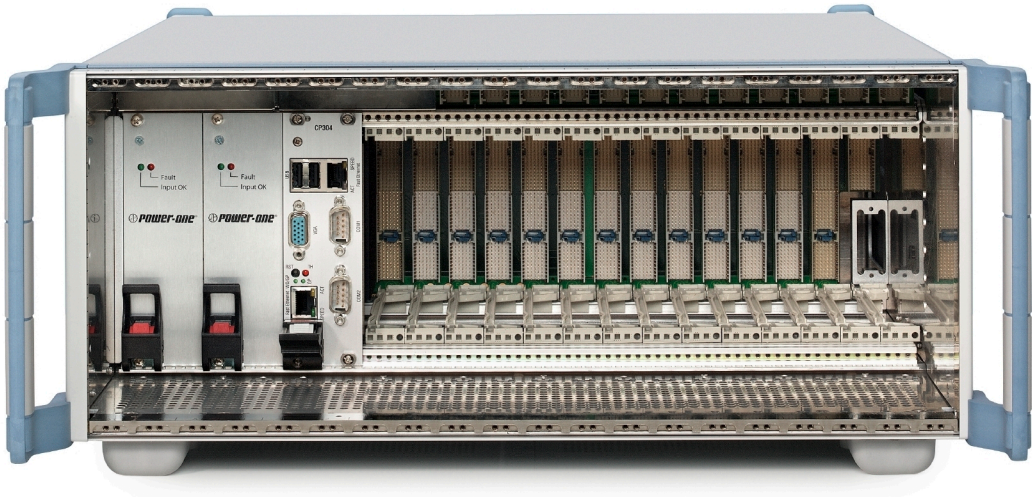


R&S®TSVP

Production Test Platform

System Manual



1178322802

This manual describes the following R&S®TSVP models:

- R&S® CompactTSVP (1152.2518.02)
- R&S®PowerTSVP (1157.8043.02)

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1178.3228.02 | Version 04 | R&S®TSVP

The following abbreviations are used throughout this manual: R&S®xyz1234 is abbreviated as R&S xyz1234.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standards of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment they require are designed, built and tested in accordance with the safety standards that apply in each case. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed, built and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards. To maintain this condition and to ensure safe operation, you must observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or, if expressly permitted, also in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for any purpose other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.

The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and, in some cases, a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation. Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.








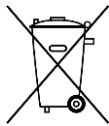



Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety instructions on personal safety, for example, that appear in relevant parts of the product documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by the Rohde & Schwarz group of companies, including instruments, systems and all accessories. For product-specific information, see the data sheet and the product documentation.

Safety labels on products

The following safety labels are used on products to warn against risks and dangers.

Symbol	Meaning	Symbol	Meaning
	Notice, general danger location Observe product documentation		ON/OFF Power
	Caution when handling heavy equipment		Standby indication
	Danger of electric shock		Direct current (DC)

Basic Safety Instructions

Symbol	Meaning	Symbol	Meaning
	Caution ! Hot surface		Alternating current (AC)
	Protective conductor terminal To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth		Direct/alternating current (DC/AC)
	Earth (Ground)		Class II Equipment to identify equipment meeting the safety requirements specified for Class II equipment (device protected by double or reinforced insulation)
	Frame or chassis Ground terminal		EU labeling for batteries and accumulators For additional information, see section "Waste disposal/Environmental protection", item 1.
	Be careful when handling electrostatic sensitive devices		EU labeling for separate collection of electrical and electronic devices For additional information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

Signal words and their meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers.



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Indicates information considered important, but not hazard-related, e.g. messages relating to property damage.

In the product documentation, the word ATTENTION is used synonymously.

These signal words are in accordance with the standard definition for civil applications in the European Economic Area. Definitions that deviate from the standard definition may also exist in other economic areas or military applications. It is therefore essential to make sure that the signal words described here are always used only in connection with the related product documentation and the related product. The use of signal words in connection with unrelated products or documentation can result in misinterpretation and in personal injury or material damage.

Basic Safety Instructions

Operating states and operating positions

The product may be operated only under the operating conditions and in the positions specified by the manufacturer, without the product's ventilation being obstructed. If the manufacturer's specifications are not observed, this can result in electric shock, fire and/or serious personal injury or death. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: predefined operating position is always with the housing floor facing down, IP protection 2X, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of $\pm 10\%$ shall apply to the nominal voltage and $\pm 5\%$ to the nominal frequency, overvoltage category 2, pollution degree 2.
2. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves). An installation that is not carried out as described in the product documentation could result in personal injury or even death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or even death.

Electrical safety

If the information on electrical safety is not observed either at all or to the extent necessary, electric shock, fire and/or serious personal injury or death may occur.

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the mains-supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with a protective conductor contact and protective conductor.
3. Intentionally breaking the protective conductor either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
4. If there is no power switch for disconnecting the product from the mains, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the mains. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 m. Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, the disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.

Basic Safety Instructions

6. The product may be operated only from TN/TT supply networks fuse-protected with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket provided for this purpose. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages $V_{rms} > 30$ V, suitable measures (e.g. appropriate measuring equipment, fuse protection, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC 60950-1 / EN 60950-1 or IEC 61010-1 / EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the protective conductor terminal on site and the product's protective conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fuse-protected in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.
14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1). Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.

Basic Safety Instructions

2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal/Environmental protection", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. Laser products are given warning labels that are standardized according to their laser class. Lasers can cause biological harm due to the properties of their radiation and due to their extremely concentrated electromagnetic power. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).
8. EMC classes (in line with EN 55011/CISPR 11, and analogously with EN 55022/CISPR 22, EN 55032/CISPR 32)
 - Class A equipment:
Equipment suitable for use in all environments except residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings
Note: Class A equipment is intended for use in an industrial environment. This equipment may cause radio disturbances in residential environments, due to possible conducted as well as radiated disturbances. In this case, the operator may be required to take appropriate measures to eliminate these disturbances.
 - Class B equipment:
Equipment suitable for use in residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.

Basic Safety Instructions

- Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, protective conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

If the information regarding batteries and rechargeable batteries/cells is not observed either at all or to the extent necessary, product users may be exposed to the risk of explosions, fire and/or serious personal injury, and, in some cases, death. Batteries and rechargeable batteries with alkaline electrolytes (e.g. lithium cells) must be handled in accordance with the EN 62133 standard.

- Cells must not be taken apart or crushed.
- Cells or batteries must not be exposed to heat or fire. Storage in direct sunlight must be avoided. Keep cells and batteries clean and dry. Clean soiled connectors using a dry, clean cloth.
- Cells or batteries must not be short-circuited. Cells or batteries must not be stored in a box or in a drawer where they can short-circuit each other, or where they can be short-circuited by other conductive materials. Cells and batteries must not be removed from their original packaging until they are ready to be used.
- Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
- If a cell develops a leak, the fluid must not be allowed to come into contact with the skin or eyes. If contact occurs, wash the affected area with plenty of water and seek medical aid.
- Improperly replacing or charging cells or batteries that contain alkaline electrolytes (e.g. lithium cells) can cause explosions. Replace cells or batteries only with the matching Rohde & Schwarz type (see parts list) in order to ensure the safety of the product.
- Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.
- Follow the transport stipulations of the carrier (IATA-DGR, IMDG-Code, ADR, RID) when returning lithium batteries to Rohde & Schwarz subsidiaries.

Transport

- The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.
- Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.

Instrucciones de seguridad elementales

3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal/Environmental protection

1. Specially marked equipment has a battery or accumulator that must not be disposed of with unsorted municipal waste, but must be collected separately. It may only be disposed of at a suitable collection point or via a Rohde & Schwarz customer service center.
2. Waste electrical and electronic equipment must not be disposed of with unsorted municipal waste, but must be collected separately.
Rohde & Schwarz GmbH & Co. KG has developed a disposal concept and takes full responsibility for take-back obligations and disposal obligations for manufacturers within the EU. Contact your Rohde & Schwarz customer service center for environmentally responsible disposal of the product.
3. If products or their components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
4. If handling the product releases hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

For additional information about environmental protection, visit the Rohde & Schwarz website.

Instrucciones de seguridad elementales

¡Es imprescindible leer y cumplir las siguientes instrucciones e informaciones de seguridad!

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estándares de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestro sistema de garantía de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el certificado de conformidad de la UE y ha salido de nuestra planta en estado impecable según los estándares técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las indicaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

Instrucciones de seguridad elementales











Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda sufrir daño. El uso del producto fuera de sus fines definidos o sin tener en cuenta las instrucciones del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado conforme a las indicaciones de la correspondiente documentación del producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos técnicos y ciertos conocimientos del idioma inglés. Por eso se debe tener en cuenta que el producto solo pueda ser operado por personal especializado o personas instruidas en profundidad con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de Rohde & Schwarz, encontraría la información debida en la documentación del producto en el capítulo correspondiente. Guarde bien las informaciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.








Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. Deberán tenerse en cuenta todas las demás informaciones de seguridad, como p. ej. las referentes a la protección de personas, que encontrarán en el capítulo correspondiente de la documentación del producto y que también son de obligado cumplimiento. En las presentes informaciones de seguridad se recogen todos los objetos que distribuye el grupo de empresas Rohde & Schwarz bajo la denominación de "producto", entre ellos también aparatos, instalaciones así como toda clase de accesorios. Los datos específicos del producto figuran en la hoja de datos y en la documentación del producto.

Señalización de seguridad de los productos

Las siguientes señales de seguridad se utilizan en los productos para advertir sobre riesgos y peligros.

Símbolo	Significado	Símbolo	Significado
	Aviso: punto de peligro general Observar la documentación del producto		Tensión de alimentación de PUESTA EN MARCHA / PARADA
	Atención en el manejo de dispositivos de peso elevado		Indicación de estado de espera (standby)
	Peligro de choque eléctrico		Corriente continua (DC)
	Advertencia: superficie caliente		Corriente alterna (AC)
	Conexión a conductor de protección		Corriente continua / Corriente alterna (DC/AC)

Instrucciones de seguridad elementales

Símbolo	Significado	Símbolo	Significado
	Conexión a tierra		El aparato está protegido en su totalidad por un aislamiento doble (reforzado)
	Conexión a masa		Distintivo de la UE para baterías y acumuladores Más información en la sección "Eliminación/protección del medio ambiente", punto 1.
	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)		Distintivo de la UE para la eliminación por separado de dispositivos eléctricos y electrónicos Más información en la sección "Eliminación/protección del medio ambiente", punto 2.
	Advertencia: rayo láser Más información en la sección "Funcionamiento", punto 7.		

Palabras de señal y su significado

En la documentación del producto se utilizan las siguientes palabras de señal con el fin de advertir contra riesgos y peligros.



Indica una situación de peligro que, si no se evita, causa lesiones graves o incluso la muerte.



Indica una situación de peligro que, si no se evita, puede causar lesiones graves o incluso la muerte.



Indica una situación de peligro que, si no se evita, puede causar lesiones leves o moderadas.



Indica información que se considera importante, pero no en relación con situaciones de peligro; p. ej., avisos sobre posibles daños materiales.

En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación del producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

Instrucciones de seguridad elementales

Estados operativos y posiciones de funcionamiento

El producto solamente debe ser utilizado según lo indicado por el fabricante respecto a los estados operativos y posiciones de funcionamiento sin que se obstruya la ventilación. Si no se siguen las indicaciones del fabricante, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte. En todos los trabajos deberán ser tenidas en cuenta las normas nacionales y locales de seguridad del trabajo y de prevención de accidentes.

1. Si no se convino de otra manera, es para los productos Rohde & Schwarz válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, uso solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4500 m sobre el nivel del mar. Se aplicará una tolerancia de $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal. Categoría de sobrecarga eléctrica 2, índice de suciedad 2.
2. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptos para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (p. ej. paredes y estantes). Si se realiza la instalación de modo distinto al indicado en la documentación del producto, se pueden causar lesiones o, en determinadas circunstancias, incluso la muerte.
3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

Seguridad eléctrica

Si no se siguen (o se siguen de modo insuficiente) las indicaciones del fabricante en cuanto a seguridad eléctrica, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, o bien si el interruptor existente no resulta apropiado para la desconexión de la red, el enchufe del cable de conexión se deberá considerar como un dispositivo de desconexión. El dispositivo de desconexión se debe poder alcanzar fácilmente y debe estar siempre bien accesible. Si, p. ej., el enchufe de conexión a la red es el dispositivo de desconexión, la longitud del cable de conexión no debe superar 3 m).
Los interruptores selectores o electrónicos no son aptos para el corte de la red eléctrica. Si se

Instrucciones de seguridad elementales

integran productos sin interruptor en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.

5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión $U_{\text{eff}} > 30 \text{ V}$ se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.
12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.

Instrucciones de seguridad elementales

17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados —los llamados alérgenos (p. ej. el níquel)—. Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación/protección del medio ambiente", punto 1.
5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. Los productos con láser están provistos de indicaciones de advertencia normalizadas en función de la clase de láser del que se trate. Los rayos láser pueden provocar daños de tipo biológico a causa de las propiedades de su radiación y debido a su concentración extrema de potencia electromagnética. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).
8. Clases de compatibilidad electromagnética (conforme a EN 55011 / CISPR 11; y en analogía con EN 55022 / CISPR 22, EN 55032 / CISPR 32)
 - Aparato de clase A:
Aparato adecuado para su uso en todos los entornos excepto en los residenciales y en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.
Nota: Los aparatos de clase A están destinados al uso en entornos industriales. Estos aparatos

Instrucciones de seguridad elementales

pueden causar perturbaciones radioeléctricas en entornos residenciales debido a posibles perturbaciones guiadas o radiadas. En este caso, se le podrá solicitar al operador que tome las medidas adecuadas para eliminar estas perturbaciones.

- Aparato de clase B:
Aparato adecuado para su uso en entornos residenciales, así como en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.

Reparación y mantenimiento

1. El producto solamente debe ser abierto por personal especializado con autorización para ello. Antes de manipular el producto o abrirlo, es obligatorio desconectarlo de la tensión de alimentación, para evitar toda posibilidad de choque eléctrico.
2. El ajuste, el cambio de partes, el mantenimiento y la reparación deberán ser efectuadas solamente por electricistas autorizados por Rohde & Schwarz. Si se reponen partes con importancia para los aspectos de seguridad (p. ej. el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada cambio de partes relevantes para la seguridad deberá realizarse un control de seguridad (control a primera vista, control del conductor de protección, medición de resistencia de aislamiento, medición de la corriente de fuga, control de funcionamiento). Con esto queda garantizada la seguridad del producto.

Baterías y acumuladores o celdas

Si no se siguen (o se siguen de modo insuficiente) las indicaciones en cuanto a las baterías y acumuladores o celdas, pueden producirse explosiones, incendios y/o lesiones graves con posible consecuencia de muerte. El manejo de baterías y acumuladores con electrolitos alcalinos (p. ej. celdas de litio) debe seguir el estándar EN 62133.

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.
5. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
6. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
7. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

Instrucciones de seguridad elementales

8. En caso de devolver baterías de litio a las filiales de Rohde & Schwarz, debe cumplirse las normativas sobre los modos de transporte (IATA-DGR, código IMDG, ADR, RID).

Transporte

1. El producto puede tener un peso elevado. Por eso es necesario desplazarlo o transportarlo con precaución y, si es necesario, usando un sistema de elevación adecuado (p. ej. una carretilla elevadora), a fin de evitar lesiones en la espalda u otros daños personales.
2. Las asas instaladas en los productos sirven solamente de ayuda para el transporte del producto por personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como p. ej. grúas, carretillas elevadoras de horquilla, carros etc. Es responsabilidad suya fijar los productos de manera segura a los medios de transporte o elevación. Para evitar daños personales o daños en el producto, siga las instrucciones de seguridad del fabricante del medio de transporte o elevación utilizado.
3. Si se utiliza el producto dentro de un vehículo, recae de manera exclusiva en el conductor la responsabilidad de conducir el vehículo de manera segura y adecuada. El fabricante no asumirá ninguna responsabilidad por accidentes o colisiones. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Asegure el producto dentro del vehículo debidamente para evitar, en caso de un accidente, lesiones u otra clase de daños.

Eliminación/protección del medio ambiente

1. Los dispositivos marcados contienen una batería o un acumulador que no se debe desechar con los residuos domésticos sin clasificar, sino que debe ser recogido por separado. La eliminación se debe efectuar exclusivamente a través de un punto de recogida apropiado o del servicio de atención al cliente de Rohde & Schwarz.
2. Los dispositivos eléctricos usados no se deben desechar con los residuos domésticos sin clasificar, sino que deben ser recogidos por separado.
Rohde & Schwarz GmbH & Co.KG ha elaborado un concepto de eliminación de residuos y asume plenamente los deberes de recogida y eliminación para los fabricantes dentro de la UE. Para desechar el producto de manera respetuosa con el medio ambiente, diríjase a su servicio de atención al cliente de Rohde & Schwarz.
3. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
4. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

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1 System Overview

1.1 Usage

There is a heightened interest in testing departments to configure the required functions in compact units as flexibly as possible so that future requirements can be covered without any need for large additional investments.

Moreover, constantly reduced product development times call for powerful, easy-to-operate and standardized software components which can be integrated as reusable modules in a multitude of applications.

Customer requirements, particularly in the telecommunications and automotive electronics sector, emphasize power density and modularity, thus clearly pointing to platform-based Test & Measurement equipment that is favourably priced and suitable for industry.

1.2 System Architecture

TSVP test platform was to provide users with an extremely wide portfolio of T & M methods of modern test equipment. This was accomplished by consistently using open industrial standards such as CompactPCI / PXI and CAN. In addition to Rohde & Schwarz modules, other commercially available hardware components that support these standards can be integrated into the system without any modifications.

The measurement and switching modules are designed for flexible use in the function test of electronics modules. This test can be optionally expanded to a combination test by means of in-circuit testing of components. This is a unique capability based on the CompactPCI/PXI standard.

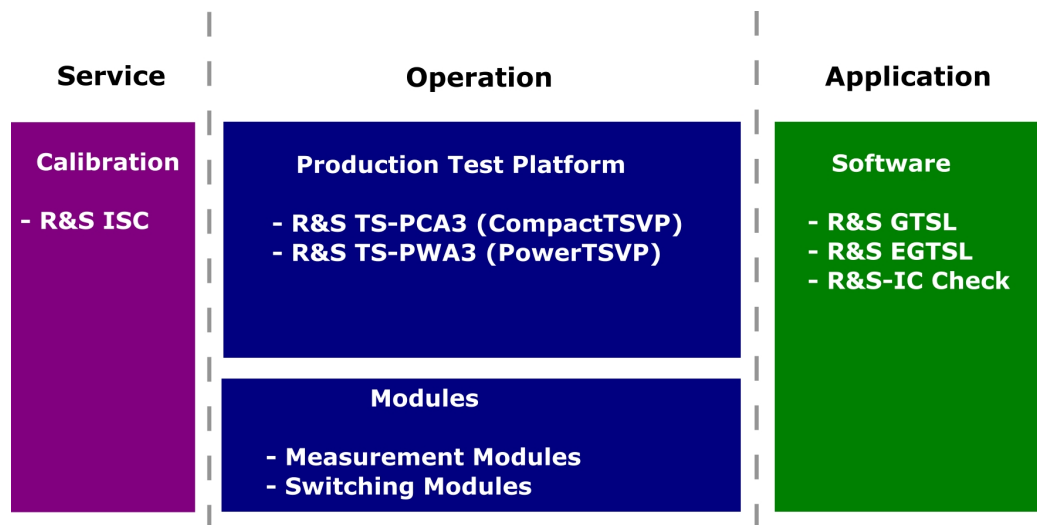


Figure 1-1: Modular System Architecture of the TSVP Test Platform

2 Introduction Production Test Platforms

2.1 R&S CompactTSVP (R&S®TS-PCA3)

The **Test System Versatile Platform R&S TS-PCA3** is a standardized modular platform for the program-controlled testing of modules and terminals in the factory or laboratory. With its flexible configuration and the use of worldwide standards, it can be perfectly adapted to suit the needs of the user.

The functionality is achieved with the R&S TS-PSYS1. It is found in the rear I/O slot 15 of the R&S TS-PCA3. The R&S TS-PSYS1 system module is controlled via cPCI-interface.

System functions such as voltage and temperature monitoring, switchable trigger signals and optocoupler interface are used to integrate the CompactTSVP and PowerTSVP in a complete system.

The module is available in two variants:

- TS-PSYS1 1157.4004.02 (obsolete)
- TS-PSYS1 1157.9910.10

The R&S TS-PSYS1 has CAN controller (CAN2 User). Buses of the controller are available on X30 connector. They allow, with help of the jumper on connector X40 to connect the module with the front module TS-PMB located in the slot 15. The CAN2 controller is operated via SW module RSCAN.

Larger ATE (**A**utomatic **T**est **E**quipment) systems can be created by combining R&S TS-PCA3 and PowerTSVP (TS-PWA3). The production test platform is intended for use with a control processor which performs the test on the test devices by means of peripheral modules. This control processor is known as the **system controller** and should preferably be in the R&S TS-PCA3. However a standard PC can also be used running across a suitable interface with the controller. The system controller executes user-created sequences that define the test procedures and specification limits.

The **modules** plugged into the R&S TS-PCA3 can be used for the creation of test and control signals and for the measuring related evaluation of the response from the UUT. For this purpose they are able to pass signals between each other and select signals under program control and pass them to external measuring systems.

The peripheral modules can be quickly and flexibly adapted to the test devices by preceding the R&S TS-PCA3 with an **adapter frame** which connects the signals securely and with a low rate of wear.

If the production test requires switching functions with a large number of channels or the switching of high currents, then the R&S TS-PCA3 can be supplemented by a R&S TS-PWA3. The R&S TS-PWA3 is controlled via the CAN-Bus of the R&S TS-PCA3 by the system controller.

2.1.1 Design

2.1.1.1 Slot Layout

Plan View

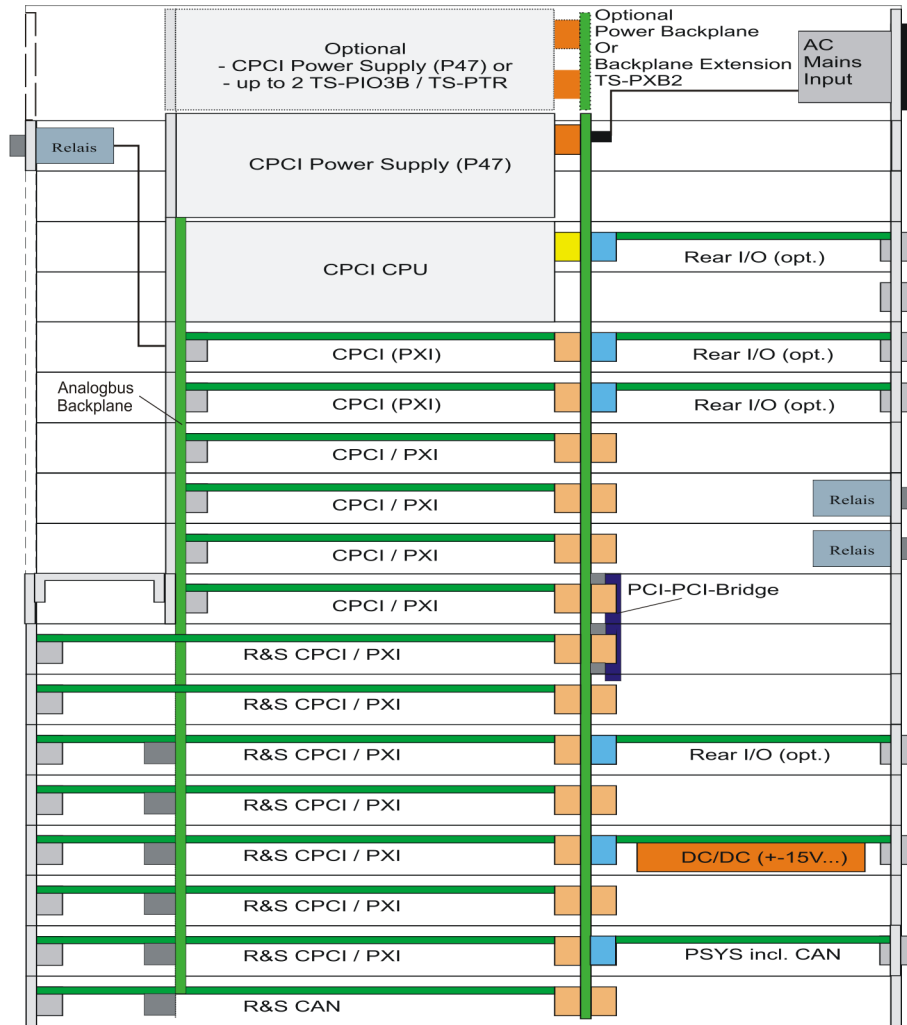
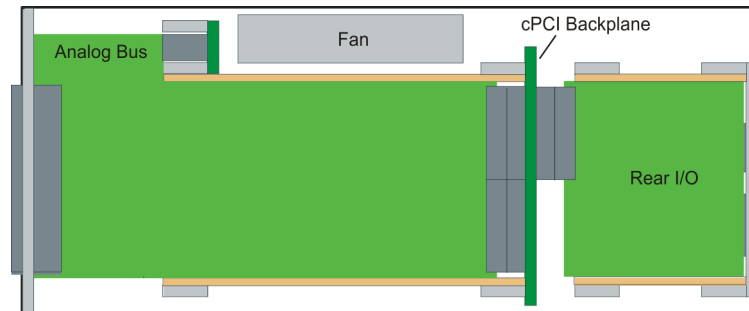


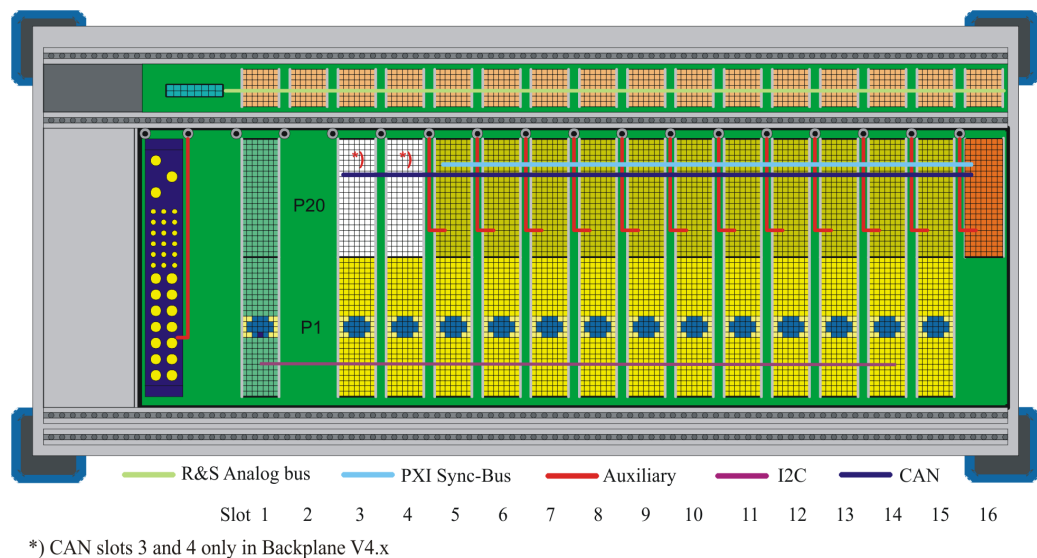
Figure 2-1: Plan View (Example)

Side View**Figure 2-2: Side View****2.1.1.2 Backplanes**

The R&S TS-PCA3 contains the following backplanes:

- cPCI backplane with PICMG Power Interface and Rear I/O support
- Analog bus backplane
- Power backplane with PICMG Power Interface (optional)

Figure 2-3 shows the backplanes with the bus systems.

**Figure 2-3: Backplanes and Bus Systems****cPCI Backplane**

The cPCI backplane is implemented as follows:

- 3 U
- 72 HP
- 32 bit
- 33 MHz

- $V_{i/o} = 5\text{ V}$

The backplane fulfils the Hot-Swap capability according to Standard PICMG 2.1 Rev. 2.0 for the exchange of measuring and control cards during operation. The 32 bit area conforms to PICMG 2.0 Rev. 3.0. **It should be noted that ROHDE & SCHWARZ TSVP modules (R&S TS-XXX) are not capable of hot swapping.**

Connector X0 (P47) serves as a power interface for a cPCI standard PSU. An additional PSU can be plugged onto an optional power backplane, in which case the connection with the cPCI backplane is made with an ATX power supply cable.

Slots 1 to 8 are the first bus segment. Slots 9 to 15 form the second bus segment that is connected to the first with a PCI-PCI bridge. Slot 15 with its rear exit for the P1 signals is designed to control the system module.

The Rear I/O conforms to IEEE 1101.11-1998. The P20 connectors at slots 3 and 4 are manufactured to cPCI standard, 32 bit with Rear I/O. Voltages up to 125 VDC can be applied at pins provided in the Rear I/O area.

Signals PXI_TRIG0 ... 7 and PXI_CLK10 according to standard PXI R2.0 are available at the P20 connections in slots 5 to 16.

Local bus

The PXI local bus is not implemented. If necessary, wiring can be created between adjacent slots by plugging in a customer-specific connection board (plugged into the backplane).

CAN-Bus

The **CAN bus** *[1] is integrated as a further system bus in addition to the IPMB0 (slots 3 to 14) according to System Management Specification PICMG 2.9 R1.0, and is available at slots 5 to 16 (starting with backplane version V4.x in slots 3 and 4 as well). Signals CAN_L and CAN_H can be terminated at the bus end with a jumper and 120 Ohm resistor (see Figure 2-4). Alternatively the bus can be extended externally with an X80 expansion connector.

* [1] to standard CAN 2.0b (1Mbit)

If the optional R&S TS-PXB2 backplane extension is used, the CAN bus is also available at slots A1 and A2. The R&S TS-PXB2 is connected to the main backplane via X80. The use of the backplane extension does not change the termination principle.

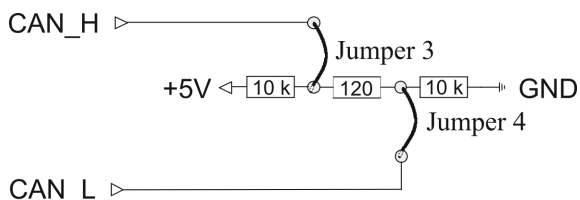


Figure 2-4: CAN Bus Termination

Table 2-1: CAN Bus

Number Lines	U_{\max} (VDC)	Pin
2	5	CAN_H: P20/C1 CAN_L: P20/D1

In the old design V1.0 - V3.0, the CAN bus is bussed directly, guided via PXI local bus lines LBL10 and LBL11. In the most unfavorable case, this resulted in conflicts with other PXI modules that were using the lines in a different way.

In the new design V4.0, the CAN bus is switched. The two signals are only switched by PhotoMOS relays on the backplane to the pins of a slot if a CAN module is detected in that slot. In that case the switch behaves like an isolating relay and does not affect the signals of the LBxx. It is able to isolate voltages up to ± 60 V DC.

PCI slots 3 + 4 now have this switch in the backplane and are thus CAN-capable. The CAN bus is continuously connected on slots 15 + 16 and (optional) on A1 + A2 without switching.

A 330Ω pull-up resistor between P2/D18 and +5 V on each module is responsible for detecting a CAN module and activating the CAN bus. Normal cPCI or PXI modules according to specification apply this pin to GND or leave it open. This ensures the CAN bus is never in conflict with analogue voltages of the local bus.

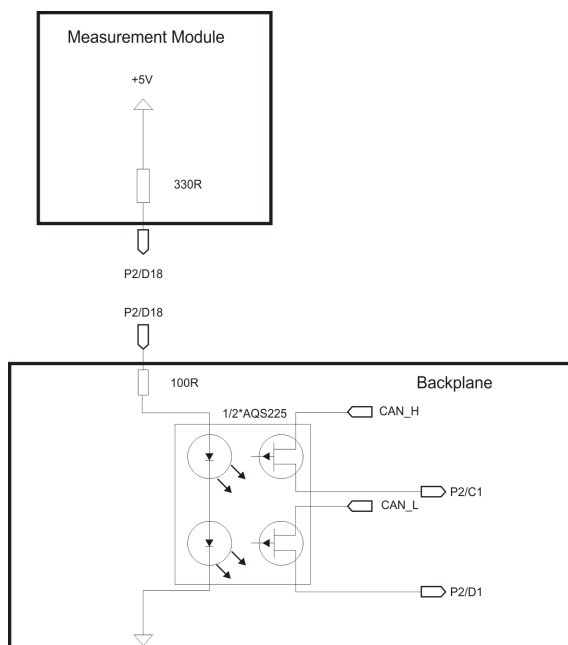


Figure 2-5: Wiring CAN bus

External additional signals (AUX)

Two additional **external signals** (for example power supply voltages) can be fed into a module via J20 on slots 5 through 16. The signals can be fed in the area of the CPCI power pack by the CPCI power supply, an internal AC/DC module or another external

signal sources. This can be used to provide a primary voltage to generate local supply voltages (DC/DC converter), etc.

Table 2-2: External Additional Signals

Number Lines	U_{\max} (VDC)	I_{\max} / Slot (ADC)	Pin
2	60	2	Input for ext. signals: J20: AUX1 B20, E19 J20: AUX2 A20, D19

+5-V and +12-V lines from the P47 connector are routed on the screw bolts above slot 4. This makes it easy to connect AUX1 with +5 V and AUX2 with +12 V via current rail or cable (see [Figure 2-6](#)).

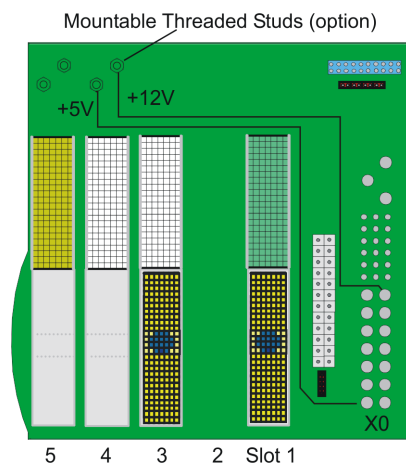


Figure 2-6: Mountable Threaded Studs on the cPCI Backplane

The AUX pins assigned to slots 5 - 16 make it possible to direct two voltages from the current rail on the upper backplane if a screw there connects the backplane signals with the current rail. Currently in backplanes V1.1 through V3.0 two pins are hard connected to carry a higher current.

This is changed in backplane V4.0 so the two pins are not connected in normal state. One pin (for example AUX1L) on the solder side is directed to the current rail and one pin (AUX1R) on the module side is directed to the current rail as well. The connection is not made until a screw with a nut is screwed in and connects the current rail and the two copper rings in the layout. It may be preferably to insert a toothed washer to ensure better contact.

Functionally this is no different than the previous version. The PXI specification is observed except for the lack of a local bus daisy chain. Full current must not be drawn unless the two pins are connected in parallel.

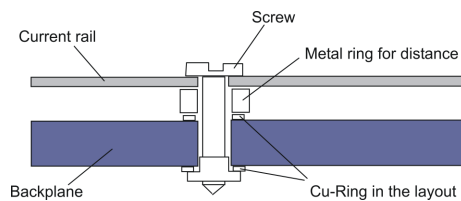


Figure 2-7: Connecting the current rail to AUX signals

Analog Bus Backplane

To simplify cabling, the R&S TS-PCA3 contains an analog bus with 8 signals. The analog bus backplane is located in the front above the cPCI backplane. A special layout meets the need for high crosstalk damping and low capacitance of the signal lines to GND.

The C module (2 mm connector system) is used as the connectors (X1...X16). Plug-in modules with no analog bus connector access the analog bus via a 26-pin connector (X22) and R&S switch modules. Signals IL1_x and IL2_x (Instrument Line) are passed from slots 5 to 16 to connector X22.

The analog bus signals pass from connector X21 to connector X2 at the back of the R&S TS-PCA3. The electrical characteristics of the analog lines are:

- Voltage 125 VDC max.
- Current 1 A max.

Concept of the Analog Bus

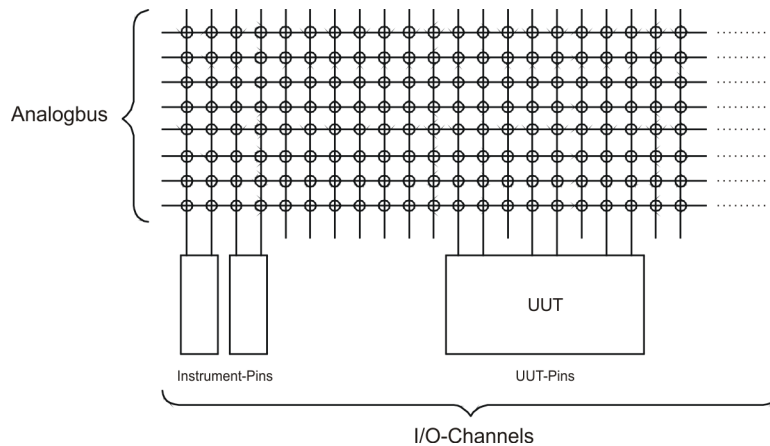


Figure 2-8: Principle of the Analog Bus

The analog bus in the R&S TS-PCA3 connects I/O channels of different plug-in modules to each other. These I/O channels may be connections of instruments (measuring and stimuli devices) and connections of the test device. Up to 8 signals can be connected simultaneously (see [Figure 2-8](#)).

The analog bus can be used flexibly with the ROHDE & SCHWARZ- specific plug-in modules. 8 equivalent lines are basically available (ABa1, ABa2, ABb1, ABb2, ABc1, ABc2, ABd1, ABd2). External instruments are usually connected to the R&S TS-PCA3

with a rear I/O connection. The signals for the test device are made available at the front-end connector of the various plug-in modules on the R&S TS-PCA3.

The analog bus can be used in different ways:

- as 1 bus with 8 lines
- in 2 part-buses with 4 lines each

The split of the analog bus into part-buses depends on the plug-in modules which are used.

The analog bus concept of the R&S TS-PCA3 fully meets the requirements that are frequently made in metrology:

- A small number of bus lines for a high number of I/O channels (e.g. In-Circuit-Test with 3 to 6 bus lines.)
- As many signals as possible simultaneously for a moderate number of I/O channels (e.g. function test with 8 lines of 50 to 100 I/O channels).
- Parallel test with split analog bus.

Line paths or higher-frequency signals are usually connected locally by special switching modules and not via the analog bus.

Typical Use of the Analog Bus

The use of the analog bus and individual bus lines is illustrated with available R&S modules and standard modules (see [Figure 2-9](#)).

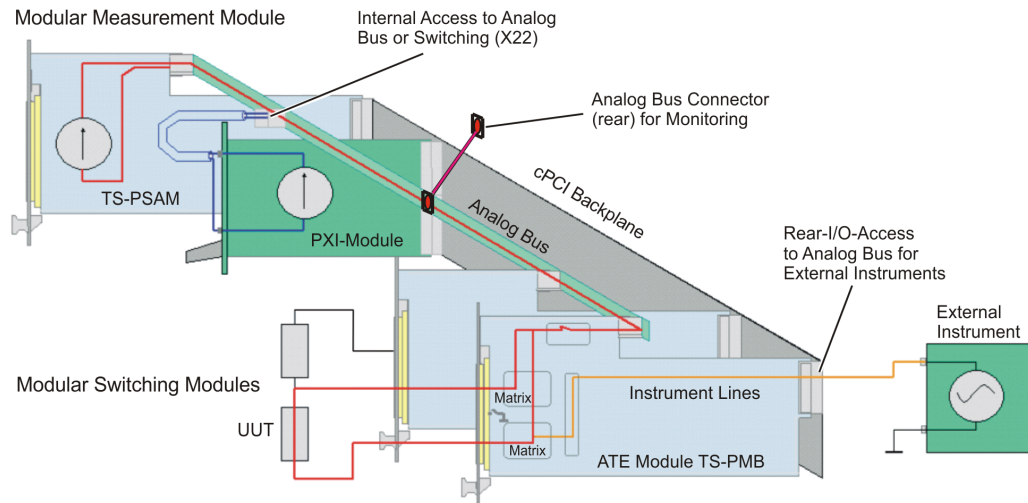


Figure 2-9: Use of the Analog Bus in the R&S TS-PCA3 (Example)

Power Backplane

The use of a second cPCI PSU in slots A1, A2 requires the optional Power Backplane (conforms to standard PICMG 2.0). From the Power Backplane, a cable with three connectors leads to a 24-pin ATX connector on the cPCI backplane. The three connectors are as follows:

- X12, 20-pin
- X13, 10-pin
- X16, 4-pin

The second PSU can be used to boost the power of the standard PSU when connected in parallel. Alternatively it can be used to supply the device on test.

Backplane Extension R&S TS-PXB2 (Option)

The R&S TS-PXB2 option expands the Test System Versatile Platform R&S TS-PCA3 by 2 CAN bus slots (A1 and A2). It can be integrated ex works only.

The two slots are intended for the R&S TS-PIO3B or R&S TS-PTR options. The R&S TS-PIO3B is an 8-channel, 8-bit Open Collector Digital I/O card with additional functions.

The R&S TS-PTR is a passive feedthrough circuit board. It can be used to feed as many as 24 signals through the device.

Ports 5, 6 and 7 of the R&S TS-PIO3B in slot A1 are routed to connector X1 on the rear panel.

Ports 5, 6 and 7 of the R&S TS-PIO3B in slot A2 are available on connector DIO on the rear I/O slot A4.

In addition, the system CAN bus is available at the CAN connector on the rear I/O slot A4.

The option R&S TS-PXB2 cannot be used together with the power backplane. The jumpers and the assignment of the connectors in the rear I/O area are described in [Chapter 2.1.1.4, "Permitted Module Configuration"](#), on page 15.

2.1.1.3 Function Description

The functionality of the R&S TS-PCA3 depends essentially on the installed plug-in modules and the related software. The R&S TS-PCA3 is basically suitable for all types of production tests.

An adapter interface can be flange-mounted to the front of the R&S TS-PCA3 for the rapid and high-pole adaption of test devices.

2.1.1.4 Permitted Module Configuration

Because of the different properties of plug-in modules, there are restrictions on the use of plug-in slots.

[Figure 2-10](#) and [Figure 2-11](#) shows an overview of which modules can be operated in which plug-in slots.

TS-PCA3 Backplane V2.1 and V3.x

Front side	A1	A2	A3	A4	1	2	3 ^{*1)}	4	5	6	7	8	9	10	11	12	13	14	15	16
Power-Supply																				
Power-Supply Ext. *5)																				
System Controller *2)																				
TS-PSAM																				
TS-PICT																				
TS-PFG																				
TS-PAM																				
TS-PDFT																				
TS-PIO4																				
TS-PIO5																				
TS-PHD1 *3)																				
TS-PMB (Vers. ≥ 3.0)																				*8)
TS-PMB (Vers. 2.x)																				
TS-PSM1																				
TS-PSM2																				*8)
TS-PSM3																				
TS-PSM4																				
TS-PSM5																				
TS-PIO1																				
TS-PIO2																				
TS-PSU/PSU12																				
TS-PIO3B / PTR *4)																				
Rear side	A1	A2	A3	A4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TS-PSYS1																				
TS-PSYS2 *7)																				
TS-PDC																				
TS-PSCx-RIO *6)																				
TS-PSC0 *2)																				
TS-PAC																				
TS-PCAL2																				
TS-PRIO																				
TS-PRIO4																				
TS-PK04																				

- *1) Module solder side must be isolated against left neighbor slot if a system controller is installed
- *2) A bridge card (TS-PSC0) OR a CPU module (TS-PSC3, TS-PSC4) must be used; TS-PSC4 only for backplane Vers. 3.x
- *3) Only in slot 9 to 15 if system controller TS-PSC3 is used; Not allowed in backplane Version 3.x
- *4) Only with optional backplane extension TS-PXB2; Cannot be combined with power supply extension TS-PCPA
- *5) Only with optional backplane extension TS-PCPA; Cannot be combined with TS-PXB2
- *6) System controller RIO module must match CPU type in front slot
- *7) Only TS-PSYS2 modules with identification number 1157.8508.02
- *8) Only if option TS-PK04 is not installed

Figure 2-10: Module Configuration R&S TS-PCA3 (Backplane Version 2.1 and 3.x)

TS-PCA3 Backplane V4.0

Front side	A1	A2	A3	A4	1	2	3 *1)	4	5	6	7	8	9	10	11	12	13	14	15	16	
Power-Supply																					
Power-Supply Ext. *5)																					
System Controller *2)																					
TS-PSAM																					
TS-PICT																					
TS-PFG																					
TS-PAM																					
TS-PDFT																					
TS-PIO4																					
TS-PIO5																					
TS-PHDT *3)																					
TS-PMB (Vers. ≥ 3.0)																					*8)
TS-PMB (Vers. 2.x)																					
TS-PSM1																					
TS-PSM2																					*8)
TS-PSM3																					
TS-PSM4																					
TS-PSM5																					
TS-PIO2																					
TS-PSU / PSU12																					
TS-PIO3B / PTR *4)																					
Rear side	A1	A2	A3	A4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
TS-PSYS1																					
TS-PSYS2 *7)																					
TS-PDC (Vers. ≥ 1.1)																					
TS-PDC (Vers. ≥ 1.1)																					
TS-PSCx-RIO *6)																					
TS-PSC0/PSC07 *2)																					
TS-PAC																					
TS-PCAL2																					
TS-PRIO																					
TS-PRIO4																					
TS-PK04																					

*1) Module solder side must be isolated against left neighbor slot if a system controller is installed
 *2) A bridge module (TS-PSC0, TS-PSC07) OR a system controller (TS-PSC3, TS-PSC4, TS-PSC5x, TS-PSC6x) must be used
 *3) Only in slot 9 to 15 if system controller TS-PSC3 is used
 *4) Only with optional backplane extension TS-PXB2; Cannot be combined with power supply extension TS-PCPA
 *5) Only with optional backplane extension TS-PCPA; Cannot be combined with TS-PXB2
 *6) System controller RIO module must match CPU type in front slot
 *7) TS-PSYS2 is not allowed in a CompactTSVP with backplane Version 4
 *8) Only if option TS-PK04 is not installed

Figure 2-11: Module Configuration R&S TS-PCA3

2.2 R&S PowerTSVP (R&S®TS-PWA3)

The **Test System Versatile Platform R&S TS-PWA3** is a standardized modular platform for the program-controlled testing of modules and terminals in the factory or laboratory. With its flexible configuration and the use of worldwide standards, it can be perfectly adapted to suit the needs of the user.

The R&S TS-PWA3 is primarily intended as a flexible switching unit for measurement signals, signal sources and UUT loads. This facilitates the migration of existing and proprietary "Rack and Stack" systems to a production test platform.

The functionality is achieved with the R&S TS-PSYS2. It is found in the rear I/O slot 15 of the R&S TS-PWA3.

The module is available in two variants:

- TS-PSYS2 1157.8508.02 (obsolete)

- TS-PSYS2 1157.9910.20

The R&S TS-PSYS2 1157.9910.20 module is identically constructed as the R&S TS-PSYS1 1157.9910.10 module of the R&S TS-PCA3. The difference is in the programming of the flash memory. If the module operates in a PowerTSVP, the function of the PCI port is automatically deactivated. Also, in this mode the CAN controller is not available.

R&S TS-PCA3 and R&S TS-PWA3 can be combined to create more complex ATE (**A**utomatic **T**est **E**quipment) systems with a high number of test pins. The R&S TS-PWA3 is controlled either by the **system controller** of a R&S TS-PCA3 (cPCI system) or by an external PC. A serial bus system (CAN bus) is used to trigger the modules in the R&S TS-PWA3. External cabling is used to make the connection with the measurement and trigger bus of the R&S TS-PCA3.

The R&S TS-PWA3 can be fitted with special ROHDE & SCHWARZ switching and load modules. The unit provides an analog bus that can be used to make complex connections. The modules can also be used without any modification in the R&S TS-PCA3.

The peripheral modules can be quickly and flexibly adapted to the UUTs by preceding the Test System Versatile Platform with an **adapter frame** which connects the signals securely and with a low rate of wear.

2.2.1 Design

2.2.1.1 Slot Layout

Plan View

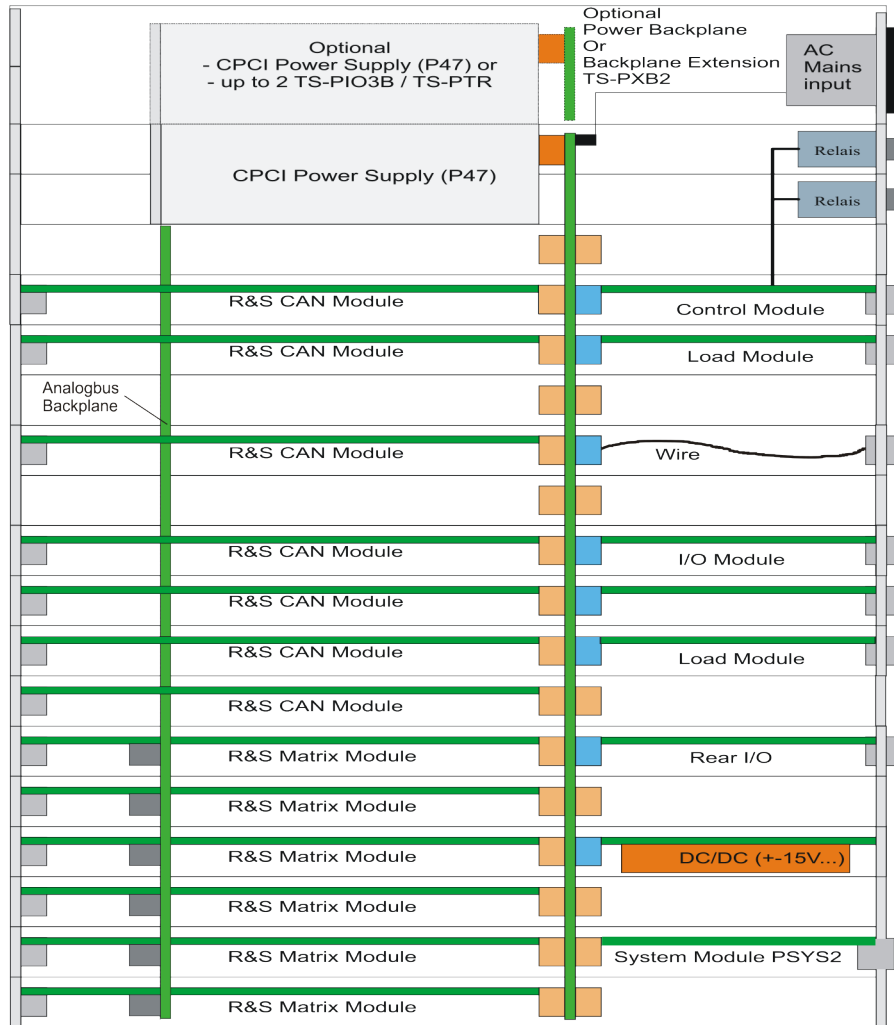


Figure 2-12: Plan View (Example)

Side View

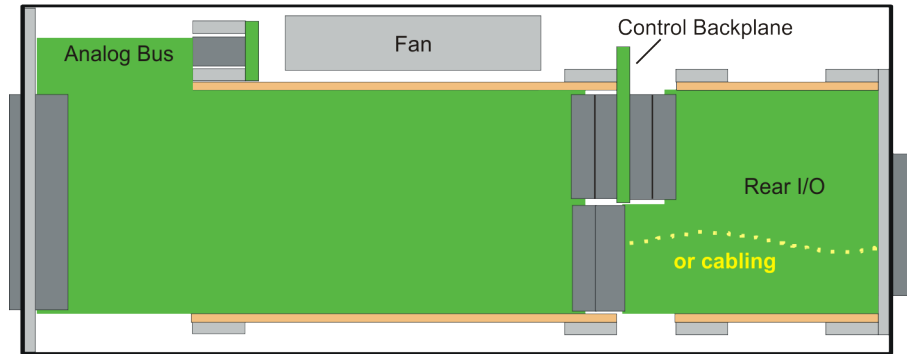


Figure 2-13: Side View

2.2.1.2 Backplanes

The R&S TS-PWA3 contains the following backplanes:

- Control backplane with PICMG Power Interface and Rear I/O support
- Analog bus backplane

Figure 2-14 shows the backplanes with the bus systems.

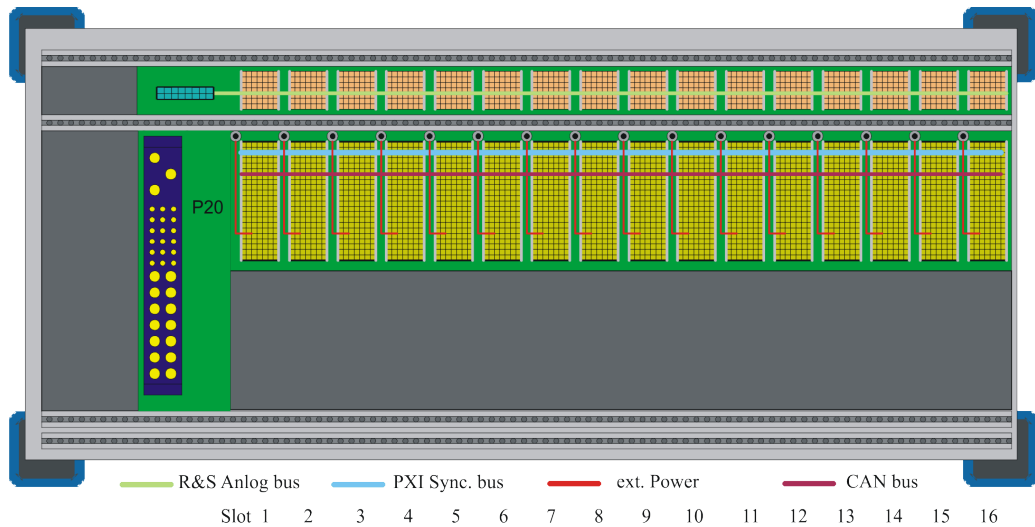


Figure 2-14: Backplanes and Bus Systems

Control Backplane

The control backplane is implemented for 16 plug-in modules to R&S format with front slots. The P2 connector of the cPCI system is used for the control interface. Pin assignment is R&S-specific (designation: P20) and compatible with the R&S CompactTSVP, so plug-in modules for the R&S PowerTSVP can also be operated in the R&S CompactTSVP.

Connector X0 (P47) serves as a power interface for a cPCI standard PSU. An additional PSU can be plugged onto an optional power backplane, in which case the connection with the control backplane is made with an ATX power supply cable.

Support for the Rear I/O concept according to Standard IEEE 1101.11-1998 is implemented for P20. Voltages up to 125 VDC can be routed in the Rear I/O area.

The PXI trigger bus according to PXI R2.0 is also implemented.

The **CAN bus** (according to standard CAN 2.0b (1Mbit)) is integrated as the management bus, and is available at all slots. Signals CAN_L and CAN_H can be terminated with jumpers and resistors (Figure 2-15). Instead of being terminated, the bus can be extended externally using the extension connector X80.

If the optional R&S TS-PXB2 backplane extension is used, the CAN bus is also available at slots A1 and A2. The R&S TS-PXB2 is connected to the main backplane via X80. The use of the backplane extension does not change the termination principle.

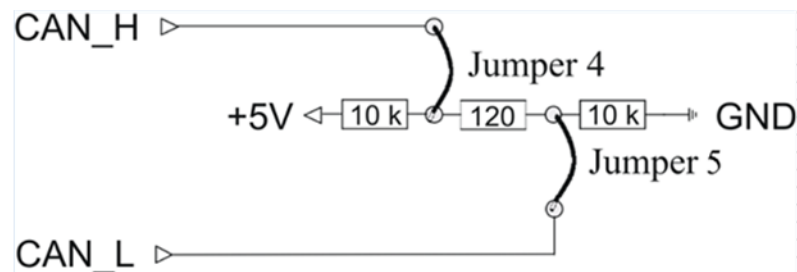


Figure 2-15: CAN Bus Termination

Table 2-3: CAN Bus

Number Lines	U max (VDC)	Pin
2	5	CAN_H: P20/C1 CAN_L: P20/D1

Two additional **external signals** (e.g. supply voltages) can be fed in via a plug-in module in P20. This input can come from an internal AC/DC module or from other external signal sources. One way in which this feature can be used is to provide a primary voltage for generating local supply voltages (DC/DC converter).

Table 2-4: External Additional Signals

Number Lines	U max (VDC)	I _{max} /Slot(ADC)	Pin
2	60	2	input for ext. signals: P20: AUX1 B20, E19 P20: AUX2 A20, D19

Lines with +5 V and +12 V are taken from connector X0 (P47) to optional threaded studs. This makes it easy to connect AUX1 to +5 V and AUX2 to +12 V, e.g. using an optional bus bar or cable (see Figure 2-16).

Mountable Threaded Studs (option)

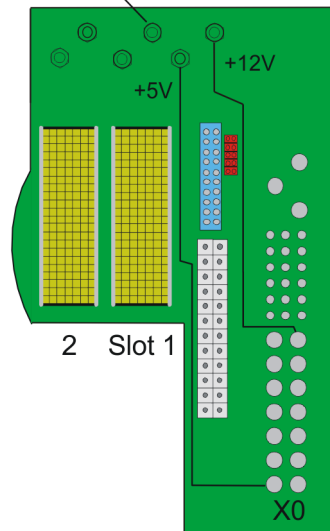


Figure 2-16: Mountable Threaded Studs on the Control Backplane

Analog Bus Backplane

To simplify cabling, the R&S TS-PWA3 contains an analog bus with 8 signals. The analog bus backplane is located in the front above the cPCI backplane. A special layout meets the need for high crosstalk damping and low capacitance of the signal lines to GND.

The C module (2 mm connector system) is used as the connectors (X1...X16). Plug-in modules with no analog bus connector access the analog bus via a 26-pin connector (X22) and R&S switch modules. Signals IL1_x and IL2_x (Instrument Line) are passed from slots 5 to 16 to connector X22.

The analog bus signals pass from connector X21 to connector X2 at the back of the R&S TS-PWA3. The electrical characteristics of the analog lines are:

- Voltage 125 VDC max.
- Current 1 A max.

Concept of the Analog Bus

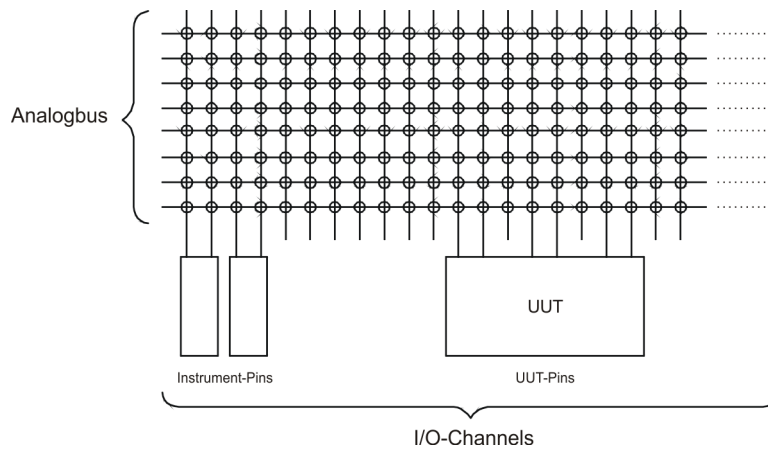


Figure 2-17: Principle of the Analog Bus

The analog bus in the R&S TS-PWA3 connects I/O channels of different plug-in modules to each other. These I/O channels may be connections of instruments (measuring and stimuli devices) and connections of the test device. Up to 8 signals can be connected simultaneously (see [Figure 2-17](#)).

The analog bus can be used flexibly with the ROHDE & SCHWARZ- specific plug-in modules. 8 equivalent lines are basically available (ABa1, ABa2, ABb1, ABb2, ABc1, ABc2, ABd1, ABd2). External instruments are usually connected to the R&S TS-PWA3 with a rear I/O connection. The signals for the test device are made available at the front-end connector of the various plug-in modules on the R&S TS-PWA3.

The analog bus can be used in different ways:

- as 1 bus with 8 lines
- in 2 part-buses with 4 lines each

The split of the analog bus into part-buses depends on the plug-in modules which are used and the application that is to be implemented.

The analog bus concept of the R&S TS-PWA3 fully meets the requirements that are frequently made in metrology:

- A small number of bus lines for a high number of I/O channels (e.g. In-Circuit-Test with 3 to 6 bus lines.)
- As many signals as possible simultaneously for a moderate number of I/O channels (e.g. function test with 8 lines of 50 to 100 I/O channels).
- Parallel test with split analog bus.

Line paths or higher-frequency signals are usually connected locally by special switching modules and not via the analog bus.

Typical Use of the Analog Bus

The use of the analog bus and individual bus lines is illustrated with available R&S modules and standard modules (see [Figure 2-18](#)).

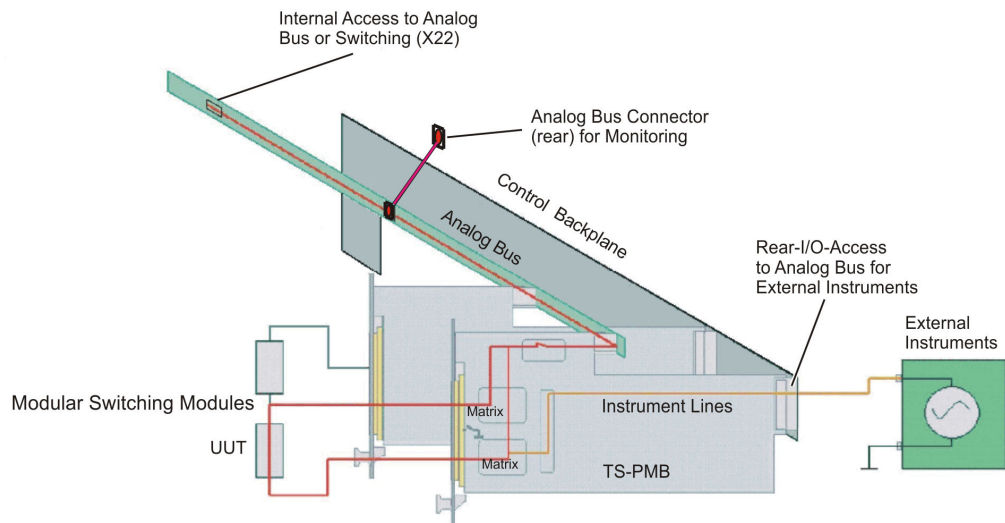


Figure 2-18: Use of the Analog Bus in the R&S TS-PWA3 (Example)

Power Backplane

The use of a second cPCI PSU in slots A1, A2 requires the optional Power Backplane (conforms to standard PICMG 2.0). From the Power Backplane, a cable with three connectors leads to a 24-pin ATX connector on the cPCI backplane. The three connectors are as follows:

- X12, 20-pin
- X13, 10-pin
- X16, 4-pin

The second PSU can be used to boost the power of the standard PSU when connected in parallel. Alternatively it can be used to supply the device on test.

Backplane Extension R&S TS-PXB2 (Option)

The R&S TS-PXB2 option expands the Test System Versatile Platform R&S TS-PWA3 by 2 CAN bus slots (A1 and A2). It can be integrated ex works only.

The two slots are intended for the R&S TS-PIO3B or R&S TS-PTR options. The R&S TS-PIO3B is an 8-channel, 8-bit Open Collector Digital I/O card with additional functions.

The R&S TS-PTR is a passive feedthrough circuit board. It can be used to feed as many as 24 signals through the device.

Ports 5, 6 and 7 of the R&S TS-PIO3B in slot A1 are routed to connector X1 on the rear panel.

Ports 5, 6 and 7 of the R&S TS-PIO3B in slot A2 are available on connector DIO on the rear I/O slot A4.

In addition, the system CAN bus is available at the CAN connector on the rear I/O slot A4.

The option R&S TS-PXB2 cannot be used together with the power backplane. The jumpers and the assignment of the connectors in the rear I/O area are described in Chapter 2.2.1.4, "Permitted Module Configuration", on page 25.

2.2.1.3 Function Description

The functionality of the R&S TS-PWA3 depends essentially on the installed plug-in modules and the related software. The R&S TS-PWA3 is basically suitable for all types of production tests.

An adapter interface can be flange-mounted to the front of the R&S TS-PWA3 for the rapid and high-pole adaption of test devices.

2.2.1.4 Permitted Module Configuration

Because of the different properties of plug-in modules, there are restrictions on the use of plug-in slots.

Figure 2-19 shows an overview of which modules can be operated in which plug-in slots.

TS-PWA3																					
Front side	A1	A2	A3	A4	1 *1)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Power-Supply																					
Power-Supply Ext. *2)																					
TS-PMB																					
TS-PSM1																					
TS-PSM2																					
TS-PSM3																					
TS-PSM4																					
TS-PSM5																					
TS-PIO1																					
TS-PIO2																					
TS-PSU / PSU12																					
TS-PIO3B / PTR *3)																					
Rear side	A1	A2	A3	A4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
TS-PSYS2																					
TS-PSYS2 (Option)																					
TS-PDC																					
TS-PAC																					
TS-PCAL2																					
TS-PRIO																					
TS-PRIO2																					
TS-PRIO3																					
TS-PRIO4																					
TS-PRIO5																					
TS-PK04P																					

*1) Module solder side must be isolated against left neighbor slot
 *2) Only with optional backplane extension TS-PCPA; Cannot be combined with TS-PXB2
 *3) Only with optional backplane extension TS-PXB2; Cannot be combined with power supply extension TS-PCPA
 *4) Only if option TS-PK04 is not installed

Figure 2-19: Module Configuration R&S TS-PWA3

3 Introduction Software

3.1 R&S GTSL

The Generic Test Software Library R&S GTSL is a collection of libraries for specific test tasks like measurements, switching and signal generation. An ASCII file contains the relevant configuration data which can be assigned to certain test sequences. So measurement parameters can be changed and adjusted easy and quickly with a standard editor.

An arbitrary test sequencer software may be used to control the test sequence. This software combines the individual test sequences to form an executable test program. It also adds all other functions important to the production operation, such as user administration, execution of multiple test sequences in multi-threading or parallel operation, collection and storage of relevant measurement results and report generation.

3.1.1 Functional Description

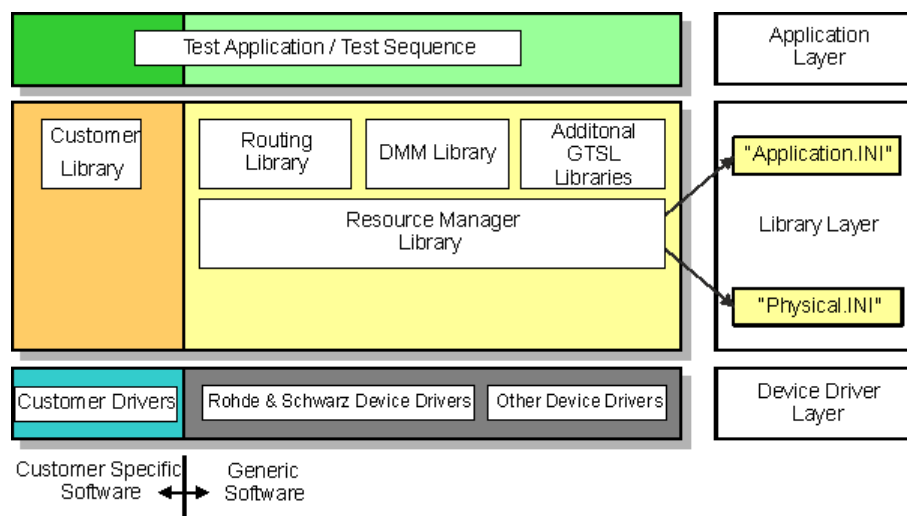


Figure 3-1: R&S GTSL layer model

In terms of its structure, the Generic Test Software Library R&S GTSL developed by ROHDE & SCHWARZ is divided into different supply components and software layers.

A distinction is made between the software components supplied by ROHDE & SCHWARZ and the components which must be supplied or adapted by the customer. The software components to be provided by the customer may for example include the following elements (specific to the customer and to the unit under test).

- device drivers
- calibration data
- test libraries

- test sequences

The software used in the R&S GTSL is divided into three different layers.

- The **lowest level** of the R&S GTSL accommodates the device drivers needed for the hardware used (Device Driver Layer). These include the device drivers for the following hardware:
 - hardware developed and used by ROHDE & SCHWARZ.
 - standard hardware.
- The **middle level** of the R&S GTSL accommodates the different test libraries (Library Layer). These test libraries provide the functions needed to execute test sequences. At this level, further information concerning the two files `PHYSICAL.INI` and `APPLICATION.INI` is transferred to the Resource Manager Library. The different device drivers of the lowest level are called from this level.
- The **highest level** accommodates the test sequences for the execution of the individual test functions (Application Layer). The test sequences call functions from the libraries in the middle level.

3.1.2 Configuration Files

PHYSICAL.INI

In the file `PHYSICAL.INI` (Physical Layer Configuration File), all hardware assemblies available in the Generic Test Software Library are described along with the corresponding definitions and settings. This file also contains definitions which are applicable to all test applications to be executed on the system (e.g. type definition). The information entered in this file is used by all test libraries and thus by each test step.

The `PHYSICAL.INI` file normally exists only once in the system as it reflects the exact physical structure. The file must only be modified in the event of a hardware change.

The Resource Manager calls and administers the information from the `PHYSICAL.INI` file.

APPLICATION.INI

In the `APPLICATION.INI` file (Application Layer Configuration File) is a description of how the individual test libraries and the test functions use the hardware components. Different hardware components can be combined into groups (bench). This bench can then be used within the test function. Furthermore, definitions are made in this file which apply to certain test applications to be executed on the system (e.g. definition of designations in the case of multi-channel operation).

The Resource Manager calls and administers the information from the `APPLICATION.INI` file.

3.1.3 GTSL Test Libraries

- `AUDIOANL.DLL`, Audio Analysis

Used for RMS calculation, frequency calculation, distortion, filter- and comparator analysis

- `DCPWR.DLL`, DC Power Supply
Used for R&S TS-PSU and power supplies with IVI compliant device drivers and for control of internal and external power supply units
- `DIOMGR.DLL`, Digital I/O Manager
Used for R&S TS-PDFT, R&S TS-PIO3B and modules using „IVI digital“ compliant device drivers.
Allows the creation of digital i/o bus topologies including more modules and a digital pattern configuration
- `DMM.DLL`, Digital Multi-meter
Used for R&S TS-PSAM and devices using „IVI DMM“ compliant device drivers
Allows the configuration and execution of analogue measurements (DCV, ACV, DCC, ACC, resistor)
- `FUNCGEN.DLL`, Function Generator
Used for R&S TS-PFG and devices using „IVI generator“ compliant drivers
Allows the creation of usual signals as sine, rectangle, triangle, the creation of arbitrary waveforms and the handling of sequences
- `SIGANL.DLL`, Signal Analyzer
Used for R&S TS-PAM and devices using „IVI scope“ compliant drivers
Allows the creation of WFA measurements and the readout of data and measurement results
- `RSMGR.DLL`, Resource Manager
Used for administration functions for any hardware defined in the `PHYSICAL.INI` file
- `ROUTE.DLL`, Signal Routing
Used for supporting functions for complex path management
Includes any switching module
NOTE:
Not in combination with `SWMGR.DLL`
- `SWMGR.DLL`, Switch Manager
Used for supporting functions for switching of single paths at single modules
NOTE:
Not in combination with `ROUTE.DLL`
- `ICT.DLL` and `ICCHECK.DLL`, In-Circuit Test
Used for supporting functions for In-Circuit and IC-Check test methods
- `FTBLIB.DLL`, Factory Toolbox
Used for supporting functions for R&S TS-PIO3B and extensions
- `SFT.DLL`, Self Test Support
Used for controlling functions for the execution of TSVP modules self test
- `TOOLKITTESTSTAND.DLL`, Toolkit TestStand
Used for supporting functions for test sequencer "TestStand" from National Instruments Corp.
- `OPERINT.DLL`, Operator Interface
Offers a configurable "TestStand" operator interface

3.2 R&S EGTSL

The Enhanced Generic Test Software Library R&S EGTSL is part of an extension to the Generic Test Software Library R&S GTSL. Using R&S EGTSL it is possible to prepare and perform in-circuit tests. The individual R&S EGTSL software components are arranged in individual layers exactly like R&S GTSL.

3.2.1 Functional Description

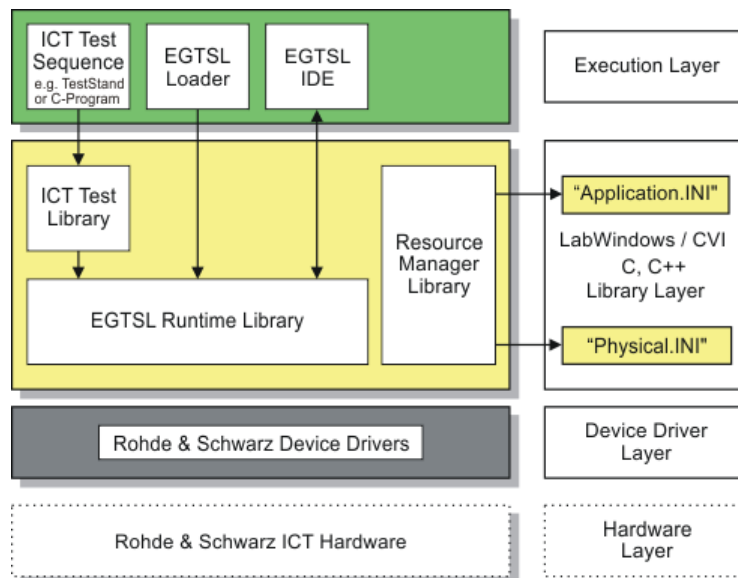


Figure 3-2: R&S EGTSL Layer Model

The bottom layer (device driver layer) of the R&S EGTSL contains the device drivers necessary for the test hardware used. The test hardware is accessed using these device drivers.

The middle layer (library layer) of the R&S EGTSL contains the ICT test library and the R&S GTSL runtime library. The ICT test library provides the functions necessary for performing the in-circuit test. Using the R&S GTSL runtime library (runtime engine) the internal R&S GTSL program processes are run. In this layer further information is passed to the resource manager library via the two files `PHYSICAL.INI` and `APPLICATION.INI`. The various device drivers from the lowest level are called from this layer.

The top layer (execution layer) contains the test sequences for performing the in-circuit test. The test sequences call functions from the ICT test library in the middle layer. The function calls include, e.g.

- loading ICT programs,
- running ICT programs,
- debugging ICT programs and
- the generation of reports.

The calls for the individual functions from the ICT test library can, e.g., be made using a sequence editor (TestStand) or a dedicated C program. The top layer (execution layer) also contains the R&S EGTSL Loader and the R&S EGTSL User Interface (R&S EGTSL IDE). The R&S EGTSL IDE is opened using the R&S EGTSL runtime library either by the R&S EGTSL Loader or a function call from the ICT test library.

3.2.2 Automatic Test Generation (ATG)

Using the Automatic Test Generator ATG utility, an executable ICT program that can be run in Enhanced Generic Test Software Library R&S EGTSL is generated from circuit description and the description of the hardware available. [Figure 3-3](#) shows the general sequence for automatic test generation using the Automatic Test Generator ATG.

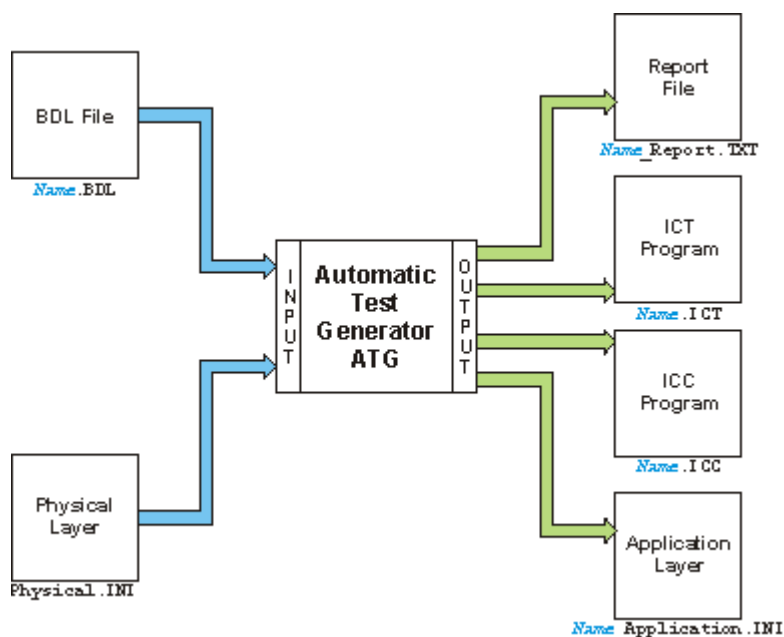


Figure 3-3: ATG sequence

The circuit description must be available in the BDL circuit description language. The test hardware available is described using the file `PHYSICAL.INI`. When the ATG is started, the file names for the BDL file (`Name.BDL`) and the file name for the Physical Layer Configuration File (`PHYSICAL.INI`) must be given.

Following the generation process, the ATG creates the following files:

- `Name_Report.TXT`
Report with the data on the generation process
- `Name.ICT`
ICT program for execution in R&S EGTSL
- `Name.ICC`
ICC program for execution in R&S IC-Check
- `Name_Application.INI`

Application Layer Configuration File for the execution of the ICT program generated in R&S EGTSL

Any errors that have occurred during the generation process are indicated in the report using error messages and warning messages. The ICT program and the ICC program is only created when there are no more error messages.

The result of the automatic test generation is essentially defined by realistic entry of the circuit description. The circuit description must correspond to the actual topology of the circuit. Otherwise, it cannot be ensured that the automatically generated ICT and ICC programs will work.



The circuit description (BDL object) from which the automatically generated ICT and ICC programs are to be generated must be free of logical data entry errors and the circuit entered must correspond as far as possible to reality.

3.2.3 Test Methods

Test Hardware

In order to perform the individual tests, the following test hardware is required.

- R&S TS-PSAM Source and Measurement Module
- R&S TS-PICT In-Circuit Test Module
The R&S TS-PICT In-Circuit Test Module is only required for the diode test, the impedance test and the guarded resistor test.
- R&S TS-PSU Power Supply/Load Module and R&S TS-PSU12 Power Supply/Load Module 12V
The R&S TS-PSU Power Supply/Load Module and the R&S TS-PSU Power Supply/Load Module 12V are only required for the zener diode test and the transistor beta test..
- R&S TS-PMB Matrix Module B
Used for the connection of the individual measuring pins (nodes). The measuring and stimulation hardware are connected to the Unit Under Test (UUT) using the R&S TS-PMB and the analog bus.

Ground Wiring

During the in-circuit tests, the UUT (Unit Under test) must be floating, i.e. it must not be connected with the ground of the test system. The correct ground wiring is shown in [Figure 3-4](#).

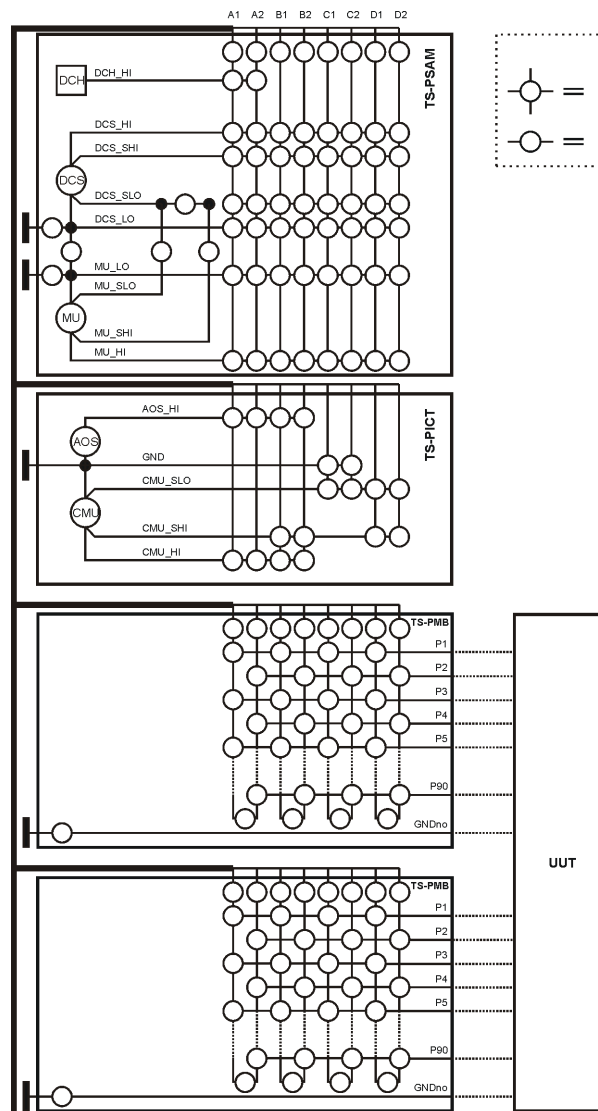


Figure 3-4: Test hardware

The ground of the UUT is connected with the GNDno connectors of the matrix card. This can be connected through a relay with the system ground GND. During the in-circuit tests, these relays must be opened. For the function test, they can be closed.

- Contact Test
- Continuity Test
- Diode Test
- Discharging Capacitors
- FET Test
- Impedance Test
- Resistor Test
- Short-circuit Test
- Transistor Test

- Transistor Beta
- Zener Diode

3.3 R&S R&S IC-Check

Using Generic Test Software Library R&S IC-Check it is possible to prepare and perform tests on pins of ICs or other mounted electronic circuit devices. The individual R&S IC-Check software components are arranged in layers exactly like R&S GTSL.

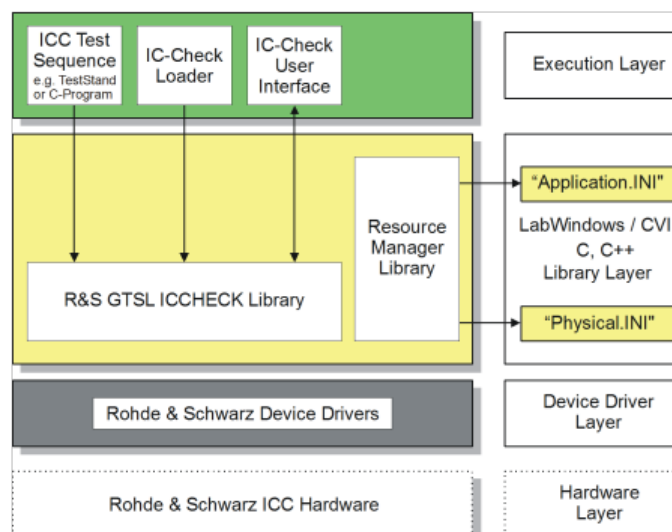


Figure 3-5: R&S IC-Check Layer Model

- The **bottom layer** (device driver layer) of the R&S IC-Check contains the device drivers necessary for the test hardware used. The test hardware is accessed using these device drivers.
- The **middle layer** (library layer) of the R&S IC-Check contains the R&S GTSL IC-Check library. The R&S IC-Check library provides the functions necessary for performing the IC-Check tests. In this layer further information is passed to the resource manager library via the two files `PHYSICAL.INI` and `APPLICATION.INI`. The various device drivers from the lowest level are called from this layer.
- The **top layer** (execution layer) contains the test sequences for performing the IC-Check tests. The test sequences call functions from the R&S IC-Check test library in the middle layer. The function calls include, e.g.
 - loading ICC programs
 - running ICC programs
 - debugging ICC programs
 - generating reports

The calls for the individual functions from the R&S IC-Check test library can be made using a sequence editor (e.g. TestStand) or a dedicated C program.

The top layer (execution layer) also contains the R&S IC-Check Loader and the R&S IC-Check User Interface which is opened using a function call from the R&S IC-Check test library.

R&S IC-Check includes the following parts and programs:

- R&S IC-Check test library
- R&S IC-Check Loader
- R&S IC-Check User interface

3.3.1 Running R&S IC-Check

The Generic Test Software Library R&S IC-Check can be executed in two ways:

- By calling a function from the R&S IC-Check test library.
- Using the R&S IC-Check Loader.

Calling R&S IC-Check Test Library Functions

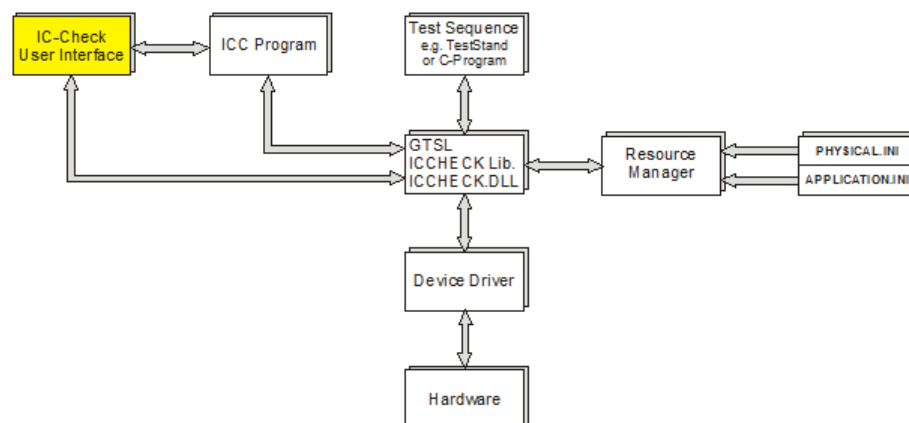


Figure 3-6: Running R&S IC-Check by calling R&S IC-Check library functions

R&S IC-Check test library functions are called from the test sequence (e.g. test sequence in a dedicated C program). The test hardware available is managed using the resource manager with the aid of the configuration files (`PHYSICAL.INI` and `APPLICATION.INI`). The R&S IC-Check library opens the R&S IC-Check User Interface and the corresponding ICC program. The ICC program opened can now be configured in the R&S IC-Check User Interface. The ICC program can be executed on the test hardware directly from the R&S IC-Check User Interface. An ICC program can also be loaded and executed without opening the R&S IC-Check User Interface.

Using the R&S IC-Check Check Loader

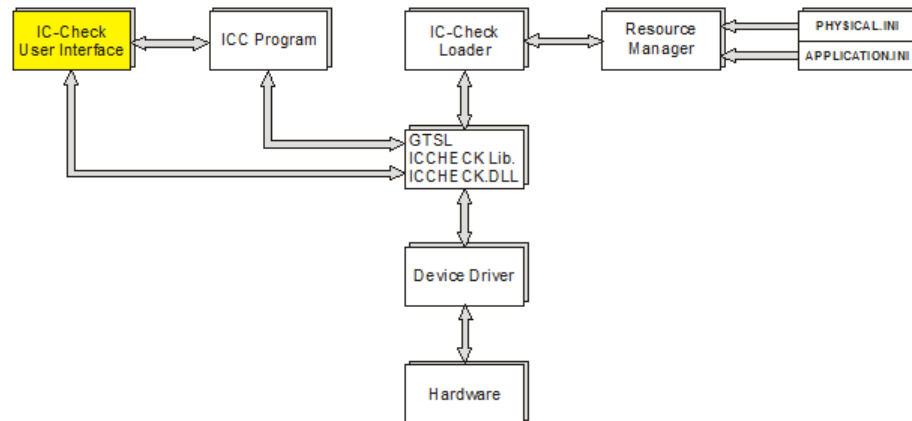


Figure 3-7: Running R&S IC-Check by starting R&S IC-Check Loader

The R&S IC-Check Loader initiates the function calls to the R&S IC-Check test library. In the R&S IC-Check Loader the names of the configuration files (`PHYSICAL.INI` and `APPLICATION.INI`) must be entered. Hardware management is performed using the resource manager. The R&S IC-Check Loader opens the R&S IC-Check User Interface and the selected ICC program. The ICC program can now be configured in the R&S IC-Check User Interface. The ICC program can be executed on the test hardware directly from the R&S IC-Check User Interface.

4 Introduction Modules

4.1 R&S TS-PAM

4.1.1 Functionality

The R&S TS-PAM waveform Analyzer Module is a CompactPCI/PXI module that takes up one slot in the R&S CompactTSVP test system versatile platform.

It offers the following key features:

- Two separate "floating" inputs
Each input can be split into 8 (single)/4 differential measurement channels
Input range: ± 0.2 V to ± 100 V (max. 125V)
- 14 - Bit ADC resolution;
- High sampling rate 20 Msamples/s for 2 channels
- 2 x 1 Msample sample memory depth
- Usable like a digital oscilloscope
- Trigger modus selectable: software, edge, vsample



Figure 4-1: View of the R&S TS-PAM

4.1.2 Usage

The following analyses are possible using the Analyzer Module R&S TS-PAM and the Signal Analysis Library:

- Voltage and voltage changes with different qualifications
- Time measurements
- Events
- Wave-form comparison

The wave form analyzer is able to record electrical signals on two measuring paths (channels) at a high sampling rate of 20 MHz or on up to eight measuring paths (channels) in the „Scan“operation (quasi simultaneous) at a the low sampling rate of 5 MHz. The signals can be evaluated after acquisition with respect to parameters such as voltage, time, frequency, events. The measurement options can, in many cases, replace a digital voltmeter (DVM), a timer/counter or a digital oscilloscope. The Analyzer Module R&S TS-PAM covers the application range above a fast sampling voltmeter (e.g. R&S TS-PAM or data acquisition module with scanner).

A wide range of trigger options for acquisition of the correct measuring interval and automatic analysis options in the actual production environment, where no optical evaluation of the signals can take place, ensure the reproducibility of the measurements.

4.1.3 Requirements and Restrictions

Each R&S TS-PAM module can only be used in the R&S CompactTSVP and requires a R&S TS-PDC at the assigned rear I/O slot.

4.2 R&S TS-PICT

4.2.1 Functionality

The R&S TS-PICT ICT Expansion Module is a CompactPCI/PXI module that takes up one slot in the R&S CompactTSVP test system versatile platform.

It offers the following key features:

- Programmable AC voltage source (AOS) for the frequencies 100 Hz, 1 kHz, 10 kHz
- Programmable DC voltage source (AOS) for the generation of offsets ± 5 V, 50 mA
- ICT Current Measuring Unit (CMU)
 - Active current measurement, 5 μ A to 250 mA
 - Triggered measurements via PXI trigger bus
 - 2 triggers derived from the measurement signal with programmable threshold
 - 4 filters
 - 16 bit converter
 - Max. signal sampling rate 200 kHz, adjustable

- Memory for 8 k sampling points
- Self-test capability in conjunction with the R&S TS-PSAM module



Figure 4-2: View of the R&S TS-PICT

4.2.2 Usage

In combination with the R&S TS-PSAM Measuring Module and the R&S EGTSL software, the R&S ICT Expansion Module is used for the realization of in-circuit measurements. For this purpose there is a programmable AC and DC voltage source (AOS) as well as a special Current Measuring Unit (CMU) for guarded measurements during the ICT (In-Circuit Test).

The following in-circuit measurements are possible (only in combination with R&S TS-PSAM and the R&S EGTSL software):

- Guarded resistance measurements (3, 4 and 6 wire)
- Guarded impedance measurements (3, 4 and 6 wire)
- Diode test

During the ICT, the units under test are connected via the R&S TS-PMB Matrix Modules. The two modules (R&S TS-PICT and R&S TS-PSAM) are synchronized when the signals are measured using the 10 MHz signal on the CPCI backplane and the PXI trigger wires.

4.2.3 Requirements and Restrictions

The R&S TS-PICT module can only be used in the R&S CompactTSVP and requires a R&S TS-PDC at the associated rear-I/O slot (the same slot number as R&S TS-PICT).

4.3 R&S TS-PDFT

4.3.1 Functionality

The R&S TS-PDFT Digital Function Test Module is a CompactPCI/PXI module that takes up one slot in the R&S CompactTSVP test system versatile platform.

It offers the following key features:

- 64-channel digital function test card (32x IN, 32x OUT)
- Simultaneous clocked pattern generating/recording (max. 40 Msample/s)
- An output level range (0 V to +10 V) that can be programmed in groups
- A high output current (max. 150 mA/channel, 500 mA/group), short-circuit resistant
- Input threshold voltage/hysteresis (0 V to 38 V) that can be programmed in groups
- Serial comm ports (CAN, K-Bus, RS232)
- Local microprocessor
- Synchronization by PXI Triggerbus
- Self-test capability

The deterministic simultaneous stimulation/recording of digital signals makes it possible to simulate test scenarios under near-actual conditions. A local microprocessor ensures high computing power with time-critical communication protocols, downloads of flash memories or analyses directly on the module. Comprehensive trigger options with pattern comparators or the PXI Triggerbus allow synchronization with other R&S measurement, stimulus or switching modules or PXI modules of other manufacturers

A LabWindows IVI driver is provided on the module for the general functions. All other hardware functions are controlled using specific extensions of the driver.



Figure 4-3: View of the R&S TS-PDFT

4.3.2 Usage

R&S TS-PDFT is ideal for use wherever simple or complex digital circuits are tested or programmed by static or dynamic stimulation/recording/ communication.

The R&S TS-PDFT module is used to test the operation of digitally mounted modules or devices. Function tests of this type test the entire operation of a digital circuit under conditions that they are as near to reality as possible. The module does this by creating digital input patterns, measuring the output signals and comparing them with the target values.

The following applications are available with the R&S TS-PDFT module:

- Digital function test (Low-Speed/High-Speed)
- Bit pattern stimulation (Low-Speed/High-Speed)
- Bit pattern measuring (Low-Speed/High-Speed)
- Monitoring of level state changes (pattern trigger)
- Digital function test at component level (no node forcing, backdriving capability)
- Protocol analysis/generation (CAN, K-Bus, RS232)
- Downloads, e.g. for flash components, serial and parallel

Should the application require additional digital channels, this can be achieved by cascading further R&S TS-PDFT modules and synchronizing them with the PXI Trigger-bus.

4.3.3 Requirements and Restrictions

The R&S TS-PDFT module can only be used in the R&S CompactTSVP.

To use the LabWindows IVI driver, the IVI and VISA libraries from National Instruments are necessary.

4.4 R&S TS-PFG

4.4.1 Functionality

The R&S TS-PFG Function Generator Modul is a CompactPCI/PXI module that takes up one slot in the R&S CompactTSVP test system versatile platform.

It offers the following key features:

- 2-channel arbitrary function generator (both channels can be operated as independent generators)
- Floating signal generation (max. 125 V working voltage)
- Resolution (16 bit)
- Sample rate up to 25 Msample/s per channel
- Output voltage up to 40 Vpp per channel (channels can be cascaded)
- Output current up to ± 250 mA per channel
- Memory depth of 1 Msample per channel
- Waveform linking and looping
- Sample-synchronous marker signal can be configured
- Synchronization via PXI trigger bus
- Switching the channels to 8 analog buses/outputs, optional feature
- Self-test capability in conjunction with R&S TS-PSAM module

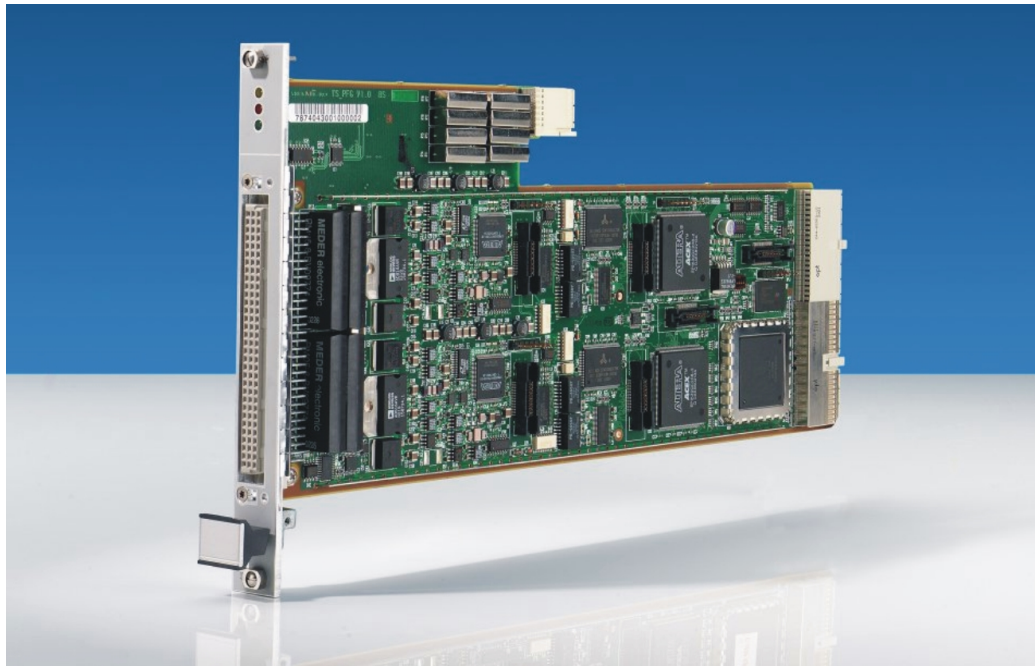


Figure 4-4: View of the R&S TS-PFG

4.4.2 Usage

The R&S TS-PFG can be used wherever the simulation of single-channel or multichannel analog output signals is required.

The following tasks are possible to do with the R&S TS-PFG:

- Generation of sine-wave, square-wave, ramp and triangular signals
- Generation of concatenated waveforms of any type
- Sensor simulation (floating stimulation)
- Generation of arbitrary signals
- Stimulation of low-frequency digital signals with variable level
- Programmable clock-pulse generators
- Generation of DUT supply voltages

If the application requires additional stimulus channels, this can be achieved by adding further R&S TS-PFG function generator modules and synchronizing them via the PXI trigger bus.

4.4.3 Requirements and Restrictions

The R&S TS-PFG module can only be used in the R&S CompactTSVP and requires the R&S TS-PDC at the assigned rear I/O slot.

To use the LabWindows IVI driver, the IVI and VISA libraries from National Instruments are necessary.

4.5 R&S TS-PHDT

4.5.1 Functionality

The R&S TS-PHDT High-Speed Digital Test Module is a CompactPCI/PXI module that takes up one slot in the R&S CompactTSVP test system versatile platform.

It offers the following key features:

- 32 output channels, high and low level for each port (8 channels), separately adjustable
- Output level range -3 V to +10 V
- Maximum output current per channel 80 mA
- Maximum output current per port:
 - 500 mA for output level \leq 2.9 V
 - 200 mA for output level $>$ 2.9 V
- Current limiting for high and low level, separately adjustable for each port
- Each channel individually switchable to TriState at the maximum pattern rate
- High-level is formattable within the pattern duration (return-to-zero)
- 32 input channels, high and low limit for each port, separately adjustable
- Input can be connected with outputs by channel
- Maximum pattern rate 40 MHz
- Independent memories for:
 - Stimulus data
 - Reference data
 - Result data

Memory depth 64 M patterns each

- Memory for independent pattern sets; selectively executable
- Comparison of reference and measurement data in real time; results available immediately (Pass/Fail, number of failed patterns, channels)
- Self-test capability
- Trigger options via PXI trigger bus
- Soft Panel for interactive operation
- IVI-C driver available

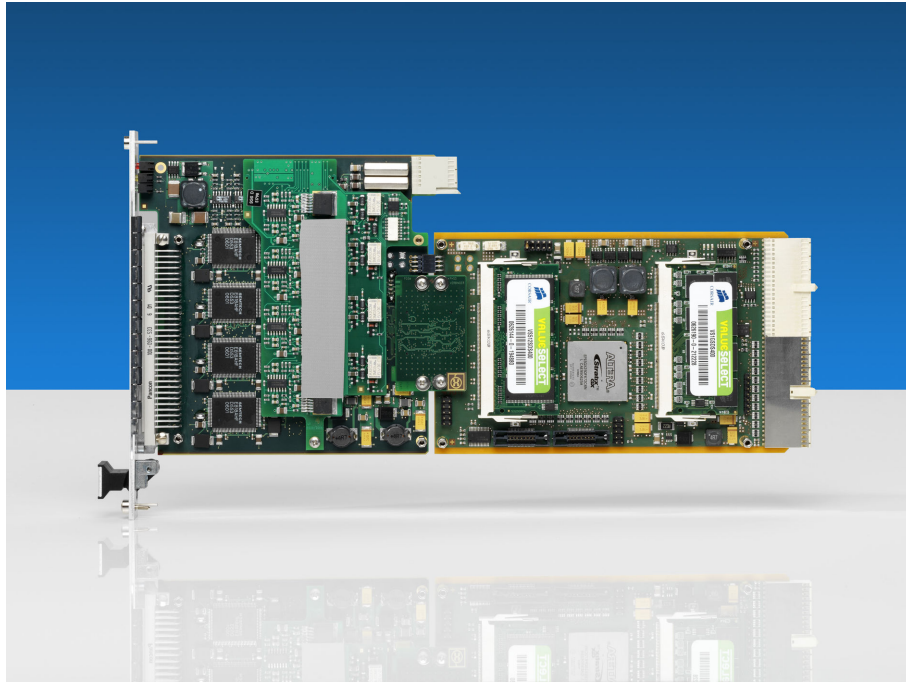


Figure 4-5: View of the R&S TS-PHDT (without cover)

4.5.2 Usage

The R&S TS-PHDT is used wherever digital circuits are tested by static or dynamic stimulation and the response is recorded. Deterministic, simultaneous stimulation and recording of digital signals make it possible to simulate operating conditions in a manner approaching reality.

The following tasks are possible:

- Simple dynamic digital test
- Evaluation functions
 - The following results are available immediately after the last pattern is executed:
 - Number of failed patterns
 - Failed channels
 - Indices of the failed patterns
- Pattern output and pattern recording

4.5.3 Requirements and Restrictions

The R&S TS-PHDT module can only be used in the R&S CompactTSVP.

To use the IVI-C driver, the IVI and VISA libraries from National Instruments are necessary.

4.6 R&S TS-PIO2

4.6.1 Functionality

The R&S TS-PIO2 Analog/Digital IO Module can be operated on the R&S CompactTSVP and R&S PowerTSVP test system versatile platforms.

It offers the following key features:

- Potential-free
- 16 input channels and 16 output channels
- Output voltage range ± 27 V
- Input voltage range ± 7 V, ± 14 V, ± 28 V
- Maximum output current for the 12 standard channels 25 mA, 100 mA for the extended channels
- Sense lines and programmable current limiting for the extended channels
- Differential voltage measurement (optional)
- High accuracy; resolution 24 bits
- Maximum sampling rate during measurement and update rate for output 5 kHz
- Memory for 4 x 5000 values (analog and digital measurement values; digital bit pattern and arbitrary waveform output)
- Access to analog bus
- Trigger options via PXI trigger bus
- Self-test capability
- Soft Panel for interactive operation
- LabWindows/CVI driver available



Figure 4-6: View of the R&S TS-PIO2

4.6.2 Usage

The R&S TS-PIO2 module provides 16 combined analog/digital input channels and 16 combined analog/digital output channels. The channels are arranged in groups of four. The last output channel in each group has special properties. These include an enhanced accuracy, adjustable current limiting, a higher maximum output current and the capability of using sense lines.

The module can operate each of the 16 output channels in the one of the following operating modes:

- Analog output
- Digital static output
- Digital dynamic output
- Arbitrary waveform
- Square wave

All 16 input channels are wired to comparators and to the input of an analog/digital converter. The limits of the comparators are adjustable.

This makes the following evaluations of a signal possible:

- Voltage measurements against module ground
- Differential voltage measurements between two channels
- Digital evaluation

4.6.3 Requirements and Restrictions

The R&S TS-PIO2 module receives its ground-free power supply from a Rear-I/O module of type R&S TS-PDC. It is controlled by the CAN bus present in the R&S CompactTSVP and R&S PowerTSVP.

The R&S CompactTSVP/ R&S PowerTSVP production platform and the R&S TS-PIO2 are designed so that users can operate at voltages up to 125 V. The requirements according to EN61010-1 for operation with “hazardous live” voltages must be observed.

4.7 R&S TS-PIO3B

4.7.1 Functionality

The R&S TS-PIO3B Digital I/O Module is a CompactPCI/PXI module that can be operated on the R&S CompactTSVP and R&S PowerTSVP test system versatile platforms.

The R&S TS-PIO3B module is a plug-in card for CAN slots of the R&S CompactTSVP or R&S PowerTSVP. The module provides digital, quasi-bidirectional lines, a TTL port, analogue inputs, SPI signals and supply voltages. All the I/O signals are referenced to earth.

The module is equipped with a separate processor and is controlled via the CAN bus.

It offers the following key features:

- 64 „quasi-bidirectional“ open drain I/O channels, all available on the front panel, 24 of these channels are also routed to the backplane.
- 8 TTL I/O channels to the front panel
- 8 analogue inputs on the front panel, 0-5 V signal range, resolution of 10 bits
- Maximum current of the open drain channels 200 mA
- External SPI interface, e.g. for adapter identification
- +5 V / 2 A and +12 V / 2 A fused available on the front connector
- Soft panel for interactive operation
- LabWindows/CVI driver available

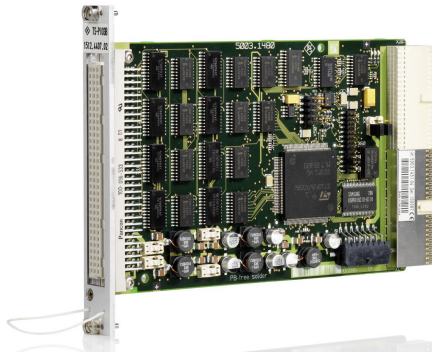


Figure 4-7: View of the R&S TS-PIO3B

4.7.2 Usage

The following tasks are possible using the R&S TS-PIO3B module.

- Control of Relays/Pneumatic Valves/Vacuum Valves
- Identification of a test adapter externally connected
- Identification of a parallel adapter via ports
- Identification of a serial adapter via SPI-EEPROM

4.7.3 Requirements and Restrictions

Each R&S TS-PIO3B module can be used in R&S CompactTSVP and R&S PowerTSVP.

The R&S TS-PIO3B module is plugged especially tightly into slots 3 – 14 of the R&S CompactTSVP. Due to the front panel section of module, there is a risk of a short circuit with components underneath a long module in the slot directly to the right (viewed from the front). For this reason, the R&S TS-PIO3B modules must absolutely be screwed in place properly.

4.8 R&S TS-PIO4

4.8.1 Functionality

The R&S TS-PIO4 digital functional test module can be operated in the test system versatile platform R&S CompactTSVP.

The module offers the following key features:

- 32-digital inputs und 32-digital outputs divided into eight ports with four channels each
- Programmable output level range from -6 V to 10 V, output impedance 30 Ω (typ.)

- Resolution of 14 bits
- Output current up to 150 mA per channel, 350 mA per port
- Three-state control in dynamic and static mode
- Two programmable input thresholds per port for hysteresis or level monitoring
- Inputs can be connected to outputs
- Pattern rate up to 40 MS/s per channel x 12.5 nsec. resolution
- Memory depth 2 Msample (32-bit data)
- External clock input
- Synchronisation/trigging via PXI trigger bus and via XTI (TTL)
- Timer/Counter function
- FPGA-based flexibility
- Standalone self-test capability
- LabWindows IVI-C driver available
- Used in R&S CompactTSVP

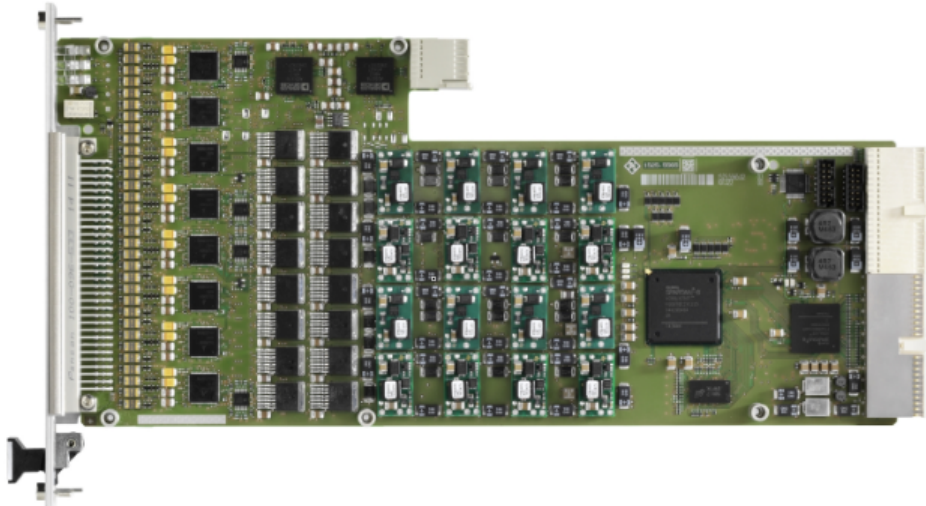


Figure 4-8: View of R&S TS-PIO4 module

4.8.2 Usage

The R&S TS-PIO4 digital functional module is used to test functions of digital modules and devices. This type of functional test is used to check the overall operation of a digital module under conditions that are as close to reality as possible. Digital input patterns that measure output signals are applied for this purpose.

The R&S TS-PIO4 digital functional test module can be used for tasks such as the following:

- Digital functional test (low-speed/high-speed, IO control)
- Bit pattern simulation (low-speed/high-speed, digital buses)
- Bit pattern measurement (low-speed/high-speed)

- Monitoring of changes in level state (pattern trigger)
- Digital functional test at component level (no node-forcing or backdriving capability)
- Downloads, e.g. for flash components, serial and parallel



A typical functional test consists of the following elements:

- Adaptation of the pin electronics to the UUT environment (logic level and logic family)
- Definition of sensor-strobes (timing)
- Definition of the stimulus and measuring behavior
- Evaluation of the test results

4.8.3 Requirements and Restrictions

The R&S TS-PIO4 digital functional test module is intended for the R&S CompactTSVP test platform. The module is controlled by the CompactPCI bus.

A soft panel is available for operation of the module. An IVI-C driver is provided to allow the module to be used under software control.

4.9 R&S TS-PIO5

4.9.1 Functionality

The R&S TS-PIO5 digital functional test module can be operated in the test system versatile platform R&S CompactTSVP.

The module offers the following key features:

- Two MDR connectors, each with 10 LVDS channels (8 data, 1 universal channel, 1 clock)
LVDM bidirectional, terminated with 100 Ω
- 2 LVTTTL signals per MDR connector
- +5 V / max. 0.30 A available at every MDR connector, protected by fuse and diode
- 10 RS485 transceiver channels available via a contact strip on the board
- Sample rate up to 200 Msample/s
- Maximum resolution 5 ns
- Memory depth 2 Mpattern (32 bit)
 - 10 bit RS485
 - 4 bit LVTTTL
 - 18 bit LVDS
- Synchronization/triggering via
 - PXI trigger bus

- SMB clock/trigger input and output
- PXI 10 MHz clock
- FPGA-based flexibility
- Standalone self-test capability
- LabWindows IVI-C driver available
- Used in R&S CompactTSVP

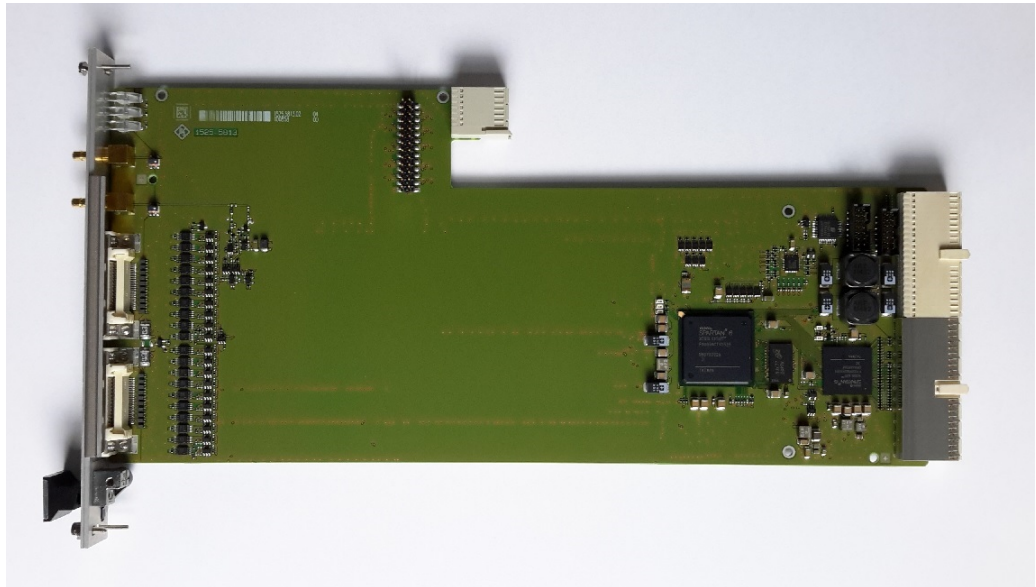


Figure 4-9: View of R&S TS-PIO5 module

4.9.2 Usage

The R&S TS-PIO5 digital functional test module is used for testing digital modules or devices that are controlled using LVDS signals. This type of functional test is used to check the overall operation of a digital circuit under conditions that are as close to reality as possible.

The module is used wherever digital circuits are tested by flexibly programmable static or dynamic stimulation and the response is recorded. Bidirectional LVDS, LVTTTL and RS485 transceiver channels are available for this purpose.

The R&S TS-PIO5 digital functional test module can be used for tasks such as the following:

- Digital functional test (low-speed/high-speed, IO control)
- Bit pattern stimulation (low-speed/high-speed, digital buses)
- Bit pattern measurement (low-speed/high-speed)
- Downloads, e.g. for flash components

4.9.3 Requirements and Restrictions

In the real-time test, overall operation of the digital section of a UUT is tested under operating conditions that are as close to reality as possible. For this purpose, digital patterns with a precisely defined, usually high clock rate and precise time response are applied at the UUT connections and the responses recorded.

The basic requirement for exact, predictable timing is that the patterns for the stimulus are stored in the memories "downstream of the drivers" and can be processed with a defined time response and at a high speed. To enable this, the module has its own sequence controller in the FPGA. The recorded input data is also initially stored in a memory on the module and later retrieved by the application on the host computer and evaluated for a PASS/FAIL decision.

The module can only be used in the R&S CompactTSVP.

4.10 R&S TS-PMB

4.10.1 Functionality

The R&S TS-PIO3B Matrix Module can be used in the CompactTSVP and PowerTSVP test system versatile platforms. The R&S TS-PMB is plugged into the front part of the TSVP chassis.

It offers the following key features:

- Access to the analog bus (8-wire)
- Full matrix with 4 buses with 90 pins
- Full matrix with 8 buses with 45 pins
- 3 Instrument ports
- Parallel test with two 4-wire systems
- In-Circuit Test wiring for 6-wire measurements
- Connection of control signals in the power test together with the R&S TS-PSM1 plug-in module.
- Self-test capability



Figure 4-10: View of the R&S TS-PMB

4.10.2 Usage

Typical product test applications are in the fields of communications, automotive electronics and general industrial electronics, especially for analog In-Circuit testing with a large number of channels.

The R&S TS-PMB module allows the universal interconnection of test products and measuring instruments. This can be done locally or using the analog bus. The ability to connect measuring instruments to the back of the TSVP avoids cross-connections at the adapter interface.

4.10.3 Requirements and Restrictions

Each R&S TS-PMB module can be used in R&S CompactTSVP and R&S PowerTSVP.

A LabWindows CVI driver provided for the R&S TS-PMB requires the IVI and VISA libraries from National Instruments.

4.11 R&S TS-PSAM

4.11.1 Functionality

The R&S TS-PSAM Analog Stimulus and Measurement Module is a CompactPCI/PXI module that takes up one slot in the R&S CompactTSVP test system versatile platform

The module's floating DC supply voltage is provided via the associated R&S TS-PDC rear I/O module. This is inserted in the appropriate rear I/O slot in the back of the device (the same slot number as R&S TS-PSAM).

The module offers the following key features:

- Floating measurement inputs using analogue bus matrix and front connector
- Floating DC voltage sources (DCS)
 - Adjustable voltage and current, limiting them up to ± 5 V and 100mA max, respectively
 - Fast setting time
 - Four-quadrant operation (i.e. the capability that the current and voltage can be programmed in both positive and negative range)
 - Sense wires
- Digital multimeter
Floating measurement units (MU)
 - Measurement range DC:
 - 10 mV to 125 V VDC
 - 1 μ A to 1A IDC,
 - Measurement range AC rms_{rms}:
 - 20 mV to 125 VAC (RMS)
 - 100 μ A to 1 A, IAC (RMS)
 - Triggered measurements across the PXI Triggerbus
 - 2 triggers derived from the measurement signal with programmable threshold
 - 4 filters
 - 1 Ω to 10 M Ω (2- and 4-wire cablings possible)
 - 16-bit A/D converter:
 - max. 200 ksamples/s
 - single or „multipoint“ measurement with storage depth up to 8 k samples
- Discharge circuit (DCH):
 - On-module discharge voltage up to 125 V
 - On-module discharge current up to 400 mA



Figure 4-11: View of the R&S TS-PSAM

4.11.2 Usage

The R&S TS-PSAM for the R&S CompactTSVP is used to perform analog measuring tasks, in-circuit measurements, and the R&S CompactTSVP self-test.

In these tests, the module functions as a measuring device with adjustable sampling rate for voltage, current and resistance measurements.

4.11.3 Requirements and Restrictions

Each R&S TS-PSAM module can only be used in the R&S CompactTSVP and requires the R&S TS-PDC at the assigned rear I/O slot.

4.12 R&S TS-PSM1

4.12.1 Functionality

The R&S TS-PSM1 Power Switch Module can be used in the CompactTSVP and the PowerTSVP test system versatile platform. It is fitted into the front of the TSVP chassis.

It offers the following key features:

- Power switching module for supplies and loads
- Switching module for high voltages (max. 60 V)
- 8 high power channels (max. 16 A)
- 10 low power channels (max. 2 A)
- 4 high power MUX channels 4 : 1 (max. 16 A)
- Indirect current measurement on high power channels with shunt
- Self-test of all relays by analog bus and TS-PSAM plug-in module
- Control bus: CAN



Figure 4-12: View of the R&S TS-PSM1

4.12.2 Usage

R&S TS-PSM1 is designed for interconnecting or distributing high voltages or current. Currents/voltages at all switching nodes can be measured or monitored with the analog bus. These functions are particularly important when the test component's current demand in both normal and standby mode has to be measured.

The following tasks are possible using the R&S TS-PSM1:

- Analog function test
- Connection of voltage/current sources
- Connection of test component loads (original loads, simulated/electronic load)
- Switch simulation
- Power Multiplexer

4.12.3 Requirements and Restrictions

Each R&S TS-PSM1 module can only be used in the R&S CompactTSVP and requires a R&S TS-PDC at the assigned rear I/O slot.

To use the Labwindows CVI driver, the IVI and VISA libraries from National Instruments are necessary.

4.13 R&S TS-PSM2

4.13.1 Functionality

The R&S TS-PSM2 Multiplex/Switch Module can be used in the CompactTSVP and the R&S PowerTSVP test system versatile platform. It is fitted into the front of the TSVP chassis. Control of the module is via the CAN bus.

It offers the following key features:

- Deployable in the R&S TS-PCA3 (R&S CompactTSVP) and R&S TS-PWA3 (R&S PowerTSVP) chassis
- Switching module for power supplies and loads with medium power
- Switching of voltages up to 125 V
- Switching of currents up to 2 A
- 8 relay groups, each with
 - 1 multiplexer 4:1, two-pin, DPST or
 - 1 change-over contact, one-pin, SPDT with shunt resistor
 - 3 make contacts, one-pin, SPST with shunt resistor
 - 1 make contact, two-pin, DPDT to local Powerbus/side plug connector
- Indirect current measurement via shunt resistors
- Direct current measurement via R&S analog bus and plug-in module R&S TS-PSAM (< 1 A)
- Self-test of all relays by analog bus and TS-PSAM plug-in module



Figure 4-13: View of the R&S TS-PSM2

4.13.2 Usage

R&S TS-PSM2 is designed for switching or distribution of signals of medium power up to 125 V DC or currents up to 2 A DC. The R&S analog bus can be used to measure voltages and currents on all circuit nodes. These functions are especially important if current must be measured for the test object in normal operation and in addition a measurement must be performed in standby mode.

In addition to the functionality of a simple power switching module, small signals can be switched in the lower MHz range with high quality.

The following are possible using the R&S TS-PSM2:

- Analog function test
- Connection of voltage/current sources
- Connection of test component loads (original loads, simulated/electronic load)
- Switch simulation
- Power Multiplexer

4.13.3 Requirements and Restrictions

Each R&S TS-PSM2 module can only be used in the R&S CompactTSVP and R&S PowerTSVP.

In the rear I/O area, an R&S TS-PRIO Rear Transmission Module can be used for the R&S TS-PSM2. This makes it possible to route the local analog bus out to the rear of the R&S CompactTSVP or R&S PowerTSVP.

4.14 R&S TS-PSM3

4.14.1 Functionality

The R&S TS-PSM3 High-power Switch Module is intended for use in the R&S CompactTSVP and R&S PowerTSVP test platform. The module occupies two slots. Control of the module is via the CAN bus.

- R&S TS-PSM3 module can be ordered with a connector of the Virginia Panel Corp. (VPC) on the front of the module as R&S TS-PSM3 (variant 03). The connector is connected to the individual channels of the module via terminals on the switch card using a pre-assembled cable set.
- R&S TS-PSM3 (variant 02) module is delivered without VPC; the user can connect his loads or power supply units with his own cables via apertures on the front plate of the module to the terminals of the channels.

A soft panel is available for interactive operating the R&S TS-PSM3. Control is via an available LabWindows IVI switch driver.

The module offers the following key features:

- Deployable in the R&S TS-PCA3 (R&S CompactTSVP) and R&S TS-PWA3 (R&S PowerTSVP) chassis
- Eight high power channels for currents up to 30 A
- Eight low power channels for currents up to 2 A
- Switching of voltages up to 30 V
- Current measurement capabilities using shunt resistors or current-voltage converters
- Feed-through of all channels to the rear of the R&S TS-PWA3 chassis by means of R&S TS-PRIO3 rear I/O module is possible
- Feed-through of all low power channels and high power channels 9 to 14 to the rear of the R&S TS-PCA3 chassis by means of optional R&S TS-PK04 cable set possible
- Support via R&S Signal Routing Library TS-LSRL
- Self-test capability

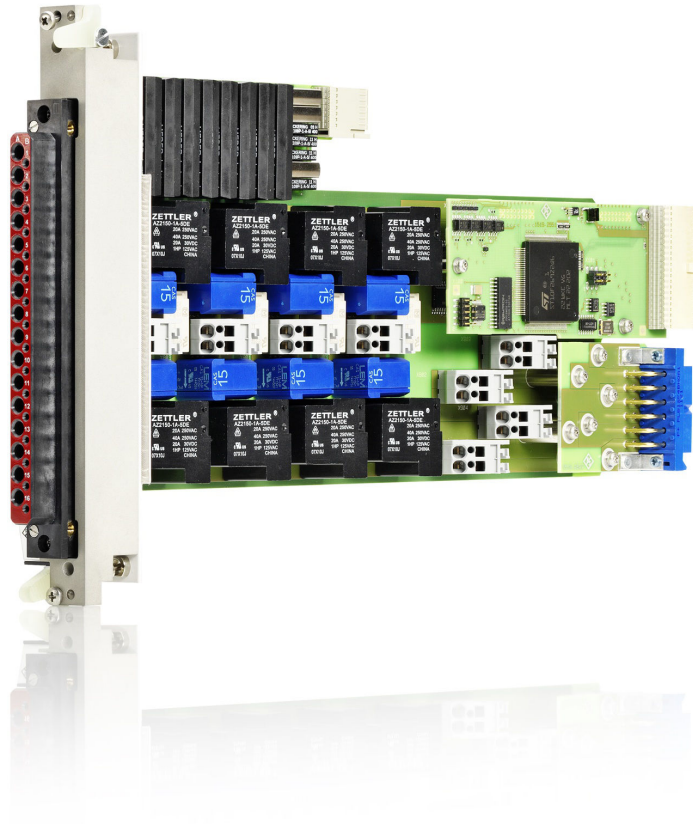


Figure 4-14: View of the R&S TS-PSM3

4.14.2 Usage

The following tasks are possible using the R&S TS-PSM3:

- Analog function test
- Connection of voltage/current sources to measure the current during active load or to measure the current with load in standby state
- Connection of test component loads (original loads, simulated/electronic load)
- Switch simulation

4.14.3 Requirements and Restrictions

Each R&S TS-PSM3 module can only be used in the R&S CompactTSVP and R&S PowerTSVP test system versatile platforms.

The R&S TS-PSM3 is suitable for voltages of up to +30 V DC and must only be used correspondingly.

To use the LabWindows IVI driver, the IVI and VISA libraries from National Instruments are necessary.

4.15 R&S TS-PSM4

4.15.1 Functionality

The R&S TS-PSM4 High-power Switch Module is intended for the R&S CompactTSVP and R&S PowerTSVP test platform. The module occupies one slot. Control of the module is via the CAN bus.

The module is available in two versions:

- R&S TS-PSM4 can be ordered with a connector of the Virginia Panel Corp. (VPC) on the front of the module as R&S TS-PSM4 (variant 03). The connector is connected to the individual channels of the module via terminals on the base board using a pre-assembled cable set.

R&S TS-PSM4 (variant 02) is delivered without VPC. The user can connect his loads or power supply units with his own cables via apertures on the front plate of the module to the terminals of the channels.

A soft panel is available for interactive operating the R&S TS-PSM4. Control is via an available LabWindows IVI switch driver.

The R&S TS-PSM4 offers the following key features:

- Deployable in the R&S TS-PCA3 (R&S CompactTSVP) and R&S TS-PWA3 (R&S PowerTSVP) chassis
- Twelve high power channels for currents up to 16 A
- Eight low power channels for currents up to 2 A
- Switching of voltages up to 30 V
- Current measurement capabilities using shunt resistors
- Feed-through of all channels to the rear of the R&S TS-PWA3 chassis by means of R&S TS-PRIO2 Rear- I/O-Module possible
- Feed-through of all channels to the rear of the R&S TS-PCA3 chassis by means of optional R&S TS-PK04 cable set possible
- Support via R&S Signal Routing Library TS-LSRL
- Self-test capability

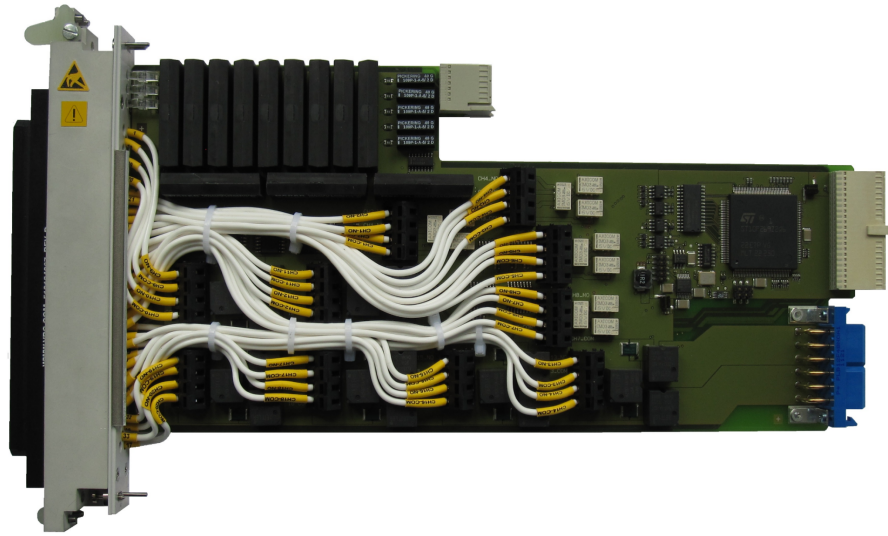


Figure 4-15: View of the R&S TS-PSM4

4.15.2 Usage

The following tasks are possible using the R&S TS-PSM4:

- Analog function test
- Connection of voltage/current sources to measure the current during active load or to measure the current with load in standby state
- Connection of test component loads (original loads, simulated/electronic load)
- Switch simulation

4.15.3 Requirements and Restrictions

Each R&S TS-PSM4 module can only be used in the R&S CompactTSVP and R&S PowerTSVP test system versatile platform.

To use the LabWindows IVI driver, the IVI and VISA libraries from National Instruments are necessary.

4.16 R&S TS-PSM5

4.16.1 Functionality

The R&S TS-PSM5 High-power Switch Module is intended for the R&S CompactTSVP and R&S PowerTSVP test system versatile platform. The module occupies two slots. Control of the module is via the CAN bus.

The module is available in two versions:

- R&S TS-PSM5 can be ordered with a connector of the Virginia Panel Corp. (VPC) on the front of the module as R&S TS-PSM5 (variant 03). The connector is connected to the individual channels of the module via terminals on the base board using a pre-assembled cable set.

R&S TS-PSM5 (variant 02) is delivered without VPC. The user can connect his loads or power supply units with his own cables via apertures on the front plate of the module to the terminals of the channels.

A soft panel is available for interactive operating the R&S TS-PSM5. Control is via an available LabWindows IVI switch driver.

The R&S TS-PSM5 offers the following key features:

- Deployable in the R&S TS-PCA3 (R&S CompactTSVP) and R&S TS-PWA3 (R&S PowerTSVP) chassis
- Four channels for currents up to 50 A
- Four channels for currents up to 2 A
- Switching of voltages up to 24 V
- Current measurement capabilities using shunt resistors or current-voltage-converters
- Feed-through of all channels to the rear of the R&S TS-PWA3 chassis is possible by means of the R&S TS-PRIO5 Rear-I/O-Module
- Feed-through of all 2 A channels and the 50 A channels 5 and 8 to the rear of the R&S TS-PCA3 chassis is possible by means of the optional R&S TS-PK04 cable set
- Support via R&S Signal Routing Library TS-LSRL
- Self-test capability

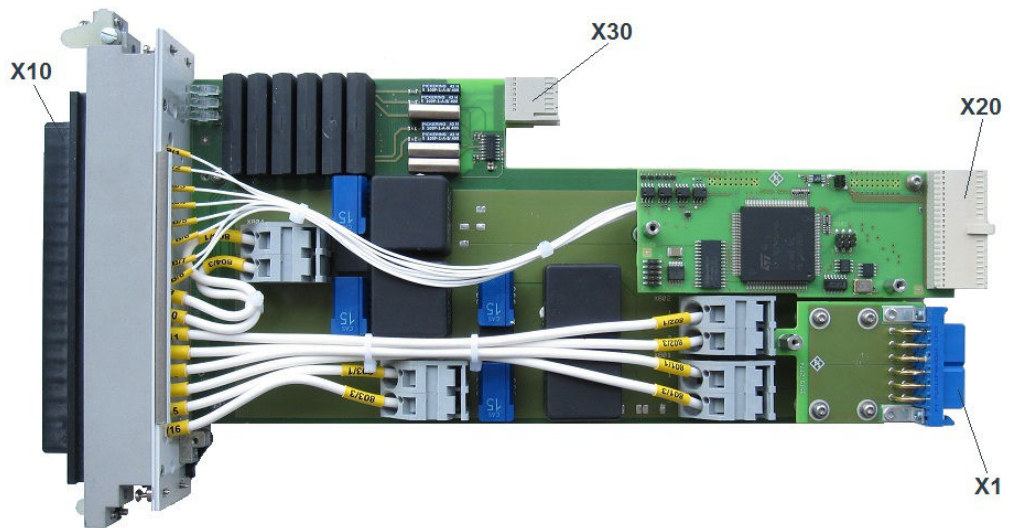


Figure 4-16: View of the R&S TS-PSM5 (variant 03)

4.16.2 Usage

The following tasks are possible using the R&S TS-PSM5:

- Analog function test
- Connection of voltage/current sources to measure the current during active load or to measure the current with load in standby state
- Connection of test component loads (original loads, simulated/electronic load)
- Switch simulation

4.16.3 Requirements and Restrictions

Each R&S TS-PSM5 module can only be used in the R&S CompactTSVP and R&S PowerTSVP test system versatile platform.

To use the LabWindows IVI driver, the IVI and VISA libraries from National Instruments are necessary.

4.17 R&S TS-PSU

4.17.1 Functionality

The R&S TS-PSU Power Supply and Load Module is based on CompactPCI developed for use on the R&S CompactTSVP and R&S PowerTSVP production test plat-

form. It has a width of only one slot and a height of four units. It is controlled via the CAN bus.

A soft panel is available for interactive operating the R&S TS-PSU. Control is via an available LabWindows/CVI switch driver.

It offers the following key features:

- Two fully independent, floating channels with maximum power 50 W each, a voltage range ± 50 V and a maximum current of 3 A
- Source and sink operation with separate sensing (four-quadrant operation)
- Electronic load with up to 20 W continuous dissipated power
- Integrated voltage and current measurement
- Two integrated voltage measurement units for external use
- Recording of voltage or current values as they change over time
- External trigger of source and measurement via PXI trigger signals
- Over voltage, over current, over temperature and short circuit protection
- 4:1 Relay multiplexer (force and sense) per channel for panel test
- Access to analog measurement bus
- Self-test capability
- GTSL (generic test software library) in DLL format



Figure 4-17: View of the R&S TS-PSU

4.17.2 Usage

Designed for four-quadrant operation, the R&S TS-PSU module can be used in functional tests (FCT) as well as in-circuit tests (ICT).

The following are some typical applications:

- High-performance voltage and current supply in functional tests
- Recording of voltage/current characteristics of the DUT being powered
- Electronic load simulation
- Auxiliary voltage source for in-circuit tests
- Charge/discharge tests 8e.g. by defined discharging of batteries)

4.17.3 Requirements and Restrictions

Each R&S TS-PSU module can only be used in the R&S CompactTSVP and R&S PowerTSVP and requires a PSU-RIO at the assigned rear I/O slot (behind the R&S TS-PSU module, in the same slot) and the PSU AC/DC converter (external power supply to be connected to the PSU-RIO).

To use the LabWindows/CVI driver, the IVI and VISA libraries from National Instruments are necessary.

4.18 R&S TS-PSU12

4.18.1 Functionality

The R&S TS-PSU12 Power Supply and Load Module 12 V is a module based on CompactPCI developed for use on the R&S CompactTSVP and R&S PowerTSVP production test platform. It has a width of only one slot and a height of four units. It is controlled via the CAN bus.

A soft panel is available for interactive operating the R&S TS-PSU12. Control is via an available LabWindows/CVI switch driver.

It offers the following key features:

- Two fully independent, floating channels with maximum power 5 W each, a voltage range ± 12 V and a maximum current of 0,5 A
- Source and sink operation with separate sensing (four-quadrant operation)
- Electronic load with up to 6 W continuous dissipated power
- Integrated voltage and current measurement
- Two integrated voltage measurement units for external use
- Recording of voltage or current values as they change over time
- External trigger of source and measurement via PXI trigger signals
- Over voltage, over current, over temperature and short circuit protection

- 4:1 Relay multiplexer (force and sense) per channel for panel test
- Access to analog measurement bus
- Self-test capability
- GTSL (generic test software library) in DLL format



Figure 4-18: View of the R&S TS-PSU12

4.18.2 Usage

The R&S TS-PSU12 module has the four-quadrant capability (i.e. the capability that the current and voltage can be programmed in both positive and negative range) letting it operated in applications as a load (sink).

The measurement units integrated into the module for each channel make it possible to read back the current and voltage of any given channel.

With the R&S TS-PSU12 It is possible to measure external voltages over time directly on the test object by using the multiplexer included in the module.

4.18.3 Requirements and Restrictions

The R&S TS-PSU12 module can only be used in the R&S CompactTSVP and R&S PowerTSVP and requires a R&S TS-PDC at the associated rear-I/O slot (the same slot number as R&S TS-PICT).

To use the LabWindows IVI driver, the IVI and VISA libraries from National Instruments are necessary.

5 Introduction Specific Modules

5.1 R&S TS-ISC

The R&S TS-ISC TSVP In-System Calibration includes the following components:

- R&S TS-PCAL2 calibration module
- Adapter and cable
- TS-LISC software license



Figure 5-1: R&S TS-PCAL2 calibration module with adapter and cable

5.1.1 R&S TS-PCAL2 Calibration Module

The R&S TS-PCAL2 card provides the signals necessary for calibration.

The module includes the following components:

- Floating 5 V reference source
- Three reference resistors
- Ground referenced current source (adjustable up to 1 A)
- Floating signal generator
 - DC voltage in range -40 V to 40 V
 - AC sinusoid:
 - 0 V_{pp} to 80 V_{pp} in frequency range 20 Hz to 50 kHz
 - 0 V_{pp} to 2 V_{pp} in frequency range 20 Hz to 1 MHz

- Floating measuring system for voltage, current and resistance measurements
- Relay matrix for connecting the components to the analog bus lines on an R&S TS-PMB module installed in the front of the R&S TSVP

5.1.2 Cable and Adapters

The following adapter components are used:

- Calibration adapter TS-PCALA
- Calibration adapter TS-PCALB
- Calibration adapter TS-PCALC
- Cable for connecting the adapters to the external multimeter

5.1.3 Usage

The TSVP In-System Calibration R&S TS-ISC enables the modules of the R&S CompactTSVP and R&S PowerTSVP production testing platforms to be calibrated in the system and readjusted if required.

5.1.4 Requirements and Restrictions

To allow calibration of the R&S CompactTSVP modules in the system, the following requirements need to be met:

- R&S TS-PMB module (firmware version 03.01 or higher) installed
- Agilent multimeter 3458 A installed
- "High stability option 002" installed in Agilent multimeter 3458 A, if R&S TS-PIO2 modules are to be adjusted
- GPIB USB-HS or GPIB-PXI module from National Instruments installed
- Windows XP or Windows 7 installed
- R&S GTSL 2.80 or higher installed
- A printer must be installed

Calibration is carried out using special testing software. The R&S TS-LISC GTSL license is required to operate this software.

6 Use Case Examples

6.1 Standard Test Procedures

According to the test goals, different types of tests can be performed.

- **In-Circuit Test**
With an In-Circuit test, each component of a printed circuit board is tested separately. The adaptation between the test system and the DUT is realized via a bed of nails adapter.
- **Functional Test**
In a Functional Test, a specific input signal is supplied to the DUT. The related output signal will be measured and compared with the expected output signal.
- **Cluster Test**
The Cluster test is a combination of an in-circuit test and a functional test. In general, this test method follows the In-Circuit test.
- **Performance Test**
The Performance test is an enhancement of the Functional test and is used for processor controlled modules with bus structure. It offers additional capabilities for emulation and test of bus oriented VLSI modules.

In order to setup a use case, the following standard steps must be performed.

1. Select the required test modules for the test use case and connect the modules with the correct backplane of the production test platform.
2. Prepare the circuit documentation according to the available data for the DUT.
3. Export the circuit description from the CAD system automatically. Alternatively, enter the circuit description manually in a text file and save the description as BDL file.
4. Prepare the test program by the Automatic Test Generator ATG.
5. Prepare the adapter.
6. Perform the test.

6.2 Self Test Procedure

The "TSVP Self Test" utility can be used to check the proper function of any R&S TSVP module.

The self test utility is by default only available for R&S TSVP modules. Additionally, it is possible to enhance the self test library for other components. Therefore, a LabWindows CVI template is offered.



A complete description of each R&S TSVP module can be found in the *Service Manual Compact TSVP and Power TSVP*.

In order to perform a self test, the following steps must be performed.

1. Open the "TSVP Self Test" utility via "GTSL" > "TSVP Self Test".

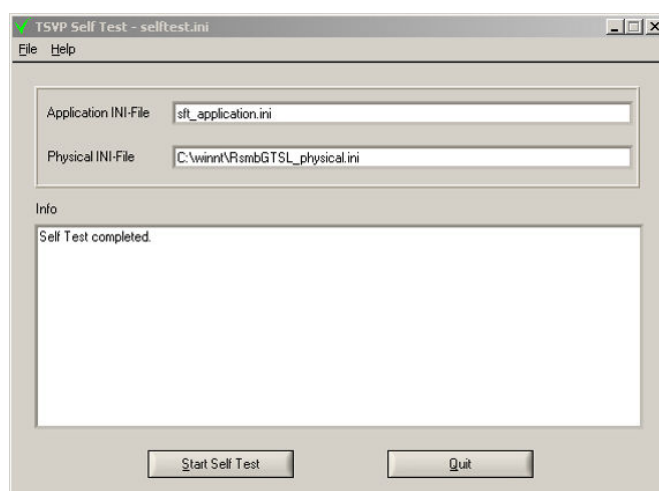


Figure 6-1: TSVP Self Test - application.ini and physical.ini

- a) For "Application INI-File", add the path and the name of the selftest application.ini file.
 - b) For "Physical INI-File", add the path and the name of the physical.ini file.
2. Click "Start Self Test" in order to start the self test.
 3. In the window "Self Test Parts and Options", the following settings can be specified.

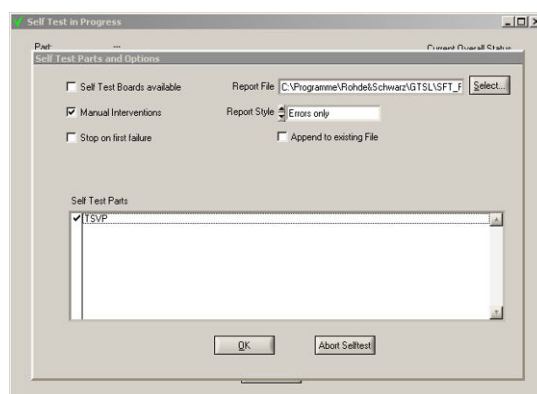


Figure 6-2: TSVP Self Test - Parts and Options

- "Self Test Boards available"
If checked, an extended test with a specific test connector is enabled
- "Manual Interventions"
If checked, some queries will be displayed

- "Stop on first failure"
If checked, the self test stops after the first error or failure occurred
 - "Report File"
Select the path and name of the result file (ASCII format)
 - "Report Style"
Select the result logging options (*Log all* or *Errors only*)
 - "Append to existing File"
If checked, the results will be appended to any existing report file
4. Click "OK".
 5. In the window "Part TSVP", select the modules to be tested. With "Check All" all available modules will be checked.

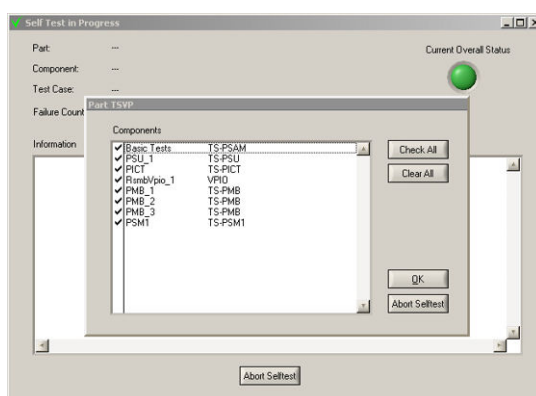


Figure 6-3: TSVP Self Test - Part TSVP

6. Click "OK".
7. After a successful self test, the message **Self Test Passed** is displayed in the window "Selftest Result". The following option can be configured.

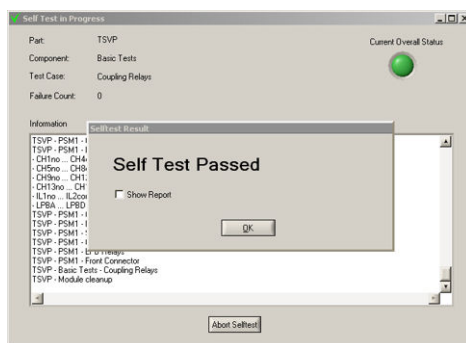


Figure 6-4: TSVP Self Test - Self Test Result

- "Show Report"
If checked, the results are displayed in a text editor (e.g. notepad)



The capability to perform a nearby complete self test is available for Rohde & Schwarz TSVP modules only. But there is a specific self test template available to create customized and additional self tests modules not yet included modules.

For a detailed description on how to implement own self test libraries, refer to *Service Manual Compact TSVP and Power TSVP*.

7 Installation of R&S CompactTSVP and R&S GTSL

Incompatibilities that can lead to a system malfunction can occur when you install, re-install software or hardware components.

- Software components include firmware, R&S GTSL, runtime setup, Microsoft Windows or R&S TSVP.
- Hardware components include new R&S TSVP modules, control computer or CompactPCI bridge solutions.

The following chapters describe known installation problems along with possible solutions.

- Different versions of Microsoft Windows require specific R&S GTSL versions. The dependencies are described in [Chapter 7.1, "Microsoft Windows Versions"](#), on page 75.
- Calibration of R&S TSVP modules requires a specific R&S GTSL version with the appropriate in-system calibration software, depending on the release date or revision status of the module. During the update process, various aspects must be considered. This process is described in [Chapter 7.2, "R&S TSVP In-System Calibration"](#), on page 76.
- Depending on the hardware configuration, various problems can occur while installing or updating drivers. The driver concept for the CAN bus modules is described in [Chapter 7.3, "CAN Bus Modules \(VCI, R&S TS-PSYS1\)"](#), on page 80.
- Solutions to problems for systems with CompactPCI bridges (R&S TS PSC0 and R&S TS PSC07) are described in [Chapter 7.4, "Compact PCI Bridges \(R&S TS-PSC0 and R&S TS-PSC07\)"](#), on page 95.
- When replacing R&S TSVP modules, an R&S GTSL update can be necessary. New modules possibly require new driver versions. These dependencies are described in [Chapter 7.5, "R&S GTSL Device Driver Updates"](#), on page 98.
- Optimized update procedures are described in [Updating a Windows XP Computer](#) and [Updating a Windows 7 Computer](#).

The final chapters cover aspects related to the license viewer and displaying the R&S GTSL documentation.

• Microsoft Windows Versions	75
• R&S TSVP In-System Calibration	76
• CAN Bus Modules (VCI, R&S TS-PSYS1)	80
• Compact PCI Bridges (R&S TS-PSC0 and R&S TS-PSC07)	95
• R&S GTSL Device Driver Updates	98
• Updating a Windows XP Computer	103

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7.1 Microsoft Windows Versions

Specific R&S GTSL versions with the appropriate runtime setup (VISA runtime, IVI compliance package, CVI runtime engine, R&S TS-PSYS driver etc.) are suitable for the versions of Microsoft Windows documented in the table.



On Windows 10 computers with the secure boot feature activated, Windows no longer boots up if the R&S TS-PSYS driver VCI version 3.x is installed. In this case, the secure boot feature must be deactivated in the BIOS.

The R&S TS-PSYS driver VCI version 4.x is suitable for Windows 10 with the secure boot feature activated. However, this driver only supports the current version of R&S TS-PSYS1 (material number 1157.9910.10).

Table 7-1: Microsoft Windows version dependencies

Windows version	R&S GTSL version	Date
Windows 2000	02.71	10.2007
Windows XP	02.80	07.2008
	02.81	12.2008
	02.82	02.2009
	02.90	11.2009
	02.91	11.2010
	02.92	10.2011
Windows XP Windows 7	03.00	09.2012
	03.10	04.2013
	03.21	07.2014
	03.30	11.2014
	03.31	04.2016
	03.32	09.2016
Windows 7 Windows 10	03.33	10.2017
	03.34	09.2018
Windows 10 with secure boot feature activated	03.40	01.2020

7.2 R&S TSVP In-System Calibration

The "in-system calibration" software is used to calibrate the R&S TSVP modules. It basically consists of the test program (010075_pa.exe) and the R&S Test Management Software G5. The test program uses the R&S GTSL device drivers and the R&S Test Management Software G5. Therefore, always use the components that are supplied as part of an R&S GTSL version together.

For calibration of R&S TSVP modules, the "in-system calibration" software in the latest R&S GTSL version should always be used to support new modules and the latest revision status of components.

7.2.1 Overview

Table 7-2: Required R&S GTSL version for calibration of specific modules

Version R&S GTSL	Date	Version test program	Version R&S Test Management Software G5	Features / changes
R&S GTSL 2.80	10.2008	05.02	02.48	<ul style="list-style-type: none"> Windows 2000 and Windows XP compatible
R&S GTSL 2.82	09.2009	05.05	02.48	<ul style="list-style-type: none"> Improvements for R&S TS-PAM, R&S TS-PIO2, R&S TS-PSAM and R&S TS-PSU
R&S GTSL 2.90	12.2009	05.08	02.54	<ul style="list-style-type: none"> Windows 2000 and Windows XP compatible Improvement for R&S TS-PCALB, R&S Test Management Software G5 version 02.54
R&S GTSL 2.92	10.2010	05.11	02.54	<ul style="list-style-type: none"> Minor changes
R&S GTSL 3.00	09.2012	05.12	02.54	<ul style="list-style-type: none"> Support for R&S TS-PAM 1157.9410.02 R&S Test Management Software G5 version 07.02 for Windows 7
R&S GTSL 3.10	04.2013	05.15	07.02 02.54	<ul style="list-style-type: none"> Support for R&S TS-PSM3
R&S GTSL 3.21	07.2014	05.36	07.02 02.54	<ul style="list-style-type: none"> Support for R&S TS-PSM4 and R&S TS-PSM5
R&S GTSL 3.30	10.2014	05.37	02.54 10.16	<ul style="list-style-type: none"> New R&S Test Management Software G5 version 10.16 for Windows 7 Minor changes

Version R&S GTSL	Date	Version test program	Version R&S Test Management Software G5	Features / changes
R&S GTSL 3.31	05.2016	05.39	10.34	<ul style="list-style-type: none"> • New R&S Test Management Software G5 version 10.34 for Windows XP and Windows 7 • Support for R&S TS-PFG 1157.9610.02 • Support for R&S TS-PICT from revision 4-00 (label 01.6.4-00)
R&S GTSL 3.32	09.2016	05.40	10.34	<ul style="list-style-type: none"> • Support for R&S TS-PIO4 and R&S TS-PIO5
R&S GTSL 3.33	10.2017	05.41	11.11	<ul style="list-style-type: none"> • New R&S Test Management Software G5 version 11.11 for Windows 7 and Windows 10 • Support for R&S TS-PSYS1 1157.9910.10 • Support for R&S TS-PSAM revision status from 6.00
R&S GTSL 3.34	09.2018	05.44	11.30	<ul style="list-style-type: none"> • New R&S Test Management Software G5 version 11.30 for Windows 7 and Windows 10 • Improvements for R&S TS-PIO4, R&S TS-PIO5 • Support for alignment R&S TS-PSAM modules from revision status 6.00 • R&S TS-PSAM offset error correction improved for AC voltage measurements -
R&S GTSL 3.40	01.2020	5.51	11.43	<ul style="list-style-type: none"> • Compliant to ISO 17025:2017

7.2.2 Updating the R&S Test Management Software G5

When updating the R&S Test Management Software G5 associated with the R&S TSVP in-system calibration solution, incompatibilities can arise when updating an old installation to a newer version. To prevent such problems, certain components must be manually uninstalled or deleted before updating the software (depending on the installed R&S Test Management Software G5 version).

Components can be uninstalled in the Windows control panel in the "Programs and Features" section.

The computer must be rebooted before installing the new software.

R&S GTSL versions 2.80 to 3.21 under Windows XP

This R&S Test Management Software G5 version must be manually uninstalled before installing a newer version.

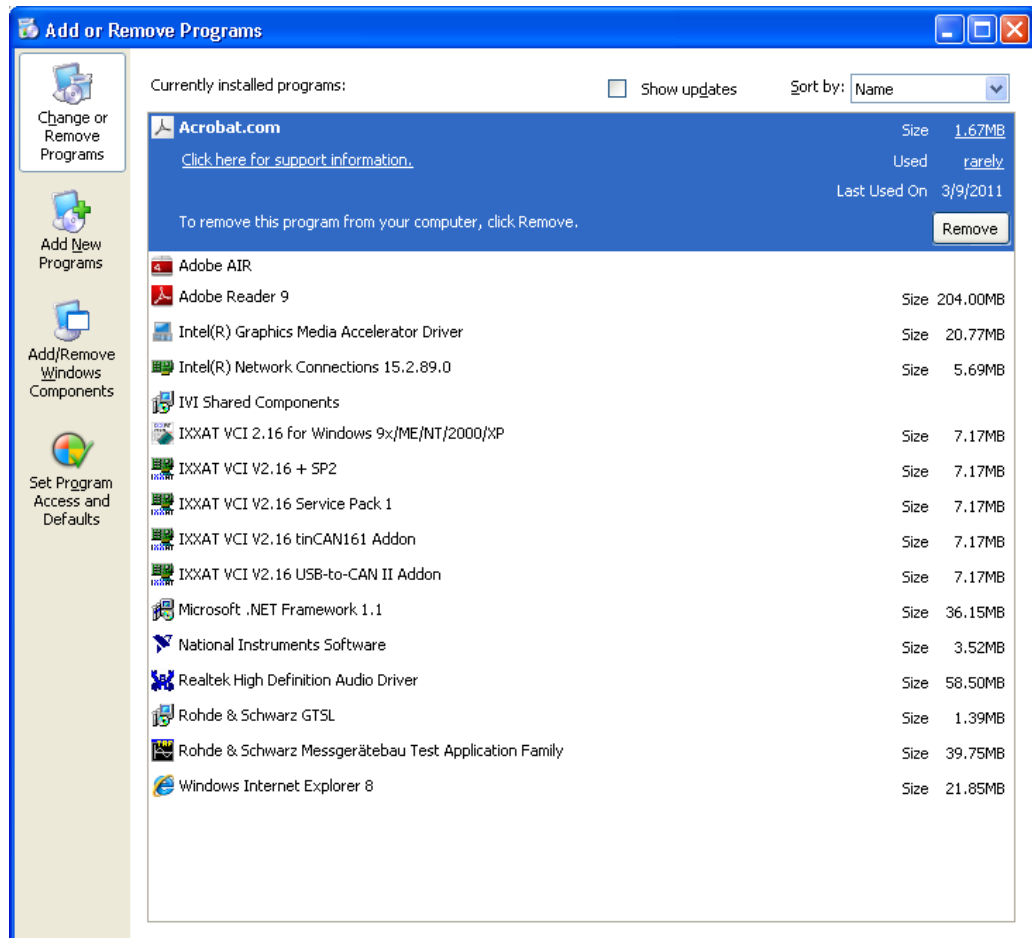


Figure 7-1: Installed R&S Test Management Software G5 components R&S GTSL 2.80 to 3.21 under Windows XP.

1. Uninstall "R&S Messgerätebau Test Application Family".
The computer automatically reboots.
2. Delete the following files and folders with the file manager:
 - C:\Windows\TESTSYSTEM.IN_
 - C:\Windows\TESTSYSTEM.INI
 - C:\Windows\system32\Rsmg5Util07.dll
 - C:\Program Files\Rohde&Schwarz\RsdmbTestApplication\TestSystem (complete folder)

R&S GTSL versions 3.00 to 3.21 under Windows 7

This R&S Test Management Software G5 version must be manually uninstalled before installing a newer version.

Name	Publisher	Installed On	Size	Version
Adobe Reader X MUI	Adobe Systems Incorporated	11/5/2012	470 MB	10.0.0
IVI Shared Components		10/25/2012		
IXXAT VCI 2.20.761.0	IXXAT Automation GmbH	11/5/2012	25.3 MB	2.20.761.0
IXXAT VCI 3.4.1.3080	IXXAT Automation GmbH	11/5/2012	33.3 MB	3.4.1.3080
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.17	Microsoft Corporation	11/5/2012	788 KB	9.0.30729
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.6161	Microsoft Corporation	8/25/2017	788 KB	9.0.30729.6161
MSXML 4.0 SP2 (KB973688)	Microsoft Corporation	11/5/2012	1.34 MB	4.20.9876.0
National Instruments - Software	National Instruments	10/25/2012		
R&S Messgerätebau Microsoft Devcon	Rohde & Schwarz Messgeräteba...	11/5/2012	44.0 KB	1.00.0000
R&S Messgerätebau Test Manager G5 Kernel	Rohde & Schwarz Messgeräteba...	11/5/2012	12.0 MB	1.00.0002
R&S Messgerätebau Test Manager G5 Kernel Documents	Rohde & Schwarz Messgeräteba...	11/5/2012	5.35 MB	1.00.0002
R&S Messgerätebau Test Manager G5 Tweak	Rohde & Schwarz Messgeräteba...	11/5/2012	436 KB	1.00.0000
R&S Messgerätebau Test Manager G5 Tweak Documents	Rohde & Schwarz Messgeräteba...	11/5/2012	200 KB	1.00.0000
R&S Messgerätebau Test Manager GIP	Rohde & Schwarz Messgeräteba...	11/5/2012	852 KB	1.00.0000
R&S Messgerätebau Test Report Manager	Rohde & Schwarz Messgeräteba...	11/5/2012	7.29 MB	1.00.0001
R&S Messgerätebau Test Report Manager Runtime Engine	Rohde & Schwarz Messgeräteba...	11/5/2012	12.5 MB	1.00.0000
R&S Messgerätebau Tms Suite First Setup	Rohde & Schwarz Messgeräteba...	11/5/2012	2.03 MB	1.00.0002
R&S Messgerätebau Tms Suite Last Setup	Rohde & Schwarz Messgeräteba...	11/5/2012	2.02 MB	1.00.0002
R&S Messgerätebau Utility	Rohde & Schwarz Messgeräteba...	11/5/2012	1.96 MB	1.00.0001
Rohde & Schwarz GTSL	Rohde & Schwarz GmbH & Co. ...	11/5/2012		03.00
VISA Shared Components 64-Bit		10/25/2012		

Figure 7-2: Installed R&S Test Management Software G5 components R&S GTSL 3.00 to 3.21 under Windows 7

1. Uninstall the following components in the following order.
 - a) "R&S Messgerätebau Test Report Manager Runtime Engine"
 - b) "R&S Messgerätebau Tms Suite Last Setup"
 - c) "R&S Messgerätebau Microsoft Devcon"
 - d) "R&S Messgerätebau Utility"
 - e) "R&S Messgerätebau Test Report Manager"
 - f) "R&S Messgerätebau Test Manager GIP"
 - g) "R&S Messgerätebau Test Manager G5 Kernel Documents"
 - h) "R&S Messgerätebau Test Manager G5 Tweak Documents"
 - i) "R&S Messgerätebau Test Manager G5 Tweak"
 - j) "R&S Messgerätebau Test Manager G5 Kernel"
 - k) "R&S Messgerätebau Tms Suite First Setup"
2. Reboot the computer.
3. Delete the following files and folders with the file manager:
 - C:\Rohde-Schwarz\RSDMB\Config\RsdmbSetupSuite.ini
 - C:\Rohde-Schwarz\RSDMB\Config\TESTSYSTEM.INI

R&S GTSL version 3.30 under Windows XP

See "[R&S GTSL versions 2.80 to 3.21 under Windows XP](#)" on page 77.

R&S GTSL version 3.30 under Windows 7

For this version, the disk must be cleaned up before the update and the computer rebooted.

◆ R&S Messgeräteebau Test Management Software Runtime	Rohde & Schwarz Messgeräteeba...	12.09.2014	124 MB	1.00.0027
◆ R&S Messgeräteebau Test Management Software Runtime Documents	Rohde & Schwarz Messgeräteeba...	12.09.2014	6,71 MB	1.00.0014

Figure 7-3: Installed R&S Test Management Software G5 components R&S GTSL 3.30 under Windows 7

1. Uninstall the following components in the following order.
 - a) "R&S Messgeräteebau Test Management Software Runtime Documents"
 - b) "R&S Messgeräteebau Test Management Software Runtime"
2. Reboot the computer.
3. Delete the following files and folders with the file manager:
 - C:\Windows\TESTSYSTEM.INI
 - \Program Files (x86)\Rohde-Schwarz\RSDMB (complete folder)
 - C:\Rohde-Schwarz\RSDMB\G5 (complete folder)
 - C:\Rohde-Schwarz\RSDMB\Config (complete folder)

R&S GTSL versions 3.31 and 3.32

Manual uninstallation is not required when updating to R&S GTSL 3.34.

◆ R&S Test Management Software Defaults	Rohde & Schwarz	16.04.2018	2,17 MB	1.00.0005
◆ R&S Test Management Software Documents	Rohde & Schwarz	16.04.2018	8,97 MB	1.00.0026
◆ R&S Test Management Software Run-Time Engine	Rohde & Schwarz	16.04.2018	140 MB	1.00.0078

Figure 7-4: Installed R&S Test Management Software G5 components R&S GTSL 3.31 and 3.32

R&S GTSL versions 3.33 and 3.34

Manual uninstallation is not required when updating to R&S GTSL 3.40.

◆ R&S Test Management Software Defaults	Rohde & Schwarz	10.09.2018	2,18 MB	1.00.0010
◆ R&S Test Management Software Documents	Rohde & Schwarz	10.09.2018	7,08 MB	1.00.0033
◆ R&S Test Management Software Run-Time Engine	Rohde & Schwarz	17.09.2018	161 MB	1.00.0105

Figure 7-5: Installed R&S Test Management Software G5 components R&S GTSL 3.33 and 3.34

7.3 CAN Bus Modules (VCI, R&S TS-PSYS1)

7.3.1 Overview

The CAN modules (e.g. R&S TS-PMB) are controlled by the CAN controller on the R&S TS-PSYS1 module.

The R&S TS-PSYS1 module comes in two versions:

- R&S TS-PSYS1 1152.4004.02 (obsolete)
- R&S TS-PSYS1 1157.9910.10

The R&S GTSL device drivers (for example `rspmb.dll`) are only able to control the CAN modules, when the Windows driver for R&S TS-PSYS1 is installed correctly. The Windows driver is installed via the "Runtime Setup" on the R&S GTSL DVD. The driver software (VCI_...) is located in the subfolder "TS-PSYS Driver". See also [Chapter 7.5.5, "R&S TS-PSYS1 System Module"](#), on page 102.

Starting with R&S GTSL 03.33 (VCI 3.5.4.4592), both cards are officially supported. However, the module R&S TS-PSYS1 1157.9910.10 can also be used starting with VCI version 3.5.2.4268 (R&S GTSL 03.31). We recommend using the newer version.

The module R&S TS-PSYS1 1152.4004.02 is no longer supported by VCI version 4.

Before the upgrade to a newer VCI version, the older versions must be removed using the control panel.

Table 7-3: VCI versions

VCI version	R&S GTSL version	rscan.dll version	Supported R&S TS-PSYS1	Windows version
VCI 2.16 + SP2	Up to 02.92	1.x	R&S TS-PSYS1 1152.4004.02	XP
VCI 3.4.1.3080 and VCI 2.20.761.0	From 03.00 to 03.20	1.x	R&S TS-PSYS1 1152.4004.02	XP and Windows 7
VCI 3.5.2.4072 and VCI 2.20.851.0	From 03.21 to 03.30	1.x	R&S TS-PSYS1 1152.4004.02	XP and Windows 7
VCI 3.5.2.4268	03.31	2.x	R&S TS-PSYS1 1152.4004.02 R&S TS-PSYS1 1157.9910.10	XP and Windows 7
VCI 3.5.4.4546	03.32	2.x	R&S TS-PSYS1 1152.4004.02 R&S TS-PSYS1 1157.9910.10	XP and Windows 7
VCI 3.5.4.4592	From 03.33 to 03.34	2.x	R&S TS-PSYS1 1152.4004.02 R&S TS-PSYS1 1157.9910.10	Windows 7 and Windows 10
VCI 4	3.40	2.x	R&S TS-PSYS1 1157.9910.10	Windows 7 and Windows 10 (with and without secure boot activated)

7.3.2 Software Layers

The R&S GTSL device drivers (e.g. `rspmb.dll`) do not directly access the VCI layer. The CAN driver `rscan.dll` is present between device driver DLL and VCI.

`rscan.dll` is available in the main versions 1.x and 2.x. The version 1.x uses the interface of VCI layer version 2. The versions `rscan.dll` 2.x use the interface of VCI layer version 3.

Windows XP up to R&S GTSL 2.92

VCI version 2 is used by the R&S GTSL device drivers via `rscan.dll` version 1.x.

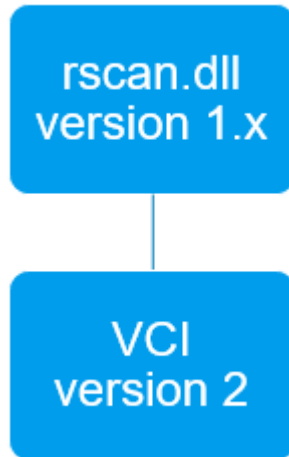


Figure 7-6: Call hierarchy up to R&S GTSL 2.92.

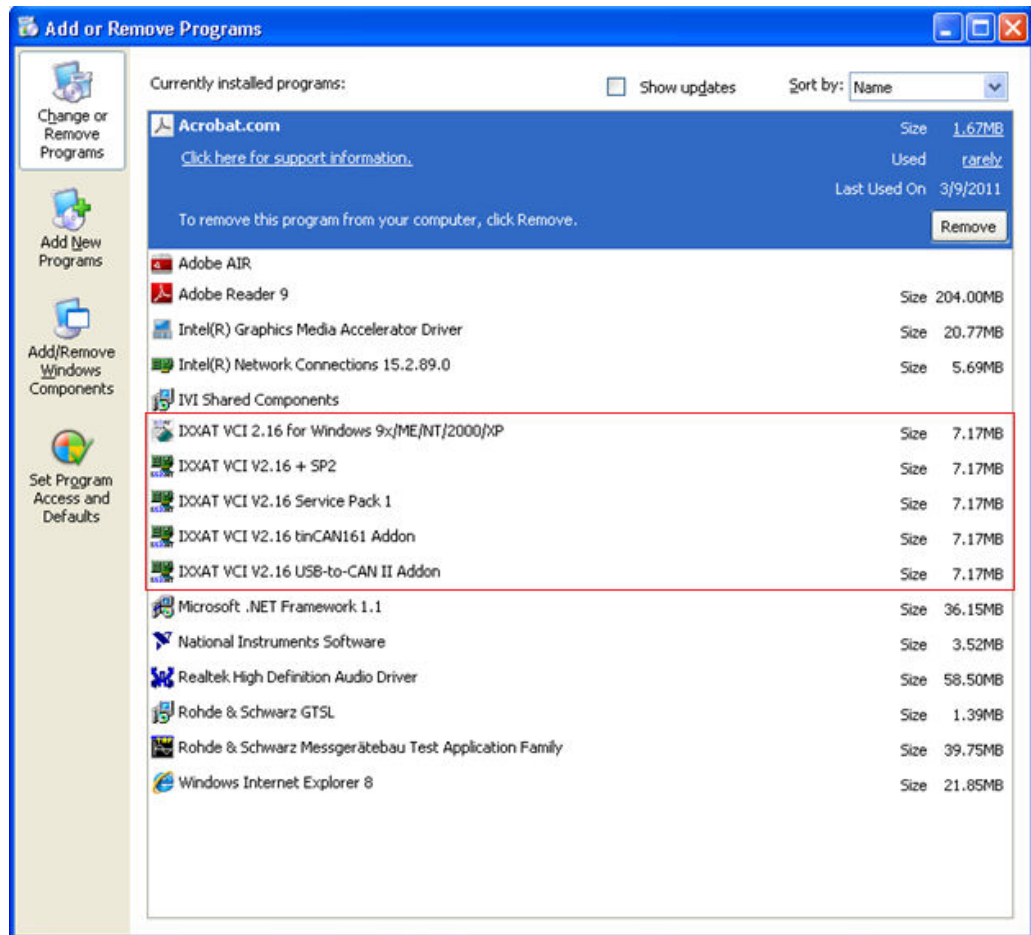


Figure 7-7: Entries in control panel – Programs and Features

Before installing VCI 3 (with or without VCI 2 wrapper), uninstall the VCI 2.16 components manually.

1. Uninstall the VCI 2.16 components in the following order.
Do not reboot the computer between the following steps.
 - a) Remove "IXXAT VCI V2.16 USB-To-CAN II Addon".
 - b) Remove "IXXAT VCI V2.16 tinCAN161 Addon".
 - c) Remove "IXXAT VCI 2.16 for Windows 9x/ME/NT/2000/XP".
 - d) Remove "IXXAT VCI V2.16 + SP2".
2. Reboot the computer.
This removes "IXXAT VCI V2.16 Service Pack 1".

Tip: If "R&S Messgerätebau Test Application Family" must also be removed, an automatic reboot is performed while uninstalling this application.

Windows 7, Windows XP from R&S GTSL 3.00 to R&S GTSL 3.30

VCI 2 wrapper and VCI 3 are installed. The `rscan.dll` version 1.x calls the VCI 2 wrapper.

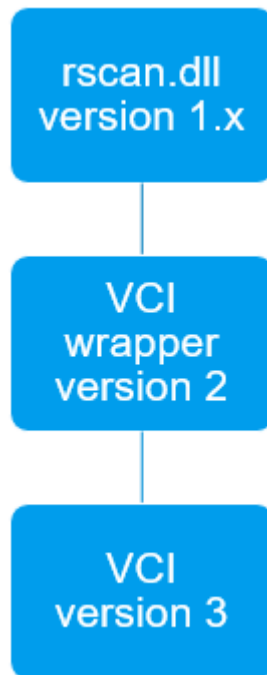


Figure 7-8: Call hierarchy from R&S GTSL 3.00 to R&S GTSL 3.30.

The wrapper and VCI 3.x appear in the list of programs.

Name	Publisher	Installed On	Size	Version
Adobe Reader X MUI	Adobe Systems Incorporated	11/5/2012	470 MB	10.0.0
IVI Shared Components		10/25/2012		
IXXAT VCI 2.20.761.0	IXXAT Automation GmbH	11/5/2012	25.3 MB	2.20.761.0
IXXAT VCI 3.4.1.3080	IXXAT Automation GmbH	11/5/2012	33.3 MB	3.4.1.3080
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.17	Microsoft Corporation	11/5/2012	788 KB	9.0.30729
Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.6161	Microsoft Corporation	8/25/2017	788 KB	9.0.30729.6161
MSXML 4.0 SP2 (KB973688)	Microsoft Corporation	11/5/2012	1.34 MB	4.20.9876.0
National Instruments - Software	National Instruments	10/25/2012		
R&S Messgerätebau Microsoft Devcon	Rohde & Schwarz Messgeräteba...	11/5/2012	44.0 KB	1.00.0000
R&S Messgerätebau Test Manager G5 Kernel	Rohde & Schwarz Messgeräteba...	11/5/2012	12.0 MB	1.00.0002
R&S Messgerätebau Test Manager G5 Kernel Documents	Rohde & Schwarz Messgeräteba...	11/5/2012	5.35 MB	1.00.0002
R&S Messgerätebau Test Manager G5 Tweak	Rohde & Schwarz Messgeräteba...	11/5/2012	436 KB	1.00.0000
R&S Messgerätebau Test Manager G5 Tweak Documents	Rohde & Schwarz Messgeräteba...	11/5/2012	200 KB	1.00.0000
R&S Messgerätebau Test Manager GIP	Rohde & Schwarz Messgeräteba...	11/5/2012	852 KB	1.00.0000
R&S Messgerätebau Test Report Manager	Rohde & Schwarz Messgeräteba...	11/5/2012	7.29 MB	1.00.0001
R&S Messgerätebau Test Report Manager Runtime Engine	Rohde & Schwarz Messgeräteba...	11/5/2012	12.5 MB	1.00.0000
R&S Messgerätebau Tms Suite First Setup	Rohde & Schwarz Messgeräteba...	11/5/2012	2.03 MB	1.00.0002
R&S Messgerätebau Tms Suite Last Setup	Rohde & Schwarz Messgeräteba...	11/5/2012	2.02 MB	1.00.0002
R&S Messgerätebau Utility	Rohde & Schwarz Messgeräteba...	11/5/2012	1.96 MB	1.00.0001
Rohde & Schwarz GTSL	Rohde & Schwarz GmbH & Co. ...	11/5/2012		03.00
VISA Shared Components 64-Bit		10/25/2012		

Figure 7-9: Entries in control panel – Programs and Features.

Before installing VCI 3.5, uninstall the old IXXAT components manually.

1. Remove IXXAT VCI 2.20.761.0.
2. Remove IXXAT VCI 3.4.1.3080.
3. Reboot the computer.

Windows 7, Windows XP from R&S GTSL 3.31

rscan.dll version 2.x directly calls the VCI 3 layer. The VCI 2 wrapper is no longer needed and should be uninstalled.

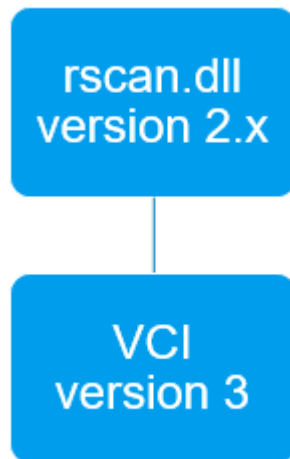


Figure 7-10: Call hierarchy from R&S GTSL 3.31.

Only one entry is left in the list of programs.

Program Name	Company	Installation Date	Size	Version
IXXAT VCI 3.5.2.4268	IXXAT Automation GmbH	10.06.2016	36,3 MB	3.5.2.4268

Figure 7-11: Entries in control panel – Programs and Features.

7.3.3 Problem Solving

After installing the runtime setup and the R&S GTSL software, the R&S TSVP soft panel must at least display the CAN module R&S TS-PSYS1 for an R&S CompactTSVP. If additional CAN modules are installed, they are also be listed:

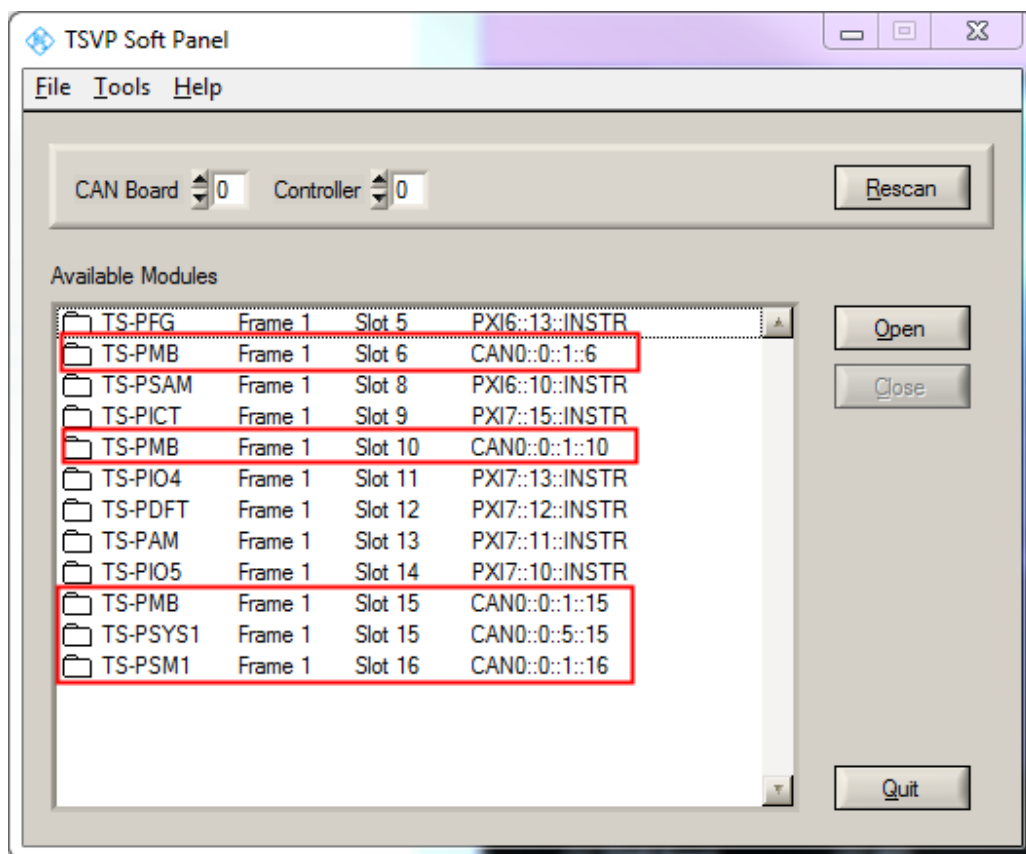


Figure 7-12: R&S TSVP soft panel

If no CAN module is displayed, there can be various reasons for the problem.

The troubleshooting process depends on the system configuration.

Systems with R&S TS-PSYS1 1152.4004.02 (obsolete)

The entry `IXXAT VCI V3 Interfaces` must appear in the device manager. "VCI3 RS TS PSYS1/PCI" are visible as a subentry below it. This is the case only if the "VCI 3..." driver is correctly assigned to the TS PSYS1 card.



This version (1152.4004.02) of the R&S TS-PSYS1 is no longer supported by VCI version 4.

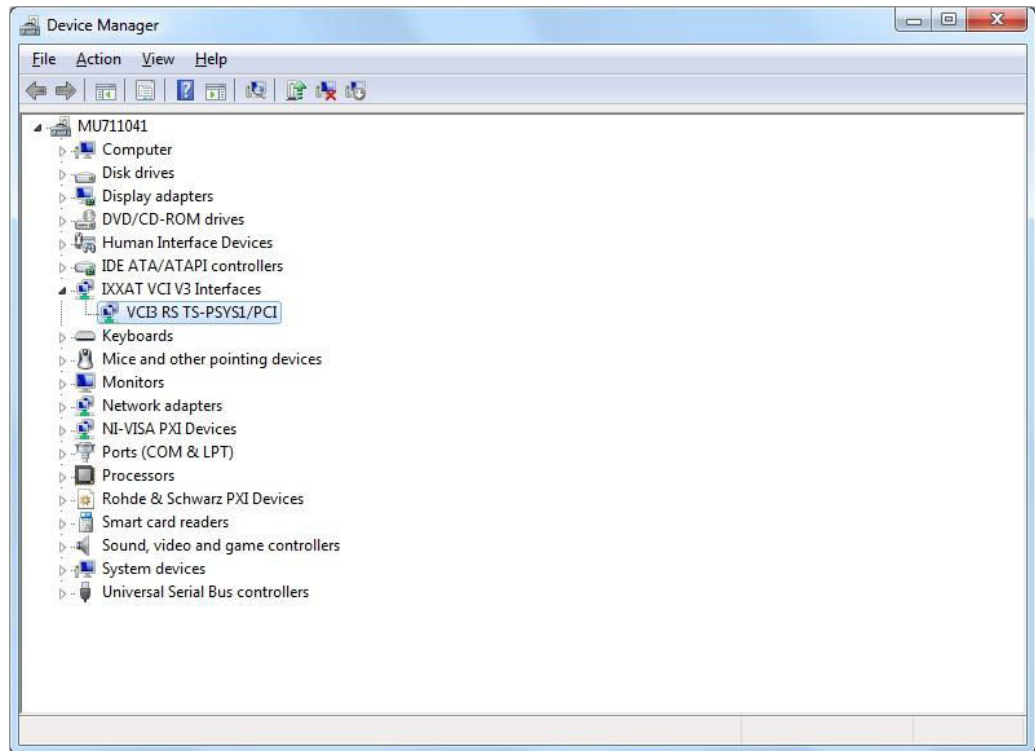


Figure 7-13: R&S TS-PSYS1 1152.4004.02 in the device manager.

In certain cases, the correct driver is not automatically assigned by the operating system to the R&S TS-PSYS1 card. The following error scenarios have occurred.

Problem with the driver installation

During installation of the R&S TS-PSYS1 driver (runtime setup on the R&S GTSL DVD; version VCI 2.16 + SP2 or newer), the component for the R&S TS-PSYS1 module was not copied to the hard disk. On Windows 7, each driver must sometimes be confirmed manually. In rare cases (depending on the VCI version and operating system), the "Always trust ..." checkbox does not have any effect.

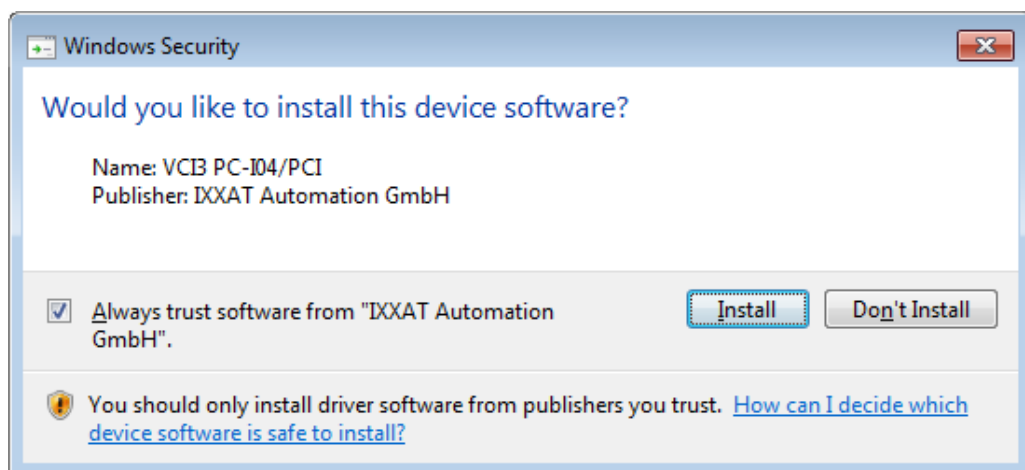


Figure 7-14: VCI3 driver installation.

Make sure that the "VCI3 RS TS-PSYS1/PCI" driver is installed.

PLX custom driver is assigned

If the control computer (internal or external with CompactPCI bridge) is booted up, Windows 7 detects the presence of the R&S TS-PSYS1 card and attempts to assign a driver to it. If R&S GTSL (and thus the "IXXAT VCI 3..." driver) was not yet installed on the PC, the operating system might assign another "suitable" driver to the R&S TS-PSYS1 card. For example, "PLX Custom PCI 9050/9052 Board" might be considered as a suitable driver since there is a PLX 9050 chip on the R&S TS-PSYS1 card.

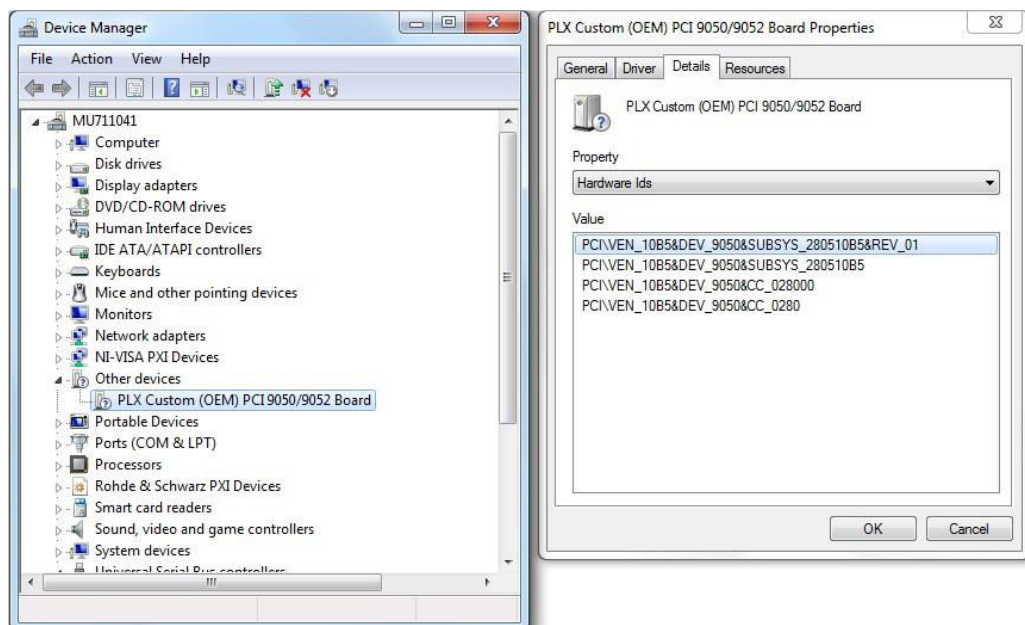


Figure 7-15: R&S TS-PSYS1 with incorrect driver assignment.

If the "IXXAT VCI 3..." driver from the R&S GTSL DVD is installed subsequently and the computer is rebooted, the "IXXAT VCI 3..." driver is no longer automatically

assigned to the R&S TS-PSYS1 card. This effect can occur, because the operating system thinks a valid (different) driver is already assigned. In this case, assign the correct "IXXAT VCI 3..." driver manually to the R&S TS-PSYS1 card in the device manager.

1. Select "Update Driver Software..." from the context menu (right mouse button).
2. Select the "Browse my computer for driver software" from the "Update Driver Software" dialog.

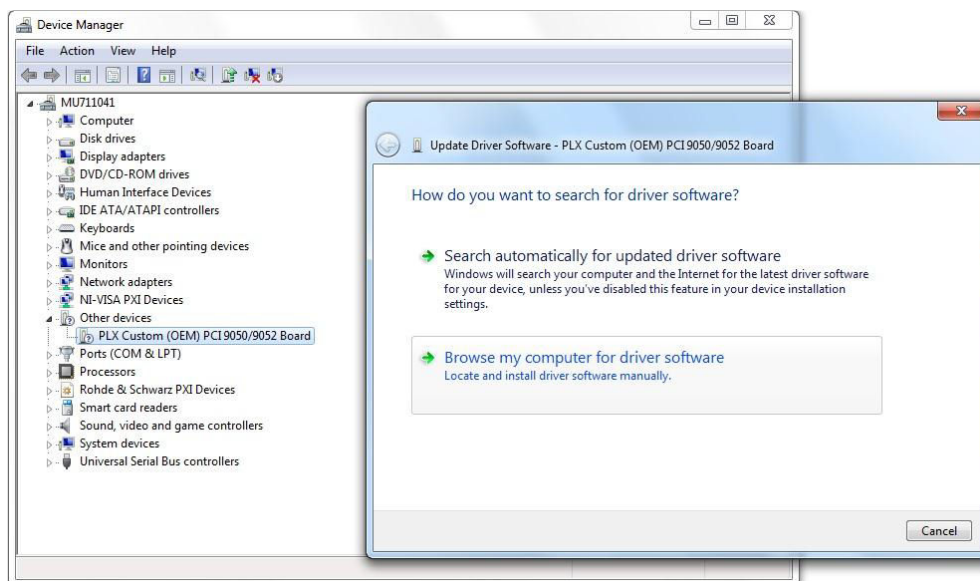


Figure 7-16: PSYS1 driver update, step 1

3. Select "Let me pick from a list of device drivers on my computer".

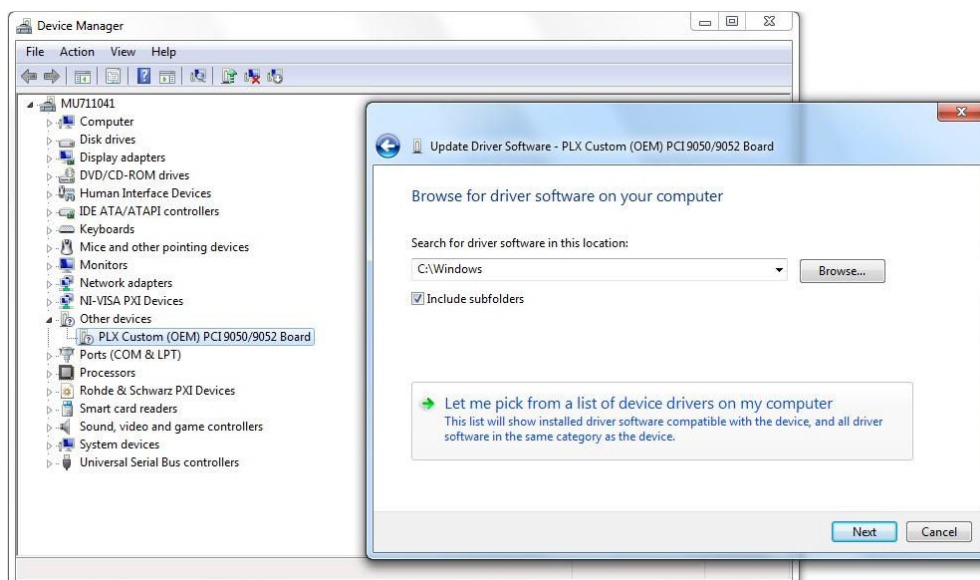


Figure 7-17: R&S TS-PSYS1 driver update, step 2.

4. Select the VCI3 RS TS-PSYS1/PCI driver which appears in the list of available drivers.

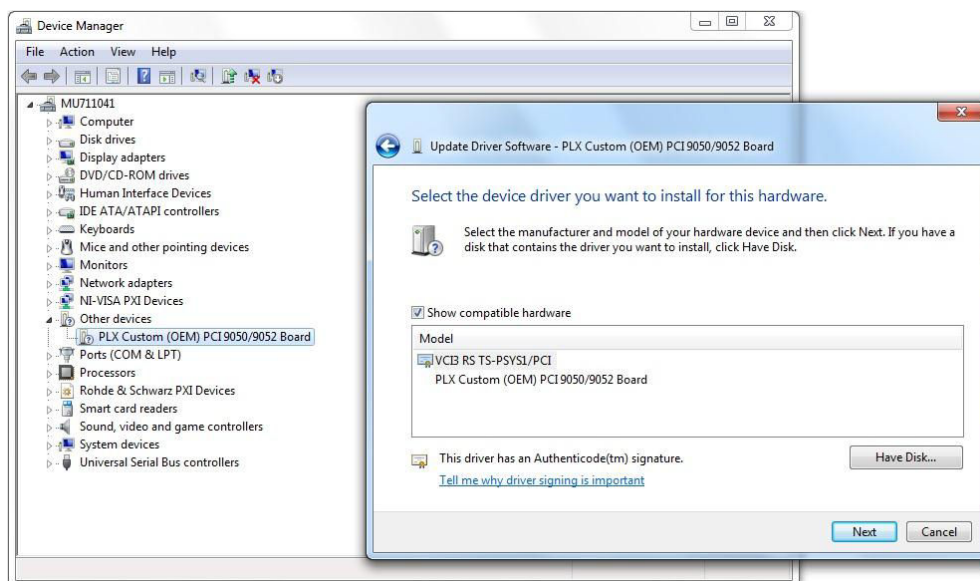


Figure 7-18: R&S TS-PSYS1 driver update, step 3.

5. After the update, a confirmation indicates that the selected driver is assigned to the hardware.

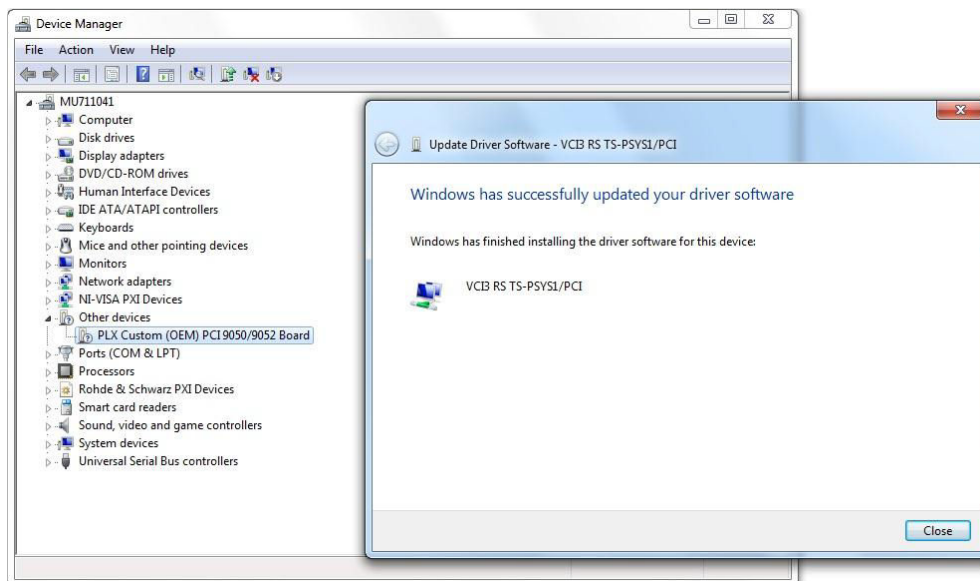


Figure 7-19: R&S TS-PSYS1 driver update, step 4.

6. Reboot the computer.
After the reboot, the "VCI 3..." driver is now assigned to the R&S TS-PSYS1 card.

Using the "Properties" context menu and the "General" tab, it is possible to confirm that the device works properly. If the device status does not show "This device is working properly" but instead reports that the driver could not be started (error code 10), then a different error scenario has occurred. See ["Systems with Windows 10 and secure boot activated"](#) on page 94.

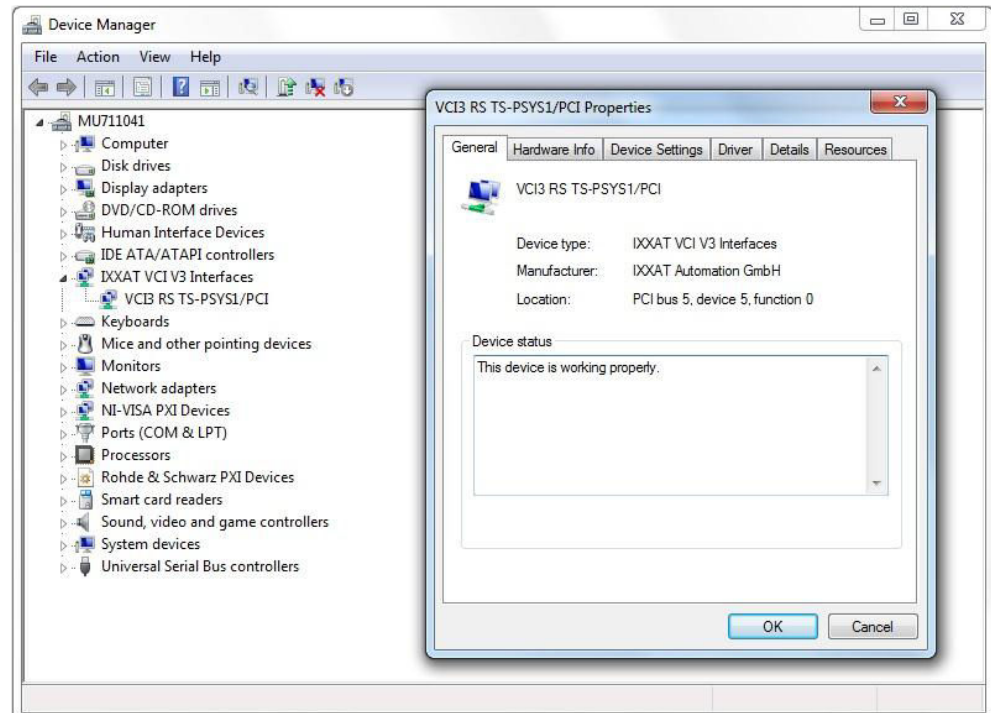


Figure 7-20: Correctly installed R&S TS-PSYS1 driver.

Driver VCI3 iPC-I165/PCI is assigned

The operating system can possibly assign the driver VCI3 iPC-I165/PCI to the R&S TS-PSYS1 card instead of the intended driver VCI3 RS TS-PSYS1/PCI. In this case, the R&S TS-PSYS1 card was not properly detected by Windows and was mistaken for an iPC-I165 card.

See ["Problem with the driver installation"](#) on page 87 for general information about assigning the correct driver to the R&S TS-PSYS1 card. The differences to the procedure are as follows:

1. In the dialog for driver selection, deselect "Show compatible hardware".
This is the only way to display the VCI3 RS TS-PSYS1/PCI driver, because it is actually not compatible with the card detected by Windows 7.

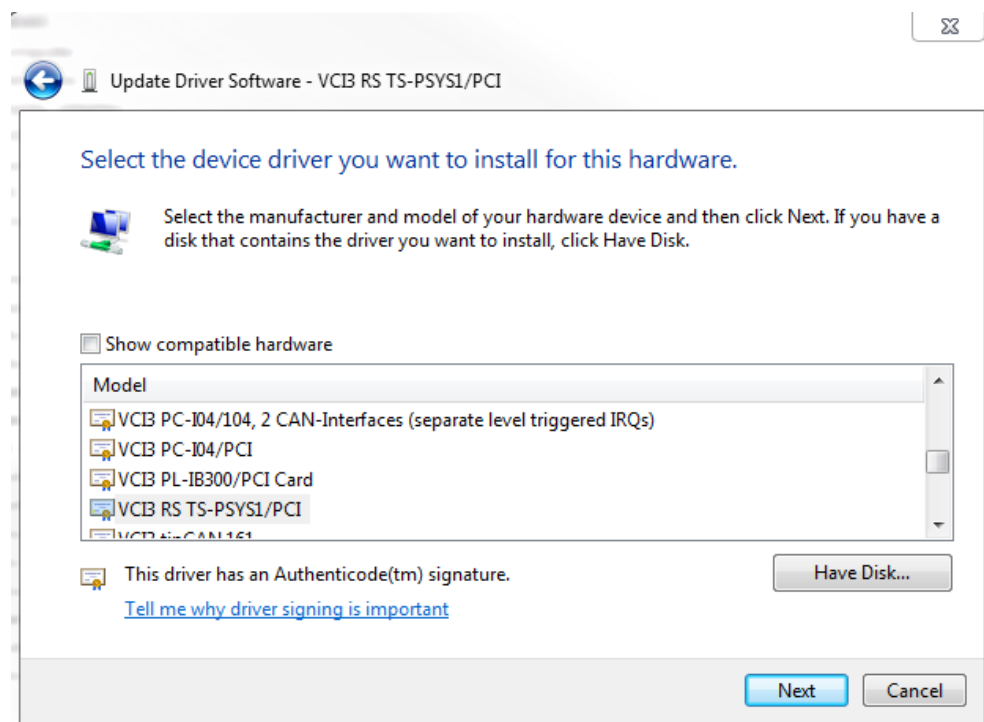


Figure 7-21:

2. Select "VCI3 RS TS-PSYS1/PCI" and continue.
3. Ignore the message to not install the driver and select to install the driver anyway.
4. Use the "Properties" context menu and the "General" tab to check whether the driver is working properly.
If error code 10 appears (meaning the driver could not be started), see ["Systems with Windows 10 and secure boot activated"](#) on page 94 for further troubleshooting steps.

Driver cannot be started

In the device manager, use the "Properties" context menu and the "General" tab to verify whether the driver for the R&S TS-PSYS card is working properly. If error code 10 appears (meaning the driver could not be started), the system changes described below can help to correct the problem. So far, this problem has occurred exclusively in combination with the option R&S TS-PSC0 or R&S TS-PSC07 in which an R&S CompactTSVP is controlled by an external control computer via a CompactPCI bridge. See ["Systems with Windows 10 and secure boot activated"](#) on page 94.

Systems with R&S TS-PSYS1 1157.9910.10

In the device manager, the entry "IXXAT VCI V3 Interfaces" must be present. "VCI3 TS PSYS10" is a subentry below it. Only this entry indicates that it was possible to correctly assign the "VCI 3..." driver to the R&S TS PSYS1 card.

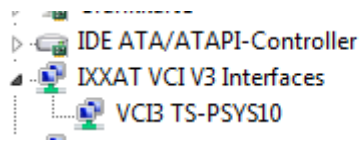


Figure 7-22: R&S TS-PSYS1 1157.9910.10 in the device manager.

If these entries are not present, the following causes should be considered.

Problem with the driver installation

During installation of the R&S TS-PSYS1 driver (runtime setup on the R&S GTSL DVD; version VCI 3.5.2.4268 or newer), the component for the new R&S TS-PSYS1 module was not copied to the hard disk. On Windows 7, each available driver must be manually confirmed sometimes. In rare cases (depending on the VCI version and operating system), the "Always trust ..." checkbox does not have an effect.

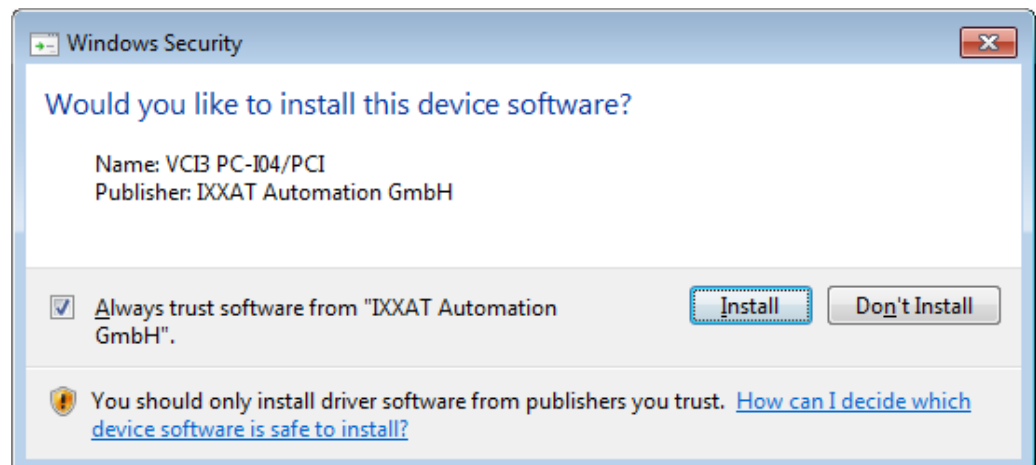


Figure 7-23: VCI3 driver installation.

Make sure that the "VCI3 TS PSYS10" driver is installed.

Problem with PCI Express Native Control

On some control computers for R&S CompactTSVP (e.g. R&S TS-PSC6), the "PCI Express Native Control" feature of Microsoft Windows must be deactivated because the PLX PCI Express bridge chip on the TS PSYS1 card does not meet the requirements. The following steps are required for this purpose:

1. Start the Windows operating system.
2. Run `cmd.exe` as administrator (right-click `C:\Windows\System32\cmd.exe` and select "Run as Administrator").
3. Enter the command: `bcdedit /set {current} pciexpress forcedisable.`
4. Reboot the computer.

Problem with Windows 10 and secure boot activated

On a control computer running Windows 10 with the secure boot feature activated, VCI version 4 must be installed. In this configuration, only the module R&S TS-PSYS1 (1157.9910.10) is supported.

On systems with CompactPCI bridge (R&S TS-PSC0 and R&S TS-PSC07), an external computer is used to control the modules in an R&S CompactTSVP. Suitable are only PCs for which the BIOS conforms exactly to the interrupt routing in accordance with the Intel/Microsoft specification min. rev. 2.1.

See also [Chapter 7.4, "Compact PCI Bridges \(R&S TS-PSC0 and R&S TS-PSC07\)"](#), on page 95.

R&S TS-PSC0

On the PC's R&S TS-PSC0 plug-in card, there are two links that each have an RX and a TX connection. Sometimes, driver problems for the R&S TS-PSYS1 card could be rectified by connecting the two cables that lead to the R&S CompactTSVP frame to the other link.

Sometimes, driver problems for the R&S TS-PSYS1 card could be rectified by plugging the TS PSC0 card into another PCI slot on the PC. Unfortunately, there are now also PCs that only have a single PCI slot on the motherboard (all of the other slots there are PCI Express slots).

Sometimes, driver problems for the R&S TS-PSYS1 card could be rectified by installing the StarFabric driver. Normally, this is not necessary for operation with R&S CompactTSVP. Install the driver only if the above-described problems are encountered.

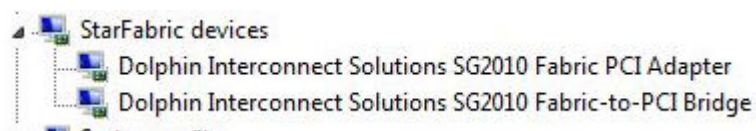


Figure 7-24: StarFabric driver entries in the device manager.

Sometimes, driver problems for the R&S TS-PSYS1 card could be rectified by removing an additional graphics card from the PC.

R&S TS-PSC07

Sometimes, driver problems for the R&S TS-PSYS1 card could be rectified by plugging the PC's R&S TS-PSC07 card into another PCI Express slot.

Systems with Windows 10 and secure boot activated

For this configuration, an R&S CompactTSVP with R&S TS-PSYS1 1157.9910.10 is required. In addition, the new VCI version 4 driver software is required. See also "[Problem with Windows 10 and secure boot activated](#)" on page 94.

7.4 Compact PCI Bridges (R&S TS-PSC0 and R&S TS-PSC07)

In these systems, an external computer is used to control the modules in an R&S CompactTSVP. Note: Only PCs are suitable for which the BIOS conforms exactly to the interrupt routing in accordance with the INTEL/MICROSOFT specification min. rev. 2.1. Problems occur during boot-up or control of the R&S TSVP modules with PCs that do not comply with this specification.

When powering on the system, the R&S CompactTSVP must always be connected to the line voltage first. This is the only way for the control computer to detect and properly initialize the installed CompactPCI modules.

7.4.1 R&S TS-PSC0

In this solution, a PCI card is installed on an external PC. In the R&S CompactTSVP, the R&S CompactPCI module is installed in rear slot 1. Do not plug any card into front system slot 1.



Figure 7-25: Cabling of the R&S TS-PSC0 components.

When connecting the cables, make sure that the cables are not damaged. If other cables are used, they must always be of the same type and have the same length. Make sure that the TX and RX connections are cross-connected. See "[CompactPCI modules are not detected](#)" on page 97 about the selection of the link.

For additional information, see

- the user manual for R&S TS-PSC0 ([TS-PSC0.pdf](#))
- the user manual for StarFabric ([StarFabric.pdf](#) in the Documentation sub-folder)

Boot problems

Some computers do not boot up if an R&S CompactTSVP is connected via R&S TS-PSC0. Such PCs are not suitable for operating the large number of PCI bridges and slots.

CompactPCI modules are not detected

If modules are not detected by the operating system (device manager), a different cabling configuration can sometimes solve the problem.

Table 7-4: R&S TS-PSC0 cabling variants

External PC	Compact R&S TSVP	Note
Link 0	Link 0	Default configuration
Link 1	Link 1	First variant
Link 0	Link 1	Second variant
Link 1	Link 0	Third variant

Another possible solution is described in the next section.

R&S TS-PFG is not detected

Sometimes, driver problems could be rectified by installing the StarFabric driver. Normally, this is not necessary for operation with R&S CompactTSVP. Install the driver only if the above-described problems are encountered.

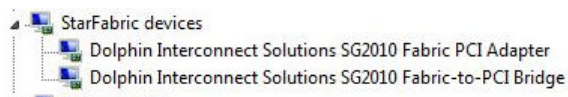


Figure 7-26: StarFabric driver entries in the device manager.

CAN modules are not detected

See [Chapter 7.3.3, "Problem Solving"](#), on page 85.

R&S TS-PFG or R&S TS-PAM do not work

In rare cases, the R&S TS-PFG or R&S TS-PAM modules cannot be used. The components are detected and displayed by the R&S TSVP soft panel. However, errors occur during the self-test (e.g. all coupling relay tests fail for R&S TS-PFG). The FPGA versions are incorrect in the identification string:

```
"Rohde & Schwarz,R&S TS-PFG,123456/002,03.03,10.00,65535,255.255"
```

This problem can be solved by reassigning the slots used by the PCI modules.

7.4.2 R&S TS-PSC07

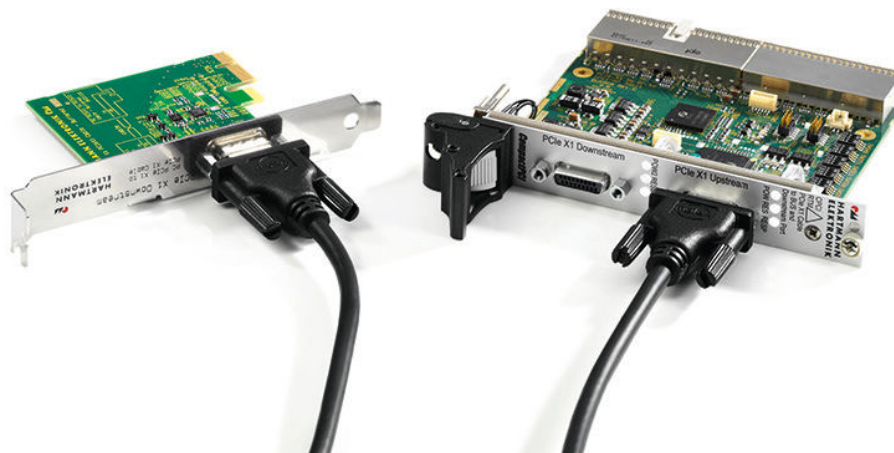


Figure 7-27: Cabling of the R&S TS-PSC07 components.

In this solution, a PCIe card is installed on an external PC. In the R&S CompactTSVP, the CompactPCI module is installed in rear slot 1. Do not plug any card into front system slot 1. The control computer is connected using the supplied cable via the "Upstream" connector on the R&S CompactTSVP.

When attaching the cable, make sure that the connector is not plugged in with a 180 degree twist.

For more information, see the user manual for R&S TS-PSC07 ([TS-PSC07.pdf](#)).

Boot problems

Some external computers do not boot up if an R&S CompactTSVP is connected via R&S TS-PSC0. Such PCs are not suitable for operating the large number of PCI bridges and slots.

Malfunction with R&S TS-PICT, R&S TS-PSAM or R&S TS-PDFT

A blue screen occurs when addressing the modules (e.g. opening the soft front panel).

Sometimes, this problem could be solved by using a different PCI Express slot in the control PC.

CAN modules are not detected

See [Chapter 7.3.3, "Problem Solving"](#), on page 85.

7.5 R&S GTSL Device Driver Updates

Some R&S TSVP modules have had to be redeveloped due to components that were no longer available. Efforts were made to ensure maximum functional compatibility.

However, since new components (interface chips, memory, etc.) were used, it was also necessary to modify the device drivers for compatibility. As a result, the R&S GTSL software must be updated when replacing old modules with newer ones.

7.5.1 R&S TS-PAM Analyzer Module

The R&S TS-PAM analyzer module (material number 1143.0100.02) has been replaced by a follow-up development. The new version (number 1157.9410.02) requires a driver version (rspam.dll) of 03.37 or higher. The new hardware is supported starting with R&S GTSL version 03.00.

Table 7-5: R&S TS-PAM variants

Type	Material number	Revision status	Firmware version	R&S GTSL version (minimum)	Driver version (minimum)
R&S TS-PAM (obsolete)	1143.0100.02 (1158.0100.02)	1.xx, 2.xx	01.16	R&S GTSL 02.71	rspam.dll 03.21
			01.18	R&S GTSL 02.90	rspam.dll 03.35
R&S TS-PAM	1157.9410.02	3.xx (from Sep. 2012)	02.01	R&S GTSL 03.00	rspam.dll 03.37
			02.03	R&S GTSL 03.10	
			02.04	R&S GTSL 03.20	

New R&S TS-PAM modules can also be identified based on the "firmware revision string". The fourth and fifth entries contain the digits "03.xx, 10.00":

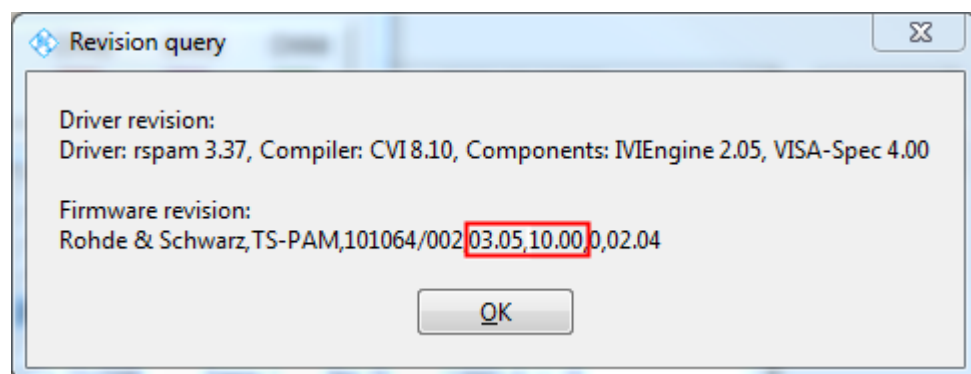


Figure 7-28: R&S TS-PAM revision query with R&S TSVP soft panel.

7.5.2 R&S TS-PFG Function Generator

The R&S TS-PFG function generator module (material number 1143.0068.02) has been replaced by a follow-up development. The new version (number 1157.9610.02)

requires a driver version (rspfg.dll) of 01.56 or higher. The new hardware is supported starting with R&S GTSL version 03.31.

Table 7-6: R&S TS-PFG variants

Type	Material number	Revision status	Firmware version	R&S GTSL version (minimum)	Driver version (minimum)
R&S TS PFG (obsolete)	1143.0068.02 (1158.0052.02)	1.xx, 2.xx	2.11	R&S GTSL 02.71	rspfg.dll 01.50
R&S TS PFG	1157.9610.02	3.xx (from April 2016)	03.03	R&S GTSL 03.31	rspfg.dll 01.56

New R&S TS-PFG modules can also be identified based on the "firmware revision string". The fourth and fifth entry contains the digits "03.xx, 10.00":

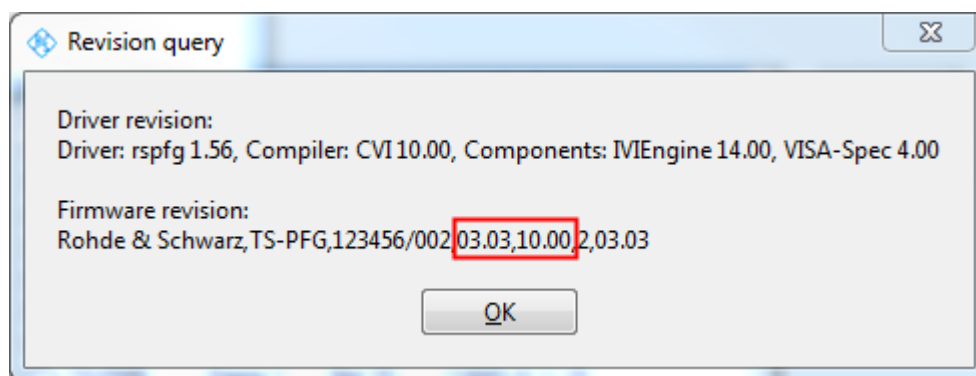


Figure 7-29: R&S TS-PFG revision query with R&S TSVP soft panel.

7.5.3 R&S TS-PICT ICT Extension Module

In this module, a flash memory chip had to be replaced (among other things). As a result, the new hardware version (from 4-00, hardware code 1) also requires a new driver version (rspict.dll) 01.40, which is part of R&S GTSL version 03.31.

Table 7-7: R&S TS-PICT versions

Type	Material number	Revision status	Hardware code	Firmware version	R&S GTSL version (minimum)	Driver version (minimum)
R&S TS-PICT	1143.0000.02 (1158.0000.02)	< 4.00	0	0.2	R&S GTSL 02.71	rspict.dll 01.31
		From 4.00 - Label 01.6.4-00 - From 06.2016 - From SN 100225	1	0.2	R&S GTSL 03.31	rspict.dll 01.40

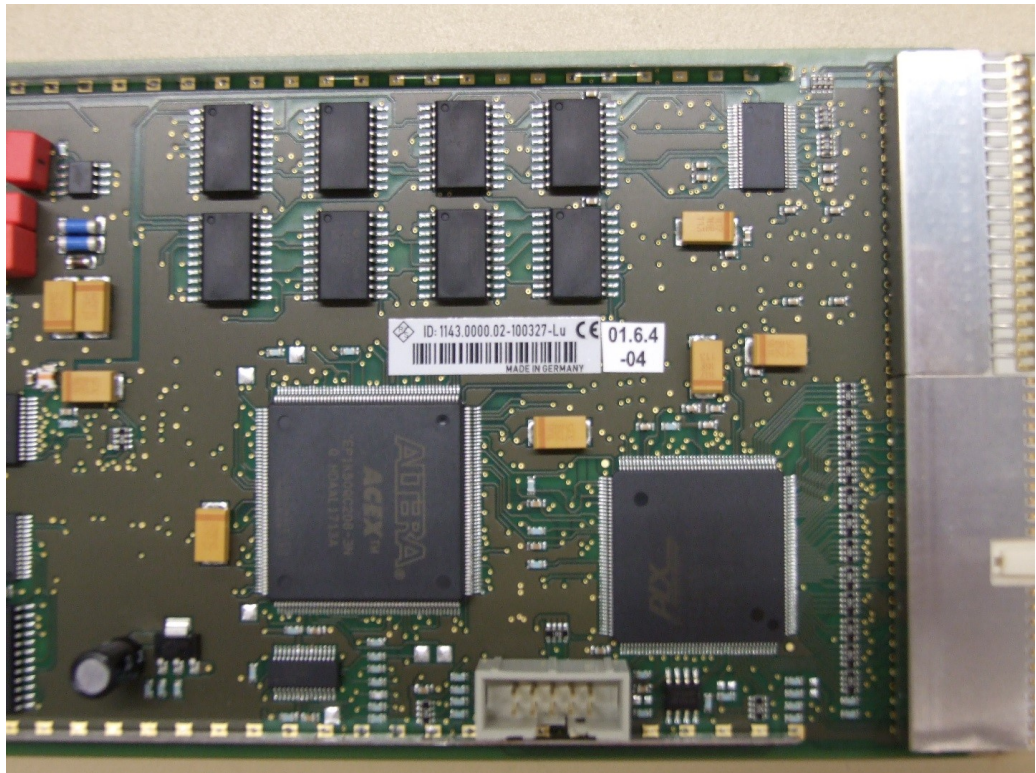


Figure 7-30: R&S TS-PICT version label

7.5.4 R&S TS-PSAM Analog Stimulus and Measurement Module

In this module, a flash memory chip had to be replaced (among other things). As a result, the new hardware version (from 6.00) also requires a new driver version (rpsam.dll from 02.90), which is part of R&S GTSL version 03.33.

R&S TS-PSAM modules from version 6.00 can also be used with restrictions with an older driver version (rpsam.dll from 02.80) (hardware code unchanged). With the old driver version, writing to the flash memory fails. A write procedure is triggered only by the in-system calibration software when replacing the correction values.

Table 7-8: R&S TS-PSAM versions

Type	Material number	Revision status	Hardware code	Firmware version	R&S GTSL version (minimum)	Driver version (minimum)
R&S TS-PSAM	1142.9503.02	< 6.00	1	0.5	R&S GTSL 02.71	rpsam.dll 02.80
		From 6.00 (Oct. 2017)	1	0.5	R&S GTSL 03.33	rpsam.dll 02.90

New R&S TS-PSAM modules can also be identified based on the "firmware revision string". The fourth entry shows the revision status.

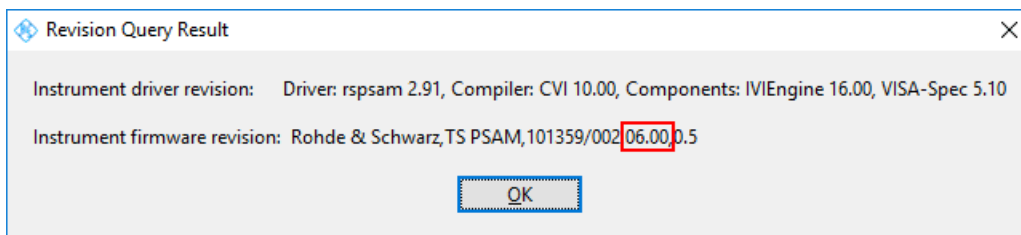


Figure 7-31: R&S TS-PSAM revision query with R&S TSVP soft panel.

7.5.5 R&S TS-PSYS1 System Module

The R&S TS-PSYS1 system module (material number 1152.4004.02) was superseded in mid-2017 by the replacement development R&S TS-PSYS1 (1157.9910.10). The new module requires the appropriate VCI driver version. See also [Chapter 7.3, "CAN Bus Modules \(VCI, R&S TS-PSYS1\)"](#), on page 80.

Table 7-9: R&S TS-PSYS1 variants

Type	Material number	Windows version	R&S GTSL version (minimum)	Driver version (minimum)
R&S TS-PSYS1 (obsolete)	1152.4004.02	Windows 2000 and Windows XP	R&S GTSL 02.71	VCI 2.16 + SP2
		Windows XP and Windows 7	R&S GTSL 03.00	VCI 3.4.1.3080 and VCI 2.20.761.0
		Windows 7 and Windows 10	R&S GTSL 03.33	VCI 3.5.2.4592
R&S TS-PSYS1	1157.9910.10	Windows XP and Windows 7	R&S GTSL 03.31	VCI 3.5.2.4268
		Windows 7 and Windows 10	R&S GTSL 03.33	VCI 3.5.2.4592
		Windows 10 with secure boot activated	R&S GTSL 03.40	VCI 4

New R&S TS-PSYS1 modules can also be identified based on the "firmware revision string". The fifth entry has the format 09.xx.

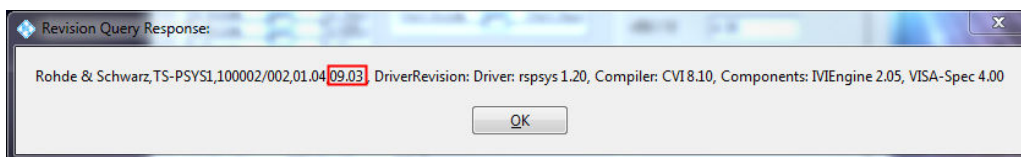


Figure 7-32: R&S TS-PSYS1 revision query with R&S TSVP soft panel.

7.6 Updating a Windows XP Computer

7.6.1 Disk Cleanup

Uninstalling the R&S TS-PSYS driver

See [Chapter 7.3, "CAN Bus Modules \(VCI, R&S TS-PSYS1\)"](#), on page 80.

Uninstalling the R&S Test Management Software G5

See [Chapter 7.2, "R&S TSVP In-System Calibration"](#), on page 76.

7.6.2 Updating the R&S GTSL Software

Preferably, install R&S GTSL software version 3.32. This is the final version for Windows XP.

Runtime setup

Install or update the following "runtime setup" components from the R&S GTSL DVD in the specified order.

Reboot the computer only after all installations of the "runtime setup" are completed and not between the single steps.

1. Install "MS .Net Framework 2.0 SP2".
2. Install "NI VISA".
Deactivate "Product Notifications" during installation.
3. Install "IVI Compliance Package".
Deactivate "Product Notifications" during installation.
4. Install "CVI Runtime Engine".
Deactivate "Product Notifications" during installation.
5. Install "TS-PSYS Driver".
Run the setup program.
6. After the setup is complete, reboot the computer.
7. Install "MS XML4 Core Services" (MSXML 4.0 SP2).
It is necessary to run the installation program as administrator.
Select "Repair" to update the "MS XML4 Core Services".

R&S GTSL setup

1. Update the software.

- a) Install R&S GTSL by running `Setup.exe` in the DVD root directory.
"MSVC++ Redistributable Package (x86)" is automatically installed.
 - b) Optional: If R&S TSVP modules must be calibrated on the system, install "In-System Calibration". Before running the in-system calibration software, a printer must be installed under Windows XP.
2. Update the drivers.
If PCI cards are installed in the R&S CompactTSVP (R&S TS-PSYS1), the drivers might need to be updated. See also [Chapter 7.3.3, "Problem Solving"](#), on page 85.
 - a) Open the "Device Manager".
 - b) Select the devices indicated with a question mark, right-click, "Update Driver...":
 - "No, not this time".
 - "Install the software automatically (Recommended)".

7.7 Updating a Windows 7 Computer

7.7.1 Disk Cleanup

Uninstalling the R&S TS-PSYS driver

See [Chapter 7.3, "CAN Bus Modules \(VCI, R&S TS-PSYS1\)"](#), on page 80.

Uninstalling the R&S Test Management Software G5

See [Chapter 7.2, "R&S TSVP In-System Calibration"](#), on page 76.

7.7.2 Updating the R&S GTSL Software

Preferably, install the latest R&S GTSL software.

Runtime setup

Install or update the following "runtime setup" components from the R&S GTSL DVD in the specified order. This procedure minimizes the number of necessary reboots.

Reboot the computer only after all installations of the "runtime setup" are completed and not between the single steps.

1. Install "NI VISA".
Deactivate "Product Notifications" during installation.
2. Install "IVI Compliance Package".
Deactivate "Product Notifications" during installation.

3. Install "CVI Runtime Engine".
Deactivate "Product Notifications" during installation.
4. Install "R&S TS-PSYS Driver".
Run the setup program.
5. After the setup is complete, reboot the computer.
6. Install "MS XML4 Core Services".
 - a) For R&S GTSL up to version 3.32 install MSXML 4.0 SP2 (MSXML4-KB973688-enu.exe).
It is necessary to run the installation program as administrator.
Select "Repair" to update the "MS XML4 Core Services".
 - b) For R&S GTSL from version 3.33 install MSXML 4.0 SP3 (MSXML.msi).
Right-click the installation file, select "Install" and then "Install now".
7. Optional for Windows 7 systems for which the runtime setup "4 - R&S TS-PSYS driver" was canceled (reason: system update not available): Install MS Win7 SP1 update.
8. Updating Microsoft .NET Framework 2.0 SP2 is not necessary.

R&S GTSL setup

1. Update the software.
 - a) Install R&S GTSL by running `Setup.exe` in the DVD root directory.
 - b) Optional: If R&S TSVP modules must be calibrated on the system, install "In-System Calibration". Before running the in-system calibration software, a printer must be installed.
2. Update the drivers.

If PCI cards are installed in the R&S CompactTSVP (R&S TS-PSYS1), the drivers might need to be updated. See also [Chapter 7.3.3, "Problem Solving"](#), on page 85.

 - a) Open the "Device Manager".
 - b) Select the devices indicated with a question mark, right-click, "Update Driver...":
 - "No, not this time"
 - "Install the software automatically (Recommended)"

7.8 License Viewer

Starting with R&S GTSL 03.30, the installed license files are no longer evaluated. They are also no longer generated for new R&S GTSL installations. As a result, the "R&S GTSL License Viewer" displays the text "No licence files found" in the "Licensed Components" window.

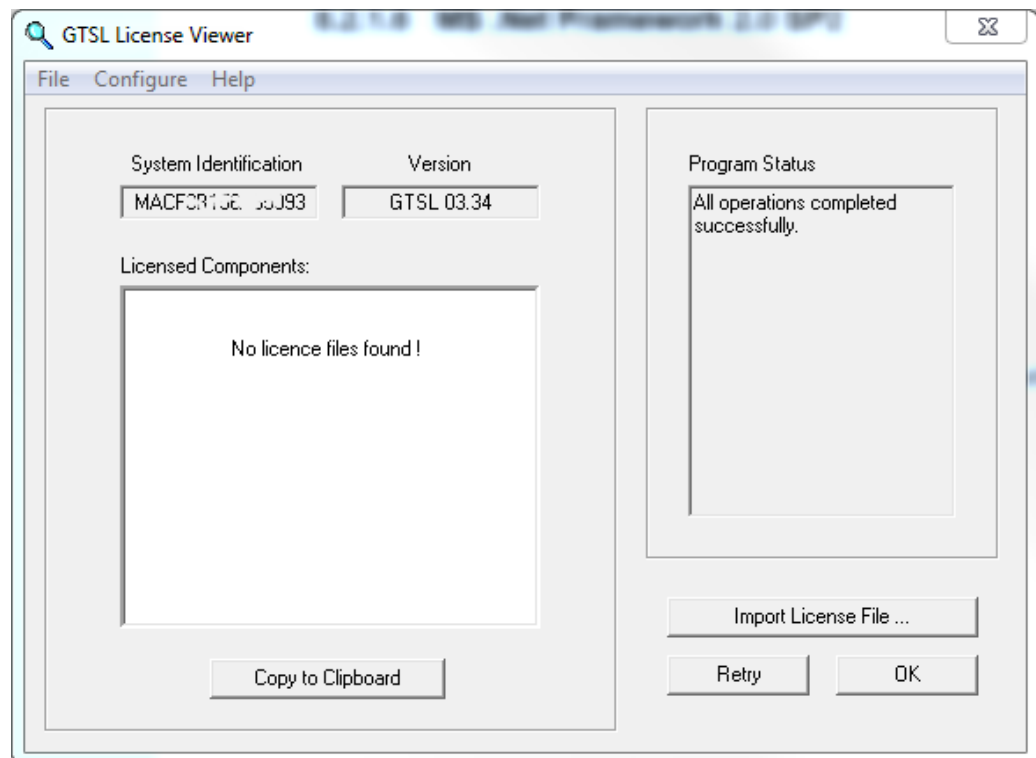


Figure 7-33: R&S GTSL License Viewer.

For system optimization, the "MAC Address" option can be selected starting with R&S GTSL 03.30 in the "Configure System Identification" configuration dialog.

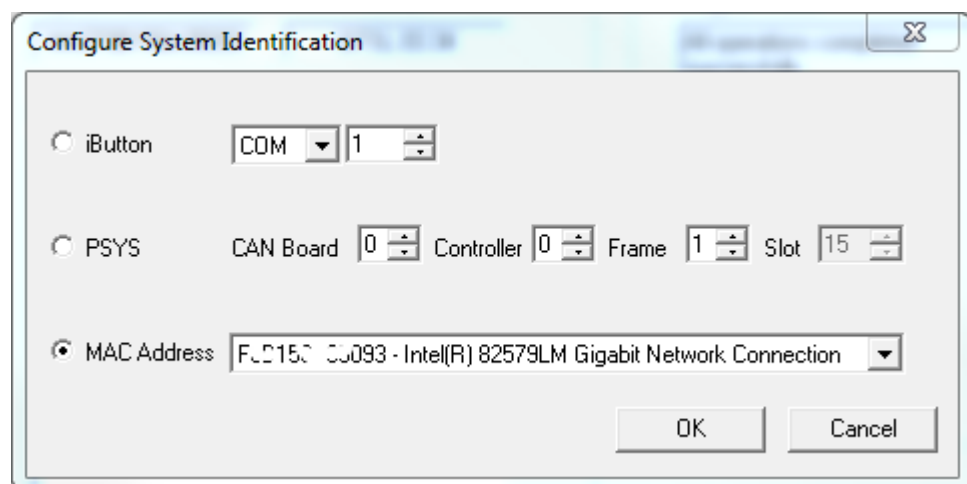


Figure 7-34: Dialog for configuring the system identification.

7.9 Adobe Acrobat Reader

Starting with R&S GTSL 03.33, Adobe Acrobat Reader is no longer included on the R&S GTSL DVD. To display the supplied documentation, a PDF file reader must be installed on the target system.