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PERFORMANCE SPECIFICATION  
FOOT-MOBILE TRUE NORTH MODULE (TNM)

1.0 Scope.

This specification covers the Foot-Mobile True North Module (TNM) system as a component of the Common Laser Rangefinder (CLRF) system, which contains the AN/PEQ-13 Laser Rangefinder (Vector 21B) (P/N 100-41V-0003-00), henceforth known as LRF.

1.1 System Description.

The Foot-Mobile TNM is a lightweight, man portable, true north measurement device capable of interfacing with the LRF and the AN/PSN-13(A) Defense Advanced Global Positioning System (GPS) Receiver (DAGR) (P/N 822-1873-001).

1.2 Definitions.

1.2.1 Foot-Mobile TNM System. The Foot-Mobile TNM System includes:

- Foot-Mobile True North Module
- LRF Interface
- LRF Accessories Interfaces
- LRF External Devices Interfaces
- Foot-Mobile TNM Battery
- Non-Magnetic Tripod (if a new LRF tripod is proposed, see 3.2.3)

1.2.2 LRF Base System. This is the minimum configuration required to use the LRF for targeting in the daytime. It includes:

- LRF (P/N 100-41V-0003-00)
- LRF tripod (P/N 600-41V-0002-00)
- LRF remote fire cable (P/N 300-38V- 0001-00)
- LRF carrying strap (P/N 190-41V-0005-00)
- LRF battery (P/N 221-0143-010)

1.2.3 LRF Accessories. These accessories enhance the LRF by enabling long range targeting, twilight operations, and digital handoff of targeting data to the DAGR. These include:

- BE-10 Optical Range Enhancer (P/N 150-41V-0001-00)
- AN/PVS-14 Monocular Night Vision Device (P/N A3256337)
- Night Vision Interface Mount (P/N 125-29V-0001-00)
- DAGR (P/N 822-1873-001)

1.2.4 LRF External Devices. These devices are attached to the LRF to enhance performance and enable night time operations and enable the ability to see laser designation spots. These include:

- AN/PAS-22 Long Range Thermal Imager (LRTI)
- AN/PAS-25 Thermal Laser Spot Imager (TLSI)
- CLRF/LRTI/TLSI Interface Mount (P/N 081-03V-0001-00)

1.2.5 Nominal Mission Profile. The nominal mission duration for the Foot-Mobile TNM system is 72 hours. During this mission profile, the Foot-Mobile TNM system will be transported, emplaced/displaced, and repositioned to accomplish the mission, undergo operator-level maintenance actions (as needed), make azimuth measurements, and digitally export data. During the mission, the Foot-Mobile TNM system will be operated for three six-hour periods. Half of the operating hours (9 total hours) will occur during daylight, the other half of the operating hours (9 total hours) will occur at night. A total of 75 azimuth measurement/data export operations will be performed. It is acceptable to change the battery set once during a nominal mission profile but the additional batteries count towards the Foot-Mobile TNM system weight (see 3.5 and 3.4.5).

## 2.0 Applicable Documents.

### 2.1 General.

The documents listed in this section are referenced in sections 3, 4, and 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, and 5 of this specification, whether or not they are listed.

### 2.2 Government Documents and Equipment.

2.2.1 Government Furnished Equipment. The government will provide LRF units and standard LRF accessories and LRF external devices to facilitate integration of the Foot-Mobile TNM system.

2.2.2 Specifications, Standards and Handbooks. The following specifications, standards, and handbooks of the exact revision listed below form a part of this document to the extent specified herein.

#### DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-129P with CHANGE 4	Military Marking for Shipment and Storage
MIL-STD-130N	Identification Marking of U.S. Military Property
MIL-STD-461F	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-810G	Environmental Engineering Considerations and Laboratory Tests

MIL-STD-882D Standard Practice for System Safety  
MIL-STD-1472F(1) Human Engineering  
MIL-STD-1474D Noise Limits  
MIL-STD-1916 DOD Preferred Methods for Acceptance of Product  
MIL-STD-2073-1E Standard Practice for Military Packaging

#### DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-217F(2) Reliability Prediction of Electronic Equipment  
DOD-HDBK-743A Anthropometry of U S Military Personnel (Metric)  
MIL-HDBK-783 Chemical and Biological (CB) Contamination Avoidance  
and Decontamination  
MIL-HDBK-784 Design to Minimize Contamination and to Facilitate  
Decontamination of Military Vehicles and Other  
Equipment: Interiors and Exteriors  
MIL-HDBK-1916 Companion Document to MIL-STD-1916

(Copies of these documents are available online at <http://assist1.daps.dla.mil/quicksearch/>, <http://forms.daps.dla.mil/>, <http://dodssp.daps.dla.mil/>, or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.3 Other Government Documents, Drawings, and Publications. The following other Government documents, drawings, and publications of the exact revision level shown form a part of this document to the extent specified herein.

#### CHAIRMAN OF THE JOINT CHIEFS OF STAFF INSTRUCTION

CJCSI 6130.01D 2007 CJCS Master Positioning, Navigation, and Timing Plan

(Copies of this document are available online at [http://www.dtic.mil/cjcs\\_directives](http://www.dtic.mil/cjcs_directives))

#### DEPARTMENT OF THE ARMY

AR 70-38 Research, Development, Test and Evaluation of Materiel for Extreme Climatic Conditions (15 September 1979 Edition)

(Copies of this document are available online at <http://www.apd.army.mil>.)

#### DEPARTMENT OF THE NAVY

NAVSEA S9310-AQ-SAF-010 Technical Manual for Batteries, Navy Lithium Safety Program Responsibilities and Procedures (20 July 1988 Edition)

(Copies of this document are available online at  
<http://www.marcorsyscom.usmc.mil/sites/PMEPS/DOCUMENTS/s9310aqsaf010.pdf>)

NAVSTAR GLOBAL POSITIONING SYSTEM JOINT PROGRAM OFFICE (GPS  
 JPO)

IS-GPS-153 REVISION D	GPS User Equipment Interface Specification for the GPS Standard Serial Interface Protocol (GSSIP) of DoD Standard GPS UE Radio Receivers, 23 July 2007 (Target Sight Message ID 5029, pages B-86 and B-87)
SS-M/V-500 REV D Part I	System Specification for NAVSTAR Global Positioning System (GPS) Precision Lightweight GPS Receiver (PLGR), 3 April 1995
SS-M/V-500D/2	Addendum Specification – Specification for NAVSTAR Global Positioning System (GPS) Precision Lightweight GPS Receiver (PLGR), 2 June 2002
SS-M/V-600B	Item Specification for the NAVSTAR Global Positioning System (GPS) Defense Advanced GPS Receiver (DAGR), 13 July 2006

2.2.4 Non-Government Documents. The following documents of the exact revision level shown form a part of this document to the extent specified herein.

Ashbury International Group Document 2213-A-4005	Interface Control Document for VECTOR 21 MOD B – CLRF
Ashbury International Group Drawing 081-03V-0001-00	CLRF/LRTI – Interface Mount
Kollsman Document EICD48151000-1	Electrical Interface Control Document for the Thermal Laser Spot Imager (TLSI)
Kollsman Drawing MICD48151000-1	Mechanical Interface Control Drawing for the Thermal Laser Spot Imager (TLSI)
Kollsman Drawing MICD48051000	Mechanical Interface Control Drawing for the AN/PAS-22 Long Range Thermal Imager (LRTI)
Vectronix Document 902777	Interface Control Document for USMC Vector 21 Mod B CLRF Modifications for Use of a TNF
Vectronix Drawing 902777_ICD_1	USMC Vector 21 Mod B
Vectronix Drawing 902211	Dimensions Vector 21 Mod B Tripod Base Plate

(Copies of these documents can be obtained by written request from NAVAL SURFACE WARFARE CENTER DAHLGREN DIVISION, ATTN: CHARLES THOMPSON, 17632 DAHLGREN ROAD, SUITE 157, DAHLGREN, VA 22448-5110.)

### 2.3 Order of Precedence.

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3.0 Requirements.

### 3.1 General System Description.

The Foot-Mobile TNM system is a device that will enhance the capabilities of the LRF system by providing an accurate azimuth measurement referenced to True North. This will be an improvement over the existing LRF Digital Magnetic Compass (DMC) which is adversely affected by magnetic disturbances. The use of the Foot-Mobile TNM system will enable highly accurate target location in environments where the DMC is adversely affected.

The Foot-Mobile TNM system is to be designed such that it does not adversely impact the use of existing LRF Accessories and LRF External Devices, either while the Foot-Mobile TNM system is functioning, not functioning, or not attached to the LRF. The Foot-Mobile TNM system is to be capable of being transported into and operating within a combat environment. A Marine wearing combat equipment can effectively use a Foot-Mobile TNM equipped LRF system.

### 3.2 Foot-Mobile TNM Components.

3.2.1 Foot-Mobile True North Module. The Foot-Mobile TNM system shall interface with the LRF base system, accessories, and external devices listed below (threshold). It shall be lightweight (see 3.5) and be capable of exporting digital data to external devices (see 3.2.5) without affecting the portability or transportability of the coupled LRF (threshold). It is desired that the Foot-Mobile TNM system interface with the Optical Range Enhancer (P/N 150-41V-0001-00) (objective). [NOTE: The LRF base system includes the LRF (P/N 100-41V-0003-00), LRF tripod (P/N 600-41V-0002-00), and LRF remote fire cable (P/N 300-38V-0001-00). The LRF accessories include the Monocular Night Vision Device (P/N A3256337), and DAGR (P/N 822-1873-001). The LRF external devices include the LRTI and TLSI.]

3.2.2 Foot-Mobile TNM Battery. Internal batteries shall be located in a position that will not affect set-up, operations, or storage (threshold). Battery storage shall be conveniently located and easily replaced without the use of additional tools (threshold). The Foot-Mobile TNM shall use a battery currently available through the Marine Corps supply system (threshold). It is desired that the Foot-Mobile TNM provide an external connection and cable(s) for the purpose of powering the Foot-Mobile TNM from the

following electrical sources: BA-5590, BB-2590, BA5557, and NATO standard tactical vehicles (objective). [NOTE: Be advised, the LRF is designed such that power cannot be drawn from its main power supply.]

3.2.3 Non-Magnetic Tripod. If a new LRF tripod is proposed, the Foot-Mobile TNM shall include a tripod made of non-magnetic, non-reflective material that is at least equal in durability to the Foot-Mobile TNM and LRF System, and capable of supporting the Foot-Mobile TNM interfaced with the LRF, LRTI or TLSI, and accessories during target observation and location missions (threshold). The tripod must support a minimum weight of 15 lbs and permit compensation of the LRF DMC (threshold). The Foot-Mobile TNM shall still be capable of interfacing with the current LRF tripod regardless of whether a new LRF tripod is proposed (threshold). The tripod operating height (as measured from the top of the LRF/tripod interface to the ground) shall be adjustable from 15 inches – 20 inches (threshold); 7 inches – 30 inches (objective). It is desired that the tripod provide a means for fine adjustment of azimuth and elevation (pan and tilt) (objective).

3.2.4 Permanently Attached Foot-Mobile TNM Components.

3.2.4.1 Any part of the Foot-Mobile TNM that is permanently attached to the LRF shall not damage the LRF metal housing (threshold). The rubber casing may be modified to access the attachment thread denoted as Attachment Thread 2 in Vectronix Drawing 902777\_ICD\_1 (threshold). The remainder of the rubber casing not covering attachment thread 2 shall not be drilled, penetrated, or opened (threshold). The metal housing shall not be drilled, penetrated, or opened, specifically the sealing screw denoted as Attachment Thread 3 in Vectronix Drawing 902777\_ICD\_1 (threshold).

3.2.4.2 If the LRF tripod bushing is covered, all writing on the LRF tripod bushing shall be replicated (durable sticker labels are acceptable) on any part of the TNM that is permanently attached to the LRF and inside the LRF battery well (threshold). It is desired that the entire tripod bushing including writing and drill holes be replicated on any part of the TNM that is permanently attached to the LRF if it covers up the current LRF tripod bushing (objective). [NOTE: Even though replication of the tripod bushing is an objective requirement, in accordance with requirement 3.2.3, the Foot-Mobile TNM shall still be capable of interfacing with the current LRF tripod regardless of whether a new LRF tripod is proposed (threshold).]

3.2.5 Digital Interface.

3.2.5.1 The Foot-Mobile TNM system shall include a digital interface with the LRF and the DAGR (P/N 822-1873-001) (threshold). As

specified in Vectronix Document 902777, the LRF shall receive an azimuth value from the Foot-Mobile TNM system (threshold). The LRF will apply the boresight offset correction value, construct the Message ID 5029, and transmit the message to the Foot-Mobile TNM system. The Foot-Mobile TNM system shall pass the Message ID 5029 on to the DAGR without altering it (threshold). It is desired that the user be able to change from tripod mounted use to handheld use without having to reconfigure cables (objective).

3.2.5.2 Should the Foot-Mobile TNM system become inoperable or unable to find a true north solution, LRF generated measurements, including the internal LRF DMC measurements, shall still be transferred to the DAGR with the azimuth north reference identified as magnetic in the Message ID 5029 (threshold) (reference IS-GPS-153 REVISION D, page B-86 as guidance).

3.2.5.3 The Foot-Mobile TNM system is not required to have GPS; however, should the Foot-Mobile TNM system include GPS, the GPS shall be SAASM compliant (CJCSI 6130.01D, 2007), shall be able to load crypto using a standard DAGR Crypto Keyfill Cable (NSN 5995-01-521-3185), and shall have an accessible GPS memory battery (threshold), as well as display target location in Military Grid Reference System (MGRS) and Latitude/Longitude (objective).

3.2.6 Field Carry Pack. If the LRF and any part of the Foot-Mobile TNM that is permanently attached to the LRF cannot fit within the standard LRF field carry pack, a MOLLE compatible soft material field carry pack in coyote brown color that the LRF and any part of the Foot-Mobile TNM that is permanently attached to the LRF can be securely stored in and protected shall be included (threshold). The Foot-Mobile TNM system is not required to interface with the Optical Range Enhancer (P/N 150-41V-0001-00); however, should the Foot-Mobile TNM system interface with the Optical Range Enhancer, the MOLLE compatible soft material field carry pack in coyote brown color shall also securely store and protect the Optical Range Enhancer while both attached and detached from the LRF (threshold). A separate MOLLE compatible soft material field carry pack in coyote brown color that all Foot-Mobile TNM system components can be securely stored in and protected shall also be included (threshold).

3.3 First Article.  
When specified, a sample shall be subjected to first article inspection in accordance with section 4.4 (threshold).

3.4 Mission Performance Requirements.

3.4.1 Foot-Mobile TNM Operational Modes. The Foot-Mobile TNM shall provide either (1) both a Quick and a Normal mode or (2) one mode that

meets the time requirement for the quick mode and the accuracy requirement of the normal mode (threshold), as well as a Close Combat Quick mode (objective).

- 3.4.1.1 Quick. Between 38 degrees North latitude and 38 degrees South latitude, the Foot-Mobile TNM system shall be capable of determining true azimuth in 120 s from the time power is applied with 8 mils  $1\sigma$  azimuth accuracy (threshold); 4 mils  $1\sigma$  azimuth accuracy (objective). Between 48 degrees North latitude and 38 degrees North latitude and between 38 degrees South latitude and 48 degrees South latitude, the Foot-Mobile TNM system shall be capable of determining true azimuth in 120 s from the time power is applied with 10 mils  $1\sigma$  azimuth accuracy (threshold); 5 mils  $1\sigma$  azimuth accuracy (objective). [NOTE: The Foot-Mobile TNM system is not required to have GPS; however, should the Foot-Mobile TNM system include GPS, Foot-Mobile TNM system initialization actions shall be from a hot start.]
- 3.4.1.2 Normal. Between 38 degrees North latitude and 38 degrees South latitude, the Foot-Mobile TNM system shall be capable of determining true azimuth in 150 s from the time power is applied with 5 mils  $1\sigma$  azimuth accuracy (threshold); 2 mils  $1\sigma$  azimuth accuracy (objective). Between 48 degrees North latitude and 38 degrees North latitude and between 38 degrees South latitude and 48 degrees South latitude, the Foot-Mobile TNM system shall be capable of determining true azimuth in 150 s from the time power is applied with 6 mils  $1\sigma$  azimuth accuracy (threshold); 3 mils  $1\sigma$  azimuth accuracy (objective). [NOTE: The Foot-Mobile TNM system is not required to have GPS; however, should the Foot-Mobile TNM system include GPS, Foot-Mobile TNM system initialization actions shall be from a hot start.]
- 3.4.1.3 Close Combat Quick. Between 38 degrees North latitude and 38 degrees South latitude, it is desired that the Foot-Mobile TNM system be capable of determining true azimuth in 15 s from the time power is applied with 10 mils  $1\sigma$  azimuth accuracy (objective). Between 48 degrees North latitude and 38 degrees North latitude and between 38 degrees South latitude and 48 degrees South latitude, the Foot-Mobile TNM system shall be capable of determining true azimuth in 15 s from the time power is applied with 12 mils  $1\sigma$  azimuth accuracy (objective). [NOTE: The Foot-Mobile TNM system is not required to have GPS; however, should the Foot-Mobile TNM system include GPS, Foot-Mobile TNM system initialization actions shall be from a hot start.]
- 3.4.1.4 Azimuth Range of Motion. The LRF shall rotate a minimum of 300 degrees in azimuth on the tripod without moving the tripod and/or requiring a recalibration (threshold); 360 degrees (objective).

- 3.4.1.5 Tripod Leveling. The user shall not need to level the tripod better than 1 degree to meet the required level of azimuth accuracy (threshold). During operation, LRF shall tilt +/- 45 degrees and provide a measurement, once emplaced; and any device affixed to the LRF shall be capable of operating throughout this range (threshold). When installed on the tripod, the Foot-Mobile TNM shall be capable of operating within the accuracy requirements of paragraphs 3.4.1.1, 3.4.1.2, and 3.4.1.3 during vibrations caused by winds of up to 33 knots and under deterministic motion due to sinking of the tripod.
- 3.4.2 Azimuth Measurement Capabilities.
- 3.4.2.1 Azimuth Determination Performance. The Foot-Mobile TNM system shall be capable of determining azimuth in accordance with the threshold performance parameters specified under 3.4.1 in all operating environments specified in 3.4.2.2 (threshold).
- 3.4.2.2 Operating Environment. The Foot-Mobile TNM system shall be capable of operating within the accuracy requirements of paragraphs 3.4.1.1, 3.4.1.2, and 3.4.1.3 in the presence of magnetic fields (transient and earth's magnetic field), under clear skies, day or night, in urban canyons, inside of buildings, and under jungle canopy with 150 degrees field of view of the sky (threshold); in all weather conditions, day or night, in urban canyons, inside of buildings, and under jungle canopy with no field of view of the sky (objective).
- 3.4.2.3 Maintaining Azimuth upon Relocation. It is desired that once the Foot-Mobile TNM has determined true north and the user moves the Foot-Mobile TNM with or without the tripod, the Foot-Mobile TNM remain calibrated and not have to be recalibrated to find true north again under the slew rate of 30 degrees per second (objective). It is desired that once the Foot-Mobile TNM has determined true north the accuracy be maintained for at least 30 minutes after initialization (objective).
- 3.4.3 Alignment.
- 3.4.3.1 Mechanism. Alignment will consist of aligning the optical axis of the LRF with the Foot-Mobile TNM azimuth reference. The Foot-Mobile TNM system shall provide a method for repeatable alignment with the LRF (threshold). It is desired that the Foot-Mobile TNM system contain a method of verifying alignment in the field (objective).
- 3.4.3.2 Interchangeability. The Foot-Mobile TNM is not required to be removable; however, if the Foot-Mobile TNM is designed to be

removable, it shall be factory boresighted and interchangeable among Foot-Mobile TNM designated LRF systems from the same vendor without requiring additional calibration and without degradation in azimuth accuracy (threshold).

- 3.4.4 Visual Indicator and Display. The Foot-Mobile TNM shall include an indicator as defined in 3.4.4.6, 3.4.4.8, and 3.4.4.9 (threshold). It is desired that the Foot-Mobile TNM system include a visual display (objective).
- 3.4.4.1 Data. The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, it shall display target location data (OT True Azimuth, OT Range, OT Vertical Angle), and shall include indication of measurement units, battery status, and north reference (magnetic or true) (threshold).
- 3.4.4.2 Legibility. The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, it shall be legible under all light conditions encountered during system operation even when users are wearing polarized eye wear (threshold). The brightness of the display shall be adjustable during daylight use and the display shall have a user-selectable low light level down to fully off for night operation to improve legibility under varying ambient light levels (threshold).
- 3.4.4.3 Visual Display Features. The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, it shall be visible within one second of the user taking a combined measurement and shall remain visible for at least 5 seconds (threshold). It is desired that the display remain visible for as long as the LRF switch is depressed and/or provide a means to recall the targeting data (objective).
- 3.4.4.4 Display Units. The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, the range display units shall be in meters and the azimuth and elevation angle units shall be in mils and degrees (threshold), or user-selectable (objective).
- 3.4.4.5 Resolution on Display. The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, the resolution on the display shall be less than or equal to 1 mil and less than or equal to 1 degree (threshold).
- 3.4.4.6 Built-In Test Indicator and Display. The Foot-Mobile TNM shall provide a BIT indicator that visually notifies the user if it passed or

failed the Power-On BIT (see 3.10) and when the device is ready to operate once the Foot-Mobile TNM has been powered on (threshold). The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, the Built-In Test (BIT) capability shall display the software version and check the display segments (threshold).

- 3.4.4.7 Resolution of Digital Export. The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, the resolution of the digital export shall be less than or equal to 0.1 mil (threshold).
- 3.4.4.8 Foot-Mobile TNM Battery Status. The Foot-Mobile TNM system shall provide a battery status indicator that visually notifies the user when the Foot-Mobile TNM has only enough battery life remaining to perform one determination of true north and 10 measurements over a span of 30 minutes (threshold). [NOTE: Determination of true north is defined as the measurement of the direction of true north. Determinations can be continuous. Measurement is defined as determining the direction of the LRF's optical axis relative to the direction of true north. See additional battery life requirements in the nominal mission profile in 1.2.5.]
- 3.4.4.9 Azimuth Performance Indicator. The Foot-Mobile TNM shall include a performance indicator that visually notifies the user with the following criteria: when azimuth accuracy is less than 5 mils, when azimuth accuracy is between 5 and 15 mils, when azimuth accuracy is greater than 15 mils (threshold). The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, it shall display estimated azimuth performance in mils and degrees and provide the operator with a cue if the azimuth performance accuracy falls below a user selectable value (threshold). This value shall be adjustable at the organizational or depot level (threshold).
- 3.4.4.10 Target Location Error Indicator. The Foot-Mobile TNM system is not required to have a visual display; however, should the Foot-Mobile TNM system include a display, it is desired that it display an estimation of the Target Location Error Category (dictated by the Joint Close Air Support publication 3-09.3, dated 08 July 2009) to the user for each measurement taken and include the errors introduced from self-location accuracy, range finding accuracy, and azimuth accuracy (objective). Target Location Error Categories are shown in Figure 1.

TARGET LOCATION ERROR CATEGORIES																		
TLE Categories (ref. Circular Error on Ground)	CAT I CE 0-20 ft 0- 6 m			CAT II CE 21-50 ft 7 – 15 m			CAT III CE 51-100 ft 16-30 m			CAT IV CE 101-300 ft 31-91 m			CAT V CE 301-1000 ft 92-305 m			CAT VI CE >1000 ft (>305m) Or Large Elliptical Error		
Circular, Vertical, Spherical Error Predictions	CE 90	VE 90	SE 90	CE 90	VE 90	SE 90	CE 90	VE 90	SE 90	CE 90	VE 90	SE 90	CE 90	VE 90	SE 90	CE 90	VE 90	SE 90

  

LEGEND			
<b>CAT</b>	category	<b>ref</b>	reference
<b>CE</b>	circular error	<b>SE</b>	spherical error
<b>ft</b>	feet	<b>TLE</b>	target location error
<b>m</b>	meter	<b>VE</b>	vertical error

Figure 1. Target Location Error Categories

3.4.5 Foot-Mobile TNM Battery Life. Without replacing batteries, a single set of batteries shall be capable of providing sufficient power to perform 6 determinations of true north and 38 measurements (threshold); 12 determinations of true north and 150 measurements (objective). [NOTE: Determination of true north is defined as the measurement of the direction of true north. Determinations can be continuous. Measurement is defined as determining the direction of the LRF's optical axis relative to the direction of true north. See additional battery life requirements in the nominal mission profile in 1.2.5.]

3.4.6 Hardware Interfaces.

3.4.6.1 LRF with Accessories. The Foot-Mobile TNM system shall function with a LRF equipped with the Monocular Night Vision Device (P/N A3256337) while mounted on a tripod (threshold), as well as the Optical Range Enhancer (P/N 150-41V-0001-00) while mounted on a tripod (objective). [NOTE: Modifications or replacements to the existing brackets for the Night Vision Interface Mount (P/N 125-29V-0001-00) and Optical Range Enhancer (P/N 150-41V-0001-00) are acceptable.]

3.4.6.2 LRF with Accessories without Foot-Mobile TNM. Any part of the Foot-Mobile TNM that is permanently attached to the LRF shall continue to permit the use of the Monocular Night Vision Device (P/N A3256337) on the tripod (threshold), as well as the Optical

Range Enhancer (P/N 150-41V-0001-00) on the tripod (objective). [NOTE: Modifications or replacements to the existing brackets for the Night Vision Interface Mount (P/N 125-29V-0001-00) and Optical Range Enhancer (P/N 150-41V-0001-00) are acceptable.]

- 3.4.6.3 LRF with LRTI. The Foot-Mobile TNM system shall function with the LRF combined with the LRTI (threshold). [NOTE: Modifications or replacements of the existing CLRf/LRTI/TLSI Interface Mount (P/N 081-03V-0001-00) are permitted; however, the mount must provide a suitable means for bore sight adjustment with the LRF and LRTI.]
- 3.4.6.4 LRF with TLSI. The Foot-Mobile TNM system shall function with the LRF combined with the TLSI (threshold). [NOTE: Modifications or replacements to the existing CLRf/LRTI/TLSI Interface Mount (P/N 081-03V-0001-00) are permitted; however, the mount must provide a suitable means for bore sight adjustment with the LRF and TLSI.]
- 3.4.6.5 LRF with LRTI or TLSI without Foot-Mobile TNM. Any part of the Foot-Mobile TNM that is permanently attached to the LRF shall continue to permit the use of the LRTI and TLSI (threshold). [NOTE: Modifications or replacements to the existing CLRf/LRTI/TLSI Interface Mount (P/N 081-03V-0001-00) are permitted; however, the mount must provide a suitable means for bore sight adjustment with the LRF and LRTI or TLSI.]
- 3.4.6.6 LRF Handheld. It is desired that a Foot-Mobile TNM equipped LRF be able to operate hand-held without a tripod with the capability of operating and meeting accuracy requirements in the presence of magnetic fields (transient and earth's magnetic field) (objective).
- 3.4.7 Graceful Degradation. The failure of the Foot-Mobile TNM system shall not result in the failure of the entire LRF system (threshold). The internal LRF DMC shall not be adversely affected if the Foot-Mobile TNM system is not in use or non-functional (threshold).

### 3.5 Weight.

The Foot-Mobile TNM (including any Foot-Mobile TNM device permanently affixed to the LRF), batteries, and tripod shall weigh no more than 4.5 lbs (threshold); 1.0 lb (objective). Any Foot-Mobile TNM device permanently affixed to the LRF shall not weigh more than 1.0 lb (threshold). [NOTE: Interfaces for the Monocular Night Vision Device, Optical Range Enhancer, LRTI, and TLSI that are not permanently affixed to the LRF will not count against system weight. The current LRF tripod or a new LRF compatible tripod that meets the requirements of 3.2.3 may be used; one of which will be included in the system weight. It is acceptable to change the battery set once during a

nominal mission profile however the additional batteries count towards the Foot-Mobile TNM system weight.]

3.6 Size.

In the stowed, carry mode, the Foot-Mobile TNM system shall not have any linear dimension (including the tripod) greater than 18 inches (threshold). In the operational mode, the Foot-Mobile TNM system shall not have any linear dimension (not including the height of the tripod) greater than 14 inches (threshold).

3.7 System Signature.

3.7.1 Aural Detectability. It is desired that the Foot-Mobile TNM not emit noise detectable to the unaided ear at a range greater than or equal to 20 meters during operation (objective).

3.7.2 Stray Light Security. It is desired that light emitted from the Foot-Mobile TNM not be visible with unaided viewing or viewing with 3<sup>rd</sup> generation night vision goggles (NVGs) at ranges greater than 20 meters (objective).

3.8 Environmental Requirements.

3.8.1 Nuclear / Biological / Chemical (NBC) Decontamination. It is desired that the Foot-Mobile TNM system be able to withstand with limited operational degradation, at least 4 exposures to the material-damaging effects of NBC contaminants, decontaminants, and decontaminating procedures in a 72-hour period (objective). (MIL-HDBK-783 and MIL-HDBK-784 may be referred to for guidance). [NOTE: Removing and discarding external covering materials to meet this requirement is acceptable provided the procedure to do so can be performed by the operator in a tactical environment and that the functionality of the Foot-Mobile TNM system is not degraded by the removal of the covering material.]

3.8.2 Military Free Fall Operations – Altitude (Non-operational). It is desired that the Foot-Mobile TNM system not suffer any damage or degradation in performance (as a result of atmospheric pressure related effects) after being subjected to a military free fall operation conducted from 7,620 m (25,000 ft) Mean Sea Level (MSL) at an altitude change rate of 8 m/s to 10 m/s (26 ft/s to 33 ft/s) for a period of 1 hour (objective). [NOTE: The Foot-Mobile TNM system shall not require a protective/storage case to meet this objective requirement; however, use of a field-carry pack is acceptable.]

3.8.3 Immersion (10.0 m). It is desired that the Foot-Mobile TNM system not suffer any damage or degradation in performance following a 30-minute submersion, while sealed in a waterproof bag in salt or fresh water at a depth of 10.0 m (32.8 ft) after being conditioned for 2 hours at 10°C (50°F) above the water temperature (objective).

- 3.8.4 Immersion (1.0 m). The Foot-Mobile TNM system shall not suffer any damage or degradation in performance following a 10-minute submersion in salt or fresh water at a depth of 1.0 m (3.3 ft) after being conditioned for 2 hours at 10°C (50°F) above the water temperature (threshold).
- 3.8.5 Operating Temperature. The Foot-Mobile TNM system shall be capable of operating in air temperatures ranging from – 21°C to + 49°C (–5°F to + 120°F) without the benefit of protective cover or sheltering enclosure for 60 minutes at each temperature (threshold). It is desired that the Foot-Mobile TNM system be capable of operating in air temperatures ranging from – 32°C to + 52°C (– 25°F to + 125°F) without the benefit of protective cover or sheltering enclosure for 60 minutes at each temperature (objective).
- 3.8.6 Storage Temperature. The Foot-Mobile TNM system shall not suffer any damage or degradation in performance following storage in air temperatures ranging from – 33°C to + 52°C (– 28°F to + 125°F) without the benefit of protective cover or sheltering enclosure for 60 minutes at each temperature (threshold). It is desired that the Foot-Mobile TNM system not suffer any damage or degradation in performance following storage in air temperatures ranging from – 35°C to + 63°C (– 30°F to + 145°F) without the benefit of protective cover or sheltering enclosure for 60 minutes at each temperature (objective).
- 3.8.7 Temperature Shock. It is desired that the Foot-Mobile TNM system not suffer any damage or degradation in performance following sudden changes in ambient air temperature greater than 10°C per minute between ambient air temperatures of -32°C and + 52°C (– 25°F and + 125°F) for a period of two hours at each temperature (objective).
- 3.8.8 Fungus. It is desired that the Foot-Mobile TNM system (free of all salt residues) neither support fungal growth nor suffer damage or degradation of performance caused by the presence of fungus spores or adjacent fungal growth (objective).
- 3.8.9 Vibration (Minimum Integrity). The Foot-Mobile TNM system shall not suffer any damage or degradation in performance after being subjected to Composite Wheeled Vehicle and Two-Wheeled Trailer as secured cargo in the Field-Carry Pack configuration for five hours per axis (threshold). The Foot-Mobile TNM system shall not suffer any damage or degradation in performance after being subjected to Loose Cargo Transportation vibration loosely stowed cargo in the Field-Carry Pack configuration for thirty minutes per axis (threshold).
- 3.8.10 Shock.
- 3.8.10.1 Transit Drop. The Foot-Mobile TNM system shall remain fully mission capable after being dropped to a surface of two-inch

plywood backed by concrete from a height of one meter in a Transit Case onto each of the 6 sides of the case – minimum of four times on each side of the case (threshold).

- 3.8.10.2 Design Shock. The Foot-Mobile TNM system shall not suffer any damage during or degradation in performance after being exposed to shocks (30 g minimum peak value, nominal duration is  $T_D = (2\sqrt{2g})/A_m$  where  $A_m$  is the peak acceleration magnitude of the trapezoidal pulse as referenced in MIL-STD-810G, Method 516.6, Procedure II, Figure 516.6-11) imposed on each of the three axes in both positive and negative directions while stored in the field carry pack (threshold).
- 3.8.11 Sand and Dust. The Foot-Mobile TNM system shall not suffer any damage or degradation in performance after being subjected to blowing fine sand and dust particles typical of a windy desert environment for a period of one hour (threshold).
- 3.8.12 Salt Fog. It is desired that the Foot-Mobile TNM system not suffer any damage or degradation of performance following exposure to a salt-sea atmosphere for alternating 24-hour periods of salt fog exposure and drying conditions for a minimum of four 24-hour periods (two wet and two dry) (objective).
- 3.8.13 Explosive Atmosphere. Authorized operator actions including but not limited to Foot-Mobile TNM operation, system assembly/disassembly, and operator maintenance, checks, and services, shall not cause ignition of an atmosphere that is heavily laden with fumes from ground vehicles or aircraft fuels (threshold).
- 3.8.14 Electromagnetic Interference/Electromagnetic Vulnerability (EMI/EMV). Electric field emissions from the Foot-Mobile TNM and its associated cabling shall conform to the performance requirements specified for RE101, RE102 (2 MHz - 1 GHz, limit for ground applications), RS101, and RS103 (2 MHz - 18GHz) when tested in accordance with the test methodology of MIL-STD-461F (threshold). The Foot-Mobile TNM and associated cabling shall be able to withstand electric fields (threshold).
- 3.8.15 Solar Radiation. The Foot-Mobile TNM system shall not suffer any damage when exposed to solar radiation of up to 1120 Watts per square meter (threshold).
- 3.9 Reliability, Availability, Maintainability.
- 3.9.1 Mean Time Between Failure (MTBF). The MTBF for the Foot-Mobile TNM shall be no less than 2600 hours (threshold).
- 3.9.2 Preventive Maintenance (PM). The Foot-Mobile TNM shall not require PM to be performed more frequently than once per week while in storage

(threshold). It shall not require more than 15 minutes to perform PM (threshold).

- 3.9.3 Operational Availability ( $A_o$ ). The Foot-Mobile TNM system shall have an  $A_o$  of 0.95 (threshold) where  $A_o$  is defined as  $MTBM/(MTBM+MDT)$ . Mean Time Between Maintenance (MTBM) is the meantime between maintenance actions (both preventive and corrective); a measure of the reliability taking into account maintenance policy. Mean Down Time (MDT) is the average time a system is unavailable for use due to either corrective or preventive maintenance. Time includes actual repair time and all delay times.
- 3.10 Built In Test.  
The Foot-Mobile TNM shall have a Power-On BIT which tests input power and memory and verifies the system is functioning nominally (threshold). The BIT shall have at least 95 percent accuracy and have a false alarm rate of less than 3 percent (threshold). It is desired that the Foot-Mobile TNM have a Commanded BIT and Continuous BIT (objective).
- 3.11 Fast Start Feature.  
It is desired that the Foot-Mobile TNM have a user selected fast start feature that will not require a re-calibration if the user is sure that the system (including the tripod) was undisturbed since the previous shut down or does not require calibration to achieve azimuth performance (objective).
- 3.12 Human Systems Integration.
- 3.12.1 Operation. The Foot-Mobile TNM, operated with the LRF shall be capable of being operated by a single 5th through 95th percentile Marine while wearing any of the full range of Marine Corps combat clothing and equipment to include the following: camouflage utilities, arctic clothing, and Mission Oriented Protective Posture (MOPP) Gear - Levels I through IV, as well as full combat load of equipment (Interceptor Body Armor including both Enhanced Small Arms Protective Inserts (E-SAPI) and Side Small Arms Protective Inserts (S-SAPI)) in accordance with DOD-HDBK-743A (threshold).
- 3.12.2 System Controls. The Foot-Mobile TNM and LRF system controls shall be easily distinguishable and readily accessible when the Foot-Mobile TNM and LRF systems are used with any of the LRF accessories or with the LRF and LRTI or TLSI together mounted on a tripod (threshold).
- 3.13 Safety.
- 3.13.1 Foot-Mobile TNM Battery Safety Requirements. The Foot-Mobile TNM battery shall comply with NAVSEA S9310-AQ-SAF-010 (threshold).
- 3.13.2 Navy Lithium Battery Review Board. If the Foot-Mobile TNM battery contains Lithium, the Foot-Mobile TNM and the Foot-Mobile TNM

battery shall be capable of meeting all requirements needed for approval by the Navy Lithium Battery Review Board (threshold).

3.13.3 Safety Assessment. The operation, maintenance, storage, transportation, or disposal of the Foot-Mobile TNM system shall not present any hazards that are assessed to be more severe than medium risks as specified in MIL-STD-882D (threshold).

3.14 Marking.

The Foot-Mobile TNM shall have a UID compliant identification plate of corrosion-resistant material permanently attached to the outside of the Foot-Mobile TNM (threshold). The identification plate shall be marked in accordance with MIL-STD-130L (threshold). It is desired that the identification plate include nomenclature and serial number (objective). It is desired that the Foot-Mobile TNM UID include warranty information (objective).

3.15 Workmanship.

Workmanship in the fabrication and assembly of Foot-Mobile TNM components shall comply with best commercial practices (threshold). The components shall be clean and free of burrs, sharp edges, unblended radii, surface defects, cracks, chips, dirt, grease (except where specifically required), rust, foreign matter or any evidence of poor workmanship that could render the system unsuitable for its intended purpose or that would affect life, serviceability, or appearance (threshold).

3.16 Materials.

3.16.1 Selection. The contractor shall select materials that meet the operational and environmental requirements specified herein (threshold). The ability of the system to meet the applicable performance requirements shall be the governing acceptance standard.

3.16.2 Toxic chemicals, hazardous substances, and ozone-depleting chemicals. The use of toxic chemicals, hazardous substances, or ozone-depleting chemicals, if possible, shall be avoided.

3.16.3 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the materials meet or exceed the operational and maintenance requirements, and promote economically advantageous life cycle costs.

4.0 Verification.

4.1 Classification of Inspections.

The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.4).
- b. Conformance inspection (see 4.5).

4.2 Verification Methods.

Methods utilized to accomplish verification include:

- a. Analysis. An element of verification that utilizes established technical or mathematical models or simulations, algorithms, charts, graphs, circuit diagrams, or other scientific principles and procedures to provide evidence that stated requirements were met.
- b. Demonstration. An element of verification that involves the actual operation of an item to provide evidence that the required functions were accomplished under specific scenarios. The item may be instrumented and performance monitored.
- c. Examination. An element of verification that is generally nondestructive and typically includes the use of sight, hearing, smell, touch, and taste; simple physical manipulation; and mechanical and electrical gauging and measurement.
- d. Test. An element of verification in which scientific principles and procedures are applied to determine the properties or functional capabilities of items.

4.3 Inspection Conditions.

Unless otherwise specified, all inspections shall be performed in accordance with the conditions specified in the applicable paragraphs in this specification or applicable verification methods. If inspection conditions are not specified, the inspections may be performed at any temperature between 18°C (64°F) and 30°C (86°F) and at 1.0 ± 0.1 atmosphere of pressure.

4.4 First Article Inspection.

The contractor is responsible for conducting First Article Inspection on the number of Foot-Mobile TNM systems specified in the contract or purchase order and shall provide objective evidence regarding the fulfillment of the requirements specified in Table 1 to the level proposed in the contract. The first article inspection shall be performed on a minimum of two systems. The first article inspection shall be performed in a sequential order acceptable to the Government and shall provide objective evidence regarding the fulfillment of the requirements.

Table 1. First Article Inspection Cross Reference Matrix

First Article Inspection	Requirement Paragraph	Verification Paragraph
Foot-Mobile TNM Interface	3.2.1	4.8.1
Foot-Mobile TNM Battery Location	3.2.2	4.8.2
Non-Magnetic Tripod	3.2.3	4.8.3

First Article Inspection	Requirement Paragraph	Verification Paragraph
Permanently Attached Foot-Mobile TNM Components	3.2.4	4.8.4
Digital Interface	3.2.5	4.8.5
Field Carry Pack	3.2.6	4.8.6
Foot-Mobile TNM Operational Modes	3.4.1	4.8.7
Azimuth Measurement Capabilities	3.4.2	4.8.8
Alignment	3.4.3	4.8.9
Visual Display	3.4.4	4.8.10
Battery Life	3.4.5	4.8.11
Hardware Interfaces	3.4.6	4.8.12
Graceful Degradation	3.4.7	4.8.13
Weight	3.5	4.9
Size	3.6	4.10
System Signature – Aural Detectably	3.7.1	4.11.1
System Signature – Stray Light Security	3.7.2	4.11.2
Nuclear/Biological/Chemical (NBC) Decontamination	3.8.1	4.12.1
Military Free Fall Operations	3.8.2	4.12.2
Immersion (10 meters)	3.8.3	4.12.3
Immersion (1.0 meter)	3.8.4	4.12.4
Operating Temperature	3.8.5	4.12.5

First Article Inspection	Requirement Paragraph	Verification Paragraph
Storage Temperature	3.8.6	4.12.6
Temperature Shock	3.8.7	4.12.7
Fungus	3.8.8	4.12.8
Vibration	3.8.9	4.12.9
Transit Drop	3.8.10.1	4.12.10.1
Design Shock	3.8.10.2	4.12.10.2
Sand and Dust	3.8.11	4.12.11
Salt Fog	3.8.12	4.12.12
Explosive Atmosphere	3.8.13	4.12.13
EMI/EMV	3.8.14	4.12.14
Solar Radiation	3.8.15	4.12.15
Mean Time Between Failure (MTBF)	3.9.1	4.13.1
Preventative Maintenance	3.9.2	4.13.2
Operational Availability	3.9.3	4.13.3
Built In Test	3.10	4.13.4
Fast Start Feature	3.11	4.13.5
Human Factors	3.12	4.14
Safety	3.13	4.15
Marking	3.14	4.16

First Article Inspection	Requirement Paragraph	Verification Paragraph
Workmanship	3.15	4.17
Materials	3.16	4.18

4.5 Conformance Inspection.

Unless otherwise specified in this document or in the contract or purchase order, the contractor shall subject all Foot-Mobile TNM systems to 100% inspection for conformance to this specification in accordance with MIL-STD-1916. The contractor developed Acceptance Test Procedure shall be approved by the Government and revised as necessary.

4.6 Responsibility for Conformance.

Contractors are required to deliver Foot-Mobile TNM systems that conform to the requirements of this specification and the contract or purchase order and to generate and maintain sufficient evidence of conformance. Contractors are responsible for establishing their own manufacturing and process controls to produce results in accordance with requirements. Contractors are expected to use recognized prevention practices such as process controls and statistical techniques. Absence of any inspection or process control requirement in this specification or in the contract does not relieve the contractor of responsibility for assuring that all products submitted to the Government for acceptance conform to all requirements of the contract and this specification.

4.7 Government Verification of Conformance.

The Government reserves the right to verify (through independent analyses, inspections and/or testing) conformance to the requirements of this specification of any Foot-Mobile TNM system offered for delivery. Deficiencies found by the Government shall be a cause for rejection of the Foot-Mobile TNM system until the manufacturer has provided evidence that the deficiencies have been corrected. The manufacturer shall correct all such deficiencies at no additional cost to the Government. The Government also reserves the right to verify the contractor's implementation of and adherence to their manufacturing and process controls and to witness the contractor's performance of conformance inspection procedures.

4.8 Mission Performance Requirements.

4.8.1 Foot-Mobile TNM Interface. The contractor shall verify, through demonstration and examination, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.2.1.

4.8.2 Foot-Mobile TNM Battery Location. The contractor shall verify, through demonstration and examination, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.2.2.

4.8.3 Non-Magnetic Tripod. The contractor shall verify, through demonstration

and examination, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.2.3.

- 4.8.4 Permanently Attached Foot-Mobile TNM Components. The contractor shall verify through examination the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.2.4.
- 4.8.5 Digital Interface. The contractor shall verify, through demonstration and examination, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.2.5.
- 4.8.6 Field Carry Pack. The contractor shall verify, through examination, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.2.6.
- 4.8.7 Foot-Mobile TNM Operational Modes. The contractor shall verify, through analysis, demonstration, examination, and testing, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.4.1.
- 4.8.8 Azimuth Measurement Capabilities. The contractor shall verify, through analysis and demonstration, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.4.2.
- 4.8.9 Alignment. The contractor shall verify, through demonstration, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.4.3.
- 4.8.10 Visual Display. The contractor shall verify, through analysis and demonstration, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.4.4.
- 4.8.11 Foot-Mobile TNM Battery Life. The contractor shall verify, through demonstration, the ability of the Foot-Mobile TNM battery to conform to the requirements specified in section 3.4.5.
- 4.8.12 Hardware Interfaces. The contractor shall verify, through demonstration, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.4.6.
- 4.8.13 Graceful Degradation. The contractor shall verify, through demonstration, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.4.7.
- 4.9 Weight.  
The contractor shall verify, through examination, the ability of the Foot-Mobile TNM system to conform to the requirements specified in section 3.5.

4.10 Size.

The contractor shall verify, through examination, the ability of the Foot-Mobile TNM system to conform to the requirements specified in section 3.6.

4.11 System Signature.

4.11.1 Aural Detectability. The contractor shall verify, through demonstration and testing in accordance with requirement 2, Table 2-II of MIL-STD-1474D, the ability of the Foot-Mobile TNM to conform to the requirements of 3.7.1.

4.11.2 Stray Light Security. The contractor shall verify, through demonstration, the ability of the Foot-Mobile TNM to conform to the requirements of 3.7.2.

4.12 Environmental Requirements.

4.12.1 Nuclear / Biological / Chemical Decontamination. The contractor shall verify, through analysis, the ability of the Foot-Mobile TNM system to conform to the requirements specified in section 3.8.1.

4.12.2 Military Free Fall Operations – Altitude (Non-operational). To determine conformance to section 3.8.2, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 500.5, Procedure I.

4.12.3 Immersion (10.0 m). To determine conformance to section 3.8.3, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 512.5, Procedure I.

4.12.4 Immersion (1.0 m). To determine conformance to section 3.8.4, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 512.5, Procedure I.

4.12.5 Operating Temperature. To determine conformance to section 3.8.5, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 501.5, Procedure II and Method 502.5, Procedure II.

4.12.6 Storage Temperature. To determine conformance to section 3.8.6, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 501.5, Procedure I, and Method 502.5, Procedure I.

4.12.7 Temperature Shock. To determine conformance to section 3.8.7, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 503.5, Procedure I-B.

4.12.8 Fungus. The contractor shall verify, through analysis, the ability of the Foot-Mobile TNM system to conform to the requirements specified in section 3.8.8.

- 4.12.9 Vibration (Minimum Integrity). To determine conformance to section 3.8.9, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 514.6, Procedure I, Figure 514.6C-2, Table 514.6C-IV and Procedure II.
- 4.12.10 Shock.
- 4.12.10.1 Transit Drop. To determine conformance to section 3.8.10.1, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 516.6, Procedure IV.
- 4.12.10.2 Design Shock. To determine conformance to section 3.8.10.2, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 516.6, Procedure II (Test parameters: minimum peak value of 30g, nominal duration is  $T_D = (2\sqrt{(2g)})/A_m$  where  $A_m$  is the peak acceleration magnitude of the trapezoidal pulse as referenced in MIL-STD-810G, Method 516.6, Procedure II, Figure 516.6-11).
- 4.12.11 Sand and Dust. To determine conformance to section 3.8.11, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 510.5, Procedures I and II. Cosmetic blemishes are acceptable that do not affect operational performance.
- 4.12.12 Salt Fog. To determine conformance to section 3.8.12, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 509.5.
- 4.12.13 Explosive Atmosphere. To determine conformance to section 3.8.13, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 511.5, Procedure I using the calculated volume of n-hexane in accordance with MIL-STD-810G, Method 511.5, Paragraph 2.2.2.
- 4.12.14 Electromagnetic Interference/Electromagnetic Vulnerability (EMI/EMV). To determine conformance to section 3.8.14, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-461F, RE101, RE102 (2 MHz - 1 GHz, limit for ground applications), RS101, and RS103 (2 MHz - 18GHz).
- 4.12.15 Solar Radiation. To determine conformance to section 3.8.15, the Foot-Mobile TNM system shall be tested in accordance with MIL-STD-810G, Method 505.5, Procedure I, subjected to a minimum of 3 solar diurnal cycles for the A1 environment.
- 4.13 Reliability, Availability, Maintainability.
- 4.13.1 Mean Time Between Failure. The contractor shall verify, through analysis, the ability of the Foot-Mobile TNM to conform to the requirements of section 3.9.1.

- 4.13.2 Preventive Maintenance. The contractor shall verify, through analysis and demonstration, the ability of the Foot-Mobile TNM to conform to the requirements of section 3.9.2.
- 4.13.3 Operational Availability. The contractor shall verify, through analysis, the ability of the Foot-Mobile TNM to conform to the requirements of section 3.9.3.
- 4.13.4 Built-In Test. The contractor shall verify, through analysis and demonstration, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.10.
- 4.13.5 Fast Start Feature. The contractor shall verify, through demonstration, the ability of the Foot-Mobile TNM to conform to the requirements specified in section 3.11.
- 4.14 Human Systems Integration.  
The contractor shall verify, through demonstration, the ability of the Foot-Mobile TNM system to conform to the requirements specified in 3.12.
- 4.15 Safety.  
The contractor shall verify, through analysis, the ability of the Foot-Mobile TNM system to conform to requirements of section 3.13.
- 4.16 Marking.  
The contractor shall verify, through examination, the ability for the Foot-Mobile TNM system to conform to the requirements of section 3.14.
- 4.17 Workmanship.  
The contractor shall verify, through examination, the ability of the Foot-Mobile TNM system to conform to the requirements of section 3.15.
- 4.18 Materials.  
The contractor shall verify, through analysis, the ability of the Foot-Mobile TNM system to conform to the requirements of section 3.16.
- 5.0 Packaging.  
Material is to be packaged for entry into the military distribution system in accordance with MIL-STD-2073-1E. Shipments shall be marked in accordance with MIL-STD-129P with CHANGE 4.
- 6.0 Notes.
- 6.1 Intended Use.  
The Foot-Mobile TNM systems covered by this specification are intended for use by USMC infantry units, artillery units, reconnaissance personnel and supporting arms observers, spotters, and controllers to observe and determine the location of battlefield targets.

6.2 Definitions.

For the purposes of this document, the following definitions shall apply:

1 $\sigma$	One standard deviation
mil	An angular unit of measure: 6,400 mils = 360 degrees = $2\pi$ radians
OT	Observer to Target
DAGR	AN/PSN-13(A) Defense Advanced GPS Receiver
GPS	Global Positioning System
LRF	AN/PEQ-13 Laser Rangefinder (Vector 21B)
TLSI	AN/PAS-25 Thermal Laser Spot Imager
LRTI	AN/PAS-22 Long Range Thermal Imager

6.3 Subject Term (key word) Listing.

True-North Azimuth Determination System  
Common Laser Rangefinder  
Long Range Thermal Imager  
Thermal Laser Spot Imager  
Defense Advanced GPS Receiver  
Laser Range Finder  
Laser Rangefinder  
LRF

CUSTODIAN:  
USMC – MCSC PM FSS

PREPARING ACTIVITY:  
USMC – MCSC PM FSS