

Sailor

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**INSTRUCTION BOOK FOR
SAILOR STANDARD-C
MESSAGE TERMINAL H2098A**



A/S S. P. RADIO · AALBORG · DENMARK

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment.

Thrane & Thrane A/S assumes no liability for the customers failure to comply with these requirements.

GROUND THE EQUIPMENT

To minimize shock hazard, the equipment chassis and cabinet must be connected to an electrical ground. For this purpose the equipment is equipped with a power connector including a ground terminal.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove equipment covers. Component replacement and internal adjustment must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt internal service or adjustments unless another person, capable of rendering first aid resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT

Because of the danger of introducing additional hazards, do not substitute parts or perform any unauthorized modification to the equipment.

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TT-3606A MESSAGE PROCESSOR

1 Specifications

1.1 Technical Specifications.

Table 1 Specifications

SYSTEM SPECIFICATIONS	
Monitor:	Depending on display adapter option installed, see appendix A for option 001 "Monochrome Display Adapter" or appendix B for option 002 "VGA display adapter".
Disk drive:	Standard 3 1/2 inch floppy disk drive with 720 kbyte. Use double sided double density diskettes.
Keyboard:	Standard IBM PC compatible keyboard operating in XT-mode or AT-mode. TT-3601 keyboard is recommended.
Real time clock:	Build in date and time function with battery back-up.
Microprocessor:	Intel 80C188.
Program memory:	192 kbyte main memory in EPROM, 512 kbyte Volatile scratchpad RAM and 8 kbyte Non-volatile EEPROM.
LOCAL INTERFACE	
Printer interface:	Parallel Centronics. TT-3608 parallel printer is recommended.
Serial interface:	Dual serial interface, CCITT Rec. V.24.
Keyboard interface:	IBM PC compatible 5-pin keyboard connector.

Table 1 Specifications (cont.)

GENERAL	
DC power source:	Floating 9.6 to 35.0 Vdc, approx 8 W
Ambient temperature:	0° C to 55° C operating, -20° C to 70° C storage.
Relative humidity:	85% non-condensing operating, 95% non-condensing storage.
Vibrations:	IEC, CEPT and MPT 1204.
Dimension:	HxWxD, 75mm x 214mm x 279mm.
Weight:	Approx 2.2 kg.

As our products are under continuous research and development, any information may change without prior notice.

2 Installation

2.1 Introduction.

This chapter provides specific information about installation of the Model TT-3606A Message Terminal. Reading this chapter will enable you to install the TT-3606A into your system, with minimal effort. See chapter 3 for configuration of the TT-3606A Message Terminal.

This chapter also includes information about initial inspection.

We recommend reading the entire chapter 2 and 3 before installation and use.

2.2 Quick system connect and checkout.

The following brief outline may be used to get the TT-3606A Message Terminal up and running.

- Unpack system components.
- Connect the TT-3606A to the battery or power supply.
- Connect the TT-3606A to the keyboard.
- Connect the TT-3606A to the monitor (if provided)
- Turn on the monitor and the TT-3606A.

The TT-3606A Message Terminal should start by displaying the Thrane & Thrane copyright message on the monitor. The monitor is then controlled by the actual application program (refer to the users manual for the specific application).

2.3 Initial inspection.

W A R N I N G

To avoid hazardous electrical shock, do not perform electrical tests if there is any sign of shipping damage to any portion of the front or rear panel of outer cover. Read the safety summary at the front of this manual before installing or operating the TT-3606A Message Terminal.

Inspect the shipping carton immediately upon receipt for evidence of mishandling during the transit. If the shipping carton is severely damaged or waterstained request that the carrier's agent be present when opening the carton. Save the carton packing material for future use.

Contents of the shipment should be as listed in the packing list supplied. If the contents are incomplete, if there is mechanical damage or defect, or if the TT-3606A Message Terminal does not work properly, notify your dealer.

After you unpack the TT-3606A Message Terminal, inspect it thoroughly for hidden damage and loose components or fittings.

- Inspect the cable harnesses for stress, loose or broken wires, or broken cable ties.
- Examine all the components for loose or missing hardware. Tighten all loose hardware.
- Clean loose debris from the cabinet interior.

2.4 Storage.

The TT-3606A Message Terminal may be stored or shipped in temperatures within the limits -20°C to $+70^{\circ}\text{C}$. It is advisable to protect the TT-3606A Message Terminal from extreme temperature variation which can cause excessive condensation. It is recommended that the TT-3606A Message Terminal is unpacked immediately on delivery.

2.5 Repacking for shipment.

The shipping carton for the TT-3606A Message Terminal has been carefully designed to protect the Message Terminal and its accessories during shipment. This carton and its associated packing material should be used when repacking for shipment. Attach a tag indicating the type of service required, return address, model number and full serial number. Mark the carton FRAGILE to ensure careful handling.

If the original shipping carton is not available, the following general instructions should be used for repacking with commercially available material.

- Wrap the TT-3606A Message Terminal in heavy paper or plastic. Attach a tag indicating the type of service required, return address, model number and full serial number.
- Use a strong shipping container, e.g. a double walled carton of 160 kg test material.

- Protect the front- and rear panel with cardboard and insert a 7 cm to 10 cm layer of shock absorbing material between all surfaces of the equipment and the sides of the container.
- Seal the shipping container securely.
- Mark the shipping container FRAGILE to ensure careful handling.

2.6 Mounting information.

The TT-3606A Message Terminal is supplied with an universal mounting bracket (41-100562) which allows "over" or "under" mounting to e.g. a table or ceiling.

The universal bracket is fastened using four 4 mm. screws, separated by 117.0 x 236.9 mm from each other.

When the TT-3606A Message Terminal is used with other Thrane & Thrane equipment (such as the TT-3020A Standard-C Satellite Transceiver or the TT-3680A Power Supply), it can be stacked in a rack with mounting bracket 41-100742.

2.7 Power requirements.

Battery operation

The TT-3606A Message Terminal may be powered from 9.6 - 35.0 Vdc with a max. load of approx 8 W.

Mains operation

In a small system we recommend the TT-3680A Power Supply. The TT-3680A can be used from 115 - 230 Vac and supplies 24 Vdc/80 W as a maximum. The TT-3680A power supply can be connected to a battery for automatic switch-over in case of line drop-out.

To use the TT-3606A Message Terminal in a system with higher power requirements the TT-3680B Power Supply can be used. This power supply can be used from 115 - 230 Vac and supplies approx 20 Vdc/200 W as a maximum. In this way the TT-3680B Power Supply can be used to drive a complete system. This is recommended for a system, where the TT-3606A Message Terminal is used together with the TT-3020A Standard-C Satellite Transceiver.

Notice: The TT-3680B Power Supply can not be stacked in a rack with the TT-3606A Message Terminal. Instead the TT-3680B Power Supply can be mounted on a wall with four screws.

Fuse

The battery/power supply is protected with one fuse F1.

The fuse located on the rear panel should be rated for:

- 3.15 A, medium timed.

Interface to Battery/Power Supply

The battery supply is connected to a four-terminal socket, X1 as listed in table 2. In case of mains operation the DC output from the power supply (TT-3680A or TT-3680B) is connected to this socket.

Table 2 Battery/Power Supply connections (X1)

Pin	Name	Signal
1	SGND	Safety ground
2	SUP+	Supply current, + terminal
3	SUP-	Supply current, - terminal
4	-	Not Used

Grounding

The safety ground in the power connector is connected to the metal frame in the TT-3606A to provide a return path for fault currents due to equipment malfunction or external faults such as lightning faults.

RF-grounding of the TT-3606A requires special attention. Each equipment shall have its own individual low-inductance earth connection. The use of a common busbar for grounding is not recommended as this can lead to unwanted common-mode coupling effects. Interconnection cables must be well screened.

2.8 General interconnect information

All external connectors, except for the power and keyboard, are of the Cannon DB-type, one 25 pole and two 9 poles. A complete set of connectors are delivered together with the TT-3606A Message Terminal.

Extra connector kit's may be purchased separately.

For applications where the cables will be made by the customer, it is important to note that the connector and the cable screen are fastened to the sockets on the TT-3606A Message Terminal by means of two screws.

Printer interface

The printer connector is a parallel printer port (Centronics) carrying all the signals required to control the printer.

Pin assignments and signal names are listed in table 3.

Table 3 Printer pin identification (X2)

Pin	Name	Signal	Direction
1	STRB	Strobe (TTL)	output
2	DAT0	Data Bit 0 (TTL)	output
3	DAT1	Data Bit 1 (TTL)	output
4	DAT2	Data Bit 2 (TTL)	output
5	DAT3	Data Bit 3 (TTL)	output
6	DAT4	Data Bit 4 (TTL)	output
7	DAT5	Data Bit 5 (TTL)	output
8	DAT6	Data Bit 6 (TTL)	output
9	DAT7	Data Bit 7 (TTL)	output
10	ACKN	Acknowledge (TTL)	input
11	BUSY	Busy Signal (TTL)	input
12	PE	Paper End (out of paper) (TTL)	input
13	SEL	Select (TTL)	input
14	ALFD	Auto Line Feed (TTL)	output
15	ERR	Error (TTL)	input
16	INIT	Initialize Printer (TTL)	output
17	SLCT	Select Input (TTL)	output
18	GND	Ground	
19	GND	Ground	
20	GND	Ground	
21	GND	Ground	
22	GND	Ground	
23	GND	Ground	
24	GND	Ground	
25	GND	Ground	

Pin 1 Strobe
A logic low level on this pin will strobe the data into the printer.

Pin 2-9 Data Bits
The data for the printer is set up on these pins. DAT0 is the Least Significant Bit.

Pin 10	Acknowledge A logic low level on this pin tells that the printer accepted the data.
Pin 11	Busy A logic high level on this pin tells that the printer is busy and not ready for receiving new data.
Pin 12	Paper End (out of paper) A logic high level on this pin tells that the printer is out of paper.
Pin 13	Select A logic high level on this pin tells that the printer is selected (online).
Pin 14	Auto Line Feed This pin is forced to a logic high level disabling Auto Line Feed.
Pin 15	Error A logic low level on this pin tells that the printer is in some sort of error condition.
Pin 16	Initialize Printer A logic low level on this pin will reset the printer to its initial state (power-up state).
Pin 17-25	Ground These pins are ground reference for all inputs and outputs.

Serial interface

The TT-3606A Message Terminal is equipped with two identical serial ports (COM1 and COM2). The connectors are DB9 type connectors with the same pin assignment as found on an IBM AT computer.

Pin assignments and signal names are listed in table 4. As shown in the table, the TT-3606A Message Terminal is defined as DTE (Data Terminal Equipment) in CCITT Rec. V24 (or EIA RS-232) terms.

Table 4 Serial interface pin identification (X3-4)

Pin	Name	Signal	Direction
1 (8)	DCD	Data Carrier Detect (RS-232/423)	input
2 (3)	RxD	Received Data (RS-232/423)	input
3 (2)	TxD	Transmitted Data (RS-232)	output
4 (20)	DTR	Data Terminal Ready (RS-232)	output
5 (7)	GND	Ground	
6 (6)	DSR	Data Set Ready (RS-232/423)	input
7 (4)	RTS	Request To Send (RS-232)	output
8 (5)	CTS	Clear To Send (RS-232/423)	input
9 (22)	RI	Ring Indicator (RS-232/423)	input

Pin numbers in parentheses refer to the standard 25 pole connector defined in the CCITT Rec. V28 and in EIA RS-232C. The TT-3606A Message Terminal uses a 9 pole connector as used on IBM AT and compatible computers.

In the following description the equipment connected to the serial interface ports of TT-3606A is referred to as the DCE (Data Communication Equipment).

- Pin 1 Data Carrier Detect
 Signals on this pin indicate whether a carrier signal is being received at the DCE.
 The ON condition indicates that a data carrier signal is being received.
 The OFF condition indicates that a data carrier is not being received.
- Pin 2 Received Data
 The data signals generated by the DCE are passed via this pin to the TT-3606A.
- Pin 3 Transmitted Data
 The data signals originated by the TT-3606A to be transmitted to the DCE are passed via this pin.
- Pin 4 Data Terminal Ready
 Signals on this pin indicates the current state of the TT-3606A.
 The ON condition, indicates that the TT-3606A is ready to operate (i.e. receive data).
 The OFF condition indicates that the TT-3606A is not ready to operate. The OFF condition shall not disable the operation of pin 9 (Ring Indicator).

Note: When the DCE is conditioned for automatic answering of calls, connection occurs only in response to a combination of an ON condition on pin 4 and pin 9 (Ring Indicator).

- Pin 5 Ground
This pin is the ground reference for all inputs and outputs.
- Pin 6 Data Set Ready
Signals on this pin indicates the state of the DCE. The ON condition indicates that the DCE is ready to operate. The OFF condition indicates that the DCE is not ready to operate. The OFF condition on this circuit shall not impair the operation of pin 9 (Ring Indicator).
- Pin 7 Request To Send
Signals on this pin control the transmit function of the DCE. The ON condition indicates that the TT-3606A is ready to receive data. The OFF condition indicates that the TT-3606A is not ready to receive data.
- Pin 8 Clear To Send
Signals on this pin indicate whether the data DCE is ready to accept data. The ON condition indicates that the DCE is ready to accept data. The OFF condition indicates that the DCE is not ready to accept data.
- Pin 9 Ring Indicator
The signals on this pin indicate whether a calling signal is being received by the DCE. The ON condition indicates that a calling signal is being received. The OFF condition indicates that no calling signal is being received.

For full operating specifications for the serial interface, refer to the CCITT Rec. V24, or the EIA counterpart.

Keyboard interface

The keyboard uses a 5 pole connector, with pin assignments and signal names as listed in table 5.

Table 5 Keyboard interface pin identification (X5)

Pin	Name	Signal	Direction
1	CLK	Keyboard clock (TTL)	in/out
2	DATA	Keyboard data (TTL)	in/out
3	RES	Reset (not used) (TTL)	in/out
4	GND	Ground	
5	VCC	+5 Vdc	output

Pin 1 Keyboard clock
The clock signal is used to synchronize the transmitter (master) and the receiver (slave).

Pin 2 Keyboard data
This line is used for serial communication to and from the keyboard.

Pin 3 Reset (not used)
This pin is reserved for a reset signal, but due to the fact that some keyboards do not use this signal, it is left unconnected in the TT-3606A Message Terminal.

Pin 4 Ground
This pin is the ground reference for the keyboard lines.

Pin 5 +5 Vdc
This line supplies the current for the keyboard microprocessor.

2.9 Installation checkout

Before using the TT-3606A Message Terminal for normal operation for the first time, check out each of the following.

- Proper fuse is installed
- The following cables are properly wired and fastened:
 - a. Power cable.
 - b. Keyboard cable.
 - c. Monitor cable, if provided.
 - d. Printer cable, if provided.
 - e. Proper HF-earth connection on all equipment.

If test cables are delivered as part of the order, a performance verification should be done prior to normal system operation.

3 Configuration

3.1 Introduction

The TT-3606A Message Terminal is factory configured to standard settings as indicated below. To change these settings, proceed as follows:

- Remove the 4 screws located on the top cover of the TT-3606A.
- Carefully disassemble the TT-3606A by removing the top cover.

The configuration strappings may now be altered according to Figure 1 and Table 6 to 7.

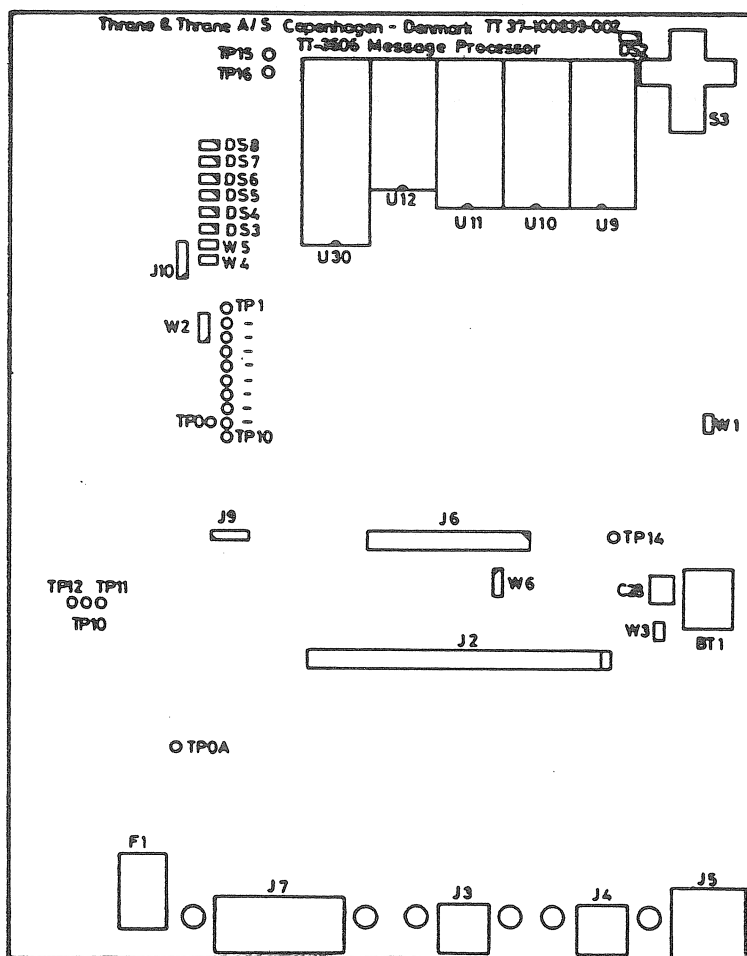


Figure 1 Jumper/adjustment locations on TT-3606A PCB.

3.2 Jumper configurations

The jumper configurations with the default factory setting are listed in table 6.

Table 6 Numerical listing of jumpers

Jumper	Function
# W1	Enhanced mode for 80C188 CPU
# W2-1/2	8742 clock selection (CPU clock)
W2-2/3	8742 clock selection (divide by two)
* W3	Battery back-up enable
W4	Watch dog disable
# W5	Speaker gate enable
W6-1/2	MO signal selection (from FDC)
W6-2/3	MO signal selection (from port)

* Factory installed jumpers
Hardwired tracks on the PCB

Jumper W3 Battery back-up enable
This jumper is normally installed to enable battery back-up of the CMOS watch (U34).

Jumper W4 Watch dog disable
This jumper is normally not installed to insure that the program will be reset by the watch dog in case of fatal failure.

Jumper W6 MO signal selection
The Motor-On signal for the disk drive is determined by this jumper:
Position 1/2 - Direct FDC control (don't use).
Position 2/3 - Explicit software control (don't use).
Not mounted - Drive select line control.

3.3 Dip-switch settings

The dip-switch settings with the default factory setting are listed in table 7.

Table 7 Numerical listing of dip-switch settings

Switch	Function
* 1	Boot DOS from disk drive if OFF
2	Number of disk drives bit 0
* 3	Number of disk drives bit 1
* 4	
* 5	
* 6	
* 7	Perform complete RAM test if OFF
* 8	Use serial screen if OFF

*** Factory settings: ON position**

Switch 1 Boot DOS from disk drive if OFF
If this switch is in the OFF position, the BIOS will attempt to load an IBM compatible Disk Operating System such as MS-DOS from the disk. In case of failure (missing disk, non-system disk etc.) the installed user program will be activated.

Switch 2/3 Number of disk drives
The TT-3606A is capable of driving two disk drives, but only one is factory installed. In case of two disk drives, set switch 3 OFF.

Switch 7 Perform complete RAM test if OFF
If this switch is in the OFF position, the BIOS will go through a complete memory test at power-up. This test can be aborted by pressing ALT-CTRL-DEL.
In the ON position, the memory test is skipped and the power up initialization is completed faster.

Switch 8 Use serial screen if OFF
If this switch is in the OFF position, the BIOS will redirect all video output to the serial interface COM2 (X4). Use 2400 baud, 8 bit and no parity. This mode of operation is not normally recommended.

3.4 CMOS watch frequency adjustment

The real time clock may be adjusted on the C28 capacitor located inside the TT-3606A Message Terminal. This is normally not recommended as the watch is factory adjusted to gain/lose less than 15 seconds per year.

C28 is adjusted to give exactly 1.000000 Hz at testpoint 14. Use a plastic screwdriver, to avoid interference.

4 Service

4.1 Fault Diagnostic.

The assembly should be inspected by qualified service personnel only.

4.2 Circuit Description.

The circuit description is not yet available.

MONOCHROME DISPLAY ADAPTER

A.1 Specifications

A.1.1 Technical Specifications.

Table A.1 Specifications (W1 in MDA position)

SYSTEM SPECIFICATIONS (W1 in MDA position)	
Text resolution:	25 lines of 80 characters.
Character matrix:	14 lines of 9 dots.
Colours (on X6 only):	8 for background and 16 for foreground.
Character set:	Standard IBM character set with ø and Ø.
Vertical scan rate:	50 Hz
Horizontal scan rate:	16.257 kHz
Display memory:	64 kbyte dynamic RAM.
Monitor connected to X6 "TTL Video":	
	IBM compatible MDA monitor, Hercules monitor or multisync type monitor with TTL interface (colour or monochrome).
Monitor connected to X7 "Analog Video":	
	TT-3602A composite monitor.

Table A.2 Specifications (W1 in CGA position)

SYSTEM SPECIFICATIONS	
Text resolution:	25 lines of 80 characters.
Character matrix:	8 lines of 8 dots.
Colours (on X6 only):	8 for background and 16 for foreground.
Character set:	Standard IBM character set with ø and Ø.
Vertical scan rate:	50 Hz
Horizontal scan rate:	14.31818 kHz
Display memory:	64 kbyte dynamic RAM.
Monitor connected to X6 "TTL Video":	
	IBM compatible CGA monitor or multisync type monitor with TTL interface (colour or monochrome).
Monitor connected to X7 "Analog Video":	
	IBM compatible CGA monitor or television monitor with composite interface.

Table A.3 General specifications

GENERAL	
Ambient temperature:	0° C to 55° C operating, -20° C to 70° C storage.
Relative humidity:	85% non-condensing operating, 95% non-condensing storage.
Vibration:	IEC, CEPT and MPT 1204.
Dimension:	HxWxD, 25 mm x 145 mm x 81 mm Mounted inside the TT-3606A Message Terminal.
Weight:	Approx 100 g

As our products are under continuous research and development, any information may change without prior notice.

A.2 Installation

A.2.1 Introduction.

This chapter provides specific information about installation of the option 001 "Monochrome Display Adapter" for Model TT-3606A Message Terminal. Reading this chapter will enable you to install the option 001 "Monochrome Display Adapter" into your TT-3606A Message Terminal.

The display adapter is normally mounted from the factory and in this case the installation section is not important.

We recommend reading the entire installation section before an attempt is made to exchange or install a new display adapter in the TT-3606A Message Terminal.

A.2.2 Mounting information.

The display adapter (option 001 or option 002) is normally installed in the TT-3606A Message Terminal from the factory. To change the display adapter or to install a new display adapter, proceed as follows:

- Remove the 4 screws located on the top cover of the TT-3606A.
- Carefully disassemble the TT-3606A by removing the top cover.
- Remove the 2 screws located on the display adapter (if provided).
- Remove the 4 screws located on the back cover of the TT-3606A Message Terminal at X6 and X7 (if provided).
- Untighten the two screws located at the rear end of the bottom cover of the TT-3606A.
- Carefully remove the display adapter (if provided) by pulling up and then forward.
- Install the new display adapter and proceed in reverse order.

After installation of a new display adapter check the system again to verify operation. In case of malfunction, the assembly should be revised by qualified service personnel.

A.3 Monitor connection

A.3.1 TTL Video

The TTL video connector is a standard DB9 type connector for monitors with TTL interface (both colour and monochrome monitors can be used).

Pin assignments and signal names are listed in table A.4.

Table A.4 TTL Video pin identification (X6)

Pin	Name	Signal	Direction
1	GND	Ground	
2	GND	Ground	
3	RED	Red video signal (TTL)	output
4	GREEN	Green video signal (TTL)	output
5	BLUE	Blue video signal (TTL)	output
6	INTEN	High intensity video signal (TTL)	output
7	MONO	Monochrome video signal (TTL)	output
8	HSYNC	Horizontal sync signal (TTL)	output
9	VSNC	Vertical sync signal (TTL)	output

Pin 1-2 Ground
This is the ground reference level.

Pin 3 Red video signal
A logic high level on this pin activates the red video gun in a colour monitor.

Pin 4 Green video signal
A logic high level on this pin activates the green video gun in a colour monitor.

Pin 5 Blue video signal
A logic high level on this pin activates the blue video gun in a colour monitor.

Pin 6 High intensity video signal
A logic high level on this pin intensifies the current video pixel.

- Pin 7 Monochrome video signal
A logic high level on this pin activates the video gun in a monochrome monitor.
- Pin 8 Horizontal sync signal
A logic low level on this pin forces the monitor to perform a horizontal retrace.
- Pin 9 Vertical sync signal
A logic low level on this pin forces the monitor to perform a vertical retrace.

A.3.2 Analog Video

The Analog video connector is a standard DB9 type connector. This is not a common standard for composite monitors. Normally the appropriate cable for the TT-3602A composite monitor is supplied with the monitor.

Pin assignments and signal names are listed in table A.5.

Table A.5 Analog Video pin identification (X7)

Pin	Name	Signal	Direction
1	GND	Ground	output
2			
3			
4			
5			
6			
7	VIDEO	Composite video signal	output
8			
9			

Pin 1 Ground
This is the ground reference level.

Pin 7 Composite video signal
This is the composite video signal for the TT-3602A composite monochrome monitor.

A.4 Configuration

A.4.1 Introduction.

The option 001 Monochrome Display Adapter is factory configured to the standard setting as indicated below. To change this setting, proceed as follows:

- Remove the 4 screws located on the top cover of the TT-3606A.
- Carefully disassemble the TT-3606A by removing the top cover.

The configuration strapping may now be altered according to Figure A.1 and Table A.6

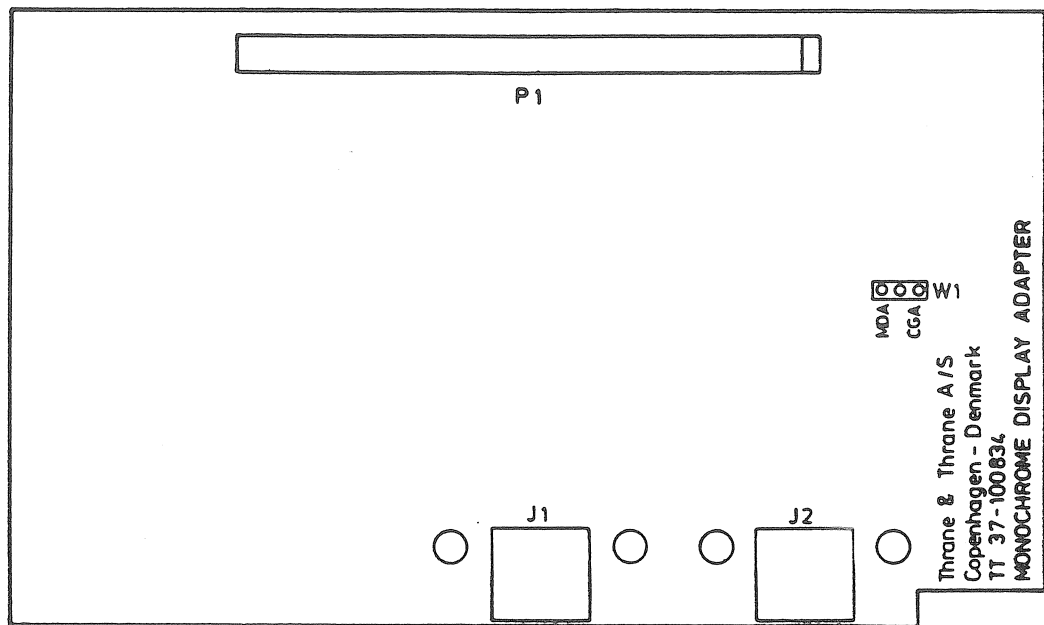


Figure A.1 Jumper location on option 001 PCB.

A.4.2 Jumper configurations

The jumper configuration with the default factory setting is shown in table A.6.

Table A.6 Jumper Setting

Jumper	Function
* W1-1/2	MDA position
W1-2/3	CGA position

*** Factory installed jumper**

Jumper W1-1/2 MDA position

This position is for the MDA compatible mode as shown in table A.1.

Jumper W1-2/3 CGA position

This position is for the CGA compatible mode as shown in table A.2.

A.5 Service

A.5.1 Fault Diagnostic.

The assembly should be examined by qualified service personnel only.

A.5.2 Circuit Description.

The circuit description is not yet available.

VGA DISPLAY ADAPTER

B.1 Specifications

B.1.1 Technical Specifications.

Table B.1 Specifications

SYSTEM SPECIFICATIONS	
Text resolution:	25 lines of 80 characters.
Character matrix:	16 lines of 14 dots.
Character set:	Standard IBM character set with ø and Ø.
Colours (on X6):	64 different colours.
Colours (on X7):	256 colours from a palette of 262144.
Vertical scan rate:	70.1 Hz
Horizontal scan rate:	31.5 kHz
Display memory:	256 kbyte dynamic RAM.
Monitor connected to X6 "TTL Video":	
	Multisync type monitor with TTL interface (both colour and monochrome monitors can be used).
Monitor connected to X7 "Analog Video":	
	IBM PS/2 compatible VGA monitor with analog interface (both colour and monochrome versions can be used). TT-3602B VGA monitor is recommended.

Table B.2 General Specifications

GENERAL	
Ambient temperature:	0° C to 55° C operating, -20° C to 70° C storage.
Relative humidity:	85% non-condensing operating, 95% non-condensing storage.
Vibrations:	IEC, CEPT and MPT 1204.
Dimension:	HxWxD, 25 mm x 145 mm x 81 mm Mounted inside the TT-3606A Message Terminal.
Weight:	Approx 120 g

As our products are under continuous research and development, any information may change without prior notice.

B.2 Installation

B.2.1 Introduction.

This chapter provides specific information about installation of the option 002 "VGA Display Adapter" for Model TT-3606A Message Terminal. Reading this chapter will enable you to install the option 002 "VGA Display Adapter" into your TT-3606A Message Terminal.

The display adapter is normally mounted from the factory and in this case the installation section is not important.

We recommend reading the entire installation section before an attempt is made to exchange or install a new display adapter in the TT-3606A Message Terminal.

B.2.2 Mounting information.

The display adapter (option 001 or option 002) is normally installed in the TT-3606A Message Terminal from the factory. To change the display adapter or to install a new display adapter, proceed as follows:

- Remove the 4 screws located on the top cover of the TT-3606A.
- Carefully disassemble the TT-3606A by removing the top cover.
- Remove the 2 screws located on the display adapter (if provided).
- Remove the 4 screws located on the back cover of the TT-3606A Message Terminal at X6 and X7 (if provided).
- Untighten the two screws located at the rear end of the bottom cover of the TT-3606A.
- Carefully remove the display adapter (if provided) by pulling up and then forward.
- Install the new display adapter and proceed in reverse order.

After installation of a new display adapter check the system again to verify operation. In case of malfunction, the assembly should be revised by qualified service personnel.

B.3 Monitor connection.**B.3.1 TTL Video**

The TTL video connector is a standard DB9 type connector for monitors with TTL interface (both colour and monochrome monitors can be used).

Pin assignments and signal names are listed in table B.3

Table B.3 TTL Video pin identification (X6)

Pin	Name	Signal	Direction
1	GND	Ground	
2	RED'	Secondary red (TTL)	output
3	RED	Primary red (TTL)	output
4	GREEN	Primary green (TTL)	output
5	BLUE	Primary blue (TTL)	output
6	GREEN'	Secondary green (TTL)	output
7	BLUE'	Secondary blue (TTL)	output
8	HSYNC	Horizontal sync signal (TTL)	output
9	VSNC	Vertical sync signal (TTL)	output

- Pin 1 Ground
This is the ground reference level.
- Pin 2 Secondary red
This is the secondary red video signal output.
- Pin 3 Primary red
This is the primary red video signal output.
- Pin 4 Primary green
This is the primary green video signal output.
- Pin 5 Primary blue
This is the primary blue video signal output.
- Pin 6 Secondary green
This is the secondary green video signal output.
- Pin 7 Secondary blue
This is the secondary blue video signal output.

Pin 8 Horizontal sync signal
 A logic low level on this pin forces the monitor to perform a horizontal retrace.

Pin 9 Vertical sync signal
 A logic low level on this pin forces the monitor to perform a vertical retrace.

B.3.2 Analog Video

The Analog video connector is a high density DB15 type connector. This is a common standard for IBM PS/2 compatible VGA type monitors.

Pin assignments and signal names are listed in table B.4.

Table B.4 Analog Video pin identification (X7)

Pin	Name	Signal	Direction
1	RED	Red video level (analog)	output
2	GREEN	Green video level (analog)	output
3	BLUE	Blue video level (analog)	output
4		Not used	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9		Not used	
10	GND	Ground	
11		Not used	
12		Not used	
13	HSYNC	Horizontal sync (TTL)	output
14	VSYNC	Vertical sync (TTL)	output
15		Not used	

Pin 1 Red video level
 This is the red video level signal for an analog VGA type monitor.

Pin 2 Green video level
 This is the green video level signal for an analog VGA type monitor.

Pin 3 Blue video level
 This is the blue video level signal for an analog VGA type monitor.

- Pin 13 Horizontal sync signal
 A logic low level on this pin forces the monitor to
 perform a horizontal retrace.
- Pin 14 Vertical sync signal
 A logic low level on this pin forces the monitor to
 perform a vertical retrace.
- Pin 5-8, 10 Ground
 This is the ground reference level.

B.4 Configuration

B.4.1 Introduction.

The option 002 VGA Display Adapter is factory configured to standard settings as indicated below. To change these settings, proceed as follows:

- Remove the 4 screws located on the top cover of the TT-3606A.
- Carefully disassemble the TT-3606A by removing the top cover.

The configuration strapping and level adjustments may now be altered according to Figure B.1 and Table B.5.

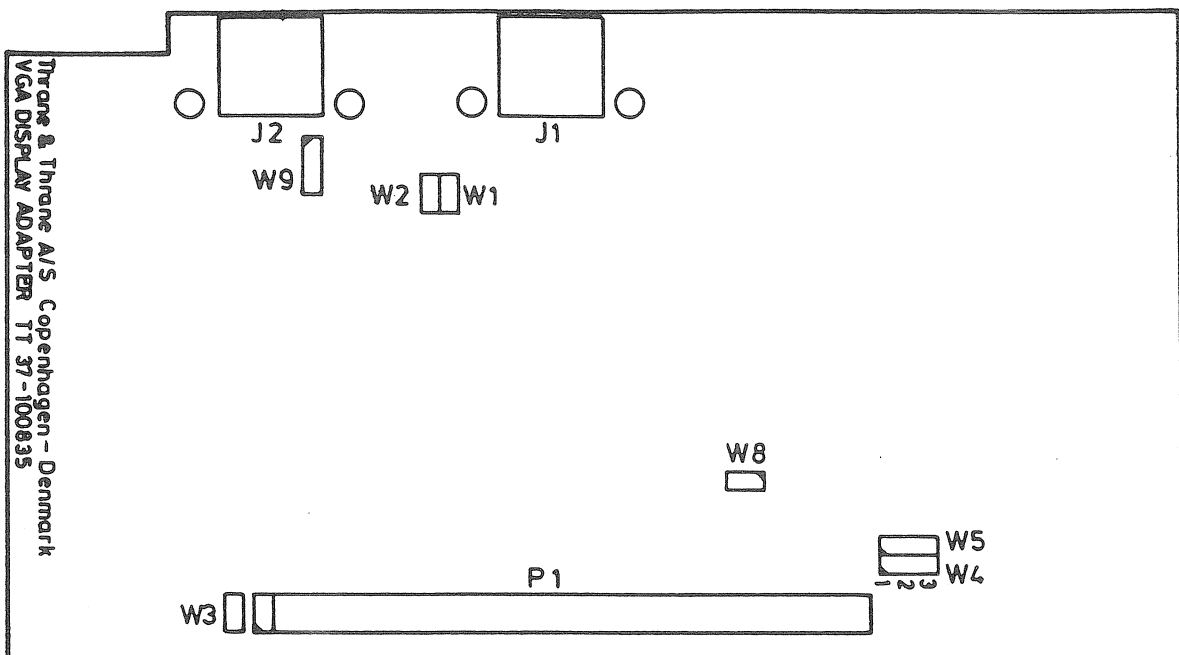


Figure B.1 Jumper locations on option 002 PCB.

B.4.2 Jumper configurations

The jumper configurations with the default factory setting are listed in table B.5.

Table B.5 Numerical listing of jumpers

Jumper	Function
W1	Misc input
W2	Misc input
W3	Enable NMI
# W4-1/2	Memory clock selection (28 MHz)
W4-2/3	Memory clock selection (25 MHz)
# W5-1/2	CLK2 selection (28 MHz)
W5-2/3	CLK2 selection (other)
W8	Interrupt enable
# W9-1/2	TTL monitor select (colour monitor)
W9-2/3	TTL monitor select (monochrome)

* Factory installed jumpers
Hardwired tracks on the PCB

- Jumper W1 Misc input
This jumper is reserved for selecting future options.
- Jumper W2 Misc input
This jumper is reserved for selecting future options.
- Jumper W3 Enable NMI
Installing this jumper allows Non Maskable Interrupts to occur in order to support auto-emulation of various video modes. As this is not yet supported by any Thrane & Thrane program, the jumper should not be installed.
- Jumper W4 Memory clock selection
This jumper is pre-routed on the PCB, and is reserved for future use.
- Jumper W5 CLK2 selection
This jumper is pre-routed on the PCB, and is reserved for future use.
- Jumper W8 Interrupt enable
Installation of this jumper allows interrupt-driven screen-update during horizontal blanking periods in certain modes. As this is not yet supported by any Thrane & Thrane program, the jumper should not be installed.

Jumper W9 TTL monitor select
This jumper is pre-routed on the PCB. If the VGA Display Adapter is to be used with a monochrome multisynch type monitor with TTL-interface (very rare situation), this jumper should be used. In this case cut the pre-routed track and install the jumper in position W9-2/3.

B.5 Service

B.5.1 Fault Diagnostic.

The assembly should be examined by qualified service personnel only.

B.5.2 Circuit Description.

The circuit description is not yet available.

