



MTS Customer Profile

Upgrading Alstom BTE Functional Test Systems with PXI



Summary

SNCF railway in France maintains a wide range of electronic assemblies that are part of the Alstom train sets operated by SNCF. In the mid-to late-1990's, Alstom deployed its Bench Test Equipment (BTE) - which incorporated Marvin Test Solutions' GTXI systems to a wide range of train set operators in world-wide locations. Besides SNCF, operators of Alstom train sets include Amtrak, New Jersey Transit, SEPTA, and NYCT in North America. These test sets, which are now more than 15 years old, have reached end-of-life, requiring railway operators to look at replacement systems that can be used to continue servicing Alstom's AGATE (Advanced Generic Alstom Transport Electronics) family of electronic control units. Marvin Test Solutions worked with Accelonix, an integrator in Paris, France to upgrade and convert these existing GTXI systems to MTS' GX7100 PXI platform which included the conversion of the legacy ATEasy test programs to the current ATEasy version.

The resulting upgrades provided SNCF with greatly improved test performance and maintainability. Key benefits included:

- ✓ Up to 60% test time reduction for some LRU tests
- ✓ Simple program conversion and retention of existing user interface by leveraging ATEasy's backward compatibility
- ✓ Modern test platform (PXI) architecture, providing a cost effective extension of the test system's life cycle

Background

The Alstom BTE (Bench Test Equipment) systems incorporate the GTXI platform with several analog modules, custom modules, and switching capabilities. These systems also include an AGATE chassis and user power supplies. Additionally, older systems included custom boards manufactured by Ercteel. These test systems and the associated ATEasy-based test programs are deployed world-wide and support a variety of AGATE modules including:

- Propulsion control electronics (PCE)
- Auxiliary control electronics (ACE)
- Audio electronics (XTER & ATER)
- Engine controllers (Locofret)

For SNCF, the requirement was to upgrade two types of test systems that are currently supporting XTER, ATER, and Locofret LRUs. The upgrade required replacement of the GTXI chassis and modules, the system controller, and migration of the ATEasy-based TPS' to the current version of ATEasy. Figure 1 details a BTE system which includes the GTXI chassis.



Figure 1 - BTE System with GTXI Chassis

Implementation

Upgrading of the Alstom BTE system was accomplished by replacing the GTXI chassis and associated modules with an MTS GX7100 3U/6U PXI chassis, configured with a complement of switching and analog instrumentation. The table below details the PXI chassis configuration that supports the functionality originally provided by the GTXI system.

GTXI Configuration	Supplier	P/N	PXI Chassis Configuration	Qty
Switching/generator	ACTEM	ACTEM-GEN	GX6196 switch card & Actem Generator	1
Switching/measurement	ACTEM	ACTEM-MES	GX6196 switch card & Actem measure card	1
Universal card 1	ACTEM	ACTEM-UNI1	GX6196 switch card & Actem-UNI-1	1
Universal card 2	ACTEM	ACTEM-UNI2	GX6196 switch card & Actem-UNI-2	1
GPIB card	NI	GPIB / TNT	IEEE cPCI card	1
Reference card	MTS	GT1034	GX1034, reference card	1
Counter / Timer	MTS	GT200	GTX2210, counter / timer	1
Controller	MTS	GTPC	GX7927, i7 controller, Windows 7	1
Chassis	MTS	GTXI-700	GX7100BR, 3U/6U 14 slot PXI chassis	1
Signal generator	MTS	SM1020	GX1110, Function generator	1
DMM	MTS	SM2020	GX2065, DMM	1

The compact size of the GX7100BR chassis (4U high) allowed this PXI replacement subsystem to easily fit into the BTE rack space occupied by the GTXI chassis (7U high), (Figure 2) and provided an easy, direct upgrade / replacement for the GTXI platform.



Figure 2 - GX7100BR: GTXI Replacement



GX7100BR Chassis

The GX7100BR offers (7) 6U and (7) 3U PXI slot with one 6U slot dedicated for the Windows controller. All instruments including an IEEE - 488 controller reside in the chassis' 6U and 3U peripheral slots. The GTXI replacement configuration consists of the following components:

- GX7100BR PXI chassis
- GX7927 Windows controller
- (4) GX6196 Switching/ interface cards
- GX1034 Reference card
- GX1110 Function generator
- GX2065 6.5 Digit DMM
- GTX2210 Counter / timer
- cPCI GPIB controller

The upgraded test systems include the following major components:

Engine Controller LRU Test

- User power supply (analog inputs driven by DACs on the Actem cards)
- Racal switching system (1256) connected via Ethernet
- RS-232 ports, Ethernet & a WorldFip card
- Alstom AGATE chassis (see Figure 3)

XTER and ATER LRU Test

- User power supply (interfaces to the Actem cards)
- HP audio tester
- GBIP card
- Alstom AGATE chassis (see Figure 3)



Figure 3 - AGATE Chassis

Test System Software

The test software for these systems uses Marvin Test Systems' ATEasy, an integrated test executive and test development software suite. A total of 21 ATEasy test programs that were developed by Alstom for various UUTs, were migrated to ATEasy 8.0. And like all previous versions of ATEasy, ATEasy 8.0 is backward compatible with previous versions, which greatly simplified the task of TPS migration.

Conversion from the legacy GTXI hardware was also straightforward since instrument capability and functionality mapped directly from the GTXI to the PXI platform, including the replacement Actem instrument cards. In addition, because the TPS's used a limited number of functional calls, the upgrade process at the driver level required minimal effort. An added side benefit associated with upgrading these systems was the opportunity to improve overall test execution time of some of the test programs. For several key LRU products, test time reductions of greater than 60% were realized and in one case, an 80% reduction in test time was achieved. The result was better utilization of test system assets and higher test throughput.



ATEasy

Test Executive And Development Studio

Summary & Benefits

By upgrading the Alstom BTE functional test platforms, SNCF was able to maintain their current repair capabilities as well as realize improved test performance and supportability. Key benefits included:

- ✓ Modernized test systems, using a high performance PXI platform and software that is supportable and expandable
- ✓ Improved test system performance, with some LRU times exhibiting reductions of 60% or more.
- ✓ Instrument capability and functionality that mapped directly from the GTXI to the PXI platform, simplifying the conversion process and allowing the use of existing test system wiring / interconnects
- ✓ ATEasy architecture and compatibility that supports the existing user UI and program flow, simplifying the overall test program conversion and verification process

To learn more about how MTS can help upgrade your Alstom BTE platform please contact us:
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To learn more about ATEasy or MTS' PXI products and systems: www.marvintest.com

To learn more about Accelonix:
www.accelonix.co.uk