TECHNICAL SUPPLEMENT #2
US ARMY BRADLEY M2A3
MAINTENANCE TRAINING SYSTEM (MTS)
DIAGNOSTIC AND TROUBLESHOOTING TRAINER (DTT)
PROTOTYPE

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Table of Contents

1 SCOPE ........................................................................................................................................1
  1.1 System Overview ..................................................................................................................1

2 REFERENCE DOCUMENTS ..................................................................................................1

3 REQUIREMENTS ..................................................................................................................1
  3.1 System Requirements .........................................................................................................1
  3.2 System Capability Requirements .......................................................................................2
  3.3 Fidelity Requirements .......................................................................................................2
  3.4 Initial Prototype Training Tasks ........................................................................................3
  3.5 Training Tasks ..................................................................................................................3
    3.5.1 Familiarization and Operation of the M2A3 BFVS ..................................................3
    3.5.2 Perform M2A3 BFVS Turret Tests using Vehicle Diagnostic Management System (VDMS) .........................................................................................3
    3.5.3 Perform Maintenance Tasks on the M2A3 BFVS ..................................................3
    3.5.4 Troubleshoot M2A3 BFVS Malfunctions using VDMS .........................................4
    3.5.5 Troubleshoot M2A3 BFVS Using Alternate Troubleshooting Procedures ..........4
    3.5.6 Troubleshoot M2A3 BFVS TPU, PCM1, TPB, SAU and GAU Malfunctions ..........4

4 NOTES ......................................................................................................................................5
  4.1 Abbreviations and Acronyms ..........................................................................................5

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1 SCOPE
This Technical Supplement (TS) defines the minimum platform specific performance requirements of the M2A3 Bradley Fighting Vehicle (BFV) Diagnostic and Troubleshooting Trainer (DTT). The requirements identified in this specification, combined with the requirements identified in the TS for the Family of Maintenance Trainers-Common Core (FMT-CC), constitute the complete set of requirements to be satisfied by the M2A3 BFV DTT. The M2A3 BFV DTT will herein be referred to as the DTT.

1.1 System Overview
The DTT is a training system that provides training in critical field level maintenance tasks required for the tactical vehicle. The objective of the DTT is to provide training for maintenance personnel in system operation, symptom verification, troubleshooting, fault isolation, adjustment, servicing, and removal/replacement of Line Replaceable Units (LRUs).

This document presents the platform specific requirements of the DTT. The DTT trainer is a completely virtual system utilizing Three Dimensional (3-D) graphics. Navigation and interaction with the trainer is through mouse and other peripheral device inputs. The DTT shall include an Instructor/Operator Station (IOS) and a Training Management System (TMS). The DTT IOS and TMS shall include functionality and software that is common to all Product Manager – Virtual Training Systems (PdM-VTS) Maintenance Training Systems. This common functionality shall be provided by a Common Core software baseline to be shared with all legacy and future Diagnostic and Troubleshooting Trainers (DTTs), Part Task Trainers (PTTs), and Hands-on-Trainers (HOTs) for all vehicle types included in the PdM-VTS portfolio. The requirements for the Common Core baseline are identified in the Technical Supplement (TS) for the FMT-CC.

2 REFERENCE DOCUMENTS
This document describes the system requirements of the M2A3 BFV DTT. Where a conflict with this specification and any documentation referenced by this specification occurs, this specification shall take precedence. There is no classified material used in the development or operation of the M2A3 BFV DTT.

3 REQUIREMENTS
3.1 System Requirements
The DTT trainers shall provide a classroom environment where the instructor presents both normal and faulted system functionality. The student display format shall allow for a selectable configuration on each monitor of either a single window view or multiple window views. The trainers shall include 3D navigational capabilities for both the interior and exterior of the vehicle. The trainers shall allow the instructor to select from one (1) of four (4) modes for training: classroom free-run, classroom lockstep, classroom free play, or workstation lockstep/free play. The trainers shall provide the capability for the instructor to control the training system through a mouse and touch screen controls. The trainers shall include a “bookmark” which enables the user to return to the same place in a procedure after an interruption. The trainers shall allow the instructor to monitor the performance of students on all tasks. The DTT shall provide field level
maintenance training in fault diagnosis, troubleshooting, replacing, adjusting, and servicing for the M2A3 in a desktop virtual environment. The trainers shall provide maintenance training for the Army’s 91M Military Occupational Specialty (MOS) and the 915A and 913A Warrant Officer Maintenance Technicians. The trainers shall provide initial basic operations and maintenance training and will also be used to provide sustainment training.

3.2 System Capability Requirements

The DTT shall be installed and operated in an existing government facility. The trainer hardware, software and courseware design shall provide a virtual environment to incorporate simulated components, tools, cables, connectors and mounting hardware to accurately reflect the vehicle and to simulate the functionality required to support the training tasks identified in this Technical Supplement.

3.3 Fidelity Requirements

The DTT shall provide a virtual environment to diagnose and troubleshoot field maintenance tasks. The virtual environment shall allow the student to navigate within a three dimensional representation of the turret, and hull. Students shall be able to perform normal system operational procedures, as well as the full array of troubleshooting and repair procedures for the tasks selected. The DTT shall simulate Built-In Test (BIT) and Fault Isolation Test (FIT) procedures as well as allow the application of alternate troubleshooting procedures. The DTT devices shall:

a. Provide a virtual three-dimensional replica of the M2A3 BFV vehicle turret, and hull, including associated components required for training.
b. Provide simulated manual traversing of the turret and elevation of the gun and TOW.
c. Contain battlefield override controls.
d. Provide functional training to develop the cognitive skills required to operate within the appropriate weapon systems crew compartment.
e. Contain sufficient fidelity to simulate the operation, both normal and malfunctions, and location of controls and subsystems to allow realistic training of the required maintenance task.
f. Simulate Built-In Test (BIT) and Fault Isolation Test (FIT) procedures to include application of Alternate Troubleshooting Procedures (ATP).
g. Require only one instructor/operator per classroom.
h. Provide a functional Turret Position Resolver (TPR) within the virtual environment to teach alignment and adjustment tasks.
i. Provide accurate and realistic aural cues required by the specified lesson set (such as the gun rotor fan and gyro).
j. Simulate the Low Ammo sensors for Armor Piercing (AP), High Explosive (HE), and 7.62 machine gun ammo boxes and associated functionality required to support the training tasks.
k. Simulate the cargo hatch and its functionality to support the task of adjusting the upper and lower limit switches on the TOW launcher.
l. Prohibit student view of all indicators showing student progress in a lesson.
3.4 **Initial Prototype Training Tasks**

a. Driver's Hatch position status incorrect  
b. CIV Complete Test  
c. Safety Sensors & Interlocks NOGO in Self-Test Summary  
d. No CTD screen  
e. Turret Drive NOGO, TOW and DRIVE MALF ON, TOW Inoperable

3.5 **Training Tasks**

This section identifies all tasks currently identified for the M2A3 Bradley Fighting Vehicle System (BFVS).

3.5.1 **Familiarization and Operation of the M2A3 BFVS**

a. Operate the M2A3 BFVS Turret  
b. Remove/Install M242 and 25MM Gun/Feeder System

3.5.2 **Perform M2A3 BFVS Turret Tests using Vehicle Diagnostic Management System (VDMS)**

a. Operate the Commander’s Tactical Display  
b. Perform the 25mm gun test  
c. Perform the CIV Complete test  
d. Perform the Gun Elevation test  
e. Perform the IBAS Complete test  
f. Perform the Power Data Bus Management Complete test  
g. Perform the Turret Traverse test  
h. Perform the Low Ammo test

3.5.3 **Perform Maintenance Tasks on the M2A3 BFVS**

a. Boresight TAS/Backup Sight to 25mm Gun  
b. Boresight TAS to TOW Launcher  
c. Remove the TPR  
d. Install and Align the TPR  
e. Remove/Install SAU  
f. Remove/Install SEU  
g. Remove TAS  
h. Adjust TOW Variable Resistor  
i. Replace TAS  
j. Adjust brake sensitive switch and brake drive linkage for traverse drive system  
k. Replace gearbox and adjust variable resistor for gun elevation drive system  
l. Remove/Replace TDCU  
m. Replace TOW Resolver  
n. Replace Gun Resolver  
o. Adjust TOW Upper Limit Switch  
p. Adjust TOW Lower Limit Switch
3.5.4 Troubleshoot M2A3 BFVS Malfunctions using VDMS

a. CIV unstows but will not rotate (CIU Fault)
b. Self-test summary displays DEGRADED weapon control. (TPB Fault)
c. Gun does not elevate or depress (GED Fault)
d. Turret power indicator on SCB does not come on (SCB Fault)
e. One or both GHS triggers cannot fire weapon (GHS Fault)
f. Loss TOW select self-test displays DEGRADED Safety Sensors & Interlocks, Weapon Control, Fire Control, Gunner Sight, and CDRs Sight (PIB Fault)
g. Self-test summary displays DEGRADED turret drive. DRIVE MALF illuminated on SCB (TGY Fault)
h. Self-test summary displays DEGRADED gunners sigh (GSCP)

3.5.5 Troubleshoot M2A3 BFVS Using Alternate Troubleshooting Procedures

a. SCB no response on bus (PCM2 Fault)
b. No CTD screen (PCM3 Fault)
c. Cannot arm any weapon (SCB Fault)
d. Commander’s palm switch inoperable (CHS Fault)
e. Gunner’s palm switch inoperable (GCU Fault)
f. Open hatch indicator doesn’t go off when hatches and turret shield door are closed (1SMAG Switch Fault)
g. Open hatch indicator doesn’t go off when hatches and turret shield door are closed (1W70 Fault)
h. Gunner’s palm switch inoperable (GHS Fault)
i. 25mm Gun inoperable (TDCU Fault)
j. Loss CHS/CSCP functions self-test displays NOGO for weapon controls/CMD sight (PCM2 Fault)
k. Turret drives inoperable (SCB Fault)
l. No weapon arm signal (CHS Fault)
m. No Turret drive at CHS (CHS Fault)
n. No Turret drive at CHS (TDCU Fault)
o. Driver's Hatch position status incorrect (DVDB Fault)
p. GHS/GSCP inoperable. LOSS: GHS Functions (PCM1 Fault)

3.5.6 Troubleshoot M2A3 BFVS TPU, PCM1, TPB, SAU and GAU Malfunctions

a. Green power indicator on, red fail indicator on, loss of CDET. (TPU Fault, include programming a TPU using the MSD Software Loader Verifier (SL/V) functionality)
b. TPU - Red fail indicator comes on. (TPU Fault, include programming a TPU using the MSD (SL/V) functionality)
c. Cannot boresight 25mm gun. (TPU Fault, include programming a TPU using the MSD (SL/V) functionality)
d. No power to the CTD. (PCM1 Fault)
e. No Turret Drives. (TPB Fault)
f. No FLIR picture in RBD. (SAU Fault)
g. CIV will not unstow. (GAU Fault)
4 NOTES

4.1 Abbreviations and Acronyms

3-D/3D  Three Dimensional
AP      Armor Piercing
ATP     Alternate Troubleshooting Procedures
BIT     Built-In Test
BFVS    Bradley Fighting Vehicle System
CASCOM  Combined Arms Support Command
CHS     Commander’s Hand Station
CIU     Countermeasure Indicator Unit
CIV     Commander’s Independent Viewer
CC      Common Core
CHS     Commander’s Hand Station
CSCP    Commander’s Sight Control Panel
CTD     Commander’s Tactical Display
DTT     Diagnostic and Troubleshooting Trainer
FIT     Fault Isolation Test
FLIR    Forward Looking Infrared
FMT     Family of Maintenance Trainers
GAU     Gimbal Assembly Unit
GHS     Gunner’s Hand Station
GCU     Gun Control Unit
GED     Gun Elevation Drive
GSCP    Gunners Sight Control Panel
HE      High Explosive
HOT     Hands On Trainer
IBAS    Improved Bradley Acquisition Subsystem
IOS     Instructor/Operator Station
LRU     Line Replaceable Unit
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>MOS</td>
<td>Military Occupational Specialty</td>
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<tr>
<td>MSD</td>
<td>Maintenance Support Device</td>
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<tr>
<td>MTS</td>
<td>Maintenance Training System</td>
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<tr>
<td>PCM</td>
<td>Power Control Module</td>
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<tr>
<td>PdM-VTS</td>
<td>Product Manager – Virtual Training Systems</td>
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<tr>
<td>PIB</td>
<td>Position Interface Box</td>
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<tr>
<td>SAU</td>
<td>Sensor Assembly Unit</td>
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<tr>
<td>SCB</td>
<td>System Control Box</td>
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<tr>
<td>SEU</td>
<td>Servo Electronic Unit</td>
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<tr>
<td>SL/V</td>
<td>Software Loader Verifier</td>
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<tr>
<td>TAS</td>
<td>Target Acquisition Subsystem</td>
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<tr>
<td>TDCU</td>
<td>Turret Drive Control Unit</td>
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<tr>
<td>TGY</td>
<td>Turret Gyro Assembly</td>
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<tr>
<td>TMS</td>
<td>Training Management System</td>
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<tr>
<td>TOW</td>
<td>Tube-launched, Optically tracked, Wire-guided</td>
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<tr>
<td>TPB</td>
<td>Turret Power Box</td>
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<tr>
<td>TPR</td>
<td>Turret Position resolver</td>
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<tr>
<td>TPU</td>
<td>Turret Processor Unit</td>
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<tr>
<td>TS</td>
<td>Technical Supplement</td>
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<tr>
<td>VDMS</td>
<td>Vehicle Diagnostics Management System</td>
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