STANDARDIZATION OF COMMERCIAL ATE IN THE ARMY INDUSTRIAL ENVIRONMENT

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ABSTRACT:
The U.S. Army Depot System Command's presentation will briefly describe the commercial testers that comprise the depot standard family of ATE, their targeted technologies, and the management of their application in the maintenance depot environment.

INTRODUCTION:
Background. The U.S. Army Depot System Command (DESCOM), a major subordinate command of the Army Material Command, is located on Letterkenny Army Depot, Chambersburg, Pa. The DESCOM principal mission is command and control of the Army maintenance depots. The depots are dedicated to supporting the Army and other services through the overhaul, repair, modification, and conversion of Department of Defense weapon systems. This support requires a large use of ATE.

In the past, support ATE identical to that which the weapon system prime contractors used on production lines was used by the Army for depot maintenance of weapon systems. This special purpose ATE typically had a very limited application. Accordingly, as new weapon systems were added to the Army inventories, equal numbers of high cost ATE systems were added to depot support equipment inventories.

The logistics of these special purpose ATE was very costly. In many cases the only source of maintenance was the original equipment manufacturer (OEM). Maintenance was typically provided by resident OEM representatives. Likewise, the test program sets used with the ATE were also maintained by the OEM.

The field Army experienced similar proliferation and support problems. In an effort to solve them, the Army developed a standard ATE system, the Integrated Family of Test Equipment (IFTE), which is the current Army standard ATE. The Army policy directs that upon determining that ATE is required to support a weapon system, IFTE must be considered above all other ATE. Nonstandard ATE will not be used in lieu of IFTE without an economic analysis using the IFTE as the base line alternative. However, due to unique depot testing requirements, and the similarities between manufacturing plant and depot environments, the ATE used by the weapon system OEMs still often migrated to the depots.

Currently. The Army, like the other services and industry, is continually searching for ways to reduce operating costs and increase competitiveness. In order to control the proliferation of depot ATE, and thus reduce logistics costs, DESCOM selected several items of commercial ATE to standardize on at the maintenance depots. This equipment is referred to as the depot standard family of ATE. Each item was selected to support a specific category of weapon system technology. That is, the HP 3070AT In-Circuit Combinational Tester (ICCT) was chosen as the tester for high density digital circuit card testing. While the GenRad 2225 and 2235 was selected for functional and diagnostic testing of low speed digital circuit card assemblies. The Schlumberger SI 635 was selected to support low density
circuit card repair programs. Finally, the DIT-MCO 9500 was designated as the standard depot level tester for cable harness and continuity testing.

The standard family of ATE provides the depots with the flexibility to choose the most cost effective test solution for their customers. Also, by using the same ATE in all depots, thus reducing the number of different makes and models of ATE systems in the inventory, it becomes cost effective to train user personnel to maintain the ATE as well as to develop and maintain the TPSs used with it.

The establishment of the standard family of commercial ATE has made it advantageous for DESCOM to consolidate requirements and award requirements contracts for the ATE systems as well as for fixturing and TPS development.

The depot standard family of ATE has proven to be very compatible with the industrial environment of the depots. The depot circuit card assemblies (CCA) test and repair facilities are environmentally controlled like the production facilities of industry. Hardened, ruggedized testers are not required in a depot environment as they are in the field.

**ATE FAMILY ELEMENTS:**

The depot standard family of ATE consists of the Army standard Integrated Family of Test Equipment (IFTE) Commercial Equivalent Equipment (CEE); the HP 3070AT In-Circuit Combinational Tester (ICT); the DIT-MCO 9500 and 2500 series cable harness tester; the GenRad 2225 digital tester; the GenRad 2235 logic system tester; and the SI 635 benchtop tester.

The IFTE CEE, manufactured by Grumman Corporation, is a commercial version of the militarized Army standard IFTE base shop test station. The CEE is equipped with a compiler and can be used for TPS development, updates, and maintenance. It can be tailored to meet user specific testing requirements by adding commercial test equipment via an IEEE-488 bus. It is capable of performing digital testing at rates to 50M bits/sec. It has analog test capability of up to 150 Mhz bandwidth at 200 volts for both stimulus and response. The IFTE CEE RF testing capability is DC to 22 Ghz. The CEE is used at the depots for functional and diagnostic testing via edge connector interface. The flexibility of the CEE allows relative unlimited applications for depot requirements.

The Hewlett Packard Company manufactured HP 3070AT ICT is the depot standard used to test the circuit cards assemblies (CCAs) of a variety of weapon systems. This commercial off-the-shelf ATE is designed to test and diagnose CCAs by combining in-circuit, cluster, functional, and guided probe test methodologies via a bed-of-nails interface. The ICT is capable of digital test rates to 12.5 Mhz. It also has analog capability which is expandable through IEEE-488 bus interface ports.

The DIT-MCO 9500 and 2500 are the depot standards for continuity testing. They are used to test wire harness assemblies; coax, triax, and twisted pair cables. Also, the DIT-MCO has a broad application for wire wrap and other backplane testing. The DIT-MCO is capable of high pot testing up to 1500 VDC and 1000 VAC. They are capable of testing 1200 and 3000 conductors per minute, respectively.

The bench top ATE adopted as standard by the Army depots is the Schlumberger Instruments SI 635. This tester is used to support low density production programs for which it is not cost effective to develop test program sets on more complex ATE. Since the SI 635 is an in-circuit tester, creating a test program is fast and easy. Testing is accomplished by clipping onto the appropriate devices in a prompted sequence until the source of the CCA failure is discovered. The SI 635 has the capability, via guided component clipping sequences, to learn the interconnections between all components of an undocumented CCA and generating a schematic. Analog and IEEE-488 bus options are available to accommodate changing test requirements.

Finally, the GenRad 2225 and 2235 comprise the depot standard digital and logic ATE. These testers are used by the depots to test low pattern rate CCA's. The GenRad 2225 is a man portable suit case tester which functionally tests digital CCA's via edge connector interface. It uses a guided probe fault isolation technique. The GenRad 2225 digital test rate is 2 Mhz. The
GenRad 2235 performance characteristics are essentially the same as the GenRad 2225. However, additional features include a dual floppy disk drive, a high speed printer interface, a CRT, an operator's foot switch and an IEEE bus interface. It is typically used where high through-put is more important than portability.

**Establishment of the Family:**

**Procurement.** The HP 3070 and DIT-MCO depot standard family members were established through full and open competition. Market surveys were conducted to determine industry's capability to meet depot requirements with commercial-off-the-shelf ATE. The surveys also revealed aspects of the equipment specifications that inhibited competition. In cases where the stated requirements appeared over restrictive, they were reevaluated and changed where possible. Multi-year requirements contracts were awarded to winning contractors to deliver the ATE. The contracts specify the maximum quantities to be delivered during the life of the contract. Some options for maintenance, training, and different size testers were included.

Depot requirements are fulfilled through delivery orders placed against the current requirements contracts. Follow-on solicitations will require test program set compatibility with the commercial ATE specified through the initial solicitation.

**Policy.** The SI 635 was added to the family via a request to USATA. The HQDESCOM request identified the test technology of the SI 635 as very useful for a low volume bench tester requirement and noted that the SI 635 already existed in the Army inventory. The USATA approved the request based on the application and low cost.

"Grandfathered". The GenRad 2225 and 2235 testers were added to the depot standard family because of their wide use in the depots. These commercially available ATE are purchased by the depot or acquired through the Army item manager. The GenRad 2225-2235 commonality of use also extends to other services.

**Program Management:**

The use of the depot standard ATE is managed internally by the depots with overview by HQDESCOM. The HQDESCOM validates the technical or economical advantages of all depot ATE prior to endorsing its use. The depots typically have the expertise required for evaluation, acquisition, programming, and maintenance of the ATE systems that they use. A depot testability analysis is performed to determine the most appropriate ATE for each customer application. The depots are continually exploring supported technologies to identify areas where their competitiveness could be improved by use of commercial testers. When the depots identify test requirements that require ATE support other than that provided by the depot standard family, the headquarters will investigate the feasibility of adding another commercial tester to the family.

The ATE is programmed and budgeted for by HQDESCOM. Also, HQDESCOM is the technical coordinator for the consolidated procurements. The Electronics and Missile Equipment Division develops the ATE specifications, performs the initial cost and technical analysis, develops the evaluation plans, and provides all other technical support functions required during the contracting process. Post contract amendments and follow-on contracting are also coordinated by the Electronics and Missile Equipment Division.

The depots are responsible for all maintenance costs associated with the testers. Maintenance is performed by depot technicians or via maintenance contracts depending on the expertise and capability of the specific depot. In order to ensure that the most appropriate ATE is selected for each requirement, the depots perform a technical and cost analysis. The analysis considers the technology of the weapon system, the cost effectiveness of the ATE, the ATE maintenance costs, the TPS development and maintenance costs, and the through-put requirements. Lastly, when feasible, the depots develop the TPS used with the ATE.

The Army considers TPSs to be an integral part of the weapon systems that they support. Therefore, the TPS development and maintenance costs, for the most part, are bore by the managers of the weapon systems. The depot personnel are usually funded to develop/convert TPSs to the standard ATE. Since depot personnel are highly skilled and trained in all
aspects of operation, maintenance, and programming of the depot standard family of ATE, the weapon system managers routinely commission the depots to perform TPS configuration management functions. Accordingly, the depots store, maintain, and update most of the TPSs used with the depot standard family of ATE.

BUSINESS ENVIRONMENT:

In the business environment in which the depots are operating, it is important that they seek every opportunity to increase their efficiency. The standard family of commercial ATE has greatly enhanced the general competitiveness of the Army depots. By standardizing on commercial-off-the-shelf testers, the depots have saved the cost of developing unique testers. Also, the standard family of ATE provides the depots the flexibility to choose the most cost effective test solution for their customers. The Army depots' test, diagnostic, and repair missions have been greatly enhanced with the establishment of the DESCOM standard family of commercial ATE.

The use of commercial ATE in the depot environment is strongly supported in the headquarters TMDE/ATE program management office. The depot standard family was first publicly introduced at AUTOTESTCON 92. The ATE managers have briefed the need of commercial ATE at all levels of the management. This included two influential presentations to the DOD Automatic Test Study Group. While the service’s standards are needed in the depot, the depot environment must have freedom to use application specific commercial ATE.

CONCLUSION:

The Army has made some significant advancements in enhancing its mission effectiveness by establishing the depot standard family of commercial ATE. The depots have been able to fulfill most of their ATE requirements with the commercial ATE, thus controlling ATE proliferation. As these testers become more common in the depots, depot personnel become more efficient in operating, maintaining, and programming them. Also, since DESCOM has established a ready source of supply for this ATE through open contracts, the depot acquisition lead time, and the resources required to obtain this ATE have been greatly reduced over that of similar equipment. Furthermore, since the depot standard family of ATE is comprised solely of commercial-off-the-shelf ATE, there are no development costs to be bore by the user. This all equates to a lower cost of ATE ownership, which contributes to a more competitive depot operation.

ACKNOWLEDGEMENTS:

The success of the program described in this paper was the result of the hard work and dedication of the following U.S Army Depot System Command employees: Don Ruth, Dennis Urban, Richard Zimmerman, Glenn Cotabish, Herb Lanier, John Suppok, Joe Savel, and Melony Harr. Contributors to this paper are: (1) Cotabish, Lanier, and Suppok, review and editing; and (2) Harr, word processing.