SAILOR®

by Thrane & Thrane

TT-3026D/M/S easyTrack Transceiver

Installation Manual

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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 customer's failure to comply with these requirements.

MICROWAVE RADIATION HAZARDS

During transmission this unit radiates microwaves from the antenna. This radiation may be hazardous if exposed directly to humans close to the antenna. Make sure that nobody is closer than the recommended minimum safety distance of 1 ft. (0.3 meters) during use of the transceiver.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove equipment covers. Only qualified maintenance personal must make component replacement and internal adjustment. Under certain conditions, dangerous voltages may exist even with the cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

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REVISION HISTORY

Rev.	Date	App.	Section	Description / Remarks
A	2005-04-25			Document created
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1 INTRODUCTION

This manual provides instructions for installing a TT-3026D/M/S easyTrack Mini-C Transceiver. There are variations of the easyTrack system:

- The TT-3026M for maritime tracking or SCADA use.
- The TT-3026S for maritime use where reception of SafetyNet messages are required[1].
- The TT-3026D for maritime use where distress capabilities are required including reception of SafetyNet messages.

A wide variety of options and accessories may be linked together with the easyTrack transceiver. Those associated with the installation of the TT-3026D/M/S are described in this manual.

[1] Please be aware of local governmental and international regulatory requirements, applicable to equipment capable of receiving maritime safety information, this requires the mandatory installation of a display device

Figure 1 TT-3026D/M/S easyTrack Transceiver

1.1 INITIAL INSPECTION

WARNING

To avoid hazardous electrical shock, do not perform electrical tests if there is any sign of shipping damage to any portion of the outer cover. Read the safety summary at the front of this manual before installing or operating the TT-3026D/M/S easyTrack Transceiver.

Inspect the shipping carton immediately upon receipt for evidence of mishandling during the transport. If the shipping carton is severely damaged or water stained, request the carrier's agent to be present when opening the carton. Save the carton packing material for future use.
Contents of the shipment should be as listed in the enclosed packing list. If the contents are incomplete, if there is

mechanical damage or defect, or if the TT-3026D/M/S does not work properly, notify your dealer.

After you unpack the TT-3026D/M/S please:

- Inspect it thoroughly for hidden damaged, loose components or loose fittings.
- Inspect the cable harness for stress, loose or broken wires, or broken cable ties.
- Examine all the components for loose or missing hardware.
- Tighten all loose hardware.

1.2 STORAGE

The TT-3026D/M/S easyTrack may be stored or shipped in temperatures within the limits -40° C to +80° C. It is recommended that the TT-3026D/M/S easyTrack is unpacked immediately on delivery.

1.3 REPACKING FOR SHIPMENT

The shipping carton for the TT-3026D/M/S easyTrack has been carefully designed to protect the transceiver and its accessories during shipment. This carton and its associated packing material should be used when repackaging 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 repackaging with commercially available material.

- Wrap the TT-3026D/M/S easyTrack 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 made of 160 kg test material.

- Seal the shipping container **FRAGILE** to ensure careful handling.

1.4 ADDITIONAL MANUALS

On the easyTrack CD ROM included, you will find the following manuals:

Ref.	T&T number	Title
[1]	TT 98-121798	TT-3026D/M/S User Manual
[2]	TT 98-116080	TT-3026 Software Interface Reference Manual.

1.5 ABBREVIATIONS

AA	Accounting Authority
GPS	Global Positioning System
HPA	High Power Amplifier (radio transmitter)
ISN	Inmarsat Serial Number of the easyTrack
ISP	Inmarsat Service Provider
LES	Inmarsat-C Land Earth Station
LESO	Inmarsat-C Land Earth Station Operator
LNA	Low Noise Amplifier (radio receiver)
MES	Mobile Earth Station
NCS	Inmarsat-C Network Coordination Station
Opt.	Short for option
PSA	Point of Service Activation
PVT	Performance Verification Test
SARF	Service Activation Registration Form
SCADA	Supervisory Control And Data Acquisition
SMS	Short Message Service. Service that enables GSM mobile phones to send and receive short messages.

2 SYSTEM DESCRIPTION

The system shown in Figure 2 corresponds to a TT-3026D easyTrack non-Solas with Distress setup. The individual products are briefly introduced in this section. For detailed information about installation please refer to the following sections.

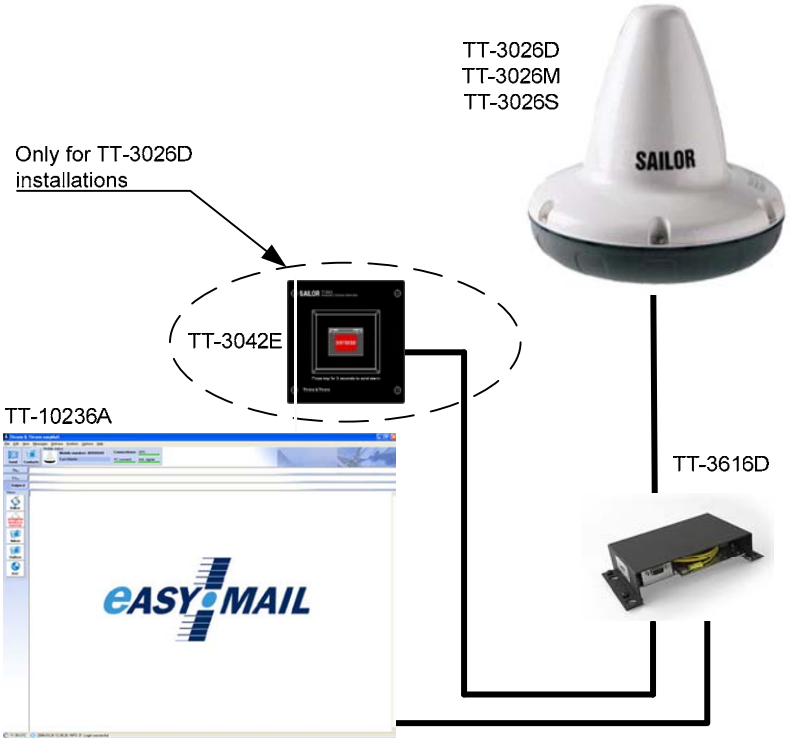


Figure 2 EasyTrack System example

A general introduction to the Inmarsat C network is given in the User Manual [1].

2.1 TT-3026D/M/S easyTrack Transceiver

The TT-3026D/M/S easyTrack is a complete Inmarsat mini-C transceiver with built-in LNA/HPA electronics and an omni-directional antenna designed to operate on vessels. The housing is sealed and contains no user serviceable parts.

The TT-3026D/M/S easyTrack is very compact and is designed to operate in a corrosive environment and in extreme weather conditions without any service.

Figure 3 TT-3026D/M/S easyTrack Transceiver

The TT-3026D/M/S easyTrack is designed to operate when the satellite is visible over the horizon and no signal path blockage is present.

The TT-3026D/M/S easyTrack antenna has an elevation angle of -15° ensuring perfect reception in sea area A3 (Inmarsat) even when the vessel has pitch and roll movements due to rough weather.

The TT-3026D/M/S easyTrack has a built-in GPS module, capable of tracking up to 12 GPS satellites.

2.2 TT-3616D INTERCONNECTION BOX

For connecting the TT-3026D/M/S easyTrack to peripheral equipment, it is recommended to use the optional TT-3616D Interconnection Breakout Box, designed to be mounted anywhere inside a vessel and to be located up to 20 metres away from the easyTrack using a special connection cable

Figure 4 TT-3616D Interconnection Box

2.3 TT-3042E DISTRESS ALARM BOX

A mandatory part of a TT-3026D easyTrack Non-Solas with Distress installation is the installation of a distress alarm button. The TT-3042E Distress Alarm Box is designed specifically for this purpose.

Figure 5 TT-3042E Distress Alarm Box

Up to two TT-3042E Distress Alarm Boxes can be connected to a TT-3026D easyTrack Non-Solas with Distress transceiver.

2.4 EASYMAIL

EasyMail is a PC program, which can be used to control Thrane & Thrane and Sailor Inmarsat-C transceivers.
With easyMail you can easily send and receive e-mail, SMS, fax and telex messages, set up position reporting, receive EGC messages and many other things.

2.5 ACCESSORIES

Product number:	**Product description**	**Picture**
Opt. 101	Standard 1" pole mount kit	
Opt. 103	Adjustable pole/railing mount kit	
Opt. 940	Connection cable, 5 meters, with 90° angular plug	
Opt. 941	Connection cable, 5 meters	
Opt. 942	Connection cable, 10 meters	
Opt. 943	Connection cable, 20 meters	
Opt. 947	Connection cable, 50 meters	
TT-3682C	AC/DC Desktop Power Supply	

3 REGISTRATION

Before use of the easyTrack transceiver on the Inmarsat-C system it must be registered to the system, which involves a little paper work. This is done using the SARF (Service Activation Registration Form) supplied with the easyTrack MES. Page 1 of the SARF is shown in Figure 6.

The SARF for registration of Maritime MES can also be found on www.inmarsat.org (CUSTOMER SUPPORT -> SERVICE ACTIVATION). The site also contains notes on how to complete the maritime form.

The Service Activation Registration Form contains different abbreviations that will be explained here.

The easyTrack MES must be registered at either a PSA company or directly to the ISP. A PSA is a company handling the activation of Inmarsat mobiles and is short for Point of Service Activation. ISP is the company that provides the Inmarsat service and is short for Inmarsat Service Provider. In many cases the PSA and ISP is the same company that also operates a Land Earth Station (LES). The local PSA or ISP can be obtained by following the guidelines in the registration form.

The Service Activation Registration Form also includes information needed to find out how to pay the bill for the Inmarsat-C service. This payment will be done directly to the Accounting Authority. In many cases the Accounting Authority (AA) is also the same company as the Inmarsat Service Provider (ISP).

In addition to the general information like name, address, etc. the ISN of the easyTrack MES must be specified. The ISN is located on the Delivery Note and in the bottom of the easyTrack MES.

Refer to Table 1 for answers to selected SARF questions.

inmarsat

Registration for service activation of Maritime Mobile Earth Station

PSA use only code

Application number

Date Day Month Year

Customer's reference number

Sections 1-4, 6 and 8 are to be completed by all customers
Tick Boxes as appropriate.
Please write in block capitals

1.Your details (See note A) PLEASE NOTIFY YOUR PSA IF ANY OF THESE DETAILS CHANGE OR YOU ARE NO LONGER THE OWNER OF THE INMARSAT EQUIPMENT. (THIS IS A LEGAL REQUIREMENT AS STATED IN THE INMARSAT TERMS AND CONDITIONS WHICH ARE ATTACHED TO THE BACK OF THIS SARF)

Your name or the name of your organisation:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Email address:

Contact person:

Title: Department:

What is their telephone number and/or extension? + Country code ( ) Area code ( ) Telephone number ( )

2. Paying the bill (See note B) PLEASE NOTIFY YOUR PSA URGENTLY IF YOU CHANGE YOUR BILLING ENTITY (AA or ISP.) (THIS IS A LEGAL REQUIREMENT AS STATED IN THE INMARSAT TERMS AND CONDITIONS WHICH ARE ATTACHED TO THE SARF)

Note: All Maritime MESs that MAY BE used for any distress and safety purposes MUST have an Accounting Authority as the billing entity. Only the FLEET F77 MES may use an Inmarsat Service Provider or Accounting Authority as the billing entity if the MES to be used for distress & safety.

Will the MES be used for distress and safety purposes? Yes ☐ No ☐

If YES, enter the Accounting Authority Code (AAIC): ☐☐☐☐

If the Code is unknown, enter the name of the AA:

If NO, have you arranged payment of calls for this MES through (tick one)
(a) Accounting Authority (AA) ☐ (b) Inmarsat Service Provider (ISP) ☐

Enter ISP or AA Code: ☐☐☐☐

If the Code is unknown enter the name of the ISP or AA:

3. What type of Mobile Earth Station (MES) are you registering? (See note C)

NOTE: If the terminal is activated as **Maritime Fixed** and placed on a vessel, you could be **Endangering Lives At Sea.**

Enviroment usage		The System		What will be the primary use of the MES?			
Maritime	☐	Inmarsat-A	☐	Trading	☐	Yachts	☐
Maritime Fixed	☐	Inmarsat-B	☐	Passenger/Cruise	☐	Other	☐
		Inmarsat-C/mini C	☐	Offshore	☐	please specify	
		Inmarsat-M	☐	Government	☐		
		Inmarsat mini-M	☐	Fishing	☐		
		Inmarsat Fleet	☐				

What will be the country of registry of this MES?

Mobile Earth Station (MES) manufacturer Mobile Earth Station (MES) model

Figure 6 Page 1 of the Service Activation Registration Form

Question in SARF	3026D	3026S	3026M
Will the MES be used for distress and safety purposes?	Yes	Yes	No
The System?	Inmarsat-C/mini C		
Mobile Earth Station (MES) manufacturer	Thrane & Thrane A/S		
Mobile Earth Station (MES) model	TT-3026D	TT-3026S	TT-3026M

Table 1 Answers to selected questions in SARF

When the easyTrack MES is registered at the ISP it is ready to be used on the Inmarsat-C network. The ISP has returned a Mobile Number for the easyTrack MES and prior to operating the easyTrack MES it must be configured with this Mobile Number. This is easiest done using easyMail. For further information on installation of easyMail please refer to section 5. Advanced users can make this configuration directly via the terminal interface using Windows® Hyperterminal or equivalent. For further information on the terminal interface please refer to the Software Interface Reference Manual [2].

4 HARDWARE INSTALLATION

The TT-3026D/M/S easyTrack is equipped with an 18-pin female connector and is meant for flat surface mounting, or pole mounting using an optional adaptor. Refer to section 4.1.1.

Figure 7 shows the minimal easyTrack system configuration, where the transceiver is pre-configured for tracking. Remember to short the Remote On/Off pin to GND (refer to section 4.2.2 for Remote On/Off installation instructions).

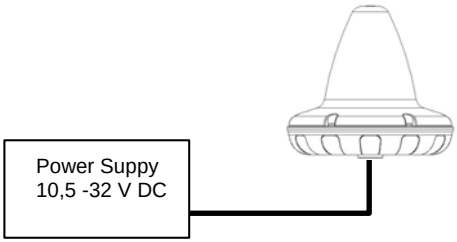


Figure 7 Minimum easyTrack system

4.1 INSTALLATION OF TT-3026D/M/S

This section describes the physical mounting of the TT-3026D/M/S easyTrack. Refer to sections 4.1.2 and 4.1.3 for guidelines on choosing the most effective and safest mounting location.

4.1.1 MOUNTING OPTIONS

The TT-3026D/M/S easyTrack transceivers are designed for mounting on one of 2 optional pole mount adaptors. In addition the easyTrack transceiver is designed for mounting on a flat surface using screws.

4.1.1.1 DRILLED HOLES ON A FLAT SURFACE

- Drill the 4 holes (3 for the mounting screws, 1 for cable access) using the mounting stencil in Appendix A.
- Place the friction gasket on the surface.
- Connect the cable and mount the screws.

4.1.1.2 POLE MOUNT 1"

40-3026 Opt. 101 is a standard 1" pole mount, Illustrated in Figure 8.

- Pull the cable in the pole and adapter.
- Connect the cable to the transceiver.
- Mount the adapter on the transceiver using screws.
- Tighten the adapter to the pole.
- Adjustable between 20 - 35 millimetre

NOTE: THE POLE MOUNT DEVICE HAS TO BE DISCONNECTED FROM THE TRANSCEIVER WHEN THE CABLE IS MOUNTED.

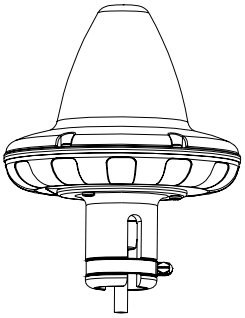


Figure 8 1" Pole mounting

4.1.1.3 ADJUSTABLE POLE/RAILING MOUNT

403026 Opt. 103 is an adjustable pole/railing mount shown in Figure 9.

- Attach the pole mount to the transceiver using the 3 screws.
- Mount the device to the pole in one of the 2 directions.
- Connect the cable.

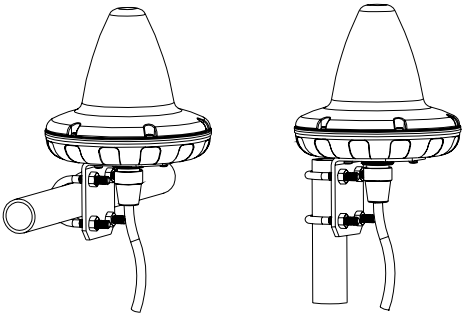


Figure 9 Vertical and Horizontal adjustable pole mount

4.1.2 ANTENNA MOUNTING CONDITIONS

When installing the TT-3026D/M/S easyTrack, find a location that is as free from obstructions as possible. Also maintain a certain distance to other antennas, especially radar installations. Normally the best place for the antenna would be above radar scanning antennas. The following safe distances should be maintained:

Distance to HF antennas	> 5 meter
Distance to VHF antennas	> 4 meter
Distance to other Inmarsat-C transceiver. **Important: Remember to check the other equipments requirements.**	> 1.5 meter
Distance to magnetic compass	> 0.3 meter

Table 2 Antenna Safe Distance

The antenna is designed to provide satellite coverage even when the vessel has pitch and roll movements up to 15°. To maintain this coverage the antenna should be free from obstructions in the area down to 15° below the horizon (refer to Figure 10). Since this may not be possible in the fore and aft directions of the vessel, the clear area can be reduced to 5° below the horizon in the fore and aft directions and 15° below the horizon in the port and starboard directions. Any compromise in this recommendation could degrade performance.

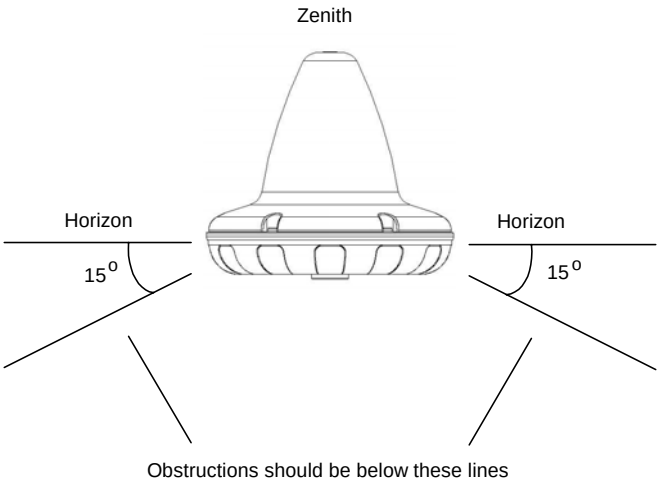


Figure 10 Viewing Angle to the Horizon

If an obstruction such as a pole or a funnel is unavoidable, the Transceiver must be positioned in such a location that the obstruction covers no more than a 2° arc along the horizon. To calculate the minimum distance, use the following formula:

Safe distance = 29 * Diameter of obstruction

Example:

Obstruction is a 4" pole (Diameter = 0.1 m)
Safe distance is 29 * 0.1 m = 2.9 m

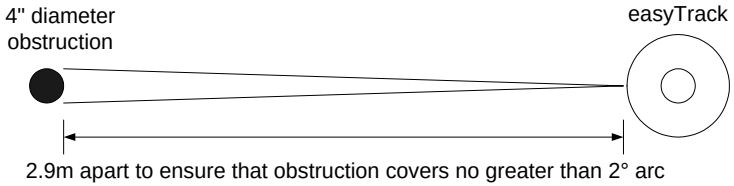


Figure 11 Mounting near pole or funnel (overhead view)

4.1.3 SAFETY DISTANCE FOR ANTENNA UNITS

When transmitting, the electromagnetic field radiated from the antenna can be harmful. To avoid danger, keep a distance of 1 ft. (30 cm.) from the transceiver.
To be sure that this distance is respected, the TT-3026D/M/S easyTrack is provided with a label declaring a minimum safety distance of 1 ft. (30 cm.) on the antenna.

The relation between the power intensity and distance is as follows:

Distance (m) from antenna	Radiated intensity (W/m^2)
0.20	10
0.13	25
0.07	100

Table 3 Radiated intensity

4.2 WIRING THE EASYTRACK SYSTEM

4 lengths of connecting cables are available from T&T: 5m, 10m, 20m and 50m (refer to section 2.5 for option numbers). Table 4 shows the description and functions of the TT-3026D/M/S easyTrack cable.

Wire colour	Function	Description
2 x Red 1mm^2	DC +	12-24 VDC (Battery Positive input)
2 x Black 1mm^2	DC -	DC - (Battery Negative input)
Yellow	ON/OFF	Remote ON/OFF
White	GND	GND
Orange	GND	GND
Black/Violet	3V3 out	3V3 out max. 100mA. for terminal equipment
Black/Blue Grey Black/Yellow Black/Grey Brown Black/Green	I/O port 1 - 2 - 3 - 4 - 5 - 6	2 to 5 user configurable 3.3V I/Os depending on transceiver type. 5V tolerant. Each open-collector output sinks 25mA.
Green	RD	RS232 Receive
Black/Red	TD	RS232 Transmit
Violet	RTS	RS232 Request to send
Blue	CTS	RS232 Clear to send

Table 4 Cable pin assignment

4.2.1 GROUNDING

Make sure that the **shield of the cable is connected to a proper ground**, i.e. the ship's structure / hull. This is very important in order to safely bypass interference from Radar, VHF/MF/HF radio equipment and other environmental noise sources.

4.2.2 REMOTE ON/OFF

The Remote ON/OFF (yellow wire) is a unique feature for the TT-3026D/M/S easyTrack Transceiver. When this wire is left floating the Transceiver is turned off and when the wire is shorted to GND (white or orange wire), the Transceiver will be switched on. This makes it possible for external equipment to perform remote power control of the TT-3026D/M/S easyTrack Transceiver.
An external relay or solid-state switch can control the power.

To control the transceiver from the built-in sleep mode function the remote on/off wire must be left floating (off).

Note if Sleepmode is not to be used then Remote ON/OFF (yellow wire) MUST be permanently connected to GND (white or orange wire). When using TT-3616D, this is done by having a jumper on W201.

4.2.3 POWER CONNECTION

The power connections of the TT-3026D/M/S consist of 4 wires (two red and two black). All 4 wires MUST be used.
The power connection input is floating (i.e., there is no galvanic connection from any of the battery poles to the connector housing = GND = cable shield).

4.2.4 POWER REQUIREMENTS

The TT-3026D/M/S easyTrack transceiver is designed to operate on floating DC in the nominal range 12V to 24V, which makes an AC/DC converter needed, in case the system is to work in an AC environment. **In case an AC/DC converter is used, please make sure to leave the output floating, i.e. do NOT connect the negative wire to ships structure.**
The actual working voltage range of the transceiver is dependent of the cable length. Refer to 4.3.3 for more information.

4.2.5 GENERAL PURPOSE I/O PORTS

The TT-3026D/M/S easyTrack also contain some configurable input/output ports.

On TT-3026M and TT3026S I/O 2 to 6 are configurable by the user.

On TT-3026D I/O's 1, 2, 5 and 6 are reserved for special purposes; please refer to section 4.6.

When used as outputs, the ports have the following characteristics:

- Open collector output.
- Internal 2.2kOhm pull-up resistor to 3.3VDC.
- Voltage allowed between GND and the output pin is 0V to 5V.
- Maximum current into the I/O pin is 25mA.

When used as inputs, the ports have the following characteristics:

- Internal 2.2kOhm pull-up resistor to 3.3VDC.
- To guarantee a logic low input signal, the input voltage must be < 0.5V.
- To guarantee a logic high input signal, the input voltage must be >3V.
- Voltage allowed between GND and the input pin is 0V to 5V.

WARNING: When using the I/O ports, it is important not to apply voltages between GND and the I/O pin higher than 5 VDC as this can cause damage to the transceiver. Negative voltages are not allowed either.

4.3 INTERCONNECTION BOX TT-3616D

Note: For installation of a TT-3616B Interconnection Box, please refer to 9.1 Interconnection box TT-3616B.

The TT-3616D/M/S Interconnection Box is designed to facilitate a simple and robust interconnection of the various system components.

Figure 12 Outside view of TT-3616D

Figure 13 Inside view of TT-3616D

4.3.1 Mounting of TT-3616D

The TT-3616D is designed to be mounted on a flat surface anywhere inside a vessel and to be located up to 50 meters away from the TT-3026M mini-C Transceiver.

In order to ease the installation, please observe the minimum clearing area as given in Figure 14.

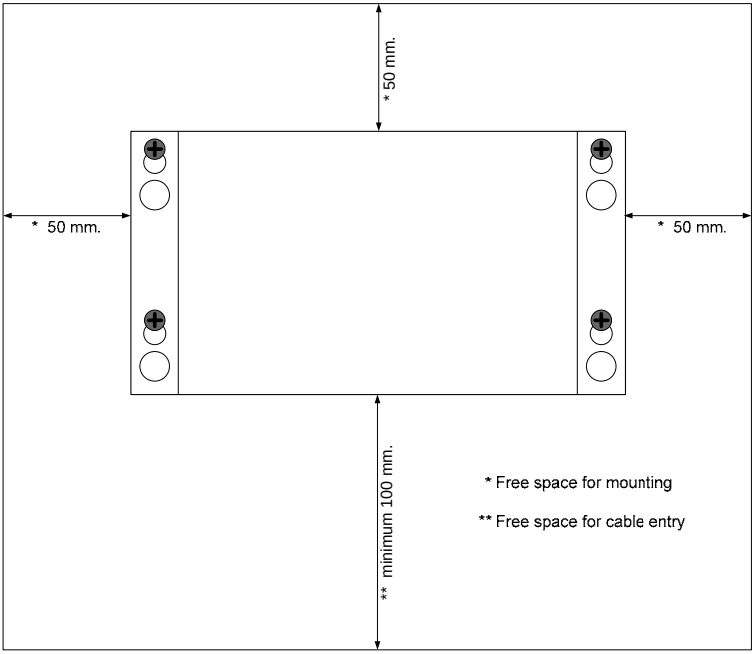


Figure 14 Recommended free space around TT-3616D.

The unit must be fastened by the used of 4 screws, one in each corner of the chassis as indicated by Figure 15. The accessories for TT-3616D include 2 different types of screws for the purpose, M5x12 and 5.5x25.

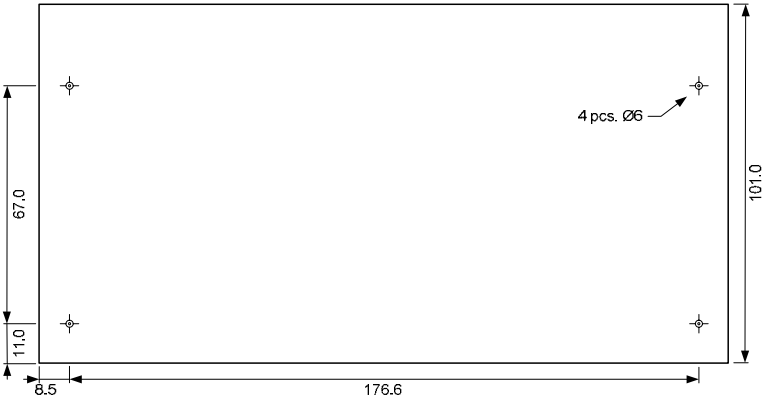


Figure 15 *Drill template. All measures in mm.*

The best grounding is made by fixing the chassis directly on to the ships structure (provided it's made of metal). If proper grounding can not be made this way, then connect the pre-mounted grounding wire to the ships structure. Find an appropriate location as close as possible to the TT-3616D and shorten the grounding wire accordingly. Terminate the grounding wire with the yellow ring terminal found in the accessory kit.

The correct (pre-mounted) position of the grounding wire can be seen on Figure 13. Please note the use of a washer underneath the yellow ring terminal.

The grounding wire delivered with the TT-3616D has a length of 1 meter and a wire cross section of 4mm^2. Avoid extending the length of the grounding wire, as the protective effect will be severely degraded in such a case.

4.3.2 Handling of wire terminals in TT-3616D

To help inserting wires into the terminals, a special tool is delivered as part of the accessory kit. It is used as shown in *Figure 16*.

Please be careful not to apply too much pressure, as this might damage the top of the terminal housing.

In case the special tool is lost, a small screwdriver can be used as well.

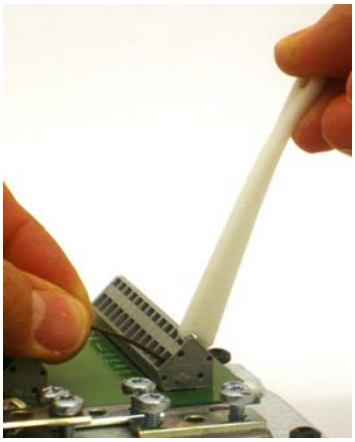


Figure 16 Wire tool.

4.3.3 Connecting power to TT-3616D

The TT-3026DMS system is designed to operate on floating DC in the range 10.5 - 32 V when using 20-meter transceiver connection cable and 16 - 32 V when using 50-meter transceiver connection cable, which makes an AC/DC converter needed, in case the system works in an AC environment.

NOTE the requirement for floating DC of minimum 16 V when using a transceiver connection cable longer than 20 meters. This is important for the operation of the TT-3026D/M/S system.

The power connector is designed to accept wire with a cross section area up to 2.5mm^2. The required wire cross section depends on the actual supply voltage, the supply cable length and the transceiver cable length. Typical cable resistance is given in Table 5.

Cross section [mm^2]	0.5	1	1.5	2	2.5
Resistance [Ω/km]	32.2	16.1	10.7	8.05	6.76

Table 5 Typical cable resistance

To calculate the maximum wire length in meters for a given cable type and transceiver cable length, the following formulas can be used:

$$L_{MAX,20M} = 156 \cdot \frac{(V_{MIN} - 10.5)}{R_{CABLE}} \quad \text{and} \quad L_{MAX,50M} = 156 \cdot \frac{(V_{MIN} - 16)}{R_{CABLE}}$$

, where V_{MIN} is the minimum guaranteed power supply voltage and R_{CABLE} is the cable resistance in Ω/km.

Example 1:
Using a 24VDC power supply with a 24V battery backup, V_{MIN} can be assumed to be above 22V. Using 50 meter of transceiver cable and a wire cross section of $1mm^2$, the maximum power supply cable length is:

$L_{MAX,50M}$ = 58 m.

Example 2:
Using a 12V battery for backup, V_{MIN} can be assumed to be above 11V (if properly charged). Using 20 meter of transceiver cable and a wire cross section of 2.5mm2, the maximum power supply cable length is:

$L_{MAX,\ 20M}$=11 m.

When connecting the cable to TT-3616D, make sure the cable screen is properly terminated at the cable relief bracket as shown in *Figure 17*. Connect the positive supply wire to the terminal denoted DC+ and the negative supply wire to the terminal denoted DC-.

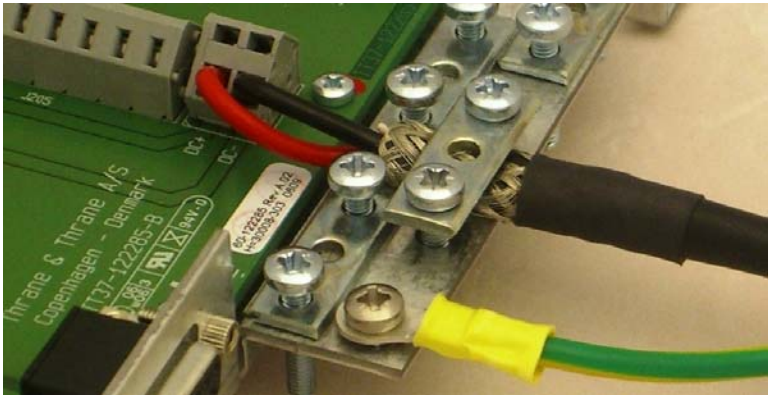


Figure 17 Power cable connections.

When power is switched on, the red LED denoted "DC in" should be turned on.

Please note that the jumper on W201 must remain on at all times.

4.3.4 Connecting TT-3026M to TT-3616D

In order to prepare the transceiver cable for mounting, start by removing 20 cm. of isolation as shown in *Figure 18*.

Figure 18 Transceiver cable preparation.

Then wind the tinned wire around the isolation as shown in *Figure 19* in order to prepare for a proper grounding of the cable screen.

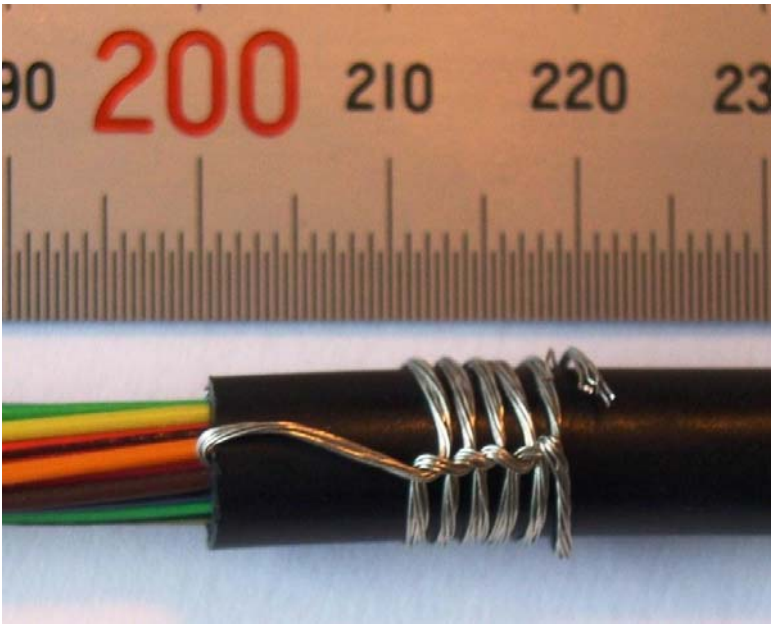


Figure 19 Preparation for grounding of the cable screen.

Then fasten the cable firmly in the cable relief bracket of the TT-3616D as shown in *Figure 20*.

Figure 20 Fixation of the transceiver cable in TT-3616D.

Finally connect the individual wires to the 12 + 6 pole terminal blocks. They are labelled by wire colour. Connect the Transceiver cable as directed by these labels. Start by connecting the thick power wires and then continue towards the other end of the connector as shown in *Figure 21*.

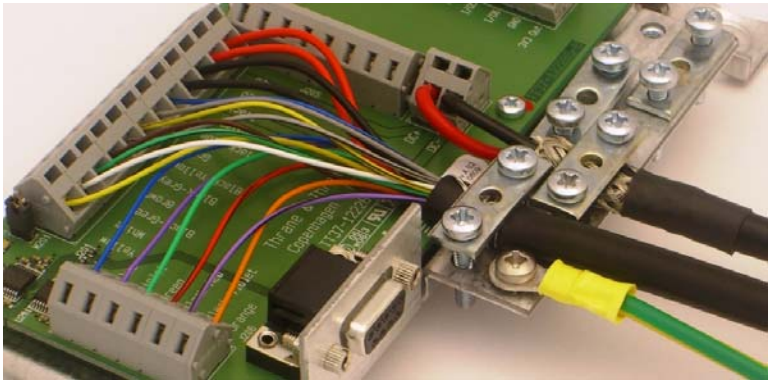


Figure 21 Mounting of transceiver cable wires.

4.4 DTE CONNECTION VIA DB9 FEMALE CONNECTOR

An option for connection of a DTE is using the opt-944 Female 9-pole sub-D connector.

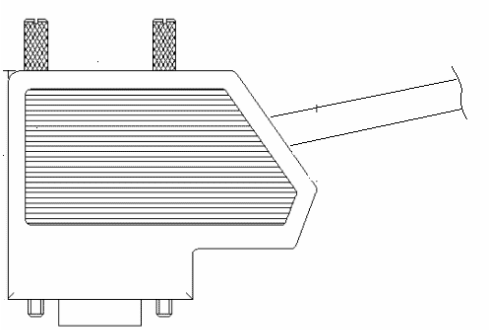


Figure 22 Sub-D with screw terminals

Wire colour in transceiver cable	Terminal no in sub-D connector	Function
Green	3	TD
Black/Red	2	RD
Violet	8	CTS
Blue	7	RTS
White	5	GND
Cable shield	Connector housing	GND
-	1 *	DCD
-	6 *	DSR
-	4 *	DTR

Table 6 Sub-D wire connections

* Connect terminal 1, 4 & 6, as some applications need these connections to work properly. Also check out Remote On/Off (refer to section 4.2.2)

4.5 EXTENDING THE CABLE LENGTHS

The connection cable can be up to 50 meters long. When using the interconnection box TT-3616B/D the RS-232 cable

can be extended with 20 meters. If this is not enough, more than one interconnection box is required, refer to Figure 23.

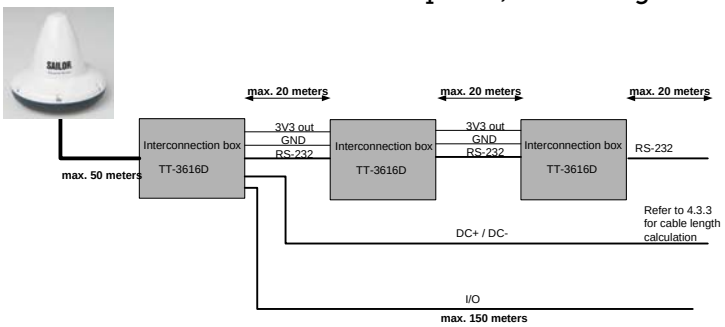


Figure 23 Connection using long cables.

NOTE: 3V3 out and GND need to be connected to all the interconnection boxes using min. 1mm^2 (AWG18) wires.

The I/O's can be extended up to 70 meters using min. 0.25mm^2 (AWG24) wires, refer to Figure 23.

Refer to Appendix C for an AGW to metric conversion table.

4.6 TT-3042E INMARSAT-C DISTRESS ALARM BOX

This applies to TT-3026D only.

IMPORTANT: DO **NEVER** TEST THIS INSTLLATION BY SENDING AN ALERT ON-AIR. ALSO BE CAREFUL **NOT** TO SEND FALSE ALERTS DURING INSTALLATION. Any distress alerts coming through the Inmarsat-C network will be taken seriously by the receiving authorities.

As a safety precaution against false alerts it is recommendable that the transceiver cannot 'see' any satellites when this installation is turned on for the first time. If the alert button starts blinking or if the connected terminal (refer to section 5)

indicates any unexpected alert activity the transceiver should be turned off again.

If a false alert is sent by accident – despite all precautions – it is important to inform the relevant authorities before a rescue operation is initiated. Refer to the User's Manual for more information about this [1].

4.6.1 SUPPLIED ITEMS

The TT-3042E Inmarsat-C Distress Alarm box comes with 5m cable suitable for connecting the Alarm box to the Interconnection box (refer to section 4.3). The cable consists of 6 wires and has an LIHH classification.

The alarm button is non-latched and covered with a lid. The switch is red and marked with "DISTRESS".

4.6.2 CONNECTING ONE DISTRESS ALARM BOX

This section describes how to connect one TT-3042E Inmarsat-C Distress Alarm Box to the TT-3616D Interconnection Box, refer to Figure 24. For connecting the TT-3616D Interconnection Box to the transceiver, the DC power supply and the DTE, please refer to section 4.3.

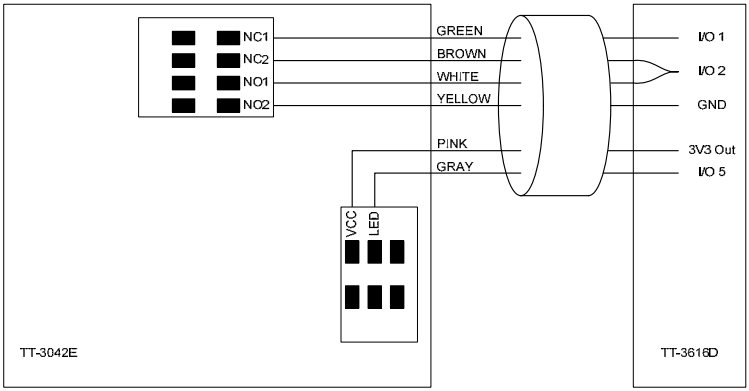


Figure 24 Connecting the TT-3042E Distress Alarm Box

Start installation by choosing a location for the TT-3042E Inmarsat-C Distress Alarm Box and the most appropriate hole and routing for the enclosed cable. Mount the TT-3042E either by the 3 thread cutting screws or by the 3 machine screws. Put the cable through the rubber grommet in the appropriate hole and tighten it with the mounting plate inside the TT-3042E, refer to Figure 24.

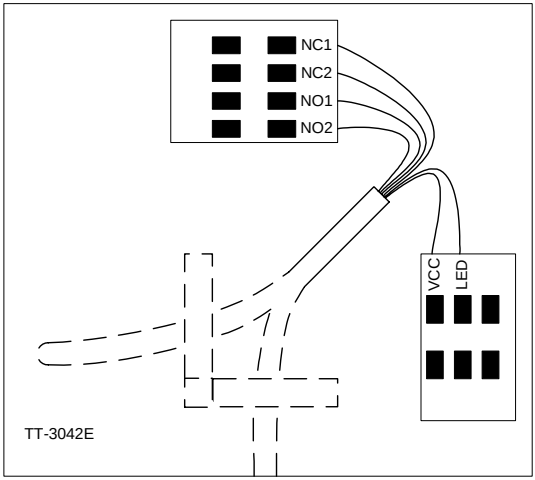


Figure 25 Cable connections inside the TT-3042E

Use the opened cable end inside the TT-3042E Inmarsat-C Distress Alarm Box. Mount the 6 cable wires as described in Figure 25 by pressing down on the terminal block with a small screwdriver to open the terminal block, insert the wire and release. Make sure, that all 6 wires are well connected in the terminal block and that the connected wire colours are as described in Figure 24.

After routing the cable and cutting the cable in appropriate length, the 6 wires are stripped and mounted in the TT-3616D Interconnection Box with the connections described in Figure 24. Note that two wires are to be connected to I/O 2.

4.6.3 CONNECTING TWO DISTRESS ALARM BOXES

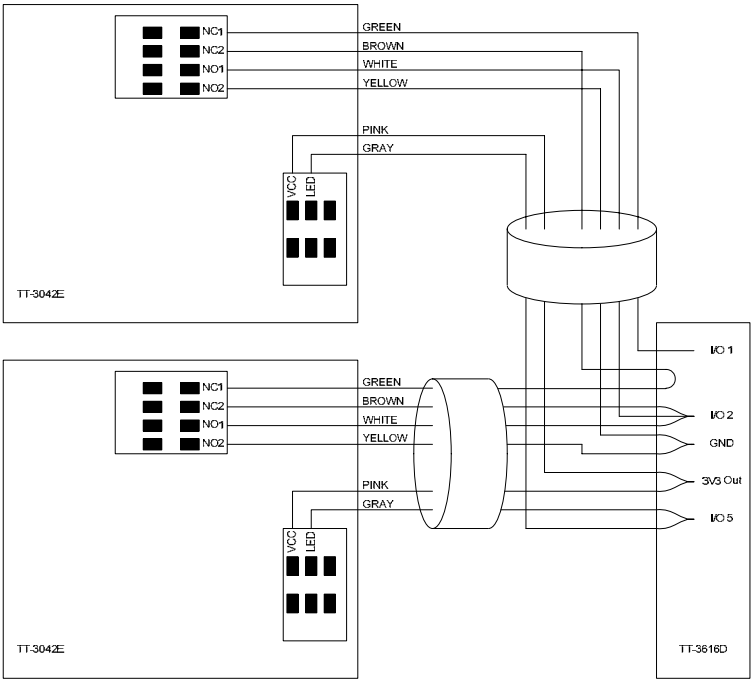


Figure 26 Connecting two TT-3042E Distress Alarm Boxes

When using two TT-3042E Inmarsat-C Distress Alarm Boxes, the connections are as described in Figure 26. Both cables are to be connected to the TT-3616D Interconnection Box. Note that two wires are to be connected to GND, 3V3 Out and I/O 5, three wires are to be connected to I/O 2, and two wires are to be interconnected without any connection to the TT-3616D Interconnection Box.

4.6.4 ADDITIONAL BUZZER AND CLEAR BUTTON

The Buzzer and Clear Button are additional, and it is not an option available via Thrane & Thrane A/S. Please refer to the User/Operators manual [1] for the functionality of the Buzzer and the Clear Button.

The Buzzer must be self-driven (i.e., sound when connected to power) and it must be working at 3.3VDC. The Buzzer is connected to the TT-3616D Interconnection Box between 3V3 Out and I/O 6, refer to Figure 27. Note correct polarity.

The Clear Button must be a non-latched normally open single pole single toggle (SPST) type. The Clear Button is connected to the TT-3616D Interconnection Box between GND and I/O 6, refer to Figure 27.

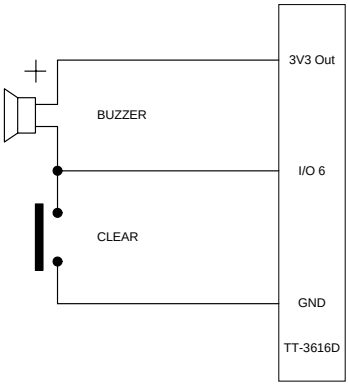


Figure 27 Connecting the optional Buzzer and Clear Button

4.7 TECHNICAL SPECIFICATION

Model	**TT-3026D/M/S**
General Specifications	Meets all INMARSAT specifications for the Inmarsat mini-C Network for Land mobile and Maritime terminals. R&TTE
Transmit Frequency	1626.5 to 1660.5 MHz. note 1
Receive Frequency	1525.0 to 1559.0 MHz. note 1
Channel Spacing	5 / 2.5 / 1.25 kHz.
Modulation	1200 symbols/sec BPSK.
Ambiguity Resolution	Unique word.
Coding	R ½ K=7 convolutional code, (interleaved code symbols RX).
Data Rate	600 bit/sec.
RX Frame Length	8.64 seconds.
TX Signalling Access Mode	Slotted ALOHA.
TX Message Channel	TDMA & FDMA, interleaved code symbols.
Terminal Interface	EIA/TIA-232-E DTE interface. CCITT Rec.V.24/28, 4800-115200 Baud IA-5 code
I/O Interface:	Six dedicated In/Out pins. Open-collector. Sinks 25 mA each.
System Set-up	S-RAM Battery backup
DC Power Source	Floating DC Nominal voltage range is 12V to 24V Working voltage range is 10.5V to 32V Max limit 100VA Max current 4A Max power 32W Power: RX: 1.8W ,TX: 23 W @ 12V supply
Fuse	Self recovering Poly fuse
Ambient Temperature	-35°C to 55°C operating -40°C to 80°C storage.
Dimensions	Ø=163 mm H: 143 mm
Weight	1.10 kg

Note 1: *Inmarsat-C frequencies: TX: 1626.5 – 1646.5 MHz*
RX: 1525 – 1545 MHz

Operating system	The TT-3026D/M/S easyTrack makes use of eCos™ operating system.
Inmarsat-C Protocol support	Message transmission and reception with IA-5, ITA-2 and binary transfer to/from the following destinations: Telex PSTN (telephone modems and fax modems) PSDN (X.25 network) EGC message reception with automatic geographical area selection. Polling and data reporting with automatic transmission of position reports down to a recommended minimum of 1 per 5 minutes. Special Access Codes DNID Messaging Program Unreserved Data reporting Transmit message size: Max 10Kbyte Receive storage: > 32 Kbytes.
TT-3026D/M/S easyTrack Transceiver	Inmarsat-C/GPS omnidirectional antenna, RHC polarised. G/T: -23.7 dB/K at 5° elevation EIRP: 7 dBW dB at 5° elevation. Temperature: -35°C to 55°C operating, -40°C to 80°C storage.
Maximum transmission length	10 Kbytes.
Solar Radiation	Max. flux density 1200W/m2.
Precipitation	Up to 100 mm/hour, droplet size 0.5 to 4.5 mm
Ice	Up to 25 mm.
Velocity	Max velocity up to 140 km/hour (87mph).
Vibration Operational	Random 5-20 Hz: 0.005 g^2/Hz 20-150 Hz: -3dB/oct. (0.5g RMS).
Vibration Survival	Random 5-20 Hz: 0.05 g^2/Hz 20-150 Hz: -3dB/oct. (1.7g RMS).
Shock	Half sine 20g/11ms

Table 7 TT-3026D/M/S Technical Specifications

Model	**TT-3042E**
General Specifications	Meets all INMARSAT specifications for the Inmarsat mini-C Network for Maritime terminals. R&TTE
DC Power Source	Powered by TT-3026D
Dimensions	91mm x 91mm x 33 mm
IP Rating	IP20
Cable between TT-3042E and TT-3026D	LIHH 6 x 0.25mm2, 5 meters.

Table 8 TT-3042E Technical Specifications

5 SOFTWARE INSTALLATION

5.1 ABOUT EASYMAIL

EasyMail is a PC program, which can be used to control Thrane & Thrane and Sailor Inmarsat-C transceivers.
With easyMail you can easily send and receive e-mail, SMS, fax and telex messages, set up position reporting, receive EGC messages and many other things.

5.2 BEFORE YOU INSTALL

Before installation of easyMail make sure that your PC fulfils the following requirements:

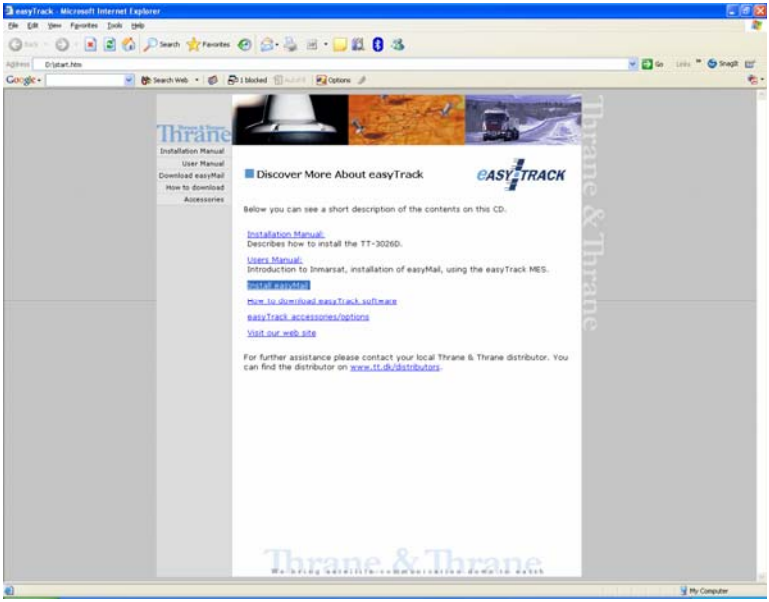
Operating system: Windows 98SE, 2000 or XP
Free hard drive space: 10MByte minimum, 50MByte recommended.

5.3 EASYMAIL INSTALLATION

Follow these steps to install easyMail:

1. CD startup

- Insert the easyMail installation CD in the CD drive of the PC. The setup program will start up automatically and the following window will be shown.

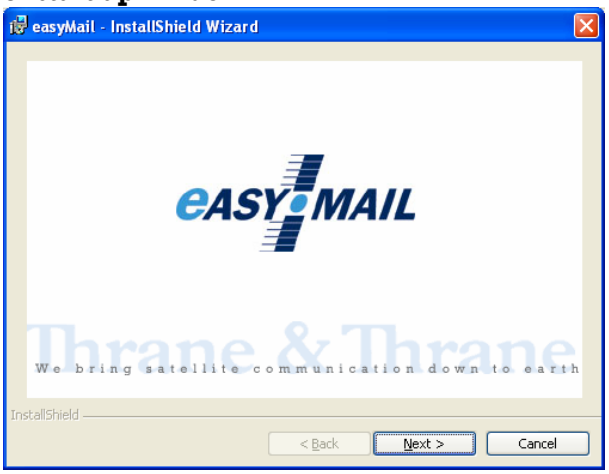


If the program does not start automatically, run start.htm from your CD drive.

2. Starting the installation

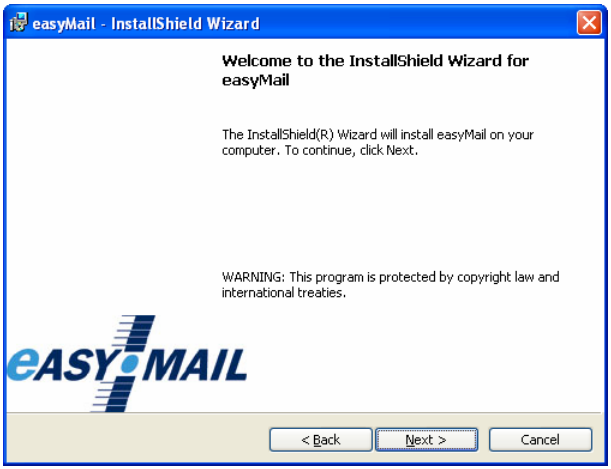
- Click 'Install easyMail'.

3. Start up window



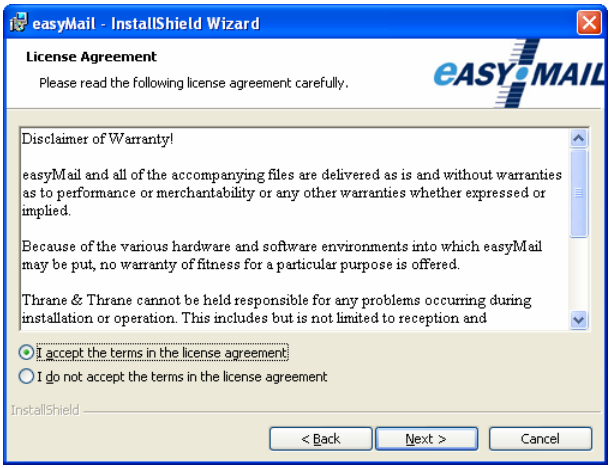
- Click 'Next'.

4. Welcome screen



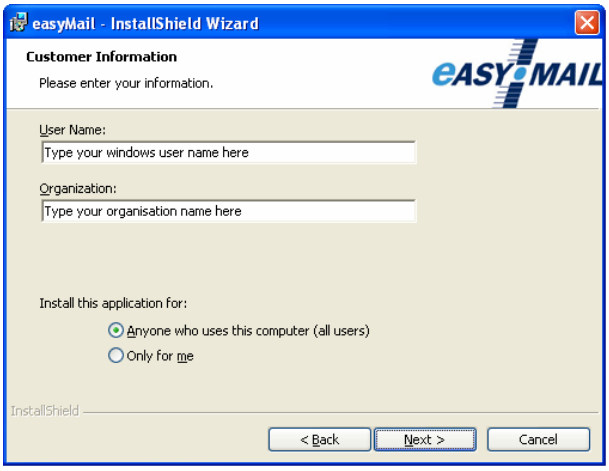
- Click 'Next'.

5. Disclaimer window



- Read the disclaimer
- Click the button ' I accept the terms in the license agreement'
- Click 'Next'

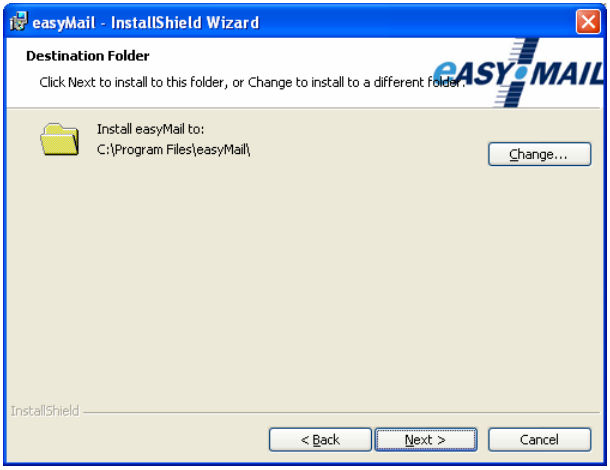
6. Customer information



- Type user name and organisation

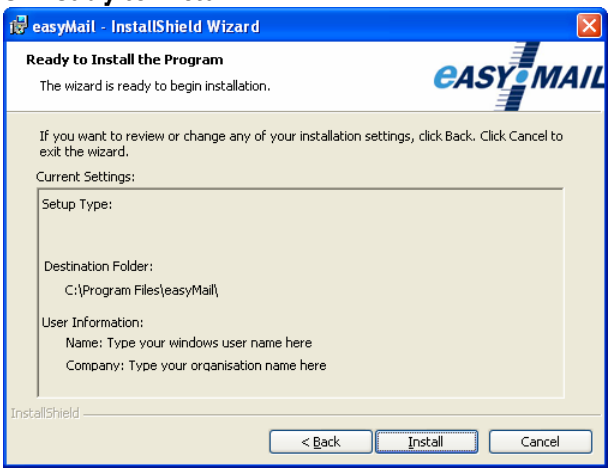
- Click 'Next'.

7. Destination folder



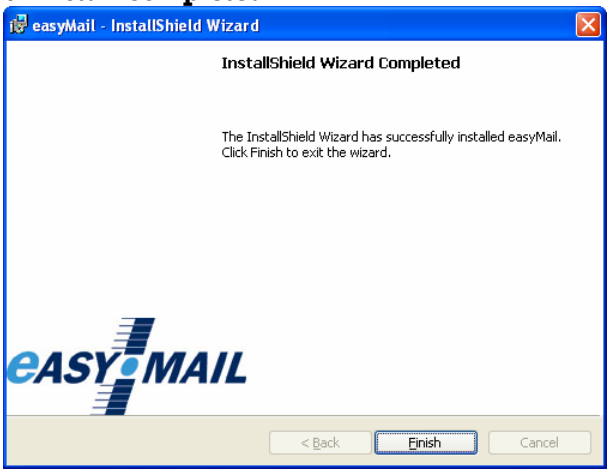
- Choose destination folder (Default and recommended folder is C:\Program Files\easyMail)
- Click 'Next'.

8. Ready to install



- Click 'Install' to begin installing easyMail.

9. Install completed



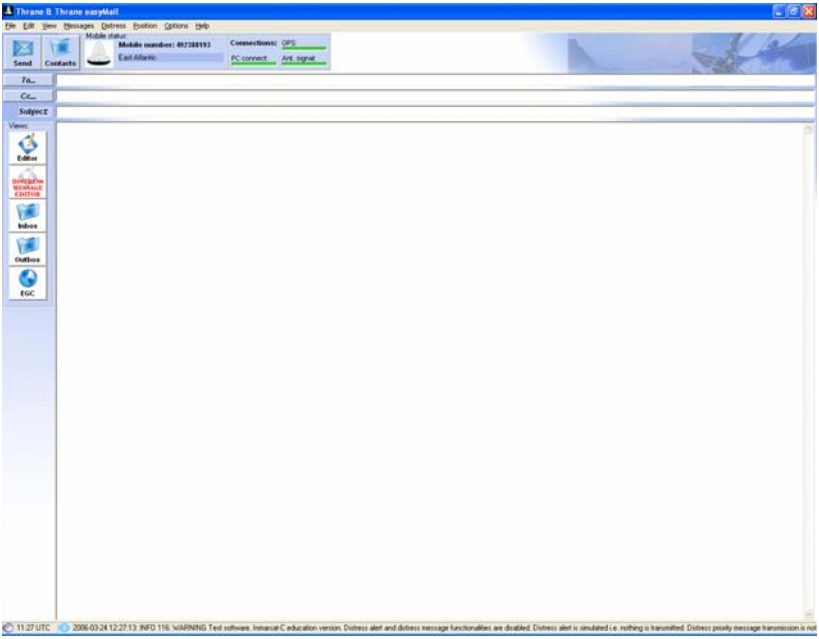
- Click 'Finish' to complete the installation procedure.

10. Starting easyMail

- easyMail can be started in one of two ways:

1. Click the easyMail icon on the desktop.
2. Start easyMail from Start→Programs→Thrane & Thrane→easyMail 1.10

The easyMail main window below will be shown.



5.4 RUNNING EASYMAIL FOR THE FIRST TIME

When starting easyMail, for a moment the Connections and Mobile status field look like this:

Figure 28 easyMail with no connection to easyTrack

After a few seconds, the fields should change to this:

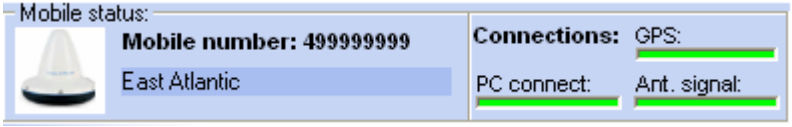


Figure 29 easyMail connected to easyTrack.

If the fields look like Figure 29, please go on to section 5.5 easyMail basic setup.

If the fields look like Figure 28, The PC has not established a connection to easyTrack. This is usually because the COM port in the PC is already open by another application, or because the COM port or baud rate set in easyMail is incorrect. Close the other application or go to Options→Configuration→COM Settings… and choose the correct port and baud rate (default 4800).

Below is an explanation of the Connections field.

GPS
Green: GPS ok. Red: GPS error or no antenna connection.

Ant. Signal
This bar has 5 steps from all green to all red, depending on the quality of the satellite signal. Green: good signal quality. Red: no signal.

PC connect
Green: easyMail has connected to easyTrack. Red: No connection between easyMail and easyTrack

Please go on to the easyMail basic setup section, for a quick guide to getting easyTrack and easyMail configured and ready to use.

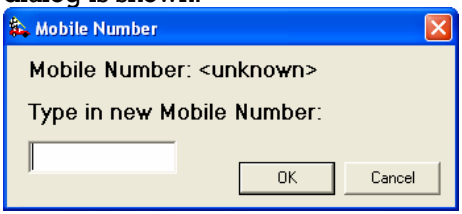
5.5 EASYMAIL BASIC SETUP

When starting easyMail for the first time, a few things need to be configured:

- Configure Mobile number.
- Log in to an Ocean Region.
- Default LES and E-mail Service Provider for sending messages.

Mobile number

Click Options→Configuration→Mobile number. The following dialog is shown:



Type the Mobile number (9 digits) and click 'Ok'.
The Mobile number should be updated:

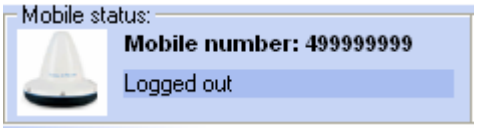


Figure 30 Example of Mobile number

Log in to an Ocean Region

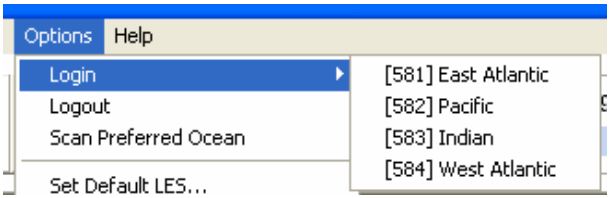


Figure 31 The login menu

Go to the menu Options→Login and choose between the 4 Ocean Regions depending on your current position.

After a short while the Mobile status field has changed:

Figure 32 Example when logged in to East Atlantic

You have now logged in to the Inmarsat satellite network.

Default LES and E-mail Service Provider for sending messages.

To set up easyMail for sending messages, the following needs to be configured.

Click Options→Set Default ISP…

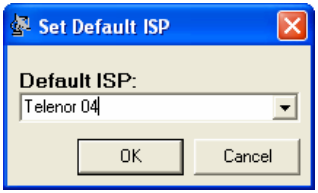


Figure 33 Choose your Service Provider

Choose your Inmarsat Service Provider on the list.

Click 'Options→Set Default LES…'

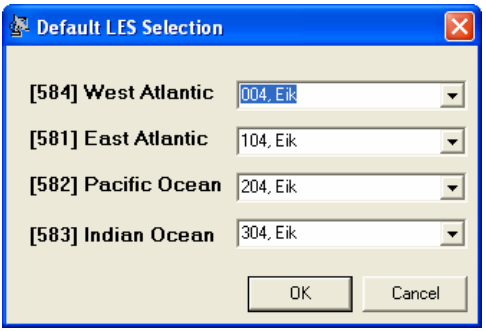


Figure 34 Land Earth Station setup

Choose the Land Earth Stations of your Inmarsat Service Provider for each Ocean Region.

You are now ready to send and receive messages.

5.6 GETTING NEW VERSIONS OF EASYMAIL

easyMail is a free program and can be downloaded on the Thrane & Thrane website on the following address:

http://www.thrane.com/easymail

6 TEST OF THE SYSTEM

6.1 LINK TEST

A link test (or PVT test) tests the satellite link between the transceiver and the Land Earth Station.

A link test is initiated by clicking 'Options→Link test'.
The test has 3 parts: Message reception, message transmission and distress test.

After the Link test is requested, the NCS will assign a LES to perform the Link test with. This can take a short while.
The transceiver will then perform three tests with a 6 minute interval.

An info will inform that the test has started and another info that the test was completed successfully or that it failed.

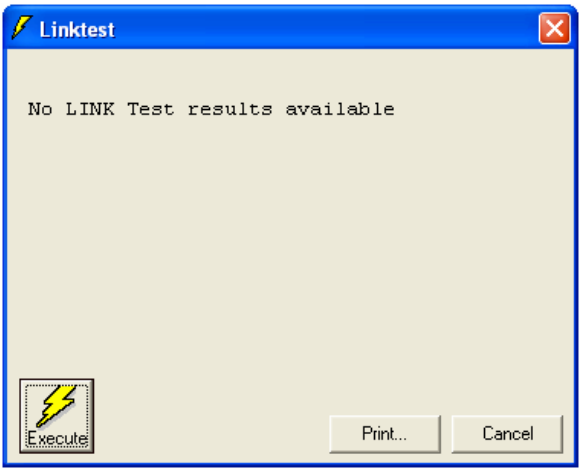


Figure 35 The link test dialog

Click 'Execute' to start the test.

6.2 ALARM BOX TEST

This applies to TT-3026D only.

IMPORTANT: DO **NEVER** TEST THIS INSTLLATION BY SENDING AN ALERT ON-AIR. ALSO BE CAREFUL **NOT** TO SEND FALSE ALERTS DURING INSTALLATION. Any Distress Alerts coming through the Inmarsat-C network will be taken seriously by the receiving authorities.

To verify the connection to the distress alarm panel choose the 'Distress→Distress Test Mode'. The windows shown in Figure 36 will be shown while test mode is active.

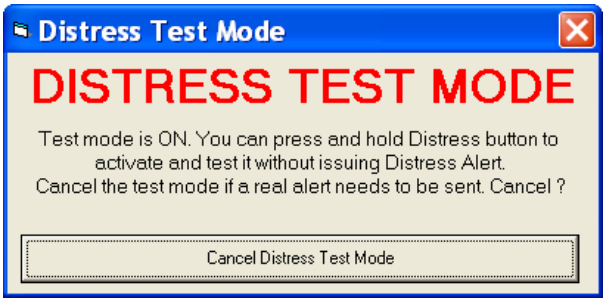


Figure 36 Distress test mode

In test mode the alarm panel can be pressed without any alerts being sent.
The recommended test procedure is this:

Action	Light in the button	Buzzer (if installed)
Press the alert button	Flashing	Beeping
Hold the button for at least 5 seconds	On with an off-period every 15 seconds.	Off
Press the CLEAR button (if installed)	Off	On
Release the CLEAR button (if installed)	Off	Off

If this test passes the installation is correct.

7 MAINTENANCE GUIDELINES

When properly installed the TT-3026D/M/S needs no maintenance.

After approximately 10 years an internal battery has to be replaced, and the transceiver must be sent for service.

7.1 HANDLING PRECAUTIONS

- Do not expose the transceiver's parting line (the blue styling gasket) & connector to high-pressure water jets.
- Exposure of chemical containing alkalis may result in physical degradation of the transceiver.
- Do not expose the transceiver to acid curing silicone.
- Avoid contact with solvents.

Do not paint the transceiver. If it is absolutely necessary to paint the transceiver, ideally water-based paints or paint system based on mild solvents should be selected.

8 APPENDIX A

8.1 MOUNTING STENCIL

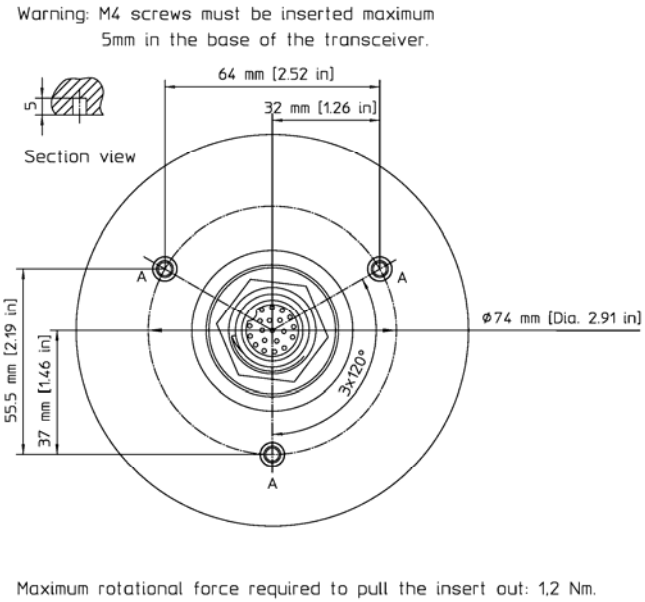


Figure 37 Mounting stencil

For connector: pre drilled hole 32mm (1.26") diameter
A: 3 x pre drilled holes 5mm (0.2") diameter for M4 screws.

9 APPENDIX B

9.1 INTERCONNECTION BOX TT-3616B

This chapter contains information on the TT-3616B interconnection box which can be used to connect the TT-3026D/M/S easyTrack to peripheral equipment. Note that TT-3616D has replaced TT-3616B. TT-3616B interconnection box includes proper connectors for DTE (Data Terminal Equipment), I/O ports (remote transducers, alarm button), on/off wire and power supply. The interconnection box also includes an amplification/buffer of the RS232 signals.

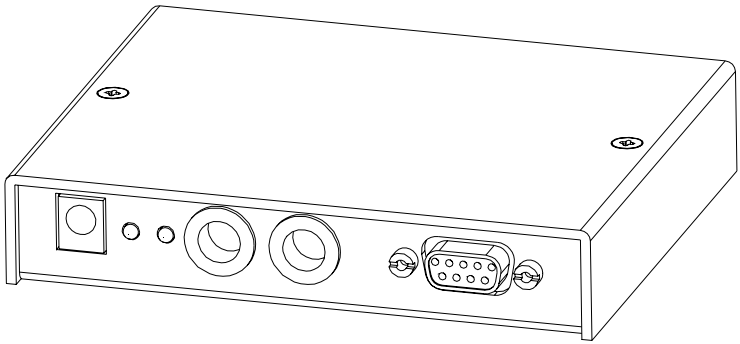


Figure 38 Interconnection box

When connecting the TT-3616B Interconnection box to a TT-3042E Inmarsat-C Distress Alarm Box, please refer to section 4.6 for wiring diagrams and installation procedures.

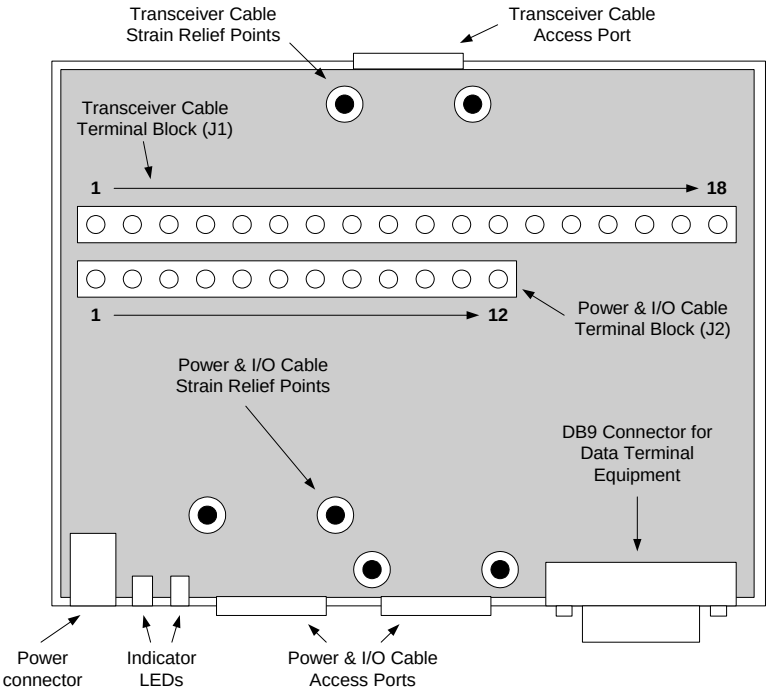


Figure 39 Interconnection Box Interior Arrangement

The J1 terminal block is labelled by wire colour. Connect the Transceiver cable as directed by these labels. The terminal numbers, colours and functions are explained in Table 5.

Number on Terminal Block J1	Wire colour in transceiver cable	Function
1	Red	DC+
2	Red	DC+
3	Black	DC-
4	Black	DC-
5	Black/Violet	3V3 out
6	White	GND
7	Black/Blue	I/O 1

Number on Terminal Block J1	Wire colour in transceiver cable	Function
8	Grey	I/O 2
9	Black/Yellow	I/O 3
10	Black/Grey	I/O 4
11	Brown	I/O 5
12	Black/Green	I/O 6
13	Yellow	Remote On/Off
14	Orange	GND
15	Blue	CTS
16	Violet	RTS
17	Green	RD
18	Black/Red	TD
Stain relief Bracket	Cable shield	GND

Table 9 Transceiver Cable Terminal Block

Remote On/Off is explained in section 4.2.2.

The DB9 Connector is connected to Data Terminal Equipment using a std. DB9 to DB9 Modem cable.

The J2 terminal block is labelled by pin function, as listed in Table 6.

Number on Terminal Block J2	Function
1	DC+
2	DC-
3	3V3 out
4	GND
5	I/O 1
6	I/O 2

Number on Terminal Block J2	Function
7	I/O 3
8	I/O 4
9	I/O 5
10	I/O 6
11	Remote On/Off
12	GND

Table 10 Power & I/O Cable Terminal Block

Jumper W2 enables LED 1, which indicates DC in.

10 APPENDIX C

10.1 AWG TO METRIC CONVERSION CHART

AWG Number	**Ø [Inch]**	**Ø [mm]**	**Ø [mm²]**	**Resistance [Ohm/m]**
4/0 = 0000	0.460	11.7	107	0.000161
3/0 = 000	0.410	10.4	85.0	0.000203
2/0 = 00	0.365	9.26	67.4	0.000256
1/0 = 0	0.325	8.25	53.5	0.000323
1	0.289	7.35	42.4	0.000407
2	0.258	6.54	33.6	0.000513
3	0.229	5.83	26.7	0.000647
4	0.204	5.19	21.1	0.000815
5	0.182	4.62	16.8	0.00103
6	0.162	4.11	13.3	0.00130
7	0.144	3.66	10.5	0.00163
8	0.128	3.26	8.36	0.00206
9	0.114	2.91	6.63	0.00260
AWG Number	**Ø [Inch]**	**Ø [mm]**	**Ø [mm²]**	**Resistance [Ohm/m]**
10	0.102	2.59	5.26	0.00328
11	0.0907	2.30	4.17	0.00413
12	0.0808	2.05	3.31	0.00521
13	0.0720	1.83	2.62	0.00657
14	0.0641	1.63	2.08	0.00829
15	0.0571	1.45	1.65	0.0104
16	0.0508	1.29	1.31	0.0132
17	0.0453	1.15	1.04	0.0166
18	0.0403	1.02	0.823	0.0210

19	0.0359	0.912	0.653	0.0264
AWG Number	**Ø [Inch]**	**Ø [mm]**	**Ø [mm²]**	**Resistance [Ohm/m]**
20	0.0320	0.812	0.518	0.0333
21	0.0285	0.723	0.410	0.0420
22	0.0253	0.644	0.326	0.0530
23	0.0226	0.573	0.258	0.0668
24	0.0201	0.511	0.205	0.0842
25	0.0179	0.455	0.162	0.106
26	0.0159	0.405	0.129	0.134
27	0.0142	0.361	0.102	0.169
28	0.0126	0.321	0.0810	0.213
29	0.0113	0.286	0.0642	0.268
AWG Number	**Ø [Inch]**	**Ø [mm]**	**Ø [mm²]**	**Resistance [Ohm/m]**
30	0.0100	0.255	0.0509	0.339
31	0.00893	0.227	0.0404	0.427
32	0.00795	0.202	0.0320	0.538
33	0.00708	0.180	0.0254	0.679
34	0.00631	0.160	0.0201	0.856
35	0.00562	0.143	0.0160	1.08
36	0.00500	0.127	0.0127	1.36
37	0.00445	0.113	0.0100	1.72
38	0.00397	0.101	0.00797	2.16
39	0.00353	0.0897	0.00632	2.73
40	0.00314	0.0799	0.00501	3.44

Table 11 AWG to Metric Conversion Chart

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