Maritime Capsat® Transceiver

TT-3020C

Installation Manual

Thrane & Thrane

Maritime Capsat® Transceiver

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REVISION HISTORY

Rev.	Date	App.	Section	Description / Remarks
D	22-Oct--2003		0	NMEA IEC61162-1
E	01-Nov-2005		3.8.2	Remote Incoming Mail LED

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 minimise shock hazard, the equipment chassis and cabinet must be connected to an electrical ground

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.

SAFETY DISTANCE FOR THE ANTENNA UNIT

Minimum safety distance of 2 feet (61 cm) from the Antenna.
Radiated intensity at 0.56m is 10 W/m^2
Radiated intensity at 0.36m is 25 W/m^2
Radiated intensity at 0.18m is 100 W/m^2

COMPASS SAFE DISTANCE

Minimum safety distance of 50 cm from the TT-3020C transceiver

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Table of Contents

TABLE OF CONTENTS

Table of Figures

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Table of Tables

Introduction

This manual provides instructions for installing, configuring and testing of a TT-3000C Integrated Capsat System that includes a TT-3020C Capsat Transceiver.
A wide variety of options and accessories may be linked together with the Capsat Transceiver, the specific installation and configuring of these are to be found in their respective Reference Manuals.

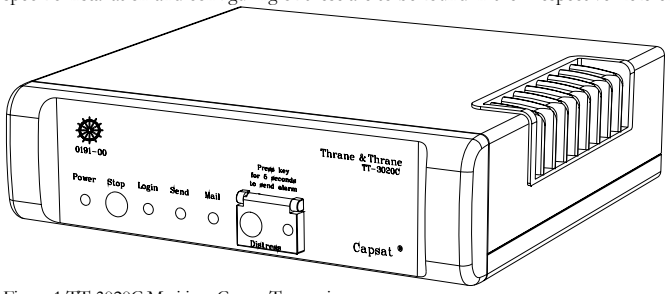

Figure 1 TT-3020C Maritime Capsat Transceiver

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 front or rear panel or the outer cover. Read the safety summary at the front of this manual before installing or operating the TT-3020C Transceiver.

Inspect the shipping carton immediately upon receipt for evidence of mishandling during the transit. If the shipping carton is severely damaged or water stained, 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 enclosed packing list. If the contents are incomplete, if there is mechanical damage or defect, or if the TT-3020C Capsat Transceiver does not work properly, notify your dealer.
After you unpack the TT-3020C Capsat Transceiver, inspect it thoroughly for hidden damage and loose components or fittings.

- Inspect the cable harness for stress, loose or broken wires, or broken cable tires.
- Examine all the components for loose or missing hardware. Tighten all loose hardware.

Storage

The TT-3020C may be stored or shipped in temperatures within the limits -40° C to +80° C. It is advisable to protect the TT-3020C from extreme temperature variation which can cause excessive condensation. It is recommended that the TT-3020C is un-packed immediately on delivery.

Repackaging for shipment

The shipping carton for the TT-3020C 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.

1. Wrap the TT-3020C in heavy paper or plastic. Attach a tag indicating the type of service required, return address, model number and full serial number.
2. Use a strong shipping container, e.g. a double walled carton of 160 kg test material.
3. 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.
4. Seal the shipping container securely.
5. Mark the shipping container **FRAGILE** to ensure careful handling.

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Installation - TT-3020C

This chapter provides specific information enabling you to install the TT-3020C Capsat Transceiver into your own system, with a minimal effort. The default, or factory configuration is described, together with procedures for altering this configuration.

Technical specifications

Model	TT-3020C
General Specifications	Meets or exceeds all INMARSAT specifications for the Inmarsat-C Network for SOLAS with distress call functions. (CN114 and IEC 60945 requirements). EEC EMC, CE and Wheel Mark
Transmit Frequency	1626.5 to 1660.5 MHz.
Receive Frequency	1525.0 to 1559.0 MHz.
Channel Spacing	5 / 2.5 / 1.25 kHz.
Modulation	1200 symbols/sec BPSK.
Ambiguity Resolution	Unique word.
Coding	R 1/2 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 symbol.

Antenna Interface	Standard 50 Ohm female TNC-connector. Max 70m cable with TT-3005A antenna or max 100m cable with TT-3001B or TT-3005M antenna.
Terminal Interface	EIA/TIA-232-E DTE interface. CCITT Rec.V.24/28, 110-38400 Baud IA-5 code, DB-9F connector.
Printer Interface	Standard parallel Centronics, DB-25F connector. IEEE P1284-I
I/O Interface:	NMEA-0183 version 2.1 interface and multidrop addressing, max.100 meter cable. ArcNet 156Kbit token based I/O, max 100 meter cable (ATA/ANSI 878.1) Four dedicated In/Out pins and two Inputs pins to the TT-3042C Remote Alarm/Distress Box. DB-15F connector
System Set-up	Flash memory
DC Power Source	10.5 to 32 V floating DC RX: 3.8 W with GPS 4.4W TX: Typ. 80 W max. 90W
Fuse	12A T
Ambient Temperature	-25°C to 55°C operating -40°C to 80°C storage.
Electronic Unit Mounting	Mounting bracket.
Dimensions H x W x D	50mm x 180mm x 165mm. (car radio standard ISO7736)
Weight	1.3 kg

Table 1 TT-3020C technical specifications.

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 Pre-assigned Data reporting Transmit message size: Max 32Kbyte Receive storage: 106 Kbyte SOLAS distress calling facilities.

Table 2 Inmarsat-C Protocol support.

Compass Safe Distance

The compass safe distance of the TT-3020C transceiver has been measured in accordance with the standards specified in ISO/R 694, Method B. The safe distance found is 50 cm.

Power requirements

The TT-3020C Maritime Capsat transceiver is designed to operate on floating DC in the range 10 - 32 V, which makes an AC/DC converter needed, in case the system is to work in an AC environment. The total power consumption varies with the particular system in question. As a guide-line, please note the power consumption of the following equipment:

Power requirements	Receive mode	Transmit mode
TT-3020C Capsat Transceiver incl. TT-3005M Antenna. Floating DC (10-32V).	3.8W	80W Max. 90W
TT-3020C Capsat Transceiver incl. TT-3005M Antenna & GPS. Floating DC (10-32V).	4..4W	80W Max. 90W

Table 3 TT-3020C power requirements

Fuse

The TT-3020C has a single fuse, which can be found on the rear panel. In case it needs replacement a 12 A T type must be used.

Functional description

This section describes the functions of the TT-3020C Maritime Capsat transceiver.

On/Off features

The TT-3020C Transceiver/GPS is powered from a DC source (10-32V). The system is switched ON by the ON/OFF switch S1 placed on the rear panel of the TT-3020C Transceiver, and the remote on/off wire (white) in the DC input cable. Please see Table 5 for more information about remote on/off. The priority of the different functions are defined in Table 4.

Master on/off switch S1	Remote on/off by the input DC cable (pin 6, white)	TT-3020C Transceiver on/off
0	x	Off
1	0	Off
1	1	On

Table 4 TT-3020C Capsat Transceiver ON/OFF overview

"1" - feature active
"0" - feature disable
"x" - don't care

Front indicators and buttons

The functions of the five indicators, the Stop and Alarm buttons are as follows.
The Power indicator will always be on when there is DC-power on the Transceiver.
The Stop button is used to set the serial port to the default values. If this button is pressed at power-on the serial port is set to 4800 baud, 8 databits, no parity, 1 stopbit. If the button is pressed after the Transceiver is turned on, nothing will happen. The Stop button can also be used for switching off the Distress indicator when the distress acknowledge has been received. Finally the Stop button can be used for initiating a manual positioning report if the transceiver is configured for this operation.
The Login indicator will be on when the Transceiver is logged into an ocean area. If the Transceiver is in synchronisation but hasn't been logged into an ocean area the indicator will flash. If the Transceiver is unable to get synchronisation the indicator will be off. Please notice that the TT-3020C during power-up will attempt to auto-login to a preferred ocean region if currently logged out of the network.
The Send indicator will be flashing when the Transceiver enters the Transmit protocol. When the Transceiver is transmitting the indicator will be on. When the transmission is completed the indicator will flash until an acknowledgement is received from the Land Earth Station (LES) .
The Mail indicator will flash if the Transceiver is receiving a Non-EGC message. When the message has been received the indicator will be on. The indicator will be on until the message has been read. If the Capsat program is used the message will be read immediately by Capsat. Because of this the user will see the Mail indicator flash when a message is being received and then turns off when the message is received.
The Distress button is used to send Distress Alerts. Pressing the Distress button will make the equipment beep and the Distress LED flash. If the button is pressed for at least 5 seconds and the Distress LED becomes steady the equipment will send a Distress Alert. The Distress Alert, with current position of the ship, will be sent to the land station used for your latest transmissions except when another destination is specified in the Distress Generator. After you have sent a maritime Distress Alert, you may then send a detailed distress message, please see software operators guide.
The Distress indicator. When a Distress Alert has been sent the Distress LED will be constantly on. The Distress indicator can be switched off when an acknowledgement is received from the LES by pressing the Stop button.

Connectors

This section defines the functions and pin assignments of the TT-3020C connectors.

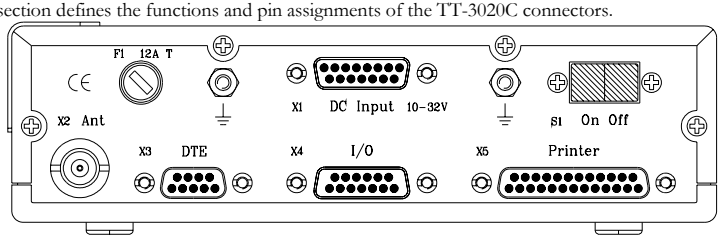

Figure 2TT-3020C Capsat Transceiver rear panel

Power connector

The battery connector is a standard DB-15 male, located on the rear panel of the TT-3020C at X1. Regardless whether the unit is designed to work on floating DC or modified to match your DC requirements the pin assignment of the DC/Battery power connector and DC cable matches the description given in Table 5.

X1 Pins	Name	Signal Description	DC Cable 37-107881-A
1,2,9,10	SUP+	10-32 VDC (Battery Positive input)	Red 2.5mm^2
3		NC	
4,5,12,13	SUP-	DC RN (Battery Negative input)	Black 2.5mm^2
6	ON/OFF	Remote ON/OFF[1]	White 0.25mm^2
7,8	SGND	Chassis (Secondary GND)	
11		NC	
14,15	9V out	Floating +9V out max 400mA on pin 14 & 15. Ref. to Chassis (Secondary GND)	Secondary GND Yellow/green wire

[1] This wire has to be connected to battery negative (black wire), to be able to turn on. Please see section 0, On/Off features.

		Note: Max. load (400mA) is a combination of this output and X4 pin 5.	with Transparent connector
Ground	GND		Ground shield

Table 5 TT-3020C Capsat Transceiver DC Power Connector pin assignment

Pin 6 is a unique feature for the TT-3020C Capsat Transceiver. When this pin is left floating the Transceiver is turned off, but if pin 6 is shorted to the negative terminal of the battery or DC-supply, the Transceiver will be switched on. This makes it possible for external equipment to perform remote power control of the TT-3020C.
The remote power control can be controlled by an external relay or solid state switch.
The battery connection input is floating, i.e. there is no galvanic connection from any of the battery poles to the cabinet frame.

DTE Communication port

The TT-3020C Capsat Transceiver communicates with a controller device via the standard EIA/TIA-232E ports on a female 9 pole Sub-D connector, located on the rear panel at X3.

BAUDRATE AND PROTOCOL SETTINGS

The TT-3020C accepts the following:

Baud rates	**Protocol settings**	**Handshake**
110 Baud	7/8 databits	Hardware
150 Baud	No/Even/Odd parity	Using DTR and CTS
300 Baud	1/2 stopbits	
600 Baud		Software
1200 Baud		Using XON and XOFF
2400 Baud		
4800 Baud		
9600 Baud		
19200 Baud		
38400 Baud		

Table 6 Automatic baudrate settings

The serial port communication parameters are factory programmed to:

4800 Baud, 8 databits, no parity, 1 stopbit

Please see section 0 to alter baudrate and protocol settings.

DTE CONNECTOR INTERFACE

The TT-3020C which is a DCE uses the signals listed in Table 7 (marked with a ✓ in the *Used* column).Please notice that DTE pin naming is used.

Name	Signal description	9-Pin	Used	Levels	Direction
DCD	Data Carrier Detect	1		EIA/TIA-232-E	□➔
RxD	Received Data	2	✓	EIA/TIA-232-E	□➔
TxD	Transmitted Data	3	✓	EIA/TIA-232-E	□➔
DTR	Data Terminal Ready	4	✓	EIA/TIA-232-E	□➔
GND	Ground	5	✓		
DSR	Data Set Ready	6	✓	EIA/TIA-232-E	□➔
RTS	Request To Send	7			
CTS	Clear To Send	8	✓	EIA/TIA-232-E	□➔
RI[1]	Ring Indicator	9	✓	EIA/TIA-232-E	□➔

Table 7 TT-3020C X3 pin assignment

The □➔ symbol means that the signal is generated by the Transceiver.
For full operating specifications for the serial interface, you are kindly requested to refer to the CCITT Rec. V24 and the EIA/TIA-232-E specifications.

INTERFACING TO PERIPHERALS

To Interface the TT-3020C to a TT-3606E Message Terminal, simply use the communication cable enclosed in the delivery.
An extended serial communication cable should not exceed 100 meters as the TT-3606E works on 4800 Baud using the EIA-423 standard.
The TT-3020C optionally uses either hardware or software flow control.
Hardware flow control is accomplished by using the DTR and CTS signals.
Software flow control is accomplished by connecting the DTR and CTS, allowing both TT-3020C and the peripheral to control data flow by means XON XOFF. ENQ/ACK cannot be used.

I/O Connector

The I/O connector **X4** on the back panel of the TT-3020C Transceiver can be used for

- ArcNet 156Kbit communication to control the TT-3042D Remote Alarm Distress Box with additional printer or the TT-3608G Printer Unit.
- The International NMEA 0183 version 2.1 communication standard input and output when connecting to a commercial available navigator device or using the built-in GPS in navigation mode.
  This interface also fully comply with the European standard IEC61162-1 approved at 2001-05-04. IEC61162-1 is supported from software version 3.32.
- Four parallel In/Out RS-410N pins and two RS-410N input pins to control the TT-3042C Remote Alarm/Distress box.

[1] The RI indicator goes high (approximately 8 Volts), when a message or an EGC is received. RI is reset to low when the message/EGC has been printed and/or routed to external printer/DTE equipment.

Signal	X4 pin	Specification general purpose I/O
I/O0 (IO)	1	Digital open collector output with pull-up/input with pull-up (RS-410N).
I/O1 (IO)	2	Digital open collector output with pull-up/input with pull-up (RS-410N).
I/O2 (IO)	3	Digital open collector output with pull-up/input with pull-up (RS-410N).
I/O3 (IO)	4	Digital open collector output with pull-up/input with pull-up (RS-410N).
9Vdc *(O)*	5	DC +9V, ±10%. Max. 400mA. Floating Supply voltage for external devices. Note: Max. load (400mA) is a combination of this output and X1 pin 14,15.
Ground	6,9	Ground reference.
ArcNet A/B (IO)	7/8	ArcNet signal wires A/B (ATA/ANSI 878.1; ARCNET/TB).
NMEA Out A/B (Talker)	10/11	NMEA 0183 output signal wires A/B (NMEA 0183 version 2.1). Outputdrive capability loads 12 units of 100Ω impedance.
NMEA In A/B (Listener)	12/13	NMEA 0183 input signal wires A/B (NMEA 0183 version 2.1). Load requirements as listener : Difference voltage of A/B ($\Delta AB_{Voltage}$) ≥2V@1mA
I4 *(I)*	14	Digital input with pull-up (RS-410N).
I5 *(I)*	15	Digital input with pull-up (RS-410N).

Table 8 TT-3020C X4 pin assignment

The I/O connector, a standard DB-15 female connector, is located on the rear panel of the transceiver and is marked X4.

SCHEMATIC OF NMEA RECEIVER AND DRIVER

Below figure show a schematic of NMEA receiver and talker driver part for TT3020C. Transmit (TX) is based on a half-duplex transceivers MAX 483. This driver loads 32 unit-loads of 12kΩ impedance or unit-loads 12 listener of 100Ω impedance. Listener voltage ($\Delta AB_{Voltage}$) are specified as $\Delta AB_{Voltage} \geq$ 2V@1mA. Receive (RX) is based on Opto-Coupler IL207. All input and output are connected by (J4) DB15F.

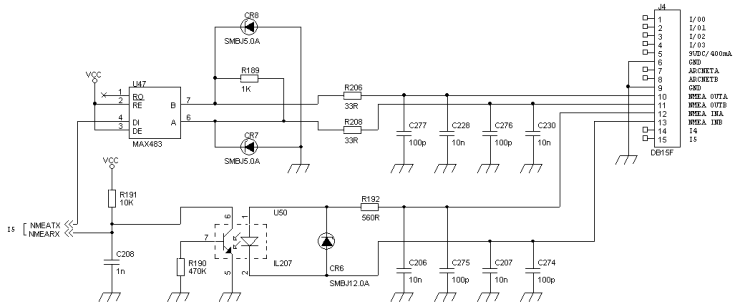

Figure 3 TT-3020C NMEA receiver and drive schematic.

Bill Of Materials

Quantity	Reference	Part
1	CR6	SMBJ12.0A
2	CR7,CR8	SMBJ5.0A
4	C206,C207,C228,C230	10n
1	C208	1n
4	C274,C275,C276,C277	100p
1	J4	DB15F
1	R189	1K
1	R190	470K
1	R191	10K
1	R192	560R
2	R208,R206	33R
1	U47	MAX483
1	U50	IL207

Figure 4 TT3020C Connector type and part number of NMEA receiver and drive schematic.

NMEA 0183 RECEPTION

The NMEA 0183 Standard uses a reduced ASCII alphabet to send strings containing fx. navigational data. This data can be read by the Transceiver via the I/O NMEA interface connector X4.
The following is a list of the NMEA codes that the Transceiver will recognise with or without a built-in GPS (only values read by the 3020C are described):

Water speed and heading:

$GPVHW, x.x(1), T, x.x, M, x.x(2), N, x.x, K*hh<CR><LF>

Values: 1: Heading, degrees true - variable number (leading and trailing zeros are optional).
2: Speed, knots - variable number.

Transducer measurements:

$GPXDR, a(1), x.x(2), a(3), c--c(4), ... a(n-3), x.x(n-2), a(n-1), c--c(n)*hh<CR><LF>

Values: The sentence (from 1 to n) is registered without being parsed (used for special transmission).

Wind speed and angle:

$GPMWV, x.x(1), a(2), x.x(3), a(4), A(5)*hh<CR><LF>

Values: 1: Wind angle in degrees - variable number.
2: Reference, (R) relative or (T) true.
3: Wind speed - variable number.
4: Wind speed units, (K) km/h, (M) m/s, (N) knots.
5: Status indicator - if 'N' (invalid), sentence is ignored.

Water temperature:

$GPMTW, x.x(1), C*hh<CR><LF>

Values: 1: Temperature, degrees C - variable number.

The following is a list of the NMEA codes that the Transceiver will recognise, if you do not have a built-in GPS or the built-in GPS is in acquisition mode.

Global positioning system (GPS) fix data:

$GPGGA, hhmmss.ss(1), llll.ll(2), a(3), yyyyy.yy(4), a(5), x(6), xx, x.x, x.x(7), M, x.x, M, x.x, xxxx*hh<CR><LF>

Values:
1: Time - fixed length (decimal fraction of second optional).
2: Latitude - fixed length(dec. fraction of min. optional).
3: Latitude N/S - fixed length.
4: Longitude-fixed length(dec. fraction of min. optional).
5: Longitude E/W - fixed length.
6: GPS quality indicator - if 0, sentence is ignored.
7: Antenna altitude above/below mean sea lvl (geoid).

Geographic position, latitude and longitude:

$GPGLL, llll.ll(1), a(2), yyyyy.yy(3), a(4), hhmmss.ss(5), A(6), a(7)*hh<CR><LF>

Values: 1: Latitude - fixed length (dec. fraction of min. optional).
2: Latitude N/S - fixed length.
3: Longitude-fixed length (dec. fraction of min. optional).
4: Longitude E/W - fixed length.
5: Time - fixed length (dec. fraction of second optional).
6: Status indicator - if V (invalid), sentence is ignored.
7: Mode indicator - if N (invalid), sentence is ignored.

Course over ground and ground speed:
$GPVTG, x.x(1), T, x.x, M, x.x(2), N, x.x, K, a(3)*hh<CR><LF>
Values: 1: Course over ground, degrees true - variable number.
2: Speed over ground in knots - variable number.
3: Mode indicator - if N (invalid), sentence is ignored.

Heading true:
$GPHDT, x.x(1), T*hh<CR><LF>
Values: 1: Heading degrees, true - variable number.

UTC Time and date:
$GPZDA, hhmmss.ss(1), xx(2), xx(3), xxxx(4), xx(5), xx(6)*hh<CR><LF>
Values: 1: UTC time - fixed length (dec. fraction of sec. optional). 2: UTC Day - fixed length.
3: UTC Month - fixed length.
4: UTC Year - fixed length.
5: Local zone hours - fixed length.
6: Local zone minutes - fixed length.

GNSS fix data:
$GPGNS, hhmmss.ss(1), llll.ll(2), a(3), yyyyy.yy(4), a(5), c--c(6), xx ,x.x, x.x, x.x(7), x.x, x.x*hh<CR><LF>
Values 1: UTC time - fixed length (dec. fraction of sec. optional). 2: Latitude - fixed length (dec. fraction of min. optional).
3: Latitude N/S - fixed length.
4: Longitude-fixed length (dec. fraction of min. optional).
5: Longitude E/W - fixed length.
6: Mode indicator - if first character is 'N' (GPS no fix), sentence is ignored.
7: Antenna altitude - variable number.

Note, no data fields of the above NMEA sentences are required - e.g. sentences are accepted as long as the talker identifier is GP, the sentence format is one of the above mentioned and checksum is correct.

NMEA 0183 NAVIGATIONAL INTERFACE

A large number of Navigators will provide suitable NMEA 0183 strings to the Capsat Transceiver.

NMEA 0183 TRANSMISSION

When your Transceiver has a built-in GPS, it sends out NMEA 0183 navigational data to the device connected to the Transceiver, via the I/O NMEA connector X4.
The following four strings:
VTG Heading and speed information
GLL Geographic position, latitude and longitude
GGA Global Positioning System fix data (includes time of position)
ZDA Time and date
are sent out when the Transceiver/GPS is in navigation mode. The time in the position strings and the Time-and-date string are always the same. The spacing between each block of data is 2 seconds and 0.5 seconds between GLL, GGA and ZDA strings when they are present. All strings transmitted are labelled with talker ID mnemonic GP (Global Positioning System - GPS).
Data field GGA/Geoidal Separation, GGA/age of differential GPS data, GGA/differential reference station ID, ZDA/local zone hours and ZDA/local zone minutes are never transmitted - e.g. part of transmitted sentences. Time fields in GGA and GLL can under certain circumstances be left out.
An example is:

$GPVTG,000.,T,000.,M,00.0,N,00.0,K,A*23

$GPGLL,,5547.60,N,01231.40,E,185219,A,A*41

$GPGGA,185219,5547.60,N,01231.40,E,1,07,1,0,M,,M,,*5C

$GPZDA,185219,13,10,2003,,*4C

The following three strings: VTG, GLL and GGA are sent out when the Transceiver/GPS is in acquisition mode and the currently stored position is less than 30 seconds old. The time indicates that of the last known position. The course and speed are 8 second mean values.

An example is:

$GPVTG,000.,T,000.,M,00.0,N,00.0,K,N*2C

$GPGLL,,5547.60,N,01231.40,E,,V,N*5F

$GPGGA,,5547.60,N,01231.40,E,0,07,3,0,M,,M,,*59

An empty GLL string is sent out when there is no built-in GPS or before the GPS module has been started by the Transceiver.

$GPGLL,,,,,,*64
$GPGLL,,,,,,*64
$GPGLL,,,,,,*64

Printer port

The printer port connector X5 is located on the rear panel.
This parallel interface conforms to the standard Centronics interface used e.g. on IBM compatible PC's.

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

Table 9 Printer port (X5) pin assignment

Grounding

RF-grounding of an Integrated Capsat System requires special attention. Each unit shall have its own individual low-inductance earth connection. The use of a common bus bar for grounding is not recommended as this can lead to unwanted common-mode coupling effects. The ground should be connected to the cabinets metal frame to provide a return path for fault currents due to equipment malfunction or external faults such as lightning. Interconnecting cables must be well screened.

Built-in GPS (optional)

GPS means Global Positioning System.
The GPS module is installed from the factory and you need not to perform any installation to use it.
If you have ordered your Capsat Transceiver without a built-in GPS and you later need to install a GPS module, then you should contact your dealer to obtain instructions on how to accomplish this.

GPS specifications

The GPS receiver module tracks 12 GPS satellites . The following power-up time estimates are available, from field test.

Start state	GPS 25
All data known	15 sec
Position, time and almanac known	45 sec
Almanac known	90 sec
No data known	5 min
Field test cold start same position after 8 hours off	
Update rate	1 second (typical)
Position accuracy	15m RMS (100m with Selective Availability on)
Typical velocity accuracy	0.2m/s RMS

Table 10 GPS Specifications

Mounting bracket

The TT-3020C Capsat Transceiver is supplied with an universal mounting plate (41-107093-A) which allows mounting to e.g. a table.

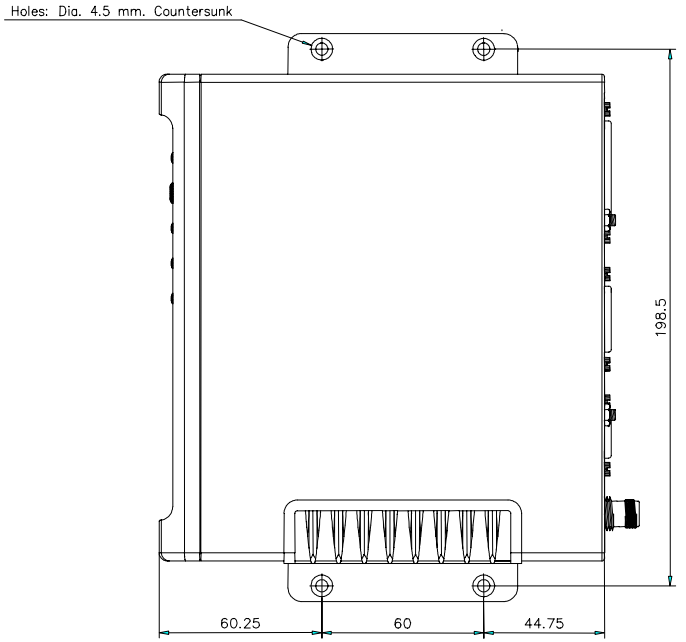

Figure 5 TT-3020C Capsat Transceiver mounting plate.

All dimensions are in mm

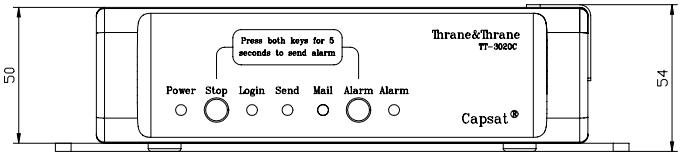

Figure 6 Front panel of the TT-3020C Capsat Transceiver with mounting bracket

All dimensions are in mm

It is recommended that the Transceiver is mounted in an open air location.

System Installation

This chapter provides specific information enabling you to install the TT-3020C Maritime Capsat system with a minimal effort. The default, or factory configuration is described, together with procedures for altering this configuration.

The TT-3000C Integrated Capsat system consists of the following components:

TT-3020C	Inmarsat-C Maritime Transceiver with GPS option.	
TT-3001B Opt. 001	Maritime Antenna Unit	or
TT-3005A	Maritime Antenna Unit.	or
TT-3005M	Maritime Antenna Unit	
TT-3606E	Message Terminal	
TT-3601E	Keyboard	
TT-3680B	Power Supply	
TT-3608A	Hard Copy Printer	or
TT-3042D	Local Printer	
TT-3042C (optional)	Remote Alarm Distress Box	
TT-3042D (optional)	Remote Alarm Distress Box with Printer	
TT-3608G (optional)	Remote Printer Unit	

Power requirements

A TT-3000C Integrated Capsat System operates on either 115 VAC, 220 VAC or a 24 V floating DC (nominal value), with an absolute minimum of 15 V DC at the input terminal of the TT-3680B AC/DC converter. The TT-3680B provides automatic switch over to the DC supply in case a drop out occurs on the mains.

The total power consumption varies with the particular system in question. As a guide-line, please note the power consumption of the following equipment:

Power requirements	Receive mode	Transmit mode
TT-3020C Capsat Transceiver incl. TT-3005M antenna. Floating DC (10-32V).	3.8W	80W Max. 90W
TT-3020C Capsat Transceiver Incl. TT-3005M Antenna & GPS. Floating DC (10-32V).	4.4W	80W Max. 90W
TT-3606E Message Terminal, incl. Keyboard. Floating DC (10.5 - 32V)	13 W average	20 W peak
TT-3608A Printer 220AC or option 010 DC supply floating (10.5 - 32V)	33W	
TT-3042D Remote Alarm Distress Box with printer	2.5 W standby	7 W printing
TT-3608G Remote Printer Unit	2.5 W standby	7 W printing

Table 11 Capsat System component power requirements

Fuses

In case you experience that a fuse needs replacement, please check that the equipment has not been exposed to physical damage before fuse replacement takes place.

WARNING

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 or the outer cover. Read the safety summary at the front of this manual before installing or operating the TT-3020C Transceiver

As a guide-line, please note the equipment fuse location given in Table 12.

Equipment	Location	Fuse size
TT-3020C Capsat Transceiver incl. Antenna.	Externally accessed, located on the rear panel.	12A T.
TT-3606E Message Terminal	Internal automatic recovering poly fuse	
TT-3042C Remote Alarm/Distress box	No fuse	
TT-3042D Remote Alarm Distress Box with printer	Internally accessed, remove top cover	1 A mT
TT-3608A Hard Copy Printer	Internally accessed, remove top cover	1.5A mT.
TT-3608G Remote Printer Unit	Internally accessed, remove top cover	1 A mT
TT-3680B Power Supply (200 Watt)	Internally accessed, remove top cover.	4 A mT 3 x 16A T 5 x 10A T

Table 12 Capsat System Fuses

The TT-3680B Power Supply may blow an internal fuse in case you power up the entire Integrated System with all DC units turned on. It is therefore recommended to power up the DC units one by one.

Compass Safe Distance

The compass safe distance of the individual devices in the TT-3000C Maritime Capsat system has been measured in accordance with the standards specified in ISO/R 694, Method B. The safe distances found are:

Model	Compass Safe Distance
TT-3020C, Transceiver	0.5 m
TT-3606E Message Terminal	0.5 m
TT-3601E Keyboard	0.3 m
TT-3042C, Remote Alarm Distress Box	0.5 m
TT-3601A, Keyboard	0.5 m
TT-3608A, Hard copy printer	2.0 m
TT-3680B, Power supply	2.0 m
TT-3005M Maritime Antenna	0.3 m

Table 13 Compass Safe Distance

Antennas

This section describes the different antennas types, which can be delivered with the TT-3000C Maritime Capsat system. The mounting consideration regarding the antennas and the choice of antenna cable are also described.

TT-3005M Maritime Antenna

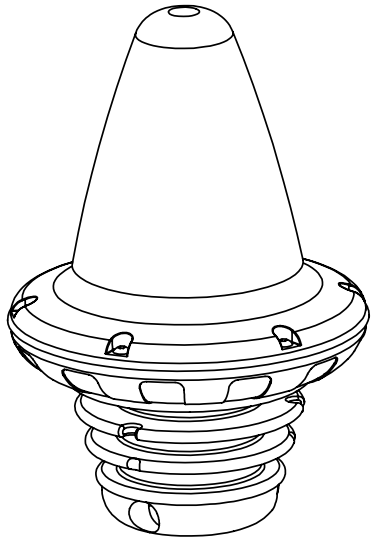

Figure 7 TT-3005M Maritime Antenna

The TT-3005M is an omni-directional antenna with built-in LNA/HPA electronics designed to operate on vessels. The antenna housing is sealed and contains no user serviceable parts.
The antenna is very compact and is designed to operate in a corrosive environment and in extreme weather conditions without any service. It has a modular construction that allows easy exchange of antenna elements.
The antenna is designed to work with the Capsat transceivers TT-3020C, TT-3022D and TT-3022C.
The TT-3005M antenna is fully compatible with the Inmarsat-C GMDSS (General Maritime Distress and Safety System) specifications, , and can also receive GPS signals while not transmitting. This antenna can handle up to 32 Kbytes transmission length and up to 100 meter coax cable.
The TT-3005M antenna is designed to operate when the satellite is visible over the horizon and no signal path blockage is present.
The TT-3005M antenna is equipped with a TNC female connector and with 1" tube mounting. Please see section 0.

TT-3005M Maritime Antenna	Inmarsat-C/GPS omnidirectional antenna, RHC polarised. G/T: -23 dB/K at 5° elevation EIRP: 14 dBW ± 2dB at 5° elevation. Temperature: -35°C to 55°C operating, -40°C to 80°C storage. Dimensions (H x D): 178 mm x 122 mm. Weight: 0.90 kg.
Maximum transmission length	32 Kbyte.
Solar Radiation	Max. flux density 1200W/m2.
Relative Humidity	95% non-condensing at 40°C.
Precipitation	Up to 100 mm/hour, droplet size 0.5 to 4.5 mm
Ice	Up to 25 mm.
Wind	Up to 200 km/hour.
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
Antenna Mounting	1" tube mounting
Transceiver coax cable	0.7Ohm max DC resistance (shield + inner conductor) 17dB max RF insertion loss at 1.6GHz. 100 meter max cable length. TNC connectors.

Table 14 TT-3005M technical specifications.

ANTENNA CONNECTOR

"N" and "TNC" type connectors are available from manufacturers like:
Suhner, Radial, Omnispectra, Kings, etc.

ANTENNA CABLE

The TT-3005M Antenna specifications requires that the total maximal attenuation at 1.65 GHz must be less than 17 dB, and the maximal total (short-circuited in one end) DC resistance must not exceed 0.7 Ohms.
In case the antenna cable is to be produced on site, the cable type should match the below listed guidelines:

Range (m)	Cable type no.	Connector type no. (Suhners)
1 - 10	RG-223U, 5.5 mm	11TNC-50-3-14c and 11N-50-3-29c
11 - 40	RG-214U, 10.8 mm	11TNC-50-7-2c and 11N-50-7-44c
41 - 80	Suhner: SA7272, 10.0 mm Nokia: 02Y(st)C2YC 2,7/7,3AF	The SA7272 cable with N connectors (11N-50-7-35) and one adapters N female to TNC male (33TNC-N-50-51) TNC male / N male
81 - 100	SA12272, 15.0 mm	The SA12272 cable with N connectors (11N-50-12-35C) and one adapter N female to TNC male (33TNC-N-50-51)

Table 15 TT-3020C Capsat Transceiver Antenna Cable types (TNC - TNC) for TT-3005M.

All antenna cables types are double shielded.
The antenna cable may run together with radar or navigator cables. Separate cable ditch is not required.
If you install your system in a permanent location, we recommend that you, after the installation of the antenna, wrap the connector with the enclosed self-bonding tape, disabling water from penetrating the connection.

MOUNTING

The TT-3005M maritime antenna is constructed for 1" tube mounting.

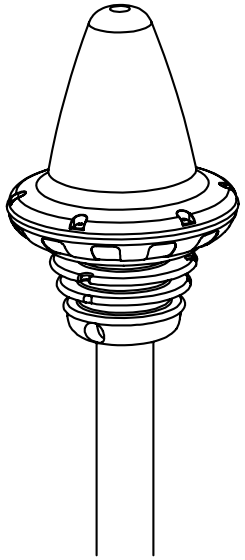

Figure 8 TT-3005M 1" Tube Mounting

It is important to notice that the pole mount device has to be disconnected from the antenna body when the antenna cable should be mounted. It is not possible to mount the cable without dismantling the pole mount.

TRANSCEIVER CONFIGURATION

This new antenna is designed to use a very low amount of power. To ensure that the transceiver detects the antenna as connected the voltage output of the transceiver has to be reduced. Issuing the following command in the transceiver shell does this:
"Se –f 0"
If this command is not run the transceiver will probably set-up a warning box stating that the antenna is not connected.
Please refer to section 0 for a detailed description.

TT-3005A Maritime Antenna

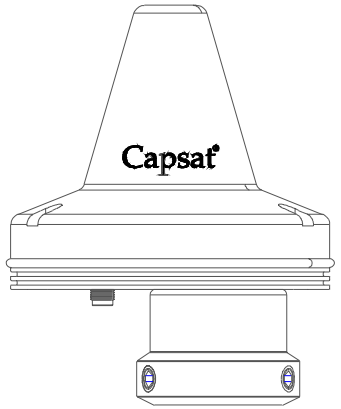

Figure 9 TT-3005A Maritime Antenna

This is an omni-directional antenna with built-in LNA/HPA electronics designed to operate on vessels. The antenna housing is sealed and contains no user serviceable parts.
The antenna is very compact and is designed to operate in a corrosive environment and in extreme weather conditions without any service. It has a modular construction that allows easy exchange of antenna elements.
The TT-3005A antenna is fully compatible with the Inmarsat-C GMDSS (General Maritime Distress and Safety System) specifications, , and can also receive GPS signals while not transmitting. This antenna can handle up to 10Kbyte transmission length and up to 70 meter coax cable.
The TT-3005A antenna is designed to operate when the satellite is visible over the horizon and no signal path blockage is present.
The TT-3005A antenna is equipped with a TNC female connector and with 1.5" tube mounting. Please see section 0.

TT-3005A Maritime Antenna	Inmarsat-C/GPS omnidirectional antenna, RHC polarised. G/T: -23 dB/K at 5° elevation EIRP: 14 dBW ± 2dB at 5° elevation. Temperature: -35°C to 55°C operating, -40°C to 80°C storage. Dimensions (H x G): 120 mm x 146 mm conical excl. gasket. Weight: 0.75 kg.
Maximum transmission length	10 Kbyte, depending on wind temperature.
Solar Radiation	Max. flux density 1200W/m2.
Relative Humidity	95% non-condensing at 40°C.
Precipitation	Up to 50 mm/hour, droplet size 0.5 to 4.5 mm
Ice	Up to 25 mm.
Wind	Up to 200 km/hour.
Vibration Operational	Random 5-20 Hz: 0.02 g^2/Hz 20-150 Hz: -3dB/oct. (1.0g 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
Antenna Mounting	1.5" tube
Transceiver coax cable	0.7Ohm max DC resistance (shield + inner conductor) 10dB max RF insertion loss at 1.6GHz. 70 meter max cable length. TNC connectors.

Table 16 TT-3005A technical specifications.

ANTENNA CONNECTOR

"N" and "TNC" type connectors are available from manufacturers like:
Suhner, Radial, Omnispectra, Kings, etc.

ANTENNA CABLE

The TT-3005A Antenna specifications requires that the total maximal attenuation at 1.65 GHz must be less than 10 dB, and the maximal total (short-circuited in one end) DC resistance must not exceed 0.7 Ohms.
In case the antenna cable is to be produced on site, the cable type should match the below listed guidelines:

Range (m)	Cable type no.	Connector type no. (Suhners)
1 - 10	RG-223U, 5.5 mm	11TNC-50-3-14c
11 - 25	RG-214U, 10.8 mm	11TNC-50-7-2c
26 - 50	Suhner: SA7272, 10.0 mm Nokia: 02Y(st)C2YC 2,7/7,3AF	The SA7272 cable with N connectors (11N-50-7-35) and two adapters N female to TNC male (33TNC-N-50-51) TNC male / TNC male
51 - 70	SA12272, 15.0 mm	The SA12272 cable with N connectors (11N-50-12-35C) and two adapters N female to TNC male (33TNC-N-50-51)

Table 17 TT-3020C Capsat Transceiver Antenna Cable types (TNC - TNC) for TT-3005A antenna.

All antenna cables are double shielded.
The antenna cable may run together with radar or navigator cables. Separate cable ditch is not required.
If you install your system in a permanent location, we recommend that you, after the installation of the antenna, wrap the connector with the enclosed self-bonding tape, disabling water from penetrating the connection.

MOUNTING

The TT-3005A maritime antenna is constructed for 1.5" tube mounting.

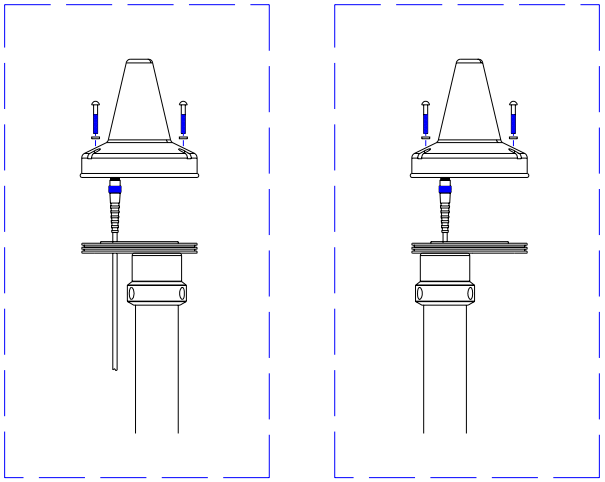

Figure 10 TT-3005A 1.5" tube mounting

LOW ANTENNA POWER IN RX MODE

The TT-3005A Antenna Rx power can be reduced from 1.1W with (14V) to 0.7W with (9V).
For information on how to reduce the antenna power, please refer to section 0.

TT-3001B Maritime Antenna

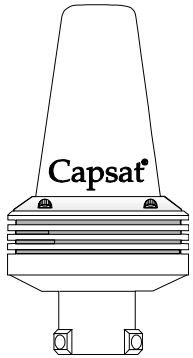

Figure 11 TT-3001B opt. 001 Maritime Antenna

This is an omni-directional antenna with built-in LNA/HPA electronics designed to operate on vessels. The antenna housing is sealed and contains no user serviceable parts.
The antenna is very compact and is designed to operate in a corrosive environment and in extreme weather conditions without any service. It has a modular construction that allows easy exchange of antenna elements. The antenna housing is sealed with tamper-resistant TORX screws, so that it can only be disassembled by Thrane & Thrane approved technicians.
The antenna is fully compatible with the Inmarsat-C GMDSS (General Maritime Distress and Safety System) specifications, and can also receive GPS signals while not transmitting and operate with up to 100 meter antenna cable.
The TT-3001B opt. 001 antenna is equipped with a N female connector and constructed for 1.5" tube mounting. Please see section 0.

TT-3001B Opt. 001 Maritime Antenna	Inmarsat-C/GPS omnidirectional antenna, RHC polarised. G/T: -23 dB/K EIRP: 14 dBW ± 2dB at 5° elevation. Temperature: -35°C to 55°C operating, -40°C to 80°C storage. Dimensions (H x G): 237 mm x 150 mm conical ex. mounting. Weight 2.2 Kg.
Maximum transmission length	32 Kbyte, which is Inmarsat maximum
Solar Radiation	Infra-red radiation 500W/m2 (EME).
Relative Humidity	95% non-condensing at 40°C.
Precipitation	Up to 50 mm/hour, droplet size 0.5 to 4.5 mm (EME).
Ice	Up to 25 mm (EME).
Wind	Up to 200 km/hour

Vibration Operational	Random 5-20 Hz: 0.02 g^2/Hz 20-150 Hz: -3dB/oct. (1.0g 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
Antenna Mounting (Maritime)	Standard 1.5" tube mounting.

Table 18 TT-3001B opt. 001 Technical Specifications

ANTENNA CONNECTOR

"N" and "TNC" type connectors are available from manufacturers like:
Suhner, Radial, Omnispectra, Kings, etc.

ANTENNA CABLE

If you are using the TT-3020C Transceiver with a TT-3001B opt. 001 antenna with N connector, use cable with N and TNC connectors. The specification of this antenna requires that the total maximum attenuation at 1.65 GHz must be less than 16 dB, and the maximal total (short-circuited in one end) DC resistance must not exceed 0.7 Ohms.
In case the antenna cable is to be produced on site, the cable type should match the below listed guidelines:

Range (m)	**Cable type no.**	**Connector type no. (Suhners)**
1 - 10	RG-223U, 5.5 mm	11TNC-50-3-14c and 11N-50-3-29c
11 - 40	RG-214U, 10.8 mm	11TNC-50-7-2c and 11N-50-7-44c
41 - 80	Suhner: SA7272, 10.0 mm Nokia: 02Y(st)C2YC 2,7/7,3AF	The SA7272 cable with N connectors (11N-50-7-35) and one adapters N female to TNC male (33TNC-N-50-51) TNC male / N male
81 - 100	SA12272, 15.0 mm	The SA12272 cable with N connectors (11N-50-12-35C) and one adapter N female to TNC male (33TNC-N-50-51)

Table 19 TT-3020C Capsat Transceiver Antenna Cable types (N - TNC) for TT-3001B opt. 001.

All antenna cables types are double shielded.
The antenna cable may run together with radar or navigator cables. Separate cable ditch is not required.
If you install your system in a permanent location, we recommend that you, after the installation of the antenna, wrap the connector with the enclosed self-bonding tape, disabling water from penetrating the connection.

MOUNTING

The TT-3001B opt. 001 maritime antenna is constructed for 1.5" tube mounting.

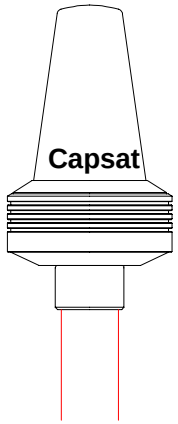

Figure 12 TT-3001B-opt. 001 1.5" Tube mounting

Antenna Mounting Considerations

When installing the a Maritime Antenna you should find a location on the vessel that is as free from obstructions as possible. Also you should 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 m
Distance to VHF antennas	> 4 m
Distance to magnetic compass	> 3 m

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. 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 will degrade performance.

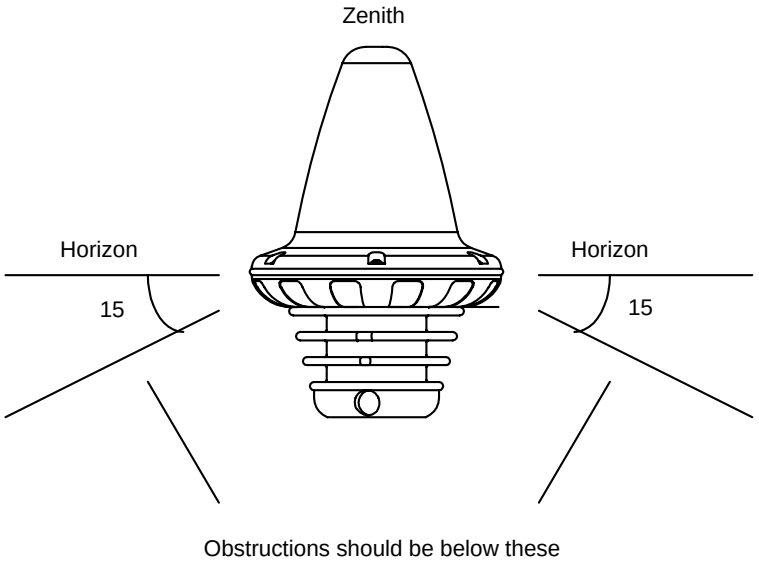

Figure 13 Inmarsat-C Antenna Mounting

If an obstruction such as a pole or a funnel is unavoidable, the following guidelines apply:
According to IMO resolution 807 the distance to the obstruction should be so large, that the obstruction only covers 2 degrees. This means that the safe distance is:

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

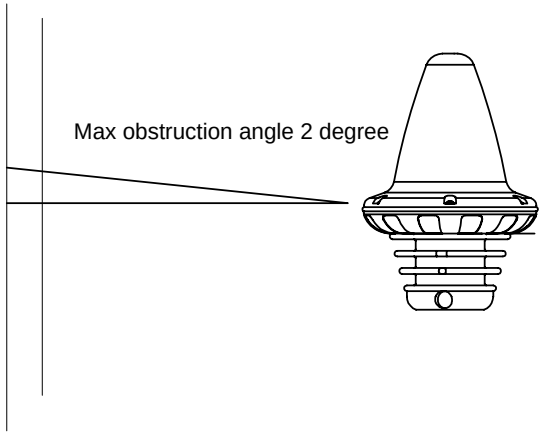

Figure 14 Inmarsat-C Antenna mounting near pole or funnel

Safety Distance for Antenna Units

The safety levels for the Thrane & Thrane INMARSAT-C Antenna Units are based on the ANSI standard C95.1-1982 "American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz"
This standard recommends the maximum power density at 1.6 GHz exposed to human beings not to exceed 5 mW/cm^2.
At the maximum radiated output power from the INMARSAT-C Antenna (16 dBW EIRP) this corresponds to a minimum safety distance of 30 cm.
In the standards from the European Telecommunication Standard Institute (ETSI) concerning 1.5/1.6 GHz Satellite Earth Stations the recommendation will be maximum 8W/m^2 (0.8 mW/cm^2). This tighter recommendation correspond to a minimum safety distance of 60 cm at 16 dBW.
To be sure that this distance is respected the Thrane & Thrane INMARSAT-C Antenna Units are provided with a label declaring a minimum safety distance on 2 feet (61 cm).
The relation between the power intensity are as follows:

Radiated intensity (W/m^2)	Distance (m)
10	0.56
25	0.36
100	0.18

Table 20 Radiated intensity

TT-3606E Message Terminal

The TT-3606E is a GMDSS approved Message Terminal for the TT-3020C Transceiver.

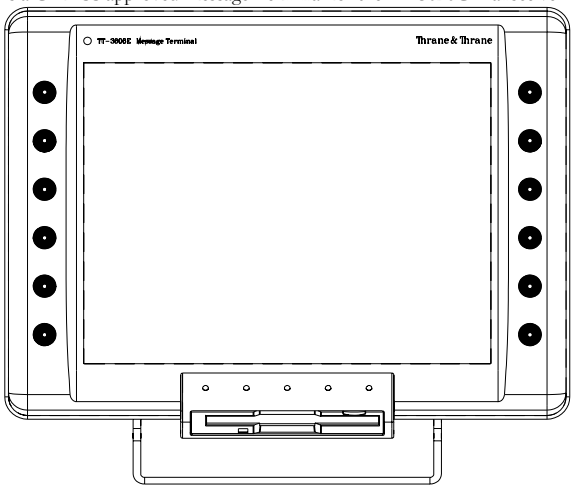

Figure 15 TT-3606E Message Terminal

In the following sections the interface to the 3606E Message Terminal are described.
Please be advised that a special Reference Manual for the TT-3606E Message Terminal is available.

Connectors

An illustration of the rear connectors is in Figure 16.

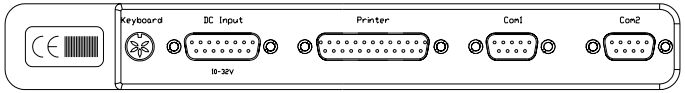

Figure 16 TT-3606E Rear Connectors

POWER CONNECTOR

The power input connector is a standard 15 pin SubD male connector, located on the rear panel of the TT-3606E and the pin assignments are as indicated below. The Remote ON/OFF input makes it possible to place an eventual on/off switch at any location.

Pin	Name	Signal Description
1,2,9,10	+ supply	10-32 VDC (Battery Positive input)
4,5,12,13	- supply	DC Return (Battery Negative input)
6	Remote ON/OFF	ON if connected to "- supply"

		OFF if floating
7,8	SGND	Chassis (Secondary GND)
Ground	GND	Shield
3,11,14,15		NC

Table 21 TT-3606E Power Connector

COMMUNICATION PORT

The TT-3606E Message Terminal communicates with the TT-3020C Capsat Transceiver via one of the two standard RS-423 ports, located on the rear panel.
The communication parameters are factory programmed to:

COM1, speed 4800 Baud, 8 databits, no parity, 1 stopbit

Alternatively these settings may be customer defined.
The CTS and DTR hardware handshake signals are used as default.
The pin assignment for the two communication ports are identical.

PRINTER PORT

The TT-3606E Message Terminal has a standard Centronics printer port. Please note that in the GMDSS system the TT-3608A Hard Copy printer must be connected to the Transceiver.
The printer port connector is located on the rear panel.

TT-3601E keyboard

The TT-3601E Keyboard plugs into the Keyboard connector on the rear panel of the TT-3606E. The keyboard connector is a standard connector but please be aware that only the TT-3601E keyboard is approved for GMDSS purposes.

Power: The keyboard is powered from TT-3606E Message Terminal.
Grounding: TT-3601E Keyboard does normally not require any separate grounding.

Specifications

Processor	386SX-40MHz
RAM	4 MB
Flash DISK	2 MB
Display	10.4" Color TFT flatpanel, 640x480
Floppy drive	3.5"
Keyboard i/f	5-pin mini-DIN
Parallel printer port	25 pin SubD female connector
Serial port COM1	9 pin SubD male connector, DTE type
Serial port COM2	9 pin SubD male connector, DTE type
Environmental	Meets or exceeds all INMARSAT specifications for the Inmarsat-C Network for SOLAS with distress call functions. (CN114 and IEC 60945 requirements). Meets CE-marking (1997) requirements. Wheel Mark approved
Power Source	10 to 32 V floating DC, 15 pin SubD female
Power Consumption	App. 20 Watts, maximum App. 13 Watts, typical
Fuse	Internal automatic recovering poly fuse
Ambient Temperature	-20°C to 55°C operating -40°C to 80°C storage.
Compass safe distance	50 cm (measured in accordance with the standards specified in ISO/R 694, Method B)
Dimensions H x W x D	221x 297 x 114.5 mm w/o bracket 256 x 297 x 114.5 mm w bracket at vertical position
Weight	3.1 kg (including mounting bracket)

Table 22 TT-3606E Message Terminal Specifications

Mounting

Figure 17 llustrates the dimension of the panel cut-out and position of mounting holes when mounting the TT-3606E Message Terminal in a console.

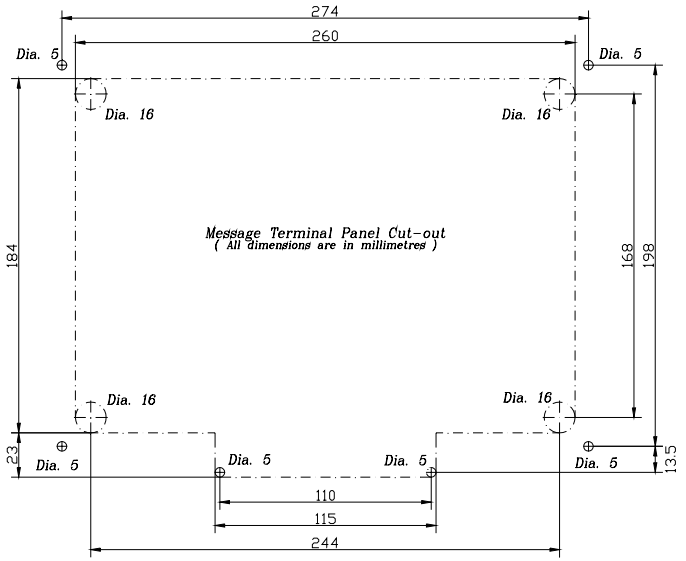

Figure 17 Mounting holes for TT-3606E

Figure 18 illustrates the position of the mounting holes for the mounting bracket.

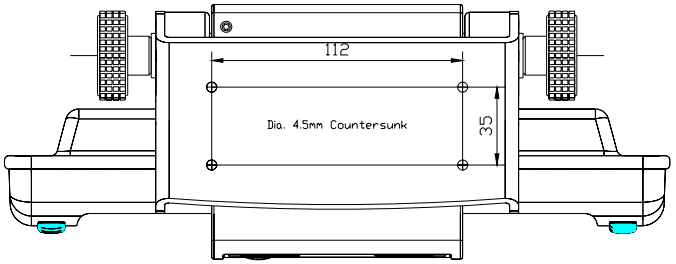

Figure 18 TT-3606E Mounting Bracket

TT-3680B Power Supply

The TT-3680B Power Supply operates on either 115 VAC or 230 VAC internally selectable. The maximum power supplied is 200 W.
The TT-3680B Power Supply has a connection for emergency batteries and offers automatic switch-over in case of a drop-out of the mains. In the TT-3000C GMDSS system the emergency voltage must be 24 V floating DC (nominal value), with an absolute minimum of 15 V DC at the input terminal of the TT-3680B AC/DC converter.
Each of the five different DC outputs are separately fused. It is therefore recommended to distribute the load on the different outputs.
Due to the heat TT-3680B develops during operation it is recommended that this unit is mounted separately.
Separate installation manual for TT-3680B, is available.

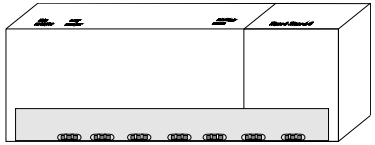

Figure 19 TT-3680B - 200W power supply.

Mounting

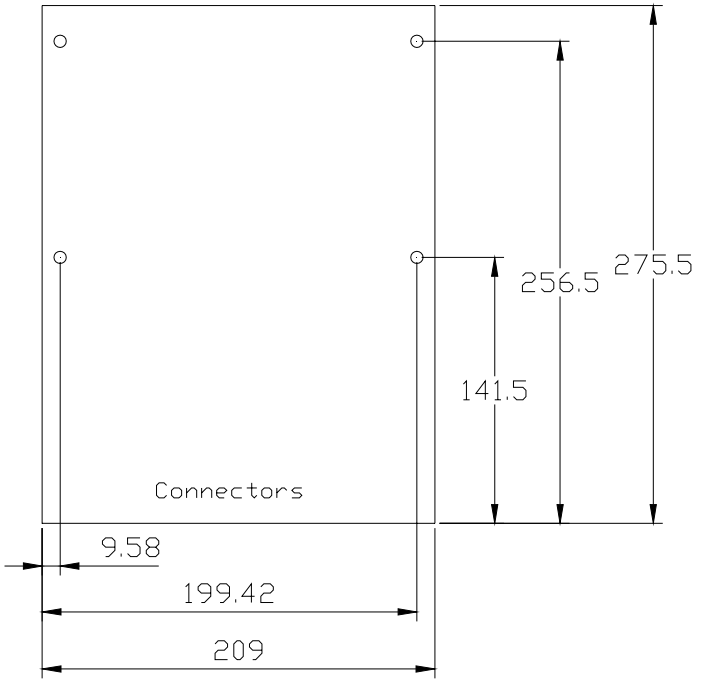

Figure 20 Mounting holes for TT-3680B

TT-3608A Hard Copy Printer

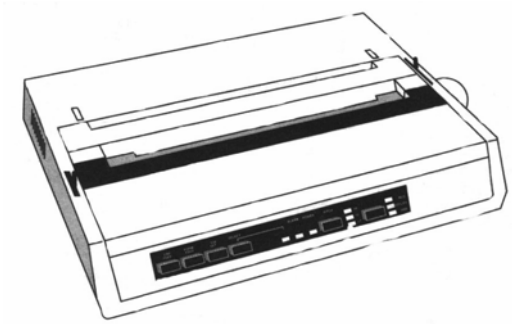

Figure 21 TT-3608A Hard copy printer

Connecting the TT-3608A Hard Copy Printer to the Transceiver offers the highest security for hard copies of incoming messages even if the TT-3606E is turned off.
The Integrated Capsat System is designed to allow the operator to guide incoming messages to the TT-3608A Hard Copy Printer and/or the TT-3606E Message Terminal for floppy disk storage.
In case both TT-3608A and TT-3606E are turned off, the Transceiver will hold the incoming messages in the internal memory for at approximately 48 hours for later Hard Coping.
The enclosed standard cable allows the printer to be located up to 1.5 meters from the Transceiver.
A special low-impedance cable is available for printer locations up to 20 meters from Transceiver.
The TT-3608A Hard Copy Printer is supplied with a mounting frame, offering horizontally oriented secured mounting.
The printer connector is located on the rear panel. The interface conforms to a standard Centronics type interface found on most personal computers today.

Mounting plate

A mounting plate is supplied with the TT-3608A Hard Copy Printer, for horizontally oriented secured mounting see section 0.

Roll Paper Stand

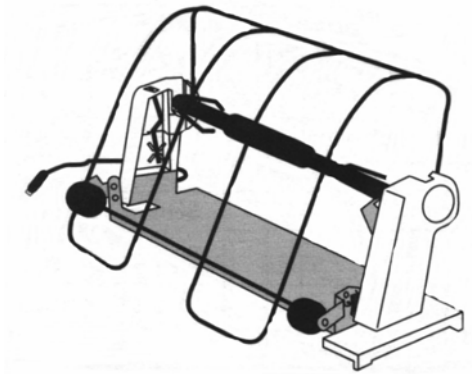

Figure 22 TT-3608A Paper Roll Stand

A roll paper stand is available for the TT-3608A Hard Copy Printer. This enables the printer to signal an advanced warning of a paper low condition, when the paper roll is almost empty. The printer continues to print the job, but an information is given by the transceiver and a "Printer almost out of paper" message is displayed by the message terminal. When "Printer almost out of paper" condition occurs the audio alarm in the transceiver will sound and the FAULT LED on any Remote Alarm/Distress Box will be turned on. When the printer is set off-line or powered off the audio alarm and the FAULT LED in any Remote Alarm/Distress Box will be turned off. If the "Printer almost out of paper" condition has not been fixed when the printer is set online again the fault indication will reappear. If the STOP button is pressed while FAULT LED/relay is turned on the FAULT LED/relay will be turned off but the FAULT LED/relay will be turned on again soon after if the fault condition has not been fixed
The DIP switch 8 “ROLL PAPER STAND” in the printer, must be set to OFF, which selects roll paper stand, and the roll paper stand connector must be attached to the back of the printer before the advanced paper low option is enabled. The DIP switch can be accessed by removing the switch cover from the back of the printer.

Mounting

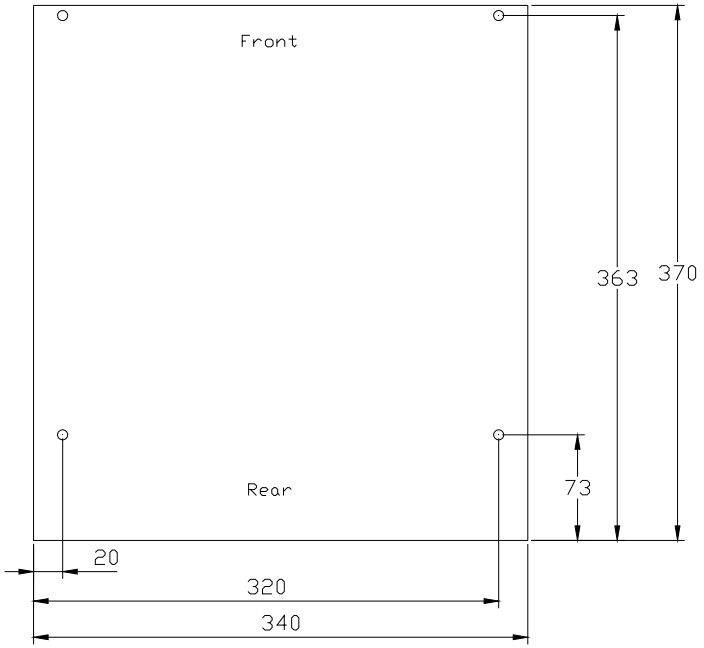

Figure 23 Mounting holes for TT-3608A

TT-3608G Printer Unit

The TT-3608G printer unit is an optional remote printer unit.
Please be advised that a dedicated Reference Manual for the TT-3608G Printer Unit is available

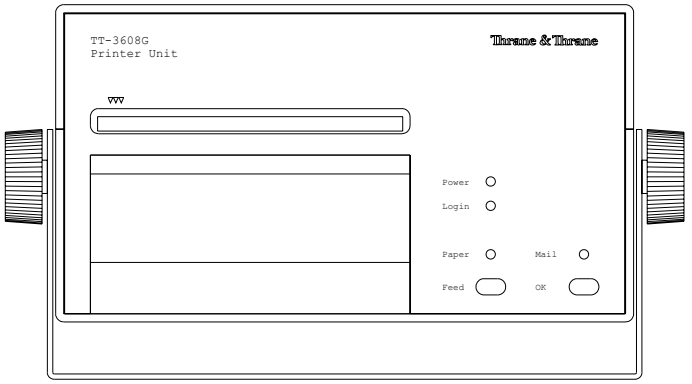

Figure 24 TT-3608G Remote Printer Unit

The TT-3608G printer unit is printing on 112 mm (4.4") width thermal paper rolls. The printer can be configured for 40 or 80 chars/line and automatic word wrapping is performed on long lines. A built-in paper detector indicates when paper is low. The printer is temperature compensated to give equal printing quality over a wide temperature range.
The TT-3608G displays receive mail indication and login status.
Up to 7 TT-3608G printer units with different address setting can be placed on various locations onboard a ship, all connected to one TT-3020C transceiver.
The TT-3608G is equipped with remote turn-on for power saving configurations. Remote turn-on is enabled by jumper setting.

Configuration.

Before installation of the TT-3608G, configuration of Arcnet address should take place.
It is important to observe that all devices connected to the same transceiver must have different address settings. If this is ignored, the Arcnet will not operate properly. Please notice that if a "network problem" info box is displayed on the message terminal the Arcnet is not configured properly.
The Printer Unit Arcnet address is configured by setting an 8 position DIP switch located under the paper inlet. To set operating parameters remove paper and turn off power. In Table 23 the possible DIP switch settings are listed.
Note: Operating parameters are only read at power-up or softreset so changes in operating parameters will not change operation until a power-cycling or softreset is performed.

Position		Setting	Fact.
1-3	Address off,off,off: off,off,on: off,on,off: off,on,on: on,off,off: on,off,on: on,on,off: on,on,on:	 1 2 3 4 5 6 7 8	1
4	Printing Direction on: off:	 Reverse Normal	off
5	Not Used		
6	NMEA/Aux.Port on: off:	 NMEA 0183[1] Serial data[2]	NMEA
7	Dot Energy on: off:	 High Normal	High
8	Printing Width on: off:	 40 Chars per line 80 Chars per line	80

Table 23 TT-3608G DIP switch settings.

Installation

To following brief outline may be used to get the TT-3608G up and running as a printer together with a Thrane & Thrane transceiver which supports Arcnet - hardware as well as software wise.

1. Set an unique Arcnet address as described in section 0.
2. Connect the 3608G to the transceiver by means of the accompanying interconnection cable (15 pole SubD connectors).
3. Connect the 3608G to a DC power source by means of the accompanying power cable. For security reasons take care to connect the ground/chassis wire properly to ground.

When power is applied it should now be possible for the transceiver to print on the TT-3608G when needed or initiated by the user.

[1] Jumper W2 and W9 should be in position 1-2 (low) in Rx mode to achieve optical isolation, else position 2-3 (high).

[2] Jumper W2 and W9 must be in position 2-3 (high).

Connectors

The connectors for the TT-3608G are placed on the rear panel of the printer unit.

X1 POWER IN

The pinout of the power supply input is as listed in Table 24.

Pin	Function
1	Battery Positive
2	Battery Negative
3	Ground
4	Remote turn-on

Table 24 TT-3608G Power Connector

X2 I/O

The pinout of the I/O connector (15 pole SubD) is listed in Table 25.

Pin	Function
1	Distress/Urgent, 100 Ohm, Open Collector
2	Safety, 100 Ohm, Open Collector
3	Routine, 100 Ohm, Open Collector
4	Not Connected
5	+5V DC, 39 ohm
6	GND
7	Arcnet A
8	Arcnet B
9	GND
10	NMEA OUT A or Ready/busy (Controlled by W9)
11	NMEA OUT B
12	NMEA IN A or Serial input
13	NMEA IN B or GND (Controlled by W2)
14	Not Connected
15	Not Connected

Table 25 TT-3608G I/O Connector

Cable

In case the accompanying Arcnet interconnection cable is not suitable and another cabling has to be made please observe the guidelines given in the following regarding establishment of an Arcnet. Please note that the Arcnet system supported is a twisted pair in bus topology.

- The Arcnet bus should be wired as a bus meaning that there must be no branches or stubs. The Arcnet devices attached should be placed like pearls on a string.
- The Arcnet bus will have two ends and both of these should be terminated with a 100 Ohm resistor (± 1%). The TT-3608G does NOT contain any termination-resistor. If needed the termination resistor could be placed in the 15 pole SubD

connector connected to the twisted pair cable. This is the case for the accompanying cable.

- Always use shielded twisted pair cables and shielded connectors (otherwise the EMC specifications are not guarantied to be fulfilled).
- The length of the cable making up the Arcnet bus should be no longer than 100 meters.
- Minimum spacing between devices connected to the Arcnet bus is 2 meter of cable.
- No more than 8 Arcnet devices (including transceiver) must be connected to the Arcnet bus.

Specifications

Indication	Visual:	LED indicators with dim function. Text back-light with dim function.
Call reset	OK button	
Arcnet/serial port	DB 15M conn:	Arcnet: Twisted pair/bus topology, max 100 meter cable. Serial port: NMEA 0183 receiver input optically isolated, NMEA 0183 generator output or Serial print input with Ready/Busy control
Printer	Type:	112 mm thermal printer with two motors.
	Width:	40 char/line normal.
		80 char/line compressed.
	Speed:	1 l/sec (normal).
	Character size:	9 dot high x 7 dot wide.
	Print direction:	Normal/Reverse, logic seek, word wrap.
	Paper roll:	Width 112 mm, diam. 48 mm, length 25 m.
Supply	Voltage:	10.5-32 V floating DC.
	Power:	2.5W standby, 7W printing.
Temperature	Operating:	-10 to +50 Deg.C
	Storage:	-20 to +70 Deg.C
Relative humidity		95% non-condensing.
Vibration	2-15.8 Hz:	1.0 mm peak.
	15.8-100 Hz:	1.0 g peak.
Dimensions	HxWxD:	117.5 mm x 213.9 mm x 57.5 mm.
	Weight:	1.3 kg.

Table 26 TT-3608G Technical Specifications

TT-3042C Remote Alarm/Distress Box (optional)

The TT-3042C Remote Alarm/Distress Box is connected to the TT-3020C by means of the Transceivers X4 I/O connector, through which it is also powered.

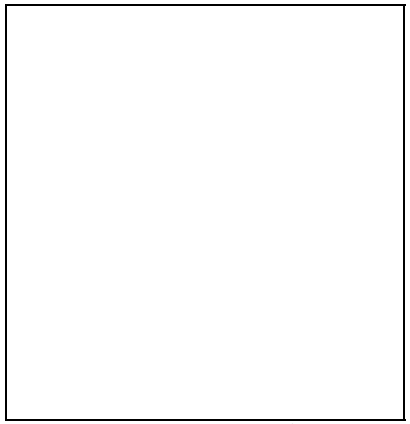

Figure 25 TT-3042C Remote Alarm/Distress Box

From the Remote Alarm/Distress Box TT-3042C Distress Alerts can be initiated. The TT-3042C also has an indicator for reception of EGC messages with distress/urgent priority. A Distress Alert can be initiated by pressing the Distress button for five seconds.
Included in the box is a Distress Relay, which makes it possible to control an external alarm panel. The function of the relay can be selected by setting two internal jumpers according to the specifications in Table 28 TT-3042C Technical Specifications. In case jumper W1 is set to enable the Distress Relay, it will be activated by an initiation of a distress alert and upon a reception of a message with distress priority.
The light intensity of the Power indicator can be adjusted by a knob below it.

J1 PIN	**TT-3042C Description**	**X4 PIN**	Satellite Communication Unit
1	+ 7.5 - 12 Volt	5	+9Volt for ext. devices
2	GND + Safety GND †	6	GND
3	Distress button-lamp	1	In/Out 0
4	Buzzer/Buzzer knob	2	In/Out 1
5	To Distress Relay	3	In/Out 2
6	To Fault Relay	4	In/Out 3
7	Distress button	14	In 4
8	GND	15	In 5
9	Distress Relay contact pole 1		
10	Distress Relay contact pole 2		
11	Fault Relay contact pole 1		
12	Fault Relay contact pole 2		

Table 27 TT-3042C and Satellite Communication Unit inter-connection

Note †: Cable screen included
The cable used for the connection between the TT-3042C Remote Alarm/Distress Box and the TT-3020C Transceiver, has to be chosen in accordance with the specifications in Table 28 TT-3042C Technical Specifications.
The Remote Alarm/Distress Box is in full compliance with the Inmarsat CN114, IEC 60945 and Wheel Mark specifications.

Model	**emote Alarm/Distress Box**
General Specifications	The unit is in full compliance with the Inmarsat CN114, IEC 60945 and Wheel Mark specifications.
Dimensions (H x W x D)	m x 99 mm
Weight	
Mountings	, 4 holes Ø4.0 mm Mounting bracket for console, 4 holes Ø4.0 mm
Power requirements	7.5V - 12V DC, Standby: 0.1W/@9V, Max.: 0.5W/@9V
Cable length / Type	Max. 100m / 8 leaders, screened signal cable †
Connector	Internal screw terminals
Distress/MES Fault Relay	Max. switching: 2A or 60W or 220V DC
Distress Relay jumpers	Enable; W1: 1-2, Disable; W1: 2-3 †† Activated: Shorted; W2: 1-2 ††, Open; W2: 2-3
MES Fault Relay jumpers	Enable; W3: 1-2, Disable; W3: 2-3 †† Activated: Open; W4: 1-2 ††, Shorted; W4: 2-3
Temperature	-25°C to 55°C operating, -40°C to 80°C storage
Relative humidity	95% non-condensing at 40°C
Vibration operational	Random vibrations: 5-20 Hz:0.005 g^2/Hz 20-150 Hz:-3 dB/oct (0.5 g rms.) Sinusoidal vibrations: 2-15.8 Hz: 2.54 mm peak ampl. 10-100 Hz:1.0 g peak acceleration
Vibration survival	Random vibrations: 5-20 Hz:0.05g^2/Hz 20-150 Hz:-3 dB/oct (1.7g rms.) Sinusoidal vibrations: 2-15.8 Hz:2.54 mm peak ampl. 10-100 Hz:1.0g peak acceleration
Shock	Half sine: 20g/11ms

Table 28 TT-3042C Technical Specifications

†: Leader resistance < 160Ω/km.
††: Factory setting

Mounting

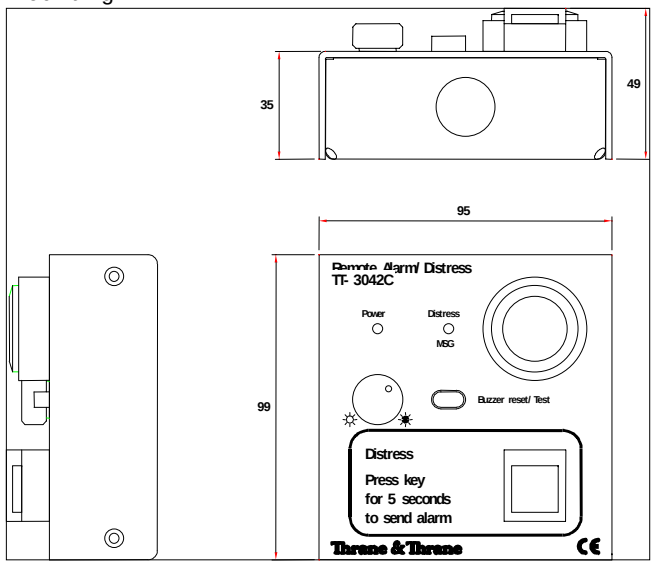

Figure 26 TT-3042C Outline drawing

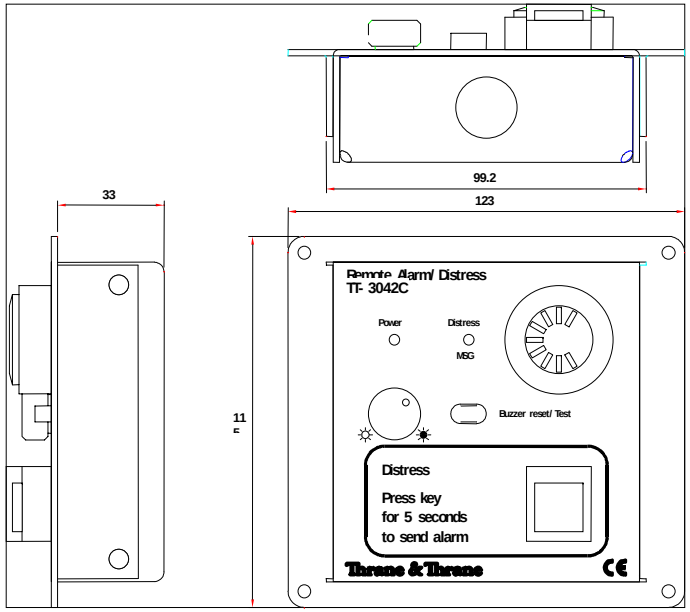

Figure 27 TT-3042C Outline drawing with console bracket

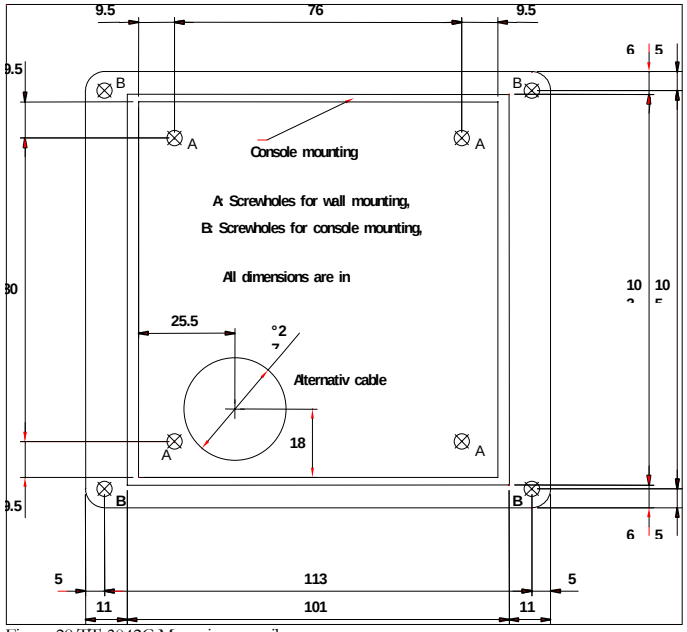

Figure 28 TT-3042C Mounting stencil.

Fasten the TT-3042C Remote Alarm/Distress Box from the inside or by using the mounting bracket, which makes console mounting possible.
If required, the cable relief are easily moved from the end of the TT-3042C to the bottom feed hole for hidden cable installation.
It is possible to connect 2 TT-3042C's in parallel to the TT-3020C Capsat Transceiver, from which they are supplied with power and control signals in one cable. The used cable has to be in compliance with the specifications in Table 28 TT-3042C Technical Specifications.

Remote Incoming Mail Indication

The transceiver can be configured to indicate incoming mail on the TT-3042C panel. This is done using the "RU –M" command (see the Software Interface Reference Manual).
When the transceiver is configured for remote incoming mail indication, the MES Fault LED will show incoming mail instead. Therefore, the enclosed "Mail" label must be attached to the 3042C panel so that it covers the "MES Fault" text completely.
When the transceiver is configured for remote mail indication, the TT-3042C will no longer have any indication for MES Fault.

TT-3042D Remote Alarm / Printer Unit

The TT-3042D Remote Alarm Distress Box with additional printer unit is an optional unit unless it is used as main printer in a GMDSS system.
Please be advised that a dedicated Reference Manual for the TT-3042D Remote Alarm is available

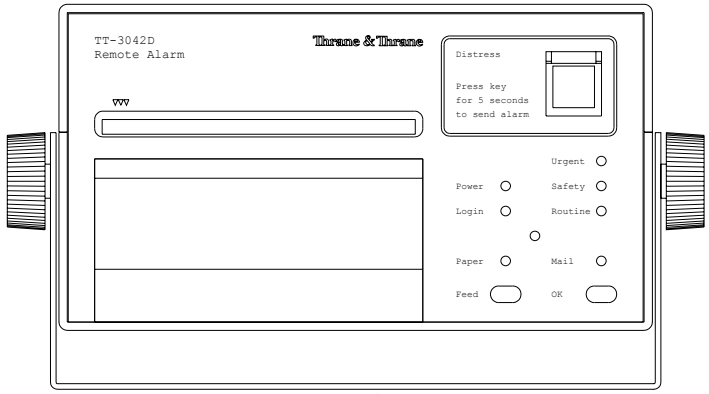

Figure 29 TT-3042D Remote Alarm Distress Box / Local Printer

The TT-3042D Remote Alarm fulfil all GMDSS requirements for remote indication and printout of EGC SafetyNet messages, initiation of distress transmissions, and general system status display.
The TT-3042D Remote Alarm can be configured as Local Printer in a GMDSS system and will then fulfil all GMDSS requirements for Local Printers or it can be configured as Remote Alarm with additional printer and will then fulfil all GMDSS requirements for Remote Alarms.
The TT-3042D additional printer unit is printing on 112 mm (4.4") width thermal paper rolls. The printer can be configured for 40 or 80 chars/line and automatic word wrapping is performed on long lines. A built-in paper detector indicates when paper is low. The printer is temperature compensated to give equal printing quality over a wide temperature range.
The TT-3042D displays receive mail indication and login status.
Up to six Remote Alarm units and one Local Printer unit all with different Arcnet address setting can be placed on various locations onboard ship, all connected to one TT-3020C Capsat transceiver with Arcnet.
The TT-3042D is equipped with remote turn-on for power saving configurations. Remote turn-on is enabled by jumper setting.

Configuration.

Before installation of the TT-3042D, configuration of Arcnet address should take place.
It is important to observe that all devices connected to the same transceiver must have different address settings. If this is ignored, the Arcnet will not operate properly. Please notice that if a "network problem" info box is displayed on the message terminal the Arcnet is not configured properly.
The Printer Unit Arcnet address is configured by setting an 8 position DIP switch located under the paper inlet. To set operating parameters remove paper and turn off power. In Table 29 the possible DIP switch settings are listed.
It is through the address setting that the TT-3042D is configured as either Remote Alarm or Local Printer. If the address is configured to 8 (1,1,1) the TT-3042D is configured as Local Printer. All other addresses are used for Remote Alarm configuration. If the TT-3042D is configured as Local Printer and the Transceiver has a printer connected locally on it's printer port the transceiver printer is considered as the only Local Printer and the TT-3042D will be treated as Remote Alarm with additional printer unit.
Note: Operating parameters are only read at power-up or softreset so changes in operating parameters will not change operation until a power-cycling or softreset is performed.

Position		Setting	Fact.
1-3	Address off,off,off: off,off,on: off,on,off: off,on,on: on,off,off: on,off,on: on,on,off: on,on,on:	 1 2 3 4 5 6 7 8[1]	1
4	Printing Direction on: off:	 Reverse Normal	off
5	Sounder Timeout on off	 10 sec. Timeout no timeout	 off
6	NMEA/Aux.Port on: off:	 NMEA 0183[2] Serial data[3]	NMEA
7	Dot Energy on: off:	 High Normal	High
8	Printing Width on: off:	 40 Chars per line 80 Chars per line	80

Table 29 TT-3042D DIP switch settings.

Installation

To following brief outline may be used to get the TT-3042D up and running as a printer together with a Thrane & Thrane transceiver which supports Arcnet - hardware as well as software wise.

1. Set an unique Arcnet address as described in section 0.

---

[1] When this address is selected the TT-3042D is configured as local printer. This address should not be used if a TT-3608A Hard Copy Printer is connected to the TT-3020C transceiver.

[2] Jumper W2 and W9 should be in position 1-2 (low) in Rx mode to achieve optical isolation, else position 2-3 (high).

[3] Jumper W2 and W9 must be in position 2-3 (high).

2. Connect the 3042D to the transceiver by means of the accompanying interconnection cable (15 pole SubD connectors).
3. Connect the 3042D to a DC power source by means of the accompanying power cable. For security reasons take care to connect the ground/chassis wire properly to ground.

When power is applied it should now be possible for the transceiver to print on the TT-3042D when needed or initiated by the user.

Connectors

The connectors for the TT-3042D are placed on the rear panel of the printer unit.

X1 POWER IN

The pinout of the power supply input is as listed in Table 30.

Pin	Function
1	Battery Positive
2	Battery Negative
3	Ground
4	Remote turn-on

Table 30 TT-3042D Power Connector

X2 I/O

The pinout of the I/O connector (15 pole SubD) is listed in Table 31.

Pin	Function
1	Distress/Urgent, 100 Ohm, Open Collector
2	Safety, 100 Ohm, Open Collector
3	Routine, 100 Ohm, Open Collector
4	Not Connected
5	+5V DC, 39 ohm
6	GND
7	Arcnet A
8	Arcnet B
9	GND
10	NMEA OUT A or Ready/busy (Controlled by W9)
11	NMEA OUT B
12	NMEA IN A or Serial input
13	NMEA IN B or GND (Controlled by W2)
14	Not Connected
15	Not Connected

Table 31 TT-3042D I/O Connector

Cable

In case the accompanying Arcnet interconnection cable is not suitable and another cabling has to be made please observe the guidelines given in the following regarding establishment of an Arcnet. Please note that the Arcnet system supported is a twisted pair in bus topology.

- The Arcnet bus should be wired as a bus meaning that there must be no branches or stubs. The Arcnet devices attached should be placed like pearls on a string.
- The Arcnet bus will have two ends and both of these should be terminated with a 100 Ohm resistor (± 1%). The TT-3042D does NOT contain any termination-resistor. If needed the termination resistor could be placed in the 15 pole SubD connector connected to the twisted pair cable. This is the case for the accompanying cable.
- Always use shielded twisted pair cables and shielded connectors (otherwise the EMC specifications are not guarantied to be fulfilled).
- The length of the cable making up the Arcnet bus should be no longer than 100 meters.
- Minimum spacing between devices connected to the Arcnet bus is 2 meter of cable.
- No more than 8 Arcnet devices (including transceiver) must be connected to the Arcnet bus.

Specifications

Indication	Visual:	LED indicators with dim function. Text back-light with dim function.
Call reset	OK button	
Arcnet/serial port	DB 15M conn:	Arcnet: Twisted pair/bus topology, max 100 meter cable. Serial port: NMEA 0183 receiver input optically isolated, NMEA 0183 generator output or Serial print input with Ready/Busy control
Printer	Type:	112 mm thermal printer with two motors.
	Width:	40 char/line normal.
		80 char/line compressed.
	Speed:	1 l/sec (normal).
	Character size:	9 dot high x 7 dot wide.
	Print direction:	Normal/Reverse, logic seek, word wrap.
	Paper roll:	Width 112 mm, diam. 48 mm, length 25 m.
Supply	Voltage:	10.5-32 V floating DC.
	Power:	2.5W standby, 7W printing.
Temperature	Operating:	-25 to +55 Deg.C
	Storage:	-30 to +70 Deg.C
Relative humidity		95% non-condensing.
Vibration	2-15.8 Hz:	1.0 mm peak.
	15.8-100 Hz:	1.0 g peak.
Dimensions	HxWxD:	117.5 mm x 213.9 mm x 57.5 mm.
	Weight:	1.3 kg.

Table 32 TT-3042D Technical Specifications

Distress Button Test

When the TT-3000C Maritime system is fully installed, it is recommended to do a distress button test. The Distress Test Mode facility in the TT-3606E Message terminal (Alt, O, E) allows test of the Distress Buttons, Distress LED's and wiring. When Distress Test Mode option is selected the Distress Test Mode message is displayed:

```
                    Test Mode

 Yes  No

Distress buttons are under test.
Cancel the test mode if a real distress alert
needs to be sent.
Cancel?
```

Please notice that the message displayed by the Message Terminal asks the operator if distress test mode should be cancelled. Do not answer yes to this question unless you are absolutely sure that you have completed distress testing.
In Distress Test Mode the Distress Buttons can be activated and tested without issuing Distress Alerts. Distress Test Mode is cancelled by pressing the Esc key. After Distress Test Mode is terminated activating the Distress Buttons will again result in a Distress Alert being send.

TT-3020C Transceiver

Test of the Distress facility on the Transceiver:
Please note that the transceiver has to be in Distress Test Mode before this test is performed. Otherwise a real Distress Alert is transmitted.

Pressing the Distress button will make the Distress LED flash and will activate an intermediate acoustic signal. If the Distress button is held for at least 5 seconds the acoustic signal will stop and the Distress LED will light constantly to indicate that a Distress Alert is send. Please see Figure 1.

TT-3042C Remote Alarm/Distress Box

When Distress Test mode is initiated the Remote Alarm Box starts a test sequence. In this sequence the Distress Msg LED, the buzzer and the MES Fault LED are activated one at a time until the user presses the buzzer reset button. After that only the buzzer is activated until the Distress Test mode is stopped. See also 0 Remote Incoming Mail Indication.
Test of the Distress Button on the Remote Alarm Box:
Please note that the transceiver has to be in Distress Test Mode before this test is performed. Otherwise a real Distress Alert is transmitted.
Pressing the Distress button will make the Distress LED flash and will activate an intermediate acoustic signal. If the Distress button is held for at least 5 seconds the acoustic signal will stop and the Distress LED will light constantly to indicate that a Distress Alert is send. Observe that the transceiver reacts by flashing the Alarm LED when the Distress Button has been activated. Figure 25.

TT-3042D Remote Alarm Distress Box

When Distress Test mode is initiated the TT-3042D Remote Alarm Box starts a test sequence. In this sequence first the Distress/Urgent LED is activated for a few seconds and then all the Safety, Routine and Mail LED's are activated for a few seconds. This sequence continues until Distress Test mode is stopped. While in Distress Test mode the buzzer will generate an intermediate acoustic signal.
Test of the Distress Button on the Remote Alarm Box:
Please note that the transceiver has to be in Distress Test Mode before this test is performed. Otherwise a real Distress Alert is transmitted.
Pressing the Distress button will make the Distress LED flash and will activate an intermediate acoustic signal. If the Distress button is held for at least 5 seconds the acoustic signal will stop and the Distress LED will light constantly to indicate that a Distress Alert is send. Observe that the transceiver reacts by flashing the Alarm LED when the Distress Button has been activated. Please see Figure 29.

General interconnect information

In Figure 30 is an example of the TT-3000C Maritime Capsat System for GMDSS use.
An Integrated Capsat System is delivered with all necessary interconnecting cables, except the cable between the TT-3020C Transceiver and the TT-3042C Remote Alarm/Distress Box.

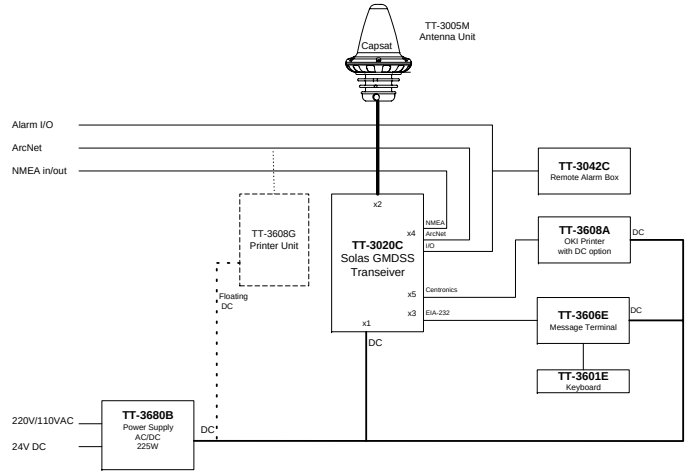

Figure 30 Interconnection diagram

The TT-3608A printer can be substituted with the compact printer/alarm panel TT-3042D (please see section 0) if special requirement exist for a compact solution.
For applications where cables will be handmade by the dealer or the customer it is important to note that the cable screen should be soldered to the connector frame to prevent static electric shocks. A complete set of connectors are delivered together with an Integrated Capsat System.

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System Generation

Terminal Mode

The TT-3020C Capsat Transceiver parameters may be accomplished by means of:

- TT-3606E Message Terminal.
- Computerised equipment.
- Handheld terminals, etc.

Please follow the below listed guide lines to set up the connected equipment in a direct terminal emulating manner.
In terminal emulation mode a ':' prompt appears.
The commands are executed by pressing the <CR> key.

TT-3606E Message Terminal

Enter the terminal emulation mode by selecting:
OPTIONS - CONFIGURATION - TERMINAL

Computerised equipment/handheld terminals

Your computer/terminal should display the ASCII characters as they appear being send from the TT-3020C Capsat Transceiver.
No alphabet or protocol conversion should take place.

Initialise System Parameters

The System Parameters are initialised using the 'set -b' command.
After issuing this command a menu appears with a number of initialisation options.

:set - b<CR>

Init system parameters menu

0 Quit

1 All

2 Basic system parameters

3 EGC Network ID's

4 Data Network ID's

5 LES Network Table

6 Link Test Results

Enter number >

Entering your mobile number

The Mobile Number in the Transceiver is entered using the 'set -u' command.

:set -u ?<CR>

Mobile Number : 492380049

Enter new number >

An Inmarsat-C mobile number is always in the range:

400000000 to 499999999

If you type a number outside this range the Transceiver will ignore it.

You should not attempt to use your equipment before, you have received a mobile number, because the Mobile Number means that you have been registered in the database for the Inmarsat-C Network.

The Transceiver only uses the mobile number when sending Message Position Reports (see the *Message Handling Software Operators Guide*), to indicate which Transceiver originated the position message.

Altering baudrate and protocol settings

The baudrate and protocol settings can be changed by the command :

```
: se -c
Console-status     : 4800,N,8,1
Software handshake : no
:
: se -c ?
Enter parameters as baudrate,parity,databits,
           stopbits > 4800,N,8,1
Software handshake Y/N > n
```

Factory settings is obtained by pressing the Stop button at power-on.

Please notice that changing the baudrate or other protocol settings in terminal mode only changes the transceiver configuration. It is therefore necessary also to change the Message Terminal serial port settings to the identical configuration otherwise the system will not function properly.

On the Message Terminal this is done in the "Application - System – Option – Serial Ports" menu.

Antenna voltage settings

The available antenna voltage shall be configured depending on which antenna that is used together with the transceiver. It Table 33 the configuration based on selected antenna is listed.

Antenna type	**Transceiver voltage setting**
TT-3001B	High antenna voltage = 14V DC
TT-3005A	High or low antenna voltage
TT-3005M	Low antenna voltage = 9 V DC

Table 33 Antenna voltage configuration

When the Transceiver is transmitting there will be +28 V DC on the antenna connector. When the Transceiver is receiving there will be either +9 V DC or +14 V DC on the antenna connector.
If a TT-3001B opt.001 Antenna type is used, and it is supplied with +9 V DC, it will not be operational. The antenna will however not be damaged by this.
In general will a low antenna voltage will lead to a lower power consumption of the antenna.
Low antenna voltage is selected by issuing the command:
"se –f 0"
in the transceiver terminal mode (described in section 0) and high antenna voltage is selected by issuing the command
"se –f 1"
in the transceiver terminal mode.
If the TT-3005M antenna is used and the antenna voltage is set to high run the transceiver will probably set-up a warning box stating that the antenna is not connected.

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Commissioning

Introduction

Before attempting to use the equipment, the commissioning papers should be send to the relevant authority.
It is recommended that a Link Test (or Performance Verification Test in Inmarsat terminology) is run before using the equipment.
The Link Test automatically verifies that the TT-3020C Capsat Transceiver is capable of both receiving and transmitting information according to Inmarsat-C specifications. No other tests are required.
The Inmarsat Mobile Number is needed to run the Link Test.
When a new unit is being installed, it is the responsibility of the service technician to verify that the unit is functioning properly, and that the unit is commissioned and logged into the Inmarsat-C System, at the end of installation.
You should only attempt to start one Link Test yourself as you have only three commissioning attempts, and these will be used up if you are not cautious.

The first Login

Your first Login attempt will be recognised by the Network Co-ordinating Station (NCS) and served normally, (downloading a Land Earth Station (LES) network table into the Transceiver) and inform the Network Database that the new unit is present and being commissioned.
The TT-3020C Capsat Transceiver is now logged in and ready to work.

Link Test

The Link Test consist of three parts:

- Message Reception Test
- Message Transmission Test and
- Distress Test.

The TT-3020C will automatically perform a distress test without any user intervention.
In the end of the test the Transceiver will receive the link test results.

Details of a Link Test

You should try to start one link test yourself to verify the unit
After a while you will see a message on your screen and on your printer saying:

- Link Test started

and when the MAIL indicator on the TT-3020C front panel starts flashing, the receive test has commenced.
A test message is then received from the LES by the Transceiver.
After the MAIL indicator has turned OFF, the transmission test begins.
The SEND indicator starts flashing and after a while it will light continuously (the data is being transmitted) and then starts flashing again.
The SEND indicator will turn OFF when the protocol has finished.
The Transceiver now automatically sends a Distress Alert test.
The printer will give an acknowledgement when the Alert has been sent.
The Transceiver now will wait for the test results to arrive from the LES, and acknowledge the reception of these by a short transmission (burst).
When receiving the results the screen will display:

- Link Test finished

and the results will be printed out.
The results of the test can also be viewed with:

- OPTION - LINK TEST

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Index

L

M

N

O

P

R

S

T