

Composite Replacement Instruments Provide Obsolescence Solution

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Aging test equipment obsolescence is a serious problem in Department of Defense (DoD) Automated Test Equipment (ATE) systems today. According to the General Accounting Office (GAO) report dated March 2003, fifty billion dollars (\$50B) were spent on DoD related ATE between 1980 and 1992. Over the lifetime of this equipment, costs are expected to exceed \$250B. These ATE are used to test everything from commercial aircraft to cell phones. Often required to operate for years, sometimes decades, in many systems the instruments are now reaching end-of-life and are failing at increased rates. Exacerbating this problem, critical components necessary to repair the original instruments are often out of production, rendering the instrument obsolete and unsupported. As a result of these factors, many complex ATE instruments have become, or are destined to become the problem-prone “system degraders” tracked in ATE program reviews. System degraders have huge cost impacts for the DoD and a downed test station is even more costly.

COTS (commercial off-the-shelf) instruments would ideally replace these obsolete legacy instruments however, COTS instruments present several challenges including incompatible communication protocols, different communication buses and measurement timing, functional differences in the way new instruments operate, mechanical packaging differences, and different calibration and maintenance procedures.

Collectively, these differences make it extremely challenging and expensive to integrate a replacement COTS instrument into an existing ATE system. Moreover, because of the extensive changes that are needed to accommodate the new instrument, the test station’s test software (called TPSs -Test Program Set) must be modified and thoroughly revalidated to verify the new instrument is working properly. This revalidation is a significant cost driver in a COTS replacement effort, often requiring re-test of hundreds of individual test programs.

Instrument Obsolescence Approaches

Several approaches to combat instrument obsolescence are listed below, along with potential drawbacks.

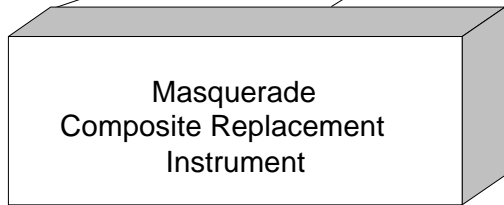
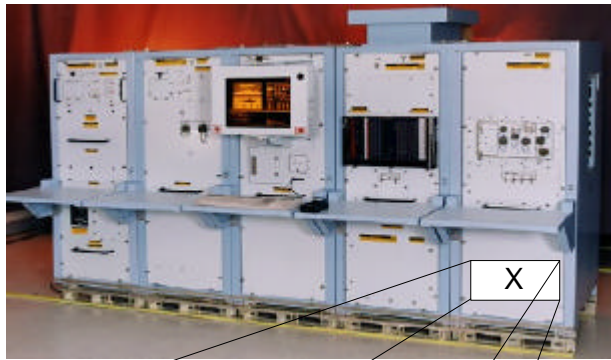
1. *Continued maintenance and repair.* In this approach the instrument is maintained and repaired, in-house or

outsourced. This solution – continued maintenance and repair – is functionally ineffective as shown by the prevalence of system downtime even with the high and ever-increasing maintenance costs.

2. *Procure replacements in the secondary market.* This can be chancy as the used instrument may be just as problem-prone as the original.
3. *Cannibalize systems to obtain replacements.* This approach looks good on paper, especially when a large number (but not all) of the in-service test systems are being decommissioned. It is tempting to stockpile the sidelined instruments to fulfill anticipated replacement needs for the remaining stations.
4. *Lifetime Buy* is an effective approach however, like the above-mentioned solutions, this is a short term solution.
5. *Procure a functional replacement.* This approach has been utilized effectively in a number of situations to solve the end-of-life reliability issues, but it typically involves custom hardware and software that is expensive to develop, difficult to maintain, and does not protect against future obsolescence.
6. *Off-load the TPS* that the instrument supported to another test platform. This can be very expensive, especially where a large number of TPSs are involved. Because of the high cost, this approach usually takes years to implement.

CRI’s Are Form, Fit, Function Replacements

DoD support logisticians facing one of the above unsavory maintenance choices or long waits for off-load would benefit from a composite replacement instrument solution. Composite Replacement Instruments (CRI’s) masquerade as the original/obsolete instruments, seamlessly replacing them in test systems – without requiring costly software upgrade or re-host. Composite Replacement Instruments provide the opportunity to extend the life of ATE systems, immediately improving reliability while reducing on-going support and maintenance costs. CRI’s are form, fit, functional, drop-in replacements for obsolete instruments in legacy ATE.



Form, Fit, Functional Replacement

All CRI's Are Alike

All Composite Replacement Instruments are alike; comprised of a COTS test instrument(s), signal conditioning, a translation computer, and instrument-specific translation software. Composite Replacement Instruments:

- Utilize COTS instrumentation as foundation
- Offer rapid, cost-effective, standardized approach leveraging reusable software and hardware components
- Preserve existing TPS investment
- Leverage IVI architecture for obsolescence prevention

The CRI's translation computer and signal conditioning act as a bridge between the new COTS instrument and the existing ATE system, making the CRI a true form, fit, and functional replacement for the obsolete instrument.

CRI's Eliminate Need For TPS Modifications

CRI's perfectly duplicate the original instrument's remote control protocol to eliminate the need for expensive TPS modifications. A custom translation program handles this task. Traditionally, this translation program development is the trickiest and most expensive part of an obsolete instrument replacement effort, often requiring man-years of labor. Standardized components combined with software technology innovations including use of reusable component architectures (COM, .NET, and Java, IVI Drivers and IVI architecture

defined by the IVI Foundation) accelerate development of CRI translations and provide obsolescence prevention.

Composite Replacement Instruments present a viable viable costs-effective alternative to other obsolescence approaches. CRI's are also favorable in the following specific applications.

- Test systems with instruments that are expensive to maintain because of a sole-source of supply. Often this supplier has no incentive to reduce costs in this scenario.
- CASS, in existence for approximately 15 years, is experiencing obsolescence in several of its instruments. These instruments could easily be replaced with Composite Replacement Instruments.
- Test systems that are no longer easily maintainable due to a discontinued product. When a vendor no longer supports a product, logisticians are forced to turn to secondary markets to get repairs or to obtain refurbished instruments that may be of questionable pedigree.
- Test systems that contain non-standard, one-of-a-kind instruments. These instruments often involve specialized maintenance procedures and sole-source parts.
- Test systems that need to be replicated, but the original instruments can no longer be procured. In this scenario the original test system is not suffering from obsolescence, but it cannot be replicated due to an obsolete instrument.
- Test systems that are in queue for offload to a standard test system, but suffering unacceptably high maintenance costs and/or degraded readiness of supported military hardware.
- Depots supporting foreign military service activities that have need for extended life because migration to a standardized ATE such as CASS is not schedule or cost justified.

Test equipment obsolescence is a serious problem in DoD ATE systems today. Composite replacement instruments offer a viable alternative to current approaches for reducing legacy ATE lifetime costs offering the following potential benefits:

- Rapid, cost-effective, standardized approach leveraging reusable software and hardware components
- Reduced risk through TPS investment and ATE configuration preservation
- Obsolescence prevention through IVI-COM architecture

About Vektrex:

Incorporated in 1986, Vektrex is a software and systems integration company supporting the test and measurement industry. The company is focused on advancing measurement technology and migrating measurements from hardware; test instruments and test tubes, into software and the PC. Vektrex has established key expertise with test instruments, instrument drivers, and software based measurements and provides enabling products and services that help clients migrate to software-based measurements. Products include patent pending Masquerade technology enabling the rapid development of Composite Replacement Instruments (CRI); form, fit, function replacements for obsolete instrumentation in legacy ATE. Vektrex also produces software products focused on drivers and reusable software components including VIVID, the software development toolkit that produces IVI compliant COM based drivers. Vektrex' clients span advanced technology industries including defense, biotechnology, and semi-conductor. See Vektrex at www.vektrex.com.