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# AUTOMATION HARDWARE MAINTENANCE

1 May 1997

## FOREWORD

The Army's maintenance requirements have not changed significantly since the onset of modern warfare experienced in the 20th century. Maintainers supporting modern warfare from WWI to Operation Desert Storm have had similar requirements to fix and sustain the Army's weapon systems. Differences in the execution of maintenance support are primarily the result of political, economic, and social changes, and more often as of late, technological advances. Successful armies have recognized and adapted to these changes and harnessed them to their advantage. It is crucial that the U.S. Army have a road map to adapt its maintenance doctrine, techniques, and procedures to an evolving reality.

The U.S. Army faces the most significant period of change since the emergence of the WWII nuclear era. Changes in technology and, more significantly, how the Army will harness it are yet to emerge in a clear definitive pattern. These changes will continue to have a significant impact on future requirements. The form and affordability of these future requirements will ultimately determine the viability of a new strategic environment and National Military Strategy. The Army has already developed a new visionary concept for the 21st century. This vision requires Army maintainers to adapt, modernize, discard antiquated methodologies, and seek innovative approaches to support a high-tech Army.

This pamphlet provides a conceptual framework for the accomplishment of maintenance support in the mid- and long-term. It is intended as a living document that presents emerging doctrinal ideas to support a high-tech power projection force. It is based on historical lessons learned and has been adjusted to fit the realities of the current force and technological environment. It will require additional adjustment as the picture for technology employment matures. This concept facilitates the type of imaginative and innovative approach required of not only the leadership in future military operations, but the supporting maintainer as well.

This concept encompasses a number of new programs, initiatives, and modernization efforts. It is influenced by the strategic, operational, and tactical levels of operations. Implementation of the concept will enable maintainers and their commanders, at all levels, to maintain and sustain a real-time automation posture, identify automation hardware maintenance problems, and available options. Moreover, implementation of this concept will give the Army an enhanced capability to respond to changing circumstances in joint, combined/coalition, and interagency operations.

**Department of the Army  
Headquarters, United States Army  
Training and Doctrine Command  
Fort Monroe, Virginia 23651-5000**

**TRADOC Pamphlet 525-76**

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## Military Operations AUTOMATION HARDWARE MAINTENANCE

**Summary.** This pamphlet serves as the basis for the development and modification of doctrine, training, leader development, organizations, materiel, and soldiers support (DTLOMS) requirements and as the interim process for Force XXI operations. As an interim, this concept is approved pending the final implementation of the Army Combat Service Support Concept and analysis of AWE's and other Force XXI initiatives.

**Applicability.** This pamphlet applies to all United States Army Training and Doctrine Command (TRADOC) installations and activities that develop DTLOMS requirements.

**Suggested improvements.** The proponent for this pamphlet is the Deputy Chief of Staff for Combat Developments. Send comments and suggested improvements on DA Form 2028 (Recommended Changes To Publications and Blank Forms) through channels to Commander, TRADOC, ATTN: ATCD-BP, Fort Monroe, VA 23651-5000. Suggested improvements may also be submitted using DA Form 1045 (Army Ideas for Excellence Program (AIEP) Proposal).

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## Chapter 1 Introduction

**1-1. Purpose.** This concept describes the capabilities the Army requires to logistically support the conduct of joint, interagency, and combined operations across the full range of military operations in support of the National Military Strategy.

**1-2. References.** Required publications are--

- a. AR 611-201 (Enlisted Career Management Fields and Military Occupational Specialties).
- b. AR 710-2 (Supply Policy Below the Wholesale level).
- c. DA Pam 738-750 (Functional Users Manual for The Army Maintenance Management System (TAMMS)).
- d. FM 100-5 (Operations).
- e. TRADOC Pam 525-5 (Force XXI Operations).
- f. TRADOC Pam 525-68 (Concept for Modularity).
- g. TRADOC Pam 525-69 (Concept for Information Operations).

**1-3. Explanation of abbreviations and terms.** Abbreviations and special terms used in this pamphlet are explained in the glossary.

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## **Chapter 2**

### **Overview**

**2-1. Why the concept is needed.** Numerous deployments for tactical and disaster relief operations have demonstrated the need for a comprehensive maintenance concept. It is projected that by 1999, a typical heavy division will have over 5,000 computer systems in operation. Currently, automation systems depend upon limited contract maintenance support and direct support (DS) for Standard Army Management Information Systems (STAMIS). Even with contractor support during deployment, there is no clear-cut automation support doctrine. The principle of "fix as far forward as possible" is not inherent in the location and density of contractor support. The magnitude of this problem requires an equally innovative and comprehensive effort to develop and implement a solution.

**2-2. Threat.** Maintenance support personnel need to know that they, their equipment, and their facilities may be a target of threat forces. They are vulnerable to attack from the entire spectrum of threat weaponry and forces. The likelihood of encountering various threats will vary depending on the proximity of their operations to other targets on the battlefield, the level of conflict, and the region of the world where operations are being conducted.

**2-3. Overarching concept.** This concept supports the umbrella force projection concept by integrating maintenance resources and efforts. Additionally, it orients this integrated structure on the force being supported rather than on the equipment needing maintenance.

#### **2-4. Limitations.**

a. This concept is limited to automation hardware maintenance and does not cover automation software management or sustainment support.

b. This concept does not address information warfare threat induced failures.

c. This concept does not cover computer systems that are embedded in weapon system platforms. However, it does cover computer systems that are used with weapon systems that can function as stand alone computers.

d. This concept is contingent upon force structure changes to meet the high numbers of computers emerging in upcoming years.

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## **Chapter 3**

### **Concept**

**3-1. Overview.** Automation systems have become an integral part of all operations for combat, combat support, and combat service support units alike. With the increased use of automation, there is a need to establish Army policy and doctrine for a maintenance concept capable of supporting the wide variety of automation systems found in military organizations today. The effectiveness of future military operations will, to a much greater extent, be inexorably tied to the operational readiness of automation systems. Regardless of the source of acquisition or procurement, this concept proposes maintenance be performed by the Army at the DS level, with sustainment maintenance performed by a "commodity" oriented maintenance activity. This concept recognizes the magnitude and complexity of the problem for current systems as well as emerging systems.

**3-2. Concept description.** DS maintenance is the cornerstone of this concept. Providing responsive, fix-forward support will enable users to optimize readiness rates of their fielded computer systems. During Desert Shield/Desert Storm, computer repairs consisted primarily of power supplies, hard/floppy drives, keyboards, tape drives, and printer boards. These repairs are identical to the type that a "soldier supported" automation hardware maintenance concept is capable of performing through on-site mobile support team (MST) or in support of a repairable exchange (RX)/base shop maintenance facility. This concept takes advantage of RX, local purchase, and warranty support. It utilizes the expertise of existing military occupational specialties (MOSs) at the DS unit level and below. Also, it utilizes the software expertise of the Combat Service Support Automation Office (CSSAMO). Furthermore, it takes advantage of the cost saving as a result of repairing unserviceable automation hardware line replaceable units (LRUs), and the benefits of having the entire program centrally managed by a commodity-oriented maintenance activity capable of projecting itself into a theater of operations as a logistics support element (LSE).

a. Strategic logistics. To effectively support sustainment maintenance of automation systems and repairable components above DS level, a centralized, commodity-oriented maintenance activity will be established. This activity will be able to deploy as a part of an LSE in support of major military operations. This activity would deploy with sustainment stocks packaged to extend a sustainment repair capability into the theater. This capability would reduce the system down-time and reduce transportation and repair costs. The commodity-oriented maintenance activity will maintain a database of all systems under its jurisdiction by system type, software supported, unit to which issued, RX status, warranty status, replacement status, and repair history. The commodity-oriented maintenance activity will provide piece-part repair and will be capable of repairing and returning to stock all levels of automation systems and associated peripheral devices. It will be a source of supply for supported units during deployed operations. The commodity-oriented maintenance activity will maintain a "24 hour hotline" (help desk) for DS maintenance repairers. This help desk must support Army operations around the world by allowing repairers to obtain technical advice and computer repair bulletins/updates via the world wide web (WWW) and satellite link.

b. Operational logistics. Repair of automation systems will be through replacement of both LRUs and shop replaceable units (SRUs). Both are simple plug-in/ pull-out subcomponents of automation systems. LRUs are defined as external items such as keyboards, monitors, printers, central processing units (CPU), mice, external hard drives, cables, compact disk-read only memory (CD-ROMs), automation information technology (AIT) devices, and modems. SRUs are defined as internal items such as power supplies, interface cards, input/output cards, wiring, switches, video cards, internal hard drives/CD-ROMs/modems, hard/floppy drives, and mother boards. The complete automation system (CPU, printer, monitor, and peripherals) will be considered as a Class VII major end item. LRUs will be considered as a Class IX component of the major end item. LRUs will be replaced at the unit level through a supply exchange program. LRUs will be repaired at the DS level by replacement of SRUs. Depending upon cost, complexity of repair, and useful economic life, LRUs can be repaired, discarded, or evacuated to a centralized commodity-oriented maintenance activity for repair. Figure 3-1 outlines this concept. DS maintenance units will use a combination of standard Army supply procedures and local vendor support to optimize computer system readiness. To support deployments, proper quantities of automation LRUs/SRUs will be stocked at a level in the supply system that best provides "speed of service" to the customer. The automation LRUs/SRUs stocked in supply channels will be controlled as pilferable items. DS maintenance units will establish local purchase programs and assist supported units in warranty management to optimize automation systems readiness. DS maintenance units will stock limited shop/bench stock tailored to the automation systems they support. DS maintenance will repair computers at the DS level and below by screening/ troubleshooting/replacing LRUs and SRUs. Major commands will develop procedures to reimburse commodity oriented maintenance activities for repairs that are not centrally funded.

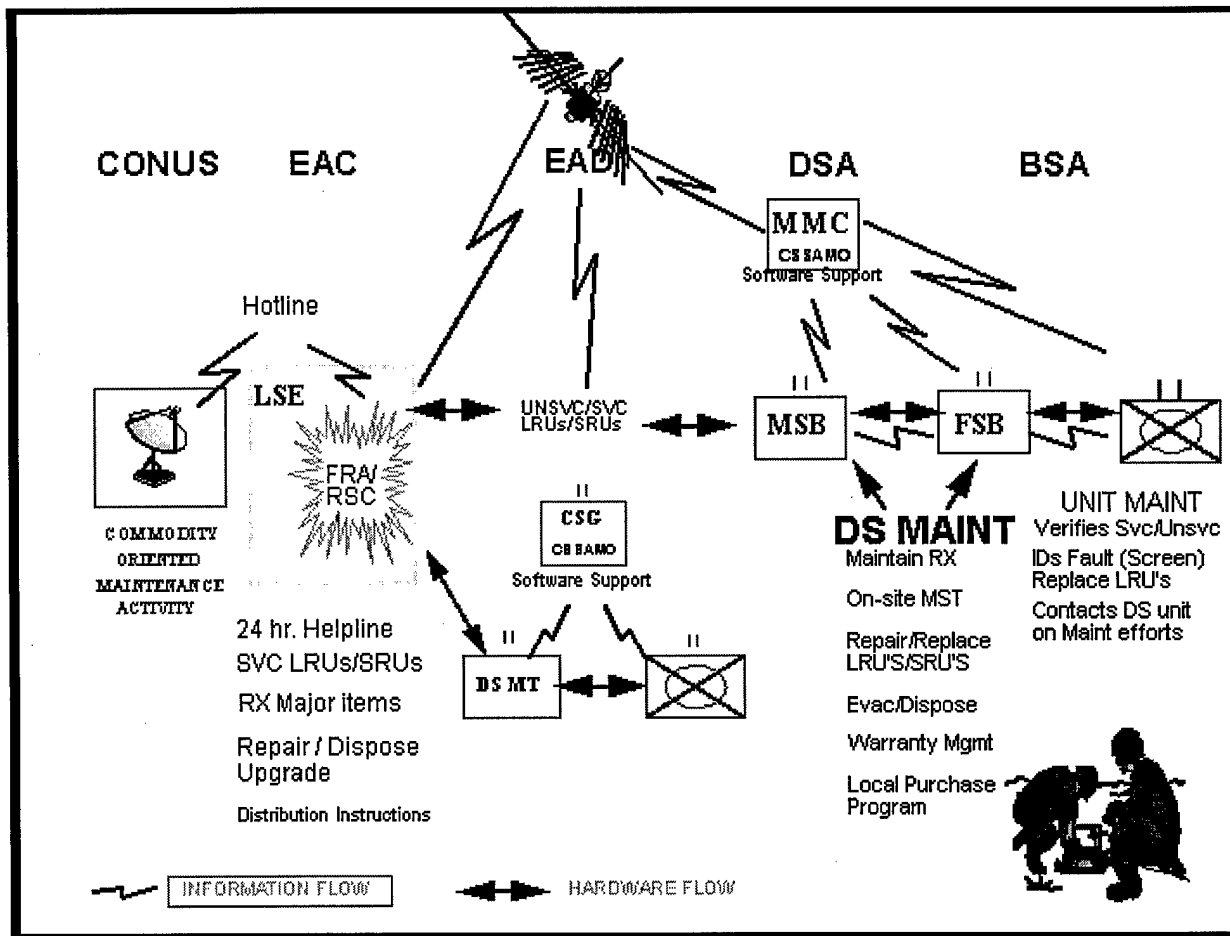


Figure 3-1. Automation Hardware Maintenance Concept

c. Procedures.

(1) The user/operator determines the automation system to be nonoperational and notifies the unit level supporter. The unit level automation system supporter verifies the status of the automation system by utilizing troubleshooting procedures to identify the failure as a software or hardware problem. Upon completion of troubleshooting procedures, the unit level automation system supporter restores the automation system by reinstalling system/application software or by identifying the malfunctioning LRUs. After the unit level automation system supporter identifies the unserviceable LRUs he or she will acquire a serviceable LRUs from the supply system.

(2) If the unit automation supporter is unable to restore the automation system he or she will contact the CSSAMO for software assistance, or the DS maintenance unit for hardware assistance or both if needed. The supporting DS maintenance unit, based on information received, can either direct an issue from stock, direct the unit to return the automation system or unserviceable LRUs, or if needed perform an on-site MST in coordination with CSSAMO, to restore the automation system to an operational status. If the CSSAMO performs an on-site MST and determines there is a hardware problem they will contact the DS maintenance unit shop officer. The shop officer can, on a case-by-case basis, authorize the CSSAMO to perform DS maintenance on automation hardware to optimize system readiness.

(3) The DS repairer performs troubleshooting and fault isolation procedures using operating system procedures, diagnostic software, and school-taught skills on the unserviceable LRUs. If the LRUs cannot be repaired the maintenance unit should seek guidance/ disposition instructions from the commodity-oriented maintenance activity.

(4) Under this concept, the unit level automation system supporter is the liaison between the operator and the DS computer repairer. The unit level automation system supporter is authorized to replace the following LRUs:

- CPUs
- Monitors
- Printers
- Keyboards
- Mice

- Cables
- External hard drives/modems/CD-ROMs
- AIT hardware

(5) DS repairer's will repair LRUs by replacement of SRUs. These SRUs can either be replaced on-site using a DS MST or replaced in the base shop maintenance facility. The DS repairer is authorized to replace the following components:

- Power supplies
- Interface cards
- Input/output/video cards
- Internal wiring/switches
- Internal hard drives/CD-ROMs/modems
- Internal hard/floppy drives
- Mother boards
- AIT hardware
- External hard drives/modems/CD-ROMs

**3-3. Future operational capabilities.** This concept requires the unit level automation supporters and DS maintainers to access to the most recent versions of diagnostic software tools via satellite or WWW. Versions of diagnostic software maintained at WWW sites must be licensed. Soldiers need the capability to connect to the WWW to download pertinent technical manuals (TMs), field manuals (FMs) and administrative data. They must have the ability to download pertinent sections of documents to perform maintenance. Unit level automation supporters and DS maintainers need the capability to remotely access automation systems to perform diagnostics.

a. Warranties must be structured to allow DS maintainers to perform maintenance on automation systems hardware without violating the warranty. Hardware procured should be compatible with current industry standard architecture.

b. This concept requires the establishment of forward repair activities (FRAs) and regional support centers (RSCs). FRA/RSCs will provide on-line maintenance assistance via telephone, WWW, and satellite televideo links. FRA/RSCs must provide piece-part repair. They will maintain a database of automation systems under their jurisdiction. FRA/RSCs will authorize DS maintenance to perform higher levels of maintenance when necessary. LSEs will be capable of early deployment and entry into an area of operations. This concept requires alternate means of support during deployment and redeployment phases.

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## **Chapter 4**

### **Implications**

**4-1. Doctrine.** The concept adheres to standard Army maintenance and supply policies and procedures. However, some regulations will have to be changed to incorporate the required capabilities of this concept. Readiness regulations will need to include rating criteria under Urgency of Need Designator (UND) codes to establish priorities of repair for automation systems. Those regulations are as follows:

- AR 750-1 Army Maintenance Policies and Procedures.
- AR 710-2 Supply Policy below the Wholesale Level.
- Maintenance Management Update.
- Unit Supply Update.

**4-2. Training.** The Army has a good training program in place. The skills of MOS 35J (Telecommunication Terminal Device Repairer) are exactly the type of DS maintenance skills required to support this concept. Personnel in 35J are currently being trained to repair computer systems. These skills will easily transfer to other pieces of automation hardware. Also, personnel in MOS 31U (Signal Support Systems Specialist) possess the skills necessary to provide unit level automation system support. Personnel in this MOS are currently being trained to support automation systems. Training impact is minimal provided these MOS's are utilized. An exportable training package should be developed to train soldiers on automation repair. MOSs with skills similar to the MOS 35J should be trained to support automation systems. Basic electronic skills are easily transferable from one MOS to the other.

**4-3. Leader development.** This concept requires no change in how the leaders are developed or utilized. However, all TRADOC schools should include some basic computer skills training as part of their standardized program of

instruction. This training should focus on developing leaders who are familiar with their branch's battlefield functional area automation system or systems.

**4-4. Organization.** This concept utilizes the current organizational structure and capabilities. MOSs with the required skills are already in the force structure in the proper places to support this concept.

**4-5. Materiel.** Materiel required to support this concept are common tools and test equipment that units have. Diagnostic software may have to be purchased and provided to units.

**4-6. Soldiers.** Soldiers are at the heart of the Army's capability to fight, win, and sustain operations in all types of military environments. Soldiers must have a capability to support themselves in an operational environment and have sustainment support in order for military operations to be successful. This concept is at the heart of digitization efforts.

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## **Glossary**

### **Section I**

#### **Abbreviations**

AIT	automation information technology
ASL	authorized stockage list
CD-ROM	compact disk-read only memory
CPU	central processing unit
CSSAMO	Combat Service Support Automation Office
DS	direct support
DTLOMS	doctrine, training, leader development, organizations, materiel, and soldiers
EAC	echelons above corps
FRA	forward repair activity
LRU	line replaceable units
LSE	logistics support element
MOS	military occupational specialty
MST	mobile support team
RSC	regional support center
RX	reparable exchange
SRU	shop replaceable unit
STAMIS	Standard Army Maintenance Information System
TOE	tables of organization and equipment
UND	urgency of need designator
WWW	world wide web

### **Section II**

#### **Terms**

##### **Automation Information Technology Hardware**

Hardware devices that read and input real time information into the information systems using radio frequency technology.

##### **Line Replaceable Units**

A component of an automation system i.e., CPU, monitor, printer, or other external peripheral that is replaced to return the automation system to an operational status.

##### **Logistics Support Element**

An EAC logistics element that is tasked organized and projected into a theater of operations to provide logistics support across the entire spectrum of logistics.

##### **Shop Replaceable Units**



An element, part, or component of a commercial off-the-shelf/nondevelopmental item (COTS/NDI) computer or automation hardware that is used to repair items by maintenance personnel.

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