# Operating Manual

# Radio Network Analyzer

## R&S® TSMU

**1153.6000.02**

## R&S® TSMU-H

**1153.6000.03**

## R&S® TSMQ

**1153.6000.50**

ROHDE&SCHWARZ
Test and Measurement

**Dear Customer,**

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# Grouped Safety Messages

**Make sure to read through and observe the following safety instructions!**

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standard of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment required for them are designed and tested in accordance with the relevant safety standards. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed 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, 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 an intention 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 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.

## Symbols and safety labels

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Observe product documentation | Weight indication for units >18 kg | Danger of electric shock | Warning! Hot surface | PE terminal | Ground | Ground terminal | Attention! Electrostatic sensitive devices |

| | |  |  |  | |
|---|---|---|---|---|---|
| Supply voltage ON/OFF | Standby indication | Direct current (DC) | Alternating current (AC) | Direct/alternating current (DC/AC) | Device fully protected by double/reinforced insulation |

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 putting the product into operation. It is also absolutely essential to observe the additional safety instructions on personal safety 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.

## Tags and their meaning

| | |
|---|---|
| DANGER | DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. |
| WARNING | WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. |
| CAUTION | CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury. |
| NOTICE | NOTICE indicates a property damage message. |
| | In the product documentation, the word ATTENTION is used synonymously. |

These tags 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 tags described here are always used only in connection with the related product documentation and the related product. The use of tags in connection with unrelated products or documentation can result in misinterpretation and thus contribute to personal injury or material damage.

## Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
   prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude 2000 m above sea level, max. transport altitude 4500 m above sea level.
   A tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.
2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel 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, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.
4. If products/components are mechanically and/or thermically 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, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.

5. If handling the product yields 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.
6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer/operator is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
8. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.
10. Intentionally breaking the protective earth connection 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.
11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.
12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is 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 e.g. tripping over the cable or suffering an electric shock.
13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, this can result in sparks, fire and/or injuries.
15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
16. For measurements in circuits with voltages $V_{rms}$ > 30 V, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
18. 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.
19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a license electrician.

20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.
21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.
22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.
23. Rohde & Schwarz products are not protected against penetration of liquids, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock for the user or damage to the product, which can also lead to personal injury.
24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.
25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.
26. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.
27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. Do not short-circuit batteries and storage batteries.
    If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries must be recycled and kept separate from residual waste. Batteries and storage batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.
28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.
29. The product can be very heavy. Be careful when moving it to avoid back or other physical injuries.
30. 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).
31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.
32. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. The driver is always responsible for the safety of the vehicle. The manufacturer assumes no responsibility for accidents or collisions.
33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the product documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.
34. Prior to cleaning, disconnect the product from the AC supply. Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluent for cellulose lacquers.

# Informaciones elementales de seguridad

**¡Es imprescindible leer y observar 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. Nuestra sección de gestión de la seguridad de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el comprobante de conformidad adjunto según las normas de la CE 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.

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 despreciando las informaciones de seguridad 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 dentro de las instrucciones de la correspondiente documentación de 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 profundos y conocimientos básicas del idioma inglés. Por eso se debe tener en cuenta que el producto sólo pueda ser operado por personal especializado o personas minuciosamente instruidas con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de R&S, encontrará 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 entréguela a usuarios posteriores.

## Símbolos y definiciones de seguridad

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Ver documen-tación de producto | Informaciones para maquinaria con un peso de > 18kg | Peligro de golpe de corriente | ¡Advertencia! Superficie caliente | Conexión a conductor protector | Conexión a tierra | Conexión a masa conductora | ¡Cuidado! Elementos de construcción con peligro de carga electroestática |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| Potencia EN MARCHA/PARADA | Indicación Stand-by | Corriente continua DC | Corriente alterna AC | Corriente continua/-alterna DC/AC | El aparato está protegido en su totalidad por un aislamiento de doble refuerzo |

Tener en cuenta las informaciones de seguridad sirve para tratar de evitar daños y peligros de toda clase. Es necesario de que se lean las siguientes informaciones de seguridad concienzudamente y se tengan en cuenta debidamente antes de la puesta en funcionamiento del producto. También deberán ser tenidas en cuenta las informaciones para la protección de personas que encontrarán en el capítulo correspondiente de la documentación de producto y que también son obligatorias de seguir. En las informaciones de seguridad actuales hemos juntado todos los objetos vendidos por el grupo de empresas Rohde & Schwarz bajo la denominación de „producto“, entre ellos también aparatos, instalaciones así como toda clase de accesorios.

## Palabras de señal y su significado

| | |
|---|---|
| PELIGRO | Identifica un peligro directo con riesgo elevado de provocar muerte o lesiones de gravedad si no se toman las medidas oportunas. |
| ADVERTENCIA | Identifica un posible peligro con riesgo medio de provocar muerte o lesiones (de gravedad) si no se toman las medidas oportunas. |
| ATENCIÓN | Identifica un peligro con riesgo reducido de provocar lesiones de gravedad media o leve si no se toman las medidas oportunas. |
| AVISO | Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.<br><br>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 de 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 malinterpretaciones y tener por consecuencia daños en personas u objetos.

## Informaciones de seguridad elementales

1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S 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, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4.500 m sobre el nivel del mar.
   Se aplicará una tolerancia de ±10% sobre el voltaje nominal y de ±5% sobre la frecuencia nominal.
2. En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de trabajo y de prevención de accidentes. El producto solamente debe de ser abierto por personal especializado autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de la corriente conductora, control de funcionamiento).

3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se producieran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.
4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.
5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.
6. Ciertos productos, como por ejemplo las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética. El empresario/usuario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo aumentado de exposición a radiaciones para evitar riesgos.
7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.
8. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del producto.
9. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.
10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto. Puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro que es controlado su estado técnico de seguridad.
11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (según la medida del cable de distribución, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

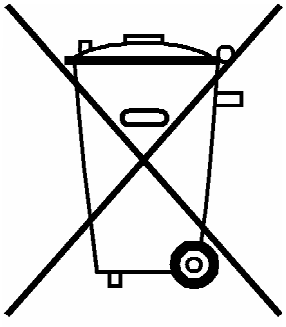
12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).
14. 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. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.
16. En las mediciones en circuitos de corriente con una tensión de entrada de $U_{eff}$ > 30 V se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos del estándar IEC950/EN60950.
18. 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 heridas, fuego o daños en el producto.
19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.
21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir cortocircuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
23. Los productos R&S no están protegidos contra líquidos si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente para el usuario o de daños en el producto lo cual también puede llevar al peligro de personas.
24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. No cortocircuitar baterías ni acumuladores. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Las baterías y acumuladores deben reutilizarse y no deben acceder a los vertederos. Las baterías y acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de evacuación y reciclaje.
28. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.
29. El producto puede poseer un peso elevado. Muévalo con cuidado para evitar lesiones en la espalda u otras partes corporales.
30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).
31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean observadas. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.
32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo. El fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de láser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación de producto. De otra manera pondrá en peligro su salud, ya que el rayo láser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo láser.
34. Antes de proceder a la limpieza, desconecte el producto de la red. Realice la limpieza con un paño suave, que no se deshilache. No utilice de ninguna manera agentes limpiadores químicos como, por ejemplo, alcohol, acetona o nitrodiluyente.

# Customer Information Regarding Product Disposal

The German Electrical and Electronic Equipment (ElektroG) Act is an implementation of the following EC directives:

- 2002/96/EC on waste electrical and electronic equipment (WEEE) and
- 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).



Product labeling in accordance with EN 50419

Once the lifetime of a product has ended, this product must not be disposed of in the standard domestic refuse. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.

Rohde & Schwarz GmbH & Co. KG has developed a disposal concept for the environmental-friendly disposal or recycling of waste material and fully assumes its obligation as a producer to take back and dispose of electrical and electronic waste in accordance with the ElektroG Act.

Please contact your local service representative to dispose of the product.

ROHDE&SCHWARZ

## Certified Quality System

# DIN EN ISO 9001 : 2000
# DIN EN 9100 : 2003
# DIN EN ISO 14001 : 1996

DQS REG. NO 001954 QM/ST UM

## QUALITÄTSZERTIFIKAT

*Sehr geehrter Kunde,*
Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Managementsystems entwickelt, gefertigt und geprüft.
Das Rohde & Schwarz Managementsystem ist zertifiziert nach:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:1996

## CERTIFICATE OF QUALITY

*Dear Customer,*
you have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards.
The Rohde & Schwarz quality management system is certified according to:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:1996

## CERTIFICAT DE QUALITÉ

*Cher Client,*
vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité.
Le système de gestion qualité de Rohde & Schwarz a été homologué conformément aux normes:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:1996

ROHDE&SCHWARZ

1171.0200.11-01.00

ROHDE&SCHWARZ

EC Certificate of Conformity

CE

Certificate No.: 2003-40

This is to certify that:

| Equipment type | Stock No. | Designation |
|---|---|---|
| TSMU | 1153.6000.02 | Radio Network Analyzer |
| TSMU-H | 1153.6000.03 | |
| TSML-W | 1153.6000.11 | |
| TSML-C | 1153.6000.12 | |
| TSML-G | 1153.6000.13 | |
| TSML-CW | 1153.6000.15 | |
| TSMQ | 1153.6000.50 | Quad Tec Drive Test Receiver |

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electrical equipment for use within defined voltage limits (73/23/EEC revised by 93/68/EEC)
- relating to electromagnetic compatibility (89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC)

Conformity is proven by compliance with the following standards:

EN61010-1 : 2001-12
EN61326 : 1997 + A1 : 1998 + A2 : 2001 + A3 : 2003
EN55011 : 1998 + A1 : 1999 + A2 : 2002

For the assessment of electromagnetic compatibility, the limits of radio interference for Class B equipment as well as the immunity to interference for operation in industry have been used as a basis.

The product complies with the requirements of the Directive relating to the radio interference of vehicles (72/245/EEC adapted by 2004/104/EC, 2005/49/EC, 2005/83/EC, 2006/28/EC, after-market equipment in accordance with Annex I, paragraph 3.2.9 of the Directive); proof of compliance provided by the measurements as described in Annex I, paragraphs 6.5, 6.6, 6.8, 6.9.

Affixing the EC conformity mark as from 2003

**ROHDE & SCHWARZ GmbH & Co. KG**
**Mühldorfstr. 15, D-81671 München**

Munich, 2006-12-13

Central Quality Management FS-QZ / Radde

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Deutschland / Germany

Telefon +49 (0)89 / 5791-1393
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Automotive

Bescheinigung Nr. / *Attestation No.*: 7021-06
Antragsteller / *Applicant*: ROHDE & SCHWARZ GmbH & Co. KG, PF 80 14 69, D-81614 München
Typ / *Type*: TSMU / TSML / TSMQ (1153.6000.xx) Blatt / *Sheet* 1/1

# B E S C H E I N I G U N G
## *A T T E S T A T I O N*

GEMÄSS RICHTLINIE 2004/104/EG, ANHANG I, 3.2.9
*WITH REGARD TO DIRECTIVE 2004/104/EC, ANNEX I, 3.2.9*

Nr. / *No.* 7021-06

| | |
|---|---|
| **Antragsteller**<br>*Applicant* | ROHDE & SCHWARZ |
| **Allgemeine Beschreibung des Produkts**<br>*General description of the product* | Funknetz Analysator<br>*Radio Network Analyzer* |
| **Typ**<br>*Type* | TSMU / TSML / TSMQ (1153.6000.xx) |
| **Vom Antragsteller eingereichte Informationen**<br>*Information submitted by the applicant* | Systembeschreibung<br>*System description* |
| **Diese EUB kann für jeden Fahrzeugtyp mit folgenden Einschränkungen verwendet werden**<br>*This ESA can be used on any vehicle type with the following restrictions* | 12V, Masse der Batterie negativ an der Karosserie (Versorgungs-spannung von 9-18V DC)<br>*12V, battery negative on the body (nominal electrical system of 9-18V DC )* |
| **Einbauvorschriften (gegebenenfalls)**<br>*Installation conditions, if any* | nicht vorhanden<br>*not applicable* |

Wir bestätigen, dass das oben beschriebene Produkt keine Funktionen im Zusammenhang mit Störfestigkeit gemäß Richtlinie 72/245/EWG in der Fassung der Richtlinie 2004/104/EG betrifft. Prüfungen der Störfestigkeit gemäß dieser Richtlinie sind nicht erforderlich.
*We confirm that the product described above is not immunity-related according to Directive 72/245/EEC, as last amended by Directive 2004/104/EC. Any testing according to immunity as defined in this Directive is not required.*

Der Sachverständige
*The Expert*

Dipl.-Ing. (FH) Stefan Rainer

Sachverständiger Prüflabor DIN EN ISO/IEC 17025 TÜV SÜD Automotive GmbH

München, 27.10.2006

# Customer Support

## Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

## Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

### USA & Canada

| | |
|---|---|
| Monday to Friday<br>8:00 AM – 8:00 PM | (except US public holidays)<br>Eastern Standard Time (EST) |
| Tel. from USA | 888-test-rsa (888-837-8772) (opt 2) |
| From outside USA | +1 410 910 7800 (opt 2) |
| Fax | +1 410 910 7801 |
| E-mail | CustomerSupport@rohde-schwarz.com |

### East Asia

| | |
|---|---|
| Monday to Friday<br>8:30 AM – 6:00 PM | (except Singaporean public holidays)<br>Singapore Time (SGT) |
| Tel. | +65 6 513 0488 |
| Fax | +65 6 846 1090 |
| E-mail | CustomerSupport@rohde-schwarz.com |

### Rest of the World

| | |
|---|---|
| Monday to Friday<br>08:00 – 17:00 | (except German public holidays)<br>Central European Time (CET) |
| Tel. from Europe | +49 (0) 180 512 42 42* |
| From outside Europe | +49 89 4129 13776 |
| Fax | +49 (0) 89 41 29 637 78 |
| E-mail | CustomerSupport@rohde-schwarz.com |

* 0.14 €/Min within the German fixed-line telephone network, varying prices for the mobile telephone network and in different countries.

ROHDE&SCHWARZ

1171.0200.22-03.00

# Address List

## Headquarters, Plants and Subsidiaries

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HAMEG Instruments GmbH
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## Locations Worldwide

**Please refer to our homepage: www.rohde-schwarz.com**

- Sales Locations
- Service Locations
- National Websites

# Important Notes

In this document, the R&S radio network analyzer series with the models R&S® TSMU, R&S® TSMU-H and R&S® TSMQ is generally abbreviated as R&S TSMx. Unless explicitly noted, the abbreviation R&S TSMx is valid for all models in this series.

**ATTENTION**

If you are using the R&S ViCom interface to control this R&S TSMx scanner, carefully follow all instructions in the ViCom manual, located in the ..\doc subdirectory of the accompanying CD-ROM.

The latest ViCom version could be downloaded from the product homepage in the internet under: http://www.rohde-schwarz.com – Section Download/Software.

# Manuals

This manual describes how to put the analyzer into operation. Additional documentation and release notes for the radio network analyzer are provided on the ..\doc section of the accompanying CD-ROM.

The ViCom programming interface for R&S TSMx analyzers is explained in detail with the ViCom manual.

For specifications and typical applications, refer to the R&S TSMx datasheet and R&S ROMES manual.

# CD-ROM

The CD-ROM labeled **R&S TSMx Utilities, Interface and Documentation"** applies the following directory structure:

| | |
|---|---|
| - Documentation (Operating Manual, ViCom Manual and Release Notes) | ..\Doc |
| - Utility tool for firmware updates | ..\TsmxFirmwareInstall |
| - Utility tool for recalling instrument setup and option key installation | ..\TsmxOptionKeyInstaller |
| - Utility tool for TSMx IEEE1394 device driver installation | ..\IEEE1394 |
| - Setup program for R&S ViCom programming interface | ..\ViCom |
| - Backup copy of the instrument flash card contents | ..\ACE_Files |
| - Backup copy of the instrument identification file | ..\IdentData |
| - Backup copy of device specific option licensing | ..\OptionKeys |

# Internet

The latest versions of all the related products data like Data Sheets, Application Notes, Application Cards, Firmware, Software and Device Drivers could be downloaded from the product homepage in the internet under: http://www.rohde-schwarz.com.

Search for your analyzer type and select the menu item “DOWNLOADS”.

# 1 General Description

Using the radio network analyzer series R&S TSMx always requires the installation of a host PC software. The high speed link between the analyzer and the host PC utilizes a serial bus interface based on the IEEE 1394a standard.

There are two different possibilities for the host PC software to run and control the analyzer:

1. Applying the ready to use Drive Test Software Platform **R&S ROMES** (**not** part of this package!)
2. Utilizing the **R&S ViCom** programming interface package and integrating this analyzer as an OEM product into a customer specific software application.

In combination with the R&S ROMES software and depending on the model and enabled firmware options, this radio network analyzer can be used as a powerful and budget-priced instrument for interference analysis and network scanning in 2G and 3G networks or RF power and spectrum measurements.

This R&S TSMx analyzer also supports the ViCom interface. This software interface and a description is part of the shipment. R&S ViCom interface is a C++ DLL based user interface designed for customers who want to integrate this scanner into their own software application.

Currently there are the following model variants of the analyzer available:

| | |
|---|---|
| **R&S TSMU**: | Radio Network Analyzer (Standard input power, Single Tech) |
| **R&S TSMU-H**: | Radio Network Analyzer (Extended input power, Single Tech) |
| **R&S TSMQ**: | Radio Network Analyzer (Quad-Tech) |

(For details please refer to the R&S TSMx datasheets and application notes)

# 2 System Requirements

Controlling and accessing measurement data with the R&S TSMx radio network analyzer series requires the availability of a IEEE 1394 network adapter on the host PC.

IEEE 1394 interface requirements:

- OHCI chip set
- data rate 400 Mbit/s
- compliant with IEEE1394a-2000 standard
- compliant with OHCI 1.1 WHQL requirements

Operating system requirements:

- Windows XP SP2 or newer

Not mandatory for normal operation but very helpful for troubleshooting and servicing of the analyzer, Rohde & Schwarz recommends the availability of a RS-232 interface on the host PC (see **Troubleshooting via the RS-232-C Interface**).

# 3 Preparations for Use

## Unpacking the Analyzer

The analyzer is being shipped in a accessory suitcase. Take the suitcase out of the shipping box, open the suitcase and make sure that all items listed in the packing list are included.

If the analyzer or any included items are damaged, immediately notify the forwarder that shipped the analyzer to you and keep the box and packing material.

For further transport or shipment of the analyzer the original suitcase and shipping box should be used .

## TSMx IEEE 1394 Device Driver Installation

Interfacing this R&S TSMx radio network analyzer with the host PC software (R&S ROMES or R&S ViCom) requires the installation of the appropriate IEEE 1394 TSMx device driver prior to initial connection.

This TSMx 1394 device driver package is part of this shipment and located in the CD-ROM directory:

**..\IEEE1394**

The installer utility could be started directly from the CD-ROM by running the corresponding executable.

Refer to the Release Notes in the ..\doc subdirectory of the CD-ROM or search in the product homepage under: http://www.rohde-schwarz.com section Firmware/Download for detailed information about this topic.

**ATTENTION**

Device diver installation requires ***administrator privileges*** on the host PC!

Device driver installation needs to be done only once in a multi-TSMx environment, where you connect more than one instrument to the same host PC.

Normally this device driver is already available with a valid R&S ROMES installation of version 3NG or higher. So this step could be neglected but reinstallation does not harm.

## Rack Mounting

The analyzer can be mounted in a 19” rack using the R&S TSMU-Z2 rack adapter in accordance with the mounting instruction supplied. To obtain the ordering number, please contact your local Rohde & Schwarz representative.

# 4 Putting the Analyzer into Operation

**CAUTION**

To prevent damage to the instrument and to avoid placing anyone in danger, always follow the instructions in the following sections. This is especially important when using the instrument for the first time.

## Prerequisites

The following hardware/software requirements need to be fulfilled to operate the R&S TSMx analyzer successfully:

- Host PC with IEEE1394 interface adapter
  R&S TSMx 1394 device driver installed
  — 1394 network adapter is not part of the package;
  (see **System Requirements and Preparations for Use**)
- Antenna
  — a magnetic mount multi-band antenna for AMPS/GSM/PCN/PCS/UMTS with FME→N adapter is part of the package
- Connection cables
  — partly part of the package;
  (see **Connecting the External Devices**)
- DC power supply
  — not part of the package
  optional accessory: R&S TSMU-Z1
- Necessary firmware options
  — Firmware options can be checked with the TSMxOptionKeyInstaller utility
  (see **Instrument Setup and Software Options**)
- R&S ROMES measurement software with appropriate TSMx software license(s)

  **respectively**
  — not part of the package
- Customer software based on R&S ViCom Interface package
  — part of this package
- **Optional**: GPS unit which provides the pulse per second (PPS) output for accurate time synchronization
  — not part of the package
  optional accessory TSMx-PPS GPS Module

## EMI Protective Measures

To prevent electromagnetic interference, always operate this analyzer when it is closed and with all shielding covers installed. Only appropriate shielded signal and control cables may be used.

# Connecting the External Devices

- Connect the IEEE 1394 port of the host PC to any of the IEEE1394 analyzer ports (1 or 2). Two IEEE 1394 cables with different connector types for the host PC adapters are included in the package.
- More than one radio network analyzer could be connected to the host PC using the spare port of the first analyzer and cascading additional analyzer(s) **in a daisy chain topology!**
- Connect the antenna FME-connector to the FME↔N adapter and connect the adapter to the RF IN connector. Both, a multi-band antenna and the adapter are part of the package.

**ATTENTION**

Do not to inject more than the maximum rated RF input power. Otherwise, the input stage could be severely damaged.

- R&S TSMU/TSMQ: -10 dBm
- R&S TSMU-H: 0 dBm

- Connect the PPS output of the GPS device to the PULSE IN connector of the R&S TSMx (optional). (This will improve frequency accuracy).

  **Input type: 3.3 – 5 V TTL, max. +/-12 V DC; declaration of the high precision edge of the PPS signal could be configured via software!**

- **Optional:** Additional multifunctional input/output connector PULSE IN/OUT. Used e.g. as distance trigger input (only used for distance triggered RF power scan measurements, R&S TSMU-K15, K35).

  **Input type: max +/- 12 V DC.**

- **Optional:** The RS232 connector should be connected with the RS-232-C interface of the host PC via a null-modem cable (for service purposes and troubleshooting; see
- Troubleshooting).
- Finally, connect the R&S TSMx to the power supply (see **Connecting the Analyzer to the Power Supply**).
- See Fig. 2 for the complete wiring diagram

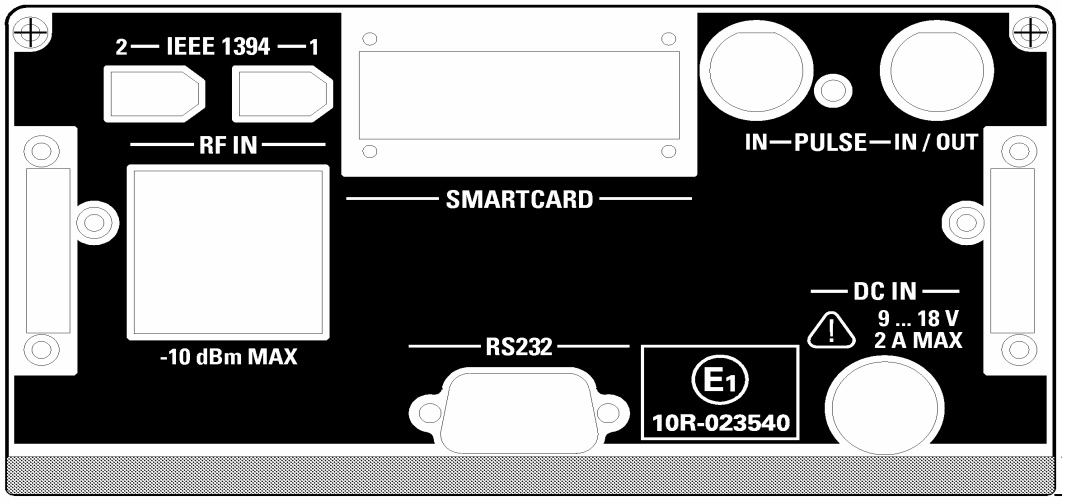



Fig. 1 R&S TSMx Rear Panel with Connectors

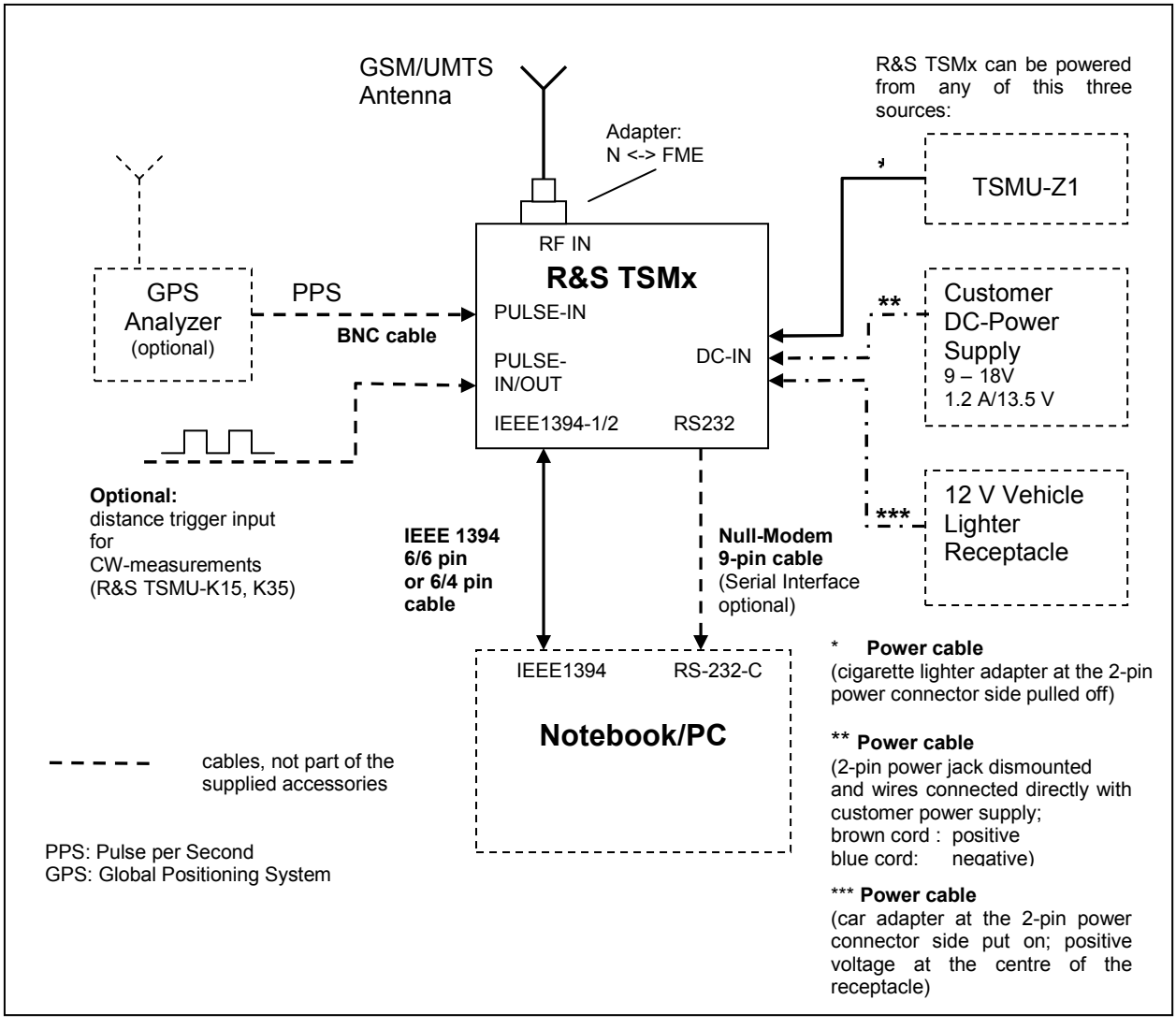



Fig. 2 Wiring Diagram

# Connecting the Analyzer to the Power Supply

**DANGER**

- Danger off shock hazard
- After moisture condensation, allow the analyzer to dry before switching on.

**ATTENTION**

- Do not cover the ventilation holes.
- Connect the analyzer only with SELV (Safety Extra Low Voltage) power supplies.
- Use only EN 60950 approved external DC power supplies.

The analyzer may be connected only to DC supplies:

**DC Input range:** 9 V to 18 V

**DC Input current:** ~ 700 mA / 13.5 V

- An additional external fuse must be inserted if the DC power supply offers more than 35 A.

Rohde & Schwarz offers a compatible power supply, the R&S TSMU-Z1. To obtain the ordering number, please contact your local Rohde & Schwarz representative.

# Power On Sequence/Idle Mode

On applying DC power the analyzer enters power on mode and passes the power on sequence and boot loop. The self test during the power on sequence initiates various reboot cycles.

The power on sequence can be monitored by means of the front-panel LEDs (see Fig. 4 for LED location). Additional information will be output via the RS-232-C interface (see **Tracing Power On Sequence**).

| LED | Color | State | Comment |
|---|---|---|---|
| PWR | Green | On | continuously after power on |
| CONFIG STATE | Amber | On | about a second after PWR LED goes on |
| | | Off | with each reboot cycle during initialization |
| | | On | continuously after completion of initialization |
| PROCESS STATE | Green | Off | continuously after power on |
| PROCESS RUN | Green | Off | continuously after power on |

Fig. 3 Front-Panel LEDs during Power On Sequence

Connecting a certain R&S TSMx analyzer for the first time to a host PC initiates Windows device driver installation (see **Initial Connection – Windows Device Driver Installation**).

Radio network analyzers which once successfully passed Windows device driver installation directly enter the idle mode. In idle mode the analyzer is ready for being interfaced with the host PC software. (see **Application Program Download/Ready Mode**).

# Initial Connection – Windows Device Driver Installation

The Windows “Found new Hardware dialog” pops up as soon as you connect an R&S TSMx analyzer for the first time to a certain host PC and Windows asks for the pleasant device driver. Select “Install software automatically” and complete Windows device driver installation.
**Requirement**: TSMx device driver installation prior to connection (see **TSMx IEEE 1394 Device Driver Installation**)!

The radio network analyzer enters idle mode after completion of the Windows device driver installation. In idle mode the analyzer is ready for being interfaced with the host PC software. (see **Application Program Download/Ready Mode**).

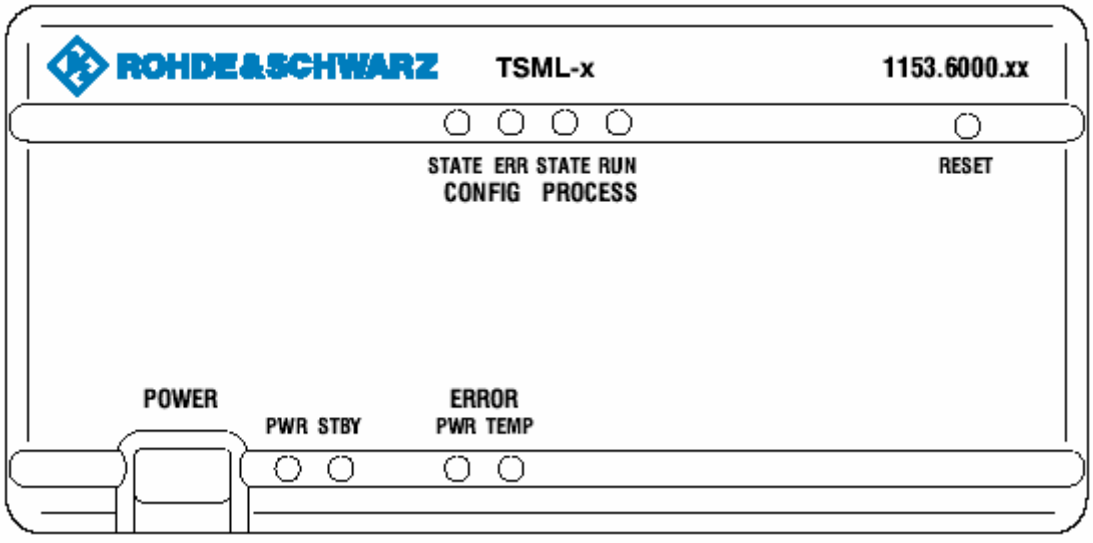



Fig. 4 R&S TSMx Front Panel and LED's

# Application Program Download/Ready Mode

Entering idle mode (see **Power On Sequence**) the R&S TSMx analyzer is ready to be interfaced from the host PC software (R&S ROMES respectively R&S ViCom).
While loading the TSMx software driver or workspace in R&S ROMES software the application program (*.elf) will be downloaded from the host and the availability of pleasant instrument options will be checked.
Similarly the program download and option check will be executed while calling the LoadTSMx function in the R&S ViCom interface.

Please refer to the corresponding R&S ROMES respectively ViCom manuals for details on this matters.

The analyzer changes to the ready mode after receiving the application program from the host. The instrument is now ready for ROMES or ViCom originated measurement tasks.

The ready mode is indicated by the front-panel LEDs: The green PROCESS LEDs STATE and RUN start blinking alternately.

(see **Tracing Application Program Download and Ready Mode** for monitoring Program Download and Ready Mode).

# Measuring Mode

The unit changes into the measuring mode after receiving a “Start Measurement/Recording” command. For information on how to carry out R&S TSMx measurements with R&S ROMES software or with R&S ViCom interface, please refer to the corresponding manuals.

There is no change in LED indication on the front panel. The green PROCESS LEDs STATE and RUN continue blinking alternately.

(see

Tracing Measuring Mode for monitoring the measuring mode).

# Analyzer Reset

Unloading the R&S TSMx software driver in ROMES, closing ROMES software or unloading the TSMx module in the R&S ViCom interface initiates an analyzer reset. After the reset had been completed, the R&S TSMx analyzer passes power-on sequence and enters the idle mode again (see **Power** On Sequence/Idle Mode). The R&S TSMx is now ready for a new application program download.
Pressing the reset button on the front panel also initiates an analyzer reset cycle.

**ATTENTION**

Do not press the reset button during ordinary R&S TSMx measurements with the R&S ROMES software or R&S ViCom interface. Otherwise, it could happen that the host PC software couldn’t be closed properly. As a result, the application will crash and must be shut down from the Windows Task Manager.

# Standby Mode

You can switch the R&S TSMx analyzer into the standby mode by pressing the POWER button on the front panel (see Fig. 4). In the standby mode, the program execution on the R&S TSMx will be stopped immediately and the unit will be powered off.
The amber STBY LED on the front panel indicates the standby mode.

**ATTENTION**

Do not press the power button while ongoing R&S TSMx measurements with the R&S ROMES software or R&S ViCom interface!

Pressing the POWER button in the standby mode initiates power-on sequence again (see **Power** On Sequence/Idle Mode).

# 5 Firmware Updates

For firmware updates the **TsmxFirmwareInstall** utility tool will be provided. The latest version of the utility including the current firmware file could be downloaded from the product homepage in the internet under: http://www.rohde-schwarz.com.
Search for your analyzer type and select the menu item “DOWNLOADS” –> “FIRMWARE”.

This tool is interactive and guides you through the entire firmware update process.

**CAUTION**

Carefully read the corresponding firmware release notes before updating!

Make sure that neither ROMES nor any other utility tool interfaces with the R&S TSMx analyzer at the same time. Shut down any active utility before starting the TsmxFirmwareInstall tool!

## Requirements

- PC/Notebook with IEEE1394 interface adapter and R&S TSMx analyzer connected.
- R&S TSMx IEEE 1394 driver installed on the host PC.
- RS-232 interface (COM1) of PC/notebook and R&S TSMx connected via a null-modem cable (see **RS-232-C Output** for terminal settings).
- R&S TSMx powered up and power on sequence completed successfully (see **Power** On Sequence/Idle Mode).
- No other application interfacing with the R&S TSMx.

## Program Start

Reset the R&S TSMx analyzer and start the utility by running the TsmxFirmwareInstall.exe in the program directory. Any of the available firmware versions located in the program subfolder **..\Firmware**, can be selected from a dialog box during program execution.

# 6 Instrument Setup and Software Options

The **TsmxOptionKeyInstaller** utility tool is used to recall the instrument setup and to install new firmware options. This tool is located on the accompanying CD-ROM respectively could be downloaded from the internet under: http://www.rohde-schwarz.com.

Search for your analyzer type and select the menu item “DOWNLOADS” –> “SOFTWARE”.

## Program Requirements

- PC/Notebook with IEEE1394 interface adapter and R&S TSMx analyzer connected (It is possible to connect more than one analyzer in a daisy chain topology!).
- R&S TSMx IEEE 1394 driver installed on the host PC
- RS-232 interface (COM1) of PC/notebook and R&S TSMx connected via a null-modem cable (see **RS-232-C Output** for terminal settings).
- R&S TSMx powered up and power on sequence completed successfully (see **Power** On Sequence/Idle Mode)
- No other software application interfacing with the R&S TSMx

## Program Start

The utility will be started by running the OptionKeyInstaller.exe in the program directory. The program needs a few seconds to set up the connection with all the connected R&S TSMx device(s). All analyzers start indicating “ready mode” after a while.
The instrument-related data for a certain analyzer will be displayed as soon as the connection is established.
If there is more than one instrument connected use the combo box “**Select TSMx**” to select the desired analyzer by choosing the appropriate serial number.

## Recalling Instrument Setup

Select the **R&S TSMx Info** property page. This page displays all the related instrument data.

- **Hardware State**
- **Serial Numbers**
- **Firmware Version**
- **Calibration Data**

# Recalling Enabled Software Options / Checking Device Key Installation

Select the **"TSMx Options"** property page. To address a certain analyzer select the appropriate serial number in the "**Select TSMx**" combo box for that purpose.

The text **"The Device Key is installed"** is output in this program dialog, if a valid device key is installed for a certain instrument.
A missing device key will be output with **"No Device Key has been found"** in the program dialog.
A valid device key installation is mandatory for ordering additional firmware options.

A list box displays the available firmware options for a certain analyzer.

**ATTENTION**

Customers with missing device key installation on their R&S TSMx analyzer are kindly asked to get in contact with their local R&S representatives to update their instrument with the latest version of option licensing.

# Reordering Software Options

Reordering firmware options for a certain R&S TSMx analyzer requires solely the supplement of the R&S TSMx serial number with the option order.
Only in cases where no device key is installed for a certain analyzer (see **Recalling Enabled Software Options**) the device specific identification file (*.hex) is mandatory to generate the option license files at Rohde & Schwarz.

Press the button **"Get Device ID File..."** in the "TSMx Options" tab to read out the device identification file. A dialog box opens to define the storage location for this file. After setting the storage location and closing this dialog the analyzer specific ID file will be stored.

Attach this ID file with the firmware option order.

# Post-Installation of Software Options

Reordered firmware options are shipped as license files on a separate CD-ROM and need to be installed by the customer using the TsmxOptionKeyInstaller utility.

**ATTENTION**

Only reordered R&S TSMx firmware options need to be installed in a post process. Ordinary ordered R&S TSMx analyzers are shipped with already pre-installed firmware options. So there is nothing to do at this point!

Please refer to the **SWInstallationManual_**xxx**.pdf** and the **FWReleaseNote_xxx.pdf** in the ..\doc subdirectory of the CD-ROM for details on how to proceed.
**xxx: Version info string**

# 7 R&S ViCom Programming Interface

## General

R&S ViCom interface is a software package to develop software applications which integrate the R&S TSMx analyzers as an OEM product into customer software.
The R&S ViCom package, which is part of the shipment, need to be installed on the host PC and includes documentation and sample applications.

**ATTENTION**

Interfacing the R&S TSMx analyzers via the R&S ViCom interface requires the availability of certain OEM firmware options (R&STSMU-K3x) on the instrument.

Per default the R&S TSMQ analyzers are equipped with any OEM firmware option whereas these firmware options for the R&S TSMU / R&S TSMU-H analyzers need to be ordered separately.

Please ask your local R&S representative for questions on this matter.

## Requirements

- Dedicated OEM option(s) TSMU-K**3**x installed on the instrument (see **Recalling Enabled Software Options**)
- R&S ViCom software interface package installed on the host PC
- Appropriate firmware version **10.1024** or higher. It is recommended to upgrade the firmware of older analyzers in the field too
  (see **Instrument Setup and Software Options**).
- R&S TSMx 1394 device driver installed on the host PC

## Installation

The setup program including sample applications and documentation is located in the CD-ROM subdirectory **..\ViCom**.

The latest ViCom version could be downloaded from the product homepage in the internet under: http://www.rohde-schwarz.com – Section Download/Software.

**ATTENTION**

If there is already an existing R&S ViCom installation on the host PC this version need to be uninstalled first (Start->Settings->Add and Remove Programs) before this setup program could be started.

The setup program could be started directly from the CD-ROM by running the setup.exe file in this sub-directory.
When starting the setup program a dialog comes up to enter the target directory. The default location for the ViCom interface package is: **..\RuS\ViCom**.

.

**ATTENTION**

It is recommended **not** to change the target directory for the R&S ViCom installation but only to adapt the target drive.

In the next step the setup program will transfer the complete R&S ViCom interface package to the host PC. Close this setup program after finishing the file transfer.

The ViCom installation adds a shortcut entry in the Windows start menu "**Rohde & Schwarz -> ViCom**" from where you have a convenient access to all the R&S ViCom specific data (demo applications, debug utilities, tools and manuals, etc.).

# 8 Troubleshooting

## Means of Error Detection

### Front Panel LEDs

The following LEDs on the front panel indicate an error (see Fig. 4):

| | | | |
|---|---|---|---|
| ERROR TEMP: | red - | lit: | **Temperature Failure**<br>Temperature inside the device is too high. |
| CONFIG STATE ERR: | red - | flash:<br>lit: | **Configuration State Failure**<br>No flash card inserted in flash card slot.<br>Data on flash card is invalid or program error. |
| ERROR PWR: | red - | lit: | **Power Failure**<br>At least one internal voltage rail is out of tolerance. |

### RS-232-C Output

During startup and normal operation, the R&S TSMx outputs status information via the RS-232-C connector on the rear panel parallel with standard communication via the IEEE1394 interface. Monitoring the output information on the serial interface does not decrease the analyzer's performance in any manner, but is always a valuable tool to verify the analyzer's current state.

To display the status information on the computer, the following steps are necessary:

Connect a serial 9-pin null modem cable between the RS-232-C socket of the analyzer and the serial interface of your PC.

- Set up a terminal program connection on your computer’s RS-232-C interface with the following settings:

| | |
|---|---|
| Bits per second: | 115200 |
| Data bits: | 8 |
| Parity: | no parity |
| Stop bit: | 1 |
| Flow control: | no flow control |

- Start the terminal session.

# Troubleshooting Errors Indicated by LEDs

## Temperature Failure

The electronic equipment in the radio network analyzer is protected against thermal destruction. If the temperature inside the analyzer exceeds a specific limit, the unit changes to the TEMP ERROR mode and switches off the main voltages.

To switch the unit to standby mode, press the POWER button.

If the temperature error occurs repeatedly within the operating temperature range, return the device to Rohde & Schwarz service.

## Configuration State Failure

Both, FPGA configuration data and the boot code are read from the internal compact flash (CF) card during power on sequence.

**CONFIG ERR LED** (LED blinking): indicates ***No Flash Card Inserted***

-> the configuration data cannot be read from the CF card.

Switch off the instrument, remove the CF card and check whether the card could be read on a Windows PC with Flash Card Reader or PCMCIA slot (PCMCIA adapter is needed!). The directory structure on the card and its contents should be the same as in ..\ACE Files on the accompanying CD-ROM.

To access the CF card, remove the small metal plate at the rear panel labeled with **SMART CARD** by loosening the screws and pull it out of the slot.

If the flash card is detected correctly in the PC and the file structure is identical, push the CF card into the slot and power on the instrument again.

In the event of a repeated error or a card-read error on the PC, contact Rohde & Schwarz support.

**CONFIG ERR LED** (LED illuminated, during the power-on sequence): indicates ***Flash Card Error***

-> the flash card may contain erroneous or corrupt files.

Remove the CF card from the instrument and insert it in a Flash Card Reader or PCMCIA slot (a PCMCIA adapter is needed) on your PC. Check the directory and file structure on the card. It should be the same as in ...\ACE Files on the accompanying CD-ROM.

With this information in hand plus the instrument's serial number read from the label on the rear panel, contact Rohde & Schwarz support.

**CONFIG ERR LED** (LED illuminated while ordinary ROMES / ViCom applications): indicates **Program Failure on the R&S TSMx analyzer**

-> at this stage, the instrument won't no longer respond to any software command. This could be checked by monitoring the RS-232-C output (see

Tracing Measuring Mode) and the PROCESS LEDs on the front panel (see **Measuring Mode**). The blinking of the front panel LEDs signaling measurement mode will be frozen.

In this case, end the task of the controlling software application from the Windows Task Manager and reset the R&S TSMx analyzer. Wait for the instrument to complete the power on sequence and initiate a new measurement session.

If the error persists, contact Rohde & Schwarz support.

## Power Failure

At least one internal voltage rail is out of range. Return the device to Rohde & Schwarz service.

# Troubleshooting via the RS-232-C Interface

Monitor the status information output on the serial interface (see **Troubleshooting via the RS-232-C Interface**) to check whether the instrument is functioning properly.

## Tracing Power On Sequence

Press the reset button on the front panel. If the unit is in standby mode, press the power button. In both cases, the following listing should appear on the "Hyper Terminal" screen (see Listing 1):

**ATTENTION**

Be sure that no software application on the host PC is connected with the instrument for this test.

```
Pipelined Version of DSOCM.
-----------------
Tsmu Boot Stage 0
dwTag >> 16 = 0000065503
ÿÿ
dwTag >> 16 = 0000065535
ÿ
Pipelined Version of DSOCM.
Pipelined Version of DSOCM.
---
---
----------------------------
TSMx BOOT STAGE 1   V.11020000
built: Tue Nov 28 19:22:25 GMT 2006
Performance Test 169 137 119
M_Pci.ChipInfo.u8RevisionId=00000061
dwPciReg24=0090b801
dwPciReg28=00bdbbab
PCI chip Revision ID = 0x61
SerialNumberVerify(TRUE)=1
M_Mt.bFirmwareMajor=0000000b
M_Mt.wFirmwareMinor=00000002
Firmware 11.0002
M_Mt.dwSoftwareVersion=11020000
Tue Nov 28 19:24:56 2006

forcing bus reset
IRQ busReset, dwNodeID=0xc000ffc1
busReset packet, dwNodeID=0xc000ffc1, dwSelfIDGeneration=1
IRQ busReset, dwNodeID=0x8000ffc0
busReset packet, dwNodeID=0x8000ffc0, dwSelfIDGeneration=2
```

Listing 1 Terminal output during power on sequence

If the output corresponds with **Listing 1** where the number of IRQ bus resets at the end of the output can vary the network analyzer completed the power on sequence and is ready for the application program download via the IEEE1394 interface.

In the event of no output string, check the "Hyper Terminal" settings and the connection cabling and reset the instrument.

If the error persists or the output end with "…bus reset not possible", contact Rohde & Schwarz support.

## Tracing Application Program Download and Ready Mode

The TSMx application program will be downloaded from the host PC either during ROMES driver configuration or while calling the LoadTsmx function of the ViCom interface. (refer to the ROMES respectively ViCom manual for details).
After program download, the radio network analyzer will start some initialization routines. Finally the receiver will enter ready mode. Any measurement from ROMES / ViCom software or ViCom could be initiated at this point. Please refer to the ROMES or ViCom manual for details.

In idle mode and depending on the availability of a valid PPS input signal on the PULSE IN connector respectively a GSM input signal on the RF antenna, the receiver will start to correct the internal system clock. An output like shown in **Listing 2** should appear at the terminal log.

```
m_dwPostofficeProtocolNumber=3
Tx packet size = 2048
PostOfficeState set to 1
Pipelined Version of DSOCM.
Start of Program StarterPipelined Version of DSOCM.
----------------------------
TSMx MEASUREMENT APPLICATION   V.11020000
built: Tue Nov 28 19:25:12 GMT 2006
M_Pci.ChipInfo.u8RevisionId=00000061
---
SerialNumberVerify(TRUE)=1
M_Mt.bFirmwareMajor=0000000b
M_Mt.wFirmwareMinor=00000002
Firmware 11.0002
M_Mt.dwSoftwareVersion=11020000
Tue Nov 28 19:26:30 2006

M_Rec.bDeviceVariantNumber=11
FE Temperature = 47°
UMTS Filter Implemented
M_Rec.FstrTsmuData.st_LevelCal & VALID=1
M_Rec.FstrTsmuData.st_IFFilterMeas & VALID=1
M_Rec.FstrTsmuData.st_UMTSFilter & VALID=1
TSMx ADC Phase Shift adjusted to 37%. Window 89%, Error Level = 22%
forcing bus reset
IRQ busReset, dwNodeID=0x8000ffc0
busReset packet, dwNodeID=0x8000ffc0, dwSelfIDGeneration=20
---
IRQ busReset, dwNodeID=0x8000ffc0
busReset packet, dwNodeID=0x8000ffc0, dwSelfIDGeneration=21
m_dwPostofficeProtocolNumber=3
Tx packet size = 2048
PostOfficeState set to 1
FPGA Configuration:
H01V10B0
Fri Nov  5 10:34:56 2004

FPGA Configuration:
H01V10B0
Fri Nov  5 10:34:56 2004

GSM TCXO Correction (-512 to +511) = -25
GSM TCXO Correction (-512 to +511) = -23
"GSM900 / GSM1800 used for GSM Synchronisation."
GSM TCXO Correction (-512 to +511) = -25
GSM TCXO Correction (-512 to +511) = -24
GSM TCXO Correction (-512 to +511) = -25
GSM TCXO Correction (-512 to +511) = -25
GSM TCXO Correction (-512 to +511) = -24
GSM TCXO Correction (-512 to +511) = -26
```

Initialization sequence

Synchronization ~ 1 output line/sec

Only if a GSM signal is available on the RF input connector!

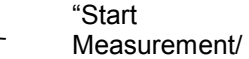
Listing 2 Terminal output during program download and in the ready mode

# Tracing Measuring Mode

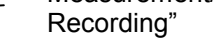
Starting measurement/recording in the ROMES software respectively launching a measurement command with the ViCom interface initiates a new measurement task at the analyzer. The instrument switches from ready mode to measuring mode.
Stopping measurement/recording in the ROMES software or with the ViCom interface switches the unit back to ready mode.
Please refer to the ROMES or ViCom manual for details.

Output like shown in **Listing 3** should appear on the terminal program screen.

```
---
PPS TCXO Correction (-512 to +511) = -24
"Start Frame Arrived"
"Start Frame Arrived"
GSM TCXO Correction (-512 to +511) = -23
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
---
---
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
StopMeasFrameArrived
PPS TCXO Correction (-512 to +511) = -24
PPS TCXO Correction (-512 to +511) = -24
---
---
```



"Start Measurement/ Recording"



"Stop Measurement/ Recording"

Listing 3 Terminal output in measuring mode

# Problems after Firmware Update

## General

Under certain cases the radio network analyzer will not boot after a firmware update, and the **CONFIG** LED on the front panel indicate an error.
The cause is usually a wrong setting of the configuration directory on the compact flash card of the device while executing firmware update.

In such a case, this mal function could be solved by the customer by editing the ini-file of the analyzer flash card on a PC with flash card slot.

## How to Solve the Configuration Problem Manually:

Pull out the flash card from the instrument. The flash card is accessible from the rear panel by loosing four screws of the metal plate cover named “SMART CARD”. Remove this plate.
Insert the card in the PC card reader or PCMCIA slot of a PC/notebook.
Open the xilinx.sys file in the root of the flash card with an editor and change the **dir** variable according to the following table:

| Before modification | | After modification |
|---|---|---|
| *dir = H01V10B0;* | → | dir = *H00V10B0;* |
| *dir = H00V10B0;* | → | dir = *H01V10B0;* |

Insert the edited flash card into the radio network analyzer again and connect it with the power supply again. The unit should now pass boot sequence correctly. If this failure persists, contact Rohde & Schwarz support.

***Background**:* Two separate configuration directories are located on the flash card of each instrument (H01V10B0 and H00V10B0). The xilinx.sys file in the root directory defines which one is the bootable directory.
Different configuration directories are necessary, because of two different versions of the printed circuit board (PCB) inside the R&S TSMx. In some cases after firmware update, the incorrect configuration directory may be activated which doesn’t comply with the PCB board version.