



Table of Contents

- 6TL About 6TL Engineering
- 6TL The Challenge of Developing a Functional Test Platform
- 6TL Modular Test Platform Concept — The Solution to Many of Your Design Problems
- 6TL Why a Mass Interconnect Interface Is a Must
- 6TL Get the Best Signal Integrity Out of Your Instrumentation and Cabling.
- 6TL Modules That Are a real Benefit to Your Engineering Efforts
 - 6TL MMI (Man Machine Interface Module)
 - 6TL Pusher, “Flipper”, Lifter and Transport Belt Modules
 - 6TL PDU (Programmable Power Distribution Unit) Modules
 - 6TL YAV90PNE (Pneumatic Subsystem Module)
 - 6TL YAVJTAGx (JTAG Universal Resource Module)
 - 6TL YAV90CLR (LED Color and Intensity Subsystem Module)
- 6TL Conclusion

About 6TL Engineering

6TL Engineering, a member of the Spanish Sistel Group, is an NI Silver Alliance Partner with over 25 years of experience in designing hardware modules that can be used to create innovative, flexible and modular base test platforms.

Based on this extensive experience, the company has developed a highly efficient and modular way to assemble base test platforms. 6TL Engineering uses only high-quality products and interface systems to guarantee the best price-performance ratio for its customers. With this modularity concept as a base, you can develop a test system that automatically delivers:

- 6TL **A highly flexible and standardized platform ready for expansion and future technologies**
- 6TL **A highly efficient platform that is easy to maintain and designed using “green engineering”**
- 6TL **A highly reliable platform using only the best modules witch, guarantees high up-times**

The Challenge of Developing a Functional Test Platform

When you are thinking of functionally testing printed circuit boards (PCBs) or assemblies, at some stage you need to build the automated test equipment (ATE), which ideally is flexible, reliable, precise, and, of course, fast.

National Instruments provides a large range of instrumentation following different technologies like PXI or NI CompactRIO, making it easy for you to find the best instrumentation for your test system. Instruments that can fulfil your testing needs (see Figure. 1).

These systems are a great help to test engineers, however, more tools are needed to successfully build an automated test system.



Figure 1. NI PXI Test Instruments.

To turn this PXI rack into a production test system, you must think about the following issues:

- ❶ **Software platform** for test monitoring, control, and report generation
- ❷ **Test procedure and tester specifications**
- ❸ **Test instrumentation and power needs**
- ❹ **Interface definition and configuration** (tester receiver)
- ❺ **Cabling** between interface (receiver) and instrumentation
- ❻ **Rack size** of the system needs to be defined (keep future in mind)
- ❼ **Technology** needed for your production, table-top, off-line or in-line
- ❽ **Options** need to be incorporated for good ergonomics, safety, noise, efficiency, service-friendly, and so on
- ❾ All items need to be ordered and **delivery** needs to be monitored
- ❿ System needs to be **build, wired, and tested**.
- ⓫ **Software** needs to be **developed, debugged and tested**
- ⓬ **Security, EMC, crosstalk, ergonomics, CE certification, documentation, user training, maintenance, and so on**

There are a number of tasks and each one requires some specific knowledge about ATE technology, which is not most commonly available in-house on the engineering teams. This results in the consequence of potential delays and losses among the process.

Modular Test Platform Concept — The Solution to Many of Your Design Problems

When using the 6TL Engineering modular concept, you always have the right tester for each task and a test platform that has none of these weak points. With 6TL Engineering standard modules and your expertise, you can create the best test system for your needs.

To create your system, follow these steps:

- ❶ **Select the base rack**
- ❷ **Select as many modules as you need to create the perfect in- or off-line test solution**
- ❸ **Add NI PXI (or other) instrumentation**
- ❹ **Define the mass interconnect interface and cabling**



Figure 2. 6TL Engineering Modular Concept.

6TL Engineering can provide you with a base test platform including manuals, wiring diagrams, CE certification, and a fully populated mass interconnect interface including cabling to your NI instrumentation (or other). You just need to add your expertise and finish the test solution.

Here are two typical business cases:

1. Together with 6TL Engineering, users define the best base test platform for their needs and use this base test platform to ask for quotations with different system integrators. Users know exactly what they get as a base solution and, in combination with the best offer from the system integrator, get the best test solution (see Figure 3).

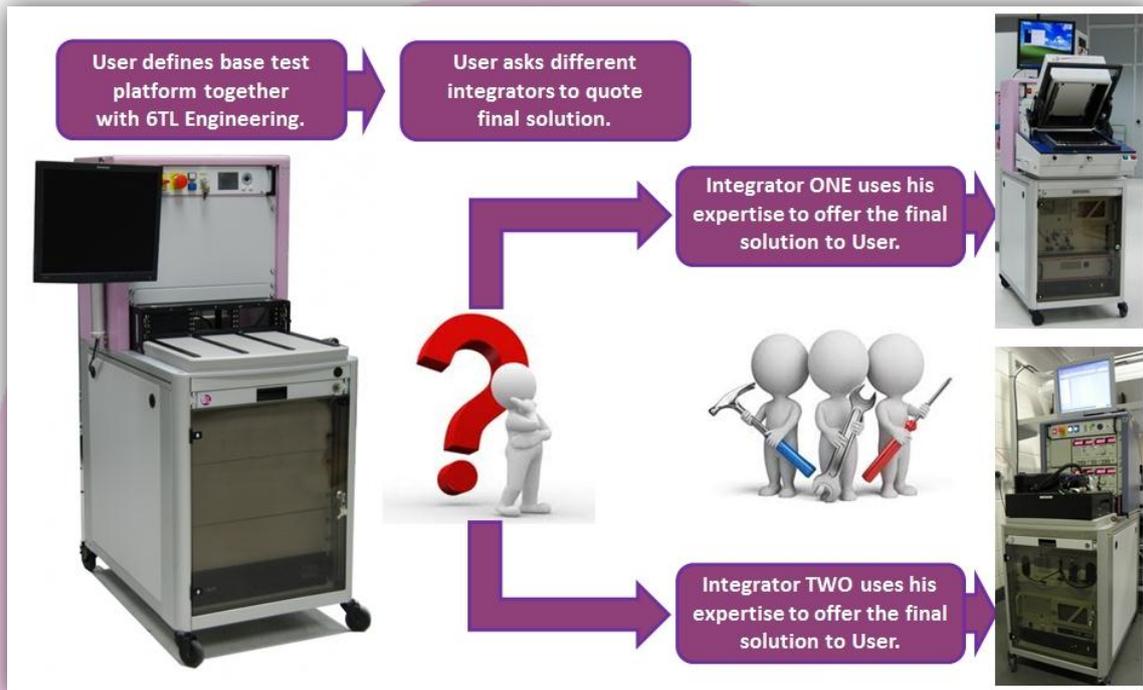


Figure 3. Business Case 1

2. Each engineer or engineering team has a special competence. Your software and electronic engineers are the backbone of your system design and test program solutions. Building test platforms is most likely not your software engineer's primary competence. However, 6TL Engineering's first competence is building base test platforms.

6TL Engineering can work with your engineering team to quickly define the best base test platform for your needs. Your engineers can then use their own competence to finish the complete test solution. By adding their skills in software and hardware development, you engineers can make it the best total test solution for the job (See Figure 4).

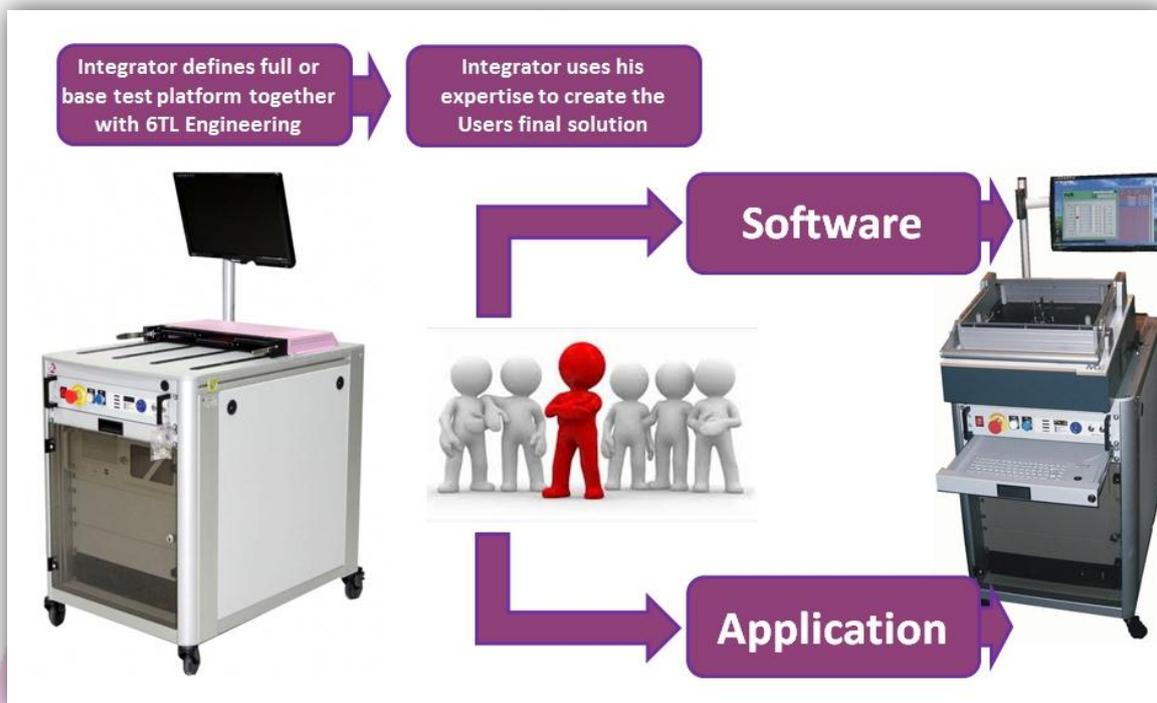


Figure 4. Business Case 2

Why a Mass Interconnect Interface is a Must

Reliability is a critical issue that needs to be addressed when developing and designing a test system. One underestimated issue is often the connection between the instrumentation and the unit under test (UUT). A test system is an expensive tool that earns its worth only when used constantly without failing. If you have a large production, you can dedicate your tester to one or two products. However, if you produce small to medium series of products, you want to use the same system for all your different UUTs. This means you have to change from one UUT to another several times a week, day, or even hour. Using the wrong interface between your UUT and the instrumentation of your test system can easily lead to false errors or contact failures that influence your test results and make your test system unreliable. Therefore, 6TL Engineering is using mass interconnect systems from Virginia Panel Corporation (VPC) in all its test platforms and modules that need to be close to the UUT (see Figure 5). Original instrument connectors are rated to work error free for a maximum of 100 to 200 cycles. A VPC mass interconnect interface is rated for 20,000 cycles without signal degradation. With only 20 changes a week and 50 weeks in a year, you already have 1,000 changeovers a year or minimal five production stops due to connector errors only per instrument. Resolving these problems results in downtime and downtime results in production losses and, finally, in less profits.



Figure 5. VPC Receiver With Some 6TL Modules.

Get the Best Signal Integrity Out of Your Instrumentation and Cabling

A side effect of adding a mass interconnect is the additional wiring between the instrumentation and the mass interconnect receiver (see Figure 6). This results in a longer signal path, more complex wiring diagrams, cross talk and so on. VPC offers complete cable assemblies for almost all NI instruments. These documented and tested cable assemblies provide a fast and modular way to create the connection between the NI instrumentation and the VPC receiver. This solution adds to the modularity of the 6TL Engineering concept.



Figure 6. Cabling From Instrumentation.

To eliminate additional cabling as much as possible, 6TL Engineering has mounted a mass interconnect module directly on the front of many of its YAVModules. These modules can be placed directly inside the mass interconnect receiver (see Figure 7).

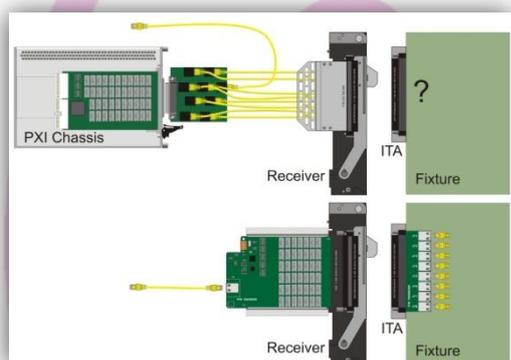


Figure 7. No Cables on YAVModules

If you use an instrument in the PXI rack, you might need many cables between the rack and the mass interconnect receiver. Using the 6TL YAVModule technology, eliminates this cabling because it is mounted directly inside the mass interconnect receiver. On the UUT side (in this example), small modules are fitted directly inside the mass

interconnect counter connector (ITA) so you can use standard CAT5 cabling in this case, making wiring extremely efficient. The same solutions are available for USB and Mini USB.

Modules That Are a Benefit to Your Engineering Efforts

6TL Engineering uses modules to efficiently build base test platforms. Combining these standard modules in one of the company's base system racks results in a complete base test platform that matches your needs. All of these modules are independent subsystems that you can easily integrate into the NI LabVIEW and NI TestStand software environments. All 6TL Engineering modules communicate through CAN bus, a simple and reliable communication bus, which makes wiring and communication between modules and test controller easy and reliable. Using the included 6TL Engineering Phi6 software based on LabVIEW, you can easily communicate to all 6TL Engineering modules through CAN bus, making debug, fault finding, and repair easy and fast.

All 6TL Engineering modules are designed for test only. This means that the 6TL Engineering YAVModules have a lot of added functionality that you can find only in expensive test systems. The best way to illustrate these benefits is to introduce you to the MMI Module.



Figure 8. MMI (Man Machine Interface Module)

The 6TL Engineering MMI (Man Machine Interface) is an independent module that covers everything you typically need to control a test platform (see Figure 8).

It holds all the necessary safety relays and features you need in any modular test platform. In addition the unit holds navigation buttons, on/off, start/stop, and emergency switches as well as a key to unlock certain programming and debug functions. A color LCD display is present to set up the system and to communicate to the operator. In the unit, there is a system power supply, user power supply, CAN Bus isolator and a LAN Interface for external communication. Furthermore, on the back of the system are inputs for temperature and cooling fans that can be controlled by the MMI. Alarms can be set on temperature en power quality, and temperature levels can be set to program the cooling speed of the test system fans. Also sockets are available for the system controller and a UPS (uninterruptible power supply). Additional inputs for extra emergency stops, a safety light curtain, and a foot pedal together with some free programmable I/O complete the unit. This provides a plug-and-play solution for all your system control needs and more.



Figure 9. Back View of the MMI

Building an In-line Base Platform (6TL-31) Using Modularity

To build an inline solution, you basically need a test rack with the above MMI controller, transport belt, lifter system to lift the PCB from the transport belt, and a pusher system to push the PCB on top of the bed of nails fixture.

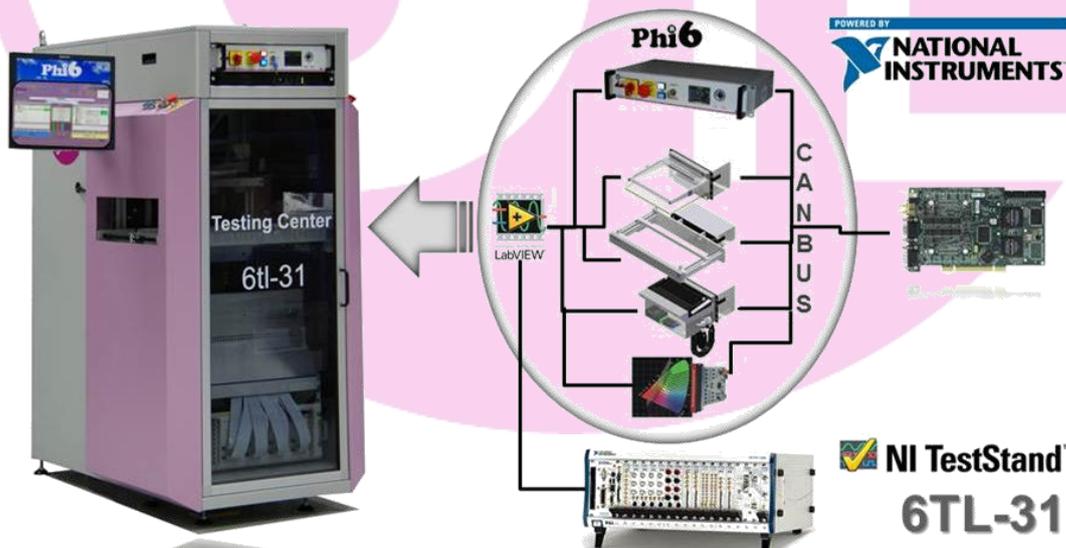


Figure 10. 6TL-31 In-Line Base Test Solution.

Within the 6TL Engineering concept, all three of these systems (modules) are independent subsystems like the MMI so you can use them in any of off- or inline test platforms (see Figure 10).

PDU Tackles a Common Problem in Test System Design



Figure 11. PDU inside a 6TL-29

The 6TL Engineering PDU (Programmable Distribution Unit) takes care of one of the many issues that test system designers need to cope with. If you switch on a test system typically your controller, power supplies and all instrumentation is connected to a power distribution bar that switches on all that is connected to it at the same time. This results in a short but large power spike — big enough to typically burn your relay contacts or activate a fuse. 6TL Engineering has added switches to its independent PDU subsystem and given it CAN bus control. This means that now the MMI or other controller can sequentially turn on your instrumentation preventing this large spike to occur.

A second benefit of this system is that you now have control in your test software (Labview/Ni Teststand). You can switch on or off individual instruments that you are not using for the particular UUT you are testing. This results in substantially lower power consumption and less wear on the instrumentation.

Efficient Use of Resources in a Test System Using YAVModules

When you develop a test solution for testing a PCB, you have to develop a test fixture to contact the PCB using spring loaded probes. When you want to test LEDs, push buttons automatically, or implement a Boundary Scan test, you have to add specific hardware inside each fixture. You typically have to buy these solutions again if you need to do the same for a new project. 6TL Engineering developed the YAVModules shown below for these applications especially. These modules have the mass interconnect interface mounted on the front of the board and can be placed directly inside the test system receiver (see Figure 5).



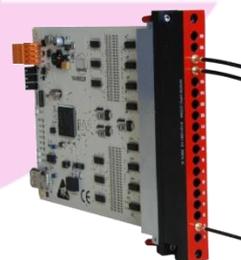
YAV9JTAGx

When you use Boundary Scan (BS) in your design and want to add non boundary scan nets to a boundary scan chain 6TL offers a solution with its YAV9JTAGx. In addition it provides high-speed digital and analog I/O's. This board is compatible with any Jtag technology, X-jtag or Göpel BS hardware solutions.



YAV90PNE

To automatically push buttons you typically have to get a lot of parts ordered to build the pneumatics to realize this. With the 6TL Engineering YAV90PNE you have one board in your test system that can control up to 10 pneumatic valves and one large external valve under program control. The modules pressure sensor warns in case of no air.



YAV90CLR

To see if a LED is the correct colour or intensity during test, you typically add measurement electronics with fiber-optics in your test fixture. With the 6TL Engineering YAV90CLR you have the detection hardware inside your test system and only need to add fiber optics inside your testfixture application for each LED.



Conclusion



SmartFixture



6TL-22



6TL-29

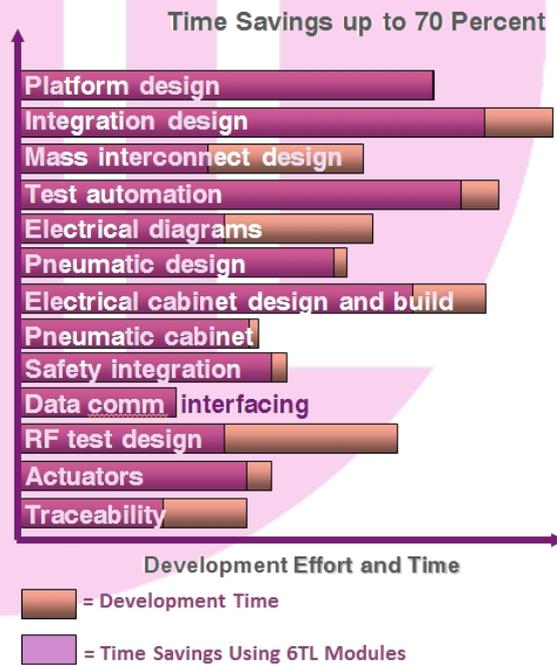


6TL-32

Test managers or system integrators who need to build a tester for their customers must ask the question, Do I **build** the system completely myself **or** do I **buy** modules?

Why spend time looking into issues that are already solved and proven in time?

- ❶ Why risk a delay in production start because you used valued engineering time developing non-core products and solutions?
- ❷ Why use your skilled resources that could be adding value in the project development, and in designing solutions for the test platform?
- ❸ Why put extra pressure on procurement to ask for separate quotations, orders, tracing shipments, guarding delivery and so on?



If you have a need in test and 6TL Engineering has a module for it, the answer is to buy



With 6TL Engineering it is “relatively” simple mathematics.

$E=MC^2$

6TL Engineering + NATIONAL INSTRUMENTS + YOU!

ATE

NATIONAL INSTRUMENTS Silver Alliance Partner

NATIONAL INSTRUMENTS LabVIEW CERTIFIED DEVELOPER

With the 6TL Engineering modules, NI instrumentation and **your expertise** you can have the best valued test solution for any given task.

For more information, email info@6TLEngineering.com or visit 6TLEngineering.com.

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