programmable controller does not report**. The PLC has not reacted to a data request from the OP 396.
ERROR 11	**Interface not ready** The data sent from the PLC cannot be interpreted by the OP 396
ERROR 12	**Block does not exist** A data block specified in the user EPROM and requested by the OP 396 does not exist in the PLC.

Table 9-2. Nonconfigurable Error Messages (continued)

Error Code	Error Description
ERROR 13	**Memory gap** The OP 396 has attempted to access a memory gap in the PLC
ERROR 14	**Data block too long** Data blocks may not be longer than 512 bytes for data dumping.
ERROR 15	**Data block length is zero** A data block with length zero has been referenced. Error in PLC program.
ERROR 17	**Data block lengths do not agree** When dumping data blocks from a storage medium (EEPROM, diskette) to the PLC, data blocks that do not have the same length in the PLC and on the storage medium are not transferred.
ERROR 18	**PLC not known** The OP 396 cannot identify the programmable controller connected.
ERROR 20	**Printer active, please wait** Data dumping is not possible before terminating the printout (Section 6.7.3)
ERROR 21	**Printout aborted.** Message as consequence of ERROR 6.
ERROR 22	**NO EEPROM** Plug in an EEPROM submodule specified in Section 2.3 for the data dump.
ERROR 23	**No OP 396 EEPROM** When writing back from a data dump, an EEPROM programmed by the OP 396 is expected.
ERROR 24	**EEPROM programming error** Read-after-write error detected during EEPROM programming; retry or use another submodule.

Table 9-2. Nonconfigurable Error Messages (continued)

Error Code	Error Description
ERROR 25	**No data transfer during data dumping** Data dumping has been aborted, as the data blocks do not exist in the PLC or their lengths do not agree.
ERROR 26	**User EEPROM defective** Use another EEPROM for data dumping.
ERROR 30	**Diskette drive not ready.**
ERROR 31	**No diskette inserted.**
ERROR 32	**Diskette is write-protected** Remove the write-protect label to be able to dump data on the diskette.
ERROR 33	**Diskette or diskette directory full.**
ERROR 34	**Read/write error on diskette** An error has occurred when reading/writing from/to diskette. Try another diskette.
ERROR 35	**Transmission error between OP 396 and diskette drive.**
ERROR 36	**System error in diskette drive** Contact the manufacturer of the diskette drive.
ERROR 37	**Diskette not formatted.**
ERROR 38	**File does not exist.**
ERROR 50	**Reenter time of day, date and prompter times.** After a power failure in the OP 396, the time of day, date and prompter times will be lost if the backup battery is defective or not installed.
ERROR 51	**Real-time clock RAM defective** Contact your nearest SIEMENS office.
ERROR 60	**V1.0 user submodule** The record on the user EPROM has been generated using COM 396 version V1.0 (Note p.1-1).

10   Connecting a Printer to the OP 396

The printer port is at the right on the display end of the OP 396 (see Figure 10-1), and can be used to connect one of the following types of printer:
- Printer with active TTY (20 mA) interface (see Section 14.2)
- Printer with hybrid interface, mode selector set to "TTY" (see Section 14.4).

You can match the OP 396's printer parameters to your printer with COM 396 (see Section 7.1 in COM 396 Instruction Manual EWA 4NEB 810 1286).

The diagram below shows the connector pin assignments for the OP 396's printer port:

Pin	Description
1 ... 5	-
6	+R x D
7	-
8	- R x D
9	-
10	+T x D
11	-
12	- T x D
13 ... 23	-
24	M_{EXT}
25	M_{EXT}
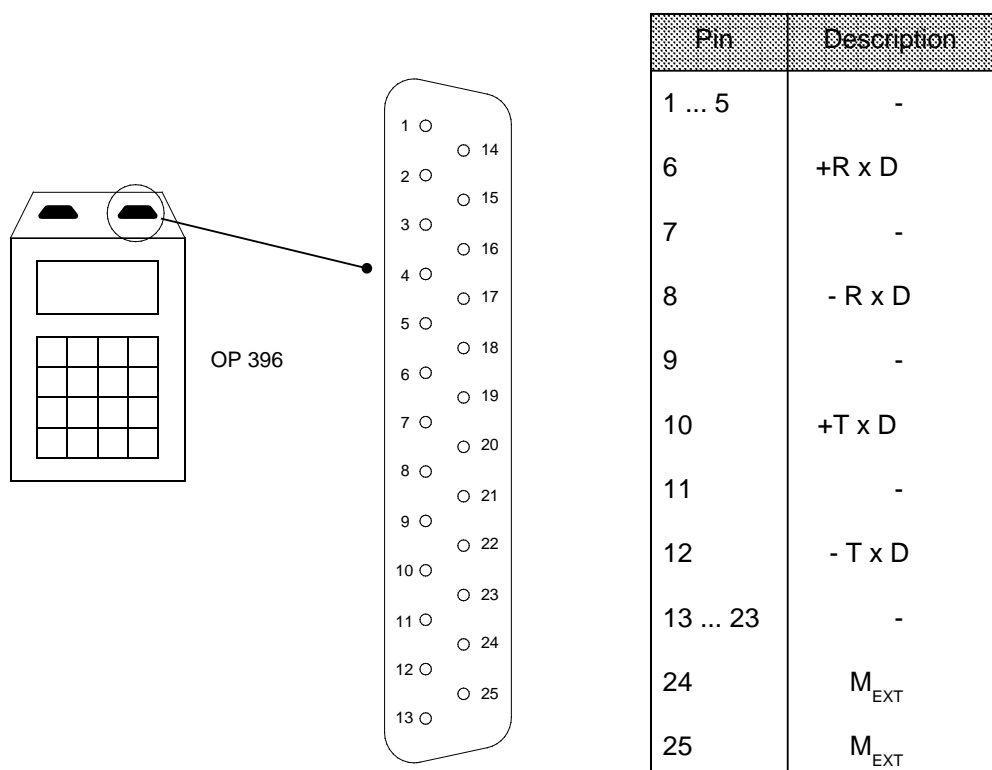
Figure 10-1.   OP 396 Printer Port

Note:
- When the BUSY signal is used for printing, "no current $\hat{=}$ not ready to receive"
- The OP sends the "CR" and "LF" signals as control characters for the printer. Before starting a printout, always position the paper to the beginning of the page.

11   Connecting a Floppy Disk Drive to the OP 396

Interface port 2 on the OP 396 is also used for interfacing a floppy disk drive (Section 10, "Connecting a Printer to the OP 396"). The drive can then be used to store and load data blocks. A floppy disk drive that uses the "C5-Code, end identifier CR-LF-CR-LF" line protocol can be obtained from:

                         CAN Computeranwendungen
                         P.O. Box 6607
                         Markgrafenstr. 66
                         D-7750 Konstanz
                         Fed. Rep. of Germany
                         Tel.: 07531 / 50077

Designation: Floppy disk drive with active interface port for the OP 396.
Please direct all orders and requests for information to the above company.

The diagram below shows the connector pin assignments for the floppy disk drive:
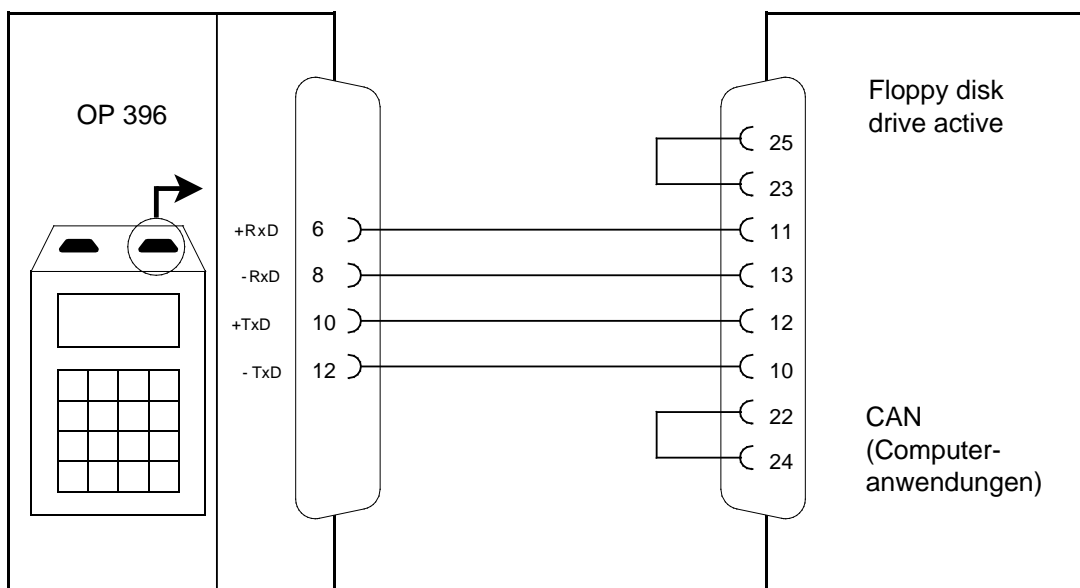
Figure 11-1.   Connecting a Floppy Disk Drive

The drive is set to the following defaults:
- Baud rate   9600 bits/s
- Parity   Even
- 8 data bits,   1stop bit
- Handshaking X_{ON}, X_{OFF}

12 OP 396 with Adapter and Power Pack

The adapter with power pack is required
- to connect the S5-90U, S5-135U, S5-150U and S5-155U programmable controllers
- when the distance between the PLC and the OP 396 exceeds 3 m (10 ft.)
- to connect a printer with a V.24 (RS 232 C) interface (see Section 14.3)
- to connect a printer with a passive TTY (20 mA) interface

The following units can also be connected to the adapter:
- Printers with active TTY (20 mA) interface (see Section 14.2)
- Printers with hybrid interface (TTY / V.24 (RS 232 C) (see Section 14.4)
- Floppy disk drive (see Section 12.4)

The adapter with power pack is not supplied with the OP 396.
The adapter is identical to the adapter of the PG 615 programmer.

Adapter with power pack on the OP 396
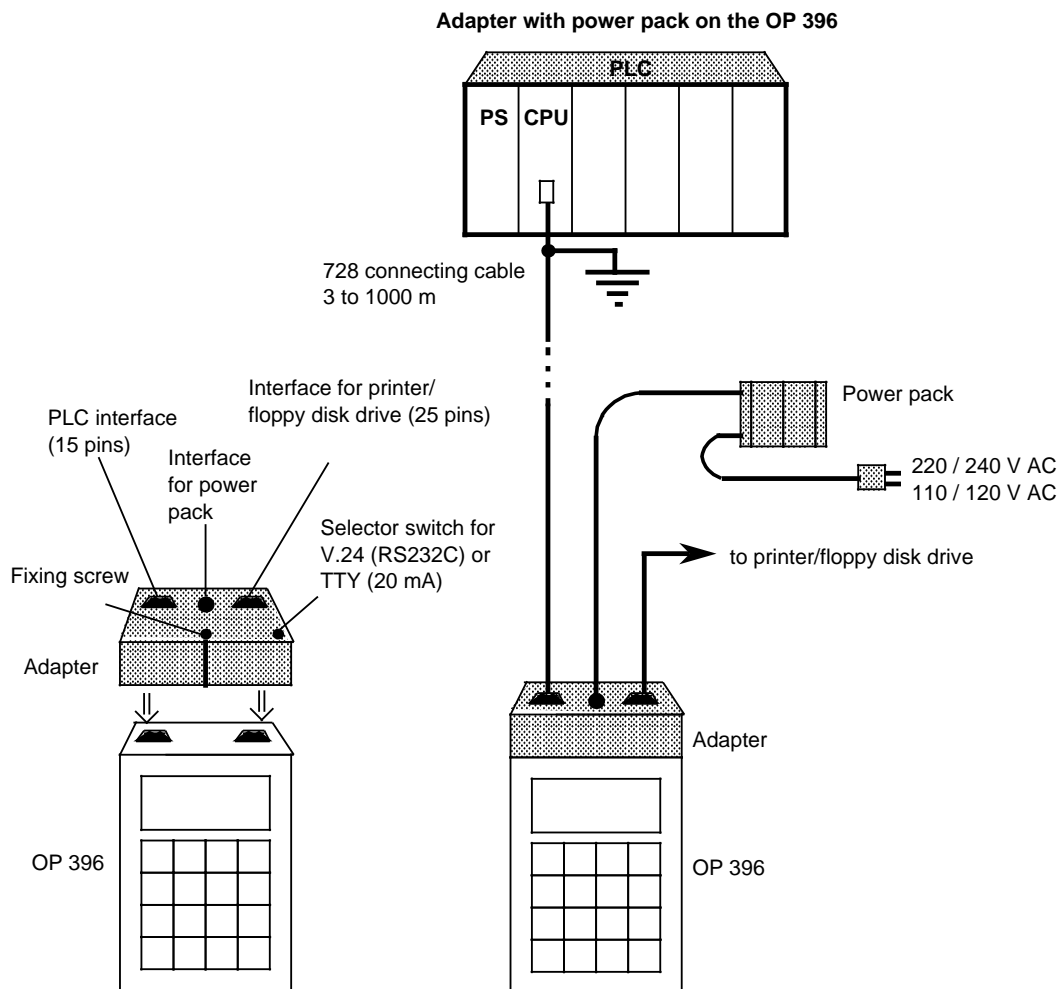
Figure 12-1. Adapter with Power Pack

12.1 Technical Specifications

Power pack

Input voltage

6ES5 984-2UA11	220 V AC	+10%
		-15%
Can be switched 240 V AC		+10%
		-15%
6ES5 984-2UB11	110 V AC	+10%
		-15%
Can be switched 120 V AC		+10%
		-15%

50/60 Hz

Output voltages and output current

5.1 V DC ±2%	650 mA
+12 V DC ±5%	120 mA
-12 V DC ±5%	35 mA
24 V DC ±5%	70 mA
Degree of protection:	IP 20 to IEC 529
Dimensions:	185 x 114 x 63 mm (length x width x height)
	(7.3 x 4.5 x 2.5 in.)
Weight:	1100 g (2.4 lbs)

Adapter

Interface to the PLC:	TTY active
Interface to the printer:	TTY passive/active
	Can be switched to V.24 (RS232C) (TxD/RxD).
Interface to the power pack:	See output voltage
Degree of protection	IP 40 to IEC 529
Dimensions	150 x 65 x 45 mm (length x width x height)
	(5.9 x 2.5 x 1.8 in.)
Weight	200 g (6.4 oz.)

Environmental conditions

Temperature:	Operating	0 to 45°C
	Nonoperating	-20 to 70°C
Relative humidity:	Operating	95% to DIN 40040
	Nonoperating	95%, no condensation

12.2   Cables for On-Line Operation

12.2.1 Cable for the 15-Pin PLC Interface (S5-90U, S5-95U, S5-100U, S5-101U, S5-115U, S5-135U, S5-155U)

• **Distance of up to 3 m (10 ft.) between OP 396 and PLC**
  The adapter and the connecting cable with the Order No. 6ES5 728-0BD00 (3NET 810 1130-01) must be used to connect the OP 396 to the S5-90U, S5-135U and S5-155U programmable controllers (the cable is part of the OP 396 standard package).

• **Distance of more than 3 m (10 ft.) between OP 396 and PLC**
  The adapter and the connecting cable with the Order No. 6ES5 728-0xxx0 are used to connect the OP 396 to the S5-90U, S5-95U, S5-100U, S5-101U, S5-115U, S5-135U and S5-155U programmable controllers.

Note:
The loop resistance (double cable length) may not exceed 250 ohms. The total cable length may not exceed 1000 m (3.300ft.).

Connection diagram with power supply unit
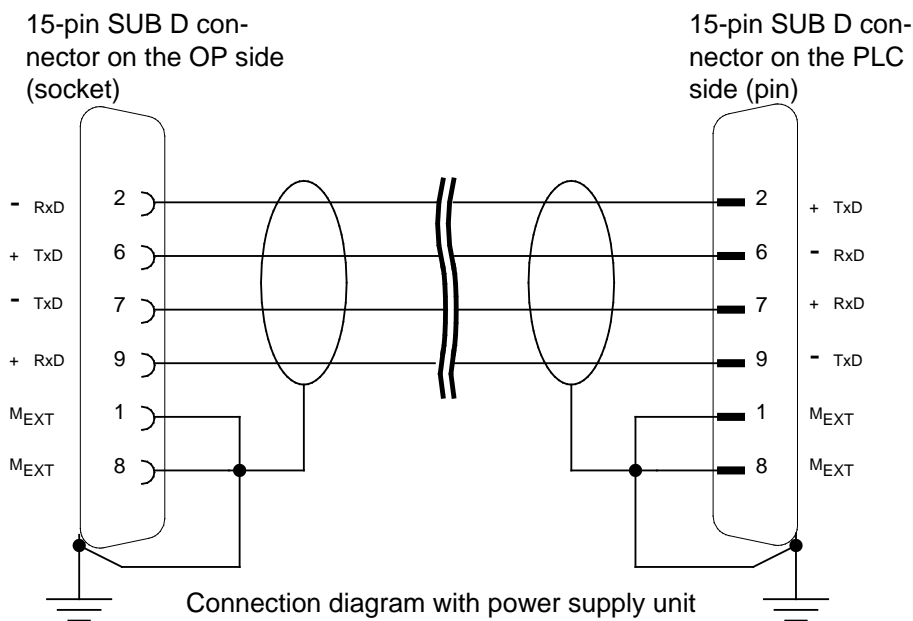
Figure 12-2.   Cable for the 15-Pin PLC Interface

Connect pins 1 and 8 and the SUB D connector's shell to the cable shield on both connectors. Lock the connectors at both ends.

12.2.2 Cable for the 25-Pin PLC Interface (AS 511) (S5-150U)

• **Distance of up to 3 m (10 ft.) between OP 396 and PLC**

| OP 396 | | Adapter | | Connecting cable 6ES5 728-1BD00 | | PLC |

• **Distance of more than 3 m (10 ft.) between OP 396 and PLC**

| OP 396 | | Adapter | | Connecting cable 6ES5 728-1xxx0 | | PLC |

Note:
The loop resistance (double cable length) may not exceed 250 ohms. The total cable length may not exceed 1000 m (3.300ft.).

25-pin SUB D con-
nector on the OP side
(socket)

25-pin SUB D connector
on the PLC side (pin)

− RxD	2		20	+ TxD
+ TxD	6		19	− RxD
− TxD	7		18	+ RxD
+ RxD	9		21	− TxD
M_{EXT}	1			
M_{EXT}	8			

Connection diagram without power supply
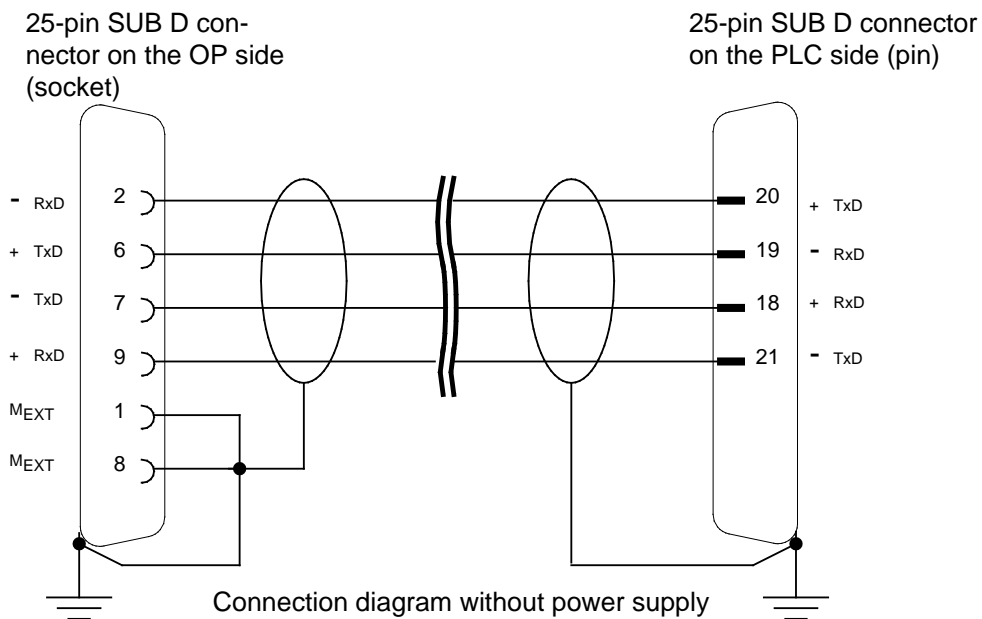
Figure 12-3. Cable for the 25-Pin PLC Interface

Connect pins 1 and 8 and the SUB D connector's shell to the cable shield on both connectors. Lock the connectors at both ends.

12.3   Connecting a Printer to the Adapter

The socket for the printer is on the right at the top end of the adapter. This port can be used to interface the following types of printers:
- Printers with active TTY (20 mA) interface (see Section 14.2)
  Selector switch on the adapter must be set to "TTY"
- Printers with passive TTY (20 mA) interface
  Selector switch on the adapter must be set to "TTY"
- Printers with V.24 (RS 232 C) interface (see Section 14.3)
  Selector switch on the adapter must be set to "V.24"
- Printers with hybrid interface (TTY/V.24) (see Section 14.4)
  Selector switch on the adapter can be set to either "TTY" or "V.24".

If required, the OP 396's printer parameters can be matched to the printer using COM 396 (refer to Section 7.1 in the COM 396 Instruction Manual with the Order No. EWA 4NEB 810 1286).
The diagram below shows the connector pin assignments for the printer port on the adapter.

Pin	Description
1	-
2	Ground
3 ... 4	-
5	RxD/BUSY (V.24)
6	+R x D
7	DSR (V.24)
8	- R x D
9	CTS (V.24)
10	+T x D
11	TxD (V.24)
12	- T x D
13	RTS (V.24)
14	-
15	DTR (V.24)
16 ... 19	-
20	+ 20 mA
21	Ground
22	+20 mA
23	Ground
24	M_{EXT}
25	M_{EXT}
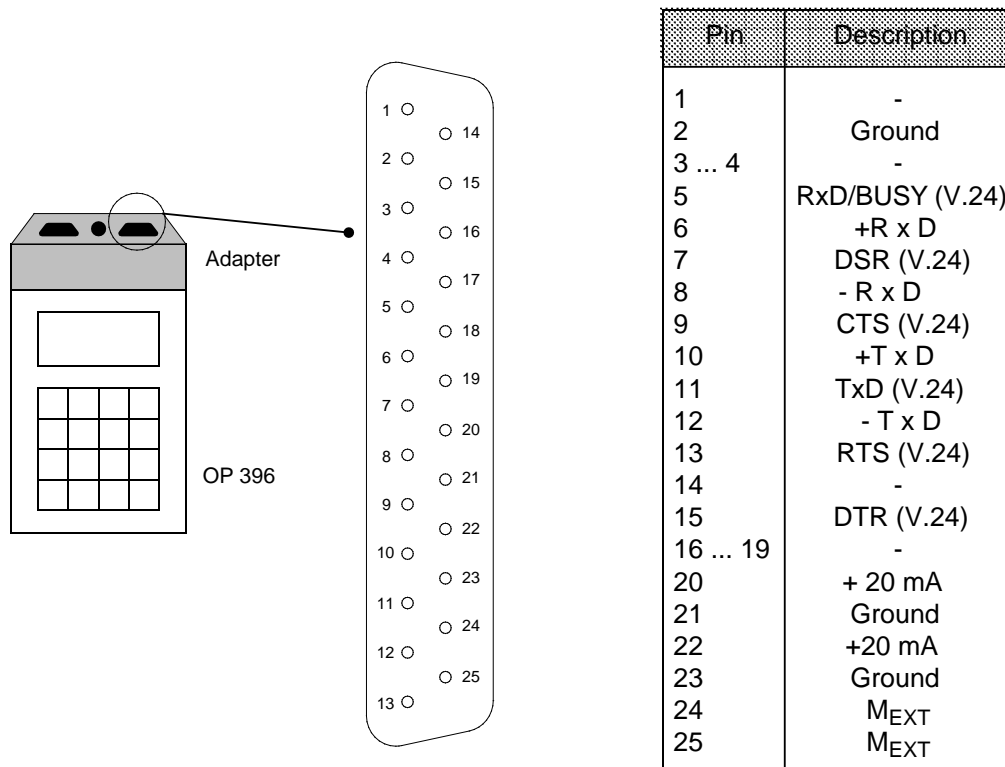
Figure 12-4.   Printer Port on the OP 396

Note:
The OP 396 evaluates pin 5 (RxD/BUSY) as BUSY signal. V >= 3 V means "Not ready to receive".

12.4   Connecting a Floppy Disk Drive to the Adapter

When a floppy disk drive is interfaced to the OP 396, the selector switch must be set to "TTY".
The drive is connected to the right-hand interface port.
Refer to Section 11 ("Connecting a Floppy Disk Drive to the OP 396") for additional information on connector pin assignments.

13   OP 396 with 984 Cable Adapter and Power Pack

The 984 cable adapter with power pack (6ES5 984-1UA31 / 6ES5 984-1UA41) supplies the OP 396 connected to the PLC interface with the required operating voltage when this voltage is not supplied by the programmable controller.
The 984 is needed

*   to interface the OP 396 to an S5-90U, S5-135U, S5-150U or S5-155U programmable controller
*   when the PLC and the OP 396 are between 3 m (10 ft.) and 1000 m (3.300 ft.) apart.

Low-resistance grounding of the cable shield with the building ground over a shield bus is required in both cases.
The adapter and the power pack are permanently connected to each other. The adapter is connected to the OP 396 via a 728 connecting cable.

**984 cable adapter with power pack
on the OP 396**
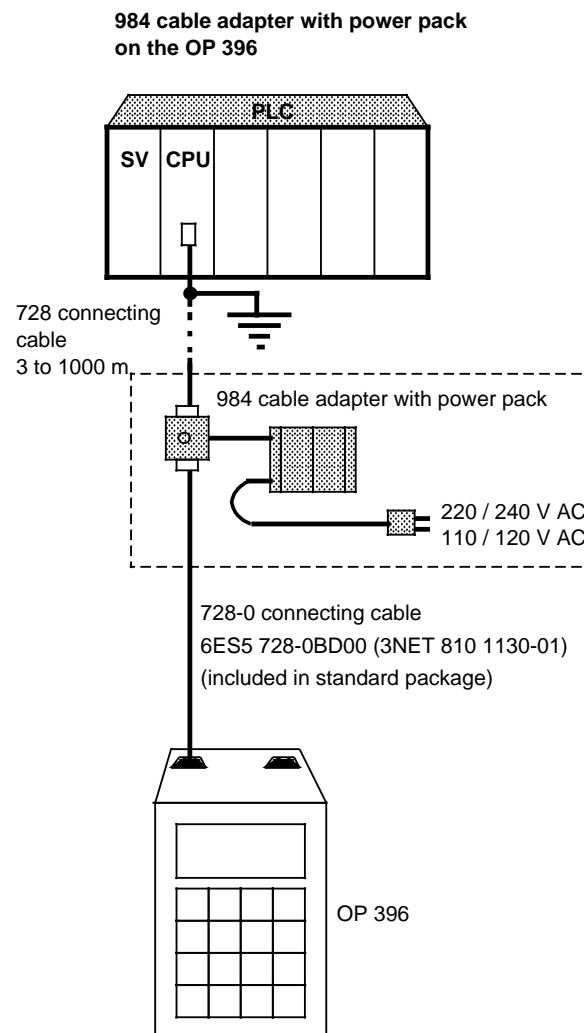
Figure 13-1.   984 Cable Adapter with Power Pack

13.1   Technical Specifications

Cable adapter with power pack (6ES5 984-1UA31)

Input voltage

	220 V AC	+10%
		‑15%
Can be switched to	240 V AC	+10%
		‑15%

Line frequency   50/60 Hz

Cable adapter with power pack (6ES5 984-1UA41)

Input voltage

	110 V AC	+10%
		‑15%
Can be switched to	120 V AC	+10%
		‑15%

Line frequency   50/60 Hz

Output voltages and output currents

5.1 V DC   650 mA
24 V DC   70 mA
2x   20 mA

Interface to the PLC: TTY active
Degree of protection: IP 20 to IEC 529
Dimensions (length x width x height in mm)
    Power pack: 185   x   114   x63 (7.3 x 4.5 x 2.5 in.)
    Adapter: 48   x   54   x27 (1.9 x 2.1 x 1.1 in.)
Weight:
    Power pack: Approx. 1000 g (2.2 lbs)
    Adapter: Approx. 70 g (2.2 oz.)

Environmental conditions

Temperature:	Operating	0 to 45°C
	Nonoperating	-20 to 70°C
Relative humidity:	Operating	95% to DIN 40040
	Nonoperating	95%, no condensation

13.2 Cables for On-Line Operation

13.2.1 Cable for the 15-Pin PLC Interface (S5-90U, S5-95U, S5-100U, S5-101U, S5-115U, S5-135U, S5-155U)

- **Distance of up to 6 m (20 ft.) between OP 396 and PLC**
  Use the adapter and two 6ES5 728-0BD00 connecting cables (3NET 810 1130-01) to connect the OP 396 to the S5-90U, S5-135U or S5-155U (one cable is included in the standard package).

| OP 396 | Connecting cable* 6ES5 728-0BD00 | Adapter 984 | Connecting cable 6ES5 728-0BD00 | PLC |

- **Distance of more than 6 m (20 ft.) between OP 396 and PLC**
  Use the adapter and a 6ES5 728 0xxx0 connecting cable to connect the OP 396 to the S5-90U, S5-95U, S5-100U, S5-101U, S5-115U, S5-135U or S5-155U.
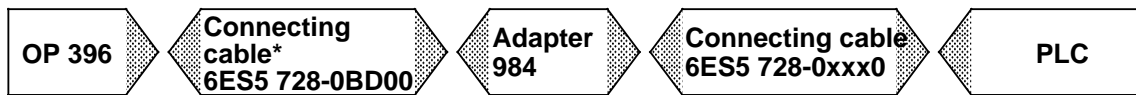
| OP 396 | Connecting cable* 6ES5 728-0BD00 | Adapter 984 | Connecting cable 6ES5 728-0xxx0 | PLC |

*   This cable is required because neither the OP 396 nor the adapter is equipped with a locking mechanism.

> **Note:**
> The loop resistance (double cable length) may not exceed 250 ohms. The total cable length may not exceed 1000 m (3.300 ft.).

15-pin
SUB D connector
on the OP side (socket)

15-pin
SUB D connector
on the PLC side (pin)

OP side		PLC side
− RxD	2	2 + TxD
+ TxD	6	6 − RxD
− TxD	7	7 + RxD
+ RxD	9	9 − TxD
M_{EXT}	1	1 M_{EXT}
M_{EXT}	8	8 M_{EXT}

Connection diagram without power supply unit
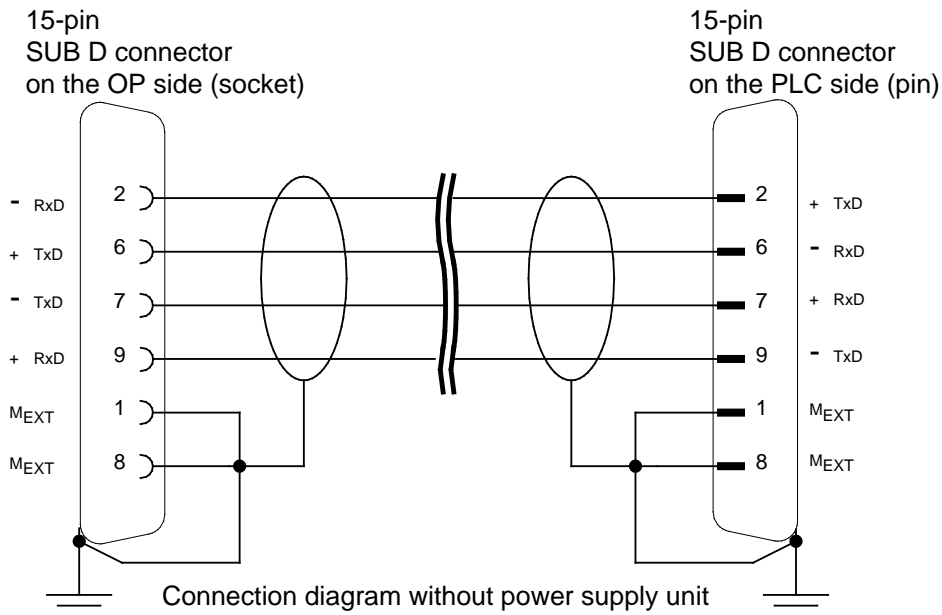
Figure 13-2.   Cable for the 15-Pin PLC Interface

Connect pins 1 and 8 and the SUB D connector's shell with the cable shield on both connectors. Lock the connectors at both ends.

13.2.2 Cable for the 25-Pin PLC Interface (AS 511) (S5-150U)

• **Distance of up to 6 m (20 ft.) between OP 396 and PLC**

| OP 396 | Connecting cable* 6ES5 728-0BD00 | Adapter 984 | Connecting cable 6ES5 728-1BD00 | PLC |

• **Distance of more than 6 m (20 ft.) between OP 396 and PLC**

| OP 396 | Connecting cable* 6ES5 728-0BD00 | Adapter 984 | Connecting cable 6ES5 728-1xxx0 | PLC |

*   This cable is required because neither the OP 396 nor the adapter is equipped with a locking mechanism.

> **Note:**
> The loop resistance (double cable length) may not exceed 250 ohms. The total cable length may not exceed 1000 m (3.300ft.).

15-pin
SUB D connector
on the OP side (socket)

15-pin
SUB D connector
on the PLC side (pin)

OP side	pin		PLC side	pin
− RxD	2		20	+ TxD
+ TxD	6		19	− RxD
− TxD	7		18	+ RxD
+ RxD	9		21	− TxD
M_{EXT}	1			
M_{EXT}	8			
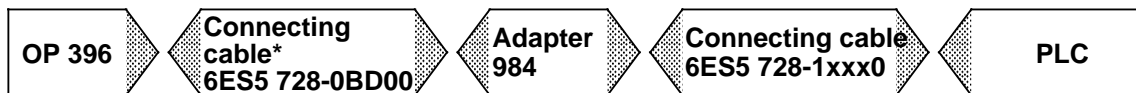
Connection diagram without power supply unit
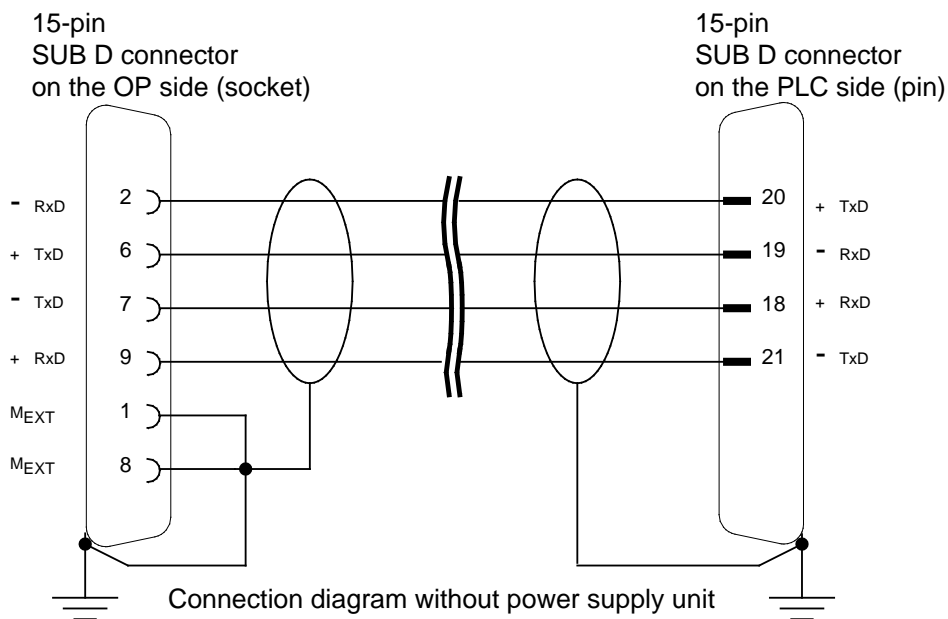
Figure 13-3.   Cable for the 25-Pin PLC Interface

Connect pins 1 and 8 and the SUB D connector's shell with the cable shield on both connectors. Lock the connectors at both ends.

14   Printers

This section provides information on
- printer connector pin assignments
- coding switch settings
- mode selector settings

A distinction is made between printers with
- TTY (20 mA) interface (see Section 14.2)
  - PT 88/89i / PT 88/89N
- V.24 (RS 232 C) interface (see Section 14.3)
  - PT 88/89i / PT 88/89N
- hybrid interface (see Section 14.4)
  - PT 88S-21 / PT 89S-21

Note:
- PT 88/89i   i: Ink-jet printer with TTY or V.24 (RS232C) interface
- PT 88/89N   N: Impact matrix printer with TTY or V.24 (RS232C) interface
- PT 88/89S-21   S-21: S-21:Ink-jet printer with hybrid interface

14.1   Character Transfer

Character transfer is based on the start-stop method, i.e. each 7-bit combination with parity bit starts with a start bit and ends with one or more stop bits. The diagram below shows the order in which the bits are transferred.
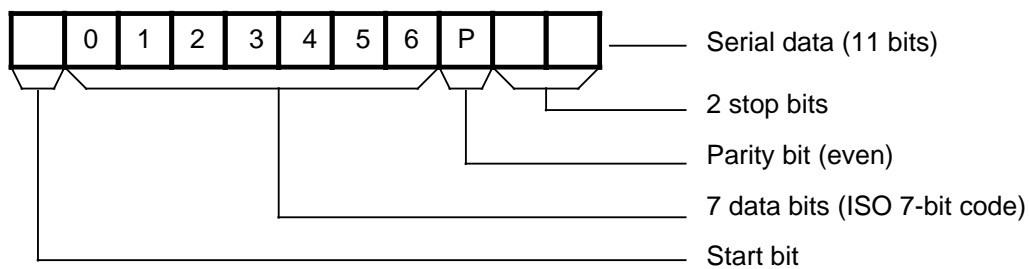
Figure 14-1.   Character Transfer

14.2   Printers with TTY Interface

14.2.1 Coding Switch for PT88/89i and PT88/89N

• Location of the coding switch

The coding switch is located beneath the carriage guide on the control panel, and is easily reached by hinging up the front cover. All switches are factory-set to "ON".
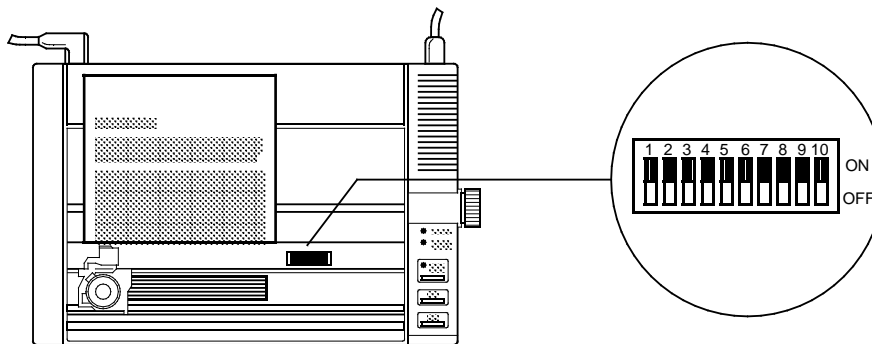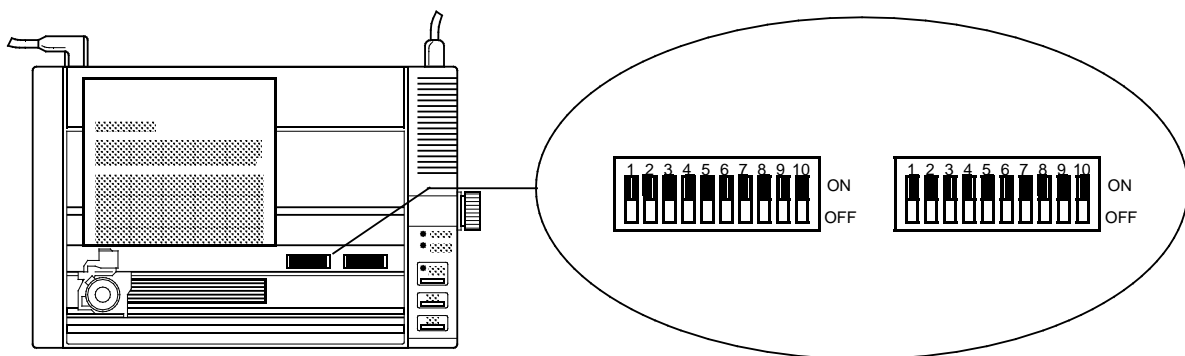

Figure 14-2.   Location of the Coding Switch (PT88/89i and PT88/89N)

• Setting the coding switch for PT88/89i and PT88/89N

Table 14-1.   Setting the Coding Switch for PT88/89i and PT88/89N

Switch Functions		Switches 1 2 3 4 5 6 7 8 9 10	Default
Character font	ASCII	▮▮▮ ▪ ▪ ▪ ▪ ▪ ▪ ▪	◁—
	Swedish	▮▮▯ ▪ ▪ ▪ ▪ ▪ ▪ ▪	
▮ = "ON"	British	▮▯▮ ▪ ▪ ▪ ▪ ▪ ▪ ▪	
▯ = "OFF"	Spanish	▮▯▯ ▪ ▪ ▪ ▪ ▪ ▪ ▪	
	IA No. 5	▯▮▮ ▪ ▪ ▪ ▪ ▪ ▪ ▪	
	German	▯▮▯ ▪ ▪ ▪ ▪ ▪ ▪ ▪	
	Danish	▯▯▮ ▪ ▪ ▪ ▪ ▪ ▪ ▪	
	French	▯▯▯ ▪ ▪ ▪ ▪ ▪ ▪ ▪	
Carriage return	on off	▪ ▪ ▪ ▮ ▪ ▪ ▪ ▪ ▪ ▪	◁—
Line feed	yes no	▪ ▪ ▪ ▪ ▮ ▪ ▪ ▪ ▪ ▪	◁—
Parity	even odd	▪ ▪ ▪ ▪ ▪ ▮ ▪ ▪ ▪ ▪	◁—
	on off	▪ ▪ ▪ ▪ ▪ ▪ ▯ ▪ ▪ ▪	
Form length	11 in. 12 in.	▪ ▪ ▪ ▪ ▪ ▪ ▪ ▯ ▪ ▪	
Line feed	$1/6$ in. $1/8$ in.	▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▯ ▪	◁—
Printer	PT88 PT89	▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▪ ▮	◁—

14.2.2 Connector Pin Assignments

• PT 88/89i and PT 88/89N
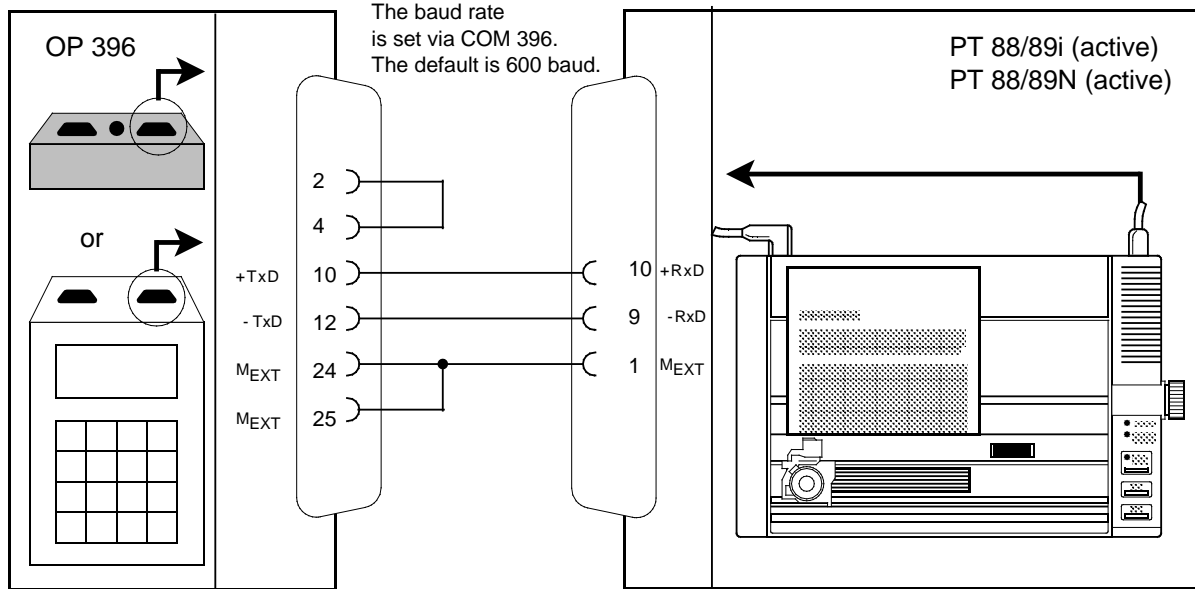
Figure 14-3. Connector Pin Assignments for the PT 88/89i and PT 88/89N Printers

Baud rate:	150 cps for i: Ink-jet printer
	80 cps for N: Impact matrix printer
Control characters:	CR, LF (output by the OP)
Connecting cable:	See Ordering Data (Section 15)

The wiring diagram shown below for a 20 mA current loop (current source in the printer) illustrates how to connect a printer with BUSY circuit:
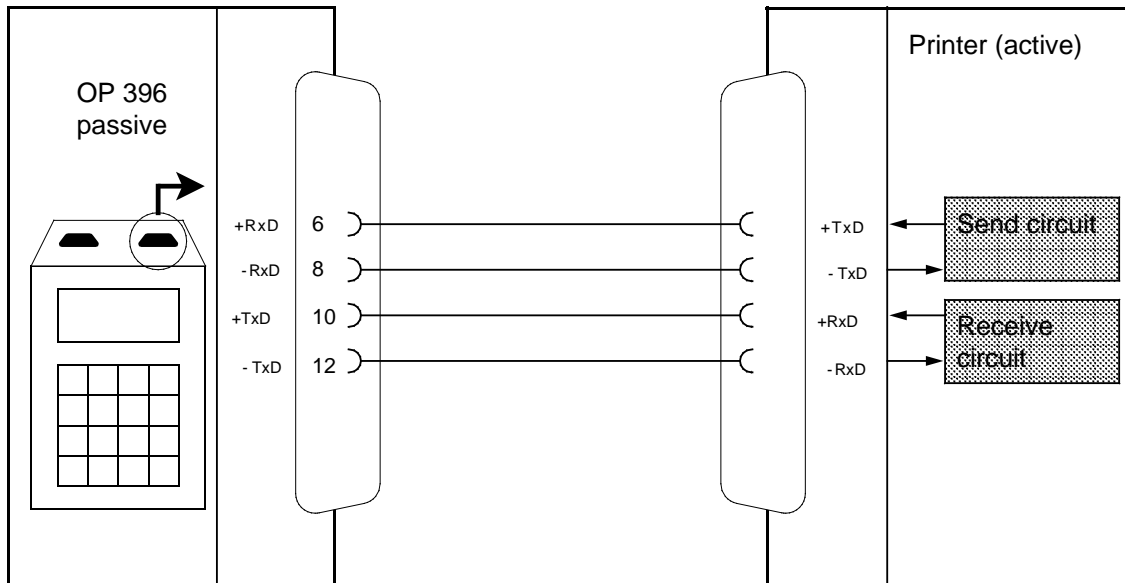
Figure 14-4. Wiring Diagram for a 20 mA Current Loop (Current Source in the Printer)

> **Note:**
> The connecting cable needed for the wiring diagram (Figure 14-4) cannot be obtained from the Siemens AG.

The following settings must be made on the OP 396 when using the wiring diagram shown in Figure 14-4:

- Baud rate: 9600
- Waiting time after CR: 0
- Waiting time after LF: 0
- BUSY signal: YES

14.2.3 Mode Selectors for the TTY Interface

- Location of the mode selectors
  The mode selectors are located on the printer's interface module.

> **N O T E   C A R E F U L L Y :**
> The mode selectors may be actuated only when the power is off!
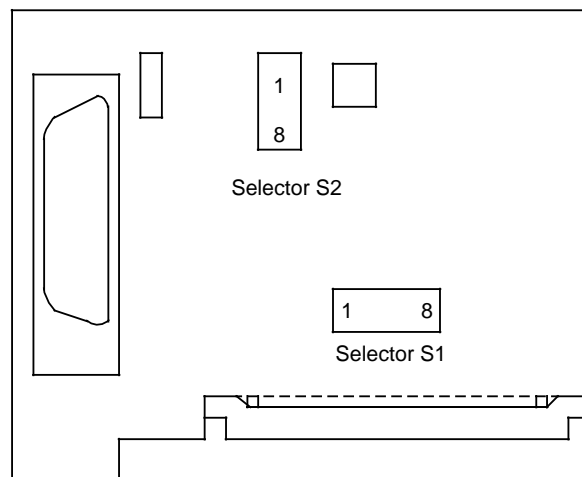
Figure 14-5. SAP-S2 Interface Module

• Setting the mode selectors

Table 14-3. Setting the Mode Selectors on the SAP-S2

Mode		Selector S1 1 2 3 4 5 6 7 8	Selector S2 1 2 3 4 5 6 7 8	Default
Baud rate bit/s	110			
	200			
	300			
	600			←
	1200			
	2400			
	4800			
	9600			
Operation with X-ON/X-OFF protocol				←
Operation with BUSY signal	Not ready to receive=current			
BUSY circuit connected to Send circuit	Not ready to receive=no current			
Own power supply				←
External power supply with protective resistor				
External power supply without protective resistor				

■/□ = "ON"   □/■ = "OFF"

14.3   Printers with V.24 (RS 232 C) Interface

A plug-on adapter is required to operate printers with a V.24 (RS232C) interface on the OP 396. The selector switch on the adapter must be set to "V.24".

14.3.1 Coding Switch for PT 88/89i and PT 88/89N

*   Location of the coding switch (see Section 14.2.1)
*   Setting the coding switch for the PT 88/89i and PT 88/89N (see Section 14.2.1)

14.3.2 Connector Pin Assignments

*   PT 88/89i and PT 88/89N
    The diagram below (Figure 14-6) shows the connector pin assignments for printing without BUSY signal.

Note:
Printing is possible without BUSY signal only when the OP 396 adapter and the PT 88/89 are interfaced to one another via a 6ES5 735-2xxx0 connecting cable, as the OP 396 does not evaluate DSR/BUSY (pin 7).
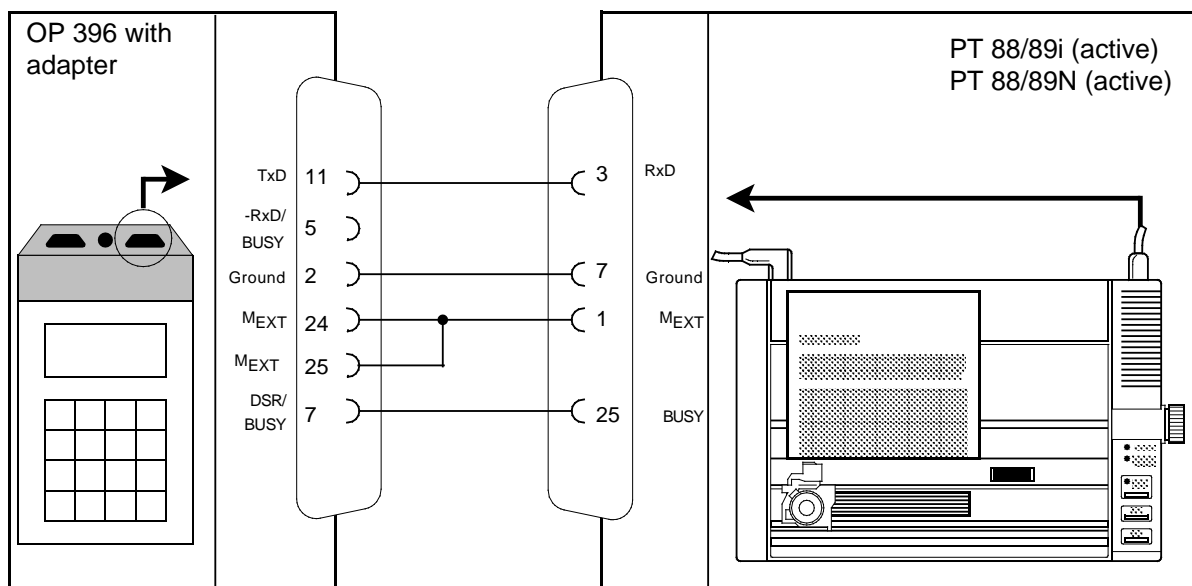
Figure 14-6.   Connector Pin Assignments for the PT 88/89i and PT 88/89N Printers

Baud rate: PT88/89i   150 cps
                                     PT88/89N   80 cps
Control characters: CR, LF output by the OP
Connecting cable: See Ordering Data (Section 15)

Proceed as follows to ensure an error-free printout:

- Select a low baud rate (BUSY: NO)
- Set the waiting time after LF to 10 ms (BUSY: NO)

The wiring diagram below (Figure 14-7) is for printing with BUSY signal.
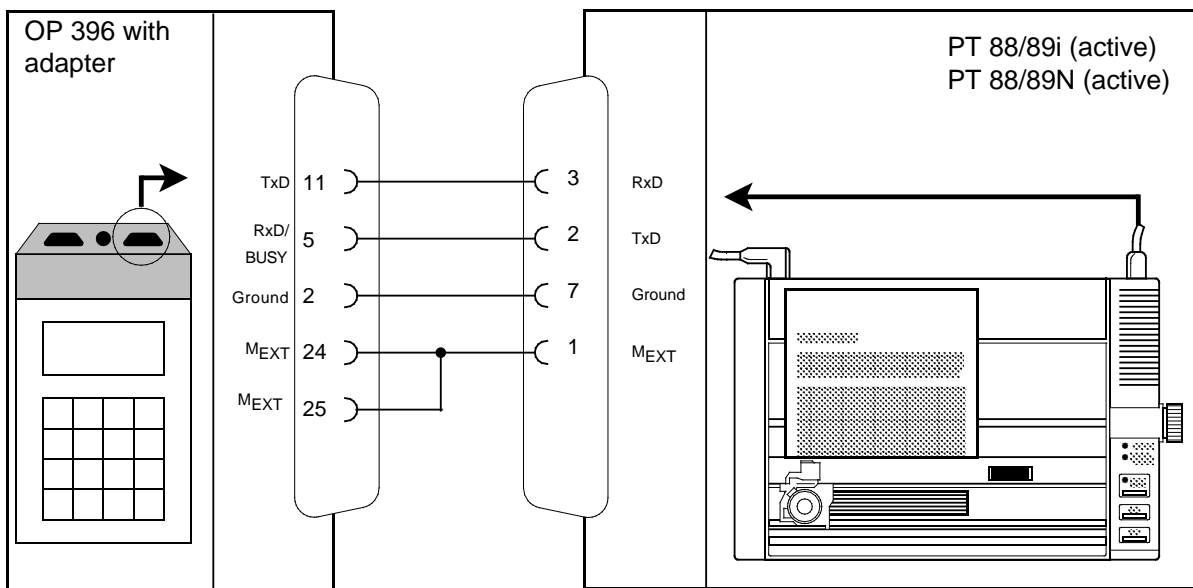
Figure 14-7.   Wiring Diagram for Printers with BUSY Signal

The connector pin assignments shown above (Figure 14-7) allow printing with BUSY signal because the printer's BUSY signal is output over the TxD line and received over the adapter's RxD/BUSY line.

Note:
The connecting cable for the wiring diagram in Figure 14-7 cannot be obtained from Siemens AG.

14.3.3 Mode Selectors for the V.24 (RS 232 C) Interface

• Location of the mode selectors
  The mode selectors are located on the printer's interface module.

N O T E   C A R E F U L L Y :
 The mode selectors may be actuated only when the power is off!
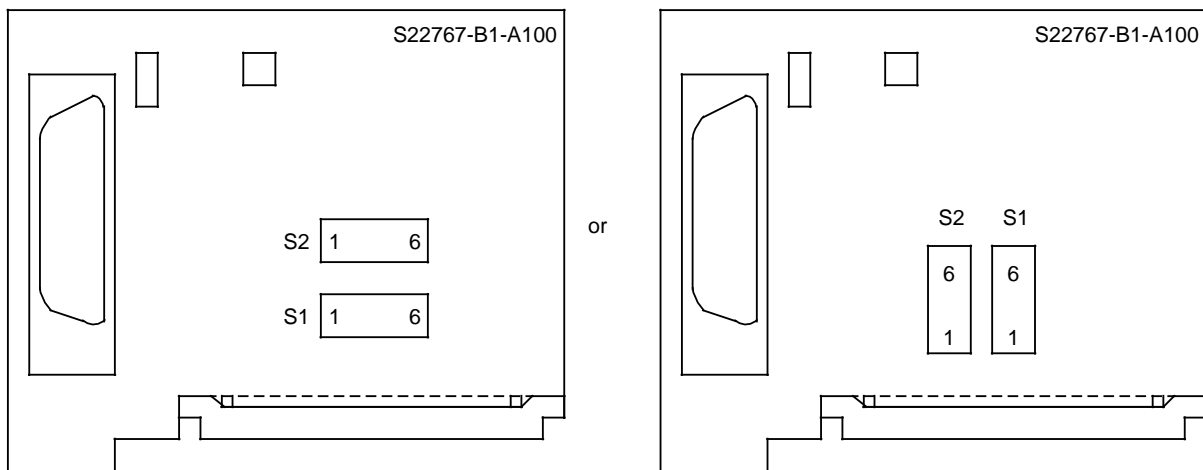
Figure 14-8.   Interface Module

• Setting the mode selector

Table 14-3.   Setting the Mode Selectors for the V.24 (RS232C) Interface

Mode *	Selector S1 1 2 3 4 5 6	Selector S2 1 2 3 4 5 6	Default
Baud rate bit/s 9600	◼◼◼▪▪▪	▪▪▪▪▪▪	←
Operation with BUSY signal	▪▪▪◼◼◼	▪▪▪▪▪▪	←
BUSY signal routed over TxD (pin 2)	▪▪▪▪▪▪	◼◼◼◼▪▪	
BUSY signal has positive potential	▪▪▪▪▪▪	▪▪▪▪◼◼	←

◼ = "ON"   ◻ = "OFF"

*   Refer to your printer manual for additional mode selector settings (such as operation with X-ON/X-OFF protocol).

14.4   Printers with Hybrid Interface (TTY/RS 232 C (V.24))

Printers with a hybrid interface can be operated in the following modes:

* TTY interface
  - Printer can be connected directly to the OP 396 or
  - Printer can be connected via an adapter (selector switch must be set to "TTY")

* RS 232 C (V.24) interface
  - Printer can be connected to the OP 396 via an adapter only (selector switch must be set to "V.24")

14.4.1 Coding Switches for PT 88/89S-21

* Location of the coding switches
  The coding switches are located beneath the carriage guide on the control panel, and can be easily reached by hinging up the front cover. All switches are factory-set to "ON".

Figure 14-9.   Location of the Coding Switches (PT88/89S-21)

- Setting the coding switches for PT 88/89S-21

Table 14-4. Setting the Coding Switches for PT 88/89S-21

Legend: ▮ (black top / white bottom) = "ON" □ (white top / black bottom) = "OFF"

Switch Functions		Switch S1 (left) 1 2 3 4 5 6 7 8	Switch S2 (right) 1 2 3 4 5 6 7 8	Default
Character font	ASCII	S1: 1=ON 2=ON 3=ON	—	←
	Swedish	S1: 1=OFF 2=ON 3=ON	—	
	British	S1: 1=ON 2=OFF 3=ON	—	
	Spanish	S1: 1=OFF 2=OFF 3=ON	—	
	IA No. 5	S1: 1=ON 2=ON 3=OFF	—	
	German	S1: 1=OFF 2=ON 3=OFF	—	
	Danish	S1: 1=ON 2=OFF 3=OFF	—	
	French	S1: 1=OFF 2=OFF 3=OFF	—	
Carriage return	with line feed / without line feed	S1: 4 (ON/OFF)	—	
Pitch	$1/10$ in. / $1/12$ in.	S1: 5 (ON/OFF)	—	←
Type style	normal / letter quality	S1: 6 (ON/OFF)	—	←
Zero	Zero=0 / Zero=∅	S1: 7 (OFF/ON)	—	
Form length	11 in. / 12 in.	S1: 8 (OFF/ON)	—	
Line feed	$1/6$ in. / $1/8$ in.	—	S2: 1 (ON/OFF)	←
Skip over perforation	1 in. / off	—	S2: 2 (OFF/ON)	
Parity evaluation	off	—	S2: 4 (ON/OFF)	←
	even / odd	—	S2: 5 (OFF/ON)	
Buzzer	on / off	—	S2: 6 (OFF/ON)	
Switches 3, 7 and 8 are unassigned.				

14.4.2 Using the Hybrid Interface in TTY (20 mA) Mode

Note:
If an adapter is used, the selector switch on the adapter must be set to "TTY".

- Connector pin assignments
  (see "PT 88/89i and PT 88/89N", Section 14.2.2)

- Mode selectors for the hybrid interface
  - Location of the mode selectors
    The mode selectors are located on the printer's interface module.

N O T E   C A R E F U L L Y :
The mode selectors may be actuated only when the power is off!
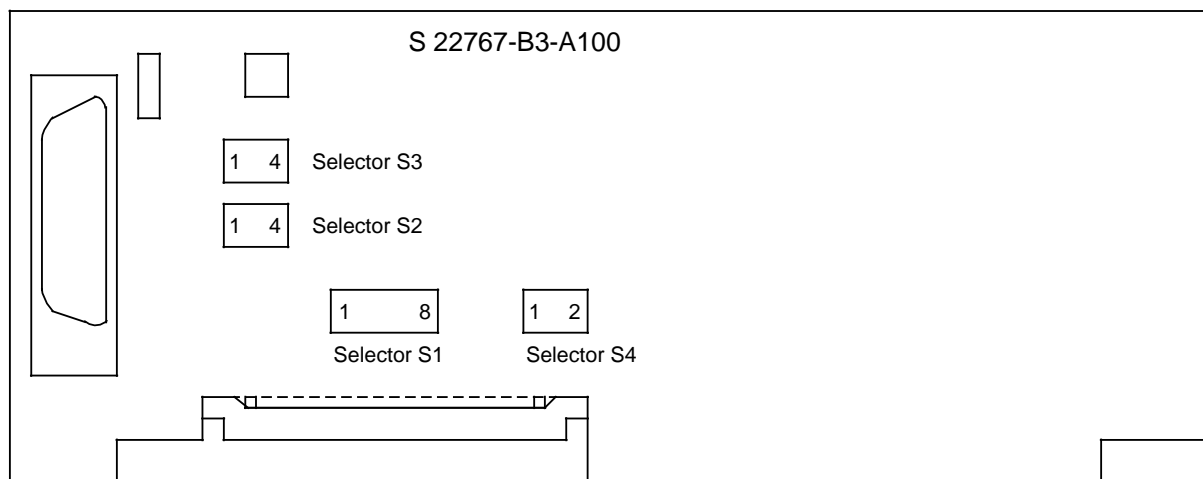
Figure 14-10.   Interface Module for the Hybrid Interface

- Setting the mode selectors for TTY mode

Note:
The hybrid interface is set to "TTY" mode when selector 4 on the interface module is in position "2".

Table 14-5. Setting the Mode Selectors for TTY Mode

Mode (selector S4 set to position 2)		Selector S1 1 2 3 4 5 6 7 8	Selector S2 1 2 3 4	Selector S3 1 2 3 4	Default
Baud rate bit/s	110				
	200				
☐ = "ON" ☐ = "OFF"	300				←
	600				
	1200				
	2400				
	4800				
	9600				
Operation with	X-ON/X-OFF protocol				
BUSY signal to	X1.25				←
	X1.25 and X1.2				
BUSY "Not ready to receive"	negative				
	positive				←
Own power supply					←
External power supply with protective resistor					
External power supply without protective resistor					

14.4.3 Using the Hybrid Interface in V.24 (RS 232 C) Mode

Note:
The selector switch on the adapter must be set to "V.24" for printers with a V.24 (RS 232 C) interface.

- Connector pin assignments
  (see "PT 88/89i and PT 88/89N", Section 14.3.2)

- Mode selectors for the hybrid interface
  - Location of the mode selectors
    The mode selectors are located on the printer's interface module.

N O T E   C A R E F U L L Y :
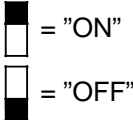The mode selectors may be actuated only when the power is off!

S 22767-B3-A100

| 1   4 | Selector S3 |
| 1   4 | Selector S2 |

| 1   8 | | 1   2 |
| Selector S1 | | Selector S4 |
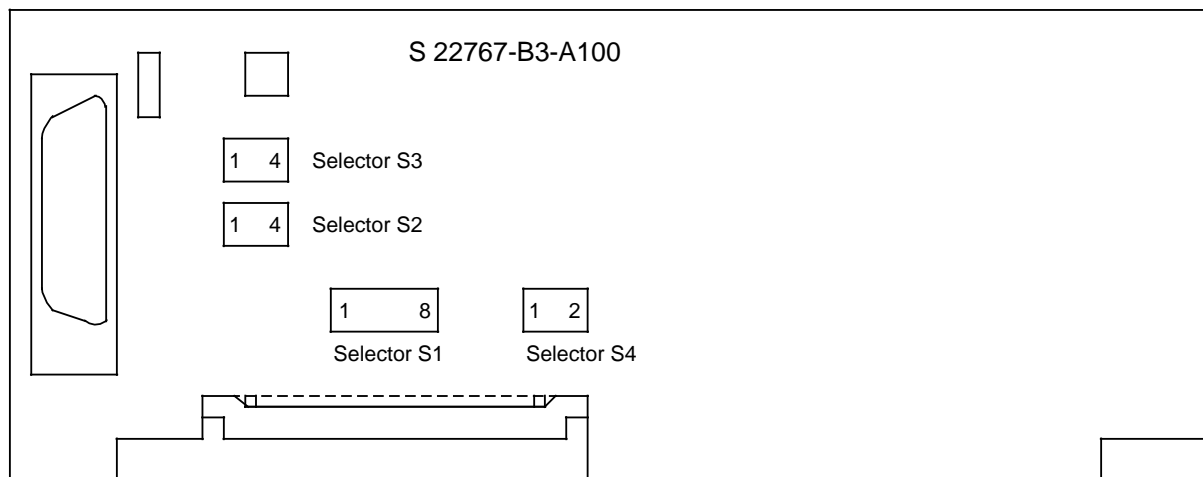
Figure 14-11.   Interface Module for the Hybrid Interface

- Setting the mode selectors for V.24 (RS 232 C) mode

Note:
The hybrid interface is set to "V.24" (RS 232 C) mode when selector 4 is in position "1".

Table 14-6. Setting the Mode Selectors for V.24 (RS 232 C) Mode

Mode * (selector S4 set to position 1)	Selector S1 1 2 3 4 5 6 7 8	Selector S2 1 2 3 4	Selector S3 1 2 3 4	Default
Baud rate bit/s 9600	■ ■ ■ · · · · ·	· · · ·	· · · ·	←
BUSY signal routed over TxD (pin 2)	· · · ▯ · · ▯ ■	· · · ·	· · · ·	
BUSY signal has positive potential	· · · · ▯ ■ · ·	· · · ·	· · · ·	←
Selectors S2 and S3 are unassigned in "V.24" (RS 232 C) mode.				

■ = "ON"   ▯ = "OFF"

*   Refer to your printer manual for additional mode selector settings (such as operation with X-ON/X-OFF protocol).

15 Ordering Data

Table 15-1. Ordering Data

Product	Order No.
OP 396 operator panel	6ES5 396-0UA11
Memory submodules for the OP 396 S5-150U;S5-90U, S5-95U, S5-100U, S5-101U, S5-115U, S5-135U (S and R processors and CPU 928) and S5-150U ASCII character font	6ES5 816-0AA11
S5-90U, S5-95U, S5-100U, S5-101U, S5-115U, S5-135U (S and R processors and CPU 928) and S5-150U Cyrillic character font	6ES5 816-0AA01
S5-90U, S5-95U, S5-100U, S5-115U, S5-135U (R processor and CPU 928) S5-150U and S5-155U ASCII character font	6ES5 816-0AB11
Adapter and power pack for 220 / 240 V AC for 110 / 120 V AC	6ES5 984-2UA11 6ES5 984-2UB11
984 cable adapter with power pack for 220 / 240 V AC for 110 / 120 V AC	6ES5 984-1UA31 6ES5 984-1UA41
For connection to the S5-90U, S5-95U, S5-100U, S5-101U, S5-115U, S5-135U and S5-155U: 728-0 connecting cable, standard length 3 m (10 ft.), 15/15-pin 728-0 connecting cable, length>3 m (10 ft.), 15/15-pin (requires use of an adapter and a power pack!) For connection to the S5-150U: (requires use of an adapter and a power pack!) 728-1 connecting cable, standard length 3 m (10 ft.), 15/25-pin 728-1 connecting cable, length>3 m (10 ft.), 15/25-pin	6ES5 728-0BD00 (3NET 810 1130-01) 6ES5 728-0 ... 0 6ES5 728-1BD00 6ES5 728-1 ... 0
OP 396 mounting kit OP 396 mounting kit with accessories for adapter installation (required for adapter and power pack (6ES5 984-2UA11 / 6ES5 984-2UB11))	6ES5 982-3UB11 6ES5 983-0UA11
Carrying case	6ES5 986-0MA11
735 connecting cable for PT 88/89 printer TTY V.24 (RS 232 C)	6ES5 735-1 ... 0 6ES5 735-2 ... 0
736 connecting cable for PT 80 printer (TTY)	6ES5 736-0BD20

Table 15-1.   Ordering Data (continued)

Product	Order No.
OP 396 instruction manual English German French Spanish Italian	 6ES5 998-0UK21 6ES5 998-0UK11 6ES5 998-0UK31 6ES5 998-0UK41 6ES5 998-0UK51
COM 396 for PG 675 (CP/M-86 operating system) English German French Spanish Italian	 6ES5 876-2UA21 6ES5 876-2UA11 6ES5 876-2UA31 6ES5 876-2UA41 6ES5 876-2UA51
COM 396 for PG 635, PG 675, PG 685, PG 695, PG 730, PG 750 (S5-DOS operating system; 3 1/2" and 5 1/4" floppy disk formats) English German French Spanish Italian	 6ES5 875-4SD21 6ES5 875-4SD11 6ES5 875-4SD31 6ES5 875-4SD41 6ES5 875-4SD51
User submodules EPROM 8 Kbytes EPROM 16K bytes EPROM 32K bytes	 6ES5 375-0LA15 6ES5 375-0LA21 6ES5 375-0LA41
Data dump submodules: EEPROM 2 Kbytes	 6ES5 357-0LC11
User or data dump submodules: EEPROM 8 Kbytes EEPROM 16 Kbytes	 6ES5 375-0LC31 6ES5 375-0LC41
Lithium backup battery for CMOS clock	6ES5 980-0AE11
PT 88N printer PT 88S printer PT 89N printer PT 89S printer	6ES5 088-0KN00 6ES5 088-2KT00 6ES5 088-1KN00 6ES5 088-3KT00

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Suggestions: ☐   **Corrections:** ☐

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