



LandSea Systems, Inc.

Satellite Communications

Exhibit 1

LandSea Systems, Inc. has the following equipment for demonstration purposes:

1	TT-3020B	Inmarsat C
1	TT-3060A	Inmarsat Mini-M
1	TT-3064A	Maritime Inmarsat Mini-M
1	TT-3062D	Vehicular Inmarsat Mini-M
1	TT-3024A	Aeronautical Inmarsat C
1	TT-3022C	Landmobile Inmarsat C

See attached specification sheets for exact data (i.e. frequency, EIRP, channel spacing, etc.).

Thrane & Thrane

Characteristics

General Specifications: Meets or exceeds current and proposed INMARSAT specifications and GMDSS requirements.

Maritime Antenna: Inmarsat-C/GPS omnidirectional antenna. RHC polarised, G/T -23dB/K, EIRP 14 dBW at 5° elevation. Coverage +90° to -15°.

Other Antennas: Please refer to dedicated leaflets.

Operating Frequencies: Receive 1530.0-1545.0 MHz, Transmit 1626.5-1646.5 MHz, GPS 1575.42 MHz.

Channel Spacing: 5 kHz.

Modulation: 1200 symbols/sec. BPSK.

Data Rate: 600 bit/sec.

Antenna Interface: Standard 50 ohm female N (transceiver), female TNC (antenna).

Terminal Interface: CCITT Rec. V24/28 110-9600 Baud IA-5 code, DB-9F connector.

Printer Interface: Standard parallel Centronics, DB-25F connector.

Data Bus & Alarm Interface: CCITT Rec. V.10 special with multi-drop addressing, female BNC, max. 100 meter cable.

Solid-State Storage: 256 kbyte RAM memory.

System Set-up: EEPROM programming from operator terminal.

Power Source: 10.5-33V floating dc 9.5/80W Rx/Tx.

Ambient temperature: Electronics Unit, -25°C to 55°C operating, -40°C to 80°C storage. Antenna Unit, -35°C to 55°C operating, -40°C to 80°C storage.

Solar Radiation: 1200 W/m² max. flux density.

Relative humidity: 95% non-condensing at 40°C.

Precipitation: Up to 10 cm/hour, droplet size 0.5 to 4.5 mm.

Wind: Up to 200 km/h.

Vibration Operational: Random 5-20 Hz 0.005 g/Hz, 20-150 Hz -3dB/Oct. (0.5g rms).

Vibration Survival: Random 5-20 Hz 0.05 g/Hz, 20-150 Hz -3dB/Oct. (1.7g rms).

Shock: Half sine, 20g/11 ms.

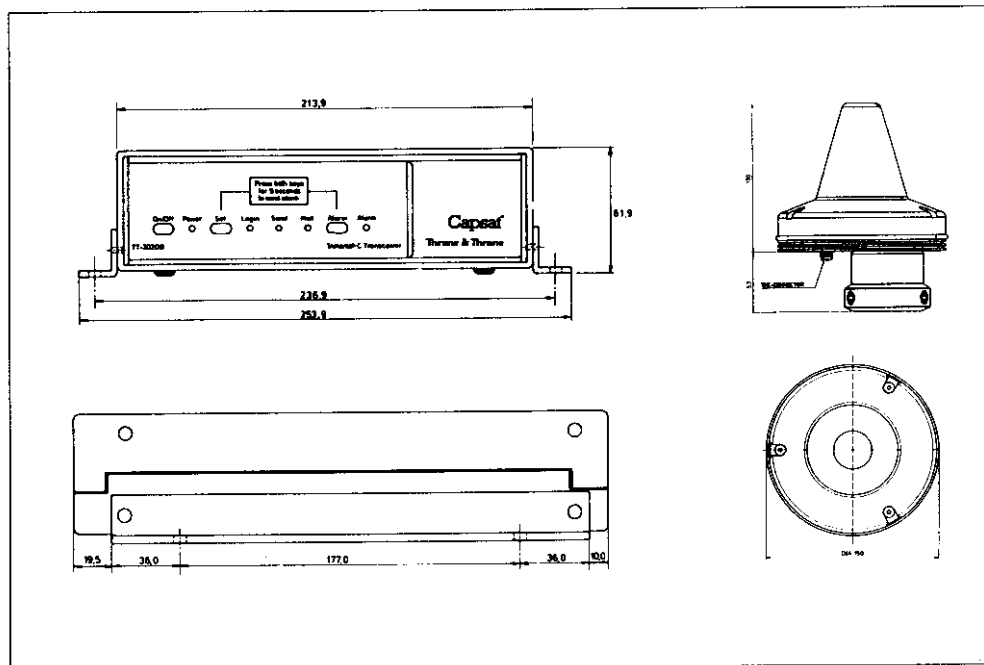
Antenna Mounting: Standard 1.5" tube mount.

Electronics Unit Mounting: Flange mounting, vertical or horizontal.

Dimension: Electronics Unit HxWxD, 52 mm x 214 mm x 279 mm. Antenna Unit HxD 124 mm x 150 mm.

Weight: Electronics Unit 3.2 kg, Antenna Unit 0.75 kg.

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Thrane & Thrane

Characteristics

General Specifications: Inmarsat-phone spot-beam operation. Meets or exceeds current and proposed specifications.

Antenna: Directional RHCP Patch Array with +/- 15 deg. beam width. G/T: -17 dB/K minimum.

EIRP: 11-17 dBW in 2 dB steps.

Antenna Cable: SMB/SMB male, max. cable loss 10 dB at L-Band, 1.8 ohm at DC.

Operating Frequencies:

Receive 1525.0-1559.0 MHz.

Transmit 1626.5-1660.5 MHz.

Channel Spacing: 1.25 kHz.

Rx-Modulation: 5.6 kbps O-QPSK SCPC (voice/fax/data), 6 kbps BPSK TDM.

Tx Modulation: 5.6 kbps O-QPSK SCPC (voice/fax/data), 3 kbps BPSK TDMA.

Voice: 4.8 kbps AMBE

3.6 kbps voice, 1.2 kbps FEC.

Async. Data Rate: Max. 2.4 kbps.

Phone Interface: 2-wire 600 ohm

CCITT Rec. G.473, standard DTMF

telephones, RJ-11 jack.

Fax Interface: 2-wire 600 ohm CCITT

Rec. G.473, T.30 Group-III Fax,

max. 2.4 kbps, RJ-11 jack.

Data Interface: Serial EIA standard RS-232E, Hayes compatible, max. 19.2 kbps, DB-9 female connector.

Printer Interface: Serial EIA standard RS-232E, max. 19.2 kbps, DB-9 female connector.

SIM Card: GSM like operation, ISO-7816.

Power Supply: 9-18Vdc, typical 370mW listen mode, 8W talk mode and 20W in fax/data mode.

Solar Panel Interface:

15-25V dc input.

Battery Capacity: Typical listen time 48 hours, talk time typical

150 min. and fax/data time 50 min.

Standard AC Adapter:

90-265 Vac, 40-70 Hz, 5 W,

charge time 5-6 hours.

Optional AC Adapter:

90-265 Vac, 40-70 Hz, 15 W,

charge time 2 hours.

Ambient temperature:

-25°C to 55°C operating,

-40°C to 80°C storage.

Relative humidity:

95% non-condensing at 40°C.

Vibration Survival:

Random 5-20 Hz 0.05 g²/Hz,

20-150 Hz -3dB/Oct. (1.7g rms).

Shock: Half sine, 20g/11 ms.

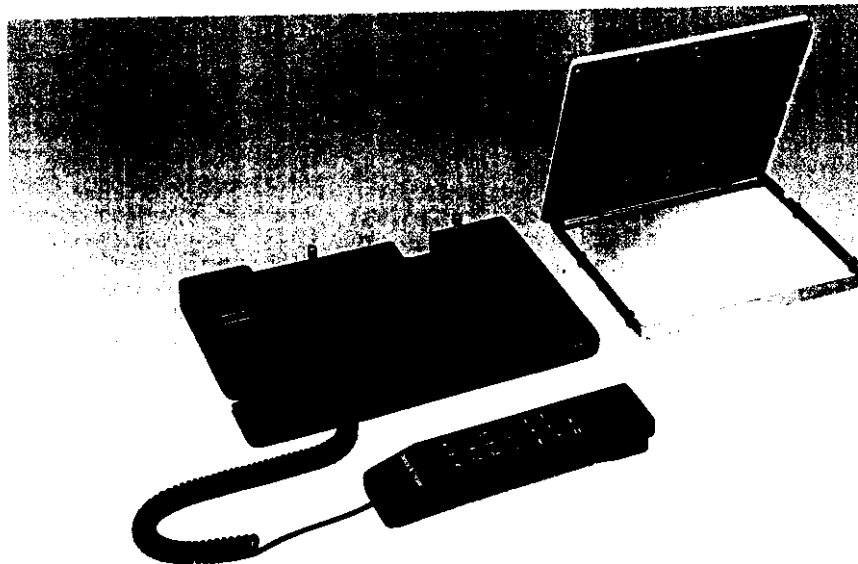
Dimensions and Weight:

H x W x D, 52 mm x 270 mm x

200 mm., 2.2 kg (incl. handset,

battery pack and antenna)

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Characteristics

General Specifications: Inmarsat Phone spot-beam operation. Meets or exceeds current and proposed specifications.

Antenna: Sensor stabilised platform with directional RHCP Antenna. No cable unwrap. Maximum pointing error ± 10 deg.

Ship Motions: Roll ± 25 deg, Pitch ± 15 deg, Yaw ± 8 deg, surge 0.2g, Sway ± 0.2 g, Heave ± 0.5 g, Turning rate ± 12 deg/s 1 deg/sq-2, Headway 30 knots.

G/T: -17 dB/K minimum.

EIRP: 8-14 dBW in 2 dB steps.

Antenna Cable: TNC/TNC female, max. cable loss 15 dB at L-Band, 1.8 ohm at DC.

Operating Frequencies:

Receive 1525.0-1559.0 MHz,

Transmit 1626.5-1660.5 MHz.

Channel Spacing: 1.25 kHz.

Rx-Modulation: 5.6 kbps O-QPSK SCPC (voice/fax/data), 6 kbps BPSK TDM.

Tx Modulation: 5.6 kbps O-QPSK SCPC (voice/fax/data), 3 kbps BPSK TDMA.

Voice: 4.8 kbps AMBE (3.6 kbps voice), 1.2 kbps FEC.

Async. Data Rate: Max. 2.4 kbps.

Phone Interface: 2-wire 600 ohm CCITT Rec. G.473, standard DTMF telephones, RJ-11 jack.

Fax Interface: 2-wire 600 ohm CCITT Rec. G.473, T.30 Group-III Fax, max. 2.4 kbps, RJ-11 jack.

Data Interface: Serial EIA standard RS-232E, Hayes compatible, max. 19.2 kbps, DB-9 female connector.

Printer Interface: Serial EIA standard RS-232E, max. 19.2 kbps, DB-9 female connector.

Hands free Microphone: $\phi 2.5$ mm connector.

Hands free Speaker: 32 Ohm. $\phi 3.5$ mm connector.

Ignition Controlled Power On: Opto-isolated input. PTR screw connector.

External Ringer: RS410-type-N open collector output. PTR screw connector.

Mute Output: RS410-type-N open collector output. PTR screw connector.

SIM Card: GSM like operation, ISO-7816.

Power Consumption: Tx mode 40w (typ) RX mode: 20w (typ), Maximum: 70W.

Power Supply: 10.5-32 Vdc floating.

Ambient temperature: -25°C to 50°C operating, -40°C to 80°C storage.

Relative humidity: 95% non-condensing at 40°C .

Spray (EME): Solid droplets from any direction.

Icing (EME): Up to 25 mm of ice (no operation).

Precipitation (EME): Up to 100 mm/hour.

Wind (EME): 100 knots (normal operation).

Vibration (EME): 4-10 Hz 2.54 mm, 10-15 Hz 0.76 mm, 15-25 Hz 0.40 mm, 25-33 Hz 0.23 mm.

Shock: Half sine, 20g/11 ms.

Dimensions and Weight:

Electronics Unit (TT-3034B): H x W x D, 25 mm x 268 mm x 211 mm., 1.3 kg.

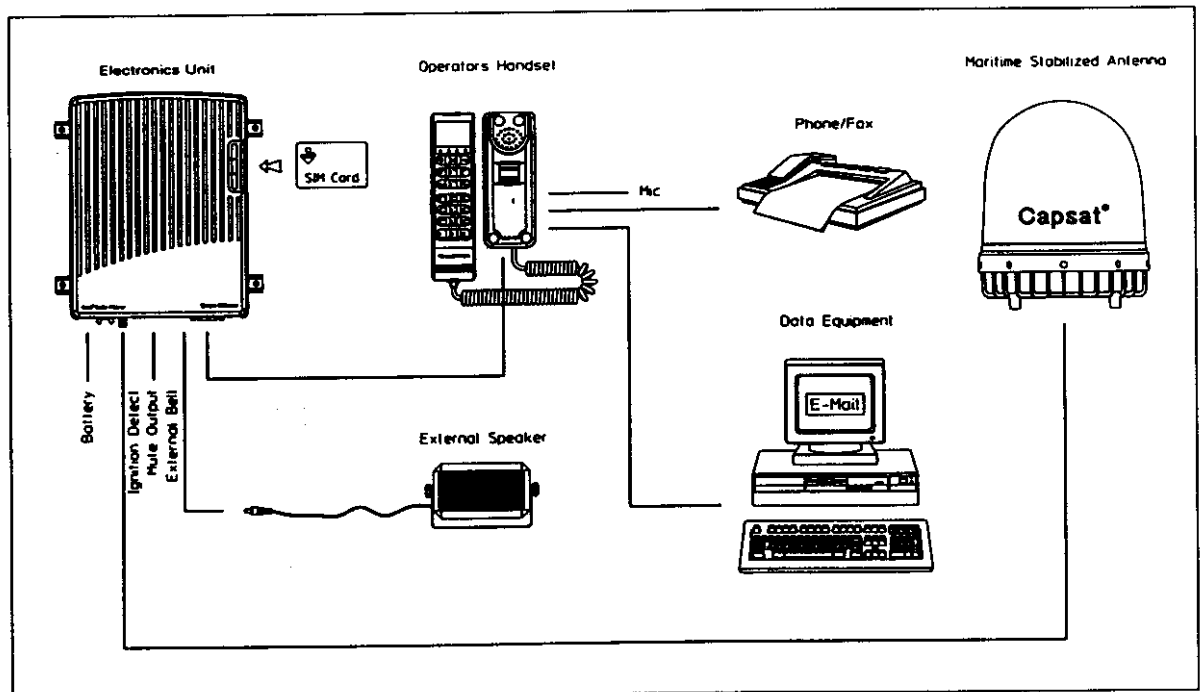
Maritime Stabilised Antenna (TT-3007C): ϕ x H, 210 mm x 240 mm, 2.2 kg. incl. FEU and connector.

Cradle for the handset (TT-3622A): H x W x D, 160 mm x 61 mm x 27 mm, 0.15 kg.

Handset (TT-3620B): H x W x D, 200 mm x 52 mm x 33 mm, 0.25 kg.

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Characteristics

General Specifications:

Inmarsat-phone spot-beam operation. Meets or exceeds current and proposed specifications.

Antenna: Azimuth stabilised antenna, manually selectable directional RHPC patch or helix antenna.

Coverage:

Patch: 32° to 67°

Helix: 15° to 41°

Vehicle Motions: Induced acceleration 0.5g, Velocity 110 km/h, Turning rate 60°/s, Turning acceleration 20°/s.

G/T: -17 dB/K minimum.

EIRP: 8-14 dBW in 2 dB steps.

Antenna Cable: TNC male / 2.5 meter.
Max. cable loss 7.5 dB at L-Band, 1.8 Ohm at DC.

Operating Frequencies:

Receive 1525.0-1559.0 MHz,

Transmit 1626.5-1660.5 MHz.

Channel Spacing: 1.25 kHz.

Rx-Modulation: 5.6 kbps O-QPSK SCPC (voice/fax/data), 6 kbps BPSK TDM.

Tx Modulation: 5.6 kbps O-QPSK SCPC (voice/fax/data), 3 kbps BPSK TDMA.

Voice: 4.8 kbps AMBE (3.6 kbps voice, 1.2 kbps FEC).

Async. Data Rate: Max. 2.4 kbps.

Phone Interface: 2-wire 600 ohm CCITT Rec. G.473, standard DTMF telephones, RJ-11 jack.

Fax Interface: 2-wire 600 ohm CCITT Rec. G.473, T.30 Group-III Fax, max. 2.4 kbps, RJ-11 jack.

Data Interface: Serial EIA standard RS-232E, Hayes compatible, max. 19.2 kbps, DB-9 female connector.

Printer Interface: Serial EIA standard RS-232E, max. 19.2 kbps, DB-9 female connector.

Hands-free Microphone: ø2.5 mm connector.

Hands-free Speaker: 8 Ohm, ø3.5 mm connector.

Ignition Input: Isolated input. PTR screw connector.

Extra Ringer: RS-410-type-N open collector output. PTR screw connector.

Mute Output: RS-410-type-N open collector output. PTR screw connector.

Sim Card: GSM like operation, ISO-7816.

Power Supply: 10.5-32 Vdc floating.

Ambient Temperature: -25° to 55° operating, -40° to 80° storage.

Relative Humidity: 95% non-condensing at 40°C.

Spray (EME): Solid droplets from any direction.

Icing (EME): Up to 25mm ice (no operation).

Rain (EME): Up to 50mm/hour.

Wind (EME): 200 km/h relative wind speed (no operation).

Vibration: Random 5-20 Hz 0.02g/Hz, 20-150 Hz -3dB/Oct. (1.05g rms).

Shock: Half sine, 20g/11ms (survival).

Dimensions & Weight:

TT-3034G Electronics Unit:

HxWxD, 25mm x 268mm x 211mm. 1.3 Kg.

TT-3007F Low Profile Antenna:

HxD, 90mm x 285mm. 2.7 Kg.

TT-3622A Handset Cradle:

HxWxD, 160mm x 61mm x 27 mm. 0.15 Kg.

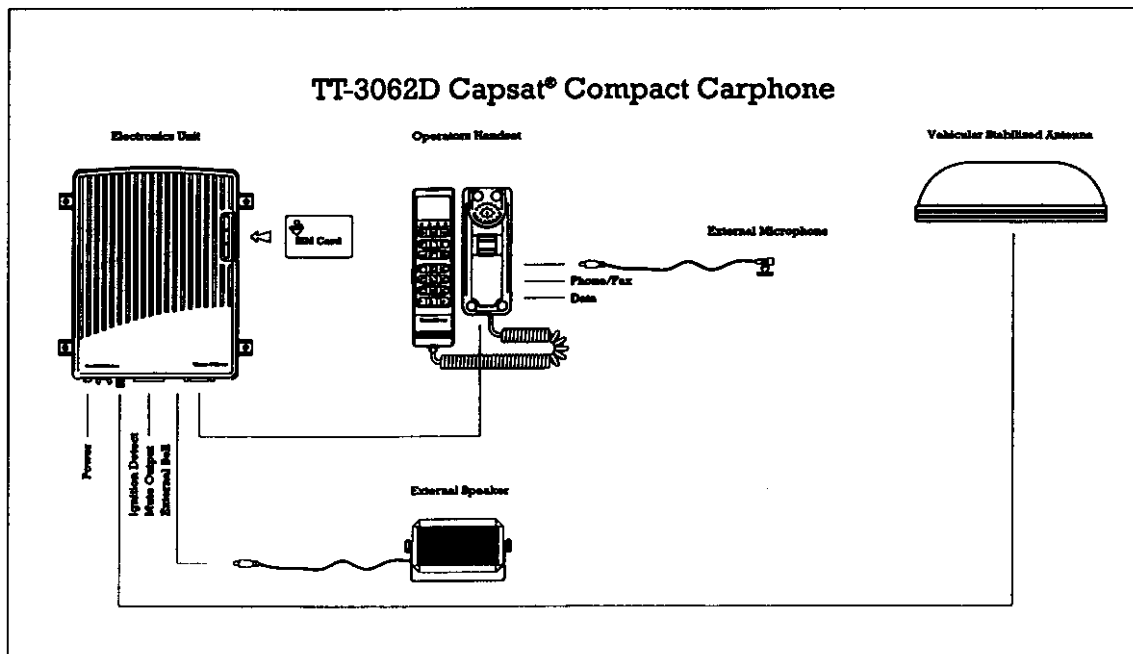
TT-3620B Handset:

HxWxD, 200mm x 52 mm x 33mm. 0.25 Kg.

EMC: ETSI 300339 (mobile equipment).

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Characteristics

General Specifications: Meets or exceeds all Inmarsat specifications for the Inmarsat-C aero system and all relevant GPS specifications.

Antenna: Integrated Inmarsat-C/GPS omnidirectional antenna, RHC polarised.

Figure-of-Merit (G/T): -23dB/K at 5° elevation.

EIRP: 12dBW minimum at 5° elevation.

Transmit Freq: 1626.5-1646.5 MHz

Receive Freq: Inm-C 1530.0-1545.0 MHz, GPS 1575.42 MHz

Channel spacing: 5 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 bits/second.

RX frame length: 8.64 sec.

TX signalling access mode: Slotted ALOHA.

TX message channel: TDMA & FDMA, interleaved code symbol.

Position reporting:

Built-in 5-channel GPS receiver with Lat/Long/Alt/Speed/Track calculation, update rate 1 sec.

Position accuracy: C/A code with 96 meter spherical error probability (SEP-SPS).

Initial stabilisation: 15 min. max doppler shift correction and GPS almanac update.

Solid-State storage: 256 kbyte RAM memory.

On-board message/data interface: RS422/423, 110-9600 bps and Centronics parallel.

Navigational interface: RS422/423 V.10 Special for interface to on-board navigational systems.

Roll & Pitch: Minimum +/- 25° from level flight.

Altitude: MSL-55,000 feet.

Airspeed: Full doppler compensation to minimum 620 knots GS.

Airspeed acceleration: Minimum +/- 1 g.

Turn rates: Frequency acquisition to rate-1 turns at max. speed.

Antenna drag: 0.55 kg @ 35,000 feet and MACH 0.85.

General Env. Category:

Electr. Assy, DO-160C

D1-BA(MNB)XXXXXXXXXXXXAUAIXX

LNA/HPA Assy, DO-180C

D2-BBCXXXXXXXXXXXXAAVAIXX

Jet Blade antenna, DO-180C

D2-ACCXSFDXKXXXXXXXX(LM)

Ambient temperature: Electronics Assy, -20°C to 55°C operational. LNA/HPA Assy and Jet Blade antenna, -55°C to 70°C operational.

Relative humidity: Electronics Assy and LNA/HPA, 95% non-condensing.

Vibration: DO-160C sect. 8 cat. B, M, N for fixed wing turboprop and turbojet and helicopters.

Shock and Crash safety: DO-160C sect. 7.

DC power source: Floating 10.5-32Vdc, 9.5W Rx, 80W Tx.

Size and weight: Vertical Jet Blade antenna with standard flange mounting, HxdxW: 114x274x98 mm, 0.75 kg. LNA/HPA Assy, WxLxH 161.0x213.9x49.5 mm, 2.3 kg. Electronics Assy, ARINC 404 1/4 sized short, WxLxH 57.15x320.5x207.6 mm, 2.5 kg.

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TT-3022C

Characteristics

General Specifications: Meets or exceeds current and proposed INMARSAT specifications and ISO 7637 - 0, 1 & 2 for Electrical disturbances for Road Vehicles.

Land-Mobile Antenna: Inmarsat-C/GPS omnidirectional antenna. RHC polarised, G/T -23dB/K, EIRP 14 dBW at 5° elevation. Coverage +90° to -15°.

Other Antennas: Please refer to dedicated leaflets.

Operating Frequencies: Receive 1525.0-1559.0 MHz, Transmit 1626.5-1660.5 MHz. GPS 1575.42 MHz.

Channel Spacing: 1.25/2.5/5 kHz.

Modulation: 1200 symbols/sec. BPSK.

Data Rate: 600 bit/sec.

Antenna Interface: Standard 50 ohm female TNC (transceiver), female TNC (antenna).

Terminal Interface: Serial EIA-232-E 110-38.400 Baud IA-5 code, DB-9F connector.

Printer Interface: Standard parallel

IEEE 1284 (Centronics), DB-25F connector.

Data & GPS I/O: Serial EIA-422-A optically isolated input (NMEA 0183 protocol), DB-15F.

Parallel I/O: RS-410 4-bit open collector input/output and 2-bit input.

ArcNet Interface: ATA/ANSI 878.1 2.5Mbit token based, twisted pair.

Solid-State Storage: 512 kbyte Flash and 256 kbyte SRAM.

Optional GPS Module: 8-Channel GPS tamper proof pc-board, 1 sec. update rate, 15m RMS accuracy (100m with S/A), 0.2m RMS velocity accuracy.

Power Source: 10-32V floating dc 4.8/81W Rx/Tx with GPS module.

Power Output: Floating 9V/400mA dc output for terminal equipment.

Sleep-Mode: Timer and event programmable modes; total system power consumption 1.14W/15min, 570mW/30min, 280mW/1h, 140mW/2h, 60mW/5h, 30mW/10h.

Ambient temperature: Electronics Unit, -25°C to 55°C operating, -40°C to 80°C storage. Antenna Unit, -35°C to 55°C operating, -40°C to 80°C storage.

Solar Radiation: 1200 W/m² max. flux density.

Relative humidity: 95% non-condensing at 40°C.

Precipitation: Up to 10 cm/hour, droplet size 0.5 to 4.5 mm.

Wind: Up to 200 km/h

Vibration Operational: Random 5-20 Hz 0.005 g²/Hz, 20-150 Hz -3dB/Oct. (0.5g rms).

Vibration Survival: Random 5-20 Hz 0.05 g²/Hz, 20-150 Hz -3dB/Oct. (1.7g rms).

Shock: Half sine, 20g/11 ms.

Antenna Mounting: Flush mounting.

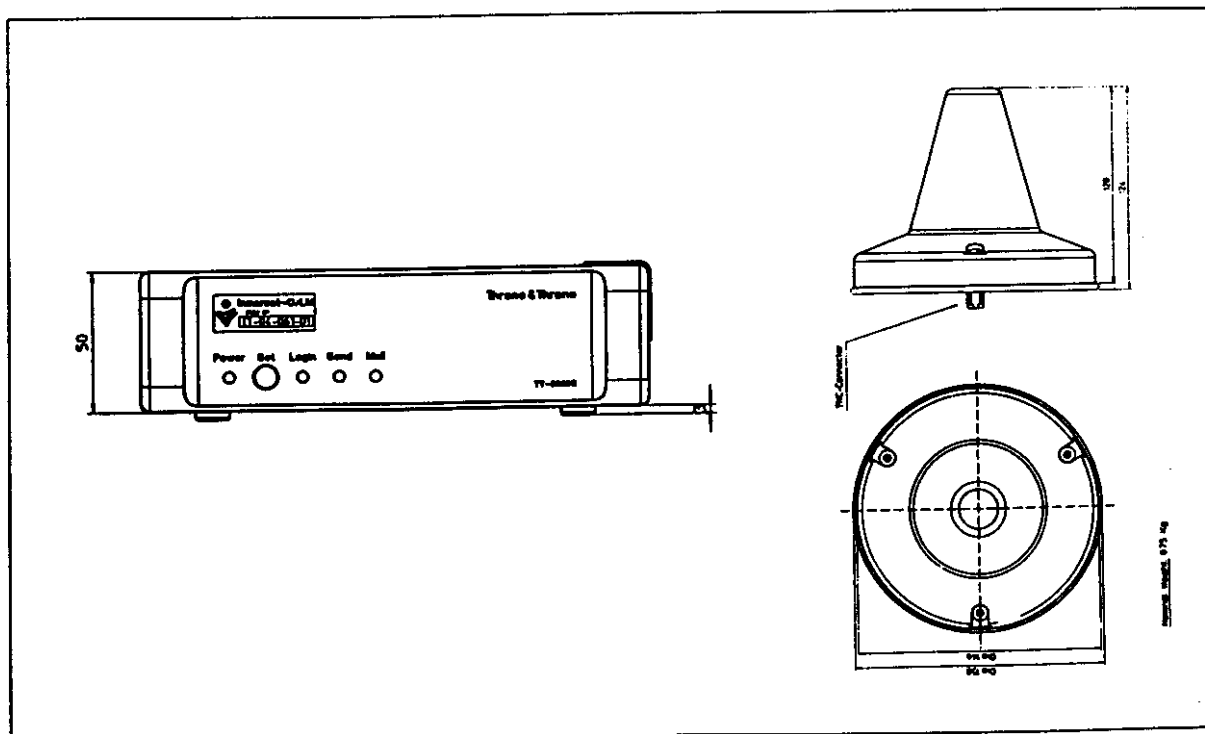
Electronics Unit Mounting: Flange mounting, vertical or horizontal.

Dimension: Electronics Unit HxWxD, 50 mm x 180 mm x 165 mm, Antenna Unit HxD 124 mm x 150 mm.

Weight: Electronics Unit 1.3 kg, Antenna Unit 0.75 kg.

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