



Live Training Transformation (LT2)

Hardware Component Agreement (HCA) for the *Crew Kill Module (CKM)*

**Document Number TESS-CKM-001
VERSION 0.2**

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CONTENTS

CHANGE HISTORY	2
1 SCOPE.....	6
1.1 IDENTIFICATION.....	6
1.1.1 Dependencies.....	7
1.1.2 Known Limitations.....	8
1.2 DOCUMENT OVERVIEW	8
2 REFERENCED DOCUMENTS.....	9
3 LT2 HW COMPONENT REQUIREMENTS.....	10
3.1 REQUIRED STATES AND MODES.....	10
3.1.1 Setup Mode.....	10
3.1.2 Operational Mode.....	11
3.1.3 Default Mode	11
3.1.4 Software Configuration Management Update Mode.....	11
3.2 CAPABILITY REQUIREMENTS.....	11
3.2.1 Association and Set-up General Capabilities Requirements.....	11
3.2.2 Initialization Capability Requirements	12
3.2.3 Operational Mode Capability Requirements.....	13
3.2.3.1 Laser Power Output Mode Requirements	14
3.2.3.2 Laser Profile Requirements.....	15
3.2.3.3 Pairing Probability Requirements	17
3.2.4 Disassociation and Default Mode Capability Requirements	17
3.2.5 Software Configuration Management Update Mode Capability Requirements.....	18
3.2.6 Logistics Software Storage and Reporting Capability Requirements	19
3.2.6.1 Component Specific Logistics Data	20
3.2.7 Built In Test (BIT) Capability Requirements.....	21
3.2.8 User Functional Status Indications Capability Requirements.....	22
3.3 EXTERNAL INTERFACE REQUIREMENTS	22
3.3.1 Interface Identification and Diagrams	22
3.3.2 Interface – E-LPAN-RF.....	22
3.3.3 Interface – E-LPAN-IR-RX.....	22
3.3.4 Interface – E-LED-RR	22
3.3.5 Interface – E-MILES-IR-TX.....	23
3.3.6 Interface – E-DMI-P.....	23

3.3.1	<i>Interface – E-DMI-S</i>	23
3.3.2	<i>Interface – E-BTY</i>	24
3.3.3	<i>Interface - E-PWR-CTL</i>	24
3.3.4	<i>Interface – E-CPS-IN</i>	24
3.4	INTERNAL INTERFACE REQUIREMENTS	24
3.4.1	<i>Interface – Internal Power (I-PWR)</i>	25
3.4.1.1	Power Operation	25
3.4.1.2	Power Control – Secondary	25
3.4.1.2.1	Replaceable Battery Backup Power	25
3.5	INTERNAL DATA REQUIREMENTS	26
3.6	ADAPTATION REQUIREMENTS	26
3.7	SAFETY REQUIREMENTS	26
3.8	SECURITY AND PRIVACY REQUIREMENTS	26
3.9	ENVIRONMENT REQUIREMENTS	26
3.10	COMPUTER RESOURCE REQUIREMENTS	26
3.10.1	<i>Computational System Requirements</i>	26
3.10.2	<i>Computer Hardware Requirements</i>	27
3.10.3	<i>Computer Hardware Resource Utilization Requirements</i>	27
3.10.4	<i>Computer Software Requirements</i>	27
3.10.4.1	Software Upgrades	27
3.10.4.2	(Reserved)	27
3.10.4.3	(Reserved)	27
3.10.4.4	Firmware	27
3.10.5	<i>Computer Communications Requirements</i>	28
3.11	QUALITY FACTORS	28
3.11.1	<i>Reliability and Availability</i>	28
3.11.2	<i>Maintainability</i>	28
3.12	DESIGN AND CONSTRUCTION CONSTRAINTS	29
3.12.1	<i>Physical Characteristics</i>	29
3.12.1.1	Weight	30
3.12.1.2	Finish	30
3.12.1.3	Color	31
3.12.2	<i>Installation and Removal Requirements</i>	31
3.12.3	<i>Mounting</i>	32

<i>Doc. No.</i>	<i>Document type</i>	<i>Date</i>	<i>Revision</i>	<i>Page</i>
TESS-CKM-001	HCA	05 Dec 2014	0.2	5 (42)

3.12.3.1	Mounting Devices	33
3.12.3.2	Interconnecting Cables	33
3.12.4	<i>Host Interface</i>	33
3.12.5	<i>Construction</i>	33
3.12.5.1	Materials and Parts	33
3.12.5.2	Electromagnetic Environment	34
3.12.5.3	Nameplates and Product Marking	34
3.13	PERSONNEL -RELATED REQUIREMENTS	35
3.13.1	<i>Human Engineering</i>	35
3.14	TRAINING RELATED REQUIREMENTS	36
3.15	LOGISTICS RELATED REQUIREMENTS	36
3.16	OTHER REQUIREMENTS.....	36
3.17	PACKAGING REQUIREMENTS	36
3.18	PRECEDENCE AND CRITICALITY OF REQUIREMENTS	37
4	QUALIFICATION PROVISIONS	38
4.1	TEST PROCEDURES.....	38
5	REQUIREMENTS TRACEABILITY	39
6	NOTES	40
APPENDIX A:	LPAN MESSAGE CLUSTER TABLE	41
APPENDIX B:	TARGET CONFIGURATIONS SUPPORTED BY CKM-001	42

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1 SCOPE

1.1 Identification

The CKM is a hardware component of the Live Training Transformation (LT2) product line that provides the TESS functionality to receive TES-relevant data from certain vehicle subsystems and to retransmit that data via MILES-based Infrared (IR) laser to “target” devices (e.g., individual combatants equipped with MILES detectors) user defined frequency over a user defined period of time. When composed in an integrated system, the CKM along with other LT2 components provide the functionality to instrument weapon systems, individuals, and infrastructure in support of simulated fire, live training (e.g., force-on-force combined arms training.)

The CKM is one of several categories of Laser Transmitters (LT), which also include the SRLT, MRLT and the LRLT. The CKM is intended to be mounted indoors (i.e., inside of a vehicle or relatively small room of a building.) When inside of an applicable vehicle, CKM can be located in any of the following Positions: Crew Cabin, Driver’s, Gunner’s, or Commander’s. A single vehicle or building room may contain multiple CKMs.

The CKM component context diagram in Figure 1 below provides an illustration of the various components and actor(s) that interact with the CKM.

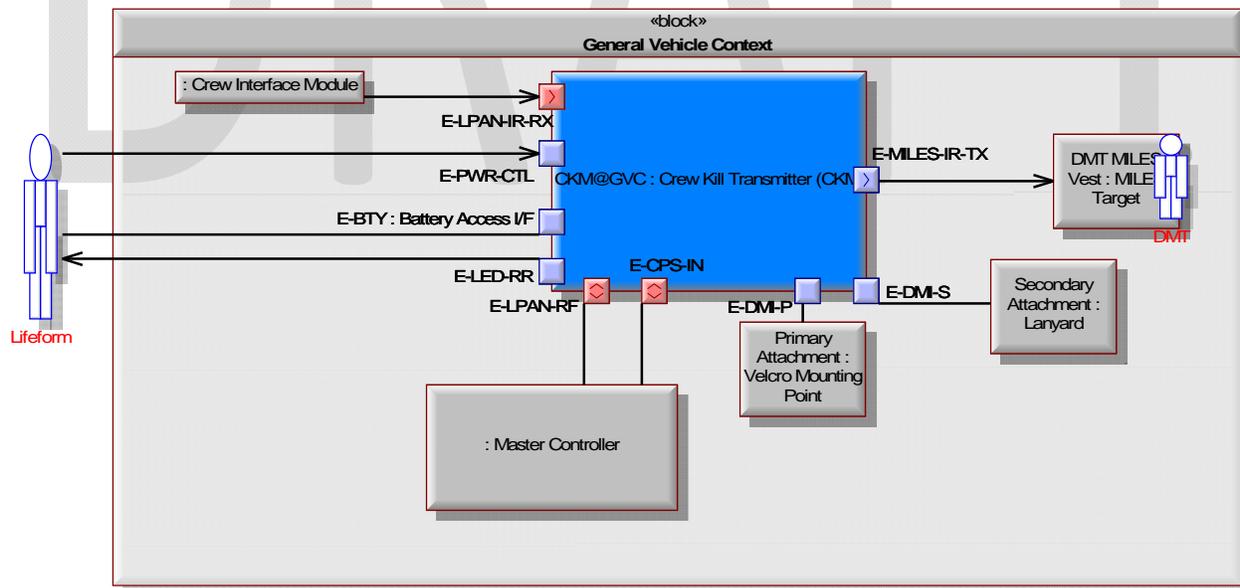


Figure 1: CKM Context Diagram

The CKM is configured to the system via the LPAN IR-RX using a suitable device that has a LPAN IR transmitter (TX) and the ability to send applicable configuration messages (e.g., a

Crew Interface Module [CIM].) The CKM communicates via LPAN RF to the Master Controller (MC.) The CKM receives primary power from an external power supply via the Common Power Supply (CPS) Input interface. However, when not connected to an active external power source, it operates off of a set of one or more internal batteries (i.e., secondary power). It displays its status via some visual mechanism (e.g., visible LED). It is attached to the platform via primary and secondary means of attachment (e.g., Velcro and lanyard). Finally, the CKM has a single MILES IR laser transmitter.

1.1.1 Dependencies

The following subsections identify the standards and other applicable documents corresponding to the enabling systems and components upon which the CKM component depends at some point in its lifecycle. That is, without any particular one of these items, the CKM could not be (or would be at significant risk of not being) adequately designed, verified (i.e., tested, integrated, etc.), manufactured, deployed, installed, validated, operated, maintained, or retired.

LT2 Dependencies:

MILES Communication Code (MCC) Standard PMT-90-S002M
Live PAN Standard PRF-PT-00549

LT2 HW Component Dependencies:

Vehicle Master Controller
Crew Interface Module

COTS HW Dependencies:

TBD

COTS SW Dependencies:

TBD

GOTS HW Dependencies:

TBD

GOTS SW Dependencies:

TBD

Open Source SW Dependencies:

TBD

1.1.2 Known Limitations

TBD

1.2 Document overview

Section 1 provides the scope of this HCA, identifying the CKM HW component to which it applies as well as the component's dependencies and known limitations.

Section 2 lists the documents referenced herein

Section 3 identifies and describes the requirements levied on the CKM HW component under consideration.

Section 4 defines the qualification provisions to be used to verify the HW component's requirements

Section 5 provides traceability

DRAFT

2 REFERENCED DOCUMENTS

Ref. no.	Doc id no.	Rev.	Date	Title
1	PRF-PT-00549	TBD	TBD	Live PAN Standard
2	TESS-FCB-001-0	TBD	TBD	Family Of Consumable Batteries
3	TESS-Env-EMI-Safety-001-0	0.3	11 SEP 2014	LT2 Environmental, Safety, and Electromagnetic Environmental Effects (E ³) Requirements Specification
4	PMT 90-S002	M	02 FEB 2011	Multiple Integrated Laser Engagement System (MILES) Communication Code (MCC) Standard, Rev M
5	48 CFR 2.101	TBD	TBD	Definitions of Words and Terms
6	49 CFR 100-185	TBD	TBD	OSHA Hazardous Materials Regulations
7	49 CFR subsection 173.185	TBD	TBD	Lithium batteries and cells
8	TESS-TVS-001	TBD	TBD	Tactical Vehicle System (TVS) System Composition Agreement (SCA)
9	TESS-VMC-001	TBD	TBD	Vehicle Master Controller (VMC) Hardware Composition Agreement (HCA)
10	TESS-CIM-001	TBD	TBD	Crew Interface Module (CIM) Hardware Composition Agreement (HCA)
11	PRF-PT-00635	TBD	TBD	LT2 L-PAN Component Message Set Description (CMSD)

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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3 LT2 HW Component Requirements

3.1 Required States and Modes

MOD-001	The component shall support the 4 following modes of operation: <ul style="list-style-type: none"> • Setup (S) • Operational (O) • Default (D) • Update / SW Configuration (U) 	TVS-16	CKM	D	O S D U
MOD-006	The component shall support the following states of operation: <ol style="list-style-type: none"> i. Powered Off ii. Powering On iii. Running / Connected iv. Running / Degraded (e.g., internal component failure detected during BIT prevent communications over LPAN RF, LPAN IR, LPAN Wired, LPAN or a component-specific interface – e.g., SRLT connection interface to Weapon system Trigger and/or to VIC is broken) v. Running / Disconnected (e.g., no BIT failure but loss of or no physical connection is detected) vi. Powering Down 	(Derived)	CKM	D	O S D U

<<<< Relevant Sequence Diagrams and Use Cases to go through states and modes to be provided by winning Contractor>>>>

3.1.1 Setup Mode

MOD-002	In the Setup mode, the component shall be enabled to be associated with other components in order to instrument a given weapon system	TVS-18	CKM	NA	S
---------	---	--------	-----	----	---

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
	and/or target system. Note: Association is initialized via LPAN IR-RX (e.g., by a user interface device such as a Crew Interface Module [CIM]) telling a component to join the designated LPAN RF network. Both the IR and RF interfaces are defined in the L-PAN Standard PRF-PT-00549.				

3.1.2 Operational Mode

MOD-003	In Operational Mode, the component shall already be associated, shall already be configured, and shall be ready to be used during the tactical training exercise to enable force-on-force combined arms engagements and training.	TVS-20	CKM	NA	O
---------	---	--------	-----	----	---

3.1.3 Default Mode

MOD-004	This mode is used at end of exercise to baseline all components to prepare for storage and upon initial power on prior to automatically joining or being told to join an LPAN network.	TVS-22	CKM	NA	D
---------	--	--------	-----	----	---

3.1.4 Software Configuration Management Update Mode

MOD-005	This mode enables software maintenance updates and configuration verification from local or remote locations individually and collectively for like components.	TVS-24	N/A	NA	U
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3.2 Capability Requirements

3.2.1 Association and Set-up General Capabilities Requirements

STAT-	The component shall have a visual mechanism used to indicate the	Derived	CKM	D	S
-------	--	---------	-----	---	---

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
001	component's overall state: Rationale: A user (such as a crew member or support personnel) needs a way to quickly determine (without having to connect or associate the component to another device or network) whether the component is powered off, running, powered on but degraded.				
STAT-002	The component's visual state indicator mechanism shall be visible to the user when the component is installed and located in its intended operational environment.	Derived	CKM	D	S
PWR-011	The component power on shall be started by placing in the component's battery and tightening the battery compartment lid.	Derived Laterally from MRLT HCA	CKM	D	S D
MI-001	The component shall provide the MILES Laser TX Indirect Illumination (MI) functional cluster IAW the LT2 L-PAN CMSD PRF-PT-00635.	Derived	E-LPAN-RF		

3.2.2 Initialization Capability Requirements

INI-001	Upon user actuating the mechanism to power on the component, the component shall initiate its power-on sequence.	Derived	CKM	D	D, S
INI-002	[P] The component shall complete its power-on sequence within TBD seconds +/- 1 second of initiating it.	Derived	CKM	D	D, S
NAMP-001	The component shall provide the Network Association Manual (NAM) functional cluster as specified in the LT2 LPAN CMSD PRF-PT-00635.	TVS-54	E-LPAN-RF, E-LPAN-IR-RX		O, S, D
NAMP-002	Upon receiving a valid NAM-Manual-Association-WPAN-Cmd while in Running State and in Setup Mode, the component	TVS-52, TVS-	E-LPAN-RF	D	S

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
	shall associate to L-PAN Server	54			
CMP-011	Once associated to the MC, the component shall send unique ID, SN, placement and current logistics baseline state data, and software version to the MC.	TVS-53	E-LPAN-RF	D	S
CMP-006	The component shall associate by an IR/RF communication process between the components and a VMC known as "association" as defined by the L-PAN Standard PRF-PT-00549.	TVS-52	CKM	D	S
CMP-007	Once associated to an L-PAN Server, the component shall remain associated to the same L-Pan Server as long as they are within RF range and both retain power.	TVS-55	CKM	D	S
LT-005	At the completion of the association process, the component shall illuminate its red rear LED for a duration of TBD <nominal value> seconds, +/- <tolerance> seconds Rationale: Illumination needs to occur momentarily, i.e., long enough for a human to observe and notice it, but not longer than what would be considered reasonable. The upper bound helps save battery power, etc.	TVS-73	E-LED-RR	D	S

3.2.3 Operational Mode Capability Requirements

LT-062	Exclusively while in the Operational Mode, upon receiving a MI-MILES-Laser-Effects- -Cmd, the component shall transmit the MILES sequence IAW the parameters specified in the MI-MILES-Laser-Effects-Cmd	Laterally Derived from MRLT-23	E-MILES-IR-TX	D	O
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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
LT-011	<p>[P] The component shall initiate Dry Fire within TBD milliseconds of receiving the corresponding MI-MILES-Laser-Effects- - - Cmd.</p> <p>Rationale: If the laser is engaged for a Dry Fire in a certain amount of time, this could delay testing and/or set-up or lead the testers to conclude that the LT is not functioning properly.</p>	Derived	E-MILES-IR-TX	T	O
LT-012	The component shall provide a visual cue indicator that its Laser TX has been activated.	Derived Laterally from MRLT-24	CKM	D	O
LT-071	The component shall provide the human observer with a visual indication that the laser transmitter is transmitting properly.	Derived Laterally from MRLT-27	CKM	D	O
LT-070	The component shall transmit the laser light beam at an IR wavelength of TBD \pm TBD nanometers.	Laterally from MRLT-31	E-MILES-IR-TX	C	O

3.2.3.1 Laser Power Output Mode Requirements

LT-060	<p>When transmitting IR signals, the component shall transmit IAW in PMT-90-S002M.</p> <p>Rationale: In order to adequately communicate with MILES-compliant target systems (e.g., an IWS on a mounted individual combatant.)</p>	Derived	E-MILES-IR-TX	D	O
LT-063	<p>The component shall meet the range requirements in the table below:</p> <p>Table 4: Laser Repeater Range Distances</p>	Derived from MRLT-36	E-MILES-IR-TX	D	O

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode																		
	<table border="1"> <thead> <tr> <th>Laser Repeater Power</th> <th>Effective Range</th> <th>Suppression Range</th> </tr> </thead> <tbody> <tr> <td></td> <td>TBD m</td> <td></td> </tr> <tr> <td>TBD % Power</td> <td>TBD m</td> <td>TBD m</td> </tr> <tr> <td>TBD % Power</td> <td>TBD m</td> <td>TBD m</td> </tr> <tr> <td>TBD % Power</td> <td>TBD m</td> <td>TBD m</td> </tr> <tr> <td>TBD % Power</td> <td>----</td> <td>TBD m</td> </tr> </tbody> </table>	Laser Repeater Power	Effective Range	Suppression Range		TBD m		TBD % Power	TBD m	TBD m	TBD % Power	TBD m	TBD m	TBD % Power	TBD m	TBD m	TBD % Power	----	TBD m				
Laser Repeater Power	Effective Range	Suppression Range																					
	TBD m																						
TBD % Power	TBD m	TBD m																					
TBD % Power	TBD m	TBD m																					
TBD % Power	TBD m	TBD m																					
TBD % Power	----	TBD m																					
LT-064	<p>The component shall have an adjustable RF range.</p> <p>Note: Currently, there is no message in any LT cluster in the CMSD that allows a consumer to specify or adjust RF range or power level.</p> <p>Rationale: Because the 3-5 June 2014 WG briefing says so. Otherwise, TBD.</p>	3-5 June 2014 WG Briefing, Slide 43, item 1	CKM	D	O S																		
LT-065	<p>The component shall have an adjustable IR range from TBD min to TBD max limits, adjustable in increments of TBD units (e.g., % of max distance, or meters)</p> <p>Note: Currently, there is no message in any LT cluster in the CMSD that allows a consumer to set or adjust IR or other Laser Optical range or power level.</p> <p>Rationale: Because the 3-5 June 2014 WG briefing says so. Otherwise, TBD.</p>	3-5 June 2014 WG Briefing, Slide 43, item 1	CKM	D	O S																		

3.2.3.2 Laser Profile Requirements

LT-025	The component laser emissions shall be capable of being decoded IAW PMT 90-S002 by the CA test bed man worn baseline at a distance of TBD meters.		CKM	T	O
LT-	The component shall have a statistical hit	I-	CKM	T	O

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
065	profile for TBD consisting of a consistent aim point that pairs the MILES hit words and PID provided in the MI-MILES-Laser-Effects-Cmd with a MILES man worn target system.	MILES CVTES S Perf Spec, 3.7.2.2			
LT-066	When measured at ranges of TBD m, TBD m, TBD m, TBD m, and TBD m [, etc.] the statistical hit profile of the component shall be in compliance with the TBD values	I- MILES CVTES S Perf Spec, 3.7.2.2	CKM	T	O
LT-029	The component's laser shall convey near miss word number IAW PMT 90-S002 including ammunition type and PID.	Derived from TVS-205	CKM	T	O
LT-066	The component shall provide a means of being mounted inside the vehicle within 5 minutes or less.	Derived from TVS-206	CKM	D	S
LT-067	During a training exercise, the component shall retain its current IR laser transmission point, direction, and angle for at least TBD > 10 hours under the environmental conditions described in section XYZ "Environmental Conditions" of the ENV Standard. Rationale: Training exercises can last several days, over that course where there is potential for much vehicle movement and activity, including dismounts entering and exiting the vehicle. So, the component must consistently send IR signal the same direction to ensure proper communication with the dismount.	I- MILES CVTES S Perf Spec, 3.7, item 15	CKM	D	O
LT-067	The mounting of component shall not interfere physically with any tactical device inside the vehicle.	Derived from TVS-208	CKM	A	O

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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3.2.3.3 Pairing Probability Requirements

LT-036	The aim point for the component shall be the center of the target profile during tests.	I-MILES CVTES S Perf Spec, 3.7.1	CKM	C	O
LT-037	The component's MILES pairing probability shall be tested in its intended operational mode.	I-MILES CVTES S Perf Spec, 3.7.1	CKM	C	O
LT-038	A valid pairing shall include the correct decoding of the MILES Code, PID, and Ammo Type.	I-MILES CVTES S Perf Spec, 3.7.1	CKM	C	O

3.2.4 Disassociation and Default Mode Capability Requirements

DDM-72	Upon disassociation, the component shall be placed in Default Mode.	TVS-274	CKM	D	D
DDM-73	The normal first time use startup mode of operation for the component shall be the default mode.	TVS-275	CKM	D	D
DDM-74	The normal long storage without batteries startup mode of operation for the component shall be the Default Mode.	TVS-276	CKM	D	D
DDM-75	The normal startup mode of operation for the component after replacement of dead batteries shall be the Default Mode.	TVS-277	CKM	D	D
DDM-76	The component power off condition shall reset the component to the default mode without user or electronic intervention.	TVS-278	CKM	D	D

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
DDM-80	The condition of the component having a dead battery while disconnected from an external power source shall reset the component to the default mode without user or electronic intervention.	Derived from TVS-279	CKM	D	D
DDM-78	Upon receiving an NA-Disassociation-Request, The component shall automatically transition to the Default Mode.	TVS-280, TVS-282	CKM	D	D
DDM-79	Upon transitioning from the Operational Mode to Default Mode, the component shall send NA-Association-Status-Report to the LPAN Server indicating that the component is Disassociated.	TVS-281	CKM	D	D

3.2.5 Software Configuration Management Update Mode Capability Requirements

SCM-001	The component shall be capable of having its software reprogrammed in a maintenance facility	TVS-284, TVS-287	CKM	D	U
SCM-002	While associated to an MC, the component shall not allow Software updates.	TVS-285	CKM	D	U, O. S
SCM-003	While in Operational Mode, the component shall not allow Software updates.	TVS-286	CKM	D	O
SCM-004	The component shall be capable of having software reprogrammed without the need to open the device.	TVS-288	CKM	D	U
SCM-005	The component shall be reprogrammable via TBD interface using the following set of messages: TBD Rationale: The components must be able to be programmed via an interface that the SSE supports.	TVS-289	E-LPAN-RF	D	U
SCM-006	The component shall provide the Device Description (DD) functional cluster IAW LT2 L-PAN CMSD PRF-PT-00635.	TVS-291, TVS-292, TVS-294,	E-LPAN-RF	D	U

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
	Rationale: The component shall store its unique ID and serial number locally and provide them upon request over any suitable external data comms. interface.	TVS-295			
SCM-007	The component shall provide the Device Firmware Management (DFM) functional cluster IAW LT2 L-PAN CMSD PRF-PT-00635. Rationale: The component must be reprogrammable, store its current FW software version locally, and provide all of it upon request over any suitable external data comms interface.	TVS-288, TVS-293, TVS-296	E-LPAN-RF	D	U
SCM-008	The component LED lights shall support sequence indications of Configuration Management Association process and success per TESS-SSE-001-0.	TVS-290	E-LED-RR	D	U

3.2.6 Logistics Software Storage and Reporting Capability Requirements

LSS-001	The component shall be capable of storing its own latest BIT results.	TVS-298	CKM	D	O, S, D
LSS-002	The components shall be capable of storing key logistics data during exercises.	TVS-299	CKM	D	O
LSS-003	The component shall be capable of forwarding BIT data during exercises.	TVS-300	E-LPAN-RF	D	O
LSS-004	The component shall be capable of forwarding key logistics data during exercises.	TVS-301	E-LPAN-RF	D	O
LSS-005	The component shall support non-exercise logistical data download requests from the Master Controller.	TVS-302	E-LPAN-RF	D	S
LSS-006	The component shall store Aggregate Data permanently locally.	TVS-303	CKM	D	O, S
LSS-007	The component shall store persistent data in non-volatile memory	TVS-304	CKM	D	O, S

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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
LSS-008	The component shall store its Unique ID indicating Vendor and component data locally.	TVS-305	CKM	D	U
LSS-009	The component shall store its serial number data locally.	TVS-306	CKM	D	U
LSS-010	The component shall store its Software Version locally.	TVS-307	CKM	D	U
LSS-011	The component shall store its Software Revision locally.	TVS-308	CKM	D	U
LSS-012	The component shall store its total power on time locally.	TVS-309	CKM	D	S U
LSS-013	The component shall store is total # of power-on cycles locally.	TVS-310	CKM	D	S U
LSS-014	The component shall send its usage data to the MC IAW Operational Status (OPS) functional cluster defined in LT2 L-PAN CMSD PRF-PT-00635.	TVS-311	E-LPAN-RF	D	S
LSS-015	The component shall send logistics data in response to logistics update data requests from the Master Controller.	TVS-312	E-LPAN-RF	D	S
LSS-016	The component shall provide the “Operational Status (OPS)” functional cluster IAW the namesake section of LT2 L-PAN CMSD PRF-PT-00635.	TVS-298 through TVS-312	E-LPAN-RF	D	S, O

3.2.6.1 Component Specific Logistics Data

LT-007	The component shall increment and store its total shots fired locally until it is reset.	TVS-315	CKM	D	O
LT-068	When sending an OPS-Operational-Status-Report, the component shall populate the “Total # of Times Actuated” field of said report with component’s total laser transmissions since the variable was last reset.	TVS-315 (Derived)	E-LPAN-RF	D	S, O

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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3.2.7 Built In Test (BIT) Capability Requirements

BIT-001	Upon completely powering on, the component shall automatically initiate its own component-level Power-On BIT sequence.	TVS-326	CKM	D	D
BIT-005	[P] The component shall initiate its component BIT sequence within TBD seconds of completing its basic power-on sequence.	(Derived)	CKM	D	D
BIT-007	[P] The component shall initiate its component BIT sequence within TBD seconds of receiving a valid BIT-Status-Request.	(Derived)	CKM	D	D
BIT-006	[P] The total duration of each component BIT sequence shall not exceed TBD seconds +/- TBD milliseconds.	(Derived)	CKM	T	D, S, O
BIT-008	While executing Associated BIT, the component shall meet all other functional requirements specified herein.	TVS-328	CKM	D	O
BIT-004	Upon completing its own component BIT, the component shall send a BIT-Status-Report containing the latest BIT results to the L-PAN Server IAW BIT Cluster specification of LT2 L-PAN CMSD PRF-PT-00635	TVS-326	E-LPAN-RF	D	D
BIT-009	The component shall provide the BIT functional cluster IAW LT2 L-PAN CMSD PRF-PT-00635	TVS-322, TVS-326, TVS-327, TVS-329	E-LPAN-RF	D	D, S, O
BIT-010	[C] When executing component BIT, the component shall test for pass and failure for every BIT flag corresponding to its DeviceType, as defined in the Device-Specific BIT Results of the BIT-Status-Report message defined in the LT2 L-PAN CMSD PRF-PT-00635.	(Derived)	CKM	D	D
BIT-002	[C] When executing component BIT, the component shall include check the pass/fail status of each of the following General BIT	TVS-320, TVS-336	CKM	D	D

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
	items, if present: flash memory, RAM, and battery status.				

3.2.8 User Functional Status Indications Capability Requirements

TBD Functional Status Indication requirements will be defined by the winning Contractor.

3.3 External Interface Requirements

3.3.1 Interface Identification and Diagrams

Figure 1: CKM Context Diagram above defines the various external interfaces of the CKM. The following sections specify all requirements for these interfaces not defined and allocated to each interface elsewhere in this document.

3.3.2 Interface – E-LPAN-RF

EIF-001	The set of frequencies used by this interface shall comply with DoD spectrum management policies and procedures.	TVS-365	E-LPAN-RF	A	D, S, O
EIF-002	This interface shall comply with all the L-PAN Standard PRF-PT-00549 except the following: <TBD sections that apply to non-802.15.4 interfaces (e.g., IR-only sections, wired-only sections, etc.)	TVS-366	E-LPAN-RF	T	D, S, O

3.3.3 Interface – E-LPAN-IR-RX

EIF-003	This interface shall comply with all the L-PAN Standard PRF-PT-00549 except the following: <TBD sections that apply only to non-IR interfaces (e.g., 802.15.4-only sections, wired-only sections, etc.)	TVS-371	E-LPAN-IR-RX	D	S D
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3.3.4 Interface – E-LED-RR

ELE-D-	The component shall have a red rear LED.	Derived from TVS-73	CKM	E	N/A
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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
001	Rationale: In order to provide visual indication of this components state, including whether it in the process of or has completed the LPAN association process, for example.				

3.3.5 Interface – E-MILES-IR-TX

EMT X-001	The component shall interface and be compatible with MILES training devices using a laser light beam communication channel through the atmosphere In Accordance With (IAW) PMT 90-S002M.	TVS-395	E-MILES-IR-TX	T	O
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3.3.6 Interface – E-DMI-P

EDM I-002	The component shall have a primary physical mechanical mounting interface that allows it to be attached by Velcro. Rationale: The component must be able to be mounted securely to the platform.	Derive d from TVS-395	E-DMI-P	E	N/A
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3.3.1 Interface – E-DMI-S

EDM I-003	The component shall have a secondary physical mounting interface that allows it to be attached with a lanyard.	3-5 June 2015 WG Briefin g, Slide 43 (j. Interfa ce Mecha nical/ Mount ing	E-DMI-S	E	N/A
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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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3.3.2 Interface – E-BTY

EBTY-001	Every replaceable, non-rechargeable battery, if any, internal to the component shall be accessible to maintenance personnel and operators without need for any special tools.	TVS-413	CKM	E	N/A
EBTY-002	Every rechargeable battery, if any, internal to the component shall be easily accessible to the maintenance personnel/operator without need for special tools.	TVS-400	CKM	E	N/A

3.3.3 Interface - E-PWR-CTL

EPW-002	The component shall have an on/off function that restores/inhibits the power from the source to said component.	TVS-375	CKM	D	O S D
EPW-003	The on/off function of this component shall have a guard to prevent accidental actuation.	TVS-376	E-PWR-CTL	E	O S D

3.3.4 Interface – E-CPS-IN

EPW-005	When connected via this component's CPS interface, the primary power for this component shall be supplied via the Common Power Supply (CPS) Clean Power Interface IAW Section X.Y.Z "Interface TBD" of TESS-CPS-ICD-001-0. Rationale: Implied by the CPS interface connection in the LT2 Architecture diagram.	(Derive d)	E-CPS-IN	E	O S D
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3.4 Internal Interface Requirements

Internal requirement regarding design and construction constraints:

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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<<<< Relevant Sequence Diagrams and Use Cases to go define design constraints >>>>

3.4.1 Interface – Internal Power (I-PWR)

3.4.1.1 Power Operation

PWR-001	The component shall have a self-contained power source (battery power) as a backup power capability.	TVS-374	CKM	E	O S D
PWR-009	When operating solely on its own battery power, the component shall transmit data received from the L-PAN to target system equally as well as when operating on primary power.	TVS-380	CKM	T	O S

3.4.1.2 Power Control – Secondary

PWR-006	Every battery, if any, internal to the component shall be on the approved list of U.S. Army Communications-Electronics Command (CECOM) (www.monmouth.army.mil/cecom/lrc < http://www.monmouth.army.mil/cecom/lrc >)	TVS-399	CKM	E	
PWR-008	The secondary power shall provide a minimum of 100 hours of continuous operation while transmitting MILES codes not less than an average of 20 times per 24-hour period.	TVS-403	CKM	D	O

3.4.1.2.1 Replaceable Battery Backup Power

PWR-010	The replaceable, non-rechargeable batteries shall take no more than ten minutes to replace.	TVS-414	CKM	D	N/A
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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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3.5 Internal Data Requirements

None.

3.6 Adaptation Requirements

None.

3.7 Safety Requirements

SFY-001	The component shall meet all safety requirements specified in section(s) 3.3 “Safety Requirements” of the LT2 Environmental, Safety, and E3 Requirements Specification TESS–Env-EMI-Safety-001-0.	TVS-522	CKM	(Various)	N/A
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3.8 Security and Privacy Requirements

SEC-002	The CKM shall meet all TBA IA requirements in section X.Y.Z of TBD standard/directive/policy/procedure	TBD	CKM	C	N/A
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3.9 Environment Requirements

ENV-001	The component shall meet all requirements specified in section 3.1 “Environmental Requirements” of the LT2 Environmental, Safety, and E ³ Requirements Specification TESS–Env-EMI-Safety-001-0.	TVS-425	CKM	C	N/A
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3.10 Computer Resource Requirements

3.10.1 Computational System Requirements

None.

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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3.10.2 Computer Hardware Requirements

None.

3.10.3 Computer Hardware Resource Utilization Requirements

None.

3.10.4 Computer Software Requirements

CSW-001	The component shall consist of the following modified, previously developed software item: Open Source GOTS Zigbee Stack TBD Software, Version XZY	(Derived)	CKM	I/A	N/A
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3.10.4.1 Software Upgrades

SWU-001	The component shall be programmable using an external programming source that does not require opening the component or removing any it parts.	TVS-448	CKM	D	N/A
SWU-002	The component shall be upgradable to future software revisions.	TVS-447	CKM	D	U

3.10.4.2 (Reserved)

3.10.4.3 (Reserved)

3.10.4.4 Firmware

FW-001	All non-proprietary code stored in the component (e.g., in a Programmable Read Only Memory) shall be incorporated into the appropriate Computer Software Configuration Item (CSCI). Rationale: Executable machine code and object	TVS-454	CKM-SW	C	N/A
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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
	code stored on the component is software and therefore subject to the same aggregation and delivery requirements as other applicable software.				
FW-002	All non-proprietary data which is stored in the component (e.g., in a Programmable Read Only Memory) shall be incorporated into the appropriate Computer Software Configuration Item (CSCI). Rationale: Firmware data code stored on the component is software and therefore subject to the same aggregation and delivery requirements as other applicable software.	TVS-454	CKM-SW	C	N/A

3.10.5 Computer Communications Requirements

None.

3.11 Quality Factors

3.11.1 Reliability and Availability

QFR-001	The Mean Time Between Essential Functional Failure (MTBEFF) of the component shall be not less than 1660 hrs., -1 hour Rationale: TBD for 1660 hours specifically.	TVS-459	CKM	A	N/A
QFR-002	The operating availability (A_o) of the component shall be not less than 0.90.	TVS-460	CKM	A	N/A

3.11.2 Maintainability

QFM-001	The Mean Time to Repair (MTTR) of this component shall not exceed TBD < 60 minutes +1 second Rationale:	TVS-462	CKM	A, D	N/A
QFM-	Proper maintenance of the component shall	TVS-	CKM	D	N/A

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
002	require not more than one person.	463			
QFM-003	Proper maintenance of the component shall require no material other than the following, if necessary: <TBD material(s)>	TVS-463	CKM	D	N/A
QFM-004	Proper maintenance of the component shall require no parts other than the following, if necessary: <TBD part nomenclature(s) and/or P/N(s)>	TVS-463	CKM	D	N/A
QFM-005	Proper maintenance of the component shall require no special tools other than the following: <TBD tool nomenclature(s) and/or P/N(s)>	TVS-463	CKM	D	N/A
QFM-006	Proper maintenance of the component shall require no equipment other than the following: <TBD tool nomenclature(s) and/or P/N(s)>	TVS-463	CKM	D	N/A
QFM-002	Proper service of the component shall require not more than one person.	TVS-463	CKM	D	N/A
QFM-003	Proper service of the component shall require no material other than the following, if necessary: <TBD material(s)>	TVS-463	CKM	D	N/A
QFM-004	Proper service of the component shall require no parts other than the following, if necessary: <TBD part nomenclature(s) and/or P/N(s)>	TVS-463	CKM	D	N/A
QFM-005	Proper service of the component shall require no special tools other than the following: <TBD tool nomenclature(s) and/or P/N(s)>	TVS-463	CKM	D	N/A
QFM-006	Proper service of the component shall require no equipment other than the following: <TBD tool nomenclature(s) and/or P/N(s)>	TVS-463	CKM	D	N/A

3.12 Design and Construction Constraints

3.12.1 Physical Characteristics

PCH-001	The component shall be a Non-Developmental Item (NDI).	TVS-466	CKM	E	N/A
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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
PCH-002	The component shall not effectively alter the visual aspect of the vehicle.	TVS-468	CKM	E	N/A
PCH-003	The physical appearance of this component shall NOT enhance the ability of an external threat to detect the host platform (e.g., vehicle, target system) upon which the component is installed. Rationale: If appended externally, for example, the component's thermal, visible (EO/IR), RADAR signature should be the same as the host or neutral.	TVS-469	CKM	E	N/A
PCH-004	The physical appearance of this component shall NOT enhance the ability of an external threat to identify of the host platform (e.g., vehicle, target system) upon which the component installed.	TVS-469	CKM	E	N/A
PCH-005	The physical appearance of this component shall NOT enhance the ability of an external threat to locate the host platform (e.g., vehicle, target system) upon which the component installed.	TVS-469	CKM	E	N/A

3.12.1.1 Weight

WT-001	The component shall be transportable by one person.	TVS-471	CKM	D	N/A
WT-002	The component (without any bracket) shall not exceed TBD lbs. +/- TBD LBS	TVS-472	CKM	E	N/A

3.12.1.2 Finish

FNS-001	All exterior surfaces of the component shall be treated with TBD <units of measure> of <TBD substance> IAW TBD Standard Rationale: In order to resist corrosion from exposure to chemicals, water, weather, sun	TVS-480	CKM	E	N/A
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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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	light, temperature, humidity.				
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3.12.1.3 Color

CLR-001	The color for all painted surfaces of the component shall be the low visibility, lusterless, non-reflective type Field Drab 33105 IAW FED-STD-595B.	TVS-482	CKM	E	N/A
CLR-002	The color of the component shall be green or black, with the exception of surfaces required for the transmission or reception of electromagnetic signals.	Derived from MRLT-126	CKM	E	N/A

3.12.2 Installation and Removal Requirements

INR-001	The component shall be installable without physical damage to the host platform (be it a vehicle, crew-served weapon system, etc.)	TVS-489	CKM	D	N/A
INR-002	The component shall be installable without permanent modification of the host platform.	TVS-489	CKM	D	N/A
INR-003	While installed on the host platform, the component shall be operable without physical damage to the host platform.	TVS-489	CKM	D	O S D U
INR-004	While installed on the host platform, the component shall be operable without permanent modification of the host platform.	TVS-489	CKM	D	O S D U
INR-005	The component shall be removable without physical damage to the host platform.	TVS-489	CKM	D	N/A
INR-006	The component shall be removable without permanent modification of the host platform.	TVS-489	CKM	D	N/A
INR-007	The time required for an individual to install this component on the host platform shall not exceed TBD < 30 minutes.	TVS-489	CKM	D	N/A
INR-	The time required for an individual to remove this fully installed component from the host	TVS-489	CKM	D	N/A

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
008	platform shall not exceed TBD < 30 minutes.				

3.12.3 Mounting

MNT-001	The component shall be designed with a form, factor and fit such that it is mountable out of the way of crew operators in every host vehicle identified in Appendix B	TVS-493	CKM	D	N/A
MNT-002	When mounted out of the way of crew operator in every host vehicle identified in Appendix B, the component shall not interfere with the operation of any of the vehicle system components.	TVS-494	CKM	D	O, S, D, U
MNT-003	The component shall be designed with a form, factor, and fit such that, for every host vehicle identified in Appendix B, when mounted in the host vehicle, the component shall not pose to the soldier either a trip or other hazard.	TVS-495	CKM	D	N/A
MNT-004	<p>The component shall have a primary and secondary means of attachment to the host platform.</p> <p>Rationale: Even if primarily designated to be inside the platform (vehicle), this component may be mounted on the outside of the host platform (e.g., a vehicle.) When mounted on the outside of the vehicle, having both a primary and secondary means of attachments will help prevent loss of the component in the training environment. Even when mounted inside, a secondary means of attachment will help prevent component damage or injury to personnel in the event the primary means of attachment fails.</p>	TVS-496	CKM	E	N/A

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
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3.12.3.1 Mounting Devices

N/A	None	N/A	N/A	N/A	N/A
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3.12.3.2 Interconnecting Cables

N/A	None	N/A	N/A	N/A	N/A
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3.12.4 Host Interface

VI-007	The component shall interface mechanically to the host vehicle.	Derived from TVS-511	CKM	D	N/A
VI-002	The component interface to each vehicle shall require NO permanent modification to the vehicle. Rationale: No permanent modifications to the vehicles or weapon systems are permitted	TVS-512	CKM	D	N/A
VI-003	The component shall not interfere or degrade the performance of any of the host war fighting platforms.	TVS-513	CKM	D	O
VI-004	The component shall not interfere or degrade the performance of crew.	TVS-513	CKM	D	U, S, O
VI-005	The component shall not interfere or degrade the performance of any weapon systems of the host vehicles.	TVS-513	CKM	D	O

3.12.5 Construction

3.12.5.1 Materials and Parts

CON-001	The component shall be composed of not less than TBD % (measure by <item quality, weight, or volume>) use of commercial and non-	TVS-520	CKM	Analysis	N/A
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ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
	developmental parts. Rationale: This and other LT2 components should maximize the use of commercial and non-developmental parts in order to keep replacement and repair costs low, help ensure availability and reliability.				

3.12.5.2 Electromagnetic Environment

EMI-001	The component shall meet all requirements specified in section 3.2 “E3 Requirements” of the LT2 Environmental, Safety, and E ³ Requirements Specification TESS-Env-EMI-Safety-001-0.	TVS-425	CKM	C	N/A
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3.12.5.3 Nameplates and Product Marking

NPM-001	The component shall have a nameplate Rationale: The component must be serialized and as a serialized device, it must have a nameplate to provide serially identifiable information.	TVS-527	CKM	E	N/A
NPM-002	The component transit case, if any, shall prominently display the product identification markings of the component, including nomenclature and part number.	TVS-528	CKM-TC	E	N/A
NPM-003	The component nameplate shall include nomenclature, part number, revision, and the component’s unique serial number.	TVS-529	CKM-NP	E	N/A
NPM-004	Every remaining component-specific replaceable accessory part (including any component-specific mounting parts) shall be visibly marked with its part number.	TVS-530	CKM	E	N/A
NPM-005	The component shall visibly identify the reference number of each connector on the exterior of the body of the component assembly.	TVS-532	CKM	E	N/A
NPM-	The component shall be marked “FOR	TVS-	CKM	E	N/A

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
006	<p>TRAINING USE ONLY” on a visible surface of the component.</p> <p>Rationale: Otherwise, the component could be mistaken for tactical equipment.</p>	533			

3.13 Personnel -Related Requirements

3.13.1 Human Engineering

HEN-001	The detailed design and functionality of the component shall be IAW the MIL-STD-1472, Section 5.1 (Control/display integration)	TVS-536	CKM	E	N/A
HEN-002	The external controls of the component shall be IAW MIL-STD-1472, Section 5.4 (Controls)	TVS-536	CKM	E	N/A
HEN-003	The component labeling shall be IAW MIL-STD-1472, Section 5.5 (Labeling)	TVS-536	CKM	E	N/A
HEN-004	The detail design and functionality of the component shall be IAW MIL-STD-1472, Section 5.6 (Anthropometry)	TVS-536	CKM	E	N/A
HEN-005	The detail design and functionality of the component shall be IAW MIL-STD-1472, Section 5.9 (Design for maintainer)	TVS-536	CKM	E	N/A
HEN-006	The component shall be IAW MIL-STD-1472, Section 5.11.1 Portability of Load Carrying	TVS-536	CKM	E	N/A
HEN-007	The component shall be IAW MIL-STD-1472, Section 5.13 (Hazards and safety)	TVS-536	CKM	E	N/A
HEN-008	<p>Every aspect of the component’s man-machine interface shall be designed such that an individual with a TBD education < (e.g., 10th grade)> and without any special skills training can operate the component.</p> <p>Rationale: Operational tasks, including installation, operation, and routine maintenance of this component must be able to be performed by soldiers, exercise support personnel who</p>	TVS-538	CKM	D	N/A

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
	may be active duty, Department of the Army Civilian (DAC), or contractor personnel.				

3.14 Training Related Requirements

N/A	None		N/A	NA	N/A
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3.15 Logistics Related Requirements

N/A	None other than logistic-related requirements specified elsewhere in this document.		N/A	NA	N/A
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3.16 Other Requirements

N/A	N/A		N/A	NA	N/A
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3.17 Packaging Requirements

PKG-001	TBD, e.g., The component width/length/height shall not exceed TBD >TBD cm, +/- TBD mm Rationale: The component must fit within in an individual transit case or multi-component transit case containing individual slots of particular form and dimensions.	(Derived from TVS-552)	CKM	E	N/A
PKG-002	The component, when packaged, shall withstand damage due to stresses incidental to movement, handling in transit, and tie-down aboard common carrying vehicles such as aircraft or trucks. Rationale: Irrespective of system-level packaging requirements, the supplier of this component must ensure that this component (or a group thereof if shipped in bulk) is packaged in such a way so that the component(s) can be	TVS-487	CKM Case	T	N/A

ID	Component Requirement Statements	Traces From	Allocated To	VM	Mode
	transported commercially via ground, air, or sea with reasonable assurance that the product will not be damaged during transit due to excessive temperature, humidity, weight of adjacent parcels, impact from shifting parcels, rough handling, etc. Even if the product is under warranty or if there is acceptance at destination on the components.				

3.18 Precedence and Criticality of Requirements

N/A	N/A		N/A	NA	N/A
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4 QUALIFICATION PROVISIONS

The qualification methods used in this document are identified as follows:

EXAMINATION (E)	Examination is an element of inspection consisting of investigation, without the use of special laboratory appliances or procedures, of supplies and services to determine conformance to those specified requirements that can be determined by such investigations. Examination is generally nondestructive and includes, but is not limited to, the use of sight, hearing, smell, touch, and taste; simple physical manipulation; mechanical and electrical gauging and measurement; and other forms of investigation.
TEST (T)	The operation of the system, or part of the system, using instrumentation or other special test equipment to collect data for later analysis.
DEMONSTRATION (D)	The operation of the system, or part of the system, that relies on observable functional operation not requiring the use of instrumentation or subsequent analysis.
INSPECTION (I)	Visual inspection of system components, documentation, etc.
ANALYSIS (A)	The processing of accumulated data obtained from other qualification methods. Examples are reduction, interpolation, or extrapolation of test results.
CERTIFICATION (C)	Certification is an element of inspection to verify that the requirement has been met. Certifications must include documented test results, performance data, analytical data, or vendor documentation. The certifications must be made available to Government representatives immediately upon request for review during inspections.

The qualification methods have been annotated in Section 3.

4.1 Test Procedures

This section covers the set of qualification test procedures for this component.

5 REQUIREMENTS TRACEABILITY

Section 3 above provides downward requirements traceability, showing how each component requirement is allocated to the component or one of its interfaces. Section 3 also provides upward traceability from the applicable set of LT2 architectural or system composition requirements to each component requirement. Note that downward traceability from a particular system requirement to this component is provided in the Requirements Traceability section of the corresponding System Composition Agreement (SCA).

6 NOTES

BIT	Built-In Test
CIM	Crew Interface Module
CKM	Crew Kill Module
DMT	Dismount
HCA	Hardware Component Agreement
IC	Individual Combatant
LRLT	Long Range Laser Transmitter
LT2	Live Training Transformation
MILES	Multiple Integrated Laser Engagement System
MRLT	Medium Range Laser Transmitter
N/A	Not Applicable
PEO STRI	Program Executive Office for Simulation, Training, & Instrumentation
SCA	System Composition Agreement
SRLT	Short Range Laser Transmitter
TBD	To Be Determined
TESS	Tactical Engagement Simulation System
TVS	Tactical Vehicle System
VM	Verification Method
VMC	Vehicle Master Controller

APPENDIX A: LPAN MESSAGE CLUSTER TABLE

The functional clusters listed in the following table are provided and/or consumed over one or more of the component's external interfaces. This table effectively identifies every message in the LT2 L-PAN CMSD PRF-PT-00635 that this component is required to send and/or receive and over which specific interface.

Table 1: Clusters (P)rovided and/or (C)onsumed Over Each Interface

Cluster Name	Abbreviation	Cluster ID	Allocated to Interface(s)	
			E-LPAN-RF	E-LPAN-IR-RX
Built-In Test	BIT	0x02	P	
Client Configuration	CC	0x03	P	P
Cluster Status	CS	0x05	P	
Device Administrative	DA	0x07	P	P
Device Description	DD	0x18	P	
Device Firmware Management	DFM	0x08	P	
MILES Laser TX Indirect Illumination	MI	0x15	P	P
Network Association Common and Server	NA	0x1B	C	
Network Association Manual	NAM	0x32	P	P
Operational Status	OPS	0x1C	P	
Wireless PAN Configuration	WPAN	0x28	P	

APPENDIX B: TARGET CONFIGURATIONS SUPPORTED BY CKM-001

1. M1 Abrams series tanks. (M1A1, M1A1 AIM, M1A1 AIM SA, M1A1 FEP, M1A2 SEP V1, and M1A2 SEP V2 configurations.)
2. M2/M3/M7 Bradley series fighting vehicles (M2A2, M3A2, M2A2 ODS, M2A2 ODS-E, M2A2 ODS SA, M3A2 ODS, M2A3, M3A3, M3A2 ODS SA, M7)
3. The following OPFOR Vehicles: T-55, T-62, T-72, T-80, T-90, BMP-1, BMP-2, BMP-3, and the Chieftain
4. All the following Tactical Vehicles: list TBD (e.g., all vehicle configurations to be equipped with TVS-specific V-TESS)
5. Applicable Building Types and dimensions
 - 5.1 Mountable inside: TBD
 - 5.2 Mountable outside: TBD