USERS MANUAL

Tron AIR

JOTRON

www.jotron.com

EC Declarations of Conformity, available at www.jotron.com

Read this Users Manual fully to familiarise yourself with the equipments functions and facilities.

Abbreviations and definitions

DEFAULT
A condition that the navigator assumes automatically if no other condition is initiated by the operator.

IEC
International Electro-technical Commission.

IMO
International Maritime Organization

IP rating
Joint factor (to indicate the waterproofing of the equipment)

ITU
International Telecommunication Union.

LED
Light Emitting Diode.

VHF
Very High Frequency -A set of frequencies in the MHz region.

VSWR
Voltage standing wave ratio.

Amendment Record

AMENDMENT NO.	INCORP. BY	DATE	PAGE(S)	VERSION	REASON FOR CHANGE
1	ES	19.01.07	32	A	New release
2	ES	19.03.08	10	B	New text
3	ES	26.03.08	13, 17	C	New text
4	ES	07.10.08	16, 22	D	New text
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

The information in this book has been carefully checked and is believed to be accurate. However, no responsibility is assumed for inaccuracies.

CAUTION!

This equipment contains CMOS integrated circuits. Observe handling precautions to avoid static discharges which may damage these devices.

Jotron AS reserves the right to make changes without further notice to any products or modules described herein to improve reliability, function or design. Jotron AS does not assume any liability arising out of the application or use of the described product.

LIST OF CONTENTS

BATTERY SAFETY DATA SHEET

(Form: EEC directive 91/155)

(2) SAFETY ADVICE

S2 Keep out of reach from children.

S8 Keep container dry.

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S43 In case of fire, use D type extinguishers. Never use water.

S45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

(3) FIRST AID MEASURES

In case of contact of cell contents with eyes, flush immediately with water for 15 min. With skin, wash with plenty of water and take off contaminated clothes. If inhalation, remove from exposure, give oxygen, seek medical advice.

(4) FIRE-FIGHTING MEASURES

Extinguishing media

Suitable:

Type D fire extinguishers

Not to be used:

Water - CO_2 - Halon, dry chemical or foam extinguishers

Special exposure hazards:

Generation of chlorine, sulfur dioxide, disulfur dichloride during thermal decomposition.

Special protective equipment:

Use protective working boots, rubber apron and safety glasses with side shields.

1 GENERAL DESCRIPTION

1.1 Introduction

Tron AIR is a battery operated 200mW carrier AM transceiver for the VHF air band (118-137MHz) covering the two frequencies 121.5MHz and 123.1MHz. The unit is specially designed and manufactured as a emergency two-way transceiver.

Tron AIR comes with a housing made of rough glass filled polycarbonate in a blue color, and is a result of a comprehensive developed to meet the requirements encountered under severe maritime conditions. The equipment is designed to meet MED 96/98/EC for Maritime VHF distress radio equipment operating on aeronautical frequencies.

1.2 Features

Waterproof
Tron AIR is waterproof to a depth of 1 meter for 5 minutes. Using battery pack X-98806, it also floats in case of accidental drop into water.

Rugged design
Tron AIR is designed to resist a drop from 1 meter onto a hard surface. It is also resistant to seawater, oil and sunlight, and is not unduly affected by this.

Handling
Tron AIR is made for easy operation, with a brief operating instruction printed on the front. It is possible to fully operate Tron AIR with only one hand and operate it when wearing thick gloves or survival suit gloves.

Housing
Tron AIR is of small size (70 x 195 x 50mm), and has no sharp edges to damage raft or clothing. It also comes with a belt clip and a short wrist strap for easy carrying.

Low power consumption
Tron AIR has a low power consumption and will operate for a long time. With a transmit, receive and standby ratio of 1 : 1 : 8 the battery lifetime is more than 8 hours using Lithium battery X-98806.

LED indicators
Tron AIR is equipped with LED's to indicate its status. There are two LED's to tell which channel is active and one to indicate power output during transmitting. The LED's can also indicate faults if this should occur. The TX LED flashes when battery voltage is low and CH LED flashes if synthesizer is out of lock.

Frequency synthesizer
Tron AIR is built with a frequency synthesizer to assure an easy channel selection, with high frequency stability.

Electronic construction
Tron AIR is built with surface mount techniques on one multilayer circuit board, to assure homogeneous quality and high reliability.

Battery pack
The Battery pack is easily replaced without any tools. It is protected from rough handling being potted inside the housing.

Service
Handheld VHF service is available through the Jotron worldwide service network. See details on www.jotron.com.

1.3 Licensing

Prior to use please check your national requirements for the operators of VHF radios and also that your radio will conform to local regulations before use.

Regulations for VHF radios may vary from country to country.

1.4 Getting started

Congratulation on your JOTRON Tron AIR purchase.

To ensure this unit gives trouble free performance from the outset, please adhere to the following safeguards:

Connect the antenna before use and charge the battery fully before connecting to the equipment.

2 TECHNICAL SPECIFICATION

2.1 General

Frequency channels:	121.5MHz and 123.1MHz.
Frequency stability:	±20 ppm
Modulation:	A3 , 300 - 3000 Hz
SW version:	1.10

2.2 Receiver

Sensitivity:	SINAD better than 12 dB for an input signal of 2μV pd (-101 dBm), 30%, 1kHz modulation, according to CCITT.
IF selectivity:	-3 dB at +/- 7,5 kHz -70dB at +/- 25 kHz
IF:	21.4 MHz and 455 kHz.
AGC:	<3 dB audio variation for input signal levels between -101 dBm and -20dBm.
Intermodulation:	Two interfering signals of equal amplitude and at least 60dB more than a desired signal giving 10dB sinad and at a distance of 100kHz from the operating frequency will not generate 3rd order intermodulation products, at the receiver output, larger than the desired signal.
Radiated spurious components:	<0.25nW.
Squelch:	Noise squelch, center frequency 18.75kHz±6.5 kHz. Adjustable and hysteresis less than 3 dB. Opening/closing < 50ms.
S/N ratio:	>35dB, 100μV, 1kHz, 70% modulation depth.
Audio response:	-3 to +1 dB rel to 1 kHz, 300-3000 Hz. -10dB at 100 Hz and -35dB at 5kHz.

Audio outputs:	Loudspeaker: Min. 200mW
Distortion:	Less than 10% with 70% modulation, 1mV input signal.
Power supply:	Battery, 6.2V-7.5V

2.3 Transmitter

Carrier power:	50-200mW at 7.2V battery supply
Distortion:	≤ 10% THD at 85% mod.(AM).
S/N ratio:	≥ 35 dB at 85% mod. (AM).
Frequency response:	300 - 3000 Hz -3 to +1 dB ref 1kHz. -10 dB at 100Hz and -35dB at 5 kHz.
Modulation:	max. 85% AM,
Harmonic emission:	Less or equal to 10 µW
Spurious emission:	Less or equal to 10 µW
Adjacent channel power:	Less or equal to -70 dB

2.4 Environmental conditions

Operating temperature:	-20 to + 55°C
Water resistant:	Capable of being immersed into water to a depth of 1m for 5 minutes.
Environmental resistance:	Not affected by sea water, oil or exposure to sunlight.

2.5 Materials

Housing:	Polycarbonate
O-ring :	Rubber
Gaskets:	Silicone rubber
Antenna:	Conical helix. Molded in high gloss, flexible thermoplastic rubber.
Dimension:	70 mm (W) * 50 mm (D) * 195 mm (H without antenna and projections)
Weight:	App. 500g

2.6 Charger

X-93080, Tron CHARGE, Jotron made dual slot fast charger with trickle charging.

Operates on 12 –24 DC, or 115/230VAC with external mains adapter. Wall and table mountable.

Size, WHD:	155mm x 69mm x 83mm
Weight:	Approx. 300g

3 FUNCTIONAL DESCRIPTION

3.1 Radio Unit

1 – Helical antenna
2 – Volume control
3 – Rotary channel selector
4 – ON / OFF
5 – Microphone
7 – PTT (Push To Talk)
8 – Loudspeaker
9 – Battery release buttons
10 – Battery pack
11 – Belt clip
12 – Squelch control
13 – Remote connector
14 – 121.5MHz indication
15 – Selected channel indication
16 – Transmit indication

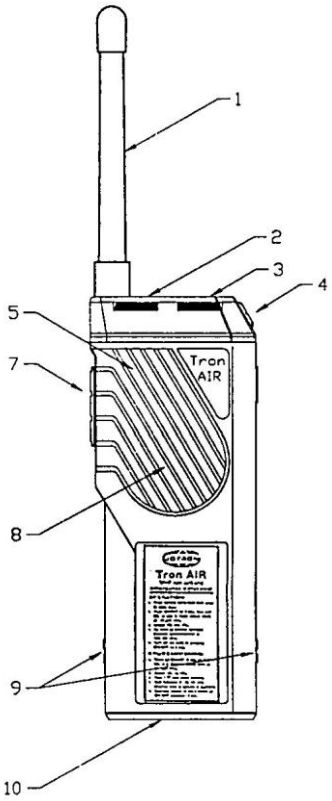

Figure 3.1.a Location of controls and facilities of the Tron AIR

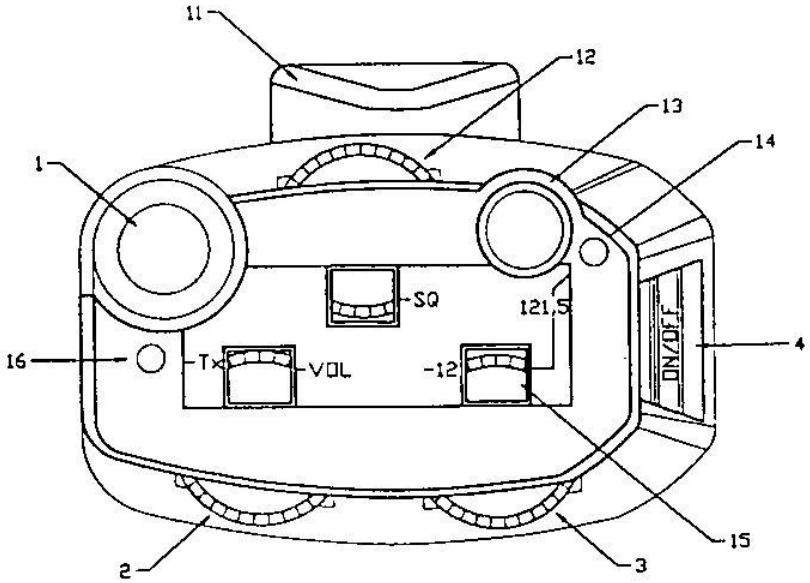

Figure 3.1.b Location of controls and facilities of the Tron AIR

3.2 Remote connector

The remote connector is located at the top of the radio.

For connection of external equipment, the connected equipment must have a shielded connection cable.

Pin no.	De-scription	Function description
1	SPKR CTRL	External speaker control. Connecting this line to 0V and the internal speaker will be switched of.
2	SPKR	External speaker output.
3	MIC CTRL	External microphone control. Connecting this line to 0V and the internal microphone will be switched of.
4	MIC	External microphone input.
5	0V	0 Volt of the TronVHF.
6	PTT/ SDA	External PTT. Connecting this line to 0V enables transmitting. If SCL is connected to 0V during power up, this line will work as I^2C-bus line SDA (Only in use during channel programming).
7	SCL	SCL line of I^2C-bus. (Only in use during channel programming)

3.3 Antenna

The antenna for Tron AIR is fitted with a standard connector.

3.4 Battery removal and replacement

To release the battery, press both battery release clips and gently pull the battery away from the radio.
To replace the battery, slide the battery into position, and make sure the battery clips fully engage.

Note! The radio is not watertight without the battery in place!

3.5 Primary battery

The primary battery unit is a 7.2V / 5000mAh lithium cell. This unit is specially designed for emergency use to preserve a long shelf- and operating-life.

Type no. of battery pack : X-80242, including 2PCs SAFT LSH14, Lithium.

Battery change procedure:

1) Hold down the two push buttons on each side, and pull the battery pack out of the housing.

2) Check the gasket inside the housing for no damage.
If it is broken, replace it with a new (stock no. X-93024). Remove dirt when replacing the gasket.

3) Replace the expired battery. The label on the battery is marked with date of replacement.

4) Push the new battery unit into the housing until you hear the two push buttons are clicking into right position. Tron AIR will not be waterproof unless the pushbuttons are in correct position.

3.5.1 When to change battery

Replace the battery before expiry date. The battery pack, X-80242, has a shelf life of 4 years.
If Tron AIR is indicating low voltage during a regular test procedure, also change the battery. The TX LED also flashes when battery voltage is low.

3.5.2 Special care

The battery pack, X-80242, is of high-energy lithium type, and some precautions must be taken.

Do not heat above 70^{o}C, recharge, crush, disassemble or incinerate. This may result in fire, explosion and severe burn hazard.

Do not throw used batteries overboard, but return them to your local dealer.
To prevent the possibility of being in an emergency situation with a Tron AIR equipped with a used battery, we strongly recommend storing an extra battery, in lifeboats and rafts. Store this battery without breaking the sealing. Secondary battery and charger

3.5.3 Using the Nickel-Cadmium (NiCad) Battery

Tron AIR can be delivered with a rechargeable NiCad battery, type 93003/93030 (850mAh/400mAh), which is equipped with two connectors for charging with Tron CHARGE.
These battery are specially designed for On-Board communication.
After recharging the battery, it can be used in the same way as the primary battery unit. However, the voltage of Nickel-Cadmium batteries drops rapidly just before they are exhausted, so when the transmit indicator LED (TX) goes out, be sure to immediately stop using it, and recharge the batteries again.

When changing the batteries, see chapter 3.4 how to change the battery.

3.5.4 How to Charge the NiCad Battery

1. Use the Tron CHARGE NiCad charger and power it up.

2. The power of Tron AIR must be switch OFF, or remove the battery unit from the transceiver.

3. Insert the Tron AIR / battery unit into the charging slot.

4. The Charge LED will indicate that the charge cycle is beginning. It is now operating in fast charge mode which will fully charge the battery within 4 hours.

5. When Charge LED goes out, the battery is recharged. The charger has now switched to trickle charge mode.

6. Charge temperature must be between 0ºC and 40ºC.

7. After charging, remove the unit from the charger. The Tron AIR and battery is now ready for operation.

3.5.5 Special care

The battery pack, 93003 and 93030, is of Nickel-Cadmium type, and some precautions must be taken.
Do not short-circuit, solder, reverse charge, crush, disassemble or incinerate. This may result in fire, explosion and severe burn hazard.
Also avoid charging under 0ºC or over 40°C.

3.5.6 The Tron Charge NiCad charger

The Tron CHARGE NiCad charger is specially made for charging your secondary battery, type 93003 or 93030. On the left side there is space for storing the primary emergency battery, type 80242.

The charger has a fast charge facility, which fully charges the 93003 battery within 4 hours. When the battery is fully charged, this is detected, and Tron CHARGE switches to trickle charge mode. This is indicated with the Charge LED switching off.

There are also built in temperature sensors detecting charge temperature limits and sudden rises in battery temperature. If the charger is detecting out of limit temperatures, this causes the unit to switch to trickle charge mode. It is important to note that the absolute battery temperature is not detected by the charger, and must be within 0ºC to 40ºC when starting the charge cycle.
The charger supply can be 230VAC, 115V AC, 12 to 16V DC or 24 to 28V DC. For changing the AC source, modifications must be done on the Printed Circuit Board. If a DC source is required, the power cable must be connected to the +12VDC socket within the unit. For 24 to 28V DC an extra resistor of 33ohm/20W must be connected in serial with the power supply. This resistor is available from JOTRON at stock number X-93750.

NOTE!
If Tron CHARGE is connected to a DC source with higher voltage than 16V DC, an extra resistor of 33ohm/20W must be connected in serial with the power supply.
This resistor is available from JOTRON at stock number X-93750.

Figure 3.5.6 Tron AIR with NiCad battery charger

4 INSTALLATION

Connect the antenna before use and charge the battery fully before connecting to the equipment.

Follow the operation procedure and set the squelch such that the background noise just disappears when in receive mode.

Place the radio and charger in a spot away from direct sea spray, chemicals, oil, exhaust and vibrations.

The location must also be easily accessible for testing and maintenance.

5 OPERATING INSTRUCTIONS

5.1 Switching ON and selecting channels

1) Turn **VOL** and **SQ** to position 0.

2) Turn Tron AIR **on** by pushing the **ON/OFF** button for 3 seconds. Tron AIR is now working at 121.5MHz.

3) Adjust the sound volume by turning **VOL**. Use noise from the loudspeaker to find a proper level.

4) Adjust the squelch level by turning **SQ**. Turn **SQ** carefully until noise from the loudspeaker is suppressed. Be careful not to turn the squelch level to high. This may lead to no squelch opening when weak signals are received. The Tron AIR is now ready for reception.

5) Selecting another channel is done with the **CH** wheel. **121.5MHz** indicating light will switch off when 123.1MHz is chosen.

5.2 Emergency call sequence

1) Start the emergency call sequence by selecting 121.5MHz.

2) **Emergency calling:**
   - Push PTT and send the emergency signal **MAYDAY**, repeated **three times**,
   - the words; **THIS IS**,
   - **call sign** or other identification on the mobile station being at distress, repeated **three times**.
   - Release PTT.

Emergency call answer:

- The word; **MAYDAY**
- the **call sign** or other identification, repeated **three times**.
- the words; **THIS IS**,
- **call sign** or other identification on the mobile station answering the emergency call, repeated **three times**,
- the words; **RECEIVED MAYDAY**.

When no answer:

- Repeat point 2).
- If there is no answer on 121.5MHz, try any channel and repeat point 2).

3) **Emergency message:**

- Push PTT and send the emergency signal **MAYDAY**,
- **call sign** or other identification on the mobile station being at distress,
- information on position,
- what kind of emergency it is,
- what kind of help is needed,
- other information that can be of any help to the rescue operation,

4) **Emergency traffic:**

- During emergency traffic, always use the emergency signal; **MAYDAY**, in front of any radio-message.

5) **Asking for silence on the air:**

- In cases where the emergency station wants to order silence, use the words; **SEELONCE MAYDAY**

5.3 Switching OFF

Switching off the Tron AIR is done by pressing ON/OFF button until all light's are off and two beeps are heard. This is indicating power off. Switching the power off will save battery power.

6 MAINTENANCE AND TROUBLESHOOTING

6.1 How to take care of your Tron AIR

Tron AIR is constructed to endure the rough maritime environment. Still the life is dependent on taking care of the equipment. It is a good practice to regularly inspect and test the equipment to trace error symptoms and prevent more serious problems.

To keep in mind during inspection:

- If Tron AIR has been immersed into sea water, it is good practice to clean it in fresh water.
- Inspect battery sealing and battery gasket.
- Inspect the housing for defects, which can affect the water sealing.

6.2 Regular test procedure

It is important to perform regularly testing to ensure proper operation in case of a distress situation. If Tron AIR is used regularly, perform test every month. When Tron AIR is stored in a lifeboat or raft, perform test at least once a year.

Regular test procedure:

Step	Item	Description
1	Turn power on	Unit will bleep (if volume adjusted to proper level) and 121.5 LEDs will light.
2	Battery	If **Tx** light is flashing, change the battery. Also check if **Tx** light is flashing during transmitting.
3	Volume control	Check if **VOL** control is smooth operating, and check if sound is increasing gradually.
4	Squelch control	Check if **SQ** control is smooth operating, and check that noise is muted with increasing squelch level.
5	Transmit	Check that **Tx** is lighting when transmitting. **Tx** light indicates that carrier is produced at the antenna output.
6	Talk test	Communicate with another radiotelephone to test receive and transmit functions.

6.3 Cleaning of dirt and oil

To clean away oil and dirt from the radio, use ordinary dish-soap and water. Immerse the radio into the solution for apx. 5 min. and wash it clean. The water temperature can be up to 45^{o}C warm. Finish of by rinsing with fresh water.

6.4 Service and Warranty

Your radio should seldom require service or repair.

Warranty time: 2 years from factory.

Before shipping Tron AIR for repair, please check the fundamental procedures on operation and battery condition.
If repair is necessary please contact the nearest JOTRON agent.

IMPORTANT!
The Tron AIR is a sealed waterproof radio and there are no user serviceable parts inside. It must never be opened, except by authorised JOTRON agents. Unauthorised disassembly will invalidate the warranty.

See the next chapter for failure diagnosis. This may be of help when discussing problems with a JOTRON agent.

6.5 Guide to troubleshooting

	Problem	Possible causes	Possible solutions
1	No lights are turning on at switch on, or **Tx** is flashing.	a) Battery is discharged. b) Failure in power supply.	a) Change to a fully charged battery. b) Voltages on circuit board must be checked.
2	All three light's are turned on.	Tron AIR is in programming mode.	Reset by switching power OFF.
3	Channel light is flashing.	a, b) Frequency synthesizer is out of lock. c) Failure in frequency synthesizer.	a) An unprogrammed channel is selected; try another channel. b) Try a reset by switching power OFF. c) Test EEPROM for channel data. An JOTRON agent can do this.If this doesn't help, check synthesizer.
4	Tx light is not responding during transmitting.	Failure in transmitter.	Transmitter must be checked.
5	Tx light is on during transmitting but communication is impossible.	Use of wrong channel number.	Use same channel number as partner station.
6	You know there is a signal coming, but Tron AIR is not responding.	a) Squelch is muting. b) Failure in receiver.	a) Adjust squelch to 0. b) Receiver must be checked.

7 PRACTICAL USE, VHF TRANSMISSION RANGE

The range of VHF communications is limited to 'line of sight', because the VHF radio waves are travelling in straight lines. A higher position of the transceiver will then increase the coverage. This applies both to the receiving and transmitting end.

Some figures are indicated in the table below:

Receiver –	Transmitter – Location 1									
	Height above sea level	1 m			9 m			30 m		
		Naut. mile	Mile	Km	Naut. mile	Mile	Km	Naut. mile	Mile	Km
	1 m	4.3	5	8	7-8.6	8.1-9.9	13-16	10.8-14	12.4-16.2	20-26
	9 m	7-8.6	8.1-9.9	13-16	10.8-14	12.4-16.2	20-26	24.8-29	28.5-33.4	46-53.7
	30 m	10.8-14	12.4-16.2	20-26	24.8-29	28.5-33.4	46-53.7	47	54	87

1 Nautical mile = 1852 Meters = 1.1508 Miles
1 Statute mile = 1.609 Kilometres

This indicates that with a handheld VHF, used at sea level, the range will be approx 8 Km (5 Miles). The range will increase if the height above sea level increases, and also if the other user in the other end is at a higher level.

8 SPARE PARTS AND ACCESSORIES

P/N	Description
• 98545	Tron AIR
• 94486	Antenna
• 93002	Lithium battery
• 98540	Users Manual
• 98800	Test report

Accessories:

• 93003/93030	NiCad battery
• 93080	Charger
• 93031	Carrier case
• 93475	Wall bracket
• 97884	Container
• 99025	Foam Pad
• 31030	Headset

9 NOTES

10 SERVICE AGENTS

Please look at www.jotron.com for Marine Service Agents.

JOTRON Group subsidiary companies:

Jotron (UK) Ltd.
Crosland Park, Off Crowhall Road
Cramlington
Northumberland NE23 1LA
United Kingdom

Tel +44 1670 712000
Fax +44 1670 590265
E-mail sales@jotron.co.uk

Jotron Asia Pte. Ltd.
Changi Logistics Center
19 Loyang Way #04-26
Singapore 508724

Tel +65 65426350
Fax +65 65429415
E-mail sales@jotron-asia.com

Jotron USA, Inc.
10645 Richmond Avenue,
Suite 140
Houston, TX 77042
USA

Tel +1 713 268 1061
Fax +1 713 268 1062
E-mail contact.us@jotron-usa.com

Jotron AS
P.O. Box 54, NO-3280 Tjodalyng, Norway
Tel: +47 33 13 97 00 | Fax: +47 33 12 67 80

www.jotron.com