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TECHNICAL MANUAL

PART NO: **II**

MEMS Inertial Navigation System

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RECORD OF CHANGES

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LIST OF ASSOCIATED HANDBOOKS

Technical Literature for MEMS INS SYSTEM

(Main Equipment/ System) comprises of the followings:

USER HANDBOOK AND INSTRUCTIONS FOR INSTALLATION INCLUDING CHECKLIST

TECHNICAL MANUAL

PART I TECHNICAL INFORMATION

Volume 1 Technical Description

Volume 2 Drawings

PART II MAINTENANCE

PART III OVERHAUL AND RECONDITIONING INSTRUCTIONS

PART IV MANUFACTURER'S PARTS LIST

Volume 1 Parts List

Volume 2 Illustrations

SAFETY WARNING

The voltages employed in this Equipment are sufficiently high to endanger human life.

POWER
MUST BE SWITCHED OFF
before servicing the equipment
&
GREAT CARE
taken when making internal adjustments etc.

FIRST AID IN CASE OF ELECTRIC SHOCK

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

1.	SWITCH OFF. If this is not possible, PROTECT YOURSELF with dry insulating material and pull the victim clear of the conductor. DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS until he is clear of the conductor, but DO NOT WASTE TIME.
2.	(a) Place the victim in the supine position. (b) Keep the air passages clear by turning the head to one side, opening the patient's mouth and clearing it of water, saline, mucus or blood, a lot of which might have accumulated in the back of the throat. (Figure 1)
3.	If the jaw is rigid try to force the mouth open by pressure on the gum behind the last molar tooth of the lower jaw. When the upper air passages are thus cleared, tilt the head backward and force the jaw forwards from the angles of the jaw in front of the ears. This would prevent mechanical obstructions to the upper air passages. (Figure 2-3)
4.	(a) Then hold the chin up and forward with one hand and pinch the nostrils of the victim with the other. (Figure 4) (b) Take a very deep breath and apply your mouth to that of the victim and blow into his mouth, until the chest of the victim moves up indicating filling of the lungs. (NEVER ALLOW THE CHIN TO SAG). (Figure 4)
5.	When the chest has moved up, withdraw your mouth and allow the chest to slink back. REPEAT this process every three to four seconds until the victim begins to breathe again or until he is taken over by a medical attendant. This method can be continued in an ambulance during transit of the patient from the site of accident to the nearest medical centre.

Caution Notes

DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

General

(a)

The demolition procedure outlined below will be used to prevent the enemy from using or salvaging this equipment. DEMOLITION OF THE EQUIPMENT WILL BE DONE ONLY ON ORDER OF THE COMMANDER.

Methods of Destruction

(b)

Use any or all the following methods to destroy the equipment.

(i) Smash – Smash the Crystals, Controls, Semiconductors, Coils, Switches, Transformers and Headsets, use Sledges, Hand-axes, Pickaxes, Hammers crowbars or heavy tools.

(ii) Cut – Cut the Cords, Headsets and Wiring : use axes, hand-axes or hatchets.

(iii) Burn – Burn the Cords, Resistors, Capacitors, Coils, Wiring, Technical Manuals, use Gasoline, Kerosene, Oil, Flamethrowers or Incendiary.

(iv) Bend – Bend the panels, cabinet and chassis.

(v) Explosives – If explosives are necessary, use firearms, grenades or TNT.

(vi) Disposal – Bury or scatter the destroyed parts in slits trenches, fox holes or other holes, or throw them into streams.

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(R) By Replacement/addition of sheet(s) **(H)** By Hand-correction **(P)** By pasting the enclosed matter **(A)** Additional information - only to be filed in the publication	This document should be filed/ pasted in the copy of the Publication before the CONTENTS Page. After carrying out (R), (H) or (P) entry should be made in Record of Changes Page.

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Chapter 1 Inspection and Maintenance Routine

Section 1 Introduction

Aeron Systems is set to supply the MEMS INS with GNSS Antenna to Cogknit Semantics Ltd. (Cogknit). The MEMS INS model OCT-2 NS7300D 01A, in conjunction with the GNSS antenna, is vital for offering accurate Armoured tank real-time tank positioning data.

Aeron Systems is obligated to deliver a range of items, encompassing documentation and spare parts, as stipulated in the agreement. The equipment to be provided by Aeron Systems will be the same as that for the Indian Infantry, while quantities, user profiles and availability requirements may differ.

Scope of Manual

This document describes the Draft Maintenance Plan concept to support the INS OCT-NS7300-01A, GNSS Antenna and harness.

This document intricately outlines the Draft Maintenance Plan concept essential for supporting the INS OCT-NS7300-01A, GNSS Antenna, and associated cable harness. This manual provides instructions for the scheduled maintenance manual for OCT-NS7300-01A and GNSS Antenna as installed in an armoured vehicle. The installation of the INS system and associated accessories is performed in accordance with their respective Technical Solution Manual.

Section 2 Maintenance Intervals

The equipment will be maintained at the following Maintenance echelons:

- O Level Maintenance (Organization Maintenance) - by the Armoured Corps technicians.
- I Level Maintenance (Intermediate Maintenance) - by the Armoured Corps technicians
- D Level Maintenance (Depot Maintenance) - by the Aeron technicians

The maintenance activities to be performed in O- and I-Level, consist of both periodic/preventive activities, as well as corrective activities.

Maintenance tasks, principles, methods and aids are described in the following sub-paragraphs

O Level Maintenance (Organization Maintenance)

Organization or O - Level Maintenance occurs at the organization unit level by Armoured Corps operational units as part of the operational team sites and Armoured Corps Maintenance team units.

OCT-2 NS7300D 01A & GNSS Antenna is not required to disassemble the units from the vehicle for the O-Level Testing.

It focuses on swift resolutions of malfunctions or inaccuracies without the need to remove the OCT-2 NS7300D 01A & GNSS Antenna units.

To check the malfunctions or inaccuracies of OCT-2 NS7300D 01A , use the Aeron Software Utility to check the system health and trace out the fault.

In case of malfunction or inaccurate data, the O-level Maintenance is optimized for turn-around, to enhance operational availability to support the unit whether the unit on board needs to be dismounted and replaced by another Line Replaceable Unit (LRU).

In case the OCT-2 NS7300D 01A or GNSS Antenna is replaced, the faulty unit shall be shipped to the Armoured Corps I-Level maintenance facility.

During period/Preventive Maintenance, the OLTE is used for the execution of functional checks (Operability test), diagnostic programs and routine procedures.

I Level Maintenance (Intermediate Maintenance)

Intermediate or I-Level maintenance occurs at the Armoured Corps Maintenance facility, by the Armoured Corps technicians.

The maintenance activities to be performed at this level will be based on Armoured Corps Maintenance technicians.

In case of malfunction or inaccurate position data, the I-Level Maintenance is optimized for a turn-around, to enhance operational availability to support the unit whether the unit on board has to be dismounted and replaced by another Line Replaceable Unit (LRU).

In case the OCT-2 NS7300D 01A or GNSS Antenna is replaced, the fault unit shall be shipped to the D-Level maintenance facility for repair. Any non-repairable module will be discarded and a new module will be supplied by Aeron Systems according to the relevant contract established between Cogknit and the Armoured Corps.

D Level Maintenance (Depot Maintenance)

Depot or D-Level maintenance occurs at Aeron Systems Maintenance facility, by Aeron technicians for both MEMS INS and GNSS Antenna and other list of deliverables items.

The maintenance activities to be performed all this level will be based on Aeron Systems D-Level Testing and manufacturing equipment.

After the warranty period, Aeron Systems will propose a D-Level maintenance contract for all repairable modules and systems, and a source for future purchasing of modules, systems etc.

Maintenance Level	Maintenance Task	Maintenance Interval	Performed By	Aids and Spare Sets
O-Level Maintenance	For MEMS INS Preventive/Operational Maintenance INS Configuration Checking the Alt/Long/Lat data readiness, and system status. Ensure the MEMS INS unit is rigidly mounted on a flat surface. For GNSS Antenna Check the Antenna placed in an obstacle location and in the open sky. Corrective Maintenance Troubleshooting failure down to LRU. Removing a faulty INS unit, GNSS Antenna unit, and harness and replacing it with a serviceable LRU.	Daily or Weekly	Armoured Corps operational unit technicians	OLTE (QTY TBD) LRUs O-Level Maintenance Documentation
I-Level Maintenance	For MEMS INS Corrective Maintenance Troubleshooting failures	Monthly / Half Yearly	Armoured Corps maintenance	ILTE (QTY TBD) LRUs

Maintenance Level	Maintenance Task	Maintenance Interval	Performed By	Aids and Spare Sets
	down to SRU level Replace the faulty modules (SRU). Configure and calibrate		unit technicians	SRU (modules) O-Level Maintenance Documentation
D-Level Maintenance	Corrective Maintenance Repair the MEMS INS with the LRU	On operational condition	Aeron's maintenance technicians	LRU Maintenance Documentation

Chapter 2 Chapter II - Test Equipment

The OCT-2 NS7300D 01A and GNSS Antenna is designed in a way that no special tools are required to perform the maintenance activities as described in this document but the following equipment are required:

- PC/laptop with OCT-2 NS7300D 01A
- Aeron Software Utility
- Power Supply
- Respective Cable Set

Section 1 Test Equipment

O-Level Test Equipment (OLTE)

The unit which is described in this paragraph and this document is identified as:

- O-Level Test Equipment
- OLTE can also be called as Testing Unit (TU).

This OLTE is Aeron Software Utility and is used on any laptop/tablet i.e. enables the Armoured Operational units to perform the maintenance activities without dismounting the MEMS INS & GNSS Antenna from the vehicle.

- Visual Inspection
- Base Functional Test such as, current consumption, System Health Status
- Initiate the Raw Data to check the data readiness of the OCT-2 NS7300D 01A unit.
- Review the satellite constellation status in GPS View
- Technician's Review of the actual software and firmware versions.

I-Level Test Equipment (ILTE)

The ILTE is used in maintenance facilities, enables the Armoured Corps maintenance units to perform maintenance activities on vehicles. During the ILTE is connected (over Moxa Uport 1150 & RS422).

- Initiate a review of the position data of the MEMS INS unit.
- Check the Power supply or check the voltage level of the power source.
- Conduct a visual check of harness bonding and cable cover/conductive tape used for electric connector bonding.
- Replace any damaged or torn straps.
- Check Corrosion on the INS unit, GNSS antenna connector, or cable harness winding.

D-Level Test Equipment

Aeron using manufacturer test and manufacturing equipment.

Section 2 Manufacturer Recommended List of Spares (MRLS)

The following list of deliverable items:

Sr. No.	Item Name	Maintenance Level	Quantity
1	OCT2-NS7300D-01A INS	D level	TBD
2	Power Cable 3 Core for OCT2-NS7300D-01A INS	I level	TBD
3	22 Pin Connector Data rugged Cable for OCT2-NS7300D-01A	I level/ D level	TBD
4	TNC Male to TNC Male rugged cable harness	I level/ D level	TBD
5	Triple band GNSS Antenna	D level	TBD
6	Moxa Uport 1150	I level	TBD

Chapter 3 Chapter III - Fault Diagnosis

Section 1 Troubleshooting

This section provides information to assist in troubleshooting if a problem occurs after completing the installation or maintenance. The following table will be used on the I-Level maintenance intervals. When troubleshooting the MEMS INS system, refer to the drawings and User Manual that are retained in the permanent records.

Symptom	Possible Cause	Corrective Action
The Inertial status not showing in the software utility	The INS unit is not powered on.	Check the power supply switch of the INS unit. Ensure the power supply 12 pin connector. Increase the input power supply to 28V.
The GNSS does not compute a position	Not receiving adequate GNSS signals.	Check the GNSS antenna connections, and make sure the GNSS antenna is clear of obstructions (hangars, buildings, trees, etc.)
GNSS signal level drops when vehicles are turned on.	Noise interference from other devices	Turn off all other devices, then turn on each device of the vehicle one at a time to locate the source of the interference. Route the GNSS connected cable and locate the GNSS antenna away from the unit that is causing the interference.
GNSS signal levels are very low	Improper antenna installation or routing	Check GNSS antenna installation, connections and cable routing. The GNSS antenna must be mounted on the top of the armoured vehicle.
	Antenna shaded from satellite signals	Ensure that the vehicle is clear of obstructions (hangars, building underground park, trees, etc.)
Inertial status not showing	Incompatible connected	Check the INS connections, check any interference cable/device around

Symptom	Possible Cause	Corrective Action
in software utility display	or improper connection	the INS unit.
GNSS FIX status not showing on the software utility	Improper connection	Check the wire connection between INS unit and GNSS antenna.
Health Status showing Red status	INS unit is an incompatible, improper connection, not configured	Check harness connection and INS calibration
GNSS FIX red status and also not showing Inertial option	GNSS FIX port configured is not selected or calibrated incorrectly	Check the Diagnostic section
INS not receiving heading data from external input	Incorrect external heading speed input settings	Check the External input speed port setting for the port that the device is connected and verify that the port and data transmitted speed is correct for that port.
	Cable connections are incorrect.	The external heading input need to check the connection and also monitor on the Aeron Software Utility. Refer to section Heading.

Section 2 Fault Unit Diagnosis

As per the Maintenance Intervals, if the fault unit is found then the I-level Maintenance will deliver the unit to D-Level Maintenance.

Appendix J1 - Address and contact details

Address

Aeron Systems Pvt. Ltd.

Plot No.7, Lane No. 5, Behind D Mart, Laxman Nagar, Balewadi, Pune-411045, MH, India

Tel - +91 020-29911228

Email - contact@aeronsystems.com

Web - www.aeronsystems.com