

# **MAC Operator Terminal**

Human-Machine-Interface

Installation Manual

**MAC 40+**

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Mitsubishi Electric Europe B.V 1997

All examples in this manual are used solely to promote understanding of how the equipment works and its operation. Mitsubishi Electric Europe B.V takes no responsibility if these examples are used in real applications.

Because of the great many application areas for this equipment, the user himself must acquire the appropriate knowledge needed to use the equipment correctly for particular applications. Mitsubishi Electric Europe B.V absolves itself of all responsibilities for damage and injuries that may occur during installation or use of this equipment.

Mitsubishi Electric Europe B.V absolves itself of all responsibilities for any type of modification made to the equipment. Only approved spare parts and accessories manufactured according to specifications of Mitsubishi Electric Europe B.V should be used.

The equipment must not be used in an explosive environment.

# Safety precautions

## General

- Check the delivery for transport damage. If damage is found, advise your supplier.
- The product fulfils the requirements of article 4 of EMC directive 89/336/EEC.
- Do not use the product in an explosive environment.
- Modifications, changes and additions to the product are forbidden.
- Use only spare parts approved by Mitsubishi Electric Europe B.V.
- Read the user instructions carefully before use.
- This equipment should only be operated by qualified personnel.

## At installation

- The product is constructed for stationary installation.
- Install the product according to the accompanying installation instructions.
- The product must be grounded according to the accompanying installation instructions.
- This equipment must be installed by qualified personnel.
- High voltage, signal and supply cables must be separated.
- The product should not be mounted in direct sunlight.

## In use

- Keep the equipment clean.
- Emergency stop and other safety functions should not be controlled from the terminal.
- Do not touch the keys, displays, etc. with sharp objects.

### **Service and maintenance**

- The agreed warranty applies.
- Clean the display and face with a soft cloth and mild detergent.
- Repairs should be made by qualified personnel.

### **At disassembly and scrapping**

- Local regulations apply concerning recycling of products or part.
- Please note that the lithium battery, electrolyte condenser and display contain hazardous substances.

# Introduction

This manual describes the operator's panels MAC 40+ and MTA-100. Hereafter these products are referred to as the terminal.

The terminal is operator's panel in a family of terminals developed to satisfy the demands made for man-machine communication.

The functions built into the terminal include among other things the possibility to display text with dynamic indication, control, function keys and LEDs. A terminal is programmed directly from the built-in keyboard or from a PC with the MAC Programmer/SW-MTA software. The programmed project is stored in the terminal. Terminals have for the most part an object-orientated way of working which makes them easy to use.

**For more detailed information see the manual for the terminals.**

## Summary of functions



### Textblock

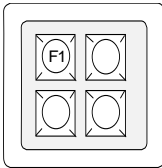
Textblock is used to build up dialogs. A Textblock can consist of an arbitrary number of text lines. At the same time, 2 rows each of 16 characters are displayed.

### Static text

Static text is text written in Textblock which is not changed when executing the program.

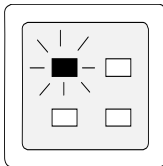
### Dynamic objects

Dynamic objects are fields in the text which are linked to the signals in the PLC system. There are 7 types of dynamic object: digital, analog, jump, date/time, bar graph, multiple choice object and text object.



### Function keys

The function keys can be linked to the digital signals which are set when the function key is pressed in run-time mode.



### LED

The LEDs are controlled by digital signals in the PLC system.

# Installation

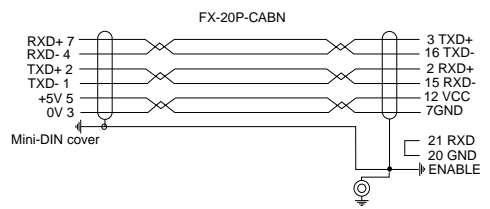
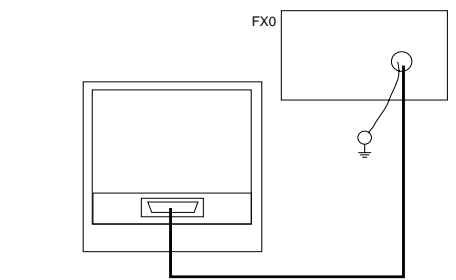
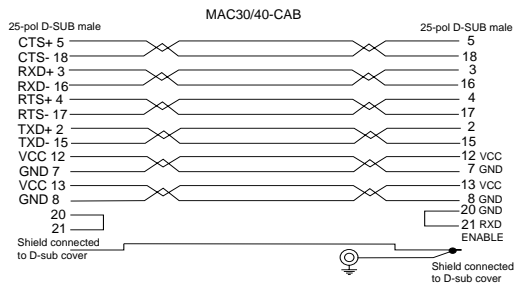
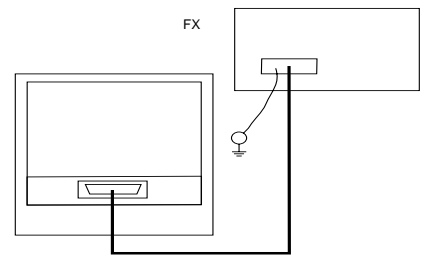
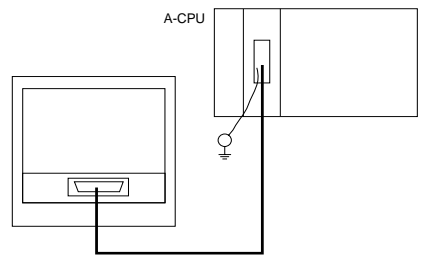
The terminals are connected to the PLC system's CPU port or the A series' communication ports.

## Voltage supply

Power for the terminal is supplied from the front port through the cable.

## Connection to the PLC system's CPU port

Connect the MAC30/40-CAB cable to the outlet on the back of the terminal. To connect to the F1/F2 series, the F2-20GF1 adaptor is required. The F2-20GF1 should be set to 19,200 baud. If the terminal is to be connected to an FX0 system, the FX-20P-CABN cable or the enclosed cable together with the FX-20P-CADP cable is used. The maximum cable length between the terminal and the PLC system is 3 meters. If you need a longer cable you must use a cable in which the power supply voltage is made external (the same cable as you use when the terminal is connected to F1/F2).



## Connection to an AJ71C24/ AJ71UC24

The terminal is connected to the RS422 port on the AJ71C24/AJ71UC24. Power supply voltage +5 VDC, must be connected from an external power supply. The switches on the AJ71C24 should be set as follows:

- Station no.:** 00
- Mode:** A
- Transmission switches** 11, 12, 14, 15, 21 and 22 ON, remainder OFF.

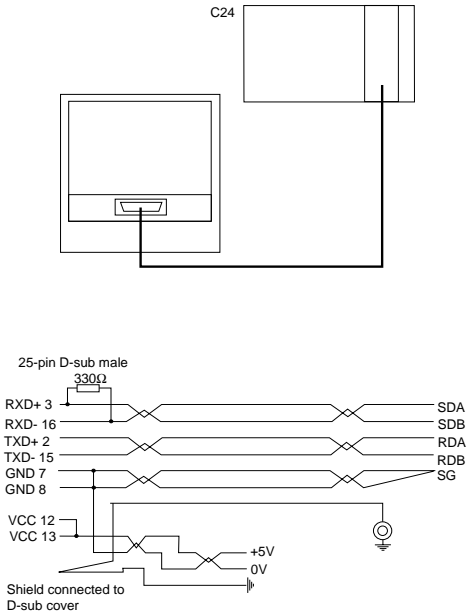
The switches on the AJ71UC24 should be set as above. Furthermore switch 23 should be ON. The settings result in 19,200 baud, 8 data bits, 1 stop bit and no parity. The parameters in configuration mode under Port parameters, PLC, in the terminal should be set in the same way.

## Connection to an A1SJ71C24-R4

The terminal is connected to the RS422 port on the A1SJ71C24-R4. Power supply voltage +5 VDC, must be connected from an external power supply. The switches on the AJ71C24 should be set as follows:

- Mode:** 5
- Transmission** 2, 4, 6, 7, 8, 12 ON switches remainder OFF.

The settings result in 19,200 baud, 8 data bits, 1 stop bit and no parity. The parameters in configuration mode under Port parameters, PLC, in the terminal should be set in the same way.





## Connection to an A2CCPUC24

The terminal is connected to the CPU port or the Computer Link port (RS422) on the A2CCPUC24. The switches on the Computer Link port should be set as follows:

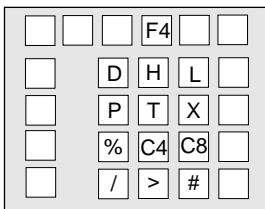
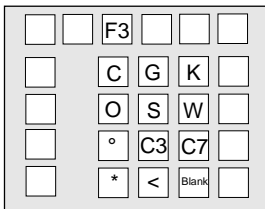
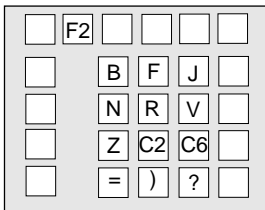
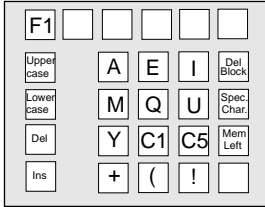
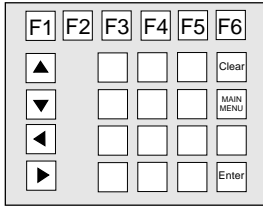
**Station no.** 00  
**Mode:** A  
**Transmission switches** 12, 13, 14, 18, 19 and 20 ON  
remainder OFF.

The settings result in 19,200 baud, 8 data bits, 1 stop bit and no parity. The parameters in configuration mode under Port parameters, PLC, in the terminal should be set in the same way.

## Programming from personal computer

For programming of the terminal it is recommended that the PC software, MAC Programmer/SW-MTA, is used. This software will make programming easy and also gives a back-up of the project. To connect a terminal to a PC use the convert unit SC-06N. The example in this manual is programmed directly from the terminal keyboard.

## Keyboard and choice of menu



The terminal has a compact keyboard where each key has several functions. There are four further characters in each corner of the number keys, the [-] and [.] keys. One of the functions key is used to write these. [F1] for the upper left, [F2] for the upper right, [F4] for lower left and [F5] for the lower right. Hold the function key pressed while pressing the required key. The codes C1-C8 stand for the character codes specific for your own language. The terminal is designed with a menu system which makes it easy for the user to enter information and monitor his system. There is a general rule when choosing from the menus. To be able to select a function, you must first point to it. You do this by moving the cursor to the right line with the arrow keys. Then press [NEXT], key [F6]. If several alternatives exist than there is room for on the screen, you can scroll the text with the arrow keys. Press [LEAVE], key [F5], to exit from a menu.

## Settings

A number of basic settings have to be entered before using the terminal. The settings are entered in the configuration mode. You are automatically in the programming mode when start up. To change to the configuration mode quickly press [LEAVE], that is to say [F5], twice. The SETUP menu is displayed in the configuration mode. The following settings are necessary:

### Choice of PLC system

You must choose to which PLC system the terminal is to be connected. Move the cursor with the arrow keys to the PLC-selection menu and press [ENTER]. Select the required PLC system and press [ENTER].

### Choice of character set

The majority of languages have letters which are specific to that language. By selecting the character set you can choose to which letters the keys C1-C8 correspond.

### Menu language

Various menu languages can be chosen with the terminal. This manual assumes that English has been chosen as menu language.

```

--- [SETUP] ---
>PLC Selection
  System signals
  Language
  Character set
  Date/Time Format
  Port parameters
  Erase memory
  Terminal options

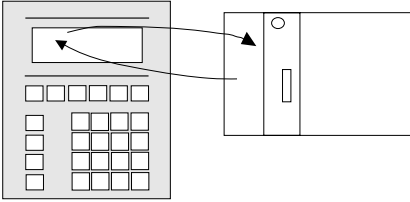
```

```

>F1/F2
  FX
  A-CPU
  AJ71-C24 (S3)

```

## A small example



The following section gives a small example of how to start creating applications quickly. The example follows the whole sequence from building up an application to executing to the PLC system. The terminal and the PLC system must be connected together to be able to use the example. In this example we shall make a Textblock which shows the status of the X0 input. Switch on the terminal and enter the programming mode. The start-up screen will be seen for a short period. This is followed by the Programming menu.

```
>Edit  
  Transfer  
  Block list
```

The Edit alternative is marked from the beginning. Press [NEXT] to enter the editing mode. You select the type of object in the menu now displayed. In this example we shall define a Textblock.

1. Select **Text blocks**. Press [NEXT].
2. Enter the number of the block here, in this case 0. The cursor,\_, is placed in the right position so that all that is needed is to press [0] and then [ENTER].
3. Move the cursor to **Statusword** and press [INFO].

```
>Text blocks
  Function keys
```

4. Place the cursor on **1st obj** and press [INFO] to show YES.
5. Press [NEXT].
6. Press [NEXT] to begin editing the block. The screen clears and you can begin entering text.

```
BLOCK NUMBER:0
Disp. sign.:
Status word:
```

```
Curs. off:NO
1:st obj:YES
Dis. MAIN:NO
MORE-ind.:NO
Auto Ent:NO
```

```

>Digital
  Analog
  Jump
  Date/Time
  Bar graph
  Mult.choice
  Text

```

```

D.Obj.: X0
Text 0: OFF
Text 1: ON
Manoeuv: NO

```

7. Press #, [F4] [.]. A list of available dynamic objects is now displayed.
8. The Digital option is already marked. Press [ENTER]. The dialog box is now displayed for the digital object.
9. First enter which I/O signal the object is to illustrate. Do this by entering the required address, in this case X0, after the text D.Object. Finally press [ENTER].
10. Enter the text which will be displayed when the signal is 0, in this example OFF, and press [ENTER].
11. Enter the text which will be displayed when the signal is 1, in this example ON, and press [ENTER].
12. Press [NEXT] to close the dialog box. The dynamic object is now shown by # and two - on the screen.
13. Press [LEAVE] until the programming menu is shown.

When the program is ready, it can now be checked in run-time mode. Press [MAIN MENU] [INFO] to switch to run-time mode. When the run-time mode starts the start-up screen is displayed. The block is then displayed automatically.

# Overview

## Modes

The terminal has three modes

### Run-time mode

Alter between run-time mode and programming mode with [MAIN MENU] [INFO].

### Programming mode

Alter between programming mode and run-time mode with [MAIN MENU] [INFO].

### Configuration mode

Press [LEAVE] when the start-up screen is displayed in programming mode

## Dynamic objects

The following dynamic text objects can be used in block and linked to the stated types of signals

**Digital:**  
A series: X, Y, M, B, F, T, C

FX series: X, Y, M, S, T, C

**Analog:** A series: D, W, R, T, C

FX series: D, T, C

**Bar graph:** A series: D, W, R, T, C

FX series: D, T, C

**Multichoice:** A series: X, Y, M, B, F, T, C

FX series: X, Y, M, S, T, C

**Text:** A series: D, W, R

FX series: D

**Jump:** Jump objects do not use signals from the PLC system

**Date/time:** PLC clock.

## System block
























Certain blocks are reserved for special purposes:

<b>0</b>	Main menu
<b>990-997</b>	<i>Reserved, do not use</i>
<b>998</b>	LED
<b>999</b>	Function keys



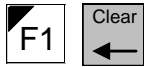
# Keys

## Programming mode Shift

Shift	
Shift	
Shift	
Shift	
Leave	
Next	
Move	   
Shift between alternatives Display status word menu	
Erase the character on the left	
Next line	
Erase the character by the cursor	 
Insert characters	 
Upper case (capital) letters	 
Lower case (small) letters	 
Gives access to special character table	 



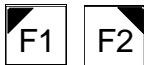
Number of bytes remaining



Erase block in block menu















Shift between programming and run-time modes



Keyboard layout

### Run-time mode

Function keys		
Move between objects		
Move linewise		
Display 0 and 1 texts for digital object Display min and max limits for analog and bar graph objects		
Display Textblock 0		
Carry out jump with jump object End entering analog object Forcibly set digital object Entry field text object List of choices multi-choice object		
Erase character on the left when entering		
Shift between programming and run-time modes		

## Technical data

### Front panel

Width 150 x height 170 mm. Black anodized aluminum sheet

### Fitting depth

Max 33 mm.

### Fitting holes Hole:

Width  $132 \pm 4$  mm x  $152 \pm 4$  mm, 4 fixed screws, M4, C-C 140 x 160 mm. Max panel thickness 7 mm.

### Safety standard for front panel

IP 65

### Safety standard for reverse side

IP 20

### Keyboard materials

Membrane keyboard with metal snap discs. Overlay film of polyester with print on reverse side. Life: 1 million operations.

### Reverse side material

Textured powder varnish, 1 mm steel plate

### Weight

Excl. D-sub cabling, 0.7 kg

### PLC system connection 25-position

D-sub connector, female with standard screw lock 4-40 UNC, RS422 communication.

### Cable for PLC system

6 pair cable, shielded, shielded D-sub casing. Locking screws to the PLC system: M2.5 locking screws to the terminal: 4-40 UNC.

### Display

LCD display (liquid crystal), Supertwist 2 lines of 16 characters each. 8 mm character height. The contrast adjustable with potentiometer inside.

**Supply voltage**

From PLC system or via external power supply  
5 VDC  $\pm 5\%$  min 200 mA.

**Memory**

10 year data retention min. 10000 write cycles/  
byte. EEPROM.

**Internal logic voltage**

+5V  $\pm 5\%$ . Connected to the chassis via 0.1 $\mu$ F  
capacitor.

**Ambient temperature**

0° to 50°C

**Storage temperature**

-20° to +60°C

**Air humidity**

Max 90% without condensation

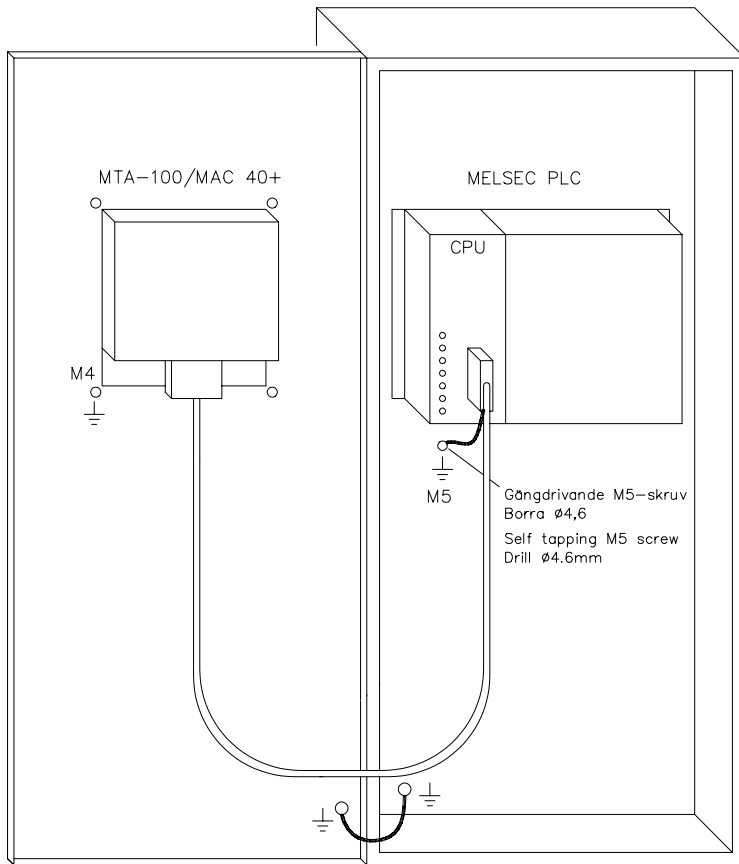
**Interference test**

Interference tested for external noise according  
to: IEC 801-2 (6 kV contact discharge, 8 kV air  
discharge), IEC 801-3 (10V/m), IEC 801-4 level  
4.

The product have passed and comply with  
specifications of the above tests. The product  
must only be used for applications covered by  
these standards.

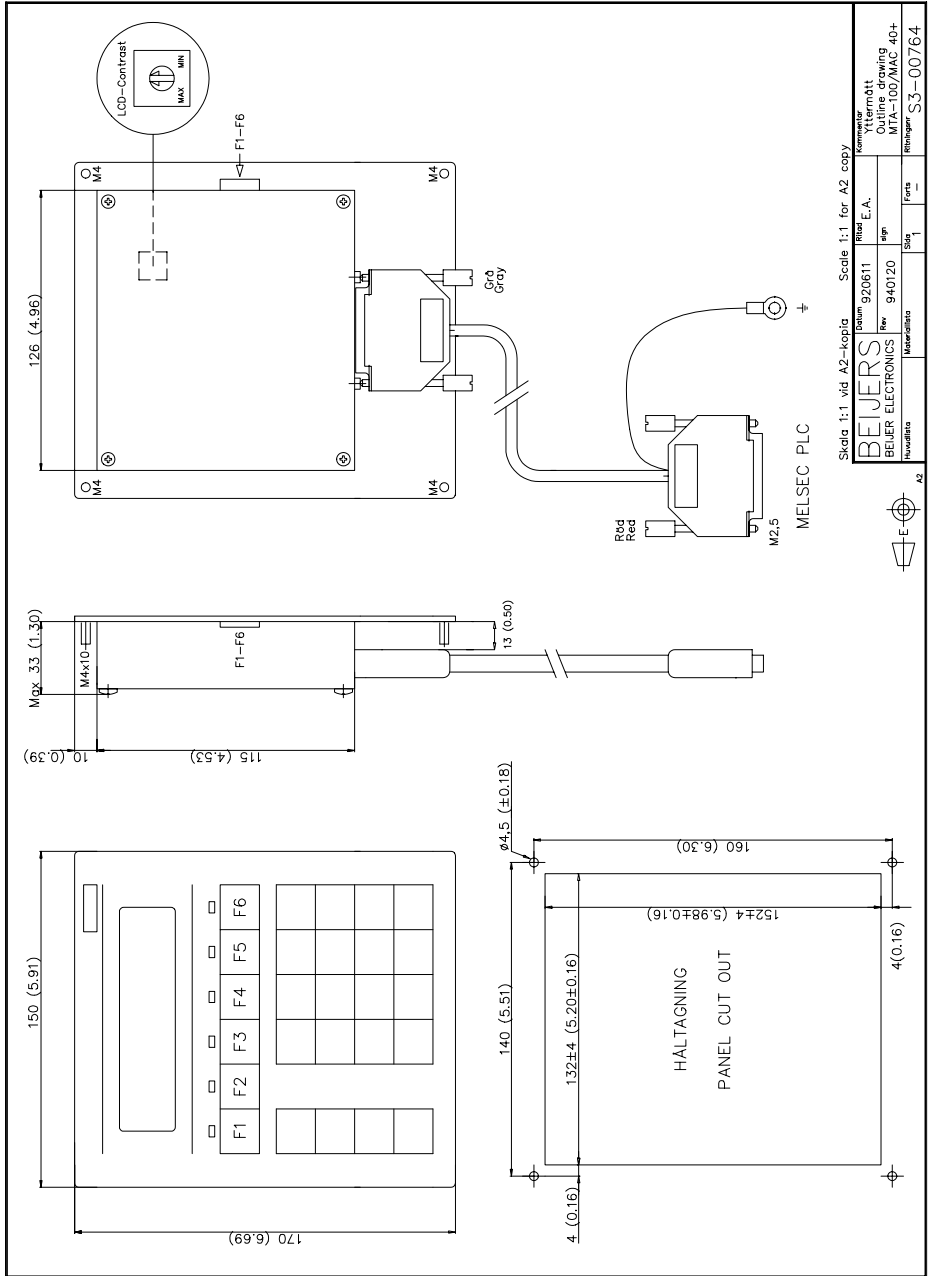
**EMC-tests on the terminal**

Beijer Electronics confirm that the terminals  
conforms with the essential protection  
requirements in article four of the directive  
89/336/EEC.



<b>BEIJERS</b> BEIJER ELECTRONICS	Datum	920611	Ritad	E.A.	Kommentar Installation MTA-100/MAC 40+	
	Rev	940120	sign			
Huvudlista	Materiallista	Sida	1	Forts	-	
					Ritningsnr	S3-00767

A4

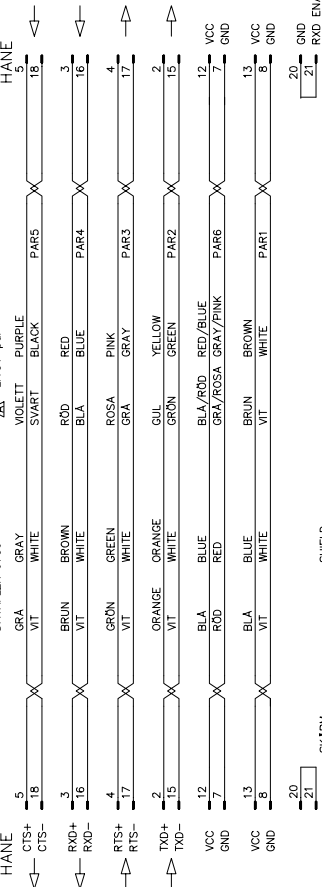


25-POL D-SUB  
HANE

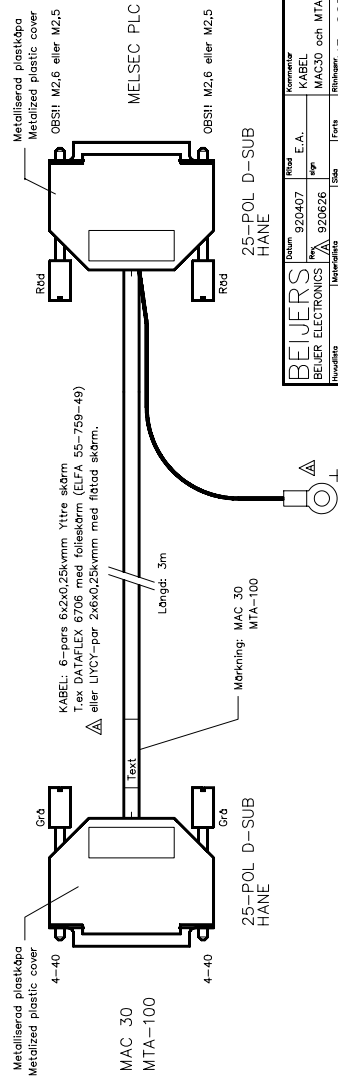
25-POL D-SUB  
HANE

DATAFLEX 6706

LYCY-par



Skärmen anslutes till D-sub kâpan  
Shield connected to D-sub cover

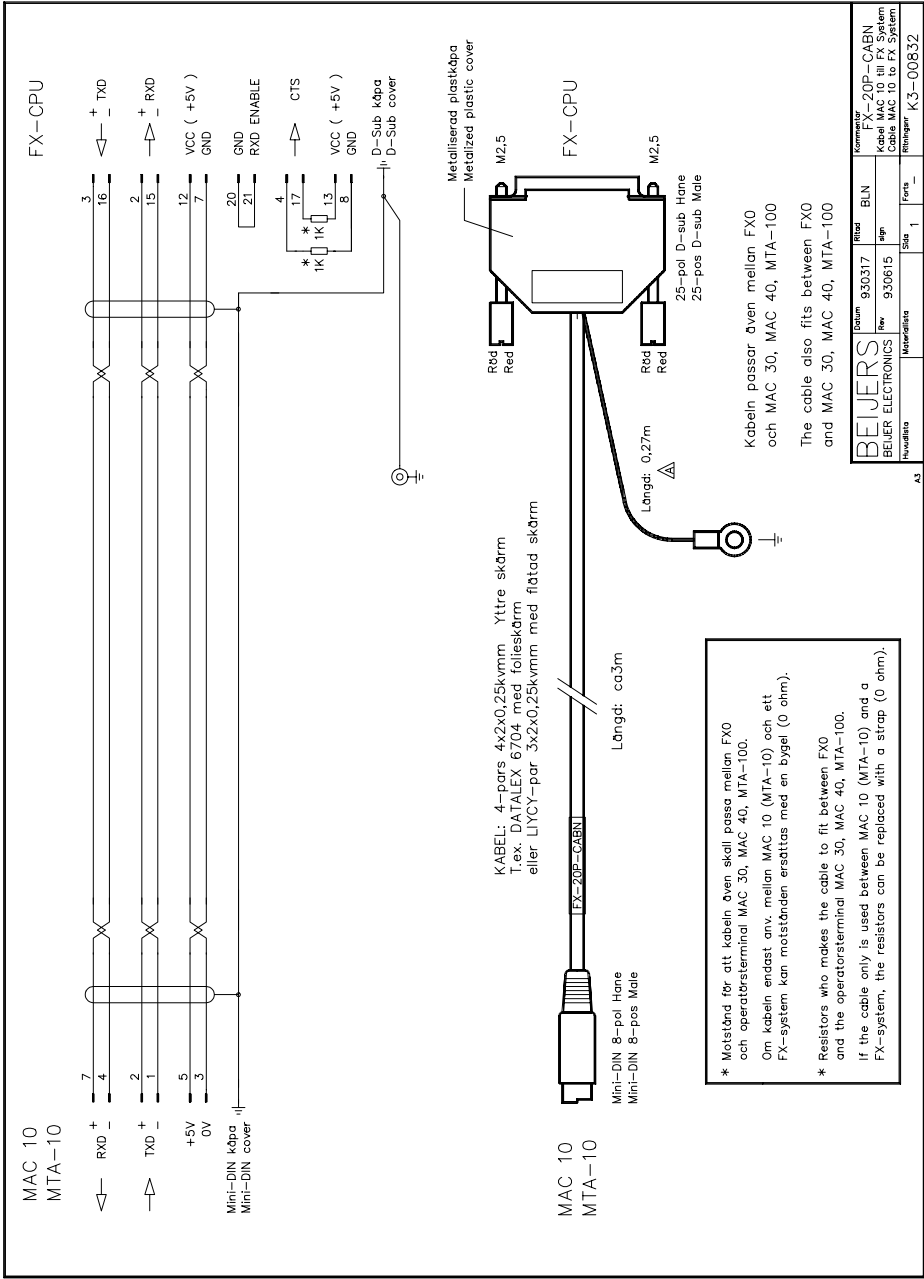


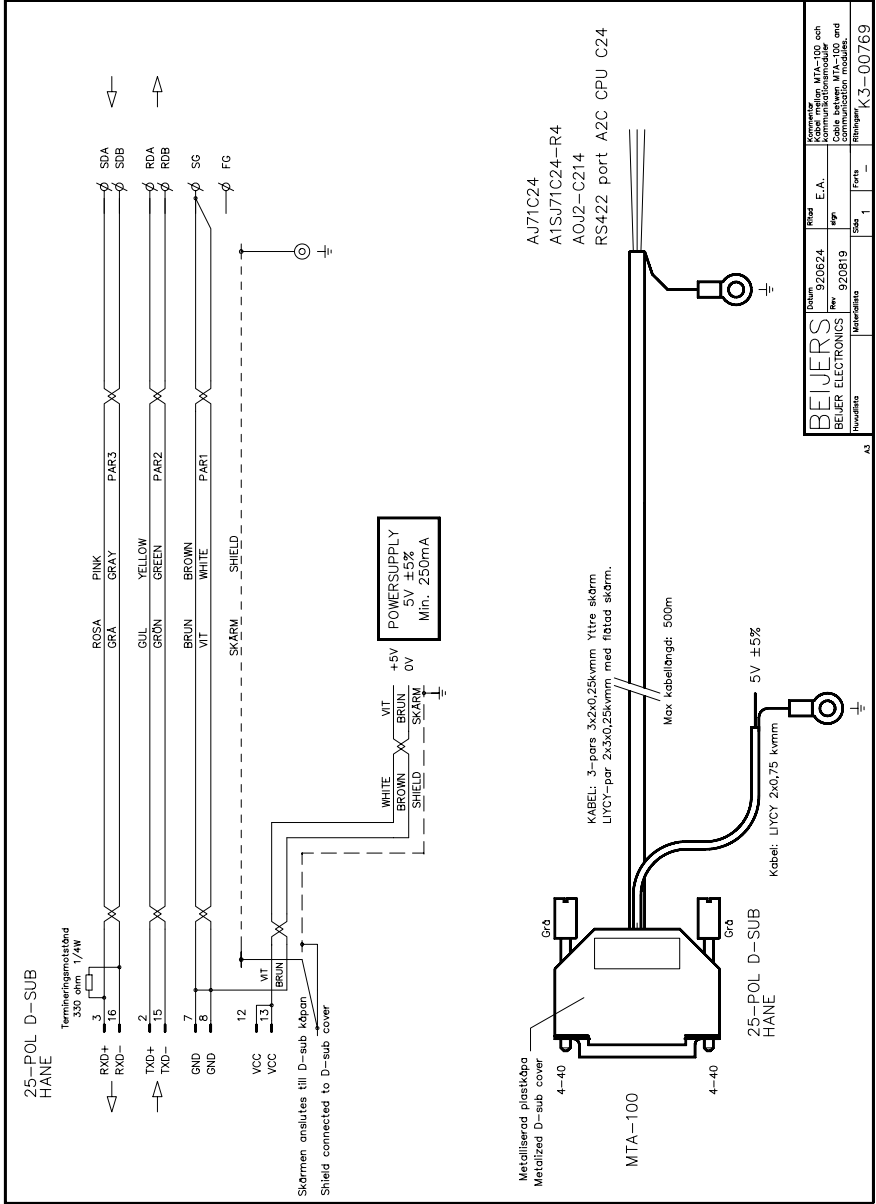
KABEL: 6-pårs 6x2x0,25kvmn Yttre skärm  
T.ex DATAFLEX 6706 eller folieskärm (EFA 55-759-49)  
eller LYCY-par 2x6x0,25kvmn med fittad skärm.

BEIJERS	Form	920407	Version	E.A.
	Part	920626	MAC30 och MTA-100	
Material	Skåp	1	Plats	—
Varuslag	Manöverkåpa		Referens	K3-00757









BEIJERS		Order No	92/0624	Rev	E.A.
BEIJER ELECTRONICS		Part No	920819	Rev	
Version		Material	Sub	1	Rev
		Part No		K3-00769	

