Instrumentation System (IS)
Tactical Engagement Simulation Systems (TESS)
Interface Standard

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Change History

Change Summary	Rev.	Release Date
Initial Release	-	03/14/2011 RN P59385-48
Removed distribution to “Distribution A”	A	06/13/2011 MCO P59402
Removed all SMODIM material. Removed requirement carried over from RCS ICD 290065 for IS to send “FF” prior to every message. Added Tactical Vehicle System (TVS) Vehicles to Table 22(20-3E) Updated Casualty Card messages to match IWS ICD (In section 5.32, TES_CASUALTY_CARD_CONTROL Message ID was changed from 42 to 6D and the message size was changed to “0A” from “Variable.” In Section 5.33, TES_CASUALTY_CARD_DATA Message ID changed from 41 to 6E.	B	11/11/11 MCO P59498
Clarified the removal of the “FF” wake up byte from the standard. The wake up byte will not be used by new radios going forward but a TESS should be capable of handling or ignoring the byte if connected to a legacy IS. Corrected error in table ten that defined the response message to the IS_BIT_REQUEST message Updated section 3.8 by adding a timeout sequence exception for the TES_SET_TIME message. Updated TES_PING_REQUEST message by adding requirement for message to be sent on an event driven basis to ensure that any changes in BIT on the IS will be immediately communicated to the TESS	C	11/13/12 MCO P58799
Several major changes to the document: • Added new variable payload messages for OneTESS • Modified existing variable payload messages • Moved the variable payload messages to Appendix A • Addressed changes from CACP STD016.	D	6/25/13 MCO R59081

Updates made based on comments from the Common Message WG meeting on 5/8/13 and draft from 5/15/13. • Added IS_STATUS_REQUEST and TES_STATUS_REPORT and TES_STATUS_EVENT_REPORT messages to provide IS Status instead of leveraging the existing PING_REQUEST messages & updated Table 15 to remove the previously defined IS Status BIT values. Original functionality of the PING_REQUEST/STATUS will remain the same. • Updated IS & TES VARIABLE_DATA Messages with Version ID, Radio Flags, and Source/Destination fields. • Reduced maximum data size of the IS to TESS Variable payloads to 230 bytes (227 bytes content). • Updated Appendix "A" payload messages based on Radio Flags & added Device ID to Payload messages A.18, A.19, A.20. • Added Event Number field to variable payloads A.3, A.5, A.7, A.8, A.11, and A.15. • Added additional Applicable TESS systems to section 3.2. • Updated sections 3.3 and 3.4 related to new physical interfaces (USB) and connector specifications.		

• Corrected Byte numbering in TES_POSITION_REPORT [0x57] message
• Corrected calculation error in number of parameters field on the TES_DEVICE_STATE_CHANGE payload message
• Corrected labeling of Lemo connectors in Figure 4 - Example Dismount Connector Configuration
• Moved the following tables to the Live Training Transformation (LT2) Interoperability Enumerations Document:
  o Table 13 FIX/NAV Failure Codes
  o Table 15 MILES Weapon Code Definitions
  o Table 17 IS Built In Test (BIT) Definitions
  o Table 22 MILES 2K BIT Definitions
  o Table 25 Kill Status Definitions
  o Table 28 Cheat Event Subcodes
  o Table 29 MILES 2K Vehicle Initialization
  o Table 30 Example PK Table
• Updated Section 1
  o Added Figures 1, 2 and 3
  o Modified text in section 1.2 on how to submit change requests against standards
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		11/15/13

documents		
• (Various minor changes, including updates Enumeration type references in several message fields throughout)	E DRAFT	3/29/14

• Updated Section 1.1 on LT2 Standards
  o Renamed overview of LT2 Interoperability Enumerations
  o Updated Overview IS-TESS Interface Standard
  o Changed "Class Message Set Description" to "Component Message Set Description" and updated description to be consistent with other LT2 Standards documents
  o Changed "Component Interface Descriptions" overview to "LT2 Hardware Component Agreements" and updated description
  o Added overview of LT2 System Composition Agreements
• Corrected a few spelling and typographical errors throughout
• IS_PING_REQUEST, IS_PING_RESPONSE: Simplified BIT Status to state 0x00 means pass, otherwise a BIT Failure
• Changed all "KillStatus" enumeration references to "TES_EntityHealthStatus" throughout
• IS_UNIT_CONFIGURATION_REPORT: Changed "Vehicle Type" to "Entity Type" and updated description since non-vehicle TES entity units apply.
• IS_VERSION_REQUEST - Changed description to reflect a request of the IS/TESS protocol version (as opposed to the IS firmware and hardware version.
• Removed following messages and all references to them throughout: IS_OP_MODE_REQUEST, TES_RESERVED, TES_START_STOP_REAL_TIME_EVENTS_TRANSFER, TES_CASUALTY_CARD_CONTROL,
	E
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		10/1/14

TES_CASUALTY_CARD_DATA, TES_SET_OPERATION, • TES_AMMO_LEVEL_SET and throughout: Changed VehicleWeaponsTableIndex to TES_EntityType • TES_PING_REQUEST and throughout: Changed ISBITStatus to BIT_Status-IS • TES_SET_AMMO_DATA: Removed redundant information from description • TES_SET_INITIAL_POSITION_TIME_DATE, TES_SET_TIME - Clarified descriptions for Month, Day, Hour, and Second as referenced to UTC • TES_VERSION_REPORT: Changed description and message fields to reflect reporting of the IS/TESS protocol version (as opposed to the IS firmware and hardware version.) • TES_TOW_INITIALIZATION_SETUP: Changed TOW Manual Kill Code and TOW Missile Message fields from enumerations to [0, 255]. • TES_DISPLAY_MESSAGE: Decreased the maximum size of the variable sequence of ASCII characters from 253 to 88 in order to accommodate message transfer over transports with small MTUs (e.g., IEEE 802.15.4 L-PAN) without the need for message fragmentation • Added "Other" column to 6.1., Table 8 IS -> TESS Messages Usage and Section 6.2, Table 9 TESS -> IS Message Usage and populated the columns • Removed several subsections in Section 8 since these defined in LT2 Interoperability Enumerations and all other references are to that document: o FIX/NAV Failure Codes o MILES Weapon Code Definitions o Indirect Fire Munition Types o IS BIT Definitions o R-VDD Module Numbers and BIT Definitions o MILES VCU Module Numbers and BIT Definitions o MILES 2K BIT Definitions o Vehicle Weapons Table o Kill Status Definitions o Cheat Event Subcodes, MILES 2K Type • Table 12 Event Report Variable Fields: Updated the Event Subcode, Zone Of Impact, and Player ID columns to refer to correct enumerated type(s) and value ranges for various event types. • Populated Glossary and Acronyms		

• Various Variable Payload Messages (IS_DEVICE_ASSOCIATION_STATUS, IS_DEVICE_LOCATION, IS_DEVICE_BIT, IS_DEVICE_STATE, TES_DEVICE_STATE_CHANGE): Changed Client Device Type to back to "Client Class" and removed Core Device Type field. • IS_DEVICE_BIT: Added BIT_Failure types to the Device-Specific Results • TES_DETONATION: Clarified description and valid data range for Player UTM Easting, Northing, and Altitude Offset fields • TES_INDIRECT_AMMO_RESUPPLY, IS_INDIRECT_AMMO_REPORT: Changed range of Number of Munition Records (M) and Number of Fuze Records (F) fields from 0-255 to "0 to 10", Number of Charge Records (C) from 0-255 to "0 - 5"		

• TES_AMMO_LEVEL_SET – Changed “VDD” references in description to “TESS”.
• Removed Section 8.2 MCC-97 Ammo/PID Combination. Moved table content to the LT2 Interoperability Enumerations PRF-PT-00617 as Ancillary Reference Information
• Removed following columns from the Event Report Variable Fields Table since this information is now provided in the LT2 Interoperability Enumerations PRF-PT-00617 or otherwise N/A:
  o Event Code Value
  o Event Code Description
  o Event Subcode
  o Position (was N/A for every row and not used by IS)
• Appendix A: Added TES-Entity-Set-PID-Cmd (Msg Id: 0x0073) as variable payload message (e.g., by reference to its definition in CMSD PRF-PT-00635)
• Appendix A: Changed the scheme of Payload ID Ranges, thereby incrementing the initial set of Variable Payload IDs by 0x4000
	E
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		10/9/2014

• Updated Event Number and Shot Event Number field descriptions throughout • Updated Event SubCode field description throughout • TES_CIS_DIRECT_FIRE_EVENT_COMMAND: Updated Event Code field description	E DRAFT	01/07/2015

• TES_REQUEST_MISSED_EVENTS: Updated Missed Event Numbers field description • TES_SET_AMMO_DATA: Updated Ammo Index field description • TES_SET_INITIAL_POSITION_TIME_DATE: Updated descriptions of the Day, Hour, and Minutes fields • TES_SET_TIME: Updated descriptions of day, hour, minute, and year • Event Report (Section 8.1) - Updated description to clarify how to locate the numeric value, description, and applicable Event Subcodes of each Event Code nmenonic literal. • Fixed a typo in Appendix A • Updated description of the Player ID field throughout • TES_DETONATION: Changed the value range representation for Player UTM Easting Offset, UTM Northing Offset, and Altitude Offset to from hex to signed decimal to improve readability. • TES_INDIRECT_AMMO_RESUPPLY: Corrected the description.		
• Removed and corrected several value ranges throughout. • Simplified valid data descriptions for various fields in various messages (e.g., IS_AMMO_LEVEL_REPORT, IS_EVENT_REPORT) • Fixed valid range for Event Number in several messages • Moved formerly Table 12 (Event Report Variable Fields) to LT2 Interoperability Enumerations and • updated all references to that table/section accordingly • Corrected byte number referenced for Checksum in IS_MISSED_EVENTS_REPORT • Prepended most hex values with "0x" for consistency with other related LT2 documents • Clarified that TES_CIS_DIRECT_FIRE_EVENT_COMMAND can be used to set the TESS PID. • Changed references to MCC Standard, Appendix A for weapon code to MILES_WeaponCode enumeration • Added Resurrect and Reset to the CIS Direct Fire Event Command Responses table, since the part of	E	03/26/2015 MCO T50963

that command enumeration. • Remove referenced to missing Client Parameter Table. • Changed various Azimuth Reference Angles to Deflection Reference Angles. • Officially re-identifed this document from GD drawing number 62-0009122 to its LT2 counterpart. Added the official LT2 document number PRF-PT-00552 to normal page footer.		

• Added IS_DETONATION message.
• Added “Munition Type” field to IS_INDIRECT_FIRE_MESSAGE.
• Added "Device Type" field to following messages:
  o IS_DEVICE_ASSOCIATION_STATUS
  o IS_DEVICE_LOCATION
  o IS_DEVICE_BIT
  o IS_DEVICE_STATE
  o IS_DEVICE_STATE_CHANGE
• Updated “Timeout Sequence” section to clarify that the TESS sends an IS_PING_REQUEST every 10 seconds while in a disconnected state and that any received message will cause the TESS to stop sending the IS_PING_REQUEST.
• Section 3.6.2: Fixed section references to TES_VARIABLE_DATA_MESSAGE[0x81]
• Removed OBE GD drawing number from the normal page footer.
	F	04/25/2017

• Changed distribution statement from “Distribution D” to “Distribution A” • Updated Contract number from “W900KK-10-D-001” to “W900KK-15-D-0003/0007”	G	08/17/2017

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1.0 BACKGROUND

The Live Training Transformation (LT2) is a strategy that utilizes product line engineering development concepts and principles to guide the acquisition of the family of live training programs under the purview of the U.S. Army Program Executive Office (PEO) for Simulation Training and Instrumentation (STRI), Project Manager Training Devices (PM TRADE).

The LT2 strategy addresses a set of Army programs as a Family of Training Systems (FTS) documented in the Live Training Transformation Family of Training Systems (LT2-FTS) Initial Capability Document. The LT2 product line concept focuses the requirements of all live domain training systems, with the objective to maximize component reuse, reduce fielding time, minimize programmatic costs, and enhance training benefits afforded to the soldier.

The LT2 strategy supports a family of compatible, live environment, engagement simulation and communication capabilities that replicate weapon effects of Line Of Sight (LOS) and non-Line Of Sight (NLOS) combat weapon systems in the conduct of Army training and testing. This family of capabilities encompasses the entire live training domain as shown in Figure 1.

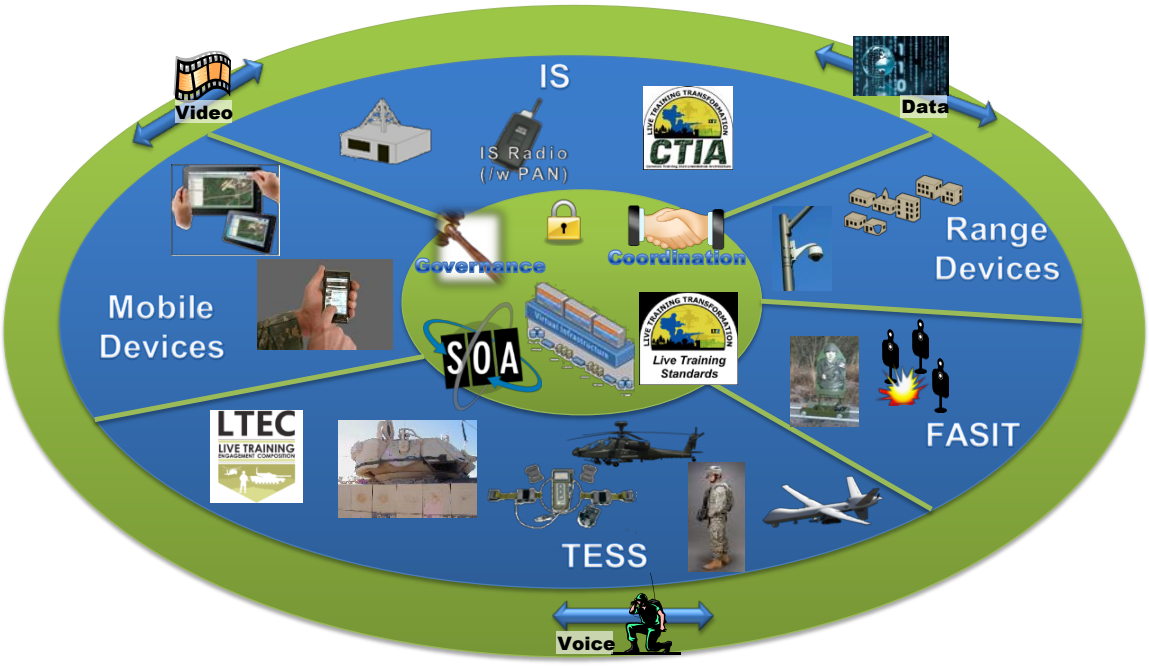

Figure 1 - Live Training Framework

1.1 LT2 Standards

This is just one document in a set of Industry Standards, LT2 Standards, Component Message Set Descriptions, Component Descriptions, and specifications that define the PM TRADE systems for live force-on-force (FoF) training, shown in Figure 2. These documents separate the transportation mechanism (standards) from the messages (Class Message Set Descriptions) sent between defined components (Component Descriptions). The LT2 Enumeration Standard defines all of the enumerations

used for all messages. These documents support the development of LT2 components which can be integrated with product-specific software and drivers to create products that meet the LT2 component's LT2 Component Description.

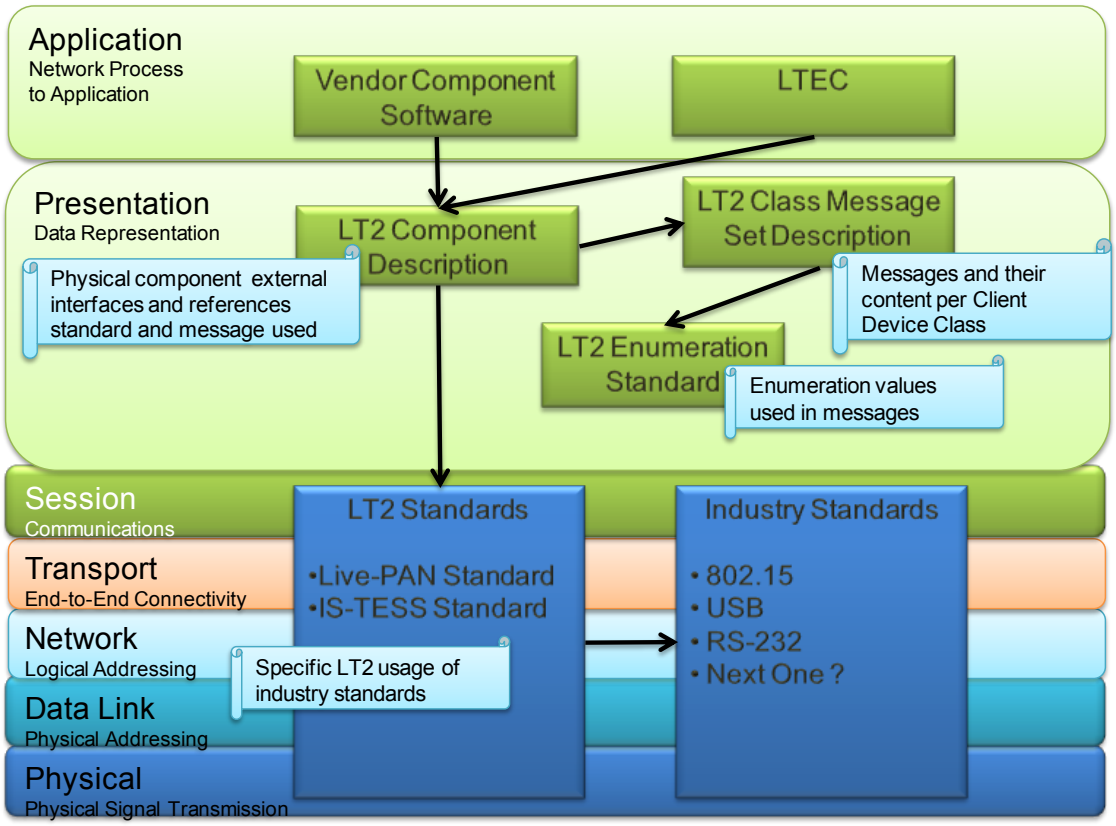

Figure 2 - Live Training Transformation Standards Relationships

1.1.1 Live-PAN Standard

The Live-PAN Standard PRF-PT-00549 defines all of the communication protocol and messages necessary to exchange information between LT2 component classes.

1.1.2 LT2 Interoperability Enumerations

The LT2 Interoperability Enumerations PRF-PT-00617 defines all of the enumerations used for all IS/TESS interface messages and L-PAN TESS messages.

1.1.3 IS-TESS Interface Standard

The IS-TESS Interface Standard PRF-PT-00552 (this document) defines all of the communication protocol and messages necessary to exchange information with the Instrumentation System.

1.1.4 Message Set Description

An LT2 Message Set Description (MSD) is a kind of interface definition that define the messages corresponding to a particular context (e.g. a component, a small set of related device capabilities (i.e., cluster), an entire system, family of systems, or even an architectural framework.) As such, a Message Set Description can be defined as an individual document or included as part of another interface specification document.

A Component Message Set Description (CMSD), in particular, focuses on one or more functional clusters of messages in a given context of one or more components. On one extreme of the spectrum, the context may be an entire system or application domain (e.g., the entire LT2 Domain could have a single CMSD defining every message of every cluster that may be used by any component.)

A CMSD is particularly useful when there is a desire to separate the message details from the rest of the component interface information specified in a Hardware Component Agreement (see 1.1.5.)

1.1.5 LT2 Hardware Component Agreements

Each LT2 Hardware Component Agreement (HCA) document describes the following for a specific LT2 hardware component in a given context: the required behavior and characteristics of the physical interfaces; the applicable message sets (either directly or by reference); and standards applicable to the component. The context of the component being described may be a system or kit configuration/design in particular (e.g., a V-TESS kit as it would apply to one or more tactical or vehicles), or the broader LT2 TESS Component Architecture in general. As such, LT2 HCAs serve as reference specifications for LT2 component/device hardware vendors, LT2 software developers/integrators, and platform integrators.

1.1.6 LT2 System Composition Agreements

Each LT2 System Composition Agreement (SCA) document defines the requirements and architectural design constraints of how a particular LT2 system is composed of common LT2 software and hardware components using an component-based acquisition approach: the set of constituent LT2 components; the required behavior and characteristics of how they interface (i.e., internal system interfaces); system external interfaces; applicable message sets; applicable standards. The context of the composition being described may be a system or kit configuration/design in particular (e.g., a V-TESS kit as it would apply to one or more tactical vehicles), or the broader LT2 TESS Component Architecture in general. Much like HCAs, LT2 SCAs also serve as reference specifications for LT2 component/device hardware vendors, LT2 software developers/integrators, TESS kit designers/integrators, and weapon system and/or target platform integrators.

1.2 Scope

This document supports development of the LT2 product line – a family of compatible and interoperable systems and devices that support live training and testing. Product Line specifications leverage this standard by referencing the standard and identifying the specific features, parameter values, and messages that the product must support. A notional TESS family of devices is shown in Figure 3. This standard will also enable possible integration with other Army Training Aids, Devices, Simulators, and Simulations (TADSS).

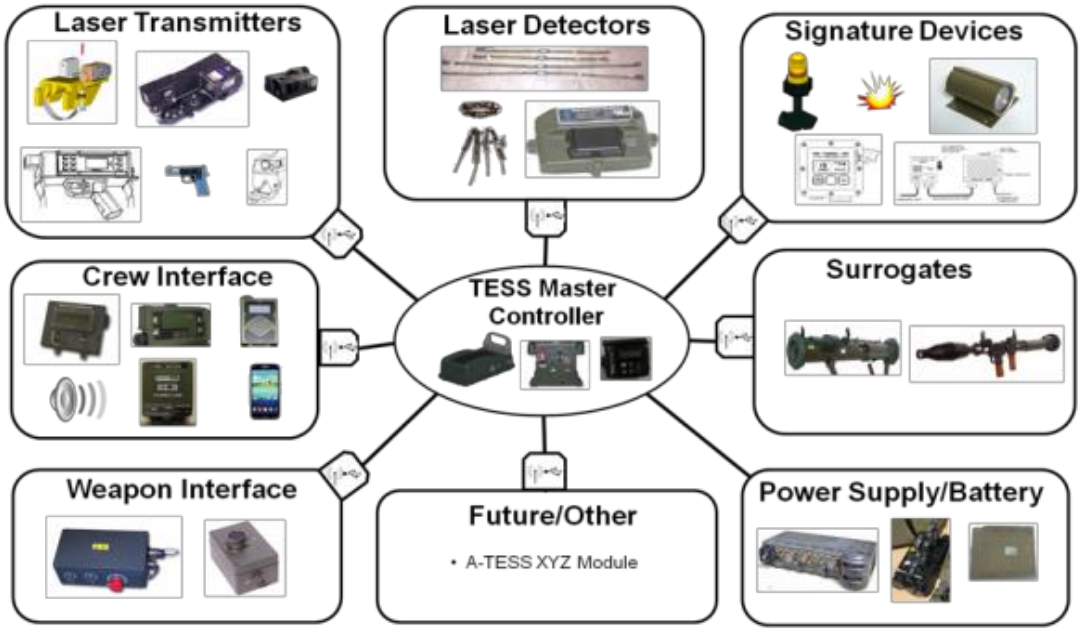

Figure 3 - Notional TESS Component Context Diagram

The LT2 Standards define message independent communication protocols. These standards are used across different LT2 Components that have potentially different LT2 Class Message Set Descriptions.

To submit comments, suggestions, or questions regarding this document please utilize the LT2 Portal Help Desk, https://www.lt2portal.org, and the Issue Tracker application. From the portal home page, select Support on the bottom right, select 'LT2 Standards' from the Help Desk Links on the left hand side of the page, and then select Issue Tracker. At the top of the Issue Tracker page click "Submit an Issue."

1.3 Applicability

This document is intended for inclusion on certain systems and components managed by Project Manager Training Devices (PM TRADE). It encompasses and drives PM TRADE Products with regards to the interface between Tactical Engagement Simulation Systems (TESS) and Instrumentation Systems (IS). This document is part of the overall LT2 Product-line standardization effort.

This document is intended for inclusion on U.S. Army contracts that support live training. This standard is approved for use by the Department of the Army and is available for use by all Departments and Agencies of the Department of Defense within the distribution limitations noted at the bottom of the cover. This is one document in a set of Standards, Component Agreements, and Specifications that define the PM-TRADE systems for live force-on-force and force-on-target training.

1.3.1 Consolidation History

This document consolidates the Interface Control Documents (ICD) previously used to detail the interface between Tactical Engagement Simulation Systems (TESS) and Instrumentation Systems (IS).

The ICDs consolidated here include:

- RCS ICD 290065 – Interface Control Document for the Interfaces between the Range Communication System (RCS) Range Data Measurement Subsystem (RDMS) Data Communication Interface Unit (DCIU) and Four Tactical Engagement Simulation Systems (TESS) for the National Training Center

- CTC ICD 706014F – Interface Control Document (ICD) for the Data Communications Interface (DCI) to Detection Device (DD) Interface Design for the Combat Training Centers (CTC) Instrumentation Systems (IS) Range Data Measurement Subsystem (RDMS) Upgrade

- I-HITS-ICD-001 – Interface Control Document (ICD) for the Initial Homestation Instrumentation Training System (I-HITS) Instrumentation Unit to the (MILES) 2000 Tactical Engagement Simulator (TES) Harness

This document uses the term "Instrumentation System" (IS) to refer to devices which provide the interface between the Range Data Measurement System (RDMS) and Tactical Engagement Simulation Systems (TESS) which conform to this standard. This document describes all aspects of the IS-TESS interface including physical and electrical interfaces, standardized connectors, and power on sequence and communication protocols.

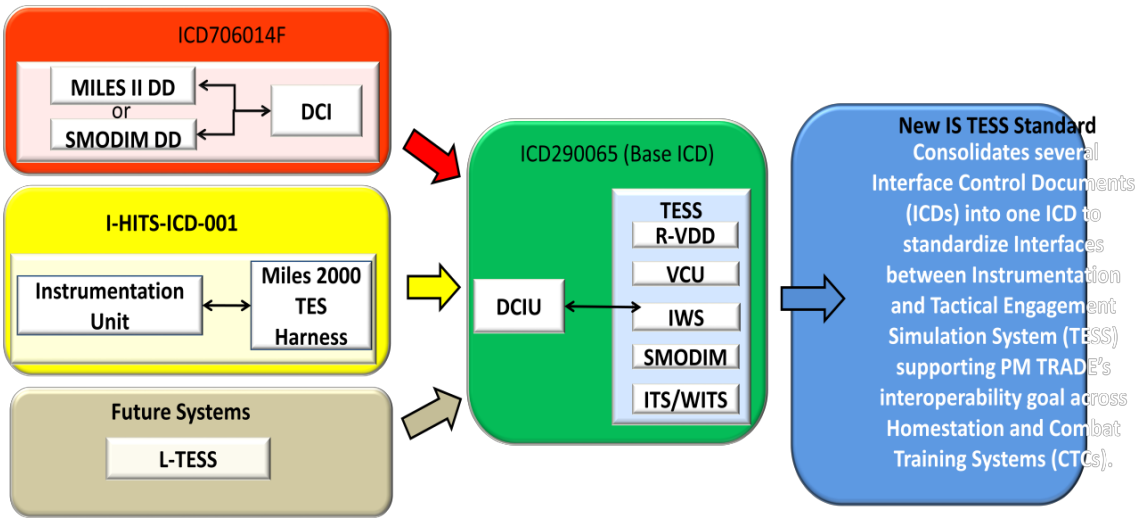

Figure 4 - IS-TESS Standard Context Diagram

This standard supports development of the LT2 product line – a family of compatible and interoperable systems and devices that support live training and testing. Product Line specifications leverage this standard by referencing the standard and identifying the specific features, parameter values and messages that the product must support. This standard will also enable possible integration with other Army Training Aids, Devices, Simulators and Simulations (TADSS).

1.4 Order of Precedence

Unless otherwise noted herein, 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.

2.0 Applicable Documents

2.1 Government Documents

Copies of these documents are available online at https://www.lt2portal.org or by request from

PEO STRI, ATTN: PM TRADE
12350 Research Parkway
Orlando, FL 32826-3275

2.1.1 Specifications

RCS ICD 290065	Interface Control Document for the Interfaces Between the Range Communication System (RCS) Range Data Measurement Subsystem (RDMS) Data Communication Interface Unit (DCIU) and Four Tactical Engagement Simulation Systems (TESS) for the National Training Center-Instrumentation System (NTC-IS)
CTC ICD 706014F	Interface Control Document (ICD) for the Data Communications Interface (DCI) to Detection Device (DD) Interface Design for the Combat Training Centers (CTC) Instrumentation Systems (IS) Range Data Measurement Subsystem (RDMS) Upgrade
I-HITS-ICD-001 Rev B	Interface Control Document (ICD) for the Initial Homestation Instrumentation Training System (I-HITS) Instrumentation Unit to the (MILES) 2000 Tactical Engagement Simulator (TES) Harness
ICD200426C	Interface Control Document for the Independent Target System
ICD200428A	Interface Control Document for the Wireless Independent Target System
MILES IWS SPECIFICATION 25 May 2005 Rev A	Performance Specification for the Multiple Integrated Laser Engagement System (MILES) Individual Weapon Systems (IWS)
ICD-3357-01A	Interface Control Document (ICD) for the Training Data Interface Between the MILES 2000 Tactical Engagement Simulators and the Instrumentation Unit
CARDS NUMBER: 2522	INITIAL CAPABILITIES DOCUMENT (ICD) For Live Training Transformation – Family of Training Systems (LT2-FTS)

2.1.2 Standards

PRF-PT-00549	Live Player Area Network (PAN) Standard
MIL-STD-348A	Radio Frequency Connector Interfaces for: MIL-C-3643, MIL-C-3650, MIL-C-3655, MIL-C-25516, MIL-C-26637, MIL-C-39012, MIL-C-49142, MIL-A-55339, and MIL-C-83517
MIL-STD-461C	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
PMT 90-S002M	Multiple Integrated Laser Engagement System (MILES) Communication Code (MCC) Standard
PRF-PT-00617	Live Training Transformation (LT2) Interoperability Enumerations

2.2 Non-Government Documents

The following documents of the exact issue shown form a part of this design to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

2.2.1 Specifications

None.

2.2.2 Other Publications

EIA-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange, August 1969
EIA-232-D	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange
ICD-GPS-200, Rev. B	NAVSTAR GPS Space Segment/Navigation User Interfaces, November 30, 1987; Rockwell International Corporation
R7264	MX7200 Series Differential GPS Receiver User's Guide and Technical Reference Manual, June, 1993; Magnavox Advanced Products and Systems Company
RTCM 134-89/SC 104, 68, Version 2.0	Radio Technical Commission for Maritime Service (RTCM) Recommended Standards for Differential NAVSTAR GPS Service, January 1, 1990; Radio Technical Commission for Maritime Commission

3.0 Requirements

3.1 Overview

To support backwards compatibility wherever practical, this Standard defines two levels of conformity for devices following this Standard.

The first level is the basic level which requires that the TESS or IS conforms to the RCS ICD 290065. Systems that currently conform to RCS ICD 290065 should already meet this basic level.

The second level requires that the TESS or IS conforms to all interfaces described in this document that apply to the individual system. This includes electrical, mechanical, message protocols, message formats and usage, and the standardized connectors defined as part of this standard. Specifically, the second conformity level requires that the IS or TESS device:

- Conform to the standard mechanical connector established in this document based on TESS type (Man-Worn and Vehicle) identified in section 3.3.2, and

- Conform to the assigned message format and usage based on TESS type (Man-Worn and Vehicle) defined in sections 4.0, 5.0, and APPENDIX A.

Variable data messages to support TESS functions such as Indirect Fire (IF) are defined in sections 4.16, 5.32 and APPENDIX A for both vehicle and dismount configurations. Included in these variable data messages is a mechanism for delivering vendor-defined variable payload messages. Such payload messages may be defined by vendors in the future and have no conformity requirement.

Section 10.1 contains definitions frequently used throughout this document.

3.2 Applicable TESS Devices

The following TESS devices are known to currently conform to one or all of the three ICDs used to create this IS-TESS Standard (see section 0). Current and future versions of these TESS devices, in addition to any other TESS devices that interface with the IS, must comply with this IS-TESS Standard.

3.2.1 Vehicle Control Unit (VCU)

The VCU-IS interface is an integral two-way digital data link supported by the RS-232D protocol. This interface transmits real-time TESS control data from the IS to the TESS via IS→VCU serial link, and receives TESS event and status data at the IS via VCU→IS serial link. Messages passed from the IS to the VCU contain initialization data, Non-Line of Sight (NLOS) data, and operational commands. Messages passed from VCU to the IS contain TESS event and status data.

3.2.2 Individual Weapon System (IWS)

The Multiple Integrated Laser Engagement System (MILES)-IWS includes the Small Arms Transmitter (SAT), Man-Worn, Training Data Transfer Device (TDTD), Dry Fire Trigger (DFT) and Transit Case (TC). The Man-Worn consists of the Harness and Halo subsystems. The MILES IWS provides real-time casualty effects necessary for tactical engagement training in direct-fire, force-on-force training scenarios and instrumented training scenarios. It replaces basic MILES currently fielded. The MILES-IWS

provides an instrumentation interface for CTCs and Homestation Instrumentation Training System (HITS).

3.2.3 Independent Target System/Wireless Independent Target System (ITS/WITS)

These systems provide real-time casualty effects necessary for tactical engagement training in Direct Fire force on force training scenarios and instrumented training scenarios. The MILES Strobe Module currently interfaces through the ITS/WITS Power Module's J2, J3, and J4 connectors with the Joint Multinational Readiness Center (JMRC) / Joint Readiness Training Center (JRTC) DCI IAW document, with the NTC IS IAW document, or with the MILES DIFCUE or MGSS IAW Document . Reference the Interface Control Document (ICD) for Independent Target System (ITS) and WITS for Connector pin-outs. (Document references are in section 2.1)

3.2.4 One Tactical Engagement System (ONETESS)

ONETESS is a family of compatible, live-environment, engagement capabilities that replicate weapon effects of combat systems in the conduct of collective training and testing. ONETESS will employ an Indirect Fire capability during live training exercises and will be capable of interfacing with the Interim Range Solution network, Homestation Instrumentation Training System (HITS) and I-MILES (for direct fire). ONETESS will also provide Forward Observer visualization capabilities.

3.2.5 Combat Vehicle Tactical Engagement Simulation System (CV TESS)

The Instrumentable - Multiple Integrated Laser Engagement System (I-MILES) Combat Vehicle Tactical Engagement Simulation System is a laser based system used for force-on-force or force-on-target training.

3.2.6 Tactical Vehicle System (TVS)

The Instrumentable - Multiple Integrated Laser Engagement System (I-MILES) Tactical Vehicle System is a laser based system used for training on various tactical vehicles without an embedded fire control system to conduct force-on-force or force-on-target training. The pieces of the TVS include a Vehicle Kill Controller (VKC), a Vehicle Kill Mast (VKM), Vehicle Detector Modules (VDMs), a Small Arms Transmitter (SAT), Serial Module RF Interface (SMRFI), a Vehicle Interface Unit (VIU), a Display Module (DM), and an iPod Touch.

3.3 Physical and Electrical Interface

3.3.1 RS-232

The IS-TESS interface is an integral two-way digital data link that conforms to the RS-232D protocol. This interface transmits real-time TESS control data from the IS to the TESS via IS→TESS serial link, and receives TESS event and status data at the IS via TESS→IS serial link. Messages passed from the IS to the TESS contain initialization data and operational commands. Messages passed from TESS to the IS contain TESS event and status data.

3.3.2 Universal Serial Bus (USB)

Future capabilities of IS-TESS systems will be required to support USB connections. There are several advantages that USB has over RS-232, such as data transfer rates and the number of devices that can be accessed through a USB connection. USB allows a faster data transfer rate, 480Mbps for USB 2.0, than RS-232 which transfers data at a rate of 9600 bps average. Another advantage of USB is that multiple

devices can be connected to the same USB connection with the use of a USB hub. The downside of using USB is that its use requires software logic to be present on both sides of the interface in order to transfer data back and forth as well in general higher power consumption. In RS-232, there are separate cables to transmit and receive data over. In USB, there are two data lines, but they are not segregated in transfer and receive, but rather in voltage positive (+) and negative (-) which are used to eliminate noise in the lines. Since both sides transmit and receive over the same lines, there has to be logic to control the flow of data. An example diagram of connectivity via USB is shown in Figure 7.

3.3.2.1 USB On-the-Go (OTG)

In a standard USB configuration, there is one host and one or more devices that can communicate with the host. On-the-Go (OTG) allows a host (based on an ID pin) to give up the host role and become a USB device, also known as a client or slave. The functionality can be useful when a device needs to assume the host role. Currently the TESS only behaves as a device (client/slave).

3.3.2.2 USB to Ethernet

For communicating with devices over Ethernet, a USB to Ethernet adapter may be used to provide an Ethernet connection (e.g. communication to future vehicle systems). There are many commercially available USB adapters that can be used to provide an Ethernet connection. It is suggested that the adapter chosen should meet the environmental requirements that military devices must adhere to.

3.3.2.3 USB to Bluetooth

For communicating with devices over Bluetooth, a USB to Bluetooth adapter may be used to communicate with devices over a Bluetooth wireless link. There are many commercially available USB adapters that can be used to provide Bluetooth connectivity. It is suggested that the adapter chosen should meet the environmental requirements that military devices must adhere to.

3.3.2.4 USB to Serial

Interfacing between serial (RS232, RS422, RS485) and USB will require an adapter and related drivers. There are many commercially available adapters to convert USB to Serial. It is recommended that the adapter chosen be compatible with Future Technology Devices International (FTDI) device drivers to allow the use of common software drivers.

3.3.2.5 USB to Human Interface Device (HID)

Peripherals that provide capabilities for humans to provide inputs to and receive outputs from training systems in forms that are easily understandable include but are not limited to keyboards, mice, pointers, microphones, speakers, and displays. When connecting displays, a USB to VGA adapter may be required.

3.3.3 Power

Source power can come from a vehicle platform or from a separate battery. The sections below define the power characteristics of each source. Per a decision made in the IS-TESS Standards IPT, currently there is no use case supporting the need to power an IS radio via the USB connection. Thus, there is no requirement to power an IS radio via the USB interface. The subsection on USB power below details the characteristics of power that a USB host can supply to attached peripheral devices.

3.3.3.1 Vehicle

The vehicle TESS provides power to the IS on the TESS - IS interface from the vehicle's power conditioner. The characteristics of the power supplied by the vehicle TESS are described below in Table 1.

Table 1 - TESS - IS Interface Power Description

Characteristic	Description
Maximum Voltage (no load)	+12.50 VDC
Minimum Voltage	+11.50 VDC
Maximum Ripple and Spikes	100 mV Peak-to-Peak
Maximum Voltage Rise Time	5.0 milliseconds (does not include switch or battery contact bounce) operating into a 10 Ohm load.
Maximum Output Current	Limited by 1.5 Amp slow blow fuse.

3.3.3.2 Battery

The IS used with a man-worn TESS gets its power from an external battery. The battery is of the type Land Warrior Battery Pack and the characteristics are detailed below in Table 2.

Table 2 - Man-Worn IS Power Description

Characteristic	Description
Maximum Voltage (no load)	+12.6 VDC
Minimum Voltage	+7.5 VDC

The battery connection to the IS is a five-wire connector with lines for power (+), ground (-), clock, data and charger. The clock line is controlled by the host (master) device and is used to synchronize data communications with the attached (client/slave) devices. The data line is used to transmit data back and forth between the host and client/slave devices.

3.3.3.3 USB Power

When a peripheral device is connected to an IS (or any other host), the IS can supply power to the peripheral device via the USB connection a detailed in Table 3 below.

Table 3 - USB Power Characteristics

Characteristic	Description
Maximum Voltage (no load)	+5.25 VDC
Minimum Voltage	+4.75 VDC
Maximum Draw	500 mA

3.4 Mechanical Interfaces

As part of the overall interface standardization, this Standard specifies the physical cable end connector interfaces for Man-Worn and Vehicle TESS devices; however the standard does not define the connector to the Instrumentation System so as to not limit which systems may be used by a vendor. The TESS connectors are as follows.

3.4.1 Vehicle Connector

The standard vehicle connector is the Amphenol MS3126P12-10P. This will connect to the J5 port on the Vehicle TESS. The connector on the IS end of the cable is vendor specific. All cables shall have strain reliefs to protect the connection of the wires to the connector. Shielding for the cable shall be connected to the metallic shell of the connector at each end of the cable.

Table 4 - Vehicle Interface Signal Description

Pin	Signal	Type	Function
K	Power	+12 VDC ± .5 VDC	Power from the conditioned power supply in the Vehicle TESS. This power is only present when platform power is present, unless the Vehicle TESS is connected to a backup battery to provide power in the event platform power is not present.
E	Power Return	RTN	The Vehicle TESS power supply return. In the Vehicle TESS configuration, this signal also acts as Signal Return for the RS-232D. The two signals are tied together within the IS circuitry.
D	Vehicle TESS – IS (RS-232)	RS-232D	Used by the Vehicle TESS & IS for transmission of data from the Vehicle TESS to the IS
C	IS – Vehicle TESS (RS-232)	RS-232D	Used by the Vehicle TESS & IS for transmission of data from the IS to the Vehicle TESS

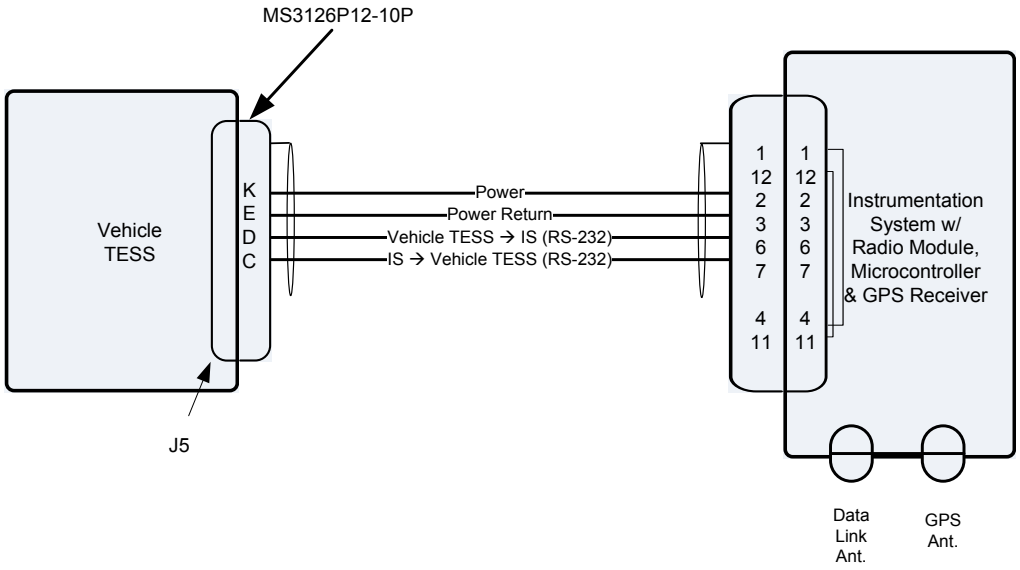

Figure 5 - Example Vehicle Connector Configuration

3.4.2 Man-Worn Connector

The standard Man-Worn connector is the Lemo PHG.0B.305.CLLD42Z Male connector. The connector will connect to a Lemo FGG.0B.305.CLAD42Z Female connector on a Man-Worn Vest. All cables shall have strain reliefs to protect the connection of the wires to the connector. Shielding for the cable shall be connected to the metallic shell of the connector at each end of the cable.

Table 5 - Man-Worn Interface Signal Description

Pin	Signal	Type	Function
A	Power	+7.5 to +12.6 VDC	Power from the commercial variant of the Land Warrior Battery Pack.
B	Power Return	RTN	The Land Warrior Battery Pack's power supply return.
3	IS-TESS (RS-232)	RS-232D	Used by the TESS & IS for transmission of data from the IS to the TESS.
4	TESS-IS (RS-232)	RS-232D	Used by the TESS & IS for transmission of data from the TESS to the IS.
5	Signal Return	RS-232D	RS-232D Ground

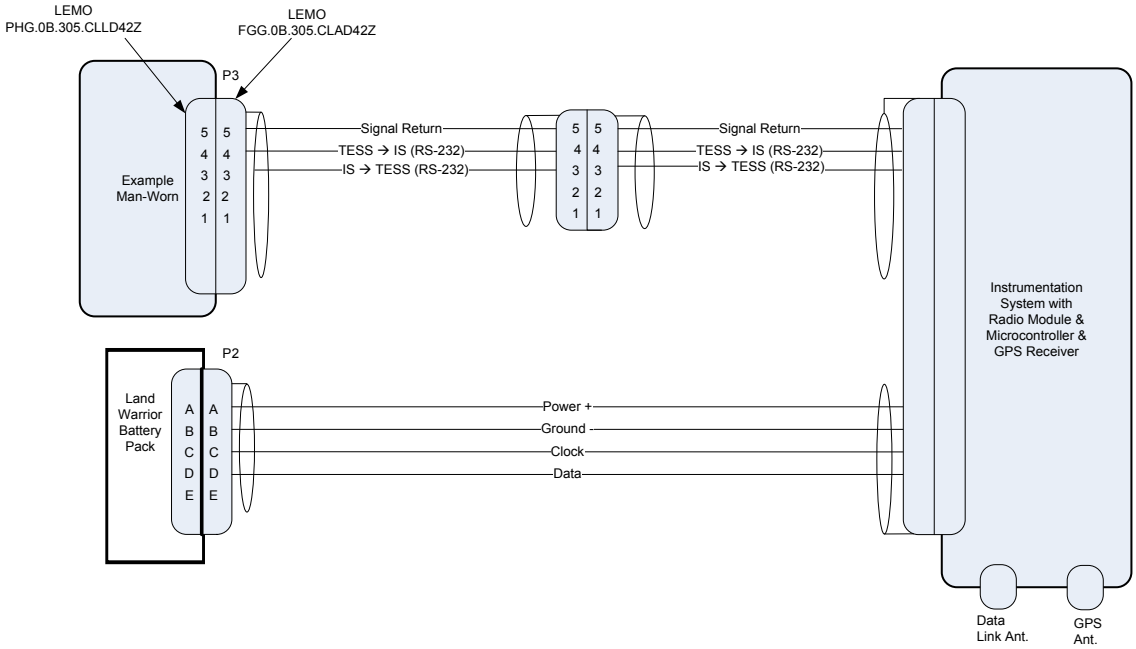

Figure 6 - Example Dismount Connector Configuration

3.4.3 USB Connector

An example USB connector configuration is displayed below.

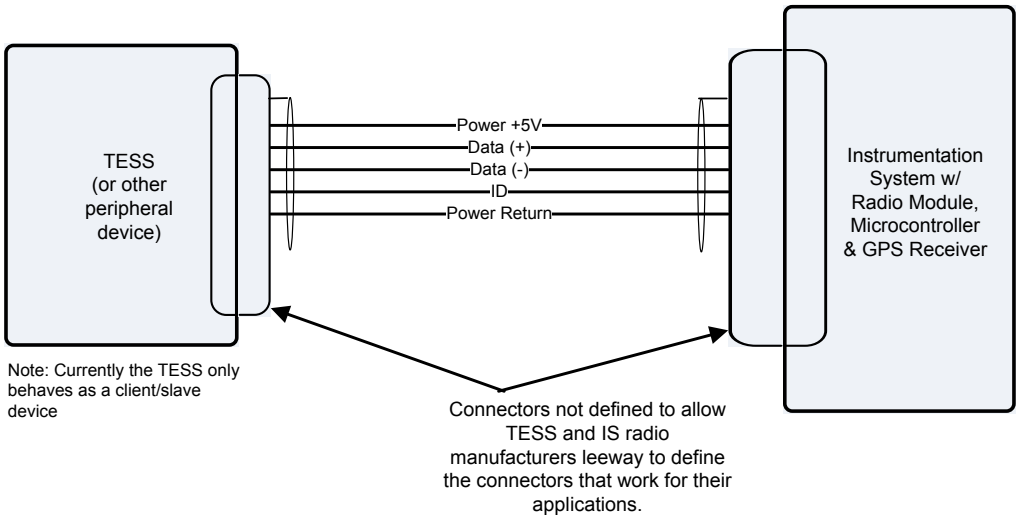

Figure 7 - USB Connector Configuration

3.5 Power-On

The following section describes the power-on sequence and requirements for each type of device.

3.5.1 Vehicles

The TESS controls the power-on of the IS in that it provides the operating power for the IS from its power conditioning circuitry. After power is applied, each IS unit performs its normal boot sequence, including power-on self-test or built-in test. The IS and TESS each store their test results for future use, such as when one device requests the other's results. During the power-on sequence, no messages are to be exchanged in either direction. After each device completes its power-on sequence, it will transition to the initialization sequence without indication on the interface.

3.5.2 Man-Worn Dismount

The TESS and IS will be capable of being powered on in either order, that is TESS first followed by IS, or IS first followed by TESS. It shall also be possible to power-off and re-power on either unit after the initialization sequence is complete while the opposite unit remains powered on. An example of this is when the IS battery pack is replaced. After power is applied, each unit will perform its normal boot up sequence, including power-on self-test or BIT. The IS and TESS each store their test results for future use, such as when one device requests the other's results. During the power-on sequence, no messages will be exchanged in either direction. After each device completes its power-on sequence it will transition to the initialization sequence without indication on the interface.

3.6 General Message Characteristics

From a message structure standpoint, all of the interfaces between a TESS device and the IS, in either direction, are formatted the same. The general format is shown in Table 6 below.

Table 6 - General Message Format

Field Title	Size in Bytes	Field Description
Sync Byte	1 byte	Hex value = BB. Used to indicate to the IS and TESS devices that the incoming message is communication between the IS and TESS.
Message ID	1 byte	Hex value = 00 to FF. Identifies a unique message type.
Message Length in Bytes	1 byte	Hex value = 05 to FF. Indicates to the receiver on the interface the total length of the incoming message. The Message Length includes the Sync and Checksum bytes.
Data Block	Variable length: 0 to 250 bytes	The payload portion of the message. The Data Block definition varies according to the message type. (See sections 4.0 through 5.37 for each specific Data Block definition.)
Checksum	2 bytes	The Checksum is computed by adding the bytes starting with the sync byte and ending with the last byte in the Data Block. The most significant byte is always sent first.

The 290065 RCS ICD which this standard is based on required that a single byte of FF (hex) be sent to TESS devices from an IS before each message so that a device may have time to wake-up from sleep mode to receive the full message. As part of this standard, this requirement has been removed and new radios should not send the wake up byte FF (hex). All TESS conforming to this standard should be capable of ignoring the wake up byte if received from a legacy radio.

3.6.1 Communication Protocol

The serial data interface used between TESS and IS utilizes RS-232D standard signaling. The interface operates at a transfer rate of 9600 Baud and in full duplex mode. The serial protocol used has 1 start bit, 1 stop bit and 8 data bits. No parity is used.

3.6.2 Message Protocols and Timing

Because both TESS and IS can send messages at any time, both interfaces are continually ready to accept messages and process the content of those messages. There will be no other hand shaking or control required (either signaling or timing) on the TESS to IS transfers.

Except as noted in the specific message descriptions in section 4.0 through section 5.32, both sides of the interface shall utilize a form of ACK/NACK protocol, indicating to the sender whether a message has been received correctly and is useable. In general the receiver of an unsolicited message will indicate acceptable reception by returning to the sender the expected response message defined in section 4.0 through section 5.32. Both sides of this interface will utilize the checksum and message length mechanisms to determine whether a message has been correctly received. In the event that the checksum or message length is incorrect for a given message, the receiving unit will ignore the message. The sending unit will re-send the message since no response had been received. The timeout sequence is described in section 3.8.

3.6.3 Message Usage

Not all messages are used by every TESS configuration. Section 6.0 contains a summary of message usage per device type (Vehicle and Man-Worn). Also, section 7.0 contains a summary of each message's expected response message(s). Note also that the message titles have a consistent naming convention that always begins with the messages destination designator. In this Standard, the designator "IS_" in a message title denotes messages that have the IS as their destination. Similarly, the designator "TES_" denotes messages whose destination is the TESS device.

3.6.4 Checksum Calculation

The Checksum bytes in each message are used only to determine if the message was transmitted and received without errors. It does not provide a means whereby the receiver may repair a message that is determined to contain one or more errors.

The Checksum is a byte-wise sum of all preceding bytes, i.e. the Sync Byte through the last byte in the Data Block. As an example, consider the hypothetical Event Message for a weapon-firing event (19 Bytes before the Checksum bytes are added) shown below where each byte value is expressed in hexadecimal:

Table 7 - Checksum Bytes

Field	Byte	Value in Hex
Sync Byte	1	BB
Message ID	2	33
Message Length (Bytes)	3	15
Data Block	4	00
	5	F1
	6	0A
	7	11
	8	00
	9	23
	10	82
	11	29
	12	65
	13	21
	14	01
	15	28
	16	0A
	17	32
	18	27
	19	03
Checksum	20	03

Field	Byte	Value in Hex
	21	F2

The byte-wise sum of the 19 bytes gives 03F2 (hex). In this case Byte 20 of the message would be set to 03 (hex) and Byte 21 would be set to F2 (hex). The receiver can perform the addition and compare the result to the two byte Checksum, or start the byte-wise addition with the Checksum value and simply subtract each byte and compare the result to 0.

3.7 Initialization Sequence

After the power on sequence is completed, each device will immediately enter the initialization sequence. The TESS initialization consists of simply preparing to receive a message from the IS. The IS will complete its initialization sequence by preparing to receive a message from the TESS without further indication to the TESS.

While the following message sequences are not considered to be part of the initialization sequence since they may occur at any time, they are described here to explain the sequence that is required for the IS and TESS to be "exercise" ready. The following procedures shall be followed after initialization of the TESS and IS:

1. The IS sends a TES_UNIT_CONFIGURATION_REQUEST Message to the TESS and waits for a response.

2. The IS receives and processes the IS_UNIT_CONFIGURATION_REPORT from the TESS.

3. The IS notifies the Exercise Control (EXCON) on the air interface that it is functional and ready for the exercise data for this player.

4. EXCON responds to the IS on the air interface with the appropriate exercise data – if EXCON fails to respond to the IS, the IS shall retry the notice periodically (every 90 seconds) until it succeeds.

5. Upon receiving the exercise configuration data, the IS will configure the TESS with the exercise configuration data using the following messages: TES_SET_VEHICLE_TYPE, TES_SET_INITIAL_POSITION_TIME_DATE, and TES_SET_TIME.

3.8 Timeout Sequence

The IS and TESS shall use a time out value of 10 seconds when expecting a response message after transmitting a message. The typical time out sequence for the IS is shown below:

1. IS sends a message to the TESS.

2. IS waits up to 10 seconds for the TES_ACKNOWLEDGE or response message from the TESS.

3. If no response is received in 10 seconds, the IS sends the original message again to the TESS.

   Note: When the IS sends the TESS a TES_SET_TIME message and the TES_ACKNOWLEDGE is not received by the IS within the 10 second time out period, the IS will send a new

TES_SET_TIME message to avoid sending a message that contains a stale time. The IS will follow the maximum three attempts and if a valid response is not received, the IS will follow steps 5 and 6 below.

4. IS repeats steps 2 and 3, for a maximum three times or until a successful response or TES_ACKNOWLEDGE is received.

5. If after three times the IS has not received a successful TES_ACKNOWLEDGE or response message, the IS shall send the TES_UNIT_CONFIGURATION_REQUEST message to the TESS.

6. At this time, the IS declares a TESS failure in the BIT field of the position report, and continues to send a TES_UNIT_CONFIGURATION_REQUEST message to the TESS every 10 seconds until a response is received. When a response is received, the initialization sequence described previously is executed.

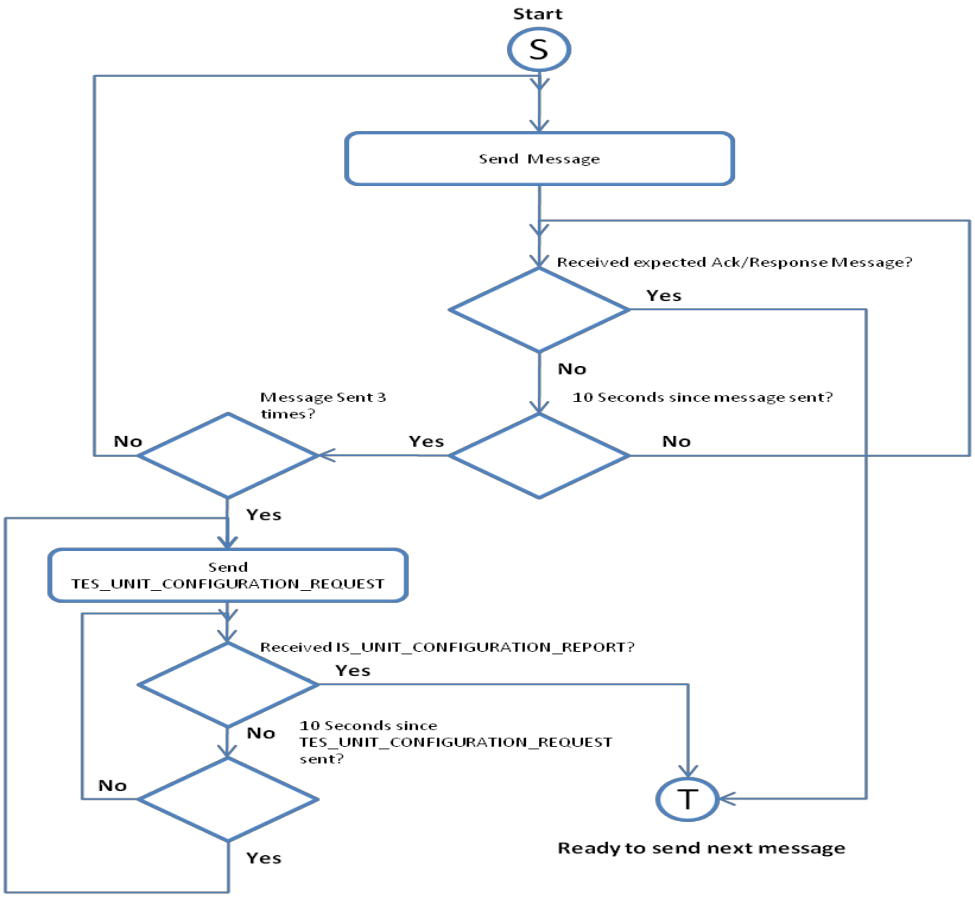

Figure 8 - IS Missed Message Handling Diagram

The TESS performs the following time out processing:

1. The TESS sends a message to the IS.

2. The TESS waits up to 10 seconds for the TES_ACKNOWLEDGE or response message from the IS.

3. If no response is received in 10 seconds, the TESS sends the original message again to the IS.

4. The TESS repeats steps 2 and 3 for a maximum of up to three times or until a successful response or TES_ACKNOWLEDGE is received.

5. If after three times the TESS has not received a successful TES_ACKNOWLEDGE or response message, the TESS will record an indication that communication is lost with the IS (for display on the console display).

6. The TESS will transmit an IS_PING_REQUEST every 10 seconds until any message is received from the IS.

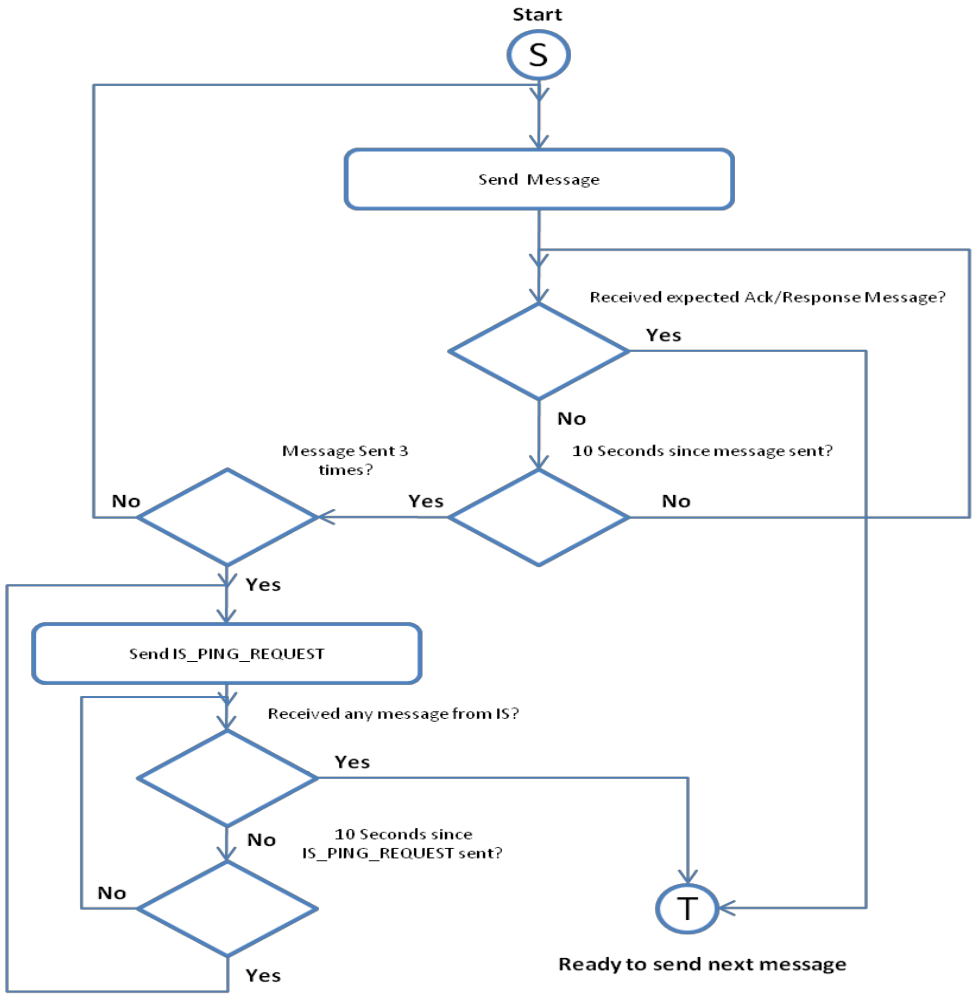

Figure 9 - TESS Timeout Processing Diagram

4.0 TESS to IS Interface Message Descriptions

In the message descriptions detailed in this section, the “Direction” portion of the message description refers to whether the message is going from the IS to the TESS or from the TESS to the IS. The message ID is identified in brackets after the message name. See section 6.0 for message usage based on TESS type (Vehicle or Man-Worn).

Each message in this Standard indicates which Response Message is required, if any.

All numbers in this section shall be interpreted at decimal unless otherwise specified.

An “N” shall be used in variable length messages to represent a variable value.

Unless explicitly noted otherwise, for all fields with two or more bytes in this section, the left byte shall be the Most Significant Byte (MSB) and the right byte shall be the Least Significant Byte (LSB).

4.1 IS_ACKNOWLEDGE [0x40]

Name: IS_ACKNOWLEDGE

Direction: TESS to IS

Description: The TESS sends this message to the IS after it has received a message from the IS that requires this response.

Use: This message is used during initialization and normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	40	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	Data	Message ID received by TESS 0 to 255
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.2 IS_ACK_NOT_SUPPORTED [0x10]

Name: IS_ACK_NOT_SUPPORTED

Direction: TESS to IS

Description: The TESS sends this message to the IS after it has received a message that is not recognized or supported by the TESS.

Use: This message is used during initialization and normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	10	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	Data	Message ID received by TESS 0 to 255
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.3 IS_AMMO_LEVEL_REPORT [0x49]

Name: IS_AMMO_LEVEL_REPORT

Direction: TESS to IS

Description: The TESS sends this message to the IS in response to a TES_AMMO_LEVEL_REQUEST. In the case where the responding TESS is an RMWV, this message contains the number of rounds fired.

Use: This message is used during initialization and normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	49	Message ID	Identifies message type
3	35	Size	Total message length in bytes

4-19	XX..XX	Main Gun	Main gun ammunition levels. For the RMWV, this field contains the number of rounds fired for the specified weapons. Each 2-byte field below is a 16-bit unsigned integer. When representing ammo level, the range is 0 to 9900. However, the total levels for all main gun ammo types must be less than or equal to 9900. · Bytes 4-5 - Ammo type A (blufor) or E (opfor) · Bytes 6-7 - Ammo type B (blufor) or F (opfor) · Bytes 8-9 - Ammo type C (blufor) or G (opfor) · Bytes 10-11 - Ammo type D (blufor) or H (opfor) · Bytes 12-13 - Ammo type I (blufor) or M (opfor) · Bytes 14-15 - Ammo type J (blufor) or N (opfor) · Bytes 16-17 - Ammo type K (blufor) or O (opfor) · Bytes 18-19 - Ammo type L (blufor) or P (opfor) For the RMWV: Each rounds fired count field below ranges from 0 to 65,535 · Bytes 4-5 - M16M4 rounds fired (RMWV) · Bytes 6-7 - M240 rounds fired (RMWV) · Bytes 8-9 - M2 rounds fired (RMWV) · Bytes 10-11 - M24 rounds fired (RMWV) Bytes 11 - Most significant byte Bytes 10 - Least significant byte · Bytes 12-13 - M107 rounds fired (RMWV) · Bytes 14-15 - M249 rounds fired (RMWV) · Bytes 16-17 - Unused (RMWV) · Bytes 18-19 - Unused (RMWV)

20-35	XX..XX	Missile	Missile ammunition levels. Note: This field is unused by the RMWV. Each 2-byte field below is a 16-bit unsigned integer from 0 to 99. However, the total levels for all missile ammo types combined must be less than or equal to 99. · Bytes 20-21 - Ammo type A (blufor) or E (opfor) · Bytes 22-23 - Ammo type B (blufor) or F (opfor) · Bytes 24-25 - Ammo type C (blufor) or G (opfor) · Bytes 26-27 - Ammo type D (blufor) or H (opfor) · Bytes 28-29 - Ammo type I (blufor) or M (opfor) · Bytes 30-31 - Ammo type J (blufor) or N (opfor) · Bytes 32-33 - Ammo type K (blufor) or O (opfor) · Bytes 34-35 - Ammo type L (blufor) or P (opfor)
36-51	XX..XX	Coax	Coax ammunition levels. This field is unused by the RMWV. Each 2-byte field below is a 16-bit unsigned integer from 0 to 9900. However, the total levels for all coax ammo types combined must be less than or equal to 9900. · Bytes 36-37 - Ammo type A (blufor) or E (opfor) · Bytes 38-39 - Ammo type B (blufor) or F (opfor) · Bytes 40-41 - Ammo type C (blufor) or G (opfor) · Bytes 42-43 - Ammo type D (blufor) or H (opfor) · Bytes 44-45 - Ammo type I (blufor) or M (opfor) · Bytes 46-47 - Ammo type J (blufor) or N (opfor) · Bytes 48-49 - Ammo type K (blufor) or O (opfor) · Bytes 50-51 - Ammo type L (blufor) or P (opfor)
52-53	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

NOTES:

Ammo type 0 will contain all the rounds (i.e. all other ammo rounds will be 0) if there are no loaders or gunners displayed hooked up to the TESS.

4.4 IS_BIT_REQUEST [0x54]

Name: IS_BIT_REQUEST

Direction: TESS to IS

Description: The TESS sends this message to request the IS to execute a BIT operation and report the results back to the TESS. Upon the completion of the BIT, the IS reports back its BIT operation results in a TES_PING_REQUEST.

Use: This message is used during normal operation.

Response Message: TES_PING_REQUEST

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	54	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.5 IS_EVENT_REPORT (Non-LBA format) [0x33]

Name: IS_EVENT_REPORT (Non-LBA format)

Direction: TESS to IS

Description: The TESS reports the recorded event when it occurs.

Use: This message is used during normal operation.

Response Message: TES_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	33	Message ID	Identifies message type
3	15	Size	Total message length in bytes
4-5	XXXX	Event Number	Index indicating the number of the event report. 16-bit unsigned integer 1 to 65,535
6	XX	Event Code	Event Code varies according to event report type. See supported enumeration in EventCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617
7	XX	Event SubCode	The actual type (i.e., value range and meaning) of fields representing a primary event subcode varies depending on the EventCode. See "Event Subcode 1" definition in the notes column of the EventCode enumeration in LT2 Interoperability Enumerations PRF-PT-00617
8	XX	Zone of Impact	Varies according to event report type. See supported enumeration in ZoneOfImpactReal section of the LT2 Interoperability Enumerations Document PRF-PT-00617
9-12	XX..XX	Position	Any data in bytes 9-12 are ignored by IS 0 to 4,294,967,295

13-14	XXXX	Player ID	Varies according to event report type. See section "Common Event Report Variable Fields" of the LT2 Interoperability Enumerations PRF-PT-00617. 1-3300
15-18	XX..XX	Time	Time of the event in BCD referenced to UTC Byte 15 - Day of Week / Tenths Least significant nibble -- tenths of second - range: 0 - 9 Most significant nibble -- See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte 16 - hours in BCD - range: 0 to 23, decimal Byte 17 - minutes in BCD - range: 0 to 59, decimal Byte 18 - seconds in BCD - range: 0 to 59 decimal
19	XX	Hull to Turret Transmitter (HUTT) Position	8-bit unsigned integer. For DFV & RMWV TESS interfaces: value = 0 For Non-turreted VDD: value = 4 For Turreted VDD, failed HUTT: value = 4 For Turreted VDD, hull to turret position, relative position in 45 degree increments - range: 0 - 7.
20-21	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.6 IS_MISSED_EVENTS_REPORT (non-LBA Format) [0x2C]

Name: IS_MISSED_EVENTS_REPORT (non-LBA Format)

Direction: TESS to IS

Description: The TESS sends all of the events indexed by the TES_REQUEST_MISSED_EVENTS message in the format defined in the IS_EVENT_REPORT (non-LBA Format) [0x33]. The data blocks (16 bytes each) of up to fifteen (15) event reports that were missed by the IS are grouped into the data block of this message. If the sequence of missed events contains an Event Code 0xB3, the event should be ignored by the IS because it is a larger than 16 byte, non standard event and will be resent in an individual message.

Use: The TESS sends this message in normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	2C	Message ID	Identifies message type
3	15 to F5	Size	Total message length in bytes
4 to 16 (M-N) +19	XX..XX	Data	8-bit unsigned integer. Data bytes 4 through 19 of IS_EVENT_REPORT for event numbers N through event report number M. N represents the first number in a sequence of event report numbers and M represents the last. If 0xB3 is used for the event code (See section "Common Event Report Variable Fields" of the LT2 Interoperability Enumerations PRF-PT-00617), the IS will ignore this event number in the report because it is a larger than 16 byte non standard event that will be resent separately in an individual message. All other fields for this event number will be zero.
16*(M-N) + 20 to 16*(M-N) +21	XXXX	Checksum	Addition of bytes 1 through 16(M-N)+19 Byte 16(M-N)+20 - Most significant byte Byte 16(M-N)+21 - Least significant byte 0 to 65535

NOTES:

The TESS will always respond to a TES_REQUEST_MISSED_EVENTS report with an IS_MISSED_EVENTS_REPORT containing all requested events which it can retrieve from memory. If no valid events fall within the requested range, the last event stored in memory will be sent.

4.7 IS_PING_REQUEST [0x62]

Name: IS_PING_REQUEST

Direction: TESS to IS

Description: The R-VDD and RMWVCU send this message to report changes in the Kill and/or BIT status and to test communication with the IS. The TESS may also send this message as a heart beat polling message if desired. The IS will respond with the TES_PING_RESPONSE message, which contains the BIT results from the IS. Sending this message does not cause BIT to be executed in the IS; it only causes the last BIT result to be reported.

Use: This message is used during normal operation.

Response Message: TES_PING_RESPONSE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	62	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	BIT Status	Current TESS BIT Status 0x00 indicates no BIT failures; else indicates BIT failure. 0 to 255
5	XX	Kill Status	Bit mask indicating the simulated health status of the TES Entity. See supported enumeration in TES_EntityHealthStatus section of the LT2 Interoperability Enumerations Document PRF-PT-00617
6-7	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.8 IS_PING_RESPONSE [0x64]

Name: IS_PING_RESPONSE

Direction: TESS to IS

Description: The TESS sends this message in response to a TES_PING_REQUEST message. It returns the most recent BIT and Kill status. The TESS does not specifically execute its BIT; it only reports the last BIT result.

Use: This message is used during normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	64	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	BIT Status	Current TESS BIT Status 0x00 indicates no BIT failures; else indicates BIT failure. 0 to 255
5	XX	Kill Status	Bit mask indicating the simulated health status of the TES Entity. See supported enumeration in TES_EntityHealthStatus section of the LT2 Interoperability Enumerations Document PRF-PT-00617
6-7	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.9 IS_POSITION_REQUEST [0x58]

Name: IS_POSITION_REQUEST

Direction: TESS to IS

Description: The TESS requests the current position data from the IS for processing purposes and for archiving with locally stored event records. The IS will answer this request with a TES_POSITION_REPORT.

Use: This message is used during normal operation.

Response Message: TES_POSITION_REPORT

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	58	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.10 IS_REPEAT_LAST_MESSAGE [0x3B]

Name: IS_REPEAT_LAST_MESSAGE

Direction: TESS to IS

Description: The TESS sends this command to the IS if the TESS detects a discrepancy with the checksum or message length of the received message. After the TESS sends this message to the IS, the IS repeats the last message it sent to the TESS. The TESS shall send this message no more than two retries after the original is determined to be corrupt. This message is typically not used since the IS and TESS will retry sending a message if a response has not been received.

Use: The TESS may send an IS_REPEAT_LAST_MESSAGE to the IS during initialization or normal operation.

Response Message: Last message sent to TESS

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	3B	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.11 IS_UNIT_CONFIGURATION_REPORT [0x56]

Name: IS_UNIT_CONFIGURATION_REPORT

Direction: TESS to IS

Description: The TESS reports its configuration (TESS type, platform type, and TESS player ID) in response to a TES_UNIT_CONFIGURATION_REQUEST message from the IS.

Use: The message is used at initialization.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	56	Message ID	Identifies message type
3	09	Size	Total message length in bytes
4	XX	Unit Configuration	Unit configuration: Enumeration See supported enumeration in UnitConfiguration section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5	XX	Entity Type	This is type of TES-equipped entity being configured. Entities may be vehicle, a dismount, crew-served weapon system not mounted to a vehicles, etc. When Unit Configuration is DFV (MILES-XXI) or RMWV, set this to 0x00, otherwise ... See supported enumeration in TES_EntityType section of the LT2 Interoperability Enumerations Document PRF-PT-00617

6-7	XXXX	Player ID	TESS true Player ID 16-bit unsigned integer Range: 1 - 3300 When Byte 4 = 8 (ITAS), Byte 6 - Leading two digits of the TESS Player ID, Byte 7 -- Trailing two bytes of the TESS player ID
8-9	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.12 IS_TIME_REQUEST [0x5D]

Name: IS_TIME_REQUEST

Direction: TESS to IS

Description: The TESS sends this message to request the IS to report the current GPS-based time to the TESS unit. The IS reports back the current GPS time in the TES_SET_TIME message.

Use: This message is used during normal operation.

Response Message: TES_SET_TIME

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	5D	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.13 IS_VERSION_REPORT [0x51]

Name: IS_VERSION_REPORT

Direction: TESS to IS

Description: The TESS sends this message to send the firmware, hardware, and vulnerability versions of the TESS in response to the ISs TES_VERSION_REQUEST message.

Use: This message is used during normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	51	Message ID	Identifies message type
3	11	Size	Total message length in bytes
4-7	XX..XX	Firmware Version String	Firmware Version String See note below Each character in this 4-byte string must have an ASCII value
8-11	XX..XX	Hardware Version String	Hardware Version String See note below Each character in this 4-byte string must have an ASCII value
12-15	XX..XX	Vulnerability Version String	Vulnerability Version String See note below Each character in this 4-byte string must have an ASCII value
16-17	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

NOTES:

The Vulnerability Version String is calculated as follows: Ammo information is maintained in the following four tables in the TESS: Aspect Angle, Vulnerability, Weapon Data,

and Ammo Data. A single version is maintained for all tables. This version is set by the LAST Vulnerability Version received in the following messages:

TES_SET_AMMO_DATA [0x6C], TES_SET_ASPECT_ANGLE_DATA [0x5F], TES_SET_VULNERABILITY_DATA [0x5B], TES_SET_WEAPON_DATA [0x55].

The version string definitions for the R-VDD, DFV, RMWV and VCU are defined in section 9.0.

4.14 IS_VERSION_REQUEST [0x52]

Name: IS_VERSION_REQUEST

Direction: TESS to IS

Description: The TESS sends this message to request the protocol version of the IS in order to verify comms compatibility. It may also be used, for example, to display on the TESS console display, if applicable.

Use: This message is used during normal operation.

Response Message: TES_VERSION_REPORT

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	52	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.15 IS_STATUS_REPORT [0x3C]

Name: IS_STATUS_REPORT

Direction: TESS to IS

Description: The TESS sends the IS_STATUS_REPORT in response to the TES_STATUS_REQUEST. This message can be used to obtain the current status of the TESS if the IS temporarily loses communication.

Use: This message is used during normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	3C	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	TESS Status	TESS Status: Bit mask Enumeration. Bit Or'd Fields See supported enumeration in TESS_Status section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.16 IS_STATUS_REQUEST [3E]

Name: IS_STATUS_REQUEST

Direction: TESS to IS

Description: The TESS uses the IS_STATUS_REQUEST to request the IS to report the current GPS Tracking Status and EXCON Link Status to the TESS unit. The IS reports back the current status in the TES_STATUS_REPORT [6F] message. Upon receiving the first IS_STATUS_REQUEST [3E] message, the IS will also send TES_STATUS_EVENT_REPORT [70] messages when the status of the IS changes since the last TES_STATUS_REPORT [6F] message. On some Legacy TESS devices the message ID was 0x6F just like TES_STATUS_REPORT. The IS shall support both the newer ID (0x3E) and legacy ID (0x6F).

Use: This message is used during normal operation.

Response Message: TES_STATUS_REPORT [6F]

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	3E or 6F	Message ID	3E or 6F
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

4.17 IS_VARIABLE_DATA_MESSAGE [0x80]

Name: IS_VARIABLE_DATA_MESSAGE

Direction: TESS to IS

Description: The IS_VARIABLE_DATA_MESSAGE is used to carry a variable length Payload Message from the TESS to the IS and CIS/EXCCON using the IS as the carrier. The IS_VARIABLE_DATA_MESSAGE contains a unique Payload Message ID that defines the content of the payload when received by the CIS/EXCON. The IS should forward the message payload information (its payload header and contents) without modification to the CIS/EXCON. The priority and quality of service will be specified by the TESS for each message sent to the IS. The IS should use these parameters if possible when transmitting the message to the CIS/EXCON. The largest payload size (payload header and content) for this message is 100 bytes to limit impact to the Player Unit Radio (PUR) and IS. Generic variable message header used for Payload messages, described in APPENDIX A, is shown below. The Payload Message IDs are specified in APPENDIX A of this specification. The Payload Message bytes are shaded in the table below.

Use: This message is used during normal operation.

Response Message: TES_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	80	Message ID	Identifies message type
3	0D to 6E	Size	Variable message length in bytes (13 + N bytes of Payload Message Content)
4-5	XXXX	Event Number	Index indicating the number of this event and should be in the same sequence as the Event Number field in the IS_EVENT_REPORT to allow the IS to request all missed events (including payloads). 16-bit unsigned integer 0x0000 - No event 0x0001 to 0xFFFF - event number

6-7	XXXX	Destination ID	Unsigned Integer containing the message destination Player Unit Radio ID. 0x0000 - Reserved for sending to the CIS/EXCON. (legacy/typical use case) 0xFFFF (65535) - Reserved for sending broadcast messages. 0x0001 to 0xFFFE (65534) - Unique ID of the intended IS radio.
8	XX	Radio Flags	This byte contains flags to communicate requests to the IS regarding the treatment of the payload contained in this message. This byte is constructed by the IS radio OR'ing together the following data bits (Hex): Bits (from LSB to MSB) 0-1 = Priority Level for this payload See supported enumeration in the Priority Level section of the LT2 Interoperability Enumerations document 2-3 = Quality of Service for this payload See supported enumeration in the Quality of Service section of the LT2 Interoperability Enumerations document 4 = Not used (future) 5 = Not used (future) 6 = Not used (future) 7 = Not used (future)
9	XX	Payload Hdr Version ID	Single byte indicating Payload Message Set revision as defined in APPENDIX A of the corresponding revision of this standard. Revision D = 0x04, E = 0x05, F = 0x06, … See supported enumeration in PayloadHdrVersionID section of the LT2 Interoperability Enumerations Document PRF-PT-00617
10-11	XXXX	Payload Hdr Message ID	Unique ID indicating the type of payload included in this message. 1 to 65535

12 up to 108	XX..XX	Payload Content	0 to 97 (100 max bytes- 3 bytes for payload header) bytes of user defined data defined by the Payload Message ID. - For valid data, see the message definition of the corresponding variable Payload Message ID
N+1-N+2	XXXX	Checksum	Addition of preceding N bytes. 0 to 65535

5.0 IS to TESS Interface Message Descriptions

In the message descriptions detailed in this section, the “Direction” portion of the message description refers to whether the message is going from IS to TESS or from TESS to IS. The message ID is identified in brackets after the message name. See section 6.0 for message usage based on TESS type (Vehicle or Man-Worn).

Each message in this Standard indicates which Response Message is required, if any.

All numbers in this section shall be interpreted at decimal unless otherwise specified.

An “N” shall be used in variable length messages to represent a variable value.

Unless explicitly noted otherwise, for all fields with two or more bytes in this section, the left byte shall be the Most Significant Byte (MSB) and the right byte shall be the Least Significant Byte (LSB).

5.1 TES_ACKNOWLEDGE [0x5E]

Name: TES_ACKNOWLEDGE

Direction: IS to TESS

Description: The IS sends this message to the TESS after it has received one of the messages shown in section 6.0. The single Data byte contains the ID of the message that was received by the IS.

Use: The IS sends a TES_ACKNOWLEDGE to the TESS during normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	5E	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	Data	Message ID received by the IS 0 to 255
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.2 TES_ACK_NOT_SUPPORTED [0x10]

Name: TES_ACK_NOT_SUPPORTED

Direction: IS to TESS

Description: The IS sends this message to the TESS after it has received a message that is not recognized or supported by the IS.

Use: This message is used during initialization and normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	10	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	Data	Message ID received by TESS 0 to 255
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.3 TES_AMMO_LEVEL_REQUEST [0x49]

Name: TES_AMMO_LEVEL_REQUEST

Direction: IS to TESS

Description: The IS requests the ammo level from the TESS.

Use: This message is used during normal operation.

Response Message: IS_AMMO_LEVEL_REPORT

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	49	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.4 TES_AMMO_LEVEL_SET [0x4A]

Name: TES_AMMO_LEVEL_SET

Direction: IS to TESS

Description: The IS sends this command to the TESS to set its ammunition level. The TESS responds with an IS_ACKNOWLEDGE. This is a one-time temporary change in the ammo level. This message can be used for a partial ammo reload since this is only a temporary change in the ammo level. When the TESS is commanded to reset or initializes, the ammo levels received in this message are discarded.

Use: This message is used during initialization and normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	4A	Message ID	Identifies message type
3	36	Size	Total message length in bytes
4	XX	Vehicle Type	The TES Entity Type of the TESS (e.g., particular Vehicle Type, Lifeform, etc.) This field is NOT used to change the TES Entity type of the TESS. Rather, this field must match the current TES Entity type of the TESS; otherwise, the message is ignored. Range: 0x00 to 0x3F See supported enumeration in TES_EntityType section of the LT2 Interoperability Enumerations Document PRF-PT-00617

5-20	XX..XX	Main Gun	Main gun ammunition levels. Each 2-byte ammo type level field in this array is a 16-bit unsigned integer from 0 to 9900. However, the total levels for all main gun ammo types combined must be less than or equal to 9900. · Bytes 5-6 - Ammo type A (blufor) or E (opfor) · Bytes 7-8 - Ammo type B (blufor) or F (opfor) · Bytes 9-10 - Ammo type C (blufor) or G (opfor) · Bytes 11-12 - Ammo type D (blufor) or H (opfor) · Bytes 13-14 - Ammo type I (blufor) or M (opfor) · Bytes 15-16 - Ammo type J (blufor) or N (opfor) · Bytes 17-18 - Ammo type K (blufor) or O (opfor) · Bytes 19-20 - Ammo type L (blufor) or P (opfor)
21-36	XX..XX	Missile	Missile ammunition levels. Each 2-byte field in this array is a 16-bit unsigned integer from 0 to 99. However, the total levels for all missile ammo types combined must be less than or equal to 99. · Byte 21-22 - Ammo type A (blufor) or E (opfor) · Byte 23-24 - Ammo type B (blufor) or F (opfor) · Byte 25-26 - Ammo type C (blufor) or G (opfor) · Byte 27-28 - Ammo type D (blufor) or H (opfor) · Byte 29-30 - Ammo type I (blufor) or M (opfor) · Byte 31-32 - Ammo type J (blufor) or N (opfor) · Byte 33-34 - Ammo type K (blufor) or O (opfor) · Byte 35-36 - Ammo type L (blufor) or P (opfor)

37-52	XX..XX	Coax	Coax ammunition levels. Each 2-byte field in this array is a 16-bit unsigned integer from 0 to 9900. However, the total levels for all coax ammo types combined must be less than or equal to 9900. · Bytes 1-2 - Ammo type A (blufor) or E (opfor) · Bytes 3-4 - Ammo type B (blufor) or F (opfor) · Bytes 5-6 - Ammo type C (blufor) or G (opfor) · Bytes 7-8 - Ammo type D (blufor) or H (opfor) · Bytes 9-10 - Ammo type I (blufor) or M (opfor) · Bytes 11-12 - Ammo type J (blufor) or N (opfor) · Bytes 13-14 - Ammo type K (blufor) or O (opfor) · Bytes 15-16 - Ammo type L (blufor) or P (opfor)
53-54	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.5 TES_CIS_DIRECT_FIRE_EVENT_COMMAND [0x59]

Name: TES_CIS_DIRECT_FIRE_EVENT_COMMAND

Direction: IS to TESS

Description: By sending this message to the TESS (via the IS), the CIS can cause an individual TESS to perform the same processing it would normally perform as though that TESS was triggered by an actual direct fire event in the field. In the case of a Hit or one of the various types of Kills, this includes only the normal processing after the Monte Carlo mechanism has determined the event result. Upon receipt of one of these messages, the TESS shall perform the appropriate processing (possibly including activation of cues) and then generate a standard IS_EVENT_REPORT message, store it, and send it to the IS. The IS will process this event the same as any other TESS event by appending position and time tag and send it to the CIS. See Table 12 for event report messages that are generated when the CIS issues a Direct Fire Event Command to the TESS.

Note: This message can also be used to set the PID of the TESS.

Use: This message is used during normal operation.

Response Message: IS_ACKNOWLEDGE followed by IS_EVENT_REPORT

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	59	Message ID	Identifies message type
3	0A	Size	Total message length in bytes
4	XX	Event Code	Enumeration indicating event codes corresponding to commands applicable (some exclusively) to Direct Fire. The commands are sent by the IS (e.g., CIS/Excon) to the TESS. See supported enumeration in EventCode-DirectFireCommand section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5	XX	Event SubCode	Varies according to the Event Code. See "Event Subcode 1" definition in the notes column of the EventCode enumeration in LT2 Interoperability Enumerations PRF-PT-00617
6	XX	Zone of Impact	Varies according to the Event Code. See section "Common Event Report Variable Fields" of the LT2 Interoperability Enumerations PRF-PT-00617. See supported enumeration in ZoneOfImpactReal section of the LT2 Interoperability Enumerations Document PRF-PT-00617

7-8	XXXX	Player ID	Player ID -- Varies according to the Event Code . See section "Common Event Report Variable Fields" of the LT2 Interoperability Enumerations PRF-PT-00617. 0 to 0xFFFF
9-10	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.6 TES_CIS_EVENT_COMMAND [0x33]

Name: TES_CIS_EVENT_COMMAND

Direction: IS to TESS

Description: This message is sent to the TESS. The TESS responds to the command by sending an IS_ACKNOWLEDGE message to the IS. TES_CIS_EVENT_COMMAND messages are initiated by the CIS and forwarded through the IS to the TESS. The TESS also stores the event and reports it back to the IS after it is acted upon. Event codes 04-09 and 0C are indirect events. See Table 13 for event report messages that are generated when the CIS issues an Event Command to the TESS.

Use: This message is used during normal operation.

Response Message: IS_ACKNOWLEDGE followed by IS_EVENT_REPORT

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	33	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	Event Code	Identifies TES_CIS_EVENT_COMMAND type. For valid values, see EventCode-TES_CIS_EventCommand section of the LT2 Interoperability Enumerations document PRF-PT-00617. Note: See section "Common Event Report Variable Fields" of the LT2 Interoperability Enumerations PRF-PT-00617 for the Event Report Event Codes that will be contained in IS_EVENT_REPORT response message. See supported enumeration in EventCode-TES_CIS_EventCommand section of the LT2 Interoperability Enumerations Document PRF-PT-00617

5	XX	Event SubCode	Varies according to event code type. Event Code (hex) — Event SubCode 00, 02, 03, 0F, 10 — 00 01 — The IS loads this field with its own IS BIT result value. See the ISBITStatus table in the LT2 Interoperability Enumerations document PRF-PT-00617 for Built In Test (BIT) Definitions 04, 05, 06, 07, 08, 09, 0C — Indirect Fire Weapon Type: See Indirect Fire Weapon Types See "Event Subcode 1" definition in the notes column of the EventCode enumeration in LT2 Interoperability Enumerations PRF-PT-00617
6-7	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.7 TES_PING_REQUEST [0x66]

Name: TES_PING_REQUEST

Direction: IS to TESS

Description: The IS sends this message to notify the TES of any changes in the IS BIT Status and to test the communication interface with the TES. It may do so at any time and in fact can use the TES_PING_REQUEST message as a heart beat polling message if desired. The TESS will respond with the IS_PING_RESPONSE message that contains the basic BIT and Kill status from the TES. Note that using the TES_PING_REQUEST does not cause BIT to be executed in the TESS; it only causes the last BIT result to be reported.

Use: This message is used during normal operation.

Response Message: IS_PING_RESPONSE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	66	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	BIT Status	Enumeration indicating BIT Status of the IS. See supported enumeration in BIT_Status-IS section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.8 TES_PING_RESPONSE [0x68]

Name: TES_PING_RESPONSE

Direction: IS to TESS

Description: The IS sends this message in response to the IS_PING_REQUEST message. It returns the BIT status. Note that the IS does not execute BIT.

Use: This message is used during normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	68	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	BIT Status	Enumeration indicating BIT Status of the IS. See supported enumeration in BIT_Status-IS section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.9 TES_POSITION_REPORT [0x57]

Name: TES_POSITION_REPORT

Direction: IS to TESS

Description: The GPS-based position data are reported to the TESS using this message. The IS obtains position from GPS, in terms of a world-wide WGS-84 latitude and longitude system, and sends that to the TESS in response to the IS_POSITION_REQUEST message. The TES_POSITION_REPORT is also used to report to the TESS the current quality of fix and the GPS time in UTC to the nearest one second. No conversion is done by the IS from the "raw" or ASCII formats except zero filling to keep the fields a fixed length. All conversion is left to the TESS device to carry out depending on its use of the data (display, event storage, time setting, etc.). The accuracy of the time field dependent on the amount of time it takes the IS to create and deliver the message to the TESS and for the TESS to read and process the message.

Use: This message is used during normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	57	Message ID	Identifies message type
3	26	Size	Total message length in bytes
4-9	XX..XX	Time of Fix	GPS time of the position fix in NMEA UTC format (ASCII characters HHMMSS to the nearest 1 second), zero filled.
10-19	XX..XX	Latitude	NMEA formatted latitude as DDMM.MMMMa, where ... DD = whole degrees, MM.MMMM = minutes of a degree to 1/10,000ths of a Minute, a = N for North or S for South. Will be zero filled if degrees are less than 10 All values are ASCII characters

20-30	XX..XX	Longitude	NMEA formatted Longitude as DDDMM.MMMMa, where ... DDD = whole degrees, MM.MMMM = minutes of a degree to 1/10,000ths of a Minute, a = E for East or W for West ; Will be zero filled if degrees are less than 100 All values are ASCII characters
31-35	XX..XX	Altitude	NMEA formatted altitude in meters above or below sea level as, SMMMM, where .... S is an optional sign character only present if minus (“-“) Otherwise, MMMMM = meters in altitude Will be zero filled as appropriate (ex: -0052 for 52 meters below sea level or 00052 for 52 meters above sea level). All values are ASCII characters
36	XX	Type of Fix	Type of Fix: Enumeration. See supported enumeration in TypeOfFix section of the LT2 Interoperability Enumerations Document PRF-PT-00617
37-38	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.10 TES_REPEAT_LAST_MESSAGE [0x3B]

Name: TES_REPEAT_LAST_MESSAGE

Direction: IS to TESS

Description: The command is sent to the TESS if the IS detects a discrepancy with the checksum or message length of the received message. After the IS sends this message to the TESS, the TESS repeats the last message it sent to the IS. The IS shall not send this message more than two times after the original is determined to be corrupt. This message is typically not used since the IS and TESS will retry sending a message if a response has not been received. If the last message sent was a TES_UNIT_CONFIGURATION_REQUEST message, the message will be resent until an IS_UNIT_CONFIGURATION_REPORT message is received.

Use: The IS may send this message to the TESS during initialization or normal operation.

Response Message: Resends most recent transmission

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	3B	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.11 TES_REQUEST_MISSED_EVENTS [0x2C]

Name: TES_REQUEST_MISSED_EVENTS

Direction: IS to TESS

Description: The IS sends a request for missed events to the TESS after the IS has detected that it has not received some event reports. The IS examines the event number field within the event reports to determine if it has missed event(s). The TESS responds to this message with IS_MISSED_EVENTS_REPORT. When the IS sends this message, the IS can only request a maximum of fifteen (15) events at one time. TESS report of missed events is limited to last 500 events.

Use: This message is used during normal operation.

Response Message: IS_MISSED_EVENTS_REPORTS

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	2C	Message ID	Identifies message type
3	09	Size	Total message length in bytes
4-7	XX..XX	Missed Event Numbers	First and last requested missed event numbers. The last minus the first event numbers must be less than 15. Byte 4-5 - First Event Number 16-bit unsigned integer, 0x0001 to 0xFFFF Byte 6-7 - Last Event Number 16-bit unsigned integer, 0x0001 to 0xFFFF
8-9	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.12 TES_SET_AMMO_DATA [0x6C]

Name: TES_SET_AMMO_DATA

Direction: IS to TESS

Description: The IS sends this message to update the ammunition data table in the R-VDD and the MILES-XXI VCU for one MILES Code or weapon type according to the variable fields in the TES_EntityHealthStatus table in the LT2 Interoperability Enumerations document PRF-PT-00617 (see it for the default values for all changeable fields.) The weapon data are transferred one weapon's data at a time in this message.

Use: This message shall not be used during normal operations due to air interface loading constraints and the large size of these messages. It is recommended that this message not be utilized for over-the-air re-programming of weapon data, and that these data be re-programmed in the depot environment.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	6C	Message ID	Identifies message type
3	18	Size	Total message length in bytes
4-7	XX..XX	Vulnerability Version String	The 4-byte field associated with the vulnerability version that applies after this change is made to the tables in the TESS. See IS_VERSION_REPORT [0x51] message for details on this field. Each character in this 4-byte string must have an ASCII value
8	XX	Table Index	The index number or MILES Code referencing the weapon type for whose ammo name will be changed. See supported enumeration in MILES_WeaponCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617
9	XX	Ammo Index	The index number designating the ammo type to receive the new name string. See MCC-97 Ammo/PID Combination table in the LT2 Interoperability Enumerations PRF-PT-00617. See supported enumeration in AmmoType section of the LT2 Interoperability Enumerations Document PRF-PT-00617

10	XX	Casualty Display	Used for casualty event display and audio cue. See supported enumeration in CasualtyDisplay section of the LT2 Interoperability Enumerations Document PRF-PT-00617
11-22	XX..XX	Ammo Name	The name string for this ammo type. 12-byte ASCII character array, zero filled
23-24	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.13 TES_SET_ASPECT_ANGLE_DATA [0x5F]

Name: TES_SET_ASPECT_ANGLE_DATA

Direction: IS to TESS

Description: The IS sends this message to provide the aspect angle dependent Pk data for one weapon platform or vehicle type to the TESS for reprogramming in non-volatile memory. The aspect angle data for one platform are transferred one record at a time in this message. The data consist of a fixed length record of aspect angle modifiers for four zones (front, right side, rear, and left side). If any Aspect Angle Modifier for a selected vehicle is not 1.00, the R-VDD will assume that the vehicle has a turret, will use the HUTT, and will report a HUTT loss of signal during built-in-test. The HUTT may also be disabled/enabled from the CIS by the TES_SET_VEHICLE_TYPE (VDD Version) message or at the VDD console via the controller key.

Use: This message shall not be used during normal operations due to air interface loading constraints and the large size of these messages. It is recommended that this message not be utilized for over-the-air re-programming of vulnerability, and that these data be re-programmed in the depot environment.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	5F	Message ID	Identifies message type
3	2A	Size	Total message length in bytes
4	XX	Vehicle Type	The vehicle type for which the included data pertains. See the Vehicle Weapons Data table in the Ancillary Reference Information section of the LT2 Interoperability Enumerations document PRF-PT-00617. The following special values shall also be acceptable: 255 - Man-Worn with Body Armor 254 - Man-Worn without Body Armor 253 - Crew Served Weapons See supported enumeration in TES_EntityType section of the LT2 Interoperability Enumerations Document PRF-PT-00617

5-8	XX..XX	Vulnerability Version String	The 4 byte field associated with the vulnerability version that applies after this change is made to the tables in the TESS. See IS_VERSION_REPORT message for details on this field. Each character in this 4-byte string must have an ASCII value
9-40	XX..XX	Aspect Angle Modifier	Thirty-two (32) 1-byte fields of Aspect Angle Modifier factors. The factors are 8-bit unsigned integers containing the actual Aspect Angle Modifier value (0.00 to 2.50) where the Least significant bit represents 1/100th. For an example, see section title "Example PK Table" in LT2 Interoperability Enumerations PRF-PT-00617 Bytes 9-12 for the 4 zones for the Front position Bytes 13-16 for the 4 zones for the Right Front position Bytes 17-20 for the 4 zones for the Right position Bytes 21-24 for the 4 zones for the Right Rear position Bytes 25-28 for the 4 zones for the Rear position Bytes 29-32 for the 4 zones for the Left Rear position Bytes 33-36 for the 4 zones for the Left position Bytes 37-40 for the 4 zones for the Left Front position The four zones are ordered as follows: Zone 1 - Front Zone 2 - Right Side Zone 3 - Rear Zone Zone 4 - Left Side
41-42	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

NOTES:

If any of the 32 modifiers are not 1.00, then the vehicle has a turret, and thus, the HUTT will be used to determine the turret angle, and the aspect angle modifiers will be applied. On vehicles that the R-VDD

software determined a turret is present; the HUTT can still be disabled or re-enabled from the TES_SET_VEHICLE message, or from Controller Mode. The HUTT enable affects both self-test and assessment.

5.14 TES_SET_INITIAL_POSITION_TIME_DATE [0x32]

Name: TES_SET_INITIAL_POSITION_TIME_DATE

Direction: IS to TESS

Description: The purpose of this message is to re-initialize GPS with an approximate position, time, and date so that the initial satellite acquisition can be performed without resorting to search-the-sky. The TESS responds to this message by sending a TES_ACKNOWLEDGE message to the IS. Bytes 4-11, 22, 23, and 25-29 shown below correspond respectively to data bytes 3-17 of the "SET INITIAL POSITION, TIME AND DATE" message (ID 02 hex) required by the GPS Receiver. Bytes 13-20 shown below correspond directly to data bytes 6-13 of the "UTM COORDINATES FOR THE SOUTHWEST CORNER OF LOCAL GRID" (not covered in this document) message (ID = 17 hex) required by the GPS Receiver. Byte 21 shown below corresponds directly to data byte 3 of the "SET LOCAL DATUM" (not covered in this document) message (ID = OA hex) required by the GPS Receiver. The WGS84 datum is used by the GPS Receiver as a default value.

Use: This message is automatically sent during initialization time.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	32	Message ID	Identifies message type
3	1F	Size	Total message length in bytes
4-7	XX..XX	Latitude	Latitude of the center of the training area. 32-bit signed integer in full P/L format. North positive South negative Range: -90 to +90 degrees Byte 4 - Least significant byte Byte 7 - Most significant byte

8-11	XX..XX	Longitude	Longitude of the center of the training area. 32-bit signed integer in full P/L format. East positive West negative Range: -180 to +180 degrees Byte 8 - Least significant byte Byte 11 - Most significant byte
12	XX	UTM Zone	UTM Zone number Range: 1-60, i.e., 0x01-0x3C
13-16	XX..XX	Easting or Longitude	VCU UTM Easting for SWRC Range: 0 - 1,000,000 meters 32 bit unsigned integer in full P/L format R-VDD Longitude times 100,000 Range: -17,999,999 to 17,999,999 Byte N - Least significant byte Byte N+3 - Most significant byte

17-20	XX..XX	Northing or Latitude	VCU UTM Northing for SWRC Range: 0 - 20,000,000 meters 32 bit unsigned integer in full P/L format R-VDD Latitude times 100,000 Range: -8,999,999 to 8,999,999 Byte N - Least significant byte Byte N+3 - Most significant byte
21	XX	Datum	Local datum selection Examples: 0x1F - NAD27, 0x31 - WGS84, 0x01 - EUR079 Range: 0x01 through 0x34
22-23	XXXX	Altitude	Height above mean sea level in meters 16-bit signed integer Least significant bit = 1 meter Byte N - Least significant byte Byte N+1 - Most significant byte
24	XX	DOP Limits	GPS DOP limits 8-bit unsigned integer 0 to 255
25	XX	Year	Year since 1980. 8-bit unsigned integer. 0 to 255
26	XX	Month	Month of the year referenced to UTC: Enumeration. 1 - 12 (JAN - DEC)

27	XX	Day	Day of the month referenced to UTC 8-bit unsigned integer 1-31
28	XX	Hour	Hour of the day referenced to UTC 8-bit unsigned integer 0-23
29	XX	Minutes	Minute of the hour referenced to UTC 0-59
30-31	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

NOTES:

All time fields (bytes 25-29) are referenced to UTC.

5.15 TES_SET_TIME [0x03]

Name: TES_SET_TIME

Direction: IS to TESS

Description: The IS sends this message in response to the IS_TIME_REQUEST message. This message will also be sent by the IS every fifteen (15) minutes. The first TES_SET_TIME message will be sent when either the IS_SET_CONFIGURATION_DATA message has been received from the CIS or every 15 minutes. When setting the Real Time Clock (RTC), it is recommended that the TESS apply an experientially determined offset to the time provided to compensate for the small processing and interface delays for the greatest accuracy.

Use: The message is used at initialization and during normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	03	Message ID	Identifies message type
3	0D	Size	Total message length in bytes
4	XX	Day of Week	Day of the Week. A valid value in the Enumeration must be specified (i.e., any except 0x00). See supported enumeration in DayOfWeek section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5	XX	Hour	Hour of the day referenced to UTC 8-bit unsigned integer 0-23
6	XX	Minute	Minute of the hour referenced to UTC 0-59
7	XX	Second	second of the minute referenced to UTC 0-59

8	XX	Day	Day of the month referenced to UTC 8-bit unsigned integer 1-31
9	XX	Month	Month of the year referenced to UTC: Enumeration. 1 - 12 (JAN - DEC)
10	XX	Year	year of the century referenced in UTC 0 to 99
11	XX	Time Zone Offset	Local time minus Universal Time in half-hours units. This data field adjusts when day light savings time changes. Range: -23 to +23 (8-bit signed integer)
12-13	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.16 TES_SET_VEHICLE_TYPE [0x02]

Name: TES_SET_VEHICLE_TYPE

Direction: IS to TESS

Description: The IS sends this message to set the vehicle type and to set the initial state of the HUTT, MES receiver message processing, and the Residual-Current Device (RCD).

Use: This message is used during initialization and normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	02	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	Vehicle Type	Vehicle type; See supported enumeration in TES_EntityType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5	XX	TESS Control Flags	TESS Control Flags - Bit Mask Enumeration that instructs the TESS do one or more of the commands found in the TESS Control Flags section of the LT2 Interoperability Enumerations document. This field is ignored by the MILES-XXI VCU. These flags may also be changed at the VDD console via the controller key. See supported enumeration in TESS_ControlFlags section of the LT2 Interoperability Enumerations Document PRF-PT-00617
6-7	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

NOTES:

When a vehicle type is selected at the VDD console via the controller key, the MES will default to enabled. MES self-test is never run due to a hardware defect in the GFE MES receiver (not replaced on the RCS program). The HUTT enable is determined by an algorithm (see the TES_SET_ASPECT_ANGLE_DATA [0x5F] message).

5.17 TES_SET_VULNERABILITY_DATA [0x5B]

Name: TES_SET_VULNERABILITY_DATA

Direction: IS to TESS

Description: The IS sends this message to provide the vulnerability assessment data for one weapon platform or vehicle type, for one MILES weapon code to the TESS for reprogramming in non-volatile memory. The vulnerability data consist of a fixed length record of four zone modifiers (front, right side, rear, and left side), three sub-Pk factors (firepower kill, mobility kill, and communication kill), and eight ammo-type dependent Pk factors (ammo types A and E, B and F, C and G, D and H, I and M, J and N, K and O, and L and P.) See the LT2 Interoperability Enumerations document PRF-PT-00617 for an example of a PK Table.

Use: This message shall not be used during normal operations due to air interface loading constraints and the large size of these messages. It is recommended that this message not be utilized for over-the-air re-programming of vulnerability, and that these data be re-programmed in the depot environment.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	5B	Message ID	Identifies message type
3	1D	Size	Total message length in bytes
4	XX	TES Entity Type	The TES Entity type to which the included data pertains. See the "TES Entity Weapons Data" table in the "Ancillary Reference Information" section of the LT2 Interoperability Enumerations document PRF-PT-00617. The special values defined in section "TES_EntityTypeSpecialValues" of PRF-PT-00617 shall also be acceptable. See supported enumeration in TES_EntityType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5	XX	Weapon Code	MILES Weapon Code: Enumeration indicating the weapon code for this record. See supported enumeration in MILES_WeaponCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617

6-9	XX..XX	Vulnerability Version String	The 4 byte field associated with the vulnerability version that applies after this change is made to the tables in the TESS. See section 4.13 the IS_VERSION_REPORT [0x51] message for details on this field. Each character in this 4-byte string must have an ASCII value
10-13	XX..XX	Zone Catastrophic PK Factors	Four (4) 8-bit unsigned integers of Zone factors. Zone factors are percentages in 0.5% increments. 0.5 to 100.0 numeric Zone Factor scaled value 0xFB - Reset 0xFC - Utility code 0xFD - Resurrect 0xFE - Near Miss in the associated zone 0xFF - No weapon effect in the associated zone Byte 10 scaled value for front zone Byte 11 scaled value for right side zone Byte 12 scaled value for rear zone Byte 13 scaled value for left side zone
14-19	XX..XX	Sub-PK Factors	Three (3) 16-bit unsigned integers representing Sub-Pk factors. Sub-Pk factor is a scalar factor in 0.01 increments. Byte 14-15 scaled value for firepower kill, LSB - 15, MSB - 14 Byte 16-17 scaled value for mobility kill, LSB - 17, MSB - 16 Byte 18-19 scaled value for communication kill, LSB-19, MSB-18 All fields 0 to 65,535

20-27	XX..XX	Ammo Type Factors	Eight (8) 8-bit unsigned integers, each representing an ammo type factor. Ammo type factor is a scalar factor in 0.01 increments. Byte 20 scaled value for Ammo Types A & E Byte 21 scaled value for Ammo Types B & F Byte 22 scaled value for Ammo Types C & G Byte 23 scaled value for Ammo Types D & H Byte 24 scaled value for Ammo Types I & M Byte 25 scaled value for Ammo Types J & N Byte 26 scaled value for Ammo Types K & O Byte 27 scaled value for Ammo Types L & P Each 8-bit integer in this array is 0 to 255
28-29	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.18 TES_SET_WEAPON_DATA [0x55]

Name: TES_SET_WEAPON_DATA

Direction: IS to TESS

Description: The IS sends this message to update the weapon data table in the VDD/VCU for one vehicle type according to the variable fields found in the Vehicle Weapons Data table of the LT2 Interoperability Enumerations document PRF-PT-00617. The weapon data are transferred one weapon's data at a time in this message. See the Vehicle Weapons Data table in the 5.3 Ancillary Reference Information section of the LT2 Interoperability Enumerations document PRF-PT-00617 for the default values for all changeable fields.

Use: This message shall not be used during normal operations due to air interface loading constraints and the large size of these messages. It is recommended that this message not be utilized for over-the-air re-programming of weapon data, and that these data be re-programmed in the depot environment.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	55	Message ID	Identifies message type
3	1E	Size	Total message length in bytes
4-7	XX..XX	Vulnerability Version String	The 4 byte field associated with the vulnerability version that applies after this change is made to the tables in the TESS. See the IS_VERSION_REPORT [0x51] message for details on this field. Each character in this 4-byte string must have an ASCII value
8	XX	Table Index	The index number into the TESS weapons data table to be modified or inserted by this command. See supported enumeration in MILES_WeaponCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617

9	XX	Vehicle Table & Force Indicator	The vehicle type for which the included data pertains. See the Vehicle Weapons Data table in the 5.3 Ancillary Reference Information section of the LT2 Interoperability Enumerations document PRF-PT-00617. Bit 7 contains the OPFOR / BLUFOR indicator where: 0 - BLUFOR 1 - OPFOR See supported enumeration in TES_EntityType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
10-15	XX..XX	Vehicle Name	The name for this vehicle type. 6-byte string of ASCII characters, zero filled
16	XX	Host Type	TESS Host Type: Enumeration indicating the particular type of TESS Host, coded in bits 0-6. See supported enumeration in HostType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
17	XX	System Cable	System Cable / Actual Vehicle Type: Enumeration representing the code for the actual vehicle type being used, equates to the system cable type. See supported enumeration in SystemCableActualVehicleType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
18	XX	MILES Code	MILES code for the weapon being modified or inserted. See the MILES_WeaponCode table in the LT2 Interoperability Enumerations document PRF-PT-00617 for details. See supported enumeration in MILES_WeaponCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617
19	XX	Ammo Index & Weapon Index	The index numbers for the ammo type corresponding to this weapon index. Bits 0-3 hold the Ammo type index Bits 4-7 hold the weapon index Ammo Type Index (See AmmoType section in the LT2 Interoperability Enumerations document PRF-PT-00617) Weapon Index (See WeaponIndex--Simple section in the LT2 Interoperability Enumerations document PRF-PT-00617)

20-21	XXXX	Basic Load	The quantity to be used for this ammo index 16-bit unsigned integer Byte 20 - Most significant byte Byte 21 - Least significant byte 0 to 65535
22	XX	Feeder & WF-TR	8-bit unsigned integer. Bits 0-3 hold the feeder number associated with this ammo index (1 or 2). Normally applies to main guns only. 0 to 15 Bits 4-7 hold the fired trigger release indicator where: 0 - WF - only a weapon fired IS_EVENT_REPORT is generated 1 - WFTR - both a weapon fired and a trigger released IS_EVENT_REPORTs are generated
23-24	XXXX	Initial Load / Feeder Capacity	Initial load. 0 to 65535
25	XX	Reload Time	Reload time for this ammo index. 0 to 255
26-27	XXXX	Reload Quantity	The quantity applied during a reload of this ammo index. 16-bit unsigned integer 0 - 255
28	XX	Weapon Track Time	The track time for this ammo index. Normally applies to guided missiles only. 0 to 255
29-30	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

NOTES:

The WF-TR portion of byte 22 is ignored by the R-VDD. Instead, the R-VDD uses an algorithm that was also used in the old VDD:

1. Main Gun: IF the Main Gun is a rapid-fire type as specified in the byte 16 (Host Type field), THEN create WF and TR events, ELSE create WF event only.

2. Missile: Create WF and TR events, as some training is required on how long to hold down the trigger

3. Coax: Since the Coax machine gun is rapid fire, a WF and TR event is created.

5.19 TES_UNIT_CONFIGURATION_REQUEST [0x28]

Name: TES_UNIT_CONFIGURATION_REQUEST

Direction: IS to TESS

Description: The IS requests the configuration of the TESS. The TESS reports back its configuration in an IS_UNIT_CONFIGURATION_REPORT message.

Use: This message is used at initialization and during normal operation.

Response Message: IS_UNIT_CONFIGURATION_REPORT

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	28	Message ID	Identifies message type
3	08	Size	Total message length in bytes
4	XX	GPS Data Update Interval	8-bit unsigned integer. This field must be 0.
5	XX	Altitude Update Interval	8-bit unsigned integer. This field must be 0.
6	XX	Heading Update Interval	8-bit unsigned integer. This field must be 0.
7-8	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.20 TES_VERSION_REQUEST [0x50]

Name: TES_VERSION_REQUEST

Direction: IS to TESS

Description: The IS sends this message to request the firmware and hardware versions of the TESS. The TESS reports back its versions in an IS_VERSION_REPORT.

Use: This message is used during normal operation.

Response Message: IS_VERSION_REPORT

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	50	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.21 TES_VERSION_REPORT [0x53]

Name: TES_VERSION_REPORT

Direction: IS to TESS

Description: The IS sends this message to specify the protocol version with which the IS is compliant in response to the TESS's IS_VERSION_REQUEST message.

Use: This message is used during normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	53	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	Protocol Version	The version of the IS/TESS Interface Standard with which the sender (i.e., the IS) complies. Senders that are compliant with this particular revision of the standard shall use 0x05 (i.e., Rev E)
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.22 TES_VEHICLE_CONTROLLER_SETUP [0x06]

Name: TES_VEHICLE_CONTROLLER_SETUP

Direction: IS to TESS

Description: The IS sends this message to set up the Weapons Engagement Simulator System (WESS) for vehicle or targets.

Use: This message is used during normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	06	Message ID	Identifies message type
3	0C	Size	Total message length in bytes
4	XX	Default/Custom	0 = default, 1 = custom
5	XX	Host Type	TESS Host Type: Enumeration indicating the particular type of TESS Host, coded in bits 0-6. See supported enumeration in HostType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
6	XX	Vehicle/Target	TES_EntityType enumeration indicating a particular kind/configuration of TES Entity, be it a vehicle, dismount, weapon system platform, or some target platform. See supported enumeration in TES_EntityType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
7	XX	MG WESS	Main Gun WESS Indicator: Enumeration indicating which type of Main Gun WESS, if any, is used or implicated. See supported enumeration in MainGunWESS_Indicator section of the LT2 Interoperability Enumerations Document PRF-PT-00617
8	XX	ULT COAX WESS	ULT Coax WESS Indicator: Enumeration indicating which mode of ULT Coax WESS, if any, is used or implicated. See supported enumeration in ULT_CoaxWESS_Indicator section of the LT2 Interoperability Enumerations Document PRF-PT-00617

9	XX	Missile WESS	Missile WESS Mode: Enumeration indicating the Missile WESS mode. See supported enumeration in MissileWESS_Mode section of the LT2 Interoperability Enumerations Document PRF-PT-00617
10	XX	Time of Flight	Time of Flight in seconds 0 = N/A, or 3 to 15
11-12	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.23 TES_MANWORN_CONTROLLER_SETUP [0x0C]

Name: TES_MANWORN_CONTROLLER_SETUP

Direction: IS to TESS

Description: The IS sends this message to set up a man-worn unit.

Use: See description

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	0C	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	Default/Custom	0 = default, 1 = custom
5	XX	Man-worn Type	8-bit unsigned integer. If Byte 4 = 0 then 0 = Regular and 1 = Flak Jacket If Byte 4 = 1 Use Custom PK Tables (Vendor Defined). For an example, see the LT2 Interoperability Enumerations document PRF-PT-00617, section "Example PK Table".
6-7	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.24 TES_TOW_CONTROLLER_SETUP [0x0E]

Name: TES_TOW_CONTROLLER_SETUP

Direction: IS to TESS

Description: The IS sends this message to setup a TESS TOW Controller

Use: This message is used during normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	0E	Message ID	Identifies message type
3	09	Size	Total message length in bytes
4	XX	Default/Custom	0 = default, 1 = custom

5	XX	TOW Type Basic	If Default then
			
			See and use the values in the TOW_TypeBasicDefault section of the LT2 Interoperability Enumerations document PRF-PT-00617
			
			Otherwise, If Custom, Use Custom PK Tables (Vendor Defined). See the Example PK Table in the T2 Interoperability Enumerations document PRF-PT-00617
			If Byte 4 = 0 then
			
			Use the values defined in the TOW_TypeBasicDefault section of the LT2 Interoperability Enumerations document PRF-PT-00617
			
			If Byte 4 = 1 Use Custom PK Tables(Vendor Defined)
			
			See Example PK Table in the LT2 Interoperability Enumerations document PRF-PT-00617

6	XX	WESS Mode	Missile WESS Mode: Enumeration indicating the Missile WESS mode. See supported enumeration in MissileWESS_Mode section of the LT2 Interoperability Enumerations Document PRF-PT-00617

7	XX	Time of Flight	Time of Flight in seconds 0 = N/A, or 3 to 15
8-9	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.25 TES_TOW_INITIALIZATION_SETUP [0x0F]

Name: TES_TOW_INITIALIZATION_SETUP

Direction: IS to TESS

Description: The IS sends this message to configure and initialize a TESS TOW.

Use: This message is used during initialization

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	0F	Message ID	Identifies message type
3	15	Size	Total message length in bytes
4	XX	TOW ID	TOW ID: Enumeration See supported enumeration in TOWID section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5	XX	TOW Missile Code	MILES Missile Code (See the MILES_WeaponCode table in the LT2 Interoperability Enumerations document PRF-PT-00617) See supported enumeration in MILES_WeaponCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617
6	XX	TOW Man Kill Code	TOW Man Kill Code: Subset of MILES codes representing the TOW manual kill. (See MCC Standard PMT 90-S002M)
7	XX	TOW Missile Messages	TOW Missile Message Type: Subset of MILES codes representing one or more TOW Missile messages (See MCC Standard PMT 90-S002M)
8	XX	TOW Missile Words	Number of words per message (See MCC Standard PMT 90-S002M)
9	XX	Man Kill Words	Number of manual kill words (See MCC Standard PMT 90-S002M)
10	XX	TOW Ammo Load	Amount of ammo load 0 to 255

11	XX	TOW Reload Rate	Seconds 0 to 255
12	XX	TOW Track Time	Seconds 0 to 255
13-18	XX..XX	Ammo Name	Name of the TOW ammunition. 6-byte string of ASCII characters, zero filled.
19	XX	Ammo Type	TOW Ammo Type: Enumeration See supported enumeration in AmmoTypeTOW section of the LT2 Interoperability Enumerations Document PRF-PT-00617
20-21	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.26 TES_MTID_CONTROLLER_SETUP [0x11]

Name: TES_MTID_CONTROLLER_SETUP

Direction: IS to TESS

Description: This message is used to set up the MTID Controller based on TOW Type.

Use: This message is used during initialization and normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	11	Message ID	Identifies message type
3	07	Size	Total message length in bytes
4	XX	Default/Custom	0 = default, 1 = custom
5	XX	TOW Type	The TOW Type If Byte 4 = 0 then see the supported enumeration in the TOW_TypeDetailedDefault section of the LT2 Interoperability Enumerations document. If Byte 4 = 1 Use Custom PK Tables (Vendor Defined). See Example PK Table section of the LT2 Interoperability Enumerations PRF-PT-00617.
6-7	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.27 TES_DISPLAY_MESSAGE [0x3F]

Name: TES_DISPLAY_MESSAGE

Direction: IS to TESS

Description: The IS sends this message to the TESS to display a message. This message is limited by the character display available on the TESS unit.

Use: This message is used during initialization and normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	3F	Message ID	Identifies message type
3	05 to 5A	Size	Total message length in bytes
4 up to 88	XX..XX	N/A	The message to display A sequence of ASCII Characters (i.e., character array of variable length)
N+1-N+2	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.28 TES_OP_MODE_DATA [0x3A]

Name: TES_OP_MODE_DATA

Direction: IS to TESS

Description: The IS sends this message to the TESS in response to the IS_OP_MODE_REQUEST message.

Use: This message is used during initialization and normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	3A	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	Operating Mode	Operating Mode: Enumeration See supported enumeration in OperatingMode section of the LT2 Interoperability Enumerations Document PRF-PT-00617
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.29 TES_STATUS_REQUEST [0x3C]

Name: TES_STATUS_REQUEST

Direction: IS to TESS

Description: The IS sends this message to request the current status of the TESS.

Use: This message is used during initialization and normal operation.

Response Message: IS_STATUS_REPORT

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	3C	Message ID	Identifies message type
3	05	Size	Total message length in bytes
4-5	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.30 TES_STATUS_REPORT [0x6F]

Name: TES_STATUS_REPORT

Direction: IS to TESS

Description: The IS reports its status using this message in response to an IS_STATUS_REQUEST [3E] message from the TESS. The IS must report this status report in less than 500 msec after receiving the status request.

Note CIS/EXCON Link Receive/Transmit flags only verify the connectivity to the IS Gateway HW and do not indicate the EXCON system is fully operational.

Use: This message is used during normal operation.

Response Message: None

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	6F	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	IS Status	IS Status: Bit Mask Enumeration. This enumeration is used to represent the overall status of a TES-equipped entity's connection to the IS. It is constructed by OR'ing together the data bits (Hex) as defined in the IS Status section of the LT2 Interoperability Enumerations document. Note: A bit will be set to '1' if the status is OK.
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.31 TES_STATUS_EVENT_REPORT [70]

Name: TES_STATUS_EVENT_REPORT

Direction: IS to TESS

Description: The IS reports its status using this message. It is sent on an event driven basis with any status change of the IS. The IS will send this message on status changes only after the IS receives its first IS_STATUS_REQUEST [3E] from the TESS. Receiving the IS_STATUS_REQUEST [3E] message indicates the TESS wishes to receive TES_STATUS_EVENT_REPORT messages. The IS must report this status report in less than 500 msec after detecting a status change. This message is similar to the TES_STATUS_REPORT [6F] however this message is sent unsolicited to the TESS when the IS detects change in its status (GPS signal/tracking, Receive Link, Transmit Link). The TES_STATUS_REPORT[6F] should be used in response to any TES_STATUS_REQUEST[3E] messages.

Note: CIS/EXCON Link Receive/Transmit flags only verify the connectivity to the IS Gateway HW and do not indicate the EXCON system is fully operational.

Use: This message is used during normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	70	Message ID	Identifies message type
3	06	Size	Total message length in bytes
4	XX	IS Status	IS Status: Bit Mask Enumeration. This enumeration is used to represent the overall status of a TES-equipped entity's connection to the IS. It is constructed by OR'ing together the data bits (Hex) as defined in the IS Status section of the LT2 Interoperability Enumerations document. Note: A bit will be set to '1' if the status is OK.
5-6	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

5.32 TES_VARIABLE_DATA_MESSAGE [0x81]

Name: TES_VARIABLE_DATA_MESSAGE

Direction: IS to TESS

Description: The TES_VARIABLE_DATA_MESSAGE is used to carry a variable length Payload Message from the IS to the TESS. The Payload Message bytes are shaded in the table below. The TES_VARIABLE_DATA_MESSAGE contains a unique Payload Message ID that defines the content of the payload. The Payload Message IDs are specified in APPENDIX A of this specification. The total Payload Message size is limited to 230 bytes which includes the payload header (3 bytes) and payload content information.

Use: This message is used during normal operation.

Response Message: IS_ACKNOWLEDGE

Byte #	Hex	Field	Description
1	BB	Sync	Identifies communication between IS and TESS
2	81	Message ID	Identifies message type
3	0A to ED	Size	Total message length in bytes
4-5	XXXX	Source ID	16-bit unsigned integer that contains the Player Unit Radio ID. 0x0000 - The ID if reserved for the CIS/EXCON. (legacy/typical use case) 0x0001 to 0xFFFE (65,534) - In the future this field will be used to support Peer to Peer radio communication. This will contain an IS unique radio ID within the IS that originated the message.
6	XX	Payload Hdr Version ID	Single byte indicating Payload Message Set revision as defined in APPENDIX A of the corresponding revision of this standard. Revision D = 0x04, E = 0x05, F = 0x06, … See supported enumeration in PayloadHdrVersionID section of the LT2 Interoperability Enumerations Document PRF-PT-00617
7-8	XXXX	Payload Hdr Message ID	Unique ID indicating the type of payload included in this message. 1 to 65535

9 up to 235	XX..XX	Payload Content	User-defined data defined by the Payload Message ID 0 to 227 (230 max bytes- 3 bytes for payload header)
N+1-N+2	XXXX	Checksum	Addition of bytes 1 through M-2, in which M is message size in bytes 0 to 65535

6.0 Summary

This section contains a message usage table based on one of two types of TESS –Vehicle and Man-Worn.

6.1 Message Usage IS → TESS

Table 8 - IS → TESS Messages Usage

Message Name	ID (hex)	Vehicle	Man-Worn	Other (e.g., Non-Vehicle Crew-Served)
TES_ACKNOWLEDGE	5E	X	X	X
TES_ACK_NOT_SUPPORTED	10	X	X	X
TES_AMMO_LEVEL_REQUEST	49	X	X	X
TES_AMMO_LEVEL_SET	4A	X	N/A	X
TES_CIS_DIRECT_FIRE_EVENT_COMMAND	59	X	X	X
TES_CIS_EVENT_COMMAND	33	X	X	X
TES_DISPLAY_MESSAGE	3F	X	X	X
TES_MANWORN_CONTROLLER_SETUP	0C	N/A	X	N/A
TES_MTID_CONTROLLER_SETUP	11	X	N/A	X
TES_PING_REQUEST	66	X	X	X
TES_PING_RESPONSE	68	X	X	X
TES_POSITION_REPORT	57	X	X	X
TES_REPEAT_LAST_MESSAGE	3B	X	X	X
TES_REQUEST_MISSED_EVENTS	2C	X	X	X
TES_SET_AMMO_DATA	6C	X	N/A	X
TES_SET_ASPECT_ANGLE_DATA	5F	X (VCU does not use)	N/A	X
TES_SET_INITIAL_POSITION_TIME_DATE	32	X (VCU does not use)	N/A	X
TES_SET_TIME	03	X	X	X
TES_SET_VEHICLE_TYPE	02	X	N/A	N/A
TES_SET_VULNERABILITY_DATA	5B	X (VCU does not use)	X	X
TES_SET_WEAPON_DATA	55	X (VCU does not use)	N/A	X
TES_STATUS_REPORT	6F	X	X	X
TES_STATUS_EVENT_REPORT	70	X	X	X
TES_STATUS_REQUEST	3C	X	X	X

Message Name	ID (hex)	Vehicle	Man-Worn	Other (e.g., Non-Vehicle Crew-Served)
TES_TOW_CONTROLLER_SETUP	0E	X	N/A	X
TES_TOW_INITIALIZATION_SETUP	0F	X	N/A	X
TES_UNIT_CONFIGURATION_REQUEST	28	X	X	X
TES_VEHICLE_CONTROLLER_SETUP	06	X	N/A	N/A
TES_VERSION_REPORT	53	X	X	X
TES_VERSION_REQUEST	50	X	X	X
TES_VARIABLE_DATA_MESSAGE	81	X	X	X

6.2 Message Usage TESS → IS

Table 9 - TESS → IS Message Usage

Message Name	ID (hex)	Vehicle	Man-Worn	Other
IS_ACKNOWLEDGE	40	X	X	X
IS_ACK_NOT_SUPPORTED	10	X	X	X
IS_AMMO_LEVEL_REPORT	49	X	X	X
IS_BIT_REQUEST	54	X	X	X
IS_EVENT_REPORT – non LBA	33	X	X	X
IS_MISSED_EVENTS_REPORT – non LBA	2C	X	X	X
IS_PING_REQUEST	62	X	X	X
IS_PING_RESPONSE	64	X	X	X
IS_STATUS_REPORT	3C	X	X	X
IS_STATUS_REQUEST	3E	X	X	X
IS_POSITION_REQUEST	58	X	X	X
IS_REPEAT_LAST_MESSAGE	3B	X	X	X
IS_TIME_REQUEST	5D	X	X	X
IS_UNIT_CONFIGURATION_REPORT	56	X	X	X
IS_VERSION_REPORT	51	X	X	X
IS_VERSION_REQUEST	52	X	X	X
IS_VARIABLE_DATA_MESSAGE	80	X	X	X

7.0 Messages and Responses

This section contains all messages found in the IS-TESS Interface Standard and their expected response message if any as well as any applicable notes. Also, Table 10 in section 7.1 contains a table with a column named "CIS" for messages that can originate at the CIS and are being sent to the TESS via the IS. Section 7.2 contains a similar table (Table 11) with the same column ("CIS") that designates messages that are (or can be) sent to the CIS by the IS after being received from the TESS. The variable message payloads have been moved to APPENDIX A.

7.1 IS → TESS Messages

Table 10 - IS → TESS Messages and Responses

IS Message Name	ID	TESS Response Message	CIS	Notes
TES_ACKNOWLEDGE	5E	None	No	TESS terminates retry timer on previous transmission.
TES_ACK_NOT_SUPPORTED	10	None	No	N/A
TES_AMMO_LEVEL_REQUEST	49	IS_AMMO_LEVEL_REPORT	No	N/A
TES_AMMO_LEVEL_SET	4A	IS_ACKNOWLEDGE	No	Partial Reload - Temporarily sets the number of rounds available
TES_CIS_DIRECT_FIRE_EVENT_COMMAND	59	IS_ACKNOWLEDGE	Yes	An associated Event Report will follow.
TES_CIS_EVENT_COMMAND	33	IS_ACKNOWLEDGE	Yes	An associated Event Report will follow
TES_DISPLAY_MESSAGE	3F	IS_ACKNOWLEDGE	No	N/A
TES_MANWORN_CONTROLLER_SETUP	0C	IS_ACKNOWLEDGE	No	N/A
TES_MTID_CONTROLLER_SETUP	11	IS_ACKNOWLEDGE	No	N/A
TES_PING_REQUEST	66	IS_PING_RESPONSE	No	N/A
TES_PING_RESPONSE	68	None	No	Generated in response to an IS_PING_REQUEST
TES_POSITION_REPORT	57	None	No	Generated in response to an IS_POSITION_REQUEST
TES_REPEAT_LAST_MESSAGE	3B	Resends most recent transmission	No	N/A
TES_REQUEST_MISSED_EVENTS	2C	IS_MISSED_EVENTS_REPORT	Yes	N/A
TES_SET_AMMO_DATA	6C	IS_ACKNOWLEDGE	No	N/A
TES_SET_ASPECT_ANGLE_DATA	5F	IS_ACKNOWLEDGE	No	N/A
TES_SET_INITIAL_POSITION_TIME_DATE	32	IS_ACKNOWLEDGE	No	N/A
TES_SET_TIME	03	IS_ACKNOWLEDGE	Yes	Sets internal RTC. A TIME Event will be generated after the Ack.
TES_SET_VEHICLE_TYPE	02	IS_ACKNOWLEDGE	Yes	Changes configuration and PK tables (see Example PK Table in LT2 Interoperability Enumerations PRF-PT-00617)
TES_SET_VULNERABILITY_DATA	5B	IS_ACKNOWLEDGE	No	N/A

IS Message Name	ID	TESS Response Message	CIS	Notes
TES_SET_WEAPON_DATA	55	IS_ACKNOWLEDGE	No	N/A
TES_STATUS_REPORT	6F	None	No	Response to IS_STATUS_REQUEST
TES_STATUS_EVENT_REPORT	70	IS_ACKNOWLEDGE	No	Sent on event basis when the IS status changes and acknowledged by the TESS
TES_STATUS_REQUEST	3C	None	No	N/A
TES_TOW_CONTROLLER_SETUP	0E	IS_ACKNOWLEDGE	No	N/A
TES_TOW_INITIALIZATION_SETUP	0F	IS_ACKNOWLEDGE	No	N/A
TES_UNIT_CONFIGURATION_REQUEST	28	IS_UNIT_CONFIGURATION _REPORT	Yes	N/A
TES_VEHICLE_CONTROLLER_SETUP	06	IS_ACKNOWLEDGE	No	N/A
TES_VERSION_REPORT	53	None	No	N/A
TES_VERSION_REQUEST	50	IS_VERSION_REPORT	No	Generated in response to an IS_VERSION_REQUEST
TES_VARIABLE_DATA_MESSAGE	81	IS_ACKNOWLEDGE	Yes	N/A

7.2 TESS → IS Messages

Table 11 - TESS → IS Messages and Responses

Message Name	ID	TESS Response Message	CIS	Notes
IS_ACKNOWLEDGE	40	None	No	IS terminated retry timer on previous transmission
IS_ACK_NOT_SUPPORTED	10	None	No	N/A
IS_AMMO_LEVEL_REPORT	49	None	No	Generated in a response to TES_AMMO_LEVEL_REQUEST
IS_BIT_REQUEST	54	TES_PING_REQUEST	No	A TES_PING_REQUEST will be generated when the IS has completed the BIT
IS_EVENT_REPORT – non LBA	33	TES_ACKNOWLEDGE	Yes	N/A
IS_INITIAL_POSITION_TIME_DATE_REQUEST	32	TES_SET_INITIAL_POSITION_TIME_DATE	No	N/A
IS_MISSED_EVENTS_REPORT – non LBA	2C	None	No	N/A
IS_PING_REQUEST	62	TES_PING_RESPONSE	No	N/A
IS_PING_RESPONSE	64	None	No	Generated in a response to a TES_PING_REQUEST
IS_STATUS_REPORT	3C	None	No	N/A
IS_POSITION_REQUEST	58	TES_POSITION_REPORT	No	N/A
IS_REPEAT_LAST_MESSAGE	3B	Resends most recent transmission	No	N/A
IS_STATUS_REQUEST	3E	TES_STATUS_REPORT	No	(in IHITS the message ID was 0x6F)
IS_TIME_REQUEST	5D	TES_ACKNOWLEDGE	No	N/A

Message Name	ID	TESS Response Message	CIS	Notes
IS_UNIT_CONFIGURATION_REPORT	56	None	Yes	Generated in a response to a TES_CONFIGURATION_REQUEST
IS_VERSION_REPORT	51	None	No	Generated in a response to a TES_VERSION_REQUEST
IS_VERSION_REQUEST	52	TES_VERSION_REPORT	No	N/A
IS_VARIABLE_DATA_MESSAGE	80	TES_ACKNOWLEDGE	Yes	N/A

8.0 Referenced Tables

8.1 CIS Direct Fire Event Command/Responses

The following table contains the event report messages that are generated when the CIS issues a Direct Fire Event Command to the TESS. The format of the common fields of the event report messages is described in section "Common Event Report Variable Fields" of LT2 Interoperability Enumerations PRF-PT-00617.

Table 12 - CIS Direct Fire Event Command Responses

CIS Direct Fire Event Command (hex)	TESS Event Response (hex)	Notes
Resurrect (0x01)	Resurrection (0x01)	N/A
Reset (0x02)	Reset (0x02)	N/A
Miss (0x0E)	Miss (0x0E)	N/A
Hit (0x0F)	Hit (0x0F)	N/A
Kill (0x10)	Kill (0x10)	N/A
Mobility Kill (0x11)	Mobility Kill (0x11)	N/A
Firepower Kill (0x12)	Firepower Kill (0x12)	N/A
Communications Kill (0x13)	Communications Kill (0x13)	N/A
Set PID (0xAB)	Set PID (0xAB)	N/A

1. VCU stores events with the zone of impact in 45-degree increments. If a CIS Direct Fire Event Command has zero, more than two, or two non-adjacent zones set, the Event Report response will show a different event than the command.

2. The sub-code field in the Event Report response will be the MILES code specified in the CIS Direct Fire Event Command.

3. The PID in the Event Report response will be the PID specified in the CIS Direct Fire Event Command

8.2 CIS Event Command/Responses

The following table contains the event report messages that are generated when the CIS issues an Event Command to the TESS. The format of the common fields of the event report messages is described in section "Common Event Report Variable Fields" of LT2 Interoperability Enumerations PRF-PT-00617.

Table 13 - CIS Event Command Responses

CIS Event Command (hex)	TESS Event Response (hex)	Notes
Initialize (0x00)	INIT (0x29)	N/A
BIT (0x01)	See Notes Below	N/A
Reset (0x02)	Reset (0x02)	N/A
Resurrect (0x03)	Resurrect (0x01)	N/A
Miss (0x04)	IF Miss (0x19)	N/A
Hit (0x05)	IF Hit (0x1A)	N/A
Kill (0x06)	IF Kill (0x1B)	N/A
Mobility Kill (0x07)	IF Mobility Kill (0x1C)	N/A
Fire Power Kill (0x08)	IF Fire Power Kill (0x1D)	N/A
Communications Kill (0x09)	IF Communications Kill (0x1E)	N/A
Chemical Contamination (0x0C)	IF Chemical Contamination (0x1F)	N/A
Chemical De-Contamination (0x0F)	IF Chemical Contamination 0x(1F)	N/A

NOTES:
When the VCU performs a Built-In Test (BIT) it also commands each device on the 485-bus to perform it's BIT. Each device performs its BIT, and reports the results (via 485) to the VCU. A separate event is generated for each device that fails BIT. For Demand and Power-On BIT, if there are no failing devices a BITPASS (A2H) event is generated. Once all expected devices have responded, a BITCOMPLETE (A4H) event is generated, containing a composite of BIT results (logical OR of the bit results for each unit), and a byte indicating which VCU WESS devices are missing.

9.0 Version Definitions

9.1 DCIU

9.1.1 Firmware & Hardware Version Definition

The format of the 4-byte version string is defined as follows:

MN<space><space>

Where

- M = Major revision number (unsigned byte)
- N = Minor revision number (unsigned byte)
- <space> = 0x20
- <space> = 0x20

For example, the byte string 0x01 0x23 0x20 0x20 would be interpreted as:

1.35.<space>.<space>

9.2 MILES-XXI (VCU)

9.2.1 Firmware & Hardware Version Definition

The format of the 4-byte version string is defined as follows:

MNTT

Where

- M = Major revision number (BCD)
- N = Minor revision number (BCD)
- T = test revision (printable ASCII character)
- T = test revision (printable ASCII character)

The version numbers are assigned by CM. The minor revision will always be zero in formal releases. The C is a test revision character and will always be a <space> in formal releases. For example, in a formal release, the byte string 0x38 0x31 0x20 0x20 would be interpreted as:

38.31.<space>.<space>

9.2.2 Vulnerability Version Definition

The DFV and VCU do not support the updating of the vulnerability tables. Therefore, the 4-byte vulnerability string will be 0x00 0x00 0x20 0x20 or interpreted as 00<space><space>.

9.3 R-VDD

9.3.1 Firmware Version Definition

Since there are 3 separate pieces of code that apply to the R-VDD CSCI, the 4 bytes in the software version are defined as follows:

MEf<space>

Where

- M = main code (hex)
- E = encoder code (hex)
- f = FPGA (printable ASCII character)
- <space> = 0x20

Although the FPGA is hardware, it is loaded at run-time like software. Interpret the version numbers for Main and Encoder as having imaginary decimal points after each digit. For example, the byte string 0x26 0x1F 0x63 0x20 would be interpreted as:

MAIN	ENCODER	FPGA	<space>
3.8	3.1	“c”	<space>

Note the highest version numbers will be '9.9' for Main and Encoder, and 'z' for the FPGA.

9.3.2 Hardware Version Definition

In a similar manner as the software, there are 3 hardware components in the VDD housing. The 4 bytes in the hardware version are all lower-case ASCII letters defined as follows:

BCP<space>

Where

- B = back-plane (lower case ASCII letters)
- C = CPU (lower case ASCII letters)
- P = power supply (lower case ASCII letters)
- <space> = 0x20

For example, the four-byte version string 0x62 0x62 0x61 0x20 would be interpreted as:

BACK	CPU	POWER	<space>
“b”	“b”	“a”	<space>

9.3.3 Vulnerability Version Definition

The PK table versions have the XYz format normally expected from the 3 bytes available where X and Y are unsigned bytes and z is a printable ASCII character. The fourth byte is always a space (0x20). For example, the byte string 0x23 0x10 0x61 0x20 would be interpreted as:

35.16.a.<space>

9.4 RCS Man-Worn Vest (RMWV)

9.4.1 Firmware Version Definition

Since there are 3 separate pieces of code that apply to the RMWV CSCI, the 4 bytes in the software version are defined as follows:

DMR<space>

Where

- D = Decoder Main code version and the decoder CCA (in hex)
- M = MILES Controller code version on the Decoder CCA (in hex.)
- R = RF Link code version in the ACL CCA (in hex)
- <space> = 0x20

Interpret the version numbers for Decode Main, MILES Controller and RF Link as having imaginary decimal points after each digit. For example, the byte string 0x26 0x1F 0x20 0x20 would be interpreted as:

Decoder	MILES Controller	RF Link	<space>
3.8	3.1	3.2	<space>

Note the highest version numbers will be '9.9'.

9.4.2 Hardware Version Definition

In a similar manner as the software, there are 2 hardware components in the Man-Worn housing. The 4 bytes in the hardware version are all lower-case ASCII letters defined as follows:

DA<space><space>

Where

- D = Decoder CCA HW version (lower case ASCII letters)
- A = Audio Cues/Logic CCA version (lower case ASCII letters)
- P = power supply (lower case ASCII letters)
- <space> = 0x20

For example, the four-byte version string 0x62 0x62 0x20 0x20 would be interpreted as:

Decoder	ACL	<space>	<space>
“b”	“b”	“.”	“.”

10.0 Definitions and Acronyms

10.1 Glossary

Associated	State in which a Live PAN Client has established and maintains a logical connection with a Live PAN Server, allowing the Client and Server to exchange application Data messages
Data Communication Interface Unit (DCIU)	The DCIU is the RDMS device that controls message traffic to and from the TESS and to and from EXCON via the radio frequency (RF) or air interface. It contains various components depending on the specific configuration, but always contains at least a micro-controller and UHF Radio Module. In some configurations it will also contain a GPS receiver.
Data Message	Protocol message types used for sending application messages or requesting pending between associated Clients and Servers
Exercise Control	Personnel and systems used to execute and control and exercise. Consists of Exercise Planners, TAF Analysts, and Observer Coach Trainers (OCT's).
Functional Cluster	A group of messages corresponding to a set of closely related functional capabilities of a device (e.g., a cluster for executing and getting status on Built-In-Test [BIT]). Each device (e.g., some LT2 TESS component) provides at least one cluster (i.e., serves the capabilities defined in the cluster) and may consume zero or more clusters (i.e., depends on the capabilities of a cluster.) In fact, some devices may both provide and consume the same cluster. For example, since a user interface device can perform BIT, it is a BIT cluster provider. However, this same device also may need to request to execute or get BIT status from one or more other devices in its context (e.g., Live PAN.) on behalf of a user; in this case, the user interface device is a BIT cluster consumer as well.
Instrumentation System	The Instrumentation System provides the tools that monitor and control the exercise and handle communication between participants and Exercise Control.
Life Form	Living participant in an exercise; sub category of entity.

Observer Coach Trainer	Personnel that observe, coach, train and provide AAR feedback for a rotation.
Parameter Value	Max possible size is 100 - (16 + 2) = 82.
Parameter Value	Max possible size is based on the size of the largest parameter defined in the PAN Standard.
Platform	A vehicle, aircraft or structure. (Truck, Armored Vehicle, RW aircraft, UAS, UGV, Towed Artillery, Mortars).
Player Area Network	A short-range, low-power wireless network that allows instrumentation to communicate with and control associated devices, such as weapon sensors, effects simulators, user interfaces, etc.
Power	Electrical power used to energize equipment.
Protocol message	The message supported in the Message packet of a PPDU.
State	Current state information on the TES-Equipped entity. The type of state information will be dependent of the type of TES-equipped entity.
Tactical Engagement System	Organic or attached equipment for an entity to participate in a training exercise.
TES-Equipped Entity	Any life form, platform or equipment involved in the exercise. TES-Equipped indicates that it has TES components appended or embedded.

10.2 Acronyms

ACK	Acknowledgement
Ammo	Ammunition (abbr.)

BCD	Binary-Coded Decimal
BIT	Built-In Test
BLUFOR	Blue Force
CCA	Clear Channel Assessment
CIS	Core Instrumentation Subsystem
CM	Configuration Management
CMSD	Component Message Set Description
CSCI	Computer Software Configuration Item
CTC	Combat Training Center
DCI	Digital/Data Communication Interface
DD	Detection Device
DFV	MILES XXI PDD or Direct Fire Vest
DOP	Dilution of Precision (GPS)
FoF	Force on Force
FPGA	Field Programmable Gate Array
FTDI	Future Technology Devices International
FTS	Family of Training Systems
GFE	Government Furnished Equipment
GPS	Global Positioning System
HCA	Hardware Component Agreement

HID	Human Interface Device
HITS	Homestation Instrumentation Training System
HUTT	Hull to Turret Transmitter
ICD	Initial Capabilities Document
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronic Engineers
IF	Indirect Fire
I-HITS	Initial Homestation Instrumentation Training System
I-MILES	Instrumentable - Multiple Integrated Laser Engagement System
IS	Information Systems
IWS	Individual Weapon System
JRTC	Joint Readiness Training Center
LBA	Long Bow Apache
LOS	Line Of Sight
L-PAN	Live Player Area Network
LSB	Least Significant Byte
LT2	Live Training Transformation
MCC	MILES Communication Code
MCO	Master Change Order
MES	Mine Effects Simulator

MGSS	Main Gun Signature Simulator
MILES	Multiple Integrated Laser Engagement System
MIL-STD	Military Standard
MSB	Most Significant Byte
MTID	MILES Target Interface Device
N/A	Not Applicable
NACK	Negative Acknowledgement
NAV	Navigation
NLOS	Non Line-Of-Sight
NMEA	National Marine Electronics Association
NTC	National Training Center
NTC-IS	NTC Instrumentation System
OPFOR	Opposing Force
OTG	USB On-the-Go
P	Publish
P/L	Position Location Data
PAN	Personal Area Network (IEEE)
PAN	Player Area Network
PEO	Program Executive Office
PID	Player Identification

PM	Project Manager
PPDU	Phy Protocol Data Unit
PRF	Pulse Repetition Frequency
PUR	Player Unit Radio
RCD	Residual-Current Device
RCS	Radio/Range Communication/Control System
RDMS	Range Data Measurement Subsystem
RF	Radio Frequency
RMWV	RCS Man-worn Vest
RMWVCU	RCS Man-worn Vest Console Unit
RTC	Real Time Clock
RTCM	Radio Technical Commission for Maritime Service
RTN	Return
R-VDD	Replacement Vehicle Detection Device
S	Subscribe
SAT	Small Arms Transmitter
SCA	System Composition Agreement
SMRFI	Serial Module RF Interface
STD	Standard (abbr.)
STRI	Simulation Training and Instrumentation

SWRC	Southwest Reference Corner
TADSS	Training Aids, Devices, Simulators, and Simulations
TBD	To Be Determined
TES	Tactical Engagement Simulation
TESS	Tactical Engagement Simulation System
TOW	Tube-launched, Optically-tracked, Wire-guided
TVS	Tactical Vehicle System
UHF	Ultra High Frequency
USB	Universal Serial Bus
UTC	Coordinated Universal Time
UTM	Universal Transverse Mercator
VCU	Vehicle Control Unit
VDD	Vehicle Detection Device
VIU	Vehicle Interface Unit
WESS	Weapons Effects Signature Simulator
WGS-84	World Geodetic System of 1984

APPENDIX A Variable Data Message Payload Definitions

This section contains the payload messages that can be payloads in the variable messages IS_VARIABLE_DATA_MESSAGE [0x80] and TES_VARIABLE_DATA_MESSAGE [0x81]. Since these messages are payload messages, they do not need to be interpreted by the IS Radio system. The IS Radio system should be able to support any payload ID as defined in Table 14.

Table 14 - Payload Message ID Ranges

Payload ID Range	Msg QTY in Range (Decimal)	Clustered?*	Description
0x0000	1	N/A	(Reserved)
0x0001 – 0x3FFF	16383	Yes	Messages defined in LT2 Live PAN Component Message Set Description (CMSD) PRT-PF-00635 (Existing and Future)
0x4000	1	N/A	(Reserved)
0x40**01** – 0x40**14**	20	No	Initial IS-TESS Variable Data Message Payloads**
0x4015 – 0x4100	236	Yes	Future IS-TESS Messages (Not in PRF-PT-00635) – Block I
0x41**01** – 0x41**79**	127	No	Legacy IS-TESS Messages***
0x4180 – 0x6762	9699	Yes	Future IS-TESS Messages (Not in PRF-PT-00635) – Block II
0x6763 – 0xFDE8	38534	TBD	Open – Available for Experimentation & Testing
0xFDE9 - 0xFFFF	535	N/A	(Reserved)

*"Yes" means that all messages in the corresponding Payload ID Range are (or will be) further subdivided and grouped into Functional Clusters (e.g., see CMSD PRF-PT-00635.) "No" means that none of the messages in the indicated Payload ID Range is clustered (e.g., legacy IS-TESS messages and the original set of IS-TESS variable payload messages.)

The Payload ID as of Rev. D bit-wise OR'ed with 0x4000; LSB is exactly the same as previous value (e.g., Payload ID 20 [i.e., 0x14**] is now 0x40**14**)

***The legacy Message ID as of Rev. D bit-wise OR'ed with 0x4100; LSB is exactly the same as previous value. Also, note that the new range accounts for all legacy messages except IS_VARIABLE_DATA_MESSAGE [0x80] and TES_VARIABLE_DATA_MESSAGE [0x81], since neither will be a payload itself.

Each message in this Standard indicates which Response Message is required, if any.

All numbers in this section shall be interpreted at decimal unless otherwise specified.

A “C”, “D”, “F” “N”, or “M” shall be used in variable length messages to represent a variable value.

Unless explicitly noted otherwise, for all fields with two or more bytes in this section, the left byte shall be the Most Significant Byte (MSB) and the right byte shall be the Least Significant Byte (LSB).

Payload Messages defined in this document should adhere to consistent payload message structure and data type formats (time, location, etc.) to guarantee consistency between existing and future payloads. Table 15 below defines some (but not necessarily all) of the common data types that should be used for all current and future payload messages:

Table 15 - Common Payload Field Structures

# Bytes	Field	Description
4	Time	Time of the event in BCD referenced to UTC Byte 1 – Day of Week / Tenths Least significant nibble – tenths of second – range: 0-9 Most significant nibble – As defined in DayofWeek section in the LT Interoperability Enumerations PRF_PT-00617 Byte 2 hours in BCD – range: 0 to 23, decimal Byte 3 minutes in BCD – range: 0 to 59, decimal Byte 4 seconds in BCD – range: 0 to 59, decimal
4	Location: Latitude	The latitude of a location record. Scaled 32-bit signed integer of latitude Floating point Latitude times (x) 10,000,000 Range: -900,000,000 to 900,000,000
4	Location: Longitude	The longitude of a location record. Scaled 32-bit signed integer of longitude Floating point Longitude times (x) 10,000,000 Range: -1,800,000,000 to 1,800,000,000
2	Location: Altitude	The altitude of a location record. Height with respect to a reference geoid (sea level, meters) 16-bit signed integer Range: -32,768 to 32,767

Table 16 below shows payload message usage from the IS -> TESS related to the type of TESS (Vehicle or Man-Worn), as well as any applicable notes. Table 17 shows payload message usage from the TESS -> IS related to the type of TESS (Vehicle or Man-Worn), as well as any applicable notes. In addition, Table 16 contains a column named "CIS" for messages that can originate at the CIS and are being sent to the TESS via the IS. Table 17 contains a similar column ("CIS") that designates messages that are (or can be) sent to the CIS by the IS after being received from the TESS.

Table 16 - IS → TESS Payload Message Usage

Message Name	Cluster ID	Payload ID	Vehicle	Man-Worn	CIS	Notes
TES-Entity-Set-PID-Cmd	0x24	0x0073	X	X	Yes	See LT2 Live PAN Component Message Set Description (CMSD) PRT-PF-00635 for message definition
TES_DETONATION	N/A	0x4003	X	X	Yes	None

Message Name	Cluster ID	Payload ID	Vehicle	Man-Worn	CIS	Notes
TES_DETONATION_COMMAND	N/A	0x4005	X	X	Yes	Detonation Detection from the TESS will follow if it was commanded with a Detonation Command from the IS
TES_LIFEFORM_HEALTH_CHANGE	N/A	0x4007	X	X	Yes	None
TES_INDIRECT_AMMO_RESUPPLY	N/A	0x4008	X	X	Yes	None
TES_ALERT_MESSAGE	N/A	0x400B	X	X	Yes	None
TES_DEVICE_STATE_CHANGE	N/A	0x400F	X	X	Yes	None
TESS_EXCON_ACK	N/A	0x4010	X	X	Yes	None

Table 17 - TESS → IS Payload Message Usage

Message Name	Cluster ID	Payload ID	Vehicle	Man-Worn	CIS	Notes
IS_INDIRECT_FIRE_MESSAGE	N/A	0x4001	X	X	Yes	None
IS_DEVICE_ASSOCIATION_STATUS	N/A	0x4002	X	X	Yes	None
IS_DETONATION_DETECTION	N/A	0x4004	X	X	Yes	None
IS_LIFEFORM_HEALTH_STATUS	N/A	0x4006	X	X	Yes	None
IS_INDIRECT_AMMO_REPORT	N/A	0x4009	X	X	Yes	None
IS_ALERT_MESSAGE	N/A	0x400A	X	X	Yes	None
IS_DEVICE_LOCATION	N/A	0x400C	X	X	Yes	None
IS_DEVICE_BIT	N/A	0x400D	X	X	Yes	None
IS_DEVICE_STATE	N/A	0x400E	X	X	Yes	None
IS_EXCON_ACK	N/A	0x4011	X	X	Yes	None

Message Name	Cluster ID	Payload ID	Vehicle	Man-Worn	CIS	Notes
IS_TOPOLOGY_ICON	N/A	0x4012	X	X	Yes	None
IS_FIRE_MISSION	N/A	0x4013	X	X	Yes	None
IS_WEAPON_REFERENCE_ANGLES	N/A	0x4014	X	X	Yes	None
IS_DETONATION	N/A	0x4015	X	X	Yes	None

A.1 IS_INDIRECT_FIRE_MESSAGE

Name: IS_INDIRECT_FIRE_MESSAGE

Direction: TESS to IS

Description: The TESS reports the indirect fire message when it occurs.

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: High / Guaranteed (0x0F)

Payload ID: 0x4001

Payload Length: 42 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Player ID	TESS true Player ID (PID). As asserted in the section entitled "MC-97 AmmonPID Combination of the LT2 Interoperability Enumerations document PRF-PT-00617, all even true PID values correspond to a friendly player (BLUFOR), otherwise the PID is for a foe (OPFOR). 1-3300
7	XX	Result Code	Enumeration defining the result of the weapon fire event. This field is only critical if there was some type of failure or other information which is needed for AAR. • 0x00: Nominal • 0x01: Munition Unarmed See supported enumeration in MunitionStatusResultCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617

8-11	XX..XX	Origin Latitude	The latitude of the origin of the shot per Table 15. -900,000,000 to 900,000,000
12-15	XX..XX	Origin Longitude	The longitude of the origin of the shot per Table 15. -1,800,000,000 to 1,800,000,000
16-17	XXXX	Origin Altitude	The altitude of the origin of the shot per Table 15. -32,768 to 32,767
18-19	XXXX	Weapon Azimuth (Heading)	Azimuthal angle in 0.01 degree increments. Value is represented as the angle in degrees multiplied by 100. 0 to 35,999
20-21	XXXX	Weapon Elevation (Pitch)	Elevation in 0.01 degree increments (0 degrees is level with the earth surface, positive measurements are up) -9,000 to 9,000
22-23	XXXX	Weapon Roll	The roll of the Weapon in 0.01 degree increments (0 for no roll component, positive measurements represent clockwise direction). Value is represented as the angle in degrees multiplied by 100. -17999 - 18000
24-31	XX..XX	Weapon ID	8-byte unique ID of the logical weapon device ID 0x0000000000000000 to 0xFFFFFFFFFFFFFFFF
32-33	XXXX	Weapon Type	Weapon type of shooter. Matches with Equipment Type in the PAN Equipment Association Status Payload. See supported enumeration in WeaponType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
34-35	XXXX	Munition Type	Munition type of shooter. See supported enumeration in MunitionType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
36-37	XXXX	Fuze Type	Fuze Type: Enumeration. The type of fuze attached to the projectile being fired. See supported enumeration in FuzeType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
38	XX	Fuze Settings	Fuze Setting: Enumeration. The setting of the fuze attached to the projectile. See supported enumeration in FuzeSettings section of the LT2 Interoperability Enumerations Document PRF-PT-00617

39-40	XXXX	Fuze Time	The time setting of the fuze (if applicable) in tenths of a second. 0 to 65,535
41	XX	Charge Count	Numerical value indicating the number of charge increments for the corresponding charge type. 0-127
42	XX	Charge Type	Enumeration indicating the type of charge. See supported enumeration in ChargeType section of the LT2 Interoperability Enumerations Document PRF-PT-00617

A.2 IS_DEVICE_ASSOCIATION_STATUS

Name: IS_DEVICE_ASSOCIATION_STATUS

Direction: TESS to IS

Description: This message is sent from the TESS whenever a device associates or disassociates with the TESS. Supports only one device per message

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: High / Guaranteed (0x0F)

Payload ID: 0x4002

Payload Length: 15 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5	XX	Status Type	Status Type: Enumeration flag indicating if this is an association or a disassociation. See supported enumeration in StatusType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
6	XX	Device Client Class	The most significant bit (7) of this byte is a flag indicating whether the device is Powered or Low-Power. The lower seven bits (0-6) contain an enumeration indicating the Client Class.- For valid data of each field, see the "ClientDevicePowerType" and "ClientClass" sections of the LT2 Interoperability Enumerations document PRF-PT-00617, respectively.
7	XX	Device Type	See supported enumeration in DeviceType section of the LT2 Interoperability Enumerations Document PRF-PT-00617

8-15	XX..XX	Device ID	8-byte unique device identifier. 0 to 0xFFFFFFFFFFFFFFFF

A.3 TES_DETONATION

Name: TES_DETONATION

Direction: IS to TESS

Description: This message is sent to inform the TESS of an indirect fire detonation. This message is only sent to TESS which is programmed to respond to these messages (such as a TESS which is programmed to perform its own BDA when a detonation occurs).

Use: This message is used during normal operation.

Response Message: IS_EXCON_ACK

Priority / QoS: High / Guaranteed (0x0F)

Payload ID: 0x4003

Payload Length:

31 (bytes) with zero (0) Number of Targets. If Number of Targets is greater than 0, then the payload length is 31 + (N * 12) bytes where N is the Number of Targets.

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Event Number	Application-level Index indicating the number of the event. 1 to 65,535
7-8	XXXX	Shooter ID	The TESS ID of the shooter 1-3300
9-10	XXXX	Shot Event Number	The event number of the shooter's indirect fire message 1-65,535

11-14	XX..XX	Detonation Latitude	The latitude of the detonation per Table 15. -900,000,000 to 900,000,000
15-18	XX..XX	Detonation Longitude	The longitude of the detonation per Table 15. -1,800,000,000 to 1,800,000,000
19-20	XXXX	Detonation Altitude	The altitude of the detonation per Table 15. Height with respect to a reference geoid (sea level, meters) 16-bit signed integer -32,768 to 32,767
21-24	XX..XX	Detonation Time	Time of the impact in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
25-26	XXXX	Munition Type	The type of munition (or round) See supported enumeration in MunitionType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
27-28	XXXX	Fuze Type	Fuze Type: Enumeration. The type of fuze attached to the projectile being fired. See supported enumeration in FuzeType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
29	XX	Fuze Setting	Fuze Setting: Enumeration. The setting of the fuze attached to the projectile. See supported enumeration in FuzeSettings section of the LT2 Interoperability Enumerations Document PRF-PT-00617
30	XX	Result Code	Munition Status Result Code: Enumeration. The status of the round being fired from the weapon. This field is only critical if there was some type of failure or other information which is needed for AAR. See supported enumeration in MunitionStatusResultCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617

31	XX	Number of Targets	The number of target data sets contained in this message. The following fields are repeated for each target. 1 to 7
32-33	XXXX	Player ID	TESS true Player ID (PID). As asserted in the section entitled "MC-97 AmmonPID Combination of the LT2 Interoperability Enumerations document PRF-PT-00617, all even true PID values correspond to a friendly player (BLUFOR), otherwise the PID is for a foe (OPFOR). 1-3300
34-35	XXXX	Player Type	Player Type: Enumeration indicating the type of TES entity (i.e., Player) See supported enumeration in PlayerType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
36	XX	Player Casualty State + Force	Combined field containing two enumerations respectively indicating the Casualty State and Force Affiliation of the target(s). Least significant nibble - See CasualtyState section of the LT2 Interoperability Enumerations document PRF-PT-00617 Most significant nibble - see ForceAffiliation section of the LT2 Interoperability Enumerations document PRF-PT-00617)
37	XX	tesFormation Type + Direction	Combined field consisting of two enumeration values indicating the Formation Type and Direction of the target(s), respectively. Least significant nibble - See FormationType section of the LT2 Interoperability Enumerations document PRF-PT-00617 Most significant nibble - See DirectionFacing section of the LT2 Interoperability Enumerations document PRF-PT-00617
38-39	XXXX	Player UTM Easting Offset	Meters offset from impact point in UTM in terms of Easting. Positive values are East. -32768 to 32767
40-41	XXXX	Player UTM Northing Offset	Meters offset North from impact point in UTM. Positive values are North. -32768 to 32767
42-43	XXXX	Player Altitude Offset	Meters offset in altitude from impact point. Positive values are above the impact point. -32768 to 32767

A.4 IS_DETONATION_DETECTION

Name: IS_DETONATION_DETECTION

Direction: TESS to IS

Description: This message is sent from the TESS if it determines that a detonation has affected it in some way.

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x4004

Payload Length: 25 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-8	XX..XX	Latitude	The latitude of the player detecting the detonation per Table 15. 32-bit signed integer -900,000,000 to 900,000,000
9-12	XX..XX	Longitude	The longitude of the player detecting the detonation per Table 15. 32-bit signed integer -1,800,000,000 to 1,800,000,000
13-14	XXXX	Altitude	The altitude of the player detecting the detonation. -32,768 to 32,767
15-16	XXXX	Shooter ID	The TESS ID of the shooter 1-3300

17-18	XXXX	Shot Event Number	The event number of the shooter's indirect fire message 1-65,535
19	XX	Hit Indication	Enumeration: Hit Indication See supported enumeration in HitIndication section of the LT2 Interoperability Enumerations Document PRF-PT-00617
20	XX	BDA	The overall BDA of a Live Training participant See supported enumeration in BDA section of the LT2 Interoperability Enumerations Document PRF-PT-00617
21-22	XXXX	Time to Incapacitation	The duration, in seconds, to incapacitation of the lifeform. If this message contains a Time field, then this duration is relative to it. Otherwise, this duration is relative to the time this message is received. A value of 0 indicates the player is incapacitated. A value of 65535 indicates there is no Time to Incapacitation. 0 to 65535. If the wound severity is KIA, the only valid data for Time To Incapacitation is 0. If the wound severity is No Severity and Wound Type is No Wound, the only valid data for Time To Incapacitation is 65535. If the wound severity is neither No Severity nor KIA (i.e. it is Low, Medium or High), then Time to Incapacitation values of 0 or 65535 are invalid.
23	XX	Wound Location	The location of the lifeform's wound. See supported enumeration in BodyPart section of the LT2 Interoperability Enumerations Document PRF-PT-00617
24	XX	Wound Type	The type of wound experienced by the lifeform. See supported enumeration in WoundType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
25	XX	Wound Severity	The severity of the lifeform's wound. See supported enumeration in WoundSeverity section of the LT2 Interoperability Enumerations Document PRF-PT-00617

A.5 TES_DETONATION_COMMAND

Name: TES_DETONATION_COMMAND

Direction: IS to TESS

Description: This message is sent to the TESS to command it as if it had been affected by a detonation.

Use: This message is used during normal operation.

Response Message: Detonation Detection from the TESS will follow if it was commanded with a Detonation Command message from the IS.

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x4005

Payload Length: 27 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Event Number	Application-level Index indicating the number of the event. 1 to 65,535
7-10	XX..XX	Latitude	The latitude of the player detecting the detonation per Table 15. 32-bit signed integer -900,000,000 to 900,000,000
11-14	XX..XX	Longitude	The longitude of the player detecting the detonation per Table 15. 32-bit signed integer -1,800,000,000 to 1,800,000,000

15-16	XXXX	Altitude	The altitude of the player detecting the detonation. -32,768 to 32,767
17-18	XXXX	Shooter ID	The TESS ID of the shooter 1-3300
19-20	XXXX	Shot Event Number	The event number of the shooter's indirect fire message 1-65,535
21	XX	Hit Indication	Enumeration: Hit Indication See supported enumeration in HitIndication section of the LT2 Interoperability Enumerations Document PRF-PT-00617
22	XX	BDA	The overall BDA of a Live Training participant See supported enumeration in BDA section of the LT2 Interoperability Enumerations Document PRF-PT-00617
23-24	XXXX	Time to Incapacitation	The duration, in seconds, to incapacitation of the lifeform. If this message contains a Time field, then this duration is relative to it. Otherwise, this duration is relative to the time this message is received. A value of 0 indicates the player is incapacitated. A value of 65535 indicates there is no Time to Incapacitation. 0 to 65535. If the wound severity is KIA, the only valid data for Time To Incapacitation is 0. If the wound severity is No Severity and Wound Type is No Wound, the only valid data for Time To Incapacitation is 65535. If the wound severity is neither No Severity nor KIA (i.e. it is Low, Medium or High), then Time to Incapacitation values of 0 or 65535 are invalid.
25	XX	Wound Location	The location of the lifeform's wound. See supported enumeration in BodyPart section of the LT2 Interoperability Enumerations Document PRF-PT-00617
26	XX	Wound Type	The type of wound experienced by the lifeform. See supported enumeration in WoundType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
27	XX	Wound Severity	The severity of the lifeform's wound. See supported enumeration in WoundSeverity section of the LT2 Interoperability Enumerations Document PRF-PT-00617

A.6 IS_LIFEFORM_HEALTH_STATUS

Name: IS_LIFEFORM_HEALTH_STATUS

Direction: TESS to IS

Description: This message is sent from the TESS whenever the lifeform health state changes.

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x4006

Payload Length: 9 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal

5-6	XXXX	Time to Incapacitation	The duration, in seconds, to incapacitation of the lifeform. If this message contains a Time field, then this duration is relative to it. Otherwise, this duration is relative to the time this message is received. A value of 0 indicates the player is incapacitated. A value of 65535 indicates there is no Time to Incapacitation. 0 to 65535. If the wound severity is KIA, the only valid data for Time To Incapacitation is 0. If the wound severity is No Severity and Wound Type is No Wound, the only valid data for Time To Incapacitation is 65535. If the wound severity is neither No Severity nor KIA (i.e. it is Low, Medium or High), then Time to Incapacitation values of 0 or 65535 are invalid.
7	XX	Wound Location	The location of the lifeform's wound. See supported enumeration in BodyPart section of the LT2 Interoperability Enumerations Document PRF-PT-00617
8	XX	Wound Type	The type of wound experienced by the lifeform. See supported enumeration in WoundType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
9	XX	Wound Severity	The severity of the lifeform's wound. See supported enumeration in WoundSeverity section of the LT2 Interoperability Enumerations Document PRF-PT-00617

A.7 TES_LIFEFORM_HEALTH_CHANGE

Name: TES_LIFEFORM_HEALTH_CHANGE

Direction: IS to TESS

Description: This message is sent from the TESS whenever the lifeform health state changes.

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x4007

Payload Length: 11 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Event Number	Application-level Index indicating the number of the event. 1 to 65,535

7-8	XXXX	Time to Incapacitation	The duration, in seconds, to incapacitation of the lifeform. If this message contains a Time field, then this duration is relative to it. Otherwise, this duration is relative to the time this message is received. A value of 0 indicates the player is incapacitated. A value of 65535 indicates there is no Time to Incapacitation. 0 to 65535. If the wound severity is KIA, the only valid data for Time To Incapacitation is 0. If the wound severity is No Severity and Wound Type is No Wound, the only valid data for Time To Incapacitation is 65535. If the wound severity is neither No Severity nor KIA (i.e. it is Low, Medium or High), then Time to Incapacitation values of 0 or 65535 are invalid.
9	XX	Wound Location	The location of the lifeform's wound. See supported enumeration in BodyPart section of the LT2 Interoperability Enumerations Document PRF-PT-00617
10	XX	Wound Type	The type of wound experienced by the lifeform. See supported enumeration in WoundType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
11	XX	Wound Severity	The severity of the lifeform's wound. See supported enumeration in WoundSeverity section of the LT2 Interoperability Enumerations Document PRF-PT-00617

A.8 TES_INDIRECT_AMMO_RESUPPLY

Name: TES_INDIRECT_AMMO_RESUPPLY

Direction: IS to TESS

Description: This message is sent to the TESS to command it to change its current supply of ammo data for a single weapon. Therefore, a separate message must be sent for each weapon whose ammo supply needs to be updated.

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x4008

Payload Length:

31 (bytes) if number of records for munition, fuze and charge are 1, otherwise the payload length is 20 + (M * 4) + (F * 4) + (C * 3) bytes where M is number of records for munitions, F is number of records for fuze and C is number of records for charge.

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Event Number	Application-level Index indicating the number of the event. 1 to 65,535
7	XX	Resupply Type	Resupply Type: Enumeration indicating the type of resupply. See supported enumeration in ResupplyType section of the LT2 Interoperability Enumerations Document PRF-PT-00617

8-9	XXXX	Weapon Type	Weapon type of shooter. Matches with Equipment Type in the PAN Equipment Association Status Payload. See supported enumeration in WeaponType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
10-17	XX..XX	Weapon ID	8-byte unique ID of the logical weapon device ID 0x0000000000000000 to 0xFFFFFFFFFFFFFFFF
18	XX	Number of Munition Records (M)	The number of Munition records to follow. The following Munition Type and Munition Count fields will be repeated for each record. 0 to 10
19-20	XXXX	[-- Munition Type]	The type of munition (or round) See supported enumeration in MunitionType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
21-22	XXXX	[-- Munition Count]	The number of rounds of the given munition type in the inventory. 0 to 32767
23	XX	Number of Fuze Records (F)	The number of Fuze supply records to follow. The following Fuze Type and Fuze Count fields will be repeated for each record. 0 to 10
24-25	XXXX	[-- Fuze Type]	The fuze type associated with this message See supported enumeration in FuzeType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
26-27	XXXX	[--Fuze Count]	The number of fuzes for the specified fuze type. 0 to 32767
28	XX	Number of Charge Records (C)	The number of Charge supply records to follow. The following Charge Type and Charge Count fields will be repeated for each record. 0 - 5
29	XX	[-- Charge Type]	The type of charge associated with this message. See supported enumeration in ChargeType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
30	XX	[-- Charge Count]	Numerical value indicating the number of charge increments for the corresponding charge type. 0-8 when used in an Indirect Fire message, 0-255 otherwise

A.9 IS_INDIRECT_AMMO_REPORT

Name: IS_INDIRECT_AMMO_REPORT

Direction: TESS to IS

Description: This message is sent from the TESS as a response to the TES_AMMO_LEVEL_REQUEST whenever there is indirect ammo to report. Modified to be only one weapon per message instead an array of weapons.

Use: This message is used during normal operation.

Response Message: TES_EXCON_ACK

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x4009

Payload Length:

28 (bytes) if number of records for munition, fuze and charge are 1otherwise the payload length is 17 + (M * 4) + (F * 4) + (C * 3) bytes where M is number of records for munition, F is number of records for fuze and C is number of records for charge.

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Weapon Type	Weapon type of shooter. Matches with Equipment Type in the PAN Equipment Association Status Payload. See supported enumeration in WeaponType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
7-14	XX..XX	Weapon ID	8-byte unique ID of the logical weapon device ID 0x0000000000000000 to 0xFFFFFFFFFFFFFFFF

15	XX	Number of Munition Records (M)	The number of Munition records to follow. The following Munition Type and Munition Count fields will be repeated for each record. 0 to 10
16-17	XXXX	[-- Munition Type]	The type of munition (or round) See supported enumeration in MunitionType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
18-19	XXXX	[-- Munition Count]	The number of rounds of the given munition type in the inventory. 0 to 32767
20	XX	Number of Fuze Records (F)	The number of Fuze supply records to follow. The following Fuze Type and Fuze Count fields will be repeated for each record. 0 to 10
21-22	XXXX	[-- Fuze Type]	The fuze type associated with this message See supported enumeration in FuzeType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
23-24	XXXX	[--Fuze Count]	The number of fuzes for the specified fuze type. 0 to 32767
25	XX	Number of Charge Records (C)	The number of Charge supply records to follow. The following Charge Type and Charge Count fields will be repeated for each record. 0 - 5
26	XX	[-- Charge Type]	The type of charge associated with this message. See supported enumeration in ChargeType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
27	XX	[-- Charge Count]	Numerical value indicating the number of charge increments for the corresponding charge type. 0-8 when used in an Indirect Fire message, 0-255 otherwise

A.10 IS_ALERT_MESSAGE

Name: IS_ALERT_MESSAGE

Direction: TESS to IS

Description: This message is sent from the TESS whenever it detects that it has violated a safety rule or because of some operator interaction which results in the sending of an alarm. This message can also be sent to the TESS to tell it that it has violated a safety alarm rule or for use to inform the participant of some general alert or alarm event. This message is transmitted up to the CIS by the IS after receiving. Note: One of the Alarm Type's included is an update to a method used by MILES2000 in ICD-3357-01A (see section 2.1) where an Event Message is sent with the Event Code being a KILL and the Host PID matches the Shooter PID which triggers the Emergency Kill at EXCON. Instead of this method, the ALERT message will simply use the designated Alarm Type for the same result.

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x400A

Payload Length: 21 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5	XX	Alarm ID	A PU unique alarm ID. Could be used to acknowledge an alarm by Ex-Man. 0 to 255

6	XX	Alarm Type	Enumeration indicating type of Alarm. See supported enumeration in AlarmType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
7	XX	Alarm State	Enumeration indicating the particular state of an Alarm that has been issued. See supported enumeration in AlarmState section of the LT2 Interoperability Enumerations Document PRF-PT-00617
8-11	XX..XX	Time Of Initial Notification	Time when first notified of this alarm in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
12-15	XX..XX	Latitude	The latitude of the player when alert occurred per Table 15. 32-bit signed integer -900,000,000 to 900,000,000
16-19	XX..XX	Longitude	The longitude of the player when the alert occurred per Table 15. 32-bit signed integer -1,800,000,000 to 1,800,000,000
20-21	XXXX	Elevation	Height above a reference geoid (sea level, meters) when alert occurred per Table 15. 16-bit signed integer -32,768 to 32,767

A.11 TES_ALERT_MESSAGE

Name: TES_ALERT_MESSAGE

Direction: IS to TESS

Description: This message is sent to the TESS either by the IS or through the IS from the CIS to tell it that it has violated a safety alarm rule or for use to inform the participant of some general alert or alarm event.

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x400B

Payload Length: 23 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Event Number	Application-level Index indicating the number of the event. 1 to 65,535
7	XX	Alarm ID	A PU unique alarm ID. Could be used to acknowledge an alarm by Ex-Man. 0 to 255
8	XX	Alarm Type	Enumeration indicating type of Alarm. See supported enumeration in AlarmType section of the LT2 Interoperability Enumerations Document PRF-PT-00617

9	XX	Alarm State	Enumeration indicating the particular state of an Alarm that has been issued. See supported enumeration in AlarmState section of the LT2 Interoperability Enumerations Document PRF-PT-00617
10-13	XX..XX	Time Of Initial Notification	Time when first notified of this alarm in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
14-17	XX..XX	Latitude	The latitude of the player when alert occurred per Table 15. 32-bit signed integer -900,000,000 to 900,000,000
18-21	XX..XX	Longitude	The longitude of the player when the alert occurred per Table 15. 32-bit signed integer -1,800,000,000 to 1,800,000,000
22-23	XXXX	Elevation	Height above a reference geoid (sea level, meters) when alert occurred per Table 15. 16-bit signed integer -32,768 to 32,767

A.12 IS_DEVICE_LOCATION

Name: IS_DEVICE_LOCATION

Direction: TESS to IS

Description: This message is sent from the TESS to indicate the location of an associated device. Contains only one device per message.

Use: This message can be used to set the location of a weapon when the radio (w/GPS) may be located at another close by location.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x400C

Payload Length: 24 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5	XX	Device Client Class	The most significant bit (7) of this byte is a flag indicating whether the device is Powered or Low-Power. The lower seven bits (0-6) contain an enumeration indicating the Client Class.- For valid data of each field, see the "ClientDevicePowerType" and "ClientClass" sections of the LT2 Interoperability Enumerations document PRF-PT-00617, respectively.
6	XX	Device Type	See supported enumeration in DeviceType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
7-14	XX..XX	Device ID	8-byte unique device identifier. 0 to 0xFFFFFFFFFFFFFFFF

15-18	XX..XX	Latitude	The latitude of the device per Table 15. 32-bit signed integer. -900,000,000 to 900,000,000
19-22	XX..XX	Longitude	The longitude of the device per Table 15. 32-bit signed integer. -1,800,000,000 to 1,800,000,000
23-24	XXXX	Altitude	The altitude of the device. -32,768 to 32,767

A.13 IS_DEVICE_BIT

Name: IS_DEVICE_BIT

Direction: TESS to IS

Description: This message is sent from the TESS whenever a BIT result is received from an associated device.

Use: This message is used during initialization and normal operation.

Response Message: TES_EXCON_ACK

Priority / QoS: High / Guaranteed (0x0F)

Payload ID: 0x400D

Payload Length:

17 (bytes) for 1 device record. If number of device records is greater than 1, then the payload length is 5 + (N * 12) bytes.

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal

5	XX	Number of Device Records (D)	The number of different pieces of equipment we are reporting about. The device class, device type, device ID, and BIT result fields are repeated for each different piece of equipment. The MAXIMUM number of Device Records indicated below is necessary in order to remain under the maximum payload size of 100 bytes for TESS -> IS messages. 0 to 13
6	XX	Device Client Class	The most significant bit (7) of this byte is a flag indicating whether the device is Powered or Low-Power. The lower seven bits (0-6) contain an enumeration indicating the Client Class.- For valid data of each field, see the "ClientDevicePowerType" and "ClientClass" sections of the LT2 Interoperability Enumerations document PRF-PT-00617, respectively.
7	XX	Device Type	See supported enumeration in DeviceType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
8-15	XX..XX	Device ID	8-byte unique device identifier. 0 to 0xFFFFFFFFFFFFFFFF
16	XX	General BIT Results	General BIT Status Flag: Bit mask enumeration used to convey information about general BIT failures for any device client. Multiple failures can be reported by setting the corresponding bits. For example, a File System Failure and Radio Failure can be reported by setting this field to 0x03. See supported enumeration in BIT_StatusFlags section of the LT2 Interoperability Enumerations Document PRF-PT-00617

17	XX	Device-Specific BIT Results	These flags are set to convey BIT Failures specific to the device's component make-up. Multiple failures can be reported by setting the corresponding bits, which are OR'ed. The details of the BIT source failure depend on the specific component aspects of the device providing the BIT results. See the corresponding BIT_Failures section in LT2 Interoperability Enumerations PRF-PT-00617: "BIT_Failures--AudioEffectsGenerator" "BIT_Failures--C2 Interface" "BIT_Failures--Composite" "BIT_Failures--FO Interface" "BIT_Failures--HapticEffectsGenerator" "BIT_Failures--Localization" "BIT_Failures--Location" "BIT_Failures--MedicalTreatmentInterface" "BIT_Failures--MILES_Receiver" "BIT_Failures--MILES_Transmitter" "BIT_Failures--Orientation" "BIT_Failures--PowerSupply" "BIT_Failures--PyroHazardousEffectsGenerator" "BIT_Failures--Relay" "BIT_Failures--Serial" "BIT_Failures--SurrogateWeapon" "BIT_Failures--UserInterface" "BIT_Failures--Visual Kill Indicator" "BIT_Failures--WESS"

A.14 IS_DEVICE_STATE

Name: IS_DEVICE_STATE

Direction: TESS to IS

Description: This message is sent from the TESS whenever a state update is received from an associated device. Modified to be only one device per message instead an array of devices.

Use: This message is used during initialization and normal operation.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x400E

Payload Length:

17 + Summation 1 to N (Size of (M)) bytes where M is the value size for 1 parameter. If number of parameters is greater than 1, the payload length is:

(15 + Summation where N is the number of parameters and M is the value size of each parameter. Note: It is assumed that the size of each parameter is not necessarily the same.

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal

5	XX	Device Client Class	The most significant bit (7) of this byte is a flag indicating whether the device is Powered or Low-Power. The lower seven bits (0-6) contain an enumeration indicating the Client Class.- For valid data of each field, see the "ClientDevicePowerType" and "ClientClass" sections of the LT2 Interoperability Enumerations document PRF-PT-00617, respectively.
6	XX	Device Type	See supported enumeration in DeviceType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
7-14	XX..XX	Device ID	8-byte unique device identifier. 0 to 0xFFFFFFFFFFFFFFFF
15	XX	Number of Parameters	The number of device parameter state values provided in the following records. NOTE: The MAXIMUM number of parameters is dependent upon the size of the parameters. As an example, the max number of parameters would be 13 if the size of each parameter is 4 bytes (18 + (13*(4+2)) = 96 bytes. 0 to 26
16	XX	Parameter ID	Parameter ID: Enumeration indicating the ID of the state parameter for this device. See supported enumeration in ParameterID section of the LT2 Interoperability Enumerations Document PRF-PT-00617
17	XX	Value Size	Number of bytes for each value. 0 to 25
17 + Summation {1 to N} (SizeOf(M)) for one parameter record.	XX..XX	Parameter Value	The parameter value, which varies depending on the specified Parameter ID. The full definition of the valid Parameter ID and values will be defined in a future revision of the LT2 L-PAN Component Message Set Description (CMSD) PRF-PT-00635.

A.15 TES_DEVICE_STATE_CHANGE

Name: TES_DEVICE_STATE_CHANGE

Direction: IS to TESS

Description: This message is also sent to the TESS whenever state is commanded to an associated device. Modified to be only one device per message instead an array of devices.

Use: This message is used during initialization and normal operation.

Response Message: IS_EXCON_ACK

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x400F

Payload Length:

19 + Summation 1 to N (Size of (M)) bytes where M is the value size for 1 parameter. If number of parameters is greater than 1, the payload length is:

(17 + Summation 1 to N (Size of (M) +2)) where N is the number of parameters and M is the value size of each parameter. Note: It is assumed that the size of each parameter is not necessarily the same.

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Event Number	Application-level Index indicating the number of the event. 1 to 65,535

7	XX	Device Client Class	The most significant bit (7) of this byte is a flag indicating whether the device is Powered or Low-Power. The lower seven bits (0-6) contain an enumeration indicating the Client Class.- For valid data of each field, see the "ClientDevicePowerType" and "ClientClass" sections of the LT2 Interoperability Enumerations document PRF-PT-00617, respectively.
8	XX	Device Type	See supported enumeration in DeviceType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
9-16	XX..XX	Device ID	8-byte unique device identifier. 0 to 0xFFFFFFFFFFFFFFFF
17	XX	Number of Parameters	The number of device parameter state values provided in the following records. NOTE: The MAXIMUM number of parameters is dependent upon the size of the parameters. As an example, the max number of parameters would be 13 if the size of each parameter is 4 bytes (18 + (13*(4+2)) = 96 bytes. 0 to 26
18	XX	Parameter ID	Parameter ID: Enumeration indicating the ID of the state parameter for this device. See supported enumeration in ParameterID section of the LT2 Interoperability Enumerations Document PRF-PT-00617
19	XX	Value Size	Number of bytes for each value. 0 to 25
17 + Summation {1 to N} (SizeOf(M)) for one parameter record.	XX..XX	Parameter Value	The parameter value, which varies depending on the specified Parameter ID. The full definition of the valid Parameter ID and values will be defined in a future revision of the LT2 L-PAN Component Message Set Description (CMSD) PRF-PT-00635.

A.16 TES_EXCON_ACK

Name: TES_EXCON_ACK

Direction: IS to TESS

Description: EXCON application sends this acknowledgement back to TESS after EXCON has received a message from TESS that requires this acknowledgement.

Use: This message is used during EXCON processing requiring an acknowledgement to TESS.

Response Message: None

Priority / QoS: High / Best Effort (0x0B)

Payload ID: 0x4010

Payload Length: 4 (bytes)

Byte #	Hex	Field	Description
1-2	XXXX	Payload Message ID	Payload Message ID received by the EXCON that is being acknowledged 1 to 65535
3-4	XXXX	Event Number	Indicates the Event number that is being acknowledged 0x0000 - No event 0x0001 to 0xFFFF - event number

A.17 IS_EXCON_ACK

Name: IS_EXCON_ACK

Direction: TESS to IS

Description: TESS application sends this acknowledgement back to EXCON after TESS has received a message from EXCON that requires this acknowledgement.

Use: This message is used during TESS processing requiring an acknowledgement to EXCON.

Response Message: None

Priority / QoS: High / Best Effort (0x0A)

Payload ID: 0x4011

Payload Length: 4 (bytes)

Byte #	Hex	Field	Description
1-2	XXXX	Payload Message ID	Payload Message ID received by the TESS that is being acknowledged 1 to 65535
3-4	XXXX	Event Number	Indicates the Event number that is being acknowledged 0x0000 - No event 0x0001 to 0xFFFF - event number

A.18 IS_TOPOLOGY_ICON

Name: IS_TOPOLOGY_ICON

Direction: TESS to IS

Description: This message defines the topology icon data to be sent from the FO Tablet client to the EXCON.

Use:

This message will be transmitted when a topology icon is created, destroyed, whenever any parameters defined in the message are updated, or when all topology icons are purged (e.g., from a map).

Response Message: TES_EXCON_ACK

Priority / QoS: High / Guaranteed (0x0F)

Payload ID: 0x4012

Payload Length: 29 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-12	XX..XX	Device ID	8-byte unique device identifier. 0 to 0xFFFFFFFFFFFFFFFF
13-16	XX..XX	Topology Icon Latitude	The latitude of the target icon in degrees times 10,000,000 -900,000,000 to 900,000,000
17-20	XX..XX	Topology Icon Longitude	The longitude of the target icon in degrees times 10,000,000 -1,800,000,000 to 1,800,000,000

21	XX	Topology Map Icon	Enumeration indicating the particular kind of Topology Map Icon. See supported enumeration in TopologyMapIcon section of the LT2 Interoperability Enumerations Document PRF-PT-00617
22-25	XX..XX	Topology Icon Label	Topology icon label (This field is also used for the Target Marker number) This field can be set to 3 possible values Target Reference Point (TRP), Target Marker, Pre-planned Target, or Forward Observer Icon details shown below. Target Reference Point (TRP): Byte 0-1 set to ASCII characters '00'. Byte 2-3 a 16-bit integer from 0001 to 9999 (right justified when displayed) Target Marker & Pre-planned target (2 ASCII chars + 16 bit integer from 1..9999): Example: AA0001 to ZZ9993 This field is 0x0000 for Forward Observer icon (32 bit integer)
26-27	XXXX	Topology Icon Identifier	Topology Icon Identifier used to specify the icon 1 to 65,535
28	XX	Topology Icon State	This field specifies if the icon currently resides on the map or if the icon has been deleted using the "Trash can" symbol. See supported enumeration in IconState section of the LT2 Interoperability Enumerations Document PRF-PT-00617
29	XX	Active/Inactive Indicator	This field specifies if the target marker is active or inactive See supported enumeration in IconActiveInactiveIndicator section of the LT2 Interoperability Enumerations Document PRF-PT-00617

A.19 IS_FIRE_MISSION

Name: IS_FIRE_MISSION

Direction: TESS to IS

Description: This message defines the topology icon data to be sent from the FO Tablet client to the EXCON.

Use: This message will be transmitted when a fire mission is created, ended, or whenever any of the fire mission parameters are updated.

Response Message: TES_EXCON_ACK

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x4013

Payload Length: 63 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-12	XX..XX	Device ID	8-byte unique device identifier. 0 to 0xFFFFFFFFFFFFFFFF
13-16	XX..XX	Target Icon Latitude	The latitude of the target icon in degrees multiplied by 10,000,000 -900,000,000 to 900,000,000
17-20	XX..XX	Target Icon Longitude	The longitude of the target icon in degrees multiplied by 10,000,000 -1,800,000,000 to 1,800,000,000
21	XX	Fire Mission Icon	FO Tablet Fire Mission map icon used for this fire mission See supported enumeration in FireMissionIcon section of the LT2 Interoperability Enumerations Document PRF-PT-00617

22-23	XXXX	Fire Mission Identifier	Fire Mission Identifier used to uniquely identify a fire mission 1 to 65,535
24-27	XX..XX	Target Icon Label	Label for the target marker or Target Reference Point (TRP) This field can be set to 3 possible values Target Reference Point (TRP), Target Marker, Pre-planned Target, or Forward Observer Icon details shown below. Target Reference Point (TRP): Byte 0-1 set to ASCII characters '00'. Byte 2-3 a 16-bit integer from 0001 to 9999 (right justified when displayed) Target Marker & Pre-planned target (2 ASCII chars + 16 bit integer from 1..9999): Example: AA0001 to ZZ9993 This field is 0x0000 for Forward Observer icon (32 bit integer)
28	XX	Fire Mission Type	Enumeration indicating type of Fire Mission See supported enumeration in FireMissionType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
29	XX	Method of Target Location	Enumeration indicating the Method of Target location used with the Fire Mission Type. See supported enumeration in TargetLocationMethod section of the LT2 Interoperability Enumerations Document PRF-PT-00617
30	XX	Mission Phase	Enumeration value indicating the Fire Mission Phase See supported enumeration in MissionPhase section of the LT2 Interoperability Enumerations Document PRF-PT-00617
31	XX	Target Type	Enumeration of different types of targets See supported enumeration in TargetType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
32-33	XXXX	Topology Icon Identifier	Topology Icon Identifier used to specify the icon associated with a fire mission 1 to 65,535
34	XX	Fire Mission State	Enumeration indicating the State of a Fire Mission See supported enumeration in FireMissionState section of the LT2 Interoperability Enumerations Document PRF-PT-00617
35	XX	TRP Registration State	Enumeration indicating if a TRP registration was successful See supported enumeration in TRP_RegistrationState section of the LT2 Interoperability Enumerations Document PRF-PT-00617

36-55	XX..XX	Target Description	Target description in ASCII Fixed 20 ASCII character as the Target Description (start at Most Significant Byte). 0x00 integer values represent unused ASCII characters.
56-57	XXXX	Target Altitude	Target Altitude above sea level in meters. Unsigned integer Range: 0 to 65,535 Default value is 0.
58-59	XXXX	Target Attitude	Target orientation in mils with mils located at true North. Range: 0 to 6399 Default value is 0.
60	XX	Target Length	Target length in meters. Range: 0 to 255 Default value is 0.
61	XX	Target Width	Target Width in meters. Range: 0 to 255 Default value is 0.
62-63	XXXX	TRP Icon Identifier	Target Reference Point identifier used to uniquely identify a TRP icon Range: 1 to 65,535 for the Registered TRP Fire Mission Type. Set to 0 for all other Fire Mission Types.

A.20 IS_WEAPON_REFERENCE_ANGLES

Name: IS_WEAPON_REFERENCE_ANGLES

Direction: TESS to IS

Description: This message contains the mortar direction of fire, reference angles and the current active reference angle.

Use: The message contents are to be used in support of AAR.

Response Message: None

Priority / QoS: Normal / Best Effort (0x0A)

Payload ID: 0x4014

Payload Length: 25 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Direction of Fire	Initial azimuthal Direction of Fire (DOF) in mils - The aim point of the weapon (e.g., mortar) at set-up (i.e., the weapon Azimuth.) 0 to 6339
7-8	XXXX	Primary Deflection Reference Angle	The Primary Deflection Reference Angle in mils 0 to 6339
9-10	XXXX	Alternate Deflection Reference Angle	The Alternate Deflection Reference Angle in mils. 0 to 6339

11-12	XXXX	Contingent Deflection Reference Angle	The Contingent Deflection Reference Angle in mils. 0 to 6339
13-14	XXXX	Emergency Deflection Reference Angle	The Emergency Deflection Reference Angle in mils. 0 to 6339
15	XX	Active Deflection Reference Angle	The Enumeration value that defines which reference angle is currently the active deflection. See supported enumeration in ActiveReferenceAngle section of the LT2 Interoperability Enumerations Document PRF-PT-00617
16-23	XX..XX	Weapon ID	8-byte unique ID of the logical weapon device ID 0x0000000000000000 to 0xFFFFFFFFFFFFFFFF
24-25	XXXX	Primary Elevation Reference Angle	The Primary Elevation Reference Angle in mils 0 to 6339

A.21 IS_DETONATION

Name: IS_DETONATION

Direction: TESS to IS

Description: This message is sent from the TESS to report a detonation if the TESS calculates the flyout time and location impact of its own indirect fire event.

Use: This message is used during normal operation.

Response Message: None

Priority / QoS: High / Guaranteed (0x0F)

Payload ID: 0x4015

Payload Length: 28 (bytes)

Byte #	Hex	Field	Description
1-4	XX..XX	Time	Time of the event in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
5-6	XXXX	Shooter ID	The TESS ID of the shooter 1-3300
7-8	XXXX	Shot Event Number	The event number of the shooter's indirect fire message 1-65,535
9-12	XX..XX	Detonation Latitude	The latitude of the detonation per Table 15. -900,000,000 to 900,000,000
13-16	XX..XX	Detonation Longitude	The longitude of the detonation per Table 15. -1,800,000,000 to 1,800,000,000

17-18	XXXX	Detonation Altitude	The altitude of the detonation per Table 15. Height with respect to a reference geoid (sea level, meters) 16-bit signed integer -32,768 to 32,767
19-22	XX..XX	Detonation Time	Time of the impact in BCD referenced to UTC per Table 15. Byte N - Day of Week / Tenths Least significant nibble - tenths of second - range: 0 - 9 Most significant nibble - See DayOfWeek section in LT2 Interoperability Enumerations PRF-PT-00617, only stored in 4-bits Byte N+1 - hours in BCD - range: 0 to 23, decimal Byte N+2 - minutes in BCD - range: 0 to 59, decimal Byte N+3 - seconds in BCD - range: 0 to 59 decimal
23-24	XXXX	Munition Type	The type of munition (or round) See supported enumeration in MunitionType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
25-26	XXXX	Fuze Type	Fuze Type: Enumeration. The type of fuze attached to the projectile being fired. See supported enumeration in FuzeType section of the LT2 Interoperability Enumerations Document PRF-PT-00617
27	XX	Fuze Setting	Fuze Setting: Enumeration. The setting of the fuze attached to the projectile. See supported enumeration in FuzeSettings section of the LT2 Interoperability Enumerations Document PRF-PT-00617
28	XX	Result Code	Munition Status Result Code: Enumeration. The status of the round being fired from the weapon. This field is only critical if there was some type of failure or other information which is needed for AAR. See supported enumeration in MunitionStatusResultCode section of the LT2 Interoperability Enumerations Document PRF-PT-00617