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Find the *Rohde & Schwarz CTS30* at our website: ***Click HERE***

ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

Digital Radio Tester

for

GSM (GSM 900) -
PCN (GSM 1800 / DCS 1800) -
PCS (GSM 1900 / DCS 1900) -
Mobiles

R&S® CTS30

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Data Sheet

Safety Instructions
Certificate of quality
EC Certificate of Conformity
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Supplement to Data Sheet CTS

Technical Specifications

The technical specifications and the functions of CTS30 are identical with those given in the CTS data sheet for GSM. However, operation of CTS 30 is controlled by Application Software CTSgo supplied with the instrument.

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Before putting the product into operation for the first time, make sure to read the following

Safety Instructions

Rohde & Schwarz makes every effort to keep the safety standard of its products up to date and to offer its 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. This product 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, Rohde & Schwarz 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 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 operating manual and within its performance limits (see data sheet, documentation, the following safety instructions). Using the products requires technical skills and knowledge of English. It is therefore essential that the products be used exclusively by skilled and specialized staff or thoroughly trained personnel with the required skills. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation.

Symbols and safety labels

							
Observe operating instructions	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

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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 other parts of the documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by Rohde & Schwarz, including instruments, systems and all accessories.

Tags and their meaning

DANGER	This tag indicates a safety hazard with a high potential of risk for the user that can result in death or serious injuries.
WARNING	This tag indicates a safety hazard with a medium potential of risk for the user that can result in death or serious injuries.
CAUTION	This tag indicates a safety hazard with a low potential of risk for the user that can result in slight or minor injuries.
ATTENTION	This tag indicates the possibility of incorrect use that can cause damage to the product.
NOTE	This tag indicates a situation where the user should pay special attention to operating the product but which does not lead to damage.

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. It is therefore essential to make sure that the tags described here are always used only in connection with the associated documentation and the associated product. The use of tags in connection with unassociated products or unassociated documentation can result in misinterpretations 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 max. 2000 m. Unless specified otherwise in the data sheet, 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.

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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 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 (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. 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.
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. Never remove the cover or part of the housing while you are operating the product. This will expose circuits and components and can lead to injuries, fire or damage to the product.

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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 skilled 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 water, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock 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. 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 are hazardous waste. Dispose of them only in specially marked containers. Observe local regulations regarding waste disposal. Do not short-circuit batteries or storage batteries.
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. Please be aware of the weight of the product. Be careful when moving it; otherwise you may injure your back or other parts of your body.
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 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.

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Por favor lea imprescindiblemente antes de la primera puesta en funcionamiento las siguientes informaciones de seguridad

Informaciones de seguridad

Es el principio de Rohde & Schwarz de tener a sus productos siempre al día con los estandards de seguridad y de ofrecer a sus 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. Este 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 estandards técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, deberá el usuario atenerse a todas las informaciones, informaciones de seguridad y notas de alerta. 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 solamente fue elaborado para ser utilizado en la indústria y el laboratorio o para fines de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda ser dañada. 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 maluso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado dentro de las instrucciones del correspondiente manual del uso y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso de los productos hace necesarios conocimientos profundos y el conocimiento del idioma inglés. Por eso se deberá tener en cuenta de exclusivamente autorizar para el uso de los productos a personas péritas o debidamente minuciosamente instruidas con los conocimientos citados. 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.

Símbolos y definiciones de seguridad

							
Ver manual de instrucciones del uso	Informaciones para maquinaria con uns 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 construción 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

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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 otro capítulo de esta documentación y que también son obligatorias de seguir. En las informaciones de seguridad actuales hemos juntado todos los objetos vendidos por 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	Indica un punto de peligro con gran potencial de riesgo para el ususario.Punto de peligro que puede llevar hasta la muerte o graves heridas.
ADVERTENCIA	Indica un punto de peligro con un protencial de riesgo mediano para el usuario. Punto de peligro que puede llevar hasta la muerte o graves heridas .
ATENCIÓN	Indica un punto de peligro con un protencial de riesgo pequeño para el usuario. Punto de peligro que puede llevar hasta heridas leves o pequeñas
CUIDADO	Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.
INFORMACIÓN	Indica una situación en la que deberían seguirse las instrucciones en el uso del producto, pero que no consecuentemente deben de llevar a un daño del mismo.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el ámbito de la comunidad económica europea. Pueden existir definiciones diferentes a esta definición. Por eso se debera tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación 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 principialmente 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.
   A menos que se especifique otra cosa en la hoja de datos, 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 périto 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. Despues de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de

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seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de 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 averigurar 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, deberan 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 radiación HF, 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 está comprometido a valorar y señalar areas de trabajo en las que se corra un riesgo de exposición a radiaciones aumentadas de riesgo aumentado 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 prodcuto.
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 ya que 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 (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 construciones o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

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12. No utilice nunca el producto si está dañado el cable eléctrico. 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.
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 Ueff > 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 de la EC950/EN60950.
18. Nunca abra la tapa o parte de ella si el producto está en funcionamiento. 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 efecutadas 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, deberá la toma de corriente estar protegida de manera que los productos o los usuarios 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 corto circuitos 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 el agua 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 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.

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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. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención celulas de Litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Baterías y acumuladores son deshechos problemáticos. Por favor tirenlos en los recipientes especiales para este fín. Por favor tengan en cuenta las prescripciones nacionales de cada país referente al tratamiento de deshechos. Nunca sometan las baterías o acumuladores a un corto circuito.
28. Tengan en consideración de que en caso de un incendio pueden escaparse gases tóxicos del producto, que pueden causar daños a la salud.
29. 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.
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 sujecion 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 tenidas en cuenta. 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 y el fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de laser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación. De otra manera pondrá en peligro su salud, ya que el rayo laser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo laser.

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EC Certificate of Conformity

CE

Certificate No.: 98121

This is to certify that:

Equipment type	Order No.	Designation
CTS30	1094.0006.30	Digital Radio Tester

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 : 1993 + A2 : 1995
EN50081-1 : 1992
EN50082-2 : 1995

Affixing the EC conformity mark as from 1998

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

Munich, 1998-12-17

Central Quality Management FS-QZ / Becker

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1 Introduction

Tester CTS is a value-for-money instrument for function tests, as well as detailed service testing on digital mobiles. These tests are performed using a personal computer.

Application Software CTSgo is supplied with the tester.

The CTSgo program comes in two versions.

- CTSgo for Windows 3.1 / Windows 3.11 for Workgroups
- CTSgo for Windows 95 / 98 / NT 4.0

The program may be installed in German or English as desired.

For detailed instructions regarding the operation of this program see chapter "Windows Application CTSgo" (Tabbed Divider 4).

Preconditions for System Use

To ensure unimpaired function of CTSgo, your system should meet the following basic requirements. For a more convenient use of CTSgo, particularly the presentation of measurement reports, the employed graphics card should have a better resolution than the one specified below.

Platform:	Windows 3.1 / Windows 3.11 for Workgroups
Processor:	486DX2/66 MHz
RAM:	8 Mbytes
Display:	VGA 640 x 480 pixels
Fixed-disk storage:	5 Mbytes
Peripherals:	Mouse, one free serial interface

Platform:	Windows 95 / Windows 98 / Windows NT 4.0
Processor	Pentium 75
RAM:	16 Mbytes
Display:	VGA 640 x 480 pixels
Fixed-disk storage:	5 Mbytes
Peripherals:	Mouse, one free serial interface

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2 Preparation for Use

- When unpacking the instrument, don't forget the items and accessories which are included.
- When transporting the instrument in future it is strongly recommended that the protective caps included in the shipping box for protection of the front and rear panel are used. This serves to prevent damage to the protruding items on the front and rear panels.

Important note:

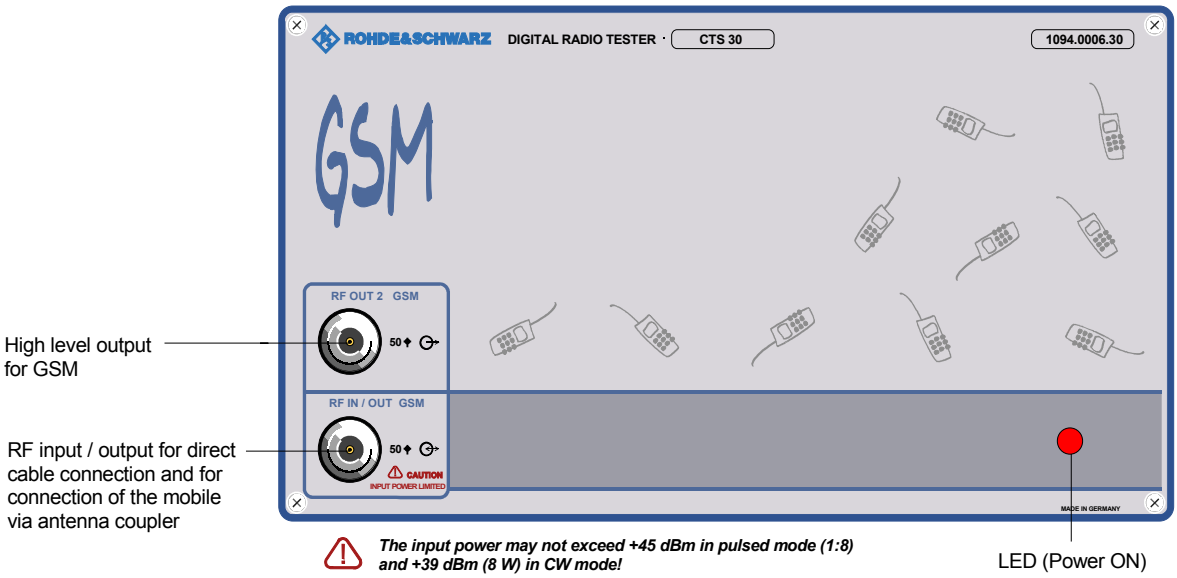
A battery-backed CMOS-RAM retains the data of the setup as well as the complete instrument settings after switch-off.

We recommend to check the lithium battery every one to two years.

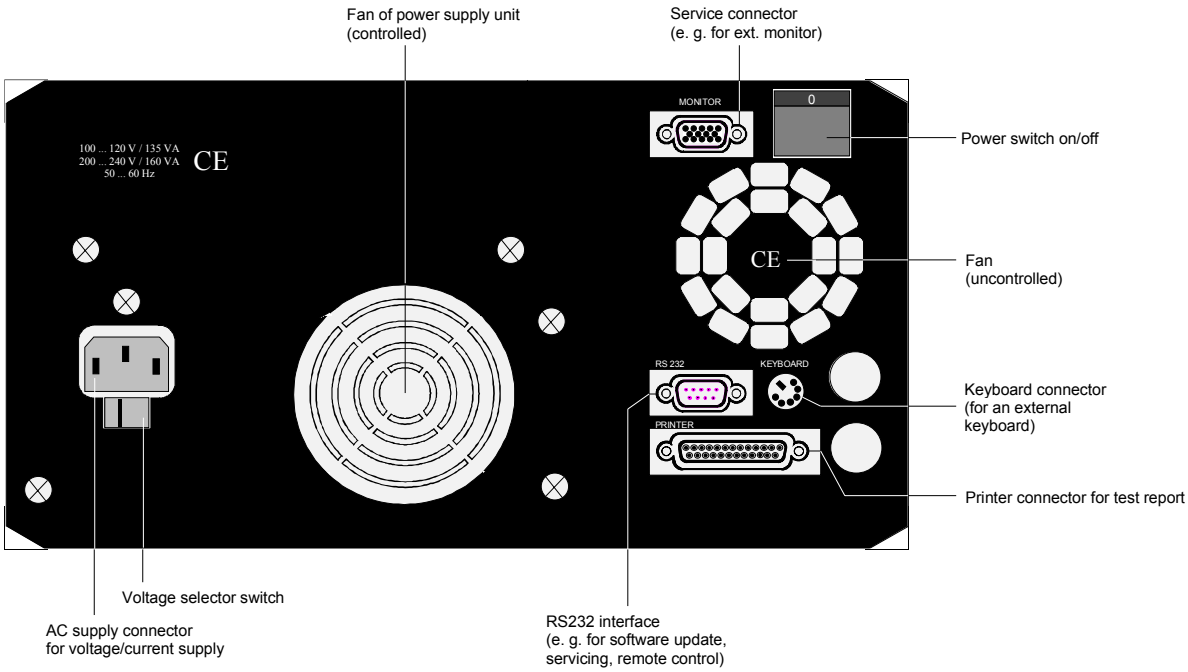
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2.1 Explanation of Front and Rear View

This page shows the front and rear view of the instrument, with short explanations on the controls and connectors.

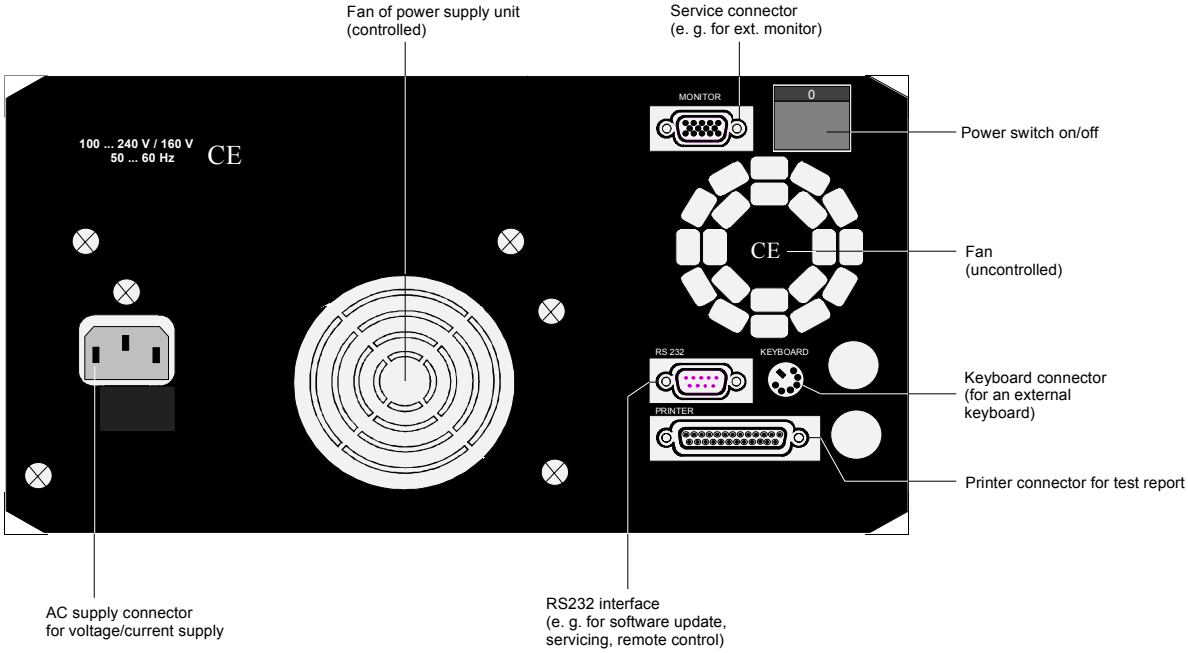


Instrument with input voltage selector



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Instrument with wide-range voltage input



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2.2 Commissioning

2.2.1 Setting up the Instrument



For convenient operation of the instrument note the following:

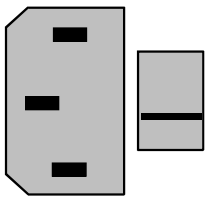
- Do not cover the ventilation openings!
- Ambient temperature +5 to +40 °C.
- Avoid moisture and condensation, if it occurs however, the instrument must be thoroughly dried before switching on.

2.2.2 Connecting the Instrument to the AC Supply

➢ Check the position of the voltage selector and set it to the local AC supply voltage if necessary.

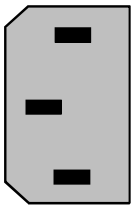
Ø Plug the supplied power cable into the rear power connector and connect the CTS to the power supply.

Instrument with input voltage selector



100...125 V / 0.6 A
200...240 V / 0.3 A
50...60 Hz

Instrument with wide-range voltage input



100 ... 240 V / 160 VA
50 ... 60 Hz

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2.2.3 Connecting the Instrument to the Personal Computer

Connect the RS232 serial interface of CTS (rear panel) to the serial interface of your personal computer using the cable supplied (the installation of the CTSgo software is described in detail in chapter 3 of the manual for Windows Application CTSgo). Switch on the CTS (power switch on its rear panel) and your PC. The LED on the CTS front panel lights to show that CTS is ready for operation.

2.2.4 Ensuring Electromagnetic Compliance (EMC)

In order to avoid electromagnetic interference, the instrument may only be operated with all covers in place as they form part of the shielding for the instrument. Only appropriate shielded signal and control cables (e.g. RF connecting cables) should be used.

2.2.5 OCXO Reference Oscillator (Option CTS-B1)

If your instrument is equipped with this option, be aware that an OCXO needs approximately 15 minutes to warm up after switching on the instrument to achieve full precision.

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3 Remote Control

3.1 Introduction

The instrument is equipped with a serial interface (RS 232-C). The connector is located at the rear of the instrument and permits to connect a controller for remote control. The instrument supports the SCPI version 1992.0 (Standard Commands for Programmable Instruments). The SCPI standard is based on standard IEEE 488.2 and aims at the standardization of device-specific commands, error handling and the status registers (see Section 3.5.1).

This section assumes basic knowledge of SCPI conform programming and operation of the controller. A description of the interface commands is to be obtained from the relevant manuals.
The requirements of the SCPI standard placed on command syntax, error handling and configuration of the status registers are explained in detail in the respective sections. Tables provide a fast overview of the commands implemented in the instrument and the bit assignment in the status registers. The tables are supplemented by a comprehensive description of every command and the status registers.

3.2 Brief Instructions

The short and simple operating sequence given below permits fast putting into operation of the instrument and setting of its basic functions.

1. Connect CTS and controller using a serial cable (see section 3.1 and annex A).
2. Use a terminal emulation on the controller with the same paramters, as configured on the CTS.
   For example 9600 baud, no parity, 8 bits, 1 stop bit and hardware-handshake.
   The character strings must be terminated by a delimiter (linefeed).
3. Send the following strings to the CTS:

```
"CONF:NETW GSM <LF>"
"PROC:SEL MAN <LF>"          Choose Manual test
```

The CTS then performs a location update if a mobile is connected and is ready to set up a call with this mobile.

4. To return to manual control, press any key at the front panel.

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3.3 Switchover to Remote Control

On power-on, the instrument is always in the manual operating state ("LOCAL" state) and can be operated via the front panel. It is switched to remote control ("REMOTE" state) as soon as it receives a command from a controller. During remote control, operation via the front panel is disabled. The instrument remains in the remote state until it is reset to the manual state via pressing the key "MENU UP". Switching from manual operation to remote control and vice versa does not affect the instrument settings.

Indications during Remote Control

In the REMOTE state, the display at the CTS can be configured:

1. Nothing is indicated on the display to increase the speed.
2. The actual remote command, the state of the testset and possibly occured errors are shown.
3. The display changes to the selected menu in a fullscreen-view.

3.4 Device Messages (Commands and Device Responses)

– **Commands** are messages the controller sends to the instrument. They operate the device functions and request information.
The commands are subdivided according to two criteria:

1. According to the effect they have on the instrument:

   Setting commands cause instrument settings such as reset of the instrument or setting the output level to 1 volt.

   Queries cause data to be provided for output on the remote-control interface, e.g. for identification of the device or polling the active input.

2. According to their definition in standard IEEE 488.2:

   Common Commands are exactly defined as to their function and notation in standard IEEE 488.2. They refer to functions such as management of the standar-dized status registers, reset and selftest.

   Device-specific commands refer to functions depending on the features of the instrument such as frequency setting. A majority of these commands has also been standar-dized by the SCPI committee (cf. Section 3.5.1).

– **Device responses** are messages the instrument sends to the controller after a query. They can contain measurement results, instrument settings and information on the instrument status (cf. Section 3.5.4).

Structure and syntax of the device messages are described in Section 3.5. The commands are listed and explained in detail in Section 3.6.

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3.5 Structure and Syntax of the Device Messages

3.5.1 SCPI Introduction

SCPI (Standard Commands for Programmable Instruments) describes a standard command set for programming instruments, irrespective of the type of instrument or manufacturer. The goal of the SCPI consortium is to standardize the device-specific commands to a large extent. For this purpose, a model was developed which defines the same functions inside a device or for different devices. Command systems were generated which are assigned to these functions. Thus it is possible to address the same functions with identical commands. The command systems are of a hierarchical structure. Fig. 3-1 illustrates this tree structure using a section of command system SOURce, which operates the signal sources of the devices. The other examples concerning syntax and structure of the commands are derived from this command system.
SCPI is based on standard IEEE 488.2, i.e. it uses the same syntactic basic elements as well as the common commands defined in this standard. Part of the syntax of the device responses is defined with greater restrictions than in standard IEEE 488.2 (see Section 3.5.4, Responses to Queries).

3.5.2 Structure of a Command

The commands consist of a so-called header and, in most cases, one or more parameters. Header and parameter are separated by a "white space" (ASCII code 0 to 9, 11 to 32 decimal, e.g. blank). The headers may consist of several key words. Queries are formed by directly appending a question mark to the header.

Note: *The commands of the SOURCE system used in the following examples are not implemented in the CTS.*

Common commands

Common commands consist of a header preceded by an asterisk "*" and one or several parameters, if any.

Examples:

`*RST`	RESET, resets the device
`*ESE 253`	EVENT STATUS ENABLE, sets the bits of the event status enable register
`*ESR?`	EVENT STATUS QUERY, queries the contents of the event status register.

Device-specific commands

Hierarchy**:** Device-specific commands are of hierarchical structure (see Fig. 3-1). The different levels are represented by combined headers. Headers of the highest level (root level) have only one key word. This key word denotes a complete command system.

Example: `SOURce` This key word denotes the command system `SOURce`.

For commands of lower levels, the complete path has to be specified, starting on the left with the highest level, the individual key words being separated by a colon ":".

Example: `SOURce:FM:EXTernal:COUPling AC`

This command lies in the fourth level of the SOURce system. It sets the coupling of the external signal source to AC.

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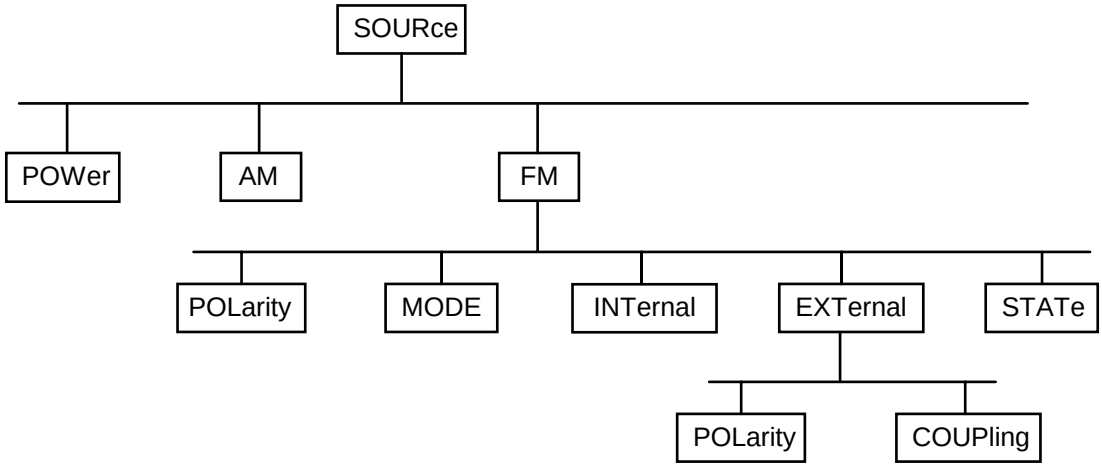


Fig. 3-1 Tree structure of the SCPI command systems using the SOURce system by way of example

Some key words occur in several levels within one command system. Their effect depends on the structure of the command, that is to say, at which position in the header of a command they are inserted.

Example: `SOURce:FM:POLarity NORMal`
This command contains key word POLarity in the third command level. It defines the polarity between modulator and modulation signal.

`SOURce:FM:EXTernal:POLarity NORMal`
This command contains key word POLarity in the fourth command level. It defines the polarity between modulation voltage and the resulting direction of the modulation only for the external signal source indicated.

Optional key words: Some command systems permit certain key words to be optionally inserted into the header or omitted. These key words are marked by square brackets in the description. The full command length must be recognized by the instrument for reasons of compatibility with the SCPI standard. Some commands are considerably shortened by these optional key words.

Example: `[SOURce]:POWer[:LEVel][:IMMediate]:OFFSet 1`
This command immediately sets the offset of the signal to 1 volt. The following command has the same effect:
`POWer:OFFSet 1`

Note: *An optional key word must not be omitted if its effect is specified in detail by a numeric suffix.*

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Long and short form: The key words feature a long form and a short form. Either the short form or the long form can be entered, other abbreviations are not permissible.

Example: `STATus:QUEStionable:ENABle 1= STAT:QUES:ENAB 1`

Note: *The short form is marked by upper-case letters, the long form corresponds to the complete word. Upper-case and lower-case notation only serve the above purpose, the instrument itself does not make any difference between upper-case and lower-case letters.*

Parameter: The parameter must be separated from the header by a "white space". If several parameters are specified in a command, they are separated by a comma ",". A few queries permit the parameters MINimum, MAXimum and DEFault to be entered. For a description of the types of parameter, refer to Section 3.5.5.

Example: `SOURce:POWer:ATTenuation? MAXimum` Response: `60`
This query requests the maximal value for the attenuation.

Numeric suffix: If a device features several functions or features of the same kind, e.g. inputs, the desired function can be selected by a suffix added to the command. Entries without suffix are interpreted like entries with the suffix 1.

Example:. `SOURce:FM:EXTernal2:COUPling AC`
This command sets the coupling of the second external signal source.

3.5.3 Structure of a Command Line

A command line may consist of one or several commands. It is terminated by a <New Line>, a <New Line> with EOI or an EOI together with the last data byte. Quick BASIC automatically produces an EOI together with the last data byte.

Several commands in a command line are separated by a semicolon ";". If the next command belongs to a different command system, the semicolon is followed by a colon.

Example:
`"SOURce:POWer:CENTer MINimum;:OUTPut:ATTenuation 10"`

This command line contains two commands. The first command is part of the SOURce system and is used to specify the center frequency of the output signal. The second command is part of the OUTPut system and sets the attenuation of the output signal.

If the successive commands belong to the same system, having one or several levels in common, the command line can be abbreviated. To this end, the second command after the semicolon starts with the level that lies below the common levels (see also Fig. 3-1). The colon following the semicolon must be omitted in this case.

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Example:
"SOURce:FM:MODE LOCKed;:SOURce:FM:INT:FREQuency 1kHz"

This command line is represented in its full length and contains two commands separated from each other by the semicolon. Both commands are part of the SOURce command system, subsystem FM, i.e. they have two common levels.
When abbreviating the command line, the second command begins with the level below SOURce:FM. The colon after the semicolon is omitted.

The abbreviated form of the command line reads as follows:

"SOURce:FM:MODE LOCKed;INT:FREQuency 1kHz"

However, a new command line always begins with the complete path.

Example: "SOURce:FM:MODE LOCKed"
"SOURce:FM:INT:FREQuency 1kHz"

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3.5.4 Responses to Queries

A query is defined for each setting command unless explicitly specified otherwise. It is formed by adding a question mark to the associated setting command. According to SCPI, the responses to queries are partly subject to stricter rules than in standard IEEE 488.2.

1 The requested parameter is transmitted without header.
Example: `SOURce:EXTernal:COUPling?` Response: `AC`

2. Maximum values, minimum values and all further quantities, which are requested via a special text parameter are returned as numerical values.
Example: `FREQuency? MAX` Response: `10E3`

3. Numerical values are output without a unit. Physical quantities are referred to the basic units or to the units set using the Unit command.
Example: `FREQuency?` Response: `1E6` for 1 MHz

4. Truth values <Boolean values> are returned as 0 (for OFF) and 1 (for ON).
Example: `OUTPut:STATe?` Response: `1`

5. Text (character data) is returned in a short form (see also Section 3.5.5).
Example: `SOURce:FM:SOURce?` Response: `INT1`

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3.5.5 Parameters

Most commands require a parameter to be specified. The parameters must be separated from the header by a "white space". Permissible parameters are numerical values, Boolean parameters, text, character strings and block data. The type of parameter required for the respective command and the permissible range of values are specified in the command description (see Section 3.6).

Numerical values

Numerical values can be entered in any form, i.e. with sign, decimal point and exponent. Values exceeding the resolution of the instrument are rounded up or down. The mantissa may comprise up to 255 characters, the exponent must lie inside the value range -32000 to 32000. The exponent is introduced by an "E" or "e". Entry of the exponent alone is not permissible. In the case of physical quantities, the unit can be entered. Permissible unit prefixes are G (giga), MA (mega), MOHM and MHZ are also permissible), K (kilo), M (milli), U (micro) and N (nano). It the unit is missing, the basic unit is used.

Example:
`SOURce:FREQuency 1.5 kHz = SOURce:FREQuency 1.5E3`

Special numerical values

The texts MINimum, MAXimum, DEFault, UP and DOWN are interpreted as special numerical values.

In the case of a query, the numerical value is provided.

Example: Setting command: `SOURce:VOLTage MAXimum`
Query: `SOURce:VOLTage?` Response: `15`

MIN/MAX — MINimum and MAXimum denote the minimum and maximum value.

DEF — DEFault denotes a preset value which has been stored in the EPROM. This value conforms to the default setting, as it is called by the *RST command

UP/DOWN — UP, DOWN increases or reduces the numerical value by one step. The step width can be specified via an allocated step command (see annex C, List of Commands) for each parameter which can be set via UP, DOWN.

INF/NINF — INFinity, Negative INFinity (NINF) Negative INFinity (NINF) represent the numerical values -9.9E37 or 9.9E37, respectively. INF and NINF are only sent as device reponses.

NAN — Not A Number (NAN) represents the value 9.91E37. NAN is only sent as device response. This value is not defined. Possible causes are the division of zero by zero, the subtraction of infinite from infinite and the representation of missing values.

Boolean Parameters

Boolean parameters represent two states. The ON state (logically true) is represented by ON or a numerical value unequal to 0. The OFF state (logically untrue) is represented by OFF or the numerical value 0. 0 or 1 is provided in a query.

Example: Setting command: `SOURce:FM:STATe ON`
Query: `SOURce:FM:STATe?` Response: `1`

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Text

Text parameters observe the syntactic rules for key words, i.e. they can be entered using a short or long form. Like any parameter, they have to be separated from the header by a white space. In the case of a query, the short form of the text is provided.

Example: Setting command: `OUTPut:FILTer:TYPE EXTernal`
Query: `OUTPut:FILTer:TYPE?` Response `EXT`

Strings

Strings must always be entered in quotation marks (' or ").

Example: `SYSTem:LANGuage "English"` or
`SYSTem:LANGuage 'English'`

Block data

Block data are a transmission format which is suitable for the transmission of large amounts of data. A command using a block data parameter has the following structure:

Example: `HEADer:HEADer #45168xxxxxxxx`

ASCII character # introduces the data block. The next number indicates how many of the following digits describe the length of the data block. In the example the 4 following digits indicate the length to be 5168 bytes. The data bytes follow. During the transmission of these data bytes all End or other control signs are ignored until all bytes are transmitted. Data elements comprising more than one byte are transmitted with the byte being the first which was specified by SCPI command "FORMat:BORDer".

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3.5.6 Overview of Syntax Elements

The following survey offers an overview of the syntax elements.

:	The colon separates the key words of a command. In a command line the colon after the separating semicolon marks the uppermost command level.
;	The semicolon separates two commands of a command line. It does not alter the path.
,	The comma separates several parameters of a command.
?	The question mark forms a query.
*	The asterix marks a common command.
"	Quotation marks introduce a string and terminate it.
#	ASCII character # introduces block data.
	A "white space (ASCII-Code 0 to 9, 11 to 32 decimal, e.g.blank) separates header and parameter.

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3.6 Description of Commands

3.6.1 Notation

In the following sections, all commands implemented in the instrument are first listed in tables and then described in detail, separated according to the command system. The notation corresponds to the one of the SCPI standards to a large extent. The SCPI conformity information can be taken from the list of commands in annex C.

Note: *The commands indicated by way of example are not implemented in the CTS.*

Table of Commands

Command: In the command column, the table provides an overview of the commands and their hierarchical arrangement (see indentations).

Parameter: In the parameter column the requested parameters are indicated together with their specified range.

Unit: The unit column indicates the basic unit of the physical parameters.

Remark: In the remark column an indication is made on:
- whether the command does not have a query form,
- whether the command has only one query form ,
- whether this command is implemented only with a certain option of the instrument.

Indentations

The different levels of the SCPI command hierarchy are represented in the table by means of indentations to the right. The lower the level is, the farther the indentation to the right is. Please observe that the complete notation of the command always includes the higher levels as well.

Example: `SOURce:FM:MODE` iis represented in the table as follows:

SOURce	first level
:FM	second level
:MODE	third level

In the individual description, the hierarchy is represented in the corresponding way. That is to say, for each command all key words above up to the left-hand margin must be considered. An example for each command is written out at the end of the individual description.

Upper/lower case notation

Upper/lower case letters serve to mark the long or short form of the key words of a command in the description (see Section 3.5.2). The instrument itself does not distinguish between upper and lower case letters.

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Special characters

| A selection of key words with an identical effect exists for several commands. These key words are indicated in the same line, they are separated by a vertical stroke. Only one of these key words has to be indicated in the header of the command. The effect of the command is independent of which of the key words is indicated.

Example: SOURce
:FREQuency
:CW|:FIXed

The two following commands of identical meaning can be formed. They set the frequency of the constantly frequent signal to 1 kHz:

```
SOURce:FREQuency:CW 1E3 = SOURce:FREQuency:FIXed 1E3
```

A vertical stroke in indicating the parameters marks alternative possibilities in the sense of "or". The effect of the command is different, depending on which parameter is entered.

Example: Selection of the parameters for the command
`SOURce:COUPling AC | DC`

If parameter AC is selected, only the AC content is fed through, in the case of DC, the DC as well as the AC content.

[ ] Key words in square brackets can be omitted when composing the header (cf. Section 3.5.2, Optional Keywords). The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards.
Parameters in square brackets can optionally be incorporated in the command or omitted as well.

{ } Parameters in braces can optionally be incorporated in the command either not at all, once or several times.

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3.6.2 Common Commands

The common commands are taken from the IEEE 488.2 (IEC 625-2) standard. Same commands have the same effect on different devices. The headers of these commands consist of "*" followed by three letters. Many common commands refer to the status reporting system which is described in detail in Section 3.8.

Table 3-1 Common Commands

Command	Parameter	Unit	Remark
***CLS**			no query
***ESE**	0...255		
***ESR?**			only query
***IDN?**			only query
***IST?**			only query
***OPC**			
***OPT?**			only query
***PRE**	0...255		
***PSC**	0 | 1		
***RST**			no query
***SRE**	0...255		
***STB?**			only query
***TST?**			only query
***WAI**			

***CLS**

CLEAR STATUS sets the status byte (STB), the standard event register (ESR) and the EVENt-part of the QUEStionable and the OPERation register to zero. The command does not alter the mask and transition parts of the registers. It clears the output buffer.

***ESE** 0...255

EVENT STATUS ENABLE sets the event status enable register to the value indicated. Query *ESE? returns the contents of the event status enable register in decimal form.

***ESR?**

STANDARD EVENT STATUS QUERY returns the contents of the event status register in decimal form (0 to 255) and subsequently sets the register to zero.

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***IDN?**

IDENTIFICATION QUERY queries the instrument identification.
The device response is for example:

ROHDE&SCHWARZ,CTSzz,ssssss/sss,x.xx yy.yy.yy
(zz is the model no., eg 55 or 65
ssssss/sss is the serial no., eg 101183/005
x.xx is the software version, eg V 1.00
yy.yy.yy is the date, eg 18.10.93)

***IST?**

INDIVIDUAL STATUS QUERY returns the contents of the IST flag in decimal form (0 | 1). The IST-flag is the status bit which is sent during a parallel poll.

***OPC**

OPERATION COMPLETE sets bit 0 in the event status register when all preceding commands have been executed. This bit can be used to initiate a service request (cf. Section 3.7).

***OPC?**

OPERATION COMPLETE QUERY writes message "1" into the output buffer as soon as all preceding commands have been executed (cf. Section 3.7).

***OPT?**

OPTION IDENTIFICATION QUERY queries the options included in the instrument and returns a list of the options installed. The options are separated from each other by means of commas.

The responses have the following meaning:

B1	OCXO Reference
B7	Module Test
K6	Remote Control

Example of a device response: B1,,B7,,K6

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***PRE 0...255**

PARALLEL POLL REGISTER ENABLE sets parallel poll enable register to the value indicated. Query *PRE? returns the contents of the parallel poll enable register in decimal form.

***PSC** 0 | 1

POWER ON STATUS CLEAR determines whether the contents of the ENABle registers is maintained or reset in switching on.

*PSC = 0 causes the contents of the status registers to be maintained. Thus a service request can be triggered in switching on in the case of a corresponding configuration of status registers ESE and SRE.

*PSC ≠ 0 resets the registers.

Query *PSC? reads out the contents of the power-on-status-clear flag. The response can be 0 or 1.

***RST**

RESET sets the instrument to a defined default status. The command essentially corresponds to pressing the [RESET] key. The default setting is indicated in the description of commands.

***SRE** 0...255

SERVICE REQUEST ENABLE sets the service request enable register to the value indicated. Bit 6 (MSS mask bit) remains 0. This command determines under which conditions a service request is triggered. Query *SRE? reads the contents of the service request enable register in decimal form. Bit 6 is always 0.

***STB?**

READ STATUS BYTE QUERY reads the contents of the status byte in decimal form.

***TST?**

SELF TEST QUERY triggers selftests of the instrument and outputs an error code in decimal form.

WAI

WAIT-to-CONTINUE only permits the servicing of the subsequent commands after all preceding commands have been executed and all signals have settled (see also section 3.7 and "*OPC").

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3.7 Instrument Model and Command Processing

The instrument model shown in Fig. 3-2 has been made viewed from the standpoint of the servicing of remote-control commands. The individual components work independently of each other and simultaneously. They communicate by means of so-called "messages".

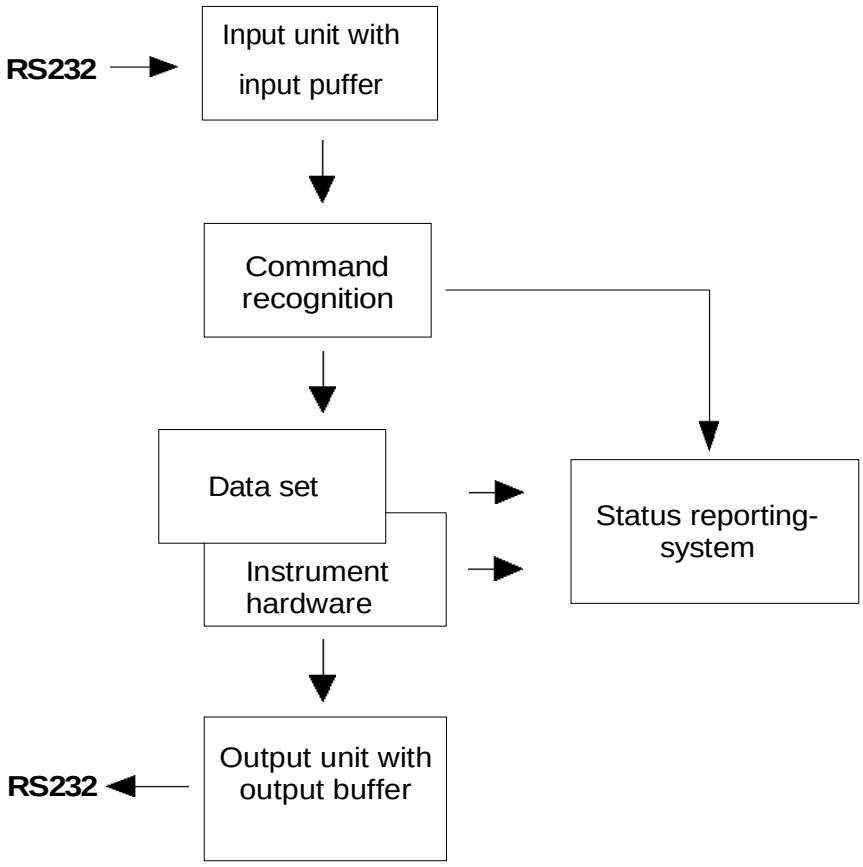


Fig. 3-2 Instrument model in the case of remote control

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3.8 Status Reporting System

The status reporting system (cf. Fig. 3-4) stores all information on the present operating state of the instrument and on errors which have occurred. This information is stored in the status registers and in the error queue. The status registers and the error queue can be queried via the remote-control interface.

The information is of a hierarchical structure. The register status byte (STB) defined in IEEE 488.2 and its associated mask register service request enable (SRE) form the uppermost level. The STB receives its information from the standard event status register (ESR) which is also defined in IEEE 488.2 with the associated mask register standard event status enable (ESE) and registers STATus:OPERation and STATus:QUEStionable which are defined by SCPI and contain detailed information on the instrument.

The IST flag ("Individual STatus") and the parallel poll enable register (PPE) allocated to it are also part of the status reporting system. The IST flag, like the SRQ, combines the entire instrument status in a single bit. The PPE fulfills an analog function for the IST flag as the SRE for the service request.

The output buffer contains the messages the instrument returns to the controller. It is not part of the status reporting system but determines the value of the MAV bit in the STB and thus is represented in Fig. 3-4.

3.8.1 Structure of an SCPI Status Register

Each SCPI register consists of 5 parts which each have a width of 16 bits and have different functions (cf. Fig. 3-3). The individual bits are independent of each other, i.e. each hardware status is assigned a bit number which is valid for all five parts. For example, bit 3 of the STATus:OPERation register is assigned to the hardware status "wait for trigger" in all five parts. Bit 15 (the most significant bit) is set to zero for all parts. Thus the contents of the register parts can be processed by the controller as positive integer.

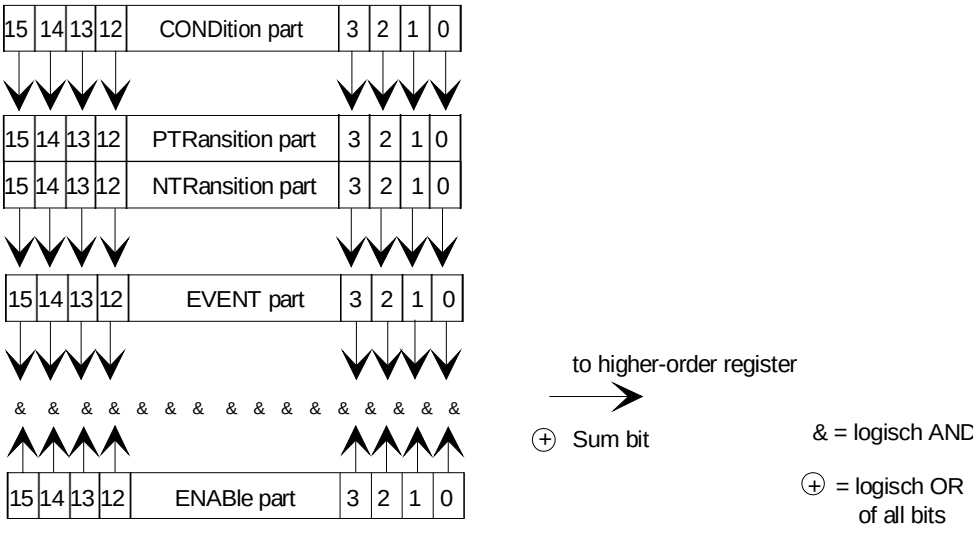


Fig. 3-3 The status-register model

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CONDition part

The CONDition part is directly written into by the hardware or the sum bit of the next lower register. Its contents reflects the current instrument status. This register part can only be read, but not written into or cleared. Its contents is not affected by reading.

PTRansition part

The Positive-TRansition part acts as an edge detector. When a bit of the CONDition part is changed from 0 to 1, the associated PTR bit decides whether the EVENt bit is set to 1.
PTR bit =1: the EVENt bit is set.
PTR bit =0: the EVENt bit is not set.
This part can be written into and read at will. Its contents is not affected by reading.

NTRansition part

The Negative-TRansition part also acts as an edge detector. When a bit of the CONDition part is changed from 1 to 0, the associated NTR bit decides whether the EVENt bit is set to 1.
NTR-Bit = 1: the EVENt bit is set.
NTR-Bit = 0: the EVENt bit is not set.
This part can be written into and read at will. Its contents is not affected by reading.

With these two edge register parts the user can define which state transition of the condition part (none, 0 to 1, 1 to 0 or both) is stored in the EVENt part.

EVENt part

The EVENt part indicates whether an event has occurred since the last reading, it is the "memory" of the condition part. It only indicates events passed on by the edge filters. It is permanently updated by the instrument. This part can only be read by the user. During reading, its contents is set to zero. In linguistic usage this part is often equated with the entire register.

ENABle part

The ENABle part determines whether the associated EVENt bit contributes to the sum bit (cf. below). Each bit of the EVENt part is ANDed with the associated ENABle bit (symbol '&'). The results of all logical operations of this part are passed on to the sum bit via an OR function (symbol '+').
ENAB-Bit = 1: the associated EVENt bit does not contribute to the sum bit
ENAB-Bit = 0: if the associated EVENT bit is "1", the sum bit is set to "1" as well.
This part can be written into and read by the user at will. Its contents is not affected by reading.

Sum bit

As indicated above, the sum bit is obtained from the EVENt and ENABle part for each register. The result is then entered into a bit of the CONDition part of the higher-order register.
The instrument automatically generates the sum bit for each register. Thus an event, e.g. a PLL that has not locked, can lead to a service request throughout all levels of the hierarchy.

Note: *The service request enable register SRE defined in IEEE 488.2 can be taken as ENABle part of the STB if the STB is structured according to SCPI. By analogy, the ESE can be taken as the ENABle part of the ESR.*

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3.8.2 Overview of the Status Registers

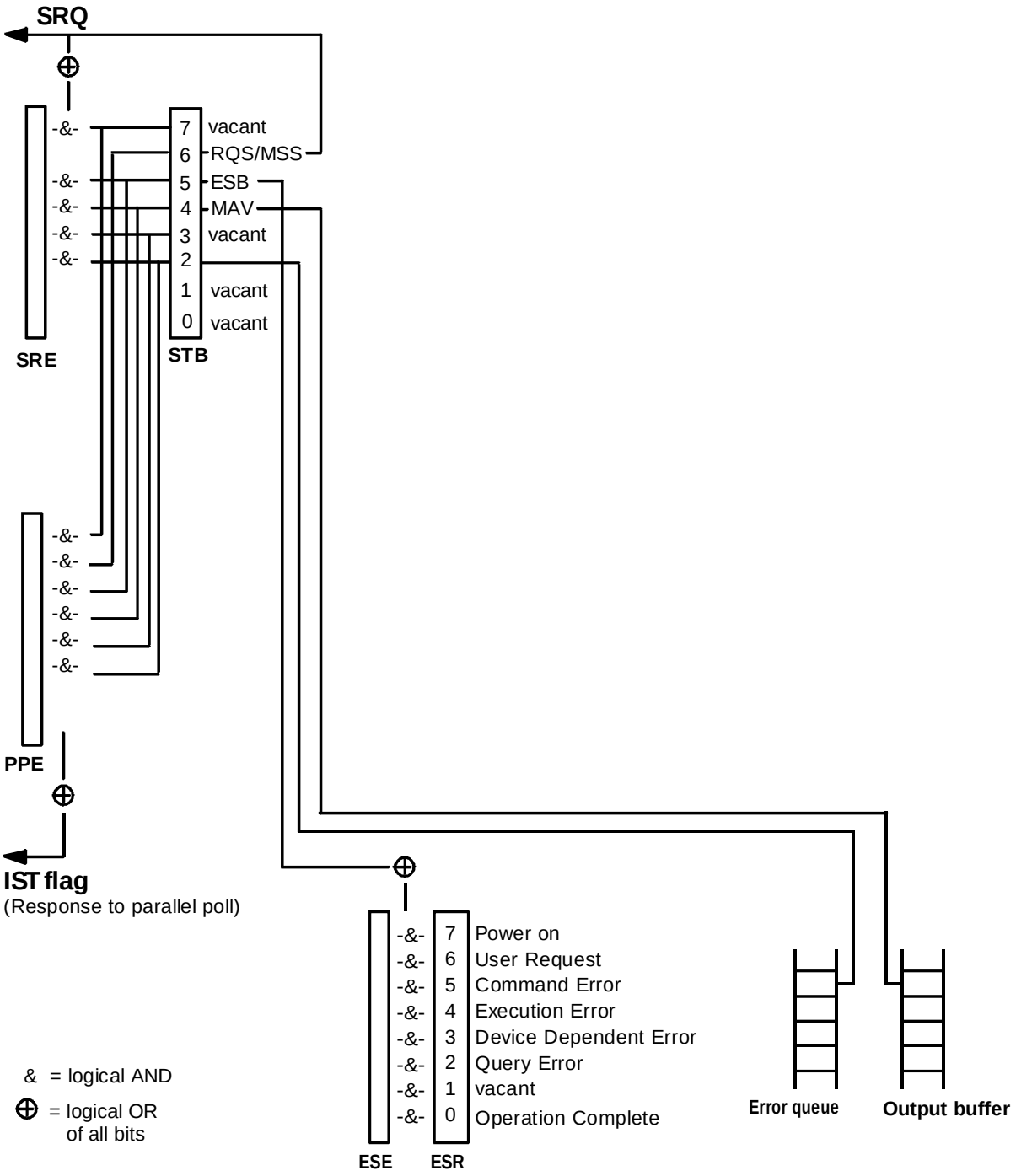


Fig. 3-4 Overview of status registers

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3.8.3 Description of the Status Registers

3.8.3.1 Status Byte (STB) and Service Request Enable Register (SRE)

The STB is already defined in IEEE 488.2. It provides a rough overview of the instrument status by collecting the pieces of information of the lower registers. It can thus be compared with the CONDition part of an SCPI register and assumes the highest level within the SCPI hierarchy. A special feature is that bit 6 acts as the sum bit of the remaining bits of the status byte.
The STATUS BYTE is read out using the command "*STB?".

Table 3-2 Meaning of the bits used in the satus byte

Bit No.	Meaning
2	**Error Queue not empty** The bit is set when an entry is made in the error queue. If this bit is enabled by the SRE, each entry of the error queue generates a Service Request. Thus an error can be recognized and specified in greater detail by polling the error queue. The poll provides an informative error message. This procedure is to be recommended since it considerably reduces the problems involved with remote control.
4	**MAV bit** (message available) The bit is set if a message is available in the output buffer which can be read. This bit can be used to enable data to be automatically read from the instrument to the controller.
5	**ESB bit** Sum bit of the event status register. It is set if one of the bits in the event status register is set and enabled in the event status enable register. Setting of this bit implies a serious error which can be specified in greater detail by polling the event status register.
6	**MSS bit** (master status smmary bit) The bit is set if the instrument triggers a service request. This is the case if one of the other bits of this registers is set together with its mask bit in the service request enable register SRE.

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3.8.3.2 Event-Status-Reg. (ESR) and Event-Status-Enable-Reg. (ESE)

The ESR is already defined in IEEE 488.2. It can be compared with the EVENt part of an SCPI register. The event status register can be read out using command "*ESR?".
The ESE is the associated ENABle part. It can be set using command "*ESE" and read using command "*ESE?".

Table 3-3 Meaning of the bits used in the event status register

Bit No.	Meaning
0	**Operation Complete** This bit is set on reception of the command *OPC exactly when all previous commands have been executed.
2	**Query Error** This bit is set if either the controller wants to read data from the instrument without having sent a query, or if it does not fetch requested data and sends new instructions to the instrument instead. The cause is often a query which is faulty and hence cannot be executed.
3	**Device-dependent Error** This bit is set if a device-dependent error occurs. An error message with a number between -300 and -399 or a positive error number, which denotes the error in greater detail, is entered into the error queue (cf. annex B, Error Messages).
4	**Execution Error** This bit is set if a received command is syntactically correct, however, cannot be performed for other reasons. An error message with a number between -200 and -300, which denotes the error in greater detail, is entered into the error queue (cf. annex B, Error Messages).
5	**Command Error** This bit is set if a command which is undefined or syntactically incorrect is received. An error message with a number between -100 and -200, which denotes the error in greater detail, is entered into the rror queue (cf. annex B, -Error Messages).
6	**User Request** This bit is set on pressing the LOCAL key, i. e., when the instrument is switched over to manual control.
7	**Power On** (supply voltage on) This bit is set on switching on the instrument.

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3.8.4 Error-Queue Query

Each error state in the instrument leads to an entry in the error queue. The entries of the error queue are detailed plain-text error messages which can be queried via the remote control using command "SYSTem:ERRor?". Each call of "SYSTem:ERRor?" provides an entry from the error queue. If no error messages are stored there any more, the instrument responds with 0, "No error".

The error queue should be queried after every SRQ in the controller program as the entries describe the cause of an error more precisely than the status registers. Especially in the test phase of a controller program the error queue should be queried regularly since faulty commands from the controller to the instrument are recorded there as well.

3.8.5 Resetting Values of the Status Reporting System

Table 3-5 comprises the different commands and events causing the status reporting system to be reset. None of the commands, except for *RST and SYSTem:PRESet influences the functional instrument settings. In particular, DCL does not change the instrument settings.

Table 3-5 Resettting instrument functions

Event / Effect	Switching on supply voltage: Power-On-Status-Clear 0	Switching on supply voltage: Power-On-Status-Clear 1	*RST or SYSTem:PRESet	STATus:PRESet	*CLS
Clear STB,ESR	—	yes	—	—	yes
Clear ESE	—	yes	—	—	—
Clear EVENTt parts of the registers	—	yes	—	—	yes
Clear error queue	yes	yes	—	—	yes
Clear output buffer	yes	yes	1)	1)	1)
Clear command processing and input buffer	yes	yes	—	—	yes

1) Every command being the first in a command line, i.e., immediately following a <PROGRAM MESSAGE TERMINATOR> clears the output buffer.

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ROHDE&SCHWARZ

Test and
Measurement Division

Windows® Application CTSgo to CTS-K6

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2 Introduction

We are very pleased to be able to present CTSgo for Windows to you. This program offers comprehensive capabilities for the remote control of Digital Radio Testers CTS50, CTS55 or CTS65. It offers in addition an autotest with versatile configurations for GSM and DECT and an interactive module test for GSM mobile phones. Autotest results are documented in an informative report, which can be stored and printed.

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2.1 First Steps with CTSgo

The best way to get familiar with a program is learning by doing, ie to utilize the functions and practice their application. New users of CTSgo are advised to read carefully through the manual or to use the online help provided by the program. A section of this manual also gives practical hints and examples on the use of CTSgo.

2.2 Basic Knowledge Required

Before using CTSgo, you should be familiar with the basic operation of Microsoft Windows. This means that you should be able to open and close a Windows application program and know how to use the mouse. For more detailed information on Windows refer to the Microsoft Windows user manual.

2.3 Preconditions for System Use

The CTSgo program comes in a version for use under Windows 95, Windows 98 or Windows NT 4.0.

The program may be installed in German or English as desired. More information is given in the Program Installation Section.
To ensure unimpaired functioning of CTSgo, your system should meet the following basic requirements. For a more convenient use of CTSgo, particularly the presentation of measurement reports, the employed graphics card should have a better resolution than the one specified below.

Platform:	Windows 95 / Windows 98 / Windows NT 4.0
Processor:	Pentium 166
RAM:	16 MByte
Display:	VGA 640x480 pixels
Hard-disk storage:	5 MByte
Peripherals:	Mouse, one free serial interface

CTS30, CTS50, CTS55 or CTS65 is also required. To be able to make full use of all the program capabilities, software version 2.00 or higher should be installed on the CTS. The autotest can be performed as of software version 1.25 of the CTS. A test SIM card (eg Rohde & Schwarz CRT-Z2, Order Number 1039.9005.02) is also required.

A serial cable should be used for connecting your PC to the CTS. Suitable cables are described in the following section.

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2.4 Suitable Serial Cables

The CTSgo program and the CTS allow for various settings of data transmission. Depending on the handshake method used, different conditions have to be met by the cable. Handshake means that the devices inform each other whether they are ready to receive data. Disabling the handshake function by setting NONE is not recommended. In the description it is assumed that a 9-contact connector is fitted at both cable ends.

Pin	Designation
1	DCD (Data Carrier Detect)
2	RxD (Receive Data)
3	TxD (Transmit Data)
4	DTR (Data Terminal Ready)
5	GND (Ground)
6	DSR (Data Set Ready)
7	RTS (Request To Send)
8	CTS (Clear To Send)
9	RI (Ring Indicator)

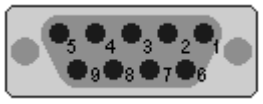
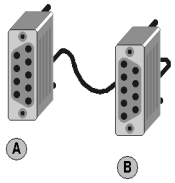


Fig.: Pin assignment of RS-232-C interface

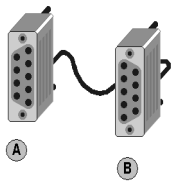
2.4.1 Cable for Xon/Xoff Protocol

Cable end A	Cable end B
Pin 2 (RxD)	Pin 3 (TxD)
Pin 3 (TxD)	Pin 2 (RxD)
Pin 5 (GND)	Pin 5 (GND)



2.4.2 Cable for Hardware Protocol RTS/CTS

Cable end A	Cable end B
Pin 2 (RxD)	Pin 3 (TxD)
Pin 3 (TxD)	Pin 2 (RxD)
Pin 7 (RTS)	Pin 8 (CTS)
Pin 8 (CTS)	Pin 7 (RTS)
Pin 5 (GND)	Pin 5 (GND)



2.5 Equipment Supplied for CTS-K6

The GSM Remote Control Option CTS-K6 (Rohde & Schwarz Order No. 1079.2001.01) comprises the following software components as well as a document with the CTS unblocking code.

- Data record “CTSgo for Windows 95 / 98 /NT 4.0 “ German version
- Data record “CTSgo for Windows 95 / 98 /NT 4.0 “ English version

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3 Installation

This section describes the installation of CTSgo. The appearance of Windows is slightly different on your PC because of the various possible configurations, but the program contents and function of control elements are identical.

3.1 Preparation

Take the set of floppies for the CTSgo variant to be installed.

3.2 Procedure

3.2.1 Step 1

Insert the first floppy into the disk drive.

3.2.2 Step 2

Select the disk drive where the floppy is inserted. With Windows 95 / 98 / NT4.0, click on the My Computer icon on the Windows desktop.

3.2.3 Step 3

Click on “Setup“ to call the execution file.

3.2.4 Step 4

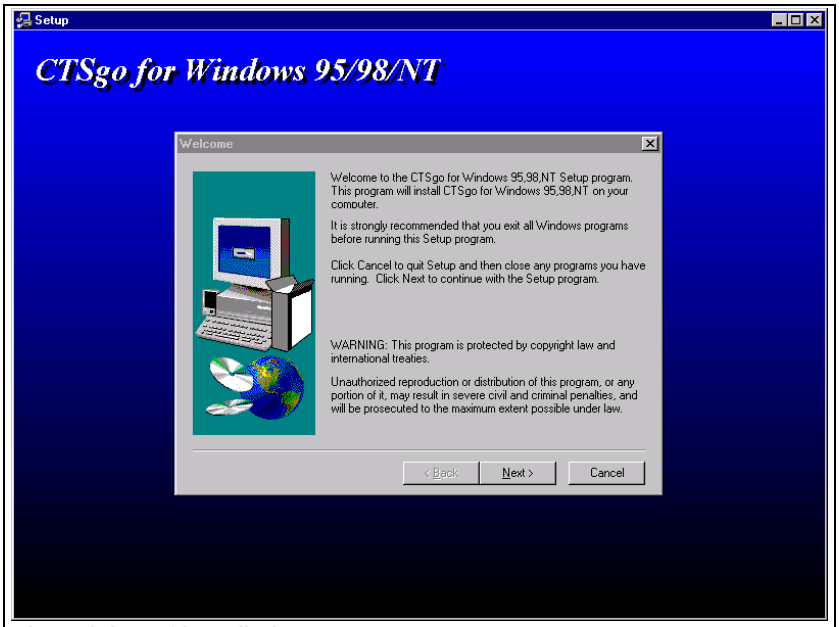


Fig.: Dialog of installation step 4

The program will guide you step by step through the installation. The following welcome screen is displayed on your PC.

Press “Next” to call the next step.

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3.2.5 Step 5

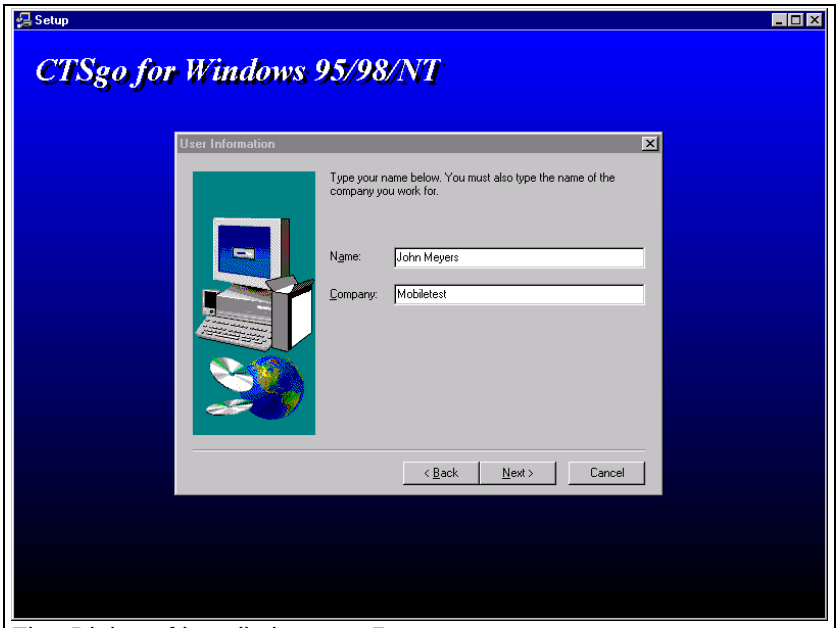


Fig.: Dialog of installation step 5

Enter your name and the name of your company in the dialog fields. After the entry continue with “Next”. Return to the last step is possible at any time by pressing “Back”.

3.2.6 Step 6

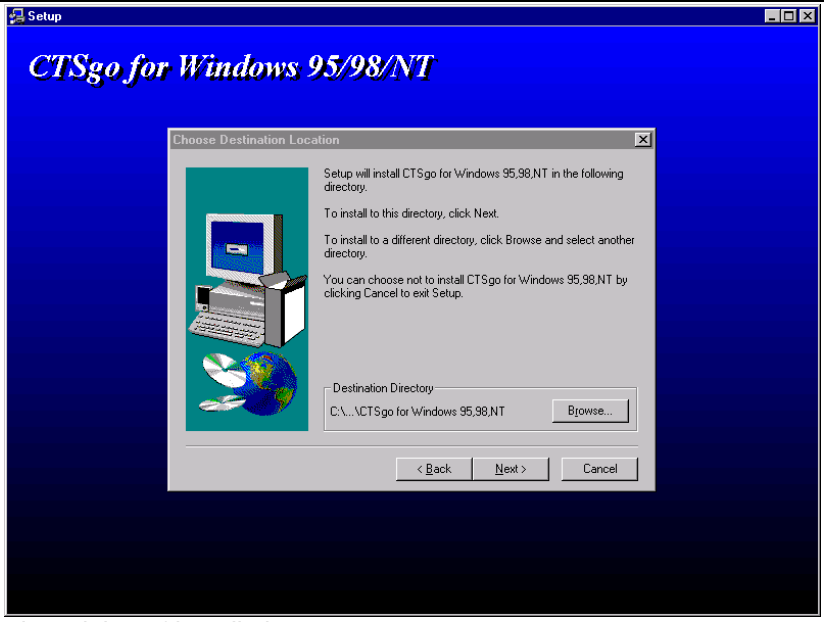


Fig.: Dialog of installation step 6

The installation software now asks for the target directory where the CTSgo software is to be installed. Press “Browse” if you do not wish to use the proposed directory. The software can be copied into any directory. The next step is again called with the “Next” button.

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3.2.7 Step 7

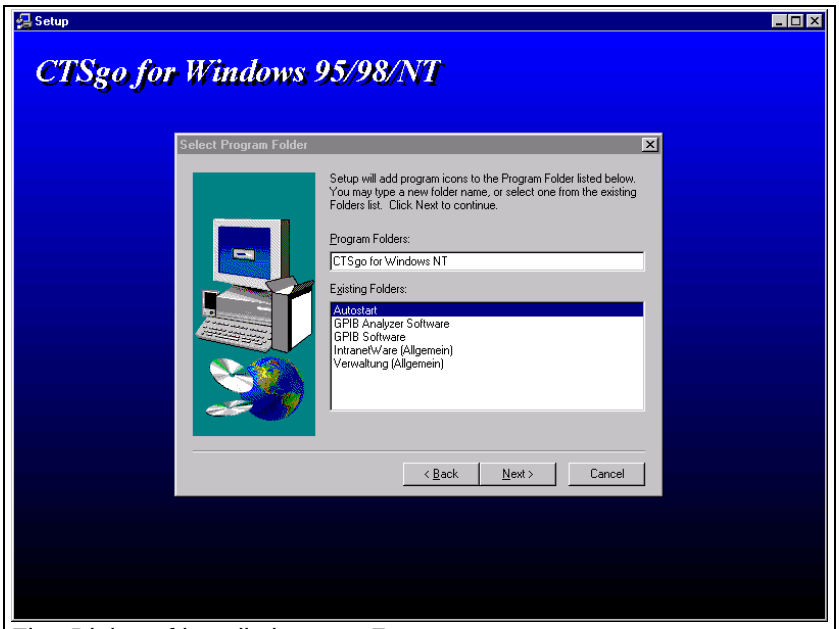


Fig.: Dialog of installation step 7

Select the folder into which the program icon is to be placed. You may create a new folder or put the icon into an already existing folder.

3.2.8 Step 8

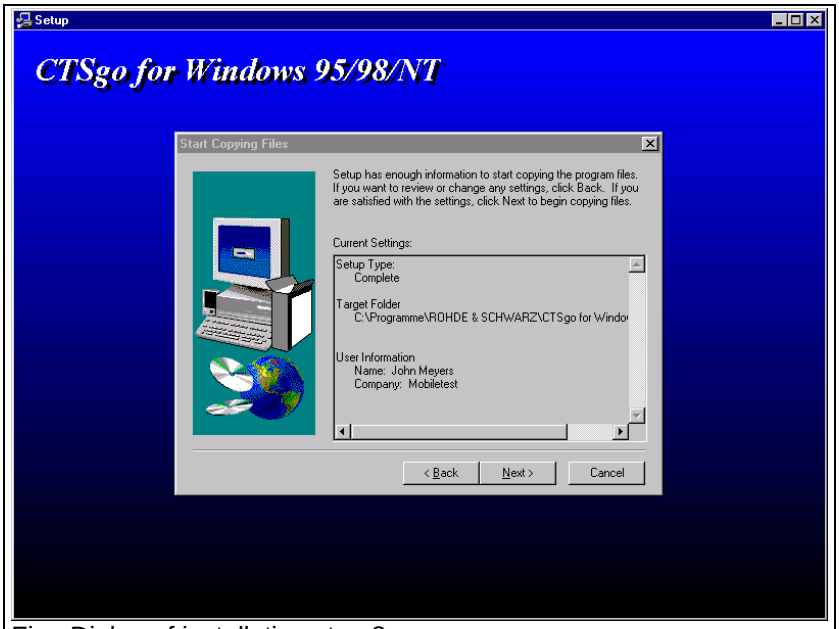


Fig.: Dialog of installation step 8

The installation software now displays all the settings made before it starts to copy the software components. Press “Back” if you wish to make further changes, otherwise press “Next”.

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3.2.9 Step 9

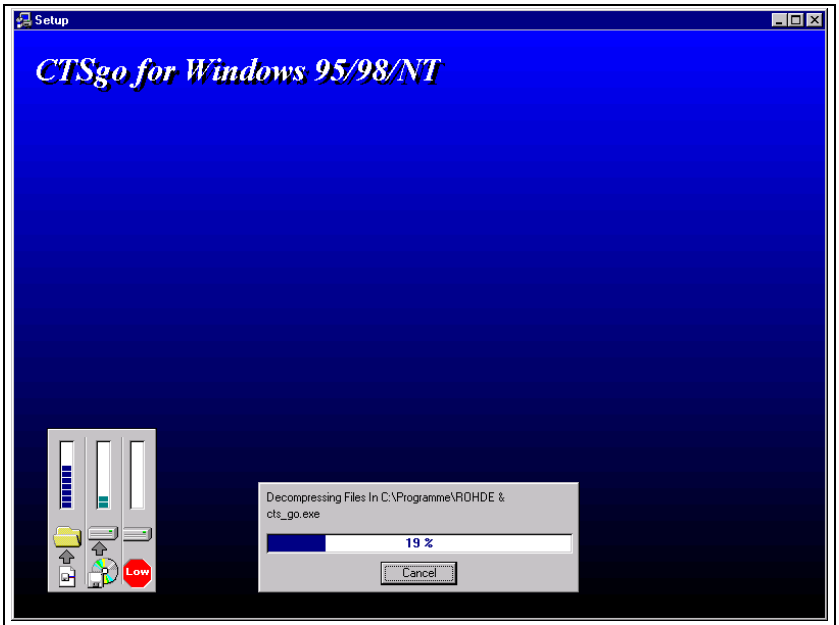


Fig.: Dialog of installation step 9

The installation software now starts to copy the software components. If desired, the installation procedure can be terminated before completion with “Cancel”. A progress bar informs you on the current installation state.

3.2.10 Step 10

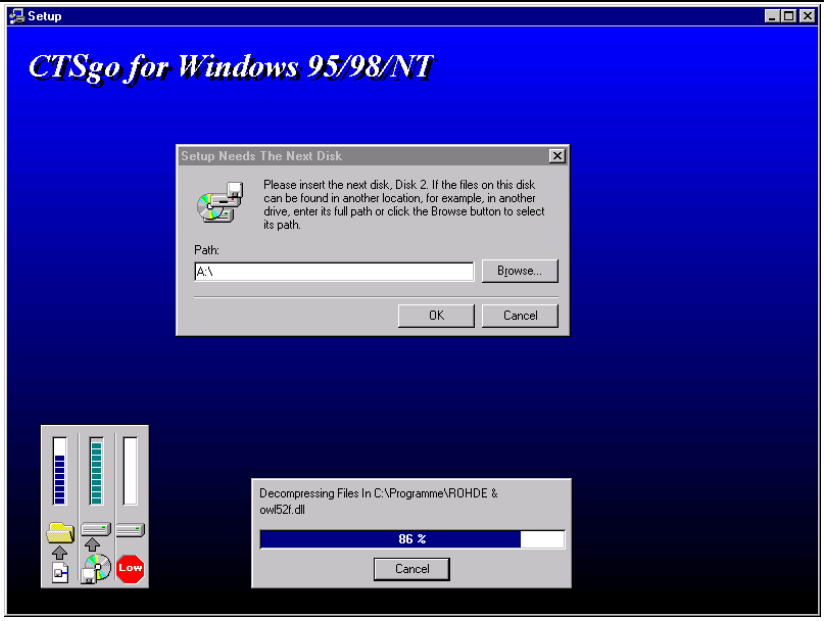


Fig.: Dialog of installation step 10

During the installation the program may prompt you to insert the next floppy. In this case remove the first floppy from the disk and insert the next one as requested.

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3.2.11 Step 11

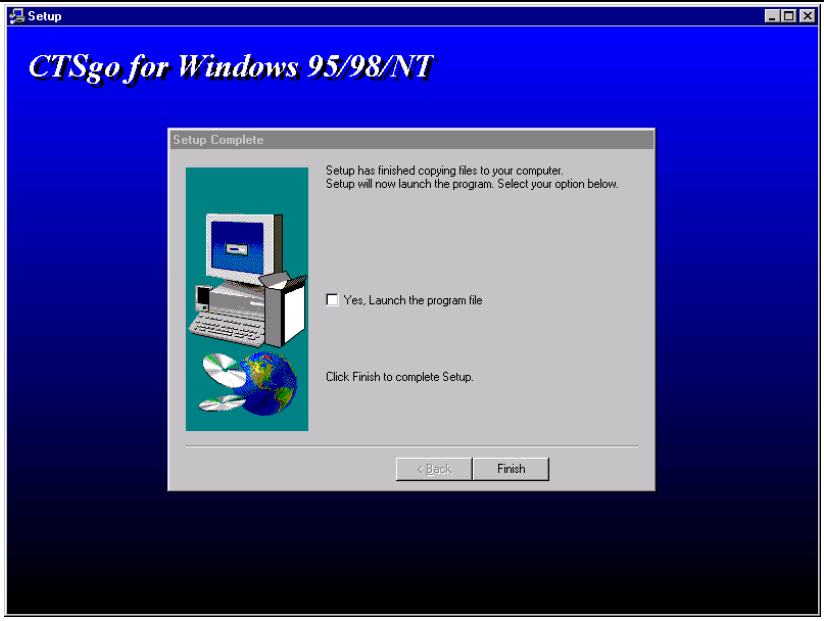


Fig.: Dialog of installation step 11

The installation was successfully completed. With the installation terminated, the program can be called up.

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4 Software Components

The installation program installs the following components. To simplify deinstallation of the program, the components should preferably not be copied into the Windows directory. If further applications are to be used and copied to the Windows system directory by the runtime libraries below, these libraries may be cleared from the installation directory. This should only be done if problems occur with the remaining hard disk memory.

4.1 Installation Components

Directory (example)	Component	Function
C:\CTSGO\	CTS_GO.EXE	Program
C:\CTSGO\	CTS_GO.HLP	Online help
C:\CTSGO\	CTS_GO.INI	Initialization file
C:\CTSGO\	CTS_GO.ULV	Definition of user level
C:\CTSGO\	BDS52F.DLL	32-bit runtime library
C:\CTSGO\	CW3230.DLL	32-bit runtime library
C:\CTSGO\	OWL52F.DLL	32-bit runtime library
C:\CTSGO\	_DEISREG32.ISR	Deinstallation file
C:\CTSGO\	_ISREG32.DLL	Deinstallation file
C:\CTSGO\	DELSL1.ISU	Deinstallation file
C:\CTSGO\AUTOSAVE	SAMPLE.MRP	Example of measurement report

4.2 Other Components

During your work with the CTSgo software, configurations can be stored and called again. This allows test limits and the extent of tests to be specified for the different types of mobile phones. Test results can also be stored.

Directory	Component	Function
any	*.MRP	Measurement reports
any	*.CFG	Saved configurations
C:\CTSGO\	CTS_GO.DS1	User-defined hints under GSM
C:\CTSGO\	CTS_GO.DS2	User-defined hints under DECT

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5 Deinstallation of Program CTSgo

Deinstallation is basically automatic on all platforms. The automatic deinstallation clears all files that have been stored in the controller during the installation. Other files like configuration files or measurement reports are not cleared. If required, these files must be manually removed.

5.1 Deinstallation under Windows 95/Windows 98 / Windows NT 4.0

To deinstall CTSgo go to the Windows system control level and click on “Software”. A list of the software will be displayed that can be automatically cleared. The list contains the entry “CTSgo for Windows“. Select this entry and then press the “Add/Remove” button.

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6 Getting Familiar with CTSgo

6.1 Explanation of Terms

If you are familiar with other Windows programs, associated terms and concepts will be known to you. However, to simplify your working with this manual and for the sake of clarity we recommend to briefly read through the terms used in the manual.

6.1.1 Title Bar



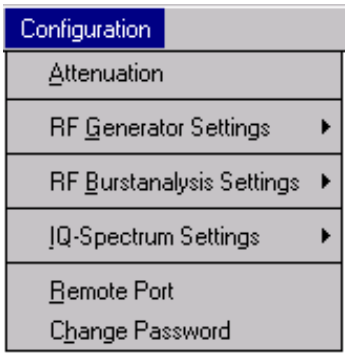
This is the horizontal bar at the top of the display. In this bar the title of the window is displayed. After a click on the bar and drawing the mouse, the CTSgo window can be shifted on the screen. By clicking the icons at the left and right end of the title bar, the CTSgo window can be reduced to an icon in the task bar, displayed at full size or closed.

6.1.2 Menu Bar



This is the line below the title bar, where the menu names are displayed. A click on a menu name opens a pulldown menu with a list of commands for the selection of CTSgo functions.

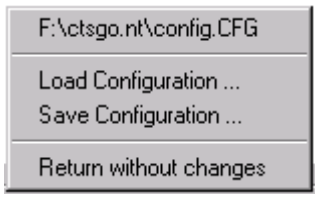
6.1.3 Pulldown Menu



This is a command line which is pulled down after clicking on a menu name in the menu bar. Move the mouse cursor through the list and select the desired command by a click on the left mouse key. A pulldown menu may contain further menus, the so-called submenus. You can recognize these submenus by the arrows that point to the left or right. If you move the mouse to such a menu item the submenu will be opened.

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6.1.4 Popup Menu



This menu contains commands and is displayed in the main menu at the position of the mouse cursor when the righthand mouse key is pressed. Move the cursor through the commands and release the righthand mouse key on the desired command. Popup menus are context-sensitive, ie they contain the main commands of the currently chosen program level.

6.1.5 Toolbar



This is the line below the menu bar where icons are displayed for the main commands. These icons correspond to the commands in the pulldown menus. Click on one of the icons to call the respective CTSgo function.

6.1.6 Status Bar



This is the horizontal bar at the bottom of the screen. In the status bar, general information is displayed, eg information on function keys pressed on the keyboard, time and program status. When a menu command is selected, a brief explanation of this command is given in this line.

6.1.7 Scrollbars



There are vertical and horizontal scrollbars. They are displayed when the current window cannot be shown completely on the screen. An arrow is displayed at the end of each scrollbar. The arrows indicate the direction into which the window can be shifted. A brief click with the left mouse key shifts the window by one step in the desired direction. By clicking on an arrow and holding the mouse key down, the displayed window can be shifted at higher speed. A slider is displayed inside the scrollbar. To go to the desired display area, this slider can be moved with the left mouse key held down. A click into the area between slider and arrow will move the slider a great step towards the arrow.

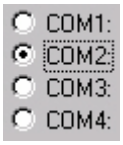
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6.1.8 Buttons



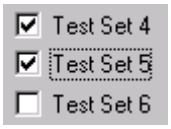
Buttons are part of dialog windows. Click on a button with the left mouse key to execute the desired function.

6.1.9 Option Boxes



Option boxes permit to select one of several different options. The selected option is filled in by a point.

6.1.10 Check Boxes



With these boxes an option can be activated or deactivated. The option is activated when an X or hook is displayed in the box. It is deactivated when the box is empty.

6.1.11 Input Boxes



Text or numerals can be entered in these fields. If it is necessary to check the range of the input value, press the OK button in the dialog. In this case you are prompted to repeat the entry with permissible values.

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6.1.12 Information Boxes



Some dialog windows contain a user info box where information in plain text or graphics on the program status or on selection or setting results is displayed.

6.1.13 Output Boxes



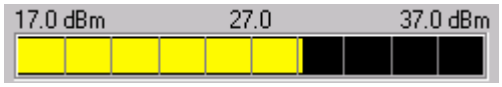
Output boxes look like info boxes, but they cannot be activated.

6.1.14 Progress Bars



Progress bars indicate the current status of an action.

6.1.15 Graphics Result Display



Measurement results are reproduced graphically in the form of a bargraph. Vertical range markers are part of the display.

6.1.16 Slider



Similar to the use in audio mixers, the slider serves for making settings. Move the slider with the left mouse key held down to obtain the desired setting. A click in the area between slider and range end will move the slider a great step towards the range end.

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6.2 CTSgo Program Structure

CTSgo uses five main operating modes:

- GSM autotest dialog. The GSM autotest can be started in this mode for generating new measurement reports.
- GSM module test dialog. This is an interactive mode where generator settings can be made on the CTS, a GSM burst analysis performed and the IQ spectrum viewed.
- GSM report display. In this mode, recorded GSM measurement reports can be loaded, viewed, saved or printed.
- DECT autotest dialog. In this mode, the DECT autotest can be started for generating new measurement reports.
- DECT report display. In this mode, recorded DECT measurement reports can be loaded, viewed, saved or printed.

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6.3 GSM Autotest Dialog

After the first start, the CTSgo program is in the GSM autotest mode. The sequence control of the autotest is in the stop mode at this point in time. If you wish to change settings for the autotest, you should do it now. The individual menus and associated commands are described in the following sections.

The autotest dialog comprises four main windows:

- "Message" window where the progress of the tests is indicated. If required, user prompts can also be displayed. So, for instance, the instruction to switch the mobile off and on again to initiate a location update.
- "Current Test" window where the currently performed autotest step is described.
- Progress bars informing on the state of the current test and of the total test to allow the user to estimate the remaining test time.
- Result window for indicating the number of performed tests with a distinction made between tests passed and tests failed.

The dialog also comprises a button for terminating the program.
In the status bar, the time and information on keyboard settings are displayed.

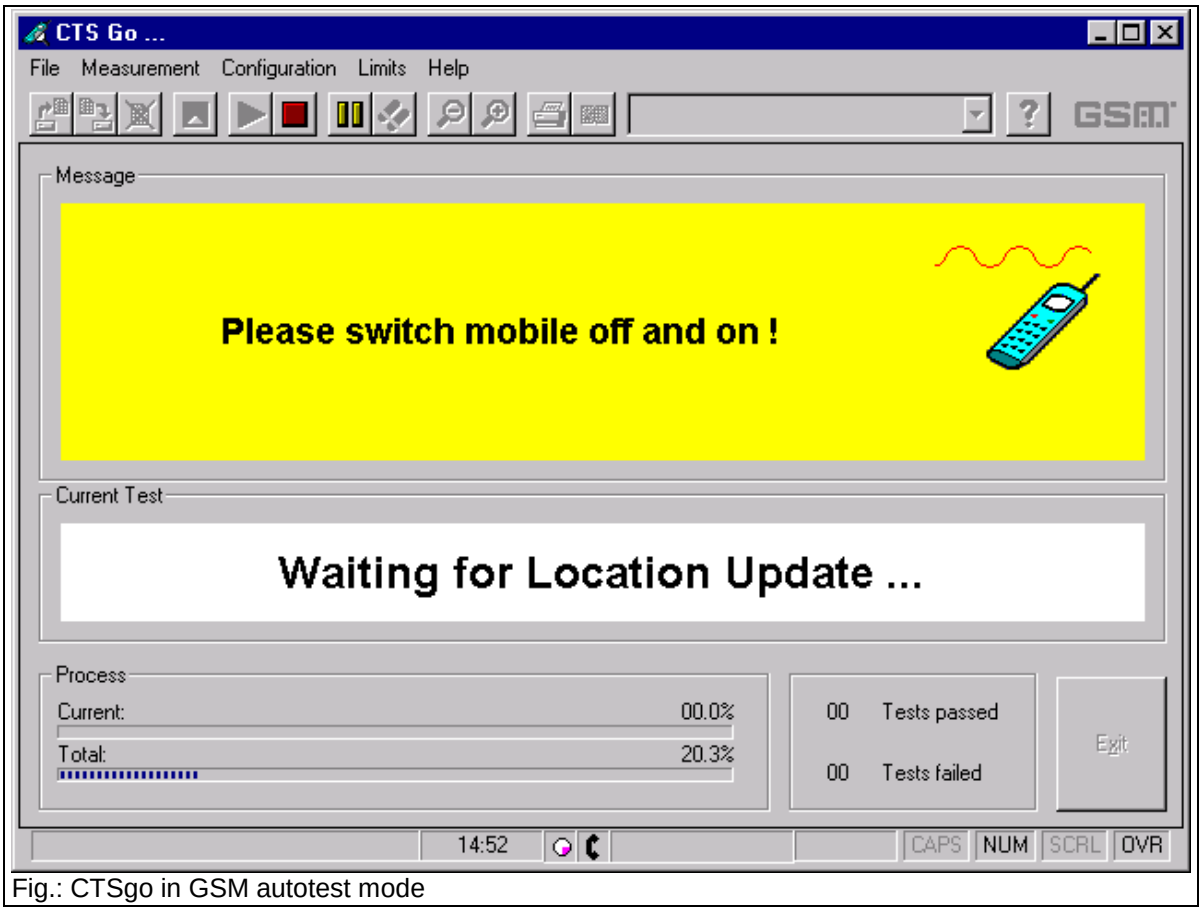


Fig.: CTSgo in GSM autotest mode

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The following elements are displayed to the right of the time of the day:

Status indication of program sequence. The status check in the sequence control is made periodically. With each performed cycle the icon is rotated by 90°. Events on the serial interface also cause the icon to move. If the icon does not rotate, the Windows system is overloaded. In this case terminate all other programs, if required, also terminate and restart CTSgo.

Status information on CTS operating status. In some sequences of the autotest, the sequence control queries the CTS operating status. Each icon corresponds to a specific status of CTS. The device states shown below are described in the remote-control section of the CTS manual. The red lamp indicates an undefined device status.

IDLE (switch-on status of CTS).

MIDL (BCCH being generated).

MSYN (Location Update terminated).

MCE (call set up).

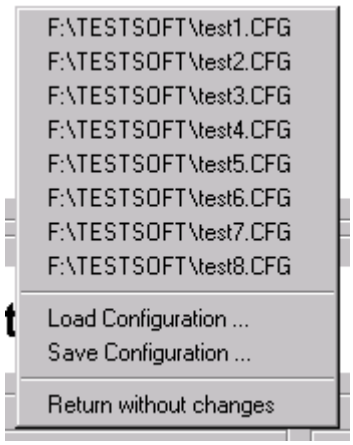


Fig.: Popup menu in GSM autotest dialog

A progress bar to the right of the CTS status icon informs the user on the status of the serial interface. At each write and read event the bar is started from the left side. The end position of the bar at the right is reached when a timeout of the remote-control interface occurs. This maximum waiting time for an interface response can be configured by the user.
Pressing the righthand mouse key in the autotest dialog window opens a popup menu , where previously entered parameter sets can be stored as configuration files for reloading later on. The paths of up to eight stored configuration files are displayed. Move to the desired entry with the righthand mouse key held down and then release the key. The selected file is loaded and the name of the selected configuration file is displayed in the title bar.

The interaction of the mobile phone and autotest is indicated in the Message field. The following animated icons are used:


The test expects the mobile to synchronize to the base station signal of the CTS.


The mobile rings and waits for call pick-up. This status is shown by a to and fro movement of the displayed handy.


The transmitter and receiver tests are in progress.


You are requested to terminate the call. The left key on the mobile shown in red flashes during animation.

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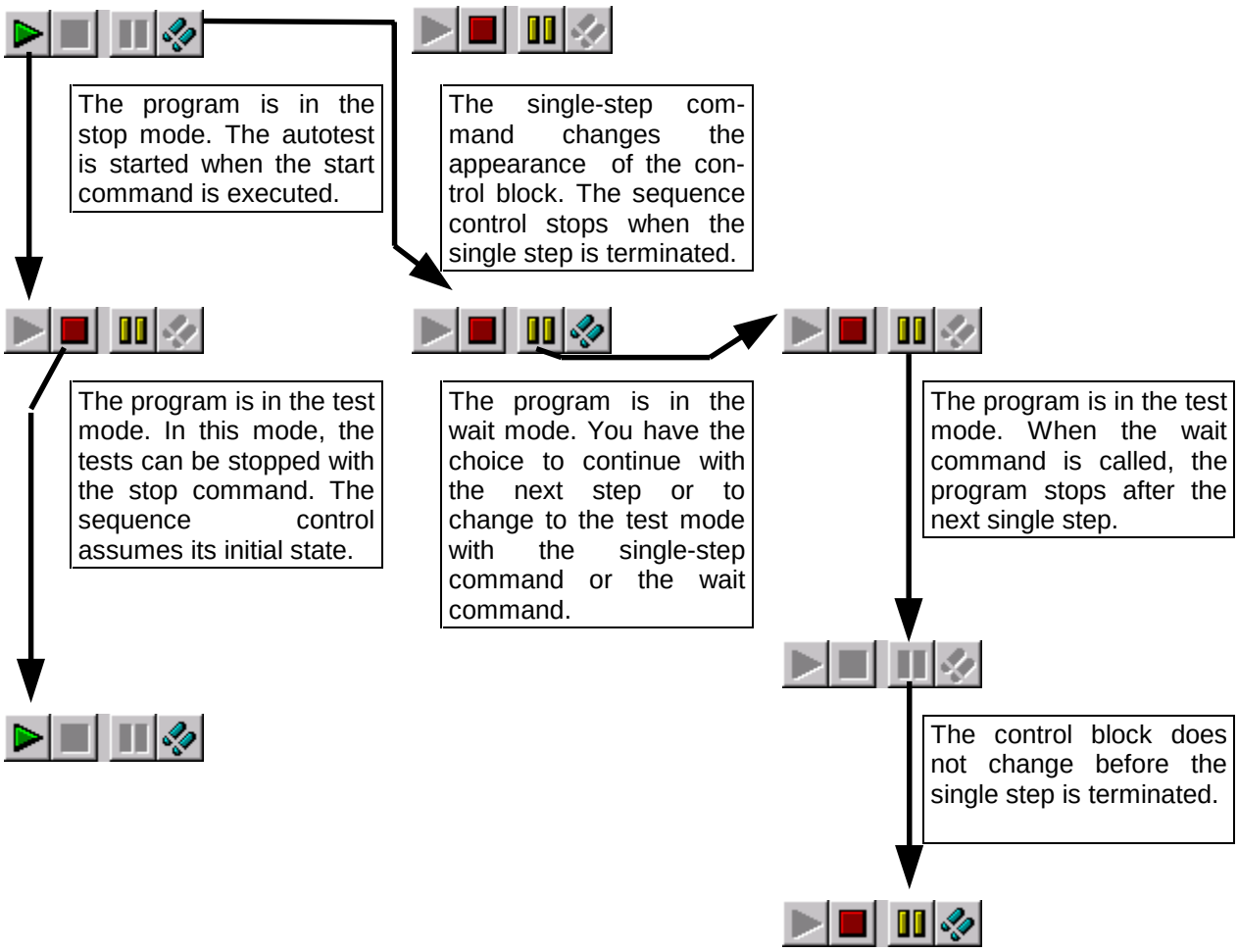


You are requested to set up a call. The righthand key on the mobile shown in green flashes.

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6.3.1 Sequence Control of Autotest

With the CTSgo program, the autotest mode is called. The sequence control is in the stop mode so that you can perform the configurations that are still needed. In this mode, you may choose between the following possibilities:

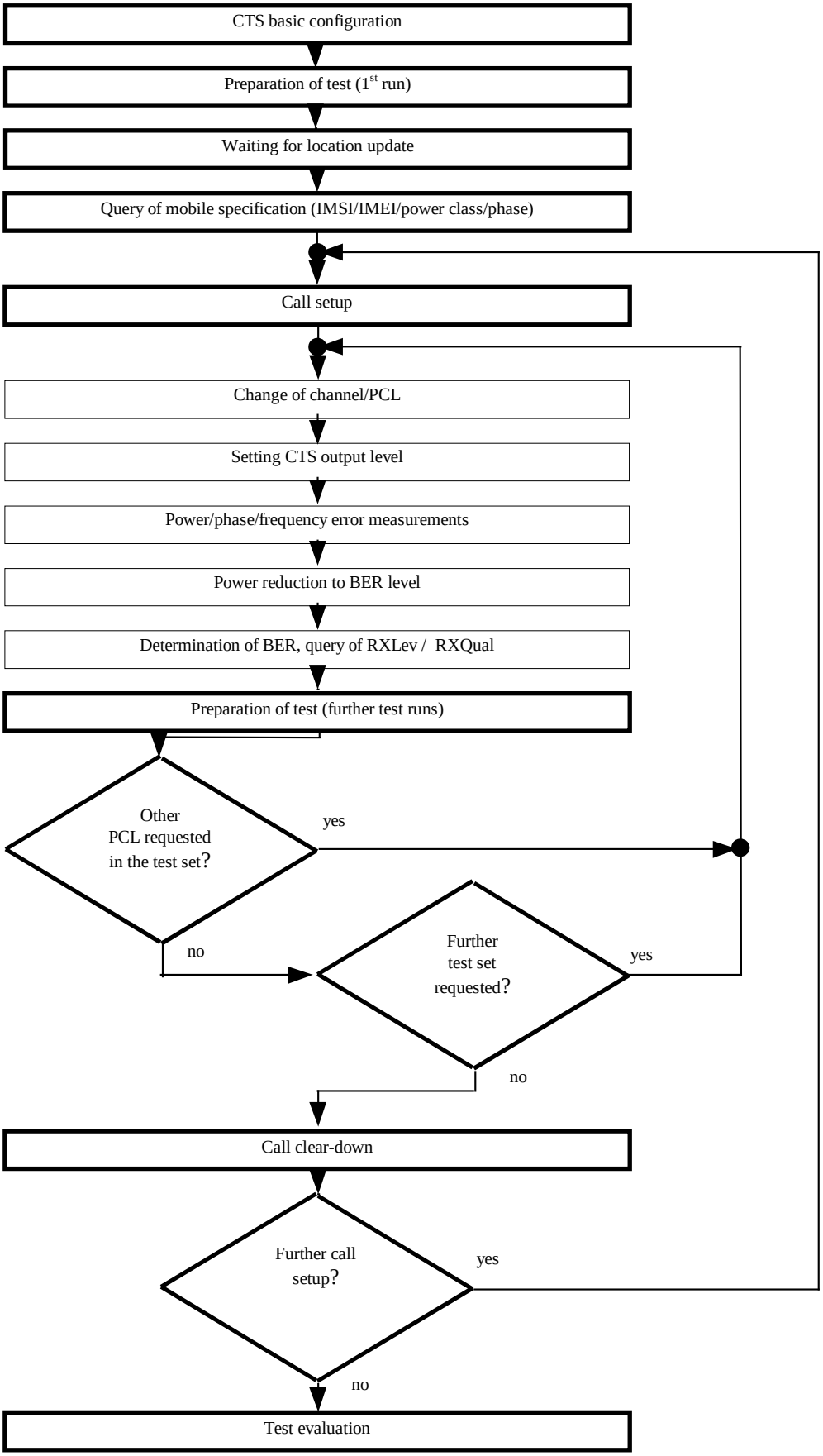


Observe the appearance of the described block in the toolbar during autotest control.

Note:
Commands of the menu bar can only be called in stop mode. After the change to the stop mode, the sequence control is reset. Restarting the sequence control restarts the autotest.

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6.3.2 Structure of GSM Autotest



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6.4 GSM Module Test Dialog

The GSM module test comprises three functions: operation of the CTS as generator, burst analysis using the CTS and IQ spectrum display. The module test and thus data transmission between CTS and CTSgo start in generator mode. The left block in the dialog window indicates which of the ten generator sets has been activated. A generator set includes the channel, the associated frequency offset, and the output level of the generator. The set level applies to connector RF In/Out or RF Out 2 of the CTS, depending on the setting. This setting can be seen under the option Used RF connector. The boxes of the block indicate whether the generator is switched on, whether the output signal contains a bit modulation or whether a ramped or continuous signal is used. The midamble used is indicated in another box of the window. To simplify the use of dual-band or triple-band mobiles, the network definition and the RF attenuation value between mobile and measuring instrument CTS are also part of the generator set. The network and the attenuation value of the current generator set can be seen in the right block.

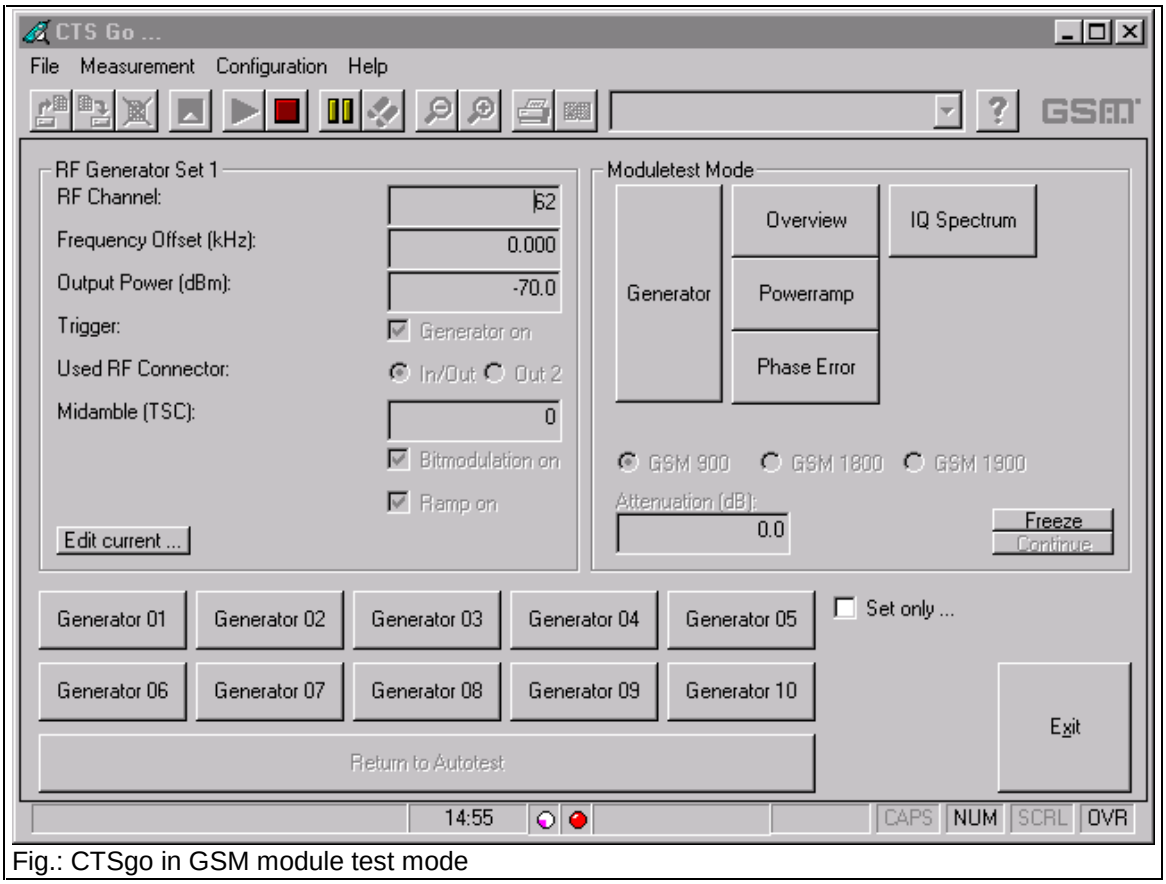


Fig.: CTSgo in GSM module test mode

Important:
With bit modulation switched off, the displayed training sequence is of no importance. All other settings are ineffective when the generator is switched off.

One of the ten generator sets can be selected using the buttons Generator 01 to „Generator 10“. The CTSgo program will act differently depending on whether the Set only box is activated or not. With this box activated, new generator settings are immediately active. When the box is empty, the user is requested in a dialog to enter the desired generator settings. Terminating the dialog with OK sets the entries.

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The RF generator dialog can also be terminated with Cancel. In this case, the generator settings are not changed. If required, the channel and the frequency offset can be converted to a frequency with the aid of this dialog. For further information refer to the dialog description.

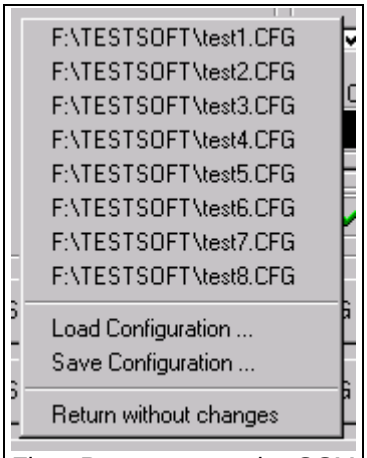


Fig.: Popup menu in GSM module test dialog

Like in the autotest, the user can load parameters or store the current setting with the aid of a popup menu. In this case, the generator settings are overwritten. This enables the user to define more than ten generator sets by including configurations in the definitions of the required generator sets. This popup menu can only be activated with a click on the righthand mouse key when the sequence control is in the stop mode. Loading of configuration files also changes the autotest settings as well as the burst analysis parameters and the IQ spectrum. The burst analysis mode can be selected by pressing one of the buttons Overview, Power ramp or Phase error. Depending on the key selected, a different popup window for the result display will appear.
The appearance in the left frame of the module test dialog window is also changed. The parameter set of the burst analysis is now displayed. It comprises the selected channel, the expected power at the input of the CTS, the trigger mode and the training sequence of the signal to be measured. The keypad now contains the ten buttons Analyzer 01 to Analyzer 10 for activating one of the ten parameter sets for burst analysis. As with generator mode, the network selected GSM900, GSM1800 or GSM1900 and the attenuation are part of the parameter set, the associated values are indicated at the right of the module test dialog.

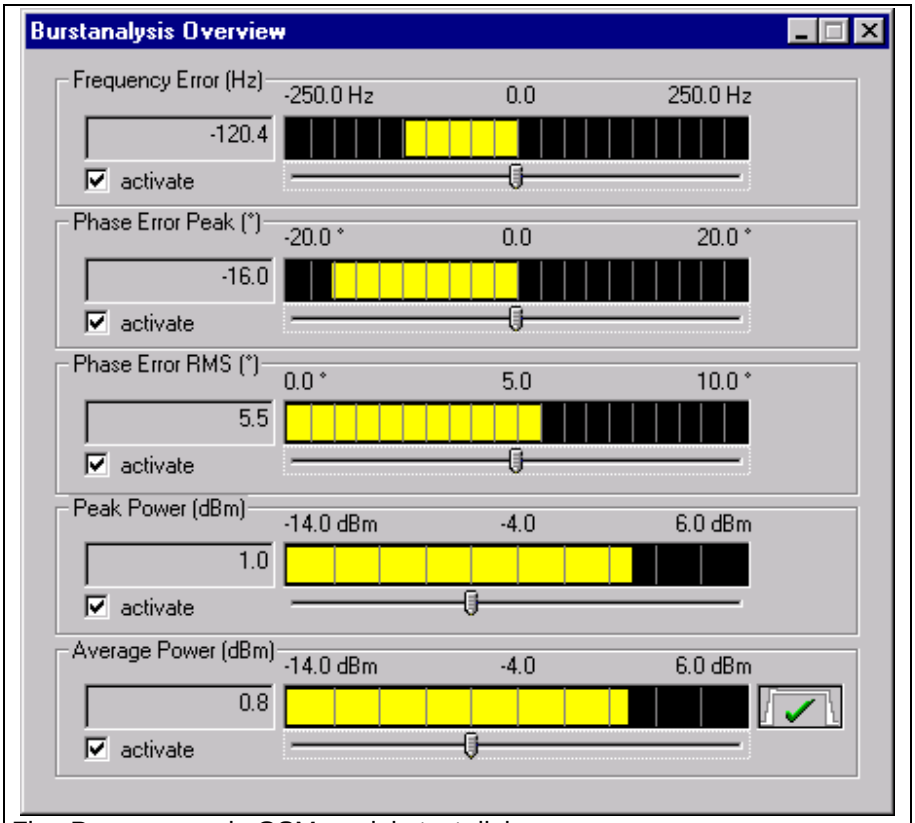
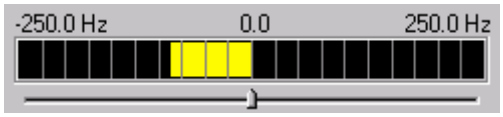


Fig.: Popup menu in GSM module test dialog

The results of the burst analysis are displayed in the popup window Burst Analysis Overview“ . The desired measurement can be activated by means of the boxes. The associated numerical result is displayed in the respective field. The measurement result is also displayed as bargraph in the graphics result display . The measurement range can be varied using the slider below the bargraph . Moving the slider to the left reduces the measurement range, moving it to the right extends the range. The bargraphs for the different measurements with range limits are shown below:

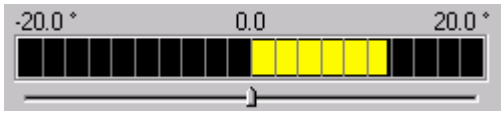
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Frequency error



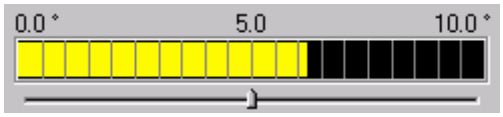
Measurement range	Lower limit	Bar center	Upper limit
Default	-250 Hz	0 Hz	+250 Hz
Minimum	-125 Hz	0 Hz	+125 Hz
Maximum	-500 Hz	0 Hz	+500 Hz

Phase error (Peak)



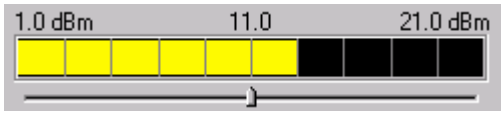
Measurement range	Lower limit	Bar center	Upper limit
Default	-20 °	0 °	+20 °
Minimum	-10 °	0 °	+10 °
Maximum	-40 °	0 °	+40 °

Phase error (RMS)



Measurement range	Lower limit	Bar center	Upper limit
Default	0 °	5 °	10 °
Minimum	0°	2,5°	5°
Maximum	0°	10°	20°

Peak power



Measurement range	Lower limit	Bar center	Upper limit
Default	x - 10 dB	x	x + 10 dB
Minimum	x - 30 dB	x	x - 10 dB
Maximum	x + 10 dB	x	x + 30 dB

x = expected power

Average power



Measurement range	Lower limit	Bar center	Upper limit
Default	x - 10 dB	x	x + 10 dB
Minimum	x - 30 dB	x	x - 10 dB
Maximum	x + 10 dB	x	x + 30 dB

x = expected power

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The graphics display next to the display of the average power informs the user on whether the measured values are within the GSM tolerance mask.


Measured values within tolerance mask.


Measured values outside tolerance mask.


Tolerance mask not evaluated.

CTSgo will not evaluate tolerances in the module test when the peak power measurement is the only one active. The expected power for the power measurement and other parameters influencing the burst analysis can be entered in a dialog which is displayed when the Burst analysis button is pressed. With the Freeze button, the numeric and the graphics result display are frozen, ie the displayed values are not updated. Remote control is however not interrupted. This status is terminated with the Continue button.

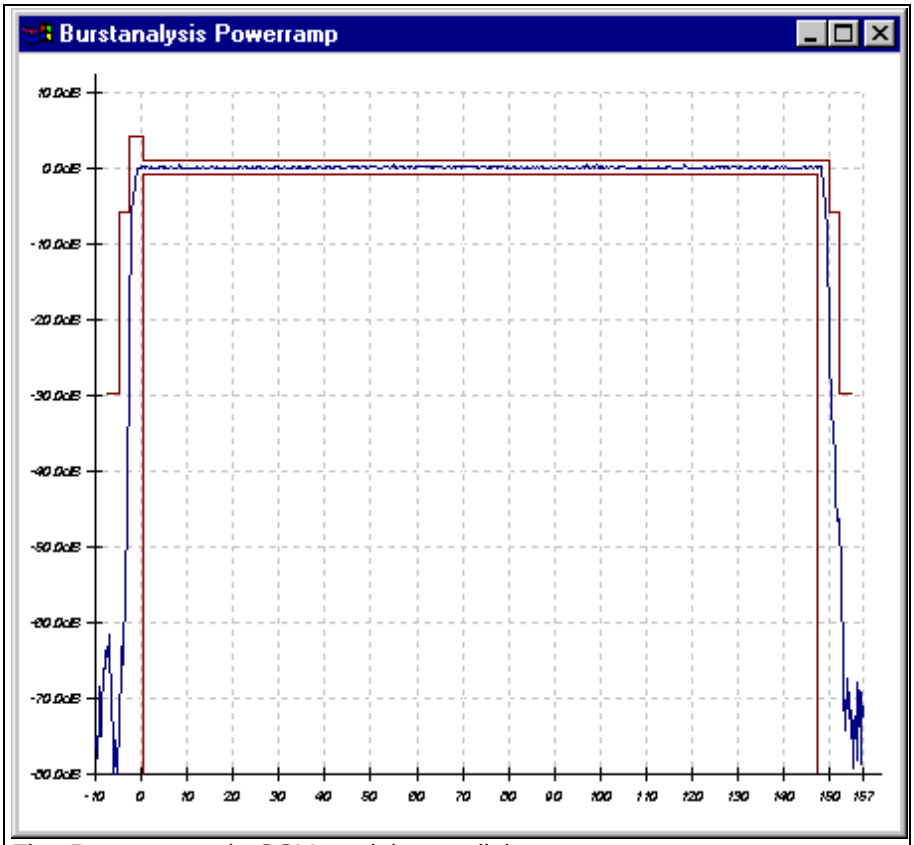


Fig.: Popup menu in GSM module test dialog

The Power ramp button permits to display a popup window with the display of the power ramp. The graph shows the power versus the bit position. The CTS measures the power with fourfold oversampling so that four measured values (quarter bits) are recorded within the time frame for one bit. Next to the power ramp that is shown as a blue curve, the tolerance mask is displayed as red curve. Since no PCL is known in the module test, the display may slightly differ compared with the autotest measurement. If the average power is not measured in parallel, the lowest tolerance lines are not displayed.

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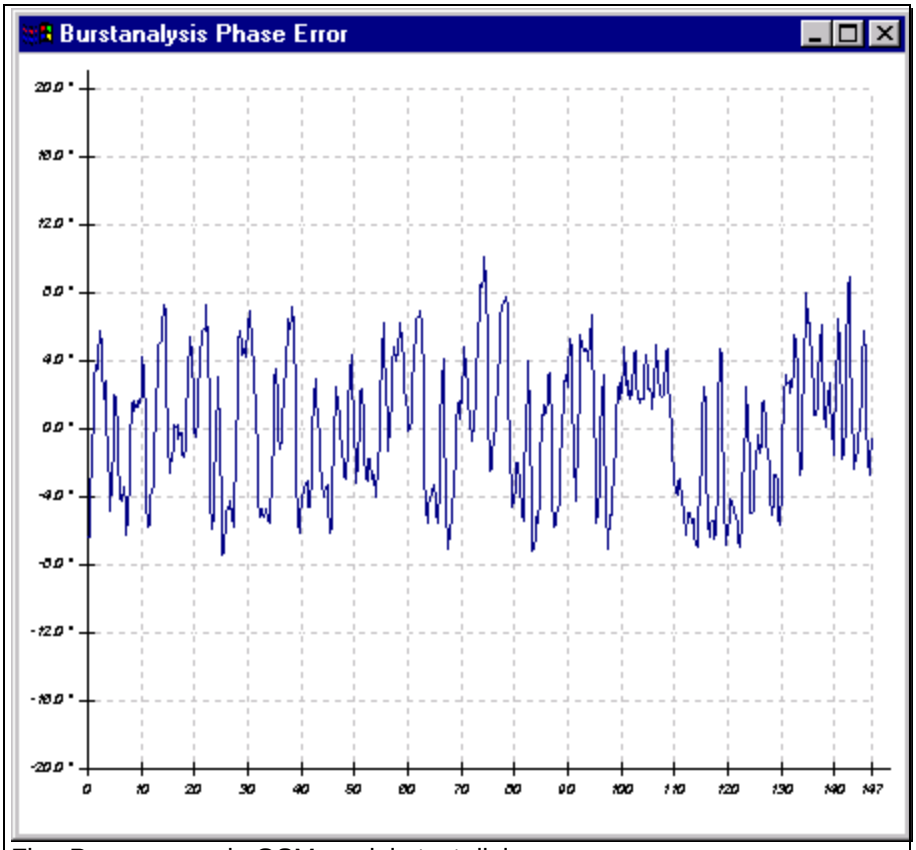


Fig.: Popup menu in GSM module test dialog

The Phase error button displays a popup window with the display of the phase curve versus the bit position within the ramp. The CTS also measures the phase with fourfold oversampling.

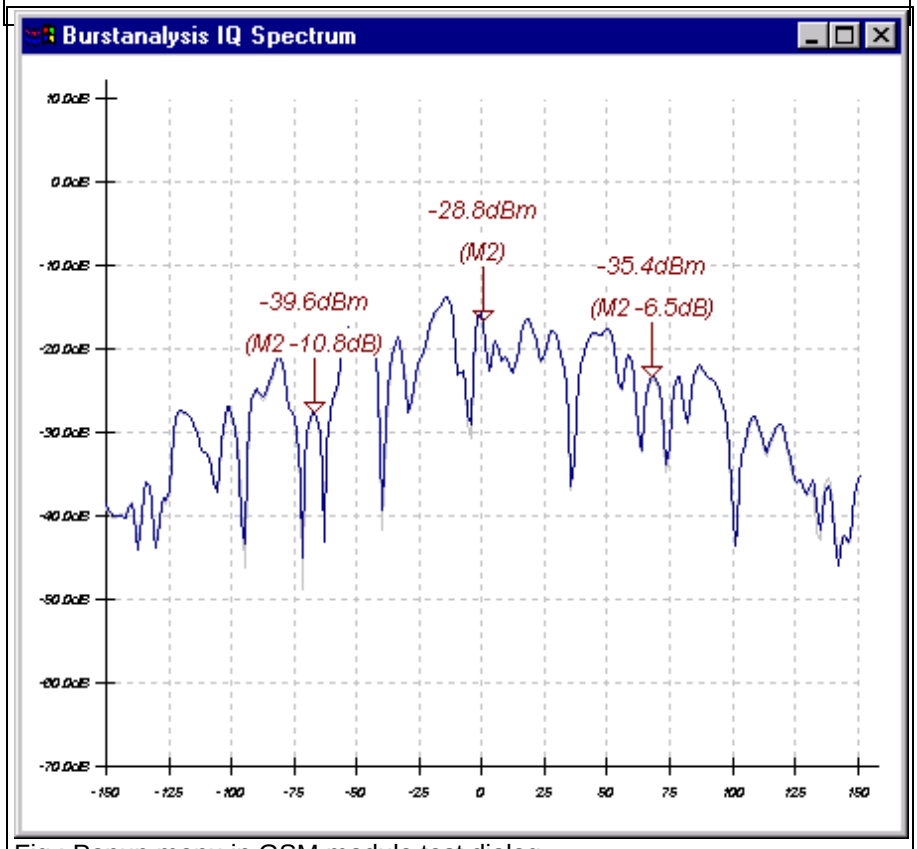


Fig.: Popup menu in GSM module test dialog

By pressing the IQ spectrum button, you can select the operating mode for viewing the spectrum within a GSM channel, which is also called “Narrow Spectrum” or “IQ spectrum“ . As with burst analysis or generator mode, 10 parameter sets are available. The keypad contains ten buttons IQ Spectrum 01 to IQ Spectrum 10, the left block displays the channel, the averaging factor, the expected power at the input of the CTS, the expected waveform and the selected filter bandwidth.

Typically, an output signal of a mobile modulated with a 0s or 1s sequence is measured without signaling in this operating mode. In this case, the signal carrier features a 67.7-kHz offset from the middle of the channel due to the GMSK modulation. The RF signal on the suppressed carrier and on the other sideband should be as low as possible.

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Three markers (M1 to M3) are displayed at the points that are typical for this measurement; in addition to the absolute level, the differences from the marker with the highest level are also displayed below. The level scale is relative to the reference level of the tester, the reference level itself is indicated at the top left of the window.

The window with the graphics display of the phase and power ramp within a burst or the IQ spectrum can be increased or reduced at will.

When the program is in stop mode, CTSgo can be terminated by pressing the End button or the operating mode of the CTSgo program changed by pressing the Return to Autotest button.

The operating status of CTS is indicated in the status bar. The icons have the following meaning:


"Red lamp". Parameter setting is not yet terminated, generator setting and burst analysis are not correctly performed.

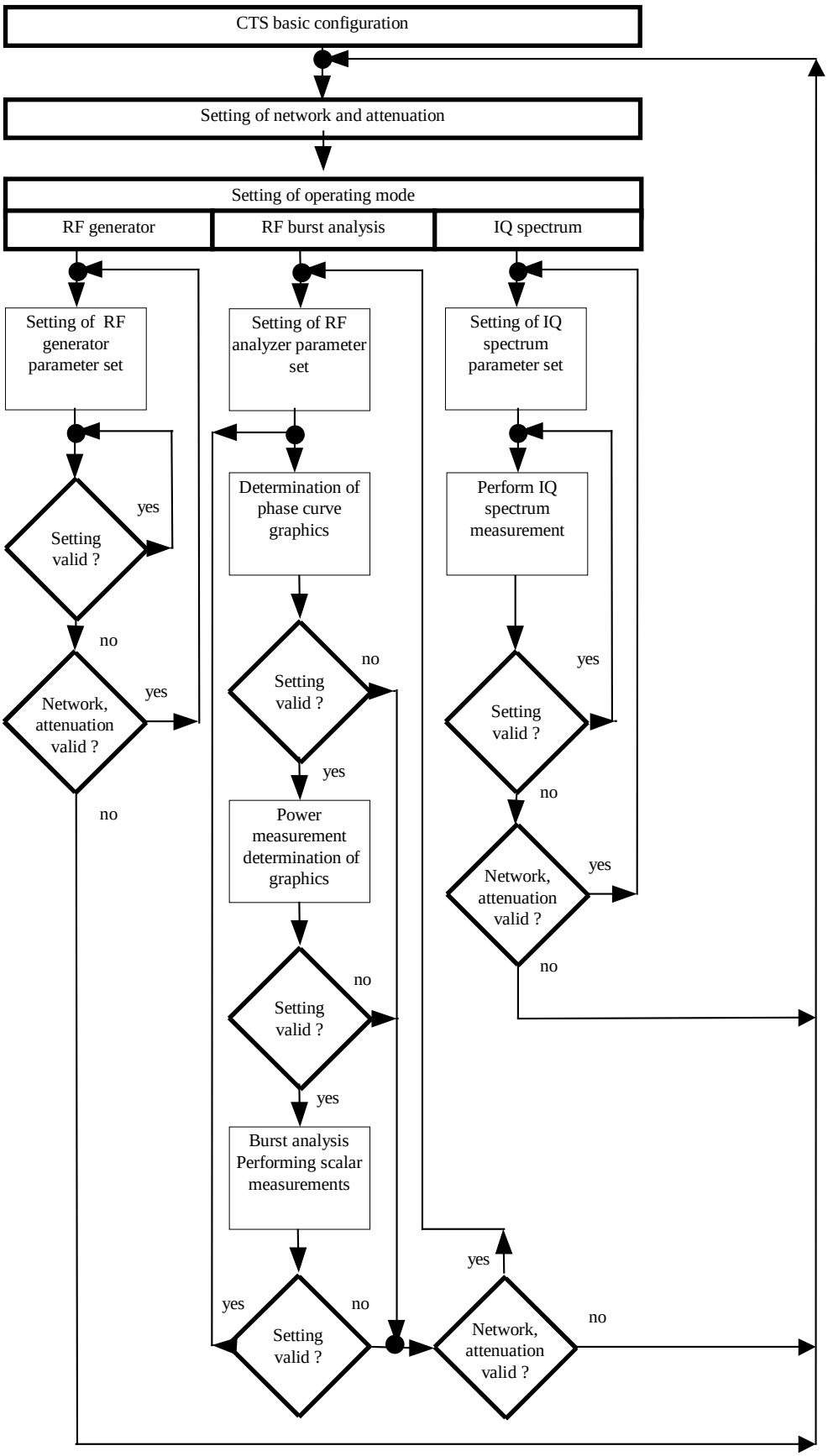

„Green lamp". Parameter setting is terminated, generator settings are valid and the burst analysis or IQ spectrum measurement is in progress.

6.4.1 Sequence Control of Module Test

When the module test is called, the sequence control is automatically started. The configurations for RF generator and burst analysis can be entered in parallel and are considered in the program when the entries are confirmed. You may also influence the sequence control in the same way as described for the sequence control in the autotest.

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6.4.2 Structure of Module Test



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6.5 GSM Report Display

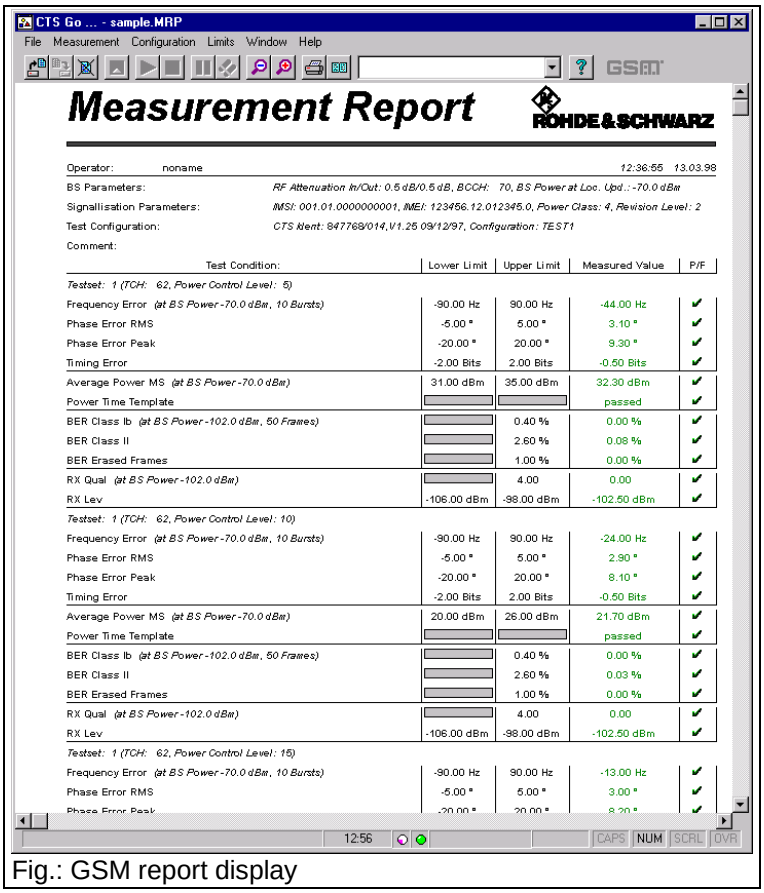


Fig.: GSM report display

In the GSM report display mode, GSM measurement results are displayed like on a hardcopy. However, contrary to the print preview, paging is not shown. Depending on the length of the measurement report and the resolution of your graphics card, the displayed section may have to be moved through the report display with the aid of the horizontal and vertical scrollbars. To optimize the displayed section, the size of the report can be reduced or expanded. To do so use a zoom command in the report display or select the command via the popup menu of the report display. This mode of CTSgo is used to display recorded measurement reports. For this reason, the sequence control is not active and the program is in the stop mode. The report mode is selected by opening a stored measurement report in the File menu by Drag & Drop, ie by drawing the icon of a measurement report into the CTSgo window with the left mouse key held down and then releasing the key. The drag & drop function will be described in a separate section.

CTSgo does not support “OLE“, ie the display of a measurement report within another application, eg word processing. Measurement results may however be exported for further processing. The displayed measurement report can also be output to a printer.

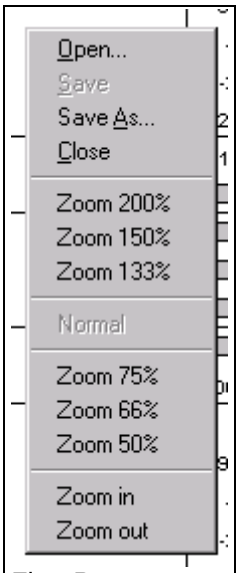


Fig.: Popup menu in report display

Note:
Only one measurement report can be displayed at a time.

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6.6 DECT Autotest Dialog

The autotest dialog in DECT mode does not considerably differ from the one in GSM mode. Depending on the operating mode previously used, the operating mode GSM autotest or DECT autotest will be active with the next program start of CTSgo. For the structure of the autotest dialog refer to the section GSM Autotest. The DECT autotest comprises the test of the **F**ixed **P**art, FP for short, and the test of the **P**ortable **P**art , PP for short. The Fixed Part test is started with, since the RFPI can be requested from the base station in this test. For testing the Portable Part, the RFPI must already be known. The **R**adio **F**ixed **P**art **I**dentity is the unambiguous identification number of the fixed part. As the CTS plays the role of the Fixed Part in the Portable Part Test, it must know the RFPI to be able to address the Portable Part.

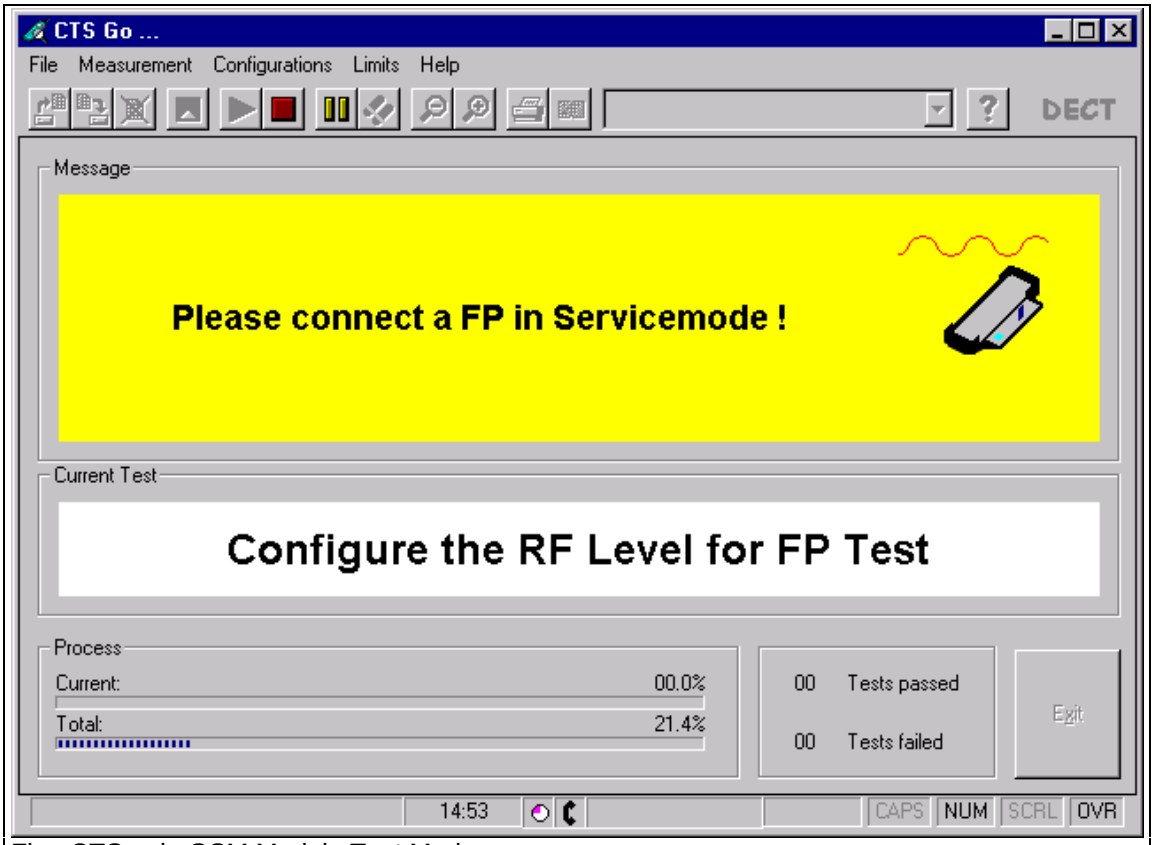
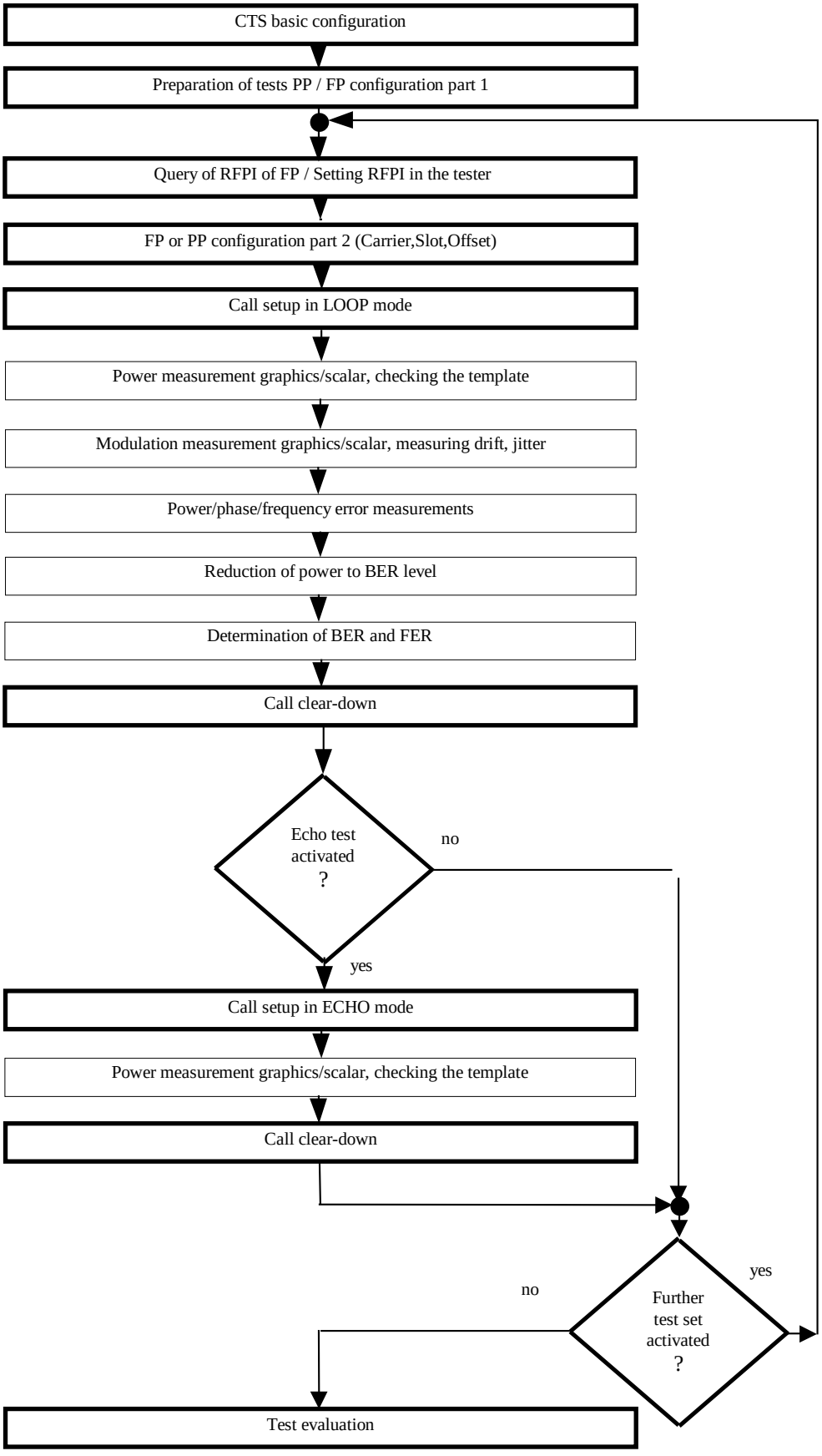


Fig.: CTSgo in GSM Module Test Mode

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6.6.1 Structure of DECT Auto Test



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6.7 DECT Report Display

The DECT report display mode indicates the DECT measurement results. The DECT report display corresponds to the GSM report display concerning the popup menu and the other characteristics.

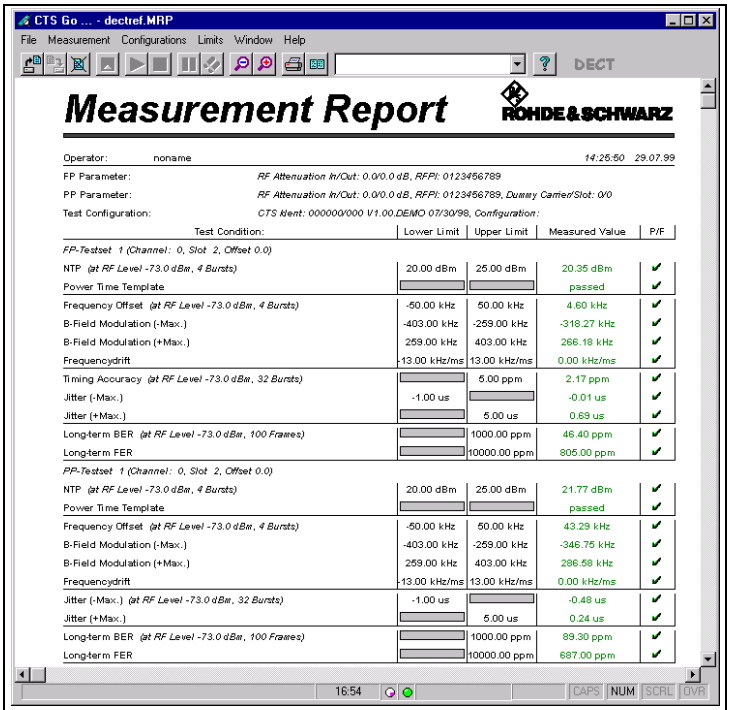


Fig.: DECT report display mode

Note:
Depending on whether GSM report or DECT report is loaded, CTSgo will change the type of display accordingly.

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7 Program Menus

This section describes the commands available in the CTSgo menus. If a command can also be called via the toolbar, its icon is displayed below the headline. A command can also be called via a popup menu when the following line is displayed below the headline.

Popup menu Autotest | Popup menu Module test | Popup menu Report display

Popup menus are context-sensitive, ie they only contain commands that are relevant to the current program status.

7.1 File Menu



Fig.: File menu

7.1.1 Open

 Popup menu Report display

With this command, a stored measurement report is opened. A dialog is displayed where the desired file can be selected. You may have to change the directory in this dialog window. After the selection of a measurement report, the program changes to the report display mode. Measurement reports are normally stored in files with the extension .MRP on the hard disk or any other storage medium. The program automatically differentiates between DECT measurement reports and GSM measurement reports.

7.1.2 Close

 Popup Menu Report display

This command permits to return from the report display mode to the autotest or module test mode. If the displayed measurement report is not yet stored, the user will be prompted to do so.

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7.1.3 Save



Popup menu Report display

This command can be used to store a measurement report. A dialog window is opened where the directory can be selected and the report stored under the desired name.

7.1.4 Save As

Popup menu Report display

This command is similar to the Save command. It allows a saved report to be stored under another name.

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7.1.5 Print Preview



This command is used to open the print preview dialog window in the report display. In this window, the measurement report is displayed in hardcopy format. Use the arrow keys to scroll between the pages. Icons are provided for switchover between single-page and double-page display. The displayed pages are indicated in the field to the right of the icons. Printing is started by a click on the respective icon. Click on Close to close the dialog and return to the report display mode.

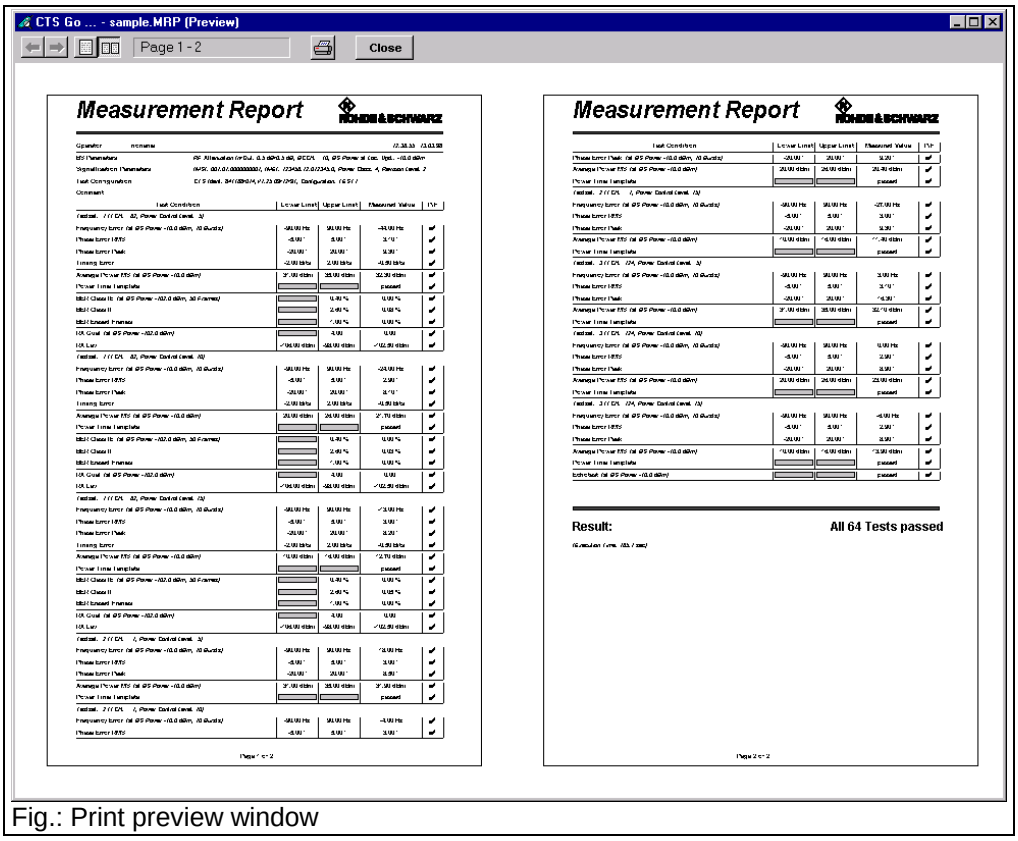


Fig.: Print preview window

7.1.6 Print



In the report display mode, the measurement report can be output to a printer. A dialog is opened where the user can select the printer to be used, the pages to be printed and the number of copies to be made. Use the print preview command to view the pages to be printed.

7.1.7 Print Setup

This command opens a dialog window at the system control level of your PC where a printer can be installed. Refer to the Windows manual for more information.

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7.1.8 Export Data

The user may want to work with a measurement report in another Windows application.
To do so, select this command to open a dialog window where the desired directory can be selected and the file assigned a new name. The standard extension of export data is .DAT. Data are stored in tabulated form. Columns are separated by a tabulator, rows by carriage return (CR). Since the number format may differ from country to country, numerals are stored in the format selected in your operating system. The measurement reports can thus be read as a word file but also by spreadsheet programs or data bases.

Note:
If the number format is set incorrectly in the system control, problems may occur when data are imported. In this case, decimal points are interpreted as commas at 1000s digits. So, measured values will be incorrect by several orders of magnitude. This should be borne in mind particularly when transferring data from German-speaking to English-speaking countries.

7.1.9 Application Mode



This command opens a dialog window where the GSM autotest and GSM module test or the DECT autotest can be selected. Click on Cancel to remain in the presently active mode.



Fig.: Application mode dialog window

Note:
The report display mode is activated by selecting the Open command in the File menu.

7.1.10 Load Configuration

Popup menu Autotest Popup menu Module test

All set configurations can be saved for subsequent use. With this command, saved configuration files can be loaded. Configuration files are assigned the extension .CFG.

Note
The previously used configurations can also be selected in the popup menu using the righthand mouse key.

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7.1.11 Save Configuration

Popup menu Autotest Popup menu Module test

This command saves the set configuration. A dialog window is opened where the directory can be selected and the configuration stored under the desired file name. Configuration files are assigned the extension .CFG.

7.1.12 Exit

This command is used to terminate the CTSgo program.

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7.2 Measurement Menus

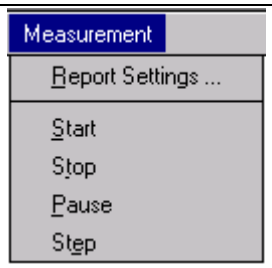


Fig.: Measurements menu in the GSM autotest, DECT autotest

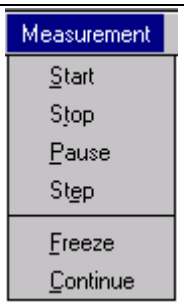


Fig.: Measurements menu in the GSM module test

7.2.1 Report Settings

This command opens the following dialog window:



Fig.: Report settings dialog window

Enter the operator name in the first input field. The name will be stored and displayed in the header of the measurement report. A comment can be optionally included in the measurement report. It can be entered in the second input field. Three scenarios are possible when the measurement is terminated:

- Display: All tests passed – Some tests failed. A measurement report is not generated as standard. After termination of the autotest, a small dialog window is opened where you can decide on whether to continue with the next test run or view another measurement report. Use this option for short tests only where only the All tests passed – Some tests failed statement is of importance.

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- Automatic generation of a measurement report. After the measurement, the program remains in the autotest dialog mode. “All tests passed – Some tests failed.” is displayed. A measurement report is saved in a user-selected directory. Measurement reports are stored with consecutive numbers „00000001.MRP“ „00000002.MRP“ etc. Like in the preceding mode, a small dialog window appears, where a measurement report can be displayed or the tests continued.
- At the end of the measurements, the CTSgo program automatically changes to the report display mode. The name and directory for storing the measurement report are then defined by the user in the File menu. This menu also contains the command for printing the measurement report.

Select the desired setting by choosing the respective option.
Enter the path for automatic storage of measurement reports in the associated input field. During program installation, the subdirectory AUTOSAVE is created as standard.

A graph is displayed at the right in the header of the measurement report. You may use the logo of your company instead of the Rohde & Schwarz logo. Within certain limits, the program tries to adapt your logo to the header of the measurement report. Optimum results can be obtained with graphics files with the following characteristics:

- Width: 900 pixels
- Height: 220 pixels
- Black/white
- Format: Windows bit map (BMP)

A file is selected in the dialog window opened with “Browse”. The “User-defined Bit Map” box“ is checked and the graph is displayed in the preview field above.

Important:
To keep the measurement report file as small as possible, the picture file is not stored in the report but merely its name. Depending on the directory in which the picture file has been stored, the file name is stored independently or with reference to the CTSgo directory. For copying measurement report files from one computer (A) to another (B), the following examples should be observed.

Storage using a relative path:

The path of the picture file is considered relative when the file is stored in the current directory or in a subdirectory of CTSgo.

Example:
The measurement report is stored in computer A:

Current directory: C:\CTSGO\
Picture file: C:\CTSGO\BITMAPS\USER.BMP

To display the measurement report on Computer B:

Current directory: C:\MYWORKS\CTSGO\
Picture file: C:\MYWORKS\CTSGO\BITMAPS\USER.BMP

Storage using an absolute path:

The path of the picture file is considered absolute when the current directory of CTSgo is not part of the picture file path.

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Example:
The measurement report is stored in computer A:

Current directory: C:\CTSGO\
Picture file: C:\BITMAPS\USER.BMP

To display the measurement report on computer B:

Current directory: C:\MYWORKS\CTSGO\
Picture file: C:\BITMAPS\USER.BMP

These settings concern both the GSM and the DECT autotest.

7.2.2 Start



The Start command is used to start a new measurement.

7.2.3 Stop



The Stop command is used to stop the current measurement. The program returns to the beginning of the autotest. The previously performed test is not output. All obtained measurement results are lost.

7.2.4 Pause



The Pause command permits to interrupt the program run. The currently performed step of the autotest is completed before the sequence control stops the test. Another click on Pause continues the measurement.

7.2.5 Step



This command permits to check the sequence control of the autotest step by step. After each single step, the program automatically goes to the pause mode.

7.2.6 Freeze

The Freeze command permits to freeze the numeric and graphics result display in the module test, ie displayed values are not updated. This does not interrupt remote control.

7.2.7 Continue

With this command, freezing of the result display in the module test is cancelled. The displayed values are continuously updated again.

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7.3 Configuration Menu in the GSM Autotest

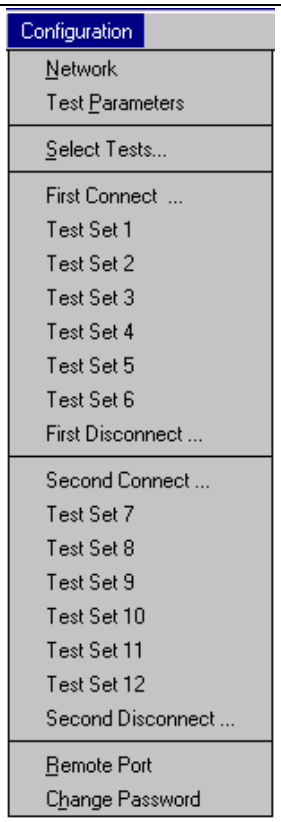


Fig.: Configuration menu in the GSM Autotest

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7.3.1 Network

This command opens the Configure Network dialog window. In this window, the measurements can be adapted to the network of your mobile. The base station power at which the mobile performs a location update is also set here.

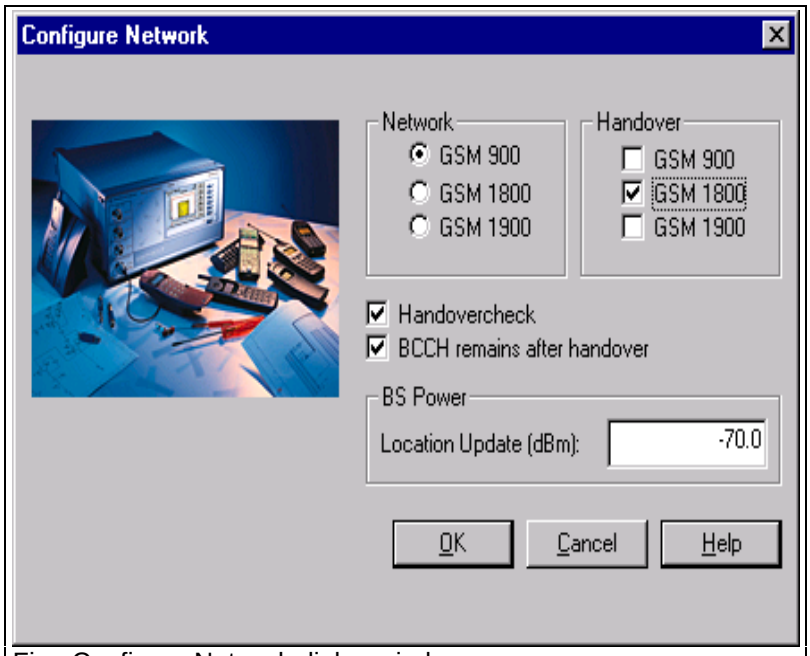


Fig.: Configure Network dialog window

After switching on, the mobile searches in all channels for a base-station carrier, also called C0 carrier. A component of the C0 carrier is the broadcast channel, also called BCCH. The mobile synchronizes to this carrier and compares the decoded data from the base station with the data on the SIM card. It then registers with the base station. This registration is called location update. If the output power is too low, your mobile may not register with the base station simulated by the CTS. Changing from GSM 900 to GSM 1800 or GSM 1900 may cause PCL steps 16 to 19 to be cleared from the test set and replaced by PCL step 15. In this case, a warning is output by CTSgo.

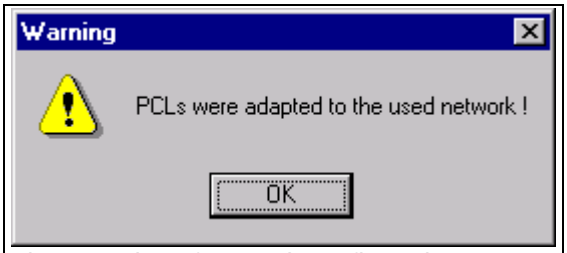


Fig.: Warning of network configuration

Dualband-Mobiles are able to use channels of the GSM 900 band as well as channels of the GSM 1800 band. You decide the primary network and the handover network. The primary network is the one, which is used for the BCCH generation. This means, that the network is used for location update and the call process. A channel change from one band to another band is called dualband handover. Check the box "Handovercheck", if you want the testset to use the signalisation for checking the dualband handover capabilities of your mobile. You have to check the box "BCCH remains after handover", if your mobile needs a remaining BCCH signal in the primary network, when changing to the secondary band. A missing BCCH signal will result in a higher frequency error after dualband handover. There are some mobiles, which have the capability to handover between GSM 900 and GSM 1900. Due to the geographical distance, there is no existing GSM 900 / 1900 dualband handover implemented in the network. On some mobile it can be used for test purposes. The method is the same, as it is for GSM 900 / 1800 dualband handover.

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Note:
The choice of networks depends on the options available in your CTS!
It is advisable to configure the network first and then make test configurations.

7.3.2 Test Parameters

The Test Parameters command opens the dialog window shown below. This window permits to set the BCCH of the base station, the path attenuation between mobile and CTS, the number of frames used for the bit-error-rate measurement and the number of bursts for the phase and frequency-error measurement.

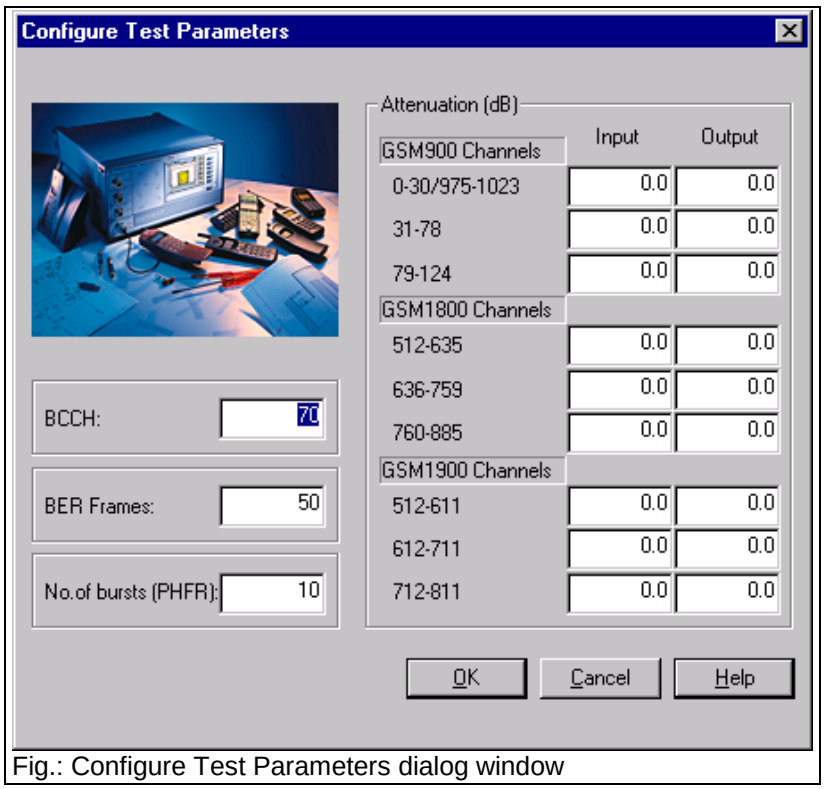


Fig.: Configure Test Parameters dialog window

The input of correct attenuation values has a decisive influence on the measurement accuracy. In the ideal case, an antenna cable should be used, which is directly connected to the mobile, eg as found in the car kit of the mobile. An attenuation between 0.5 and 2 dB is normally obtained in this case. Problems will however arise when using antenna couplers. The attenuation of the mobile types may differ considerably, and it may vary depending on the frequency channel used. If you do not know the attenuation of your antenna coupler proceed as described below:

- Establish a connection to your mobile in the manual mode of CTS.
- Set a power of eg –70 dBm for the traffic channel TCH.
- Measure RXLev. This is the power the mobile receives, which is signaled to the base station at regular intervals in so-called measurement reports.
- Compare the measured RXLev with the TCH power of the CTS.
- Select an average power control level (PCL) on the CTS.
- Compare the measured output power of the mobile with the rated value of the selected PCL.

The input of the attenuation values happens independently for each band. The attenation values for each band are separated for low, mid and high channels.

Bear in mind that, in addition to the measurement inaccuracy of the tester, the production tolerance of the mobile has to be taken into account to estimate the total error. This method requires the mobile to be fully operational.
The BER measurement is the only way to determine the receiving quality and particularly the sensitivity of the mobile. The measurement itself is a statistical evaluation of the sent bits and the errored bits.

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More reliable results are obtained by increasing the frames and thus the number of bits, but this extends the measurement time.

Note:
The measurement time for the phase/frequency error measurement also depends on the number of bursts to be considered.

7.3.3 Select Tests

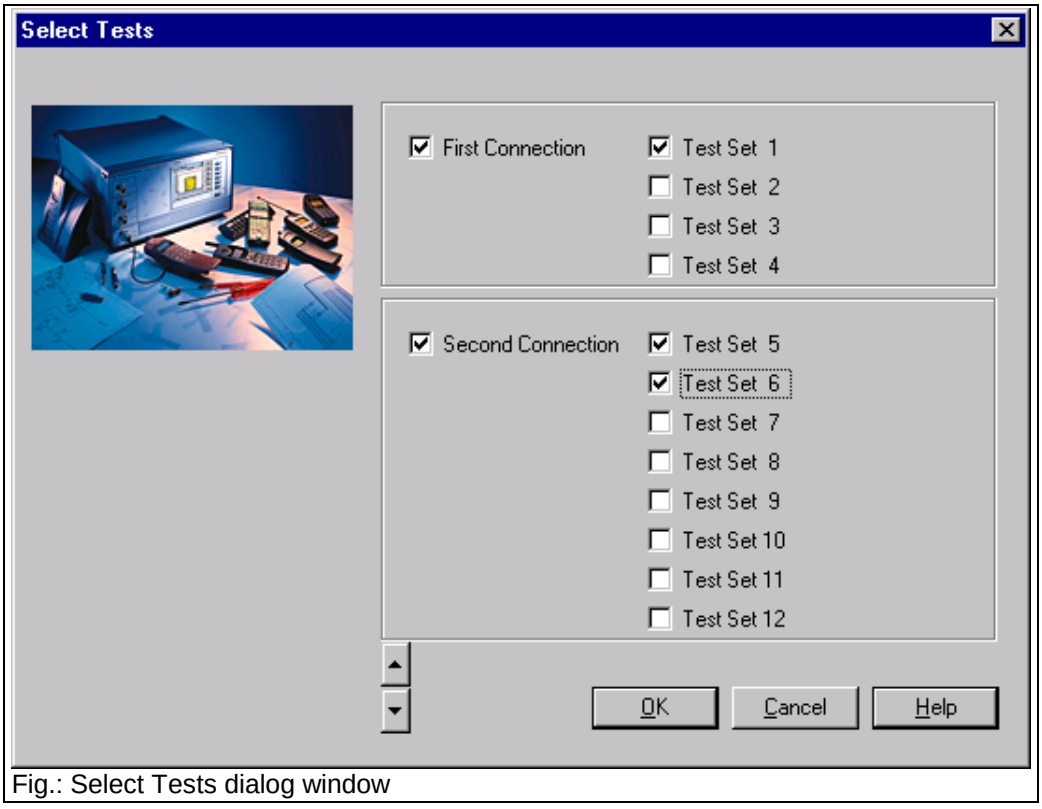


Fig.: Select Tests dialog window

This command opens the Select Tests dialog window. By checking the respective boxes you decide whether the call is set up and cleared down once or twice during the test. You also select the number of test sets used. By default up to six test sets can be selected for each connection. Using the up / down arrow buttons, you can change the position for the second connection inside the testplan.

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7.3.4 First Connect

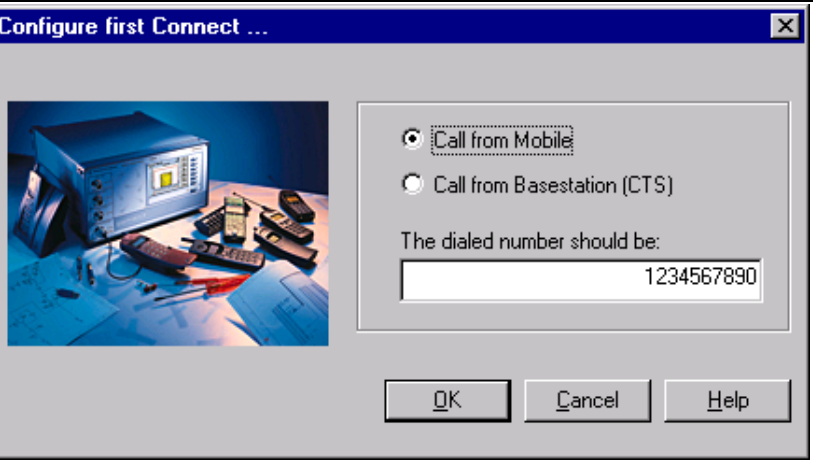


Fig.: Configure first Connect dialog window

This command permits to define the method for the first call setup. To this end, select whether the CTSgo program expects a call from the mobile or whether the call should be set up by the CTS. In the case of a mobile call, you can define an expected numerical entry, which will then be compared with the call number received and evaluated in the test report. Thus the number keys of the mobile can also be easily checked.

Note:
This command can only be selected if the first connection is activated for the test.

7.3.5 Test Set 1

You can decide for each test set which measurements should be performed in a traffic channel (TCH). To do so enter the TCH to be used in the first entry field. Select the measurements to be performed from the list at the right. Enter the RF output power of the CTS (BS power) for the individual tests in the entry fields “Standard“ and “BER“.

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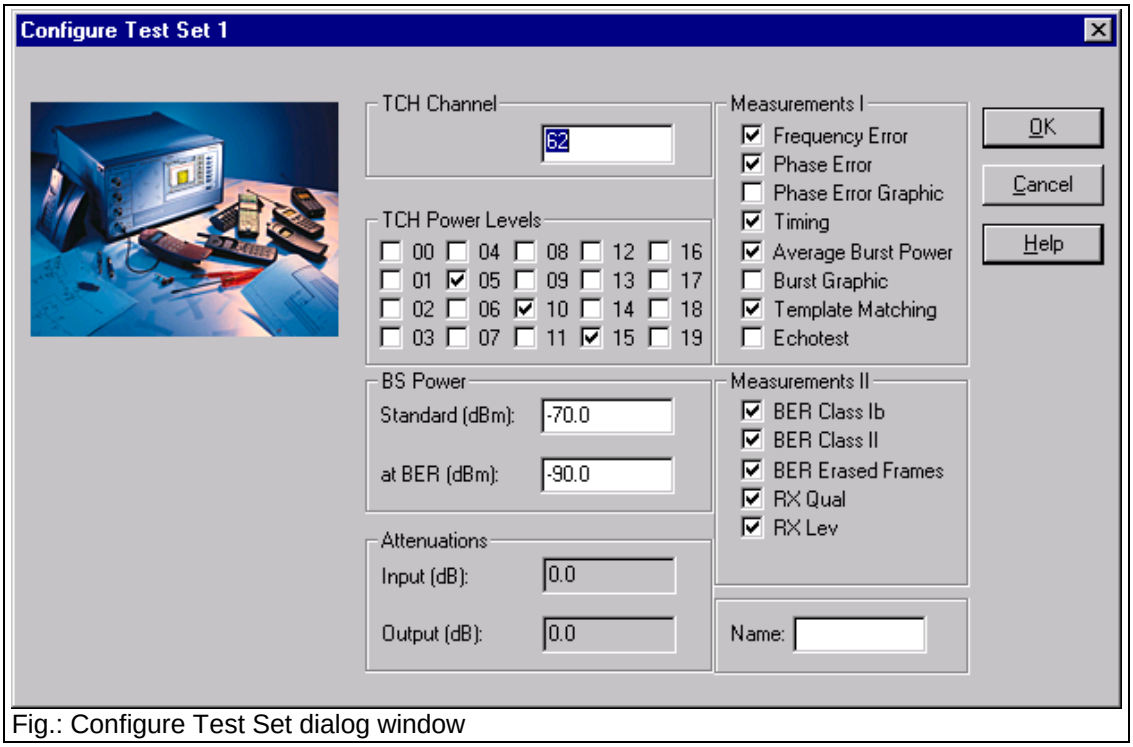


Fig.: Configure Test Set dialog window

The standard BS output power is used for the following measurements:

- Frequency error
- Phase error (RMS and peak value are determined numerically)
- Phase error (phase error curve within burst)
- Bit timing
- Average burst power
- Graphics display of power ramp
- Echo test

The BER base-station power is used for the remaining measurements:

- BER class Ib
- BER class II
- BER EFR (Erased Frames)
- RXQual
- RXLev

The measurements are repeated at all power levels (PCLs) selected in the boxes.
As an option, the test set can be assigned a short name, which will also be displayed in the menu.
The graphics display of power ramp and phase error is shown in the appendix when the measurement report is generated. E-GSM channels are part of network GSM900. The attenuation values shown in this dialog are channel depending. These values are only shown for your information.

Note:
This command can only be selected if test set 1 is activated for the test.

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7.3.6 Test Set 2

You can determine the measurements to be performed in the selected TCH channels. For details refer to the description under Test set 1.

Note:
This command can only be selected if Test set 2 is activated for the test.

7.3.7 Test Set 3

You can determine the measurements to be performed in the selected TCH channels. For details refer to the description under Test set 1.

Note:
This command can only be selected if Test set 3 is activated for the test.

7.3.8 Test Set 4

You can determine the measurements to be performed in the selected TCH channels. For details refer to the description under Test set 1.

Note:
This command can only be selected if Test set 4 is activated for the test.

7.3.9 Test Set 5

You can determine the measurements to be performed in the selected TCH channels. For details refer to the description under Test set 1.

Note:
This command can only be selected if Test set 5 is activated for the test.

7.3.10 Test Set 6

You can determine the measurements to be performed in the selected TCH channels. For details refer to the description under Test set 1.

Note:
This command can only be selected if Test set 6 is activated for the test.

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7.3.11 First Disconnect

Using this command you can determine the procedure for the first call clear-down. Select by a click on the respective box whether a call release is expected from the mobile or whether the call should be cleared down by the CTS.



Fig.: Configure Disconnect dialog window

Note:
This command can only be selected if the first connection is activated for the test.

7.3.12 Second Connect

This command permits to select the procedure for the second call clear-down. Select by a click on the respective box whether the CTSgo program expects a call from the mobile or whether the call should be set up by the CTS.

Note:
This command can only be selected if the second connection is activated for the test.

7.3.13 Test Set 7

You can determine the measurements to be performed in the selected TCH channel. For details refer to the description under Test set 1.

Note:
This command can only be selected if test set 7 is activated for the test.

7.3.14 Test Set 8

You can determine the measurements to be performed in the selected TCH channel. For details refer to the description under Test set 1.

Note:
This command can only be selected if test set 8 is activated for the test.

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7.3.15 Test Set 9

You can determine the measurements to be performed in the selected TCH channel. For details refer to the description under Test set 1.

Note:
This command can only be selected if test set 9 is activated for the test.

7.3.16 Test Set 10

You can determine the measurements to be performed in the selected TCH channel. For details refer to the description under Test set 1.

Note:
This command can only be selected if test set 10 is activated for the test.

7.3.17 Test Set 11

You can determine the measurements to be performed in the selected TCH channel. For details refer to the description under Test set 1.

Note:
This command can only be selected if test set 11 is activated for the test.

7.3.18 Test Set 12

You can determine the measurements to be performed in the selected TCH channel. For details refer to the description under Test set 1.

Note:
This command can only be selected if test set 12 is activated for the test.

7.3.19 Second Disconnect

Using this command you can determine the procedure for the second call clear-down. Select by a click on the respective box whether a call release is expected from the mobile or whether the call should be cleared down by the CTS.

Note:
This command can only be selected if the second connection is activated for the test.

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7.3.20 Remote Port

To ensure error-free functioning of the CTSgo software, the settings made for the remote control interface (RS232) should match the settings on the CTS.
The parameters of the serial interface such as baud rate, data bits used, stop bits, parity used and the protocol can be selected on the CTS. Adapt the settings of CTSgo to those of CTS by checking the respective box. The serial interface of your PC and the command line terminator should also be set. <CR>+<LF> should normally be used.

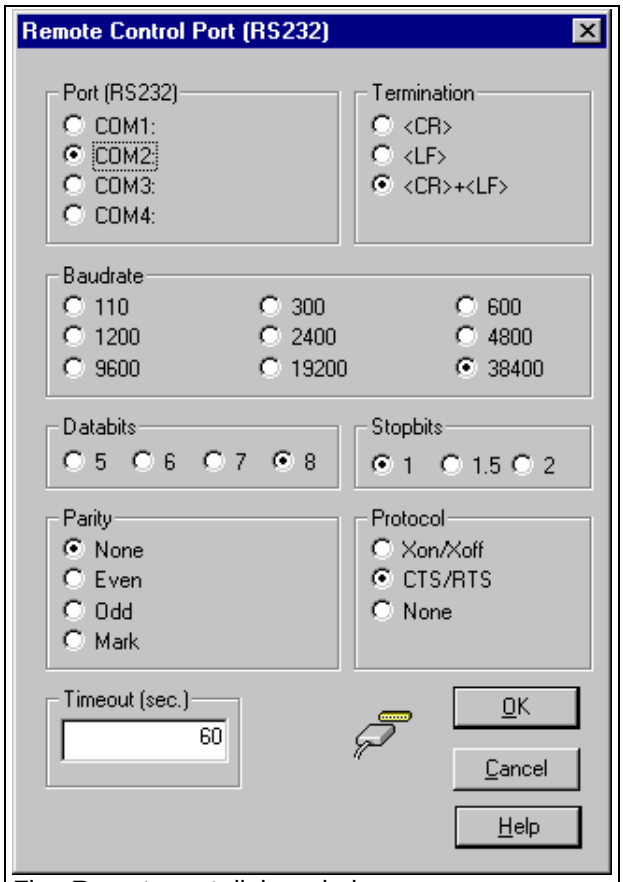


Fig.: Remote port dialog window

The timeout of the CTS for responding to a query should now be defined. This parameter depends on the configuration of the individual tests. See also the note for the Test Parameters command.

Note:
In the case of a CTS30 the parameters of the serial interface are set as follows:

- Baud rate 38400
- 8 data bits
- 1 stop bit
- Parity None
- Protocol CTS/RTS

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7.3.21 Change Password

Your configuration can be protected against unauthorized changes. To this end, enter a password in the first field and repeat it in the next. The password function is activated by selecting the “Activate” box.

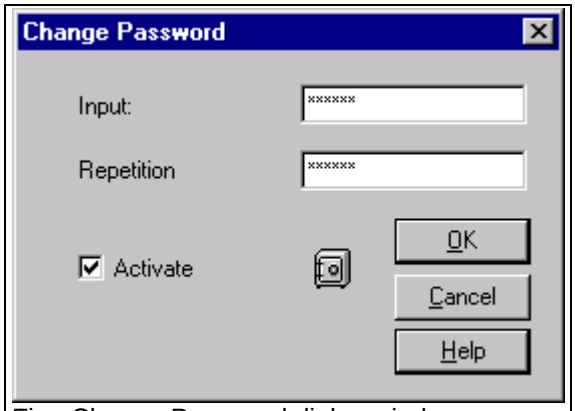


Fig.: Change Password dialog window

Each time a configuration command of the program menus is selected, you will then be prompted to enter this password. After entering a correct password, changes can be made in the configuration until the sequence control of the program is started.



Fig.: Enter Password dialog window

The password mainly serves for preventing inadvertent changes being made to your data and does not provide 100% protection. In case you have forgotten the password, clear the entry in the initialization file ”CTS_GO.INI“

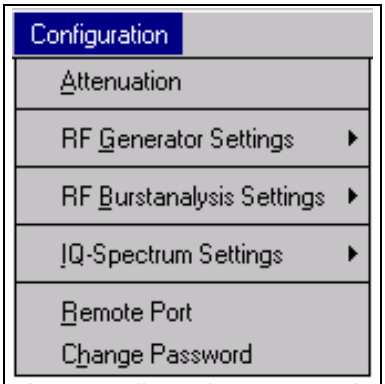


Fig.: Configuration menu in GSM module test

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7.4 Configuration Menu in the GSM Module Test

7.4.1 Attenuation

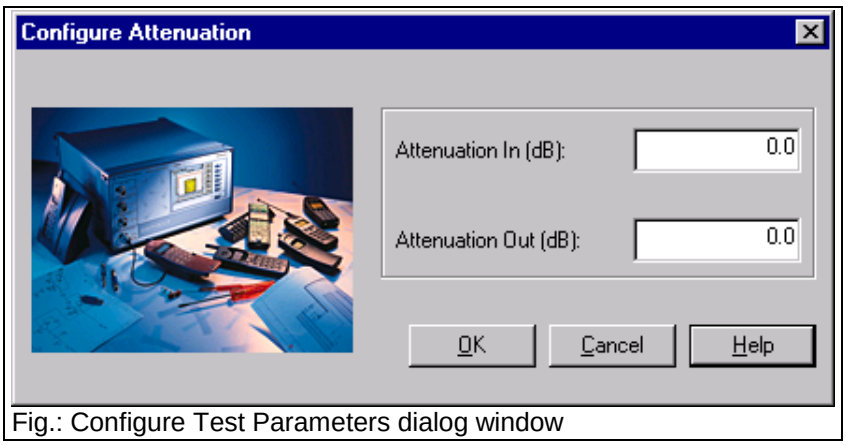


Fig.: Configure Test Parameters dialog window

In the module test, this dialog permits to standardize the attenuation values of the parameter sets in generator, burst analysis and IQ spectrum mode. After entering the input attenuation and output attenuation, close the dialog window by clicking on OK. In another dialog window, you will be prompted whether you really want to overwrite all parameter sets with these values. Click on Yes if you are really sure about it, otherwise select No.

7.4.2 Generator Settings

The Configurations menu includes the Generator Settings submenu, where the menu items “RF Generator 1” to “RF Generator 10” can be found. Select one of these commands in order to edit the desired generator parameter set.
The CTS provides an RF signal. The parameters of this RF signal are set in this dialog window. In the first field, the transmission channel of the CTS is entered, in the second the frequency offset to the fixed GSM frequency grid of 200 kHz. The CTS output power can be set in the third field. This power is present at the selected RF connector “RF In/Out“ or “RF Out 2“. A click on “Generator on“ decides whether the RF generator sends the set signal or not. With “Bitmodulation on” you can decide whether a midamble is included in the signal or not. In the fourth field, the training sequence (TSC) of the midamble is defined. With “Ramp on” you can decide whether the RF signal is with or without a burst.

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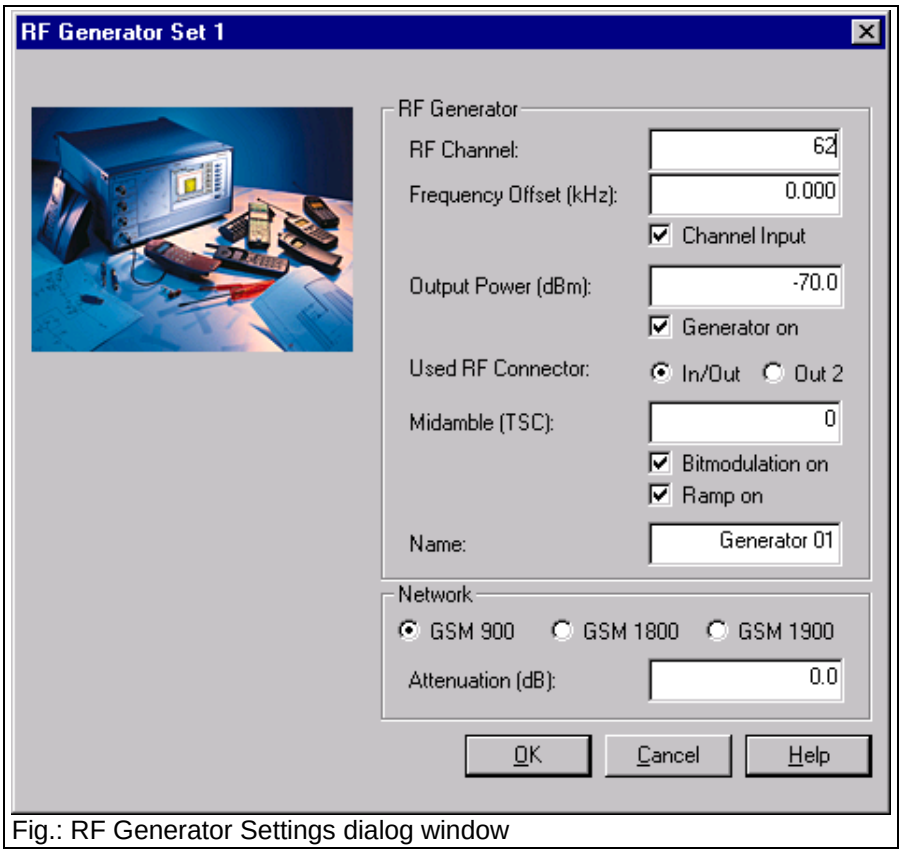
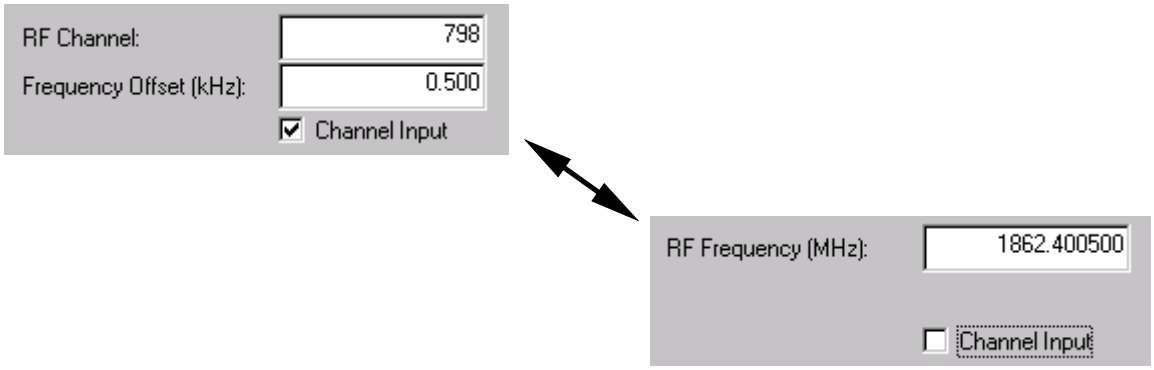


Fig.: RF Generator Settings dialog window

Whether the channel or the frequency is entered is selected with the Channel Input box. If frequency is entered, it is adapted to the channel and frequency offset.



The entered channel or the conversion to the respective frequency also depends on the currently active network. Channels and associated frequencies are listed in the tables below. Channels outside the currently used band are displayed on a dark background.

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Channel (GSM900)	Frequency	
-175	875.0 MHz	
-174	875.2 MHz	
...	...	
0	935.0 MHz...	
1	935.2 MHz	
2	935.4 MHz	
...	...	
123	959.6 MHz	
124	959.8 MHz	
...	...	
299	994.8 MHz	GSM 900 channel
300	995.0 MHz	Fictitious channel

Channel (GSM1800)	Frequency	
486	1800.0 MHz	
487	1800.2 MHz	
...	...	
512	1805.2 MHz...	
513	1805.4 MHz	
...	...	
884	1879.6 MHz	
885	1879.8 MHz	
...	...	
1435	1989.8 MHz	GSM 1800 channel
1436	1990.0 MHz	Fictitious channel

Channel (GSM1900)	Frequency	
-139	1800.0 MHz	
-138	1800.2 MHz	
...	...	
0	1827.8 MHz...	
...	...	
512	1930.2 MHz...	
513	1930.4 MHz	
...	...	
809	1989.6 MHz	
810	1989.8 MHz	GSM 1900 Channel
811	1990.0 MHz	Fictitious channel

The generator parameter set can be assigned a short name in the input field “Name”. This short name appears both in the submenu and in the labeling of the buttons of the module test dialog. The associated network for the parameter set is determined by clicking on “GSM900“, “GSM1800“ and “GSM1900“. The output attenuation is also included in the parameter set and can be varied in the respective field.

When the configurations are completed, press OK to send the settings to the CTS. If the current RF signal of the CTS generator should not be changed, press the Cancel button.

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7.4.3 Burst Analysis Settings

The Configurations menu includes the Burst Analysis Settings submenu, where the menu items “RF Analyzer 1” to “RF Analyzer 10” can be found. Select one of these commands for editing the respective burst analysis parameter set.
This command permits to set the module test parameters in the Configure Burst Analysis dialog window. In the first field, enter the channel of the signal to be evaluated, in the second the expected training sequence of the midamble. With GSM, the training sequences are used for time synchronization of the received bit sequence. Since this sync bit sequence is in the middle of the burst it is called midamble.
In the third field, the expected power can be entered. This setting is signaled to the CTS. The dynamic range of the graphics result display for power measurements also depends on these settings. The trigger mode can be selected by a click on the desired option.

Power:
The signal must be a burst signal with a midamble. It is triggered on the incoming power.

Freerun:
The signal to be measured must contain a midamble to allow the CTS to synchronize.

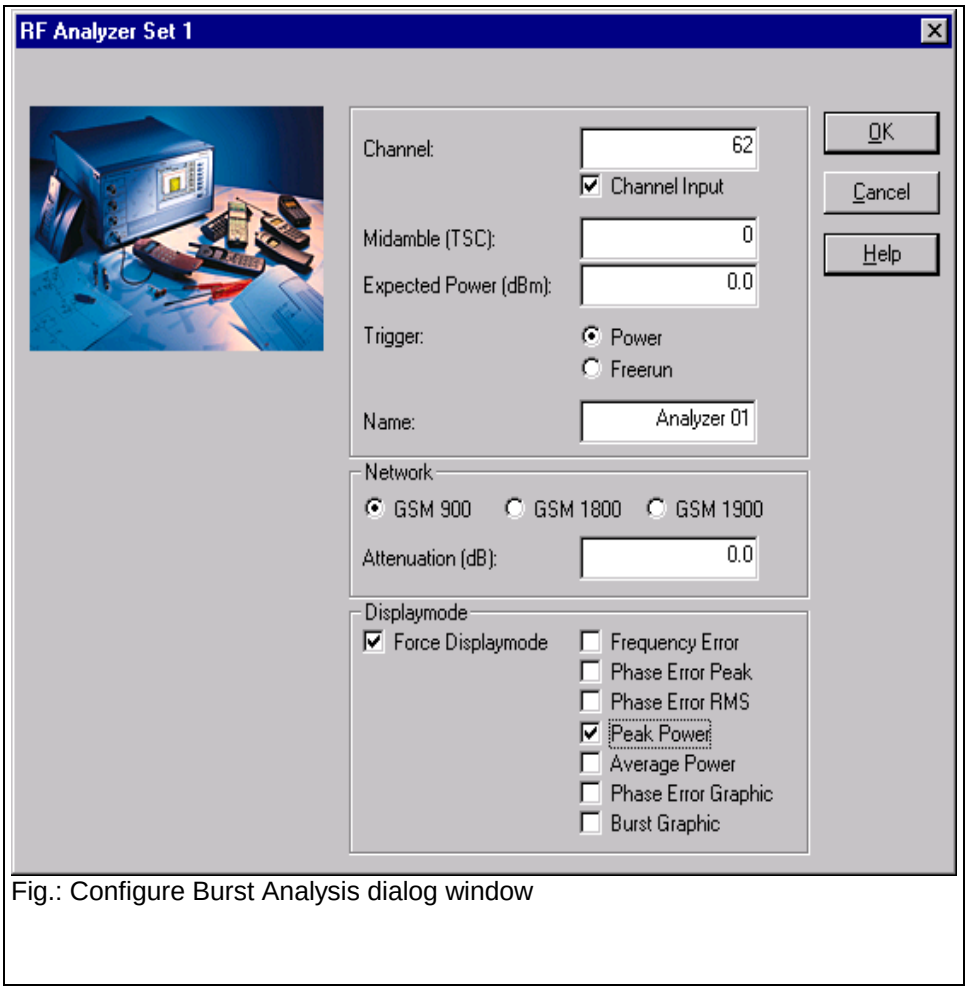
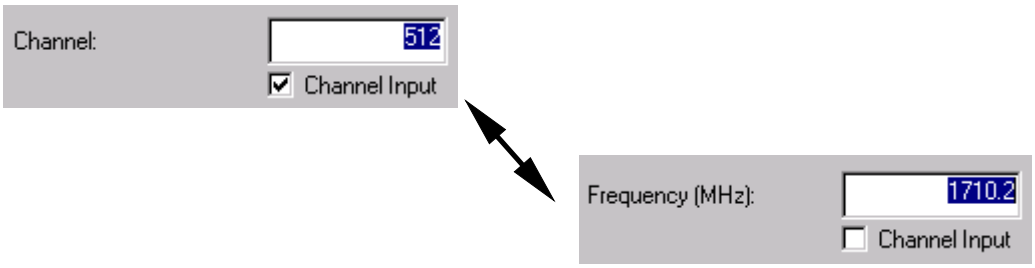


Fig.: Configure Burst Analysis dialog window

By activating the Channel Input box, you can change between channel and frequency input. If the frequency is entered, it it adapted to the GSM channel spacing.

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The entered channel or the conversion to its frequency also depends on the currently active network. Channels and associated frequencies are listed in the tables below. Channels outside the currently used band are displayed on a dark background.

Channel (GSM900)	Frequency	
-75	875.0 MHz	
-74	875.2 MHz	
...	...	
0	890.0 MHz...	
1	890.2 MHz	
2	890.4 MHz	
...	...	
123	914.6 MHz	
124	914.8 MHz	
...	...	
449	979.8 MHz	GSM 900 Kanal
450	980,0 MHz	Fictitious channel

Channel (GSM1800)	Frequency	
461	1700.0 MHz	
462	1700.2 MHz	
...	...	
512	1710.2 MHz...	
513	1710.4 MHz	
...	...	
884	1784.6 MHz	
885	1784.8 MHz	
...	...	
1510	1909.8 MHz	GSM 1800 Kanal
1511	1910.0 MHz	Fictitious channel

Channel (GSM1900)	Frequency	
-239	1700.0 MHz	
-238	1700.2 MHz	
...	...	
0	1747.8 MHz...	
...	...	
512	1850.2 MHz...	
513	1850.4 MHz	
...	...	
809	1909.6 MHz	
810	1909.8 MHz	GSM 1900 channel
811	1910.0 MHz	Fictitious channel

The burst analysis parameter set can be assigned a short name in the Name field. This short name appears both in the submenu and in the labeling of the buttons of the module test dialog. The associated network for the parameter set is determined by clicking on “GSM900“, “GSM1800“ and “GSM1900“. The input attenuation is also included in the parameter set and can be varied in the respective field.

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As a particular feature of the configuration dialog for burst analysis, you can force a certain display mode. When this configuration set is called later on, the popup windows of burst analysis will be opened or closed, certain measurements marked or some marking cleared. Select the desired display mode and make a mark the “Force Displaymode” box in this dialog window.

After completing all the configurations, press OK to send the settings to the CTS. If you do not want to change the currently active burst analysis settings of the CTS click on Cancel.

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7.4.4 IQ Spectrum Settings

The Configurations menu includes the submenu “IQ Spectrum Settings”. This submenu contains the menu items “IQ Spectrum 1” to “IQ Spectrum 10”. Select one of these commands to edit an IQ spectrum parameter set.
This command permits to set module test parameters in the dialog window “IQ Spectrum Settings“ . In the first field enter the channel of the signal to be evaluated, in the second the averaging factor, ie the number of burst for averaging. The expected power is entered in the third field and then signaled to the CTS. Besides, the dynamic range of the graphics result display for the power measurements depends on the selected setting. In the first field of the dialog window, you can enter whether a ramped or a continuous input signal is expected.

CW:
„Continuous Wave“, ie a signal with continuous power and without power ramp.

Burst:
The signal to be measured has a power ramp.

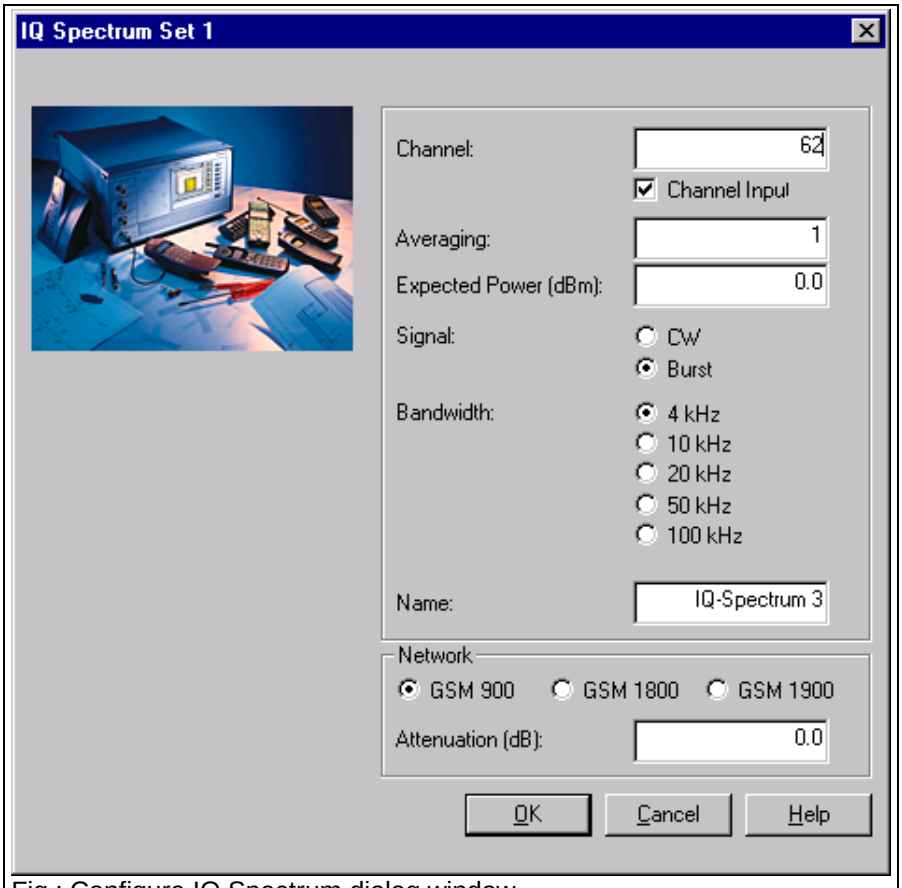


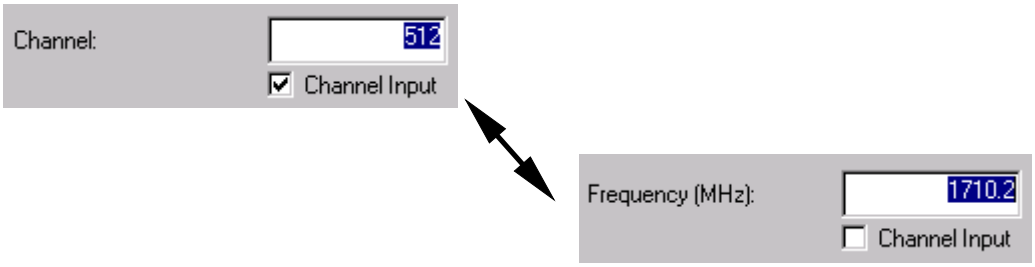
Fig.: Configure IQ Spectrum dialog window

In the second field of the dialog, the used bandwidth of the input filter is entered. The following settings are available:

- 4 kHz
- 10 kHz
- 20 kHz
- 50 kHz
- 100 kHz

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By activating the Channel Input box, you can change between channel input and frequency input. If the frequency is entered, it is adapted to the GSM channel spacing.



The entered channel or the conversion to its frequency also depends on the currently active network. Channels and associated frequencies are listed in the tables below. Channels outside the currently used band are displayed on a dark background.

Channel (GSM900)	Frequency
-75	875.0 MHz
-74	875.2 MHz
...	...
0	890.0 MHz...
1	890.2 MHz
2	890.4 MHz
...	...
123	914.6 MHz
124	914.8 MHz
...	...
449	979.8 MHz
450	980.0 MHz

GSM 900 channel
Fictitious channel

Channel (GSM1800)	Frequency
461	1700.0 MHz
462	1700.2 MHz
...	...
512	1710.2 MHz...
513	1710.4 MHz
...	...
884	1784.6 MHz
885	1784.8 MHz
...	...
1510	1909.8 MHz
1511	1910.0 MHz

GSM 1800 channel
Fictitious channel

Channel (GSM1900)	Frequency
-239	1700.0 MHz
-238	1700.2 MHz
...	...
0	1747.8 MHz...
...	...
512	1850.2 MHz...
513	1850.4 MHz
...	...
809	1909.6 MHz
810	1909.8 MHz
811	1910.0 MHz

GSM 1900 channel
Fictitious channel

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The IQ spectrum parameter set can be assigned a short name in the Name field. This short name appears both in the submenu and in the labeling of the buttons of the module test dialog window. The associated network is determined for the parameter set by clicking on “GSM900“, “GSM1800“ and “GSM1900“ in the respective field. The parameter set also includes the input attenuation which can be varied in the respective field.

After completing all configurations press OK to send the settings to the CTS. If you do not want to change the current IQ spectrum settings of the CTS press Cancel.

7.4.5 Remote Port

The same dialog window as for the GSM autotest is displayed. For further information refer to the respective chapter of the GSM autotest.

7.4.6 Change Password

The same dialog window as for the GSM autotest is displayed. For further information refer to the respective chapter of the GSM autotest.

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7.5 Configuration Menu in the DECT Autotest

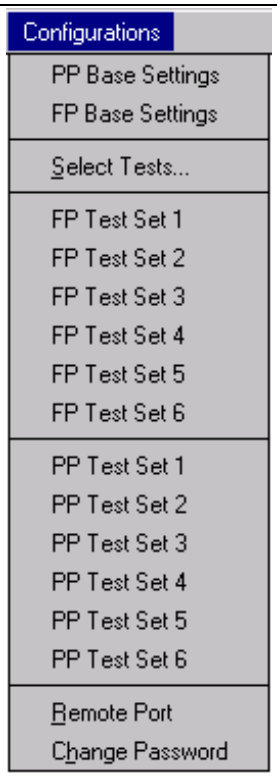


Fig.: Configuration menu in the DECT autotest

7.5.1 PP Base Settings

This command permits to call the “PP Base Settings“ dialog window. Use this dialog to adapt the test mode to the parameters of your portable part. The portable part can only be tested if the RFPI of the DUT is known. Enter this RFPI in the respective field. In order to test a set consisting of portable part and fixed part the RFPI from the FP test can be used. To do so, note the description of the FP base settings in this manual. In the two following fields, you can enter the channel and the slot of the dummy bearer generated by the CTS. The dummy bearer is the carrier to which a portable part is synchronized after it has been switched on. The Q-packages of the MAC level are sent from the CTS during the PP test. These are three binary packages Q0, Q3 and Q6. The associated values can be entered as hexadecimal values. The QMUX indicates the transmission sequence of the packages. A value of “03060306“ means that first a Q0, then a Q3, a further Q0 and then a Q6 package, etc. are sent. Further information on Q-package messages can be obtained from the ETSI standard ETS 300-175 Part 3. Finally, for compensation of RF losses, you can enter attenuation values for the input and output in the respective. The CTS will then convert its output level and the measured output power of the mobile accordingly.

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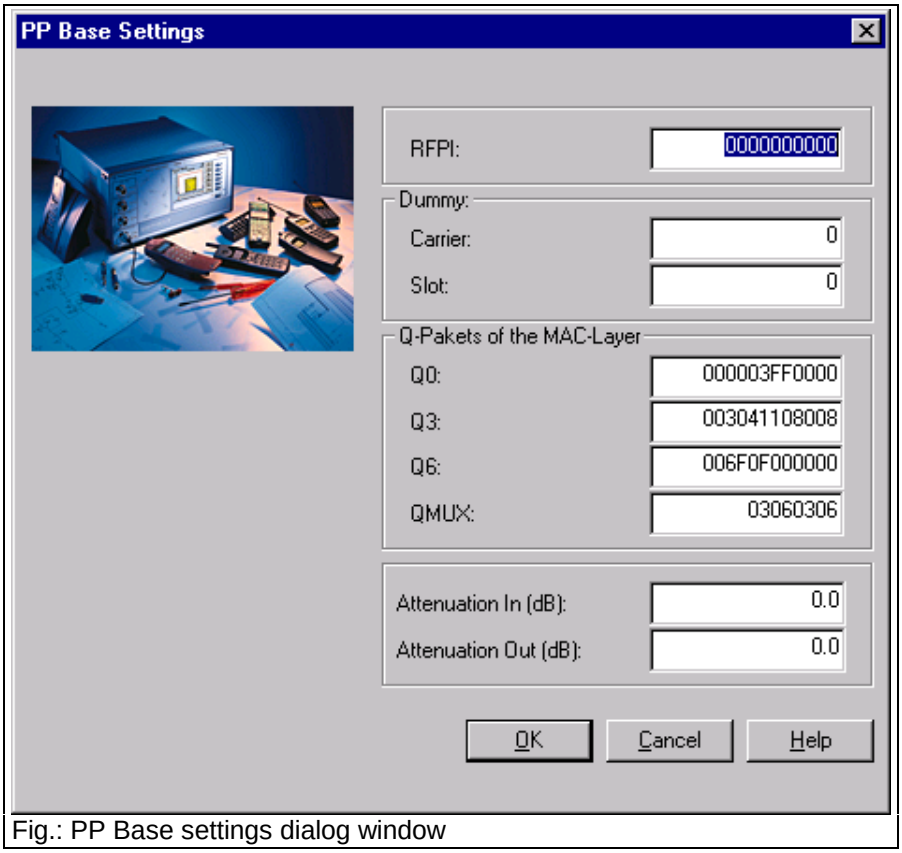


Fig.: PP Base settings dialog window

Note:
For information about how to switch the portable part to service mode contact your manufacturer.
It is very difficult to determine the attenuation to be set for DECT devices empirically. On the one hand, fixed parts or portable parts have no antenna connectors, which is why antenna couplers must be used. On the other hand, neither portable parts nor fixed parts signal the power received at the antenna to the tester as in the case of GSM mobiles. If there are no empirical values for PP or FP or the coupler, they can only be derived from the two values NTP and BER. The NTP of portable part and fixed part is typically 24 dBm. If no attenuation is entered on the CTS, the input attenuation can be approximately determined from the difference between the measured NTP and the typical NTP. The output attenuation is obtained via the BER, the bit error rate typically increases considerably starting from a certain receiving level on the DUT. If the sensitivity of the DUT and thus the associated output level of the CTS is known, the attenuation can again be approximately determined from the difference between the expected output level and the set output level. In general, large limits should be selected for the tests for determination of power and bit error rate in order to take into account the inaccurate determination of the attenuation.

7.5.2 FP Base Settings

This command is used to call the dialog window “FP Base Settings“. Use this dialog window to adapt the tester to the settings of your fixed part. After your fixed part has been switched to service mode, it continuously transmits the dummy bearer with a typical RFPI. The CTS can detect the RFPI of the strongest dummy bearer. If you wish automatic use of this RFPI, click on the respective box. You can as well enter the RFPI manually in the RFPI field. In this case, make sure that there is no mark in the respective box. By means of the box “Use detected RFPI in PP Test”, you can automatically use a detected RFPI in the subsequent portable part test. This is particularly useful if you want to measure both the fixed part and the portable part, but do not know the RFPI of this set. Enter the MAC identity of the portable part expected from your fixed part in the PMID field. In the FP test, the CTS behaves like a portable part. During the test, the fixed part queries this PMID. Normally, fixed parts accept any PMID in service mode, however, it is also possible that it accepts only certain PMIDs , eg only PMIDs starting with “Exxxx“. In case of doubts, you can look up the PMID of the portable part in manual CTS mode in the menu “Call set up” of the Portable Part Test.

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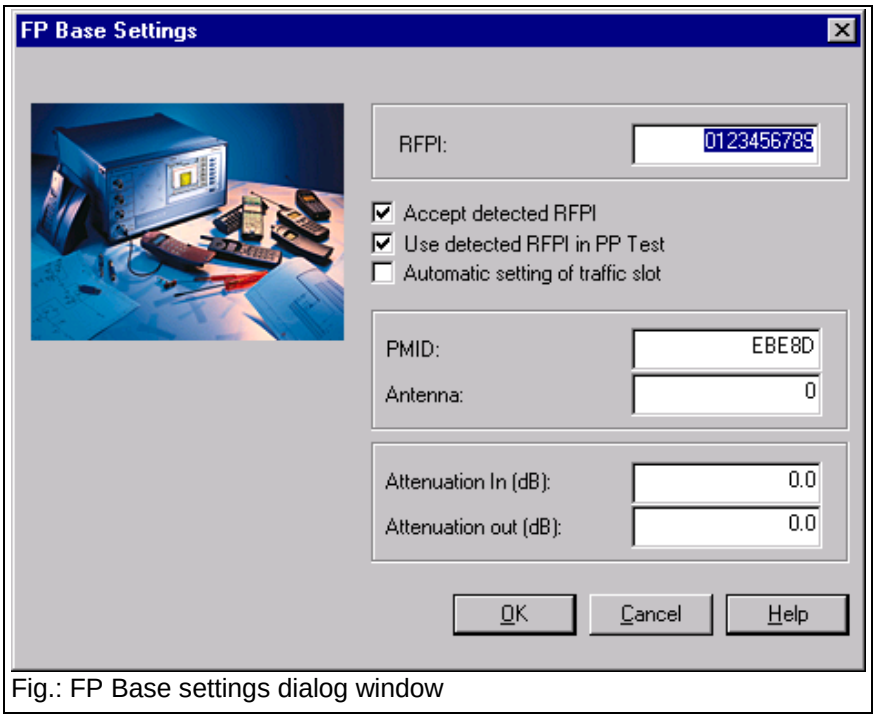


Fig.: FP Base settings dialog window

The antenna to be used can be entered in the input field below. The input and output attenuation are entered in two further fields.

Note:
For information about how to switch the portable part to service mode contact your manufacturer.
It is very difficult to determine the attenuation to be set for DECT devices empirically. On the one hand, fixed parts or portable parts have no antenna connectors, which is why antenna couplers must be used. On the other hand, neither portable parts nor fixed parts signal the power received at the antenna to the tester as in the case of GSM mobiles. If there are no empirical values for PP or FP or the coupler, they can only be derived from the two values NTP and BER. The NTP of portable part and fixed part is typically 24 dBm. If no attenuation is entered on the CTS, the input attenuation can be approximately determined from the difference between the measured NTP and the typical NTP. The output attenuation is obtained via the BER, the bit error rate typically increases considerably starting from a certain receiving level on the DUT. If the sensitivity of the DUT and thus the associated output level of the CTS is known, the attenuation can again be approximately determined from the difference between the expected output level and the set output level. In general, large limits should be selected for the tests for determination of power and bit error rate in order to take into account the inaccurate determination of the attenuation.

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7.5.3 Select Tests

This command opens the dialog window below. The number of test sets for the fixed part test and the number of test sets for the portable part test are selected using the respective boxes. If you do not want to perform a fixed part test or a portable part test, clear the respective mark in the box. Up to six FP test sets and six PP test sets are provided.

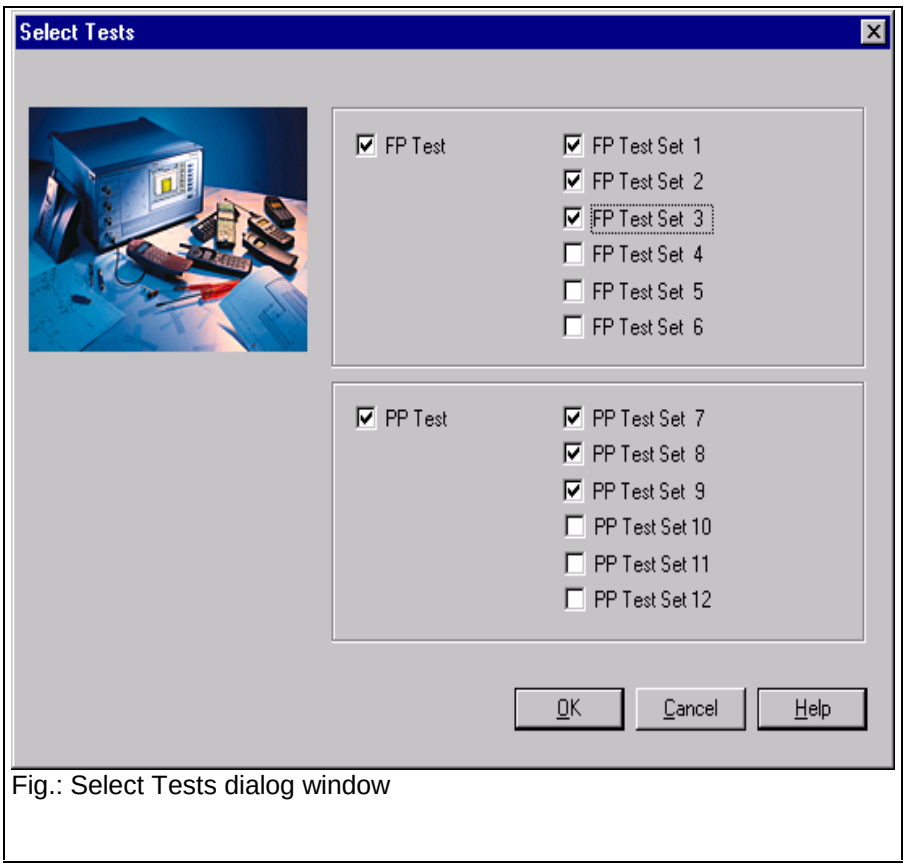


Fig.: Select Tests dialog window

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7.5.4 FP Test Set 1

Within the test sets, you can determine the measurements to be performed for a traffic bearer. To this end, enter the carrier of the traffic bearer to be used in the first input field. You may as well enter the carrier offset. In addition, the slot to be used can also be defined in the respective field. Select the tests to be performed within the frames “RX Measurements” and “TX Measurements” by checking the respective boxes.

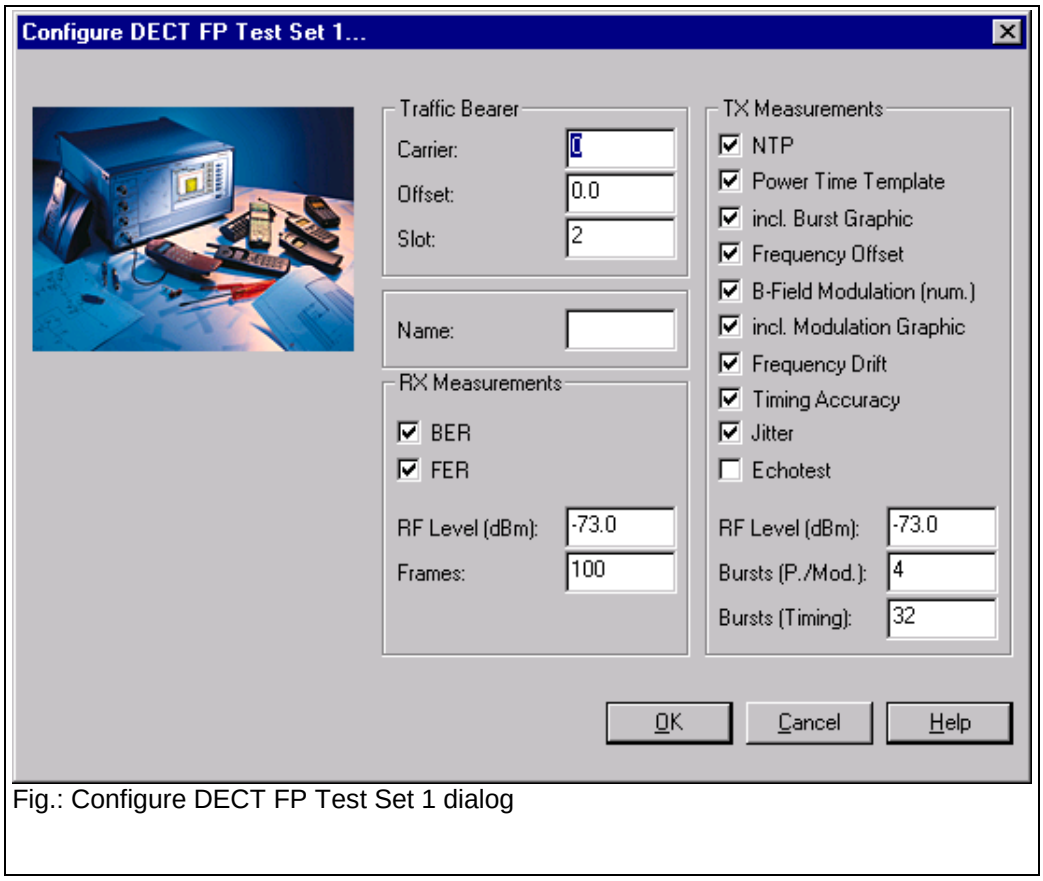


Fig.: Configure DECT FP Test Set 1 dialog

The assignment of frequencies and channel and offset values can be obtained from the table below:

Chan-nel		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Offset	**-3**	1902.528	1900.800	1899.072	1897.344	1895.616	1893.888	1892.160	1890.432	1888.704	1886.976
	-2.5	1901.664	1899.936	1898.208	1896.480	1894.752	1893.024	1891.296	1889.568	1887.840	1886.112
	-2	1900.800	1899.072	1897.344	1895.616	1893.888	1892.160	1890.432	1888.704	1886.976	1885.248
	-1.5	1899.936	1898.208	1896.480	1894.752	1893.024	1891.296	1889.568	1887.840	1886.112	1884.384
	-1	1899.072	1897.344	1895.616	1893.888	1892.160	1890.432	1888.704	1886.976	1885.248	1883.520
	-0,5	1898.208	1896.480	1894.752	1893.024	1891.296	1889.568	1887.840	1886.112	1884.384	1882.656
	0	**1897.344**	**1895.616**	**1893.888**	**1892.160**	**1890.432**	**1888.704**	**1886.976**	**1885.248**	**1883.520**	**1881.792**
	0,5	1896.480	1894.752	1893.024	1891.296	1889.568	1887.840	1886.112	1884.384	1882.656	1880.928
	1	1895.616	1893.888	1892.160	1890.432	1888.704	1886.976	1885.248	1883.520	1881.792	1880.064
	1.5	1894.752	1893.024	1891.296	1889.568	1887.840	1886.112	1884.384	1882.656	1880.928	1879.200
	2	1893.888	1892.160	1890.432	1888.704	1886.976	1885.248	1883.520	1881.792	1880.064	1878.336
	2.5	1893.024	1891.296	1889.568	1887.840	1886.112	1884.384	1882.656	1880.928	1879.200	1877.472
	3	1892.160	1890.432	1888.704	1886.976	1885.248	1883.520	1881.792	1880.064	1878.336	1876.608

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The following RX measurements are available:

- BER (Bit Error Rate)
- FER (Frame Error Rate)

The RF output level of the CTS for these measurements is to be determined in the RF Level field of RX Measurements. Besides, the number of frames to be sent is determined.

The following TX measurements are available:

- NTP (Normal Transmit Power)
- Power ramp (Template)
- Graphics burst display in the appendix to the measurement report
- Frequency offset
- B-field modulation
- Graphics display of the modulation in the appendix to the measurement report
- Frequency drift
- Time accuracy
- Jitter
- Acoustic echo test

For these measurements, the RF output level of the CTS is to be entered in the RF Level field of TX Measurements. Besides, the number of bursts to be sent is determined for the power and modulation measurement or the number of bursts to be sent for the timing measurement.

Note:
This command can only be called if FP test set 1 is activated for the test.

7.5.5 FP Test Set 2

You can determine the tests to be performed for the Traffic Bearer. For details refer to the description of FP Test set 1.

Note:
This command can only be called if FP Test set 2 is activated for the test.

7.5.6 FP Test Set 3

You can determine the tests to be performed for the Traffic Bearer. For more details refer to the description of FP test set 1.

Note:
This command can only be called if FP test set 3 is activated for the test.

7.5.7 FP Test Set 4

You can determine the tests to be performed for the Traffic Bearer. For more details refer to the description of FP test set 1.

Note:
This command can only be called if FP test set 4 is activated for the test.

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7.5.8 FP Test Set 5

You can determine the number of tests for the Traffic Bearer. For more details refer to the description of FP test set 1.

Note:
This command can only be called if FP test set 5 is activated for the test.

7.5.9 FP Test Set 6

You can determine the tests to be performed for the Traffic Bearer. For more details refer to the description of FP test set 1.

Note:
This command can only be called if FP test set 6 is activated for the test.

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7.5.10 PP Test Set 1

Within the test sets, you can determine the tests to be performed for a traffic bearer. To do so, enter the carrier of the traffic bearer to be used in the first input field. You can as well enter the carrier offset. In addition, you can define the used slot in the respective field. Select the tests to be performed for the RF measurements and the TX measurements by checking the respective boxes.

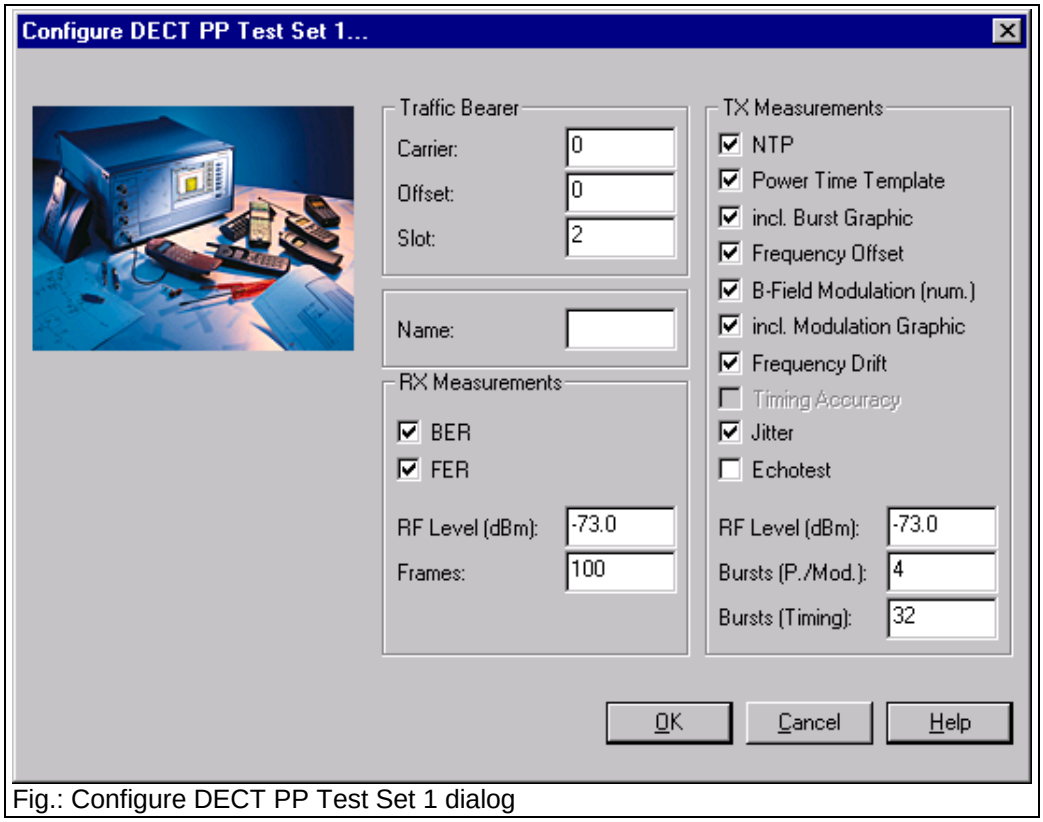


Fig.: Configure DECT PP Test Set 1 dialog

The assignment of frequencies to channel and offset values can be obtained from the table below. Bear in mind that only integral offset values are permissible when testing a portable part.

Chan-nel		0	1	2	3	4	5	6	7	8	9
Offset	**-3**	1902.528	1900.800	1899.072	1897.344	1895.616	1893.888	1892.160	1890.432	1888.704	1886.976
	-2	1900.800	1899.072	1897.344	1895.616	1893.888	1892.160	1890.432	1888.704	1886.976	1885.248
	-1	1899.072	1897.344	1895.616	1893.888	1892.160	1890.432	1888.704	1886.976	1885.248	1883.520
	0	**1897.344**	**1895.616**	**1893.888**	**1892.160**	**1890.432**	**1888.704**	**1886.976**	**1885.248**	**1883.520**	**1881.792**
	1	1895.616	1893.888	1892.160	1890.432	1888.704	1886.976	1885.248	1883.520	1881.792	1880.064
	2	1893.888	1892.160	1890.432	1888.704	1886.976	1885.248	1883.520	1881.792	1880.064	1878.336
	3	1892.160	1890.432	1888.704	1886.976	1885.248	1883.520	1881.792	1880.064	1878.336	1876.608

The following RX measurements are available:

- BER (Bit error rate)
- FER (Frame error rate)

For these measurements, the RF output level of the CTS is defined in the RF Level field for RX measurements. Besides, the number of frames to be sent is entered.

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The following TX measurements are available:

- NTP (Normal Transmit Power)
- Power ramp (Template)
- Graphics burst display in the appendix to the measurement report
- Frequency offset
- B-field modulation
- Graphics display of modulation in the appendix to the measurement report
- Frequency drift
- Jitter
- Acoustic echo test

For these measurements, the RF output level of the CTS is to be entered in the RF Level field for the TX measurements. Besides, the number of bursts to be sent is defined for power and modulation measurements or the number of bursts to be sent for the timing measurements.

Note:
This command can only be called if PP test set 1 is activated for the tests.

7.5.11 PP Test Set 2

You can determine the tests to be performed for the specified TCH channel. For more details refer to the description of test set 1.

Note:
This command can only be called if PP test set 2 is activated for the tests.

7.5.12 PP Test Set 3

You can determine the tests to be performed for the specified TCH channel. For more details refer to the description of test set 1.

Note:
This command can only be called if PP test set 3 is activated for the tests.

7.5.13 PP Test Set 4

You can determine the tests to be performed for the specified TCH channel. For more details refer to the description of test set 1.

Note:
This command can only be called if PP test set 4 is activated for the tests.

7.5.14 PP Test Set 5

You can determine the tests to be performed for the specified TCH channel. For more details refer to the description of test set 1.

Note:
This command can only be called if PP test set 5 is activated for the tests.

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7.5.15 PP Test Set 6

You can determine the tests to be performed for the specified TCH channel. For more details refer to the description of test set 1.

Note:
This command can only be called if PP test set 6 is activated for the tests.

7.5.16 Remote Port

The same dialog window appears as for the GSM autotest, for more information refer to the respective chapter of the GSM autotest.

7.5.17 Change Password

The same dialog window appears as for the GSM autotest, for more information refer to the respective chapter of the GSM autotest.

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7.6 Limits Menu in the GSM Autotest

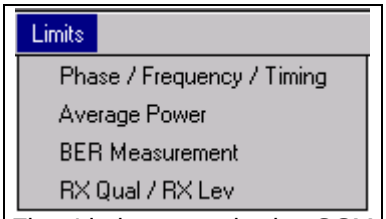


Fig.: Limits menu in the GSM autotest

With the items in the Limits menu, the upper and lower limits for the results are set. The settings made here influence all subsequently generated measurement reports. Tolerances of already stored measurement reports will not be influenced by these settings. Set limits are displayed in the second and third column of the measurement report.

Note:
It is recommended to store the settings in the form of a configuration file.

7.6.1 Phase / Frequency / Timing

This dialog window permits to define tolerances for frequency error, RMS phase error, peak phase error and timing error measurements. The frequency error is entered for GSM900, the values for GSM1800 and GSM1900 are automatically two times the entered value. Entered values are set by pressing OK. If newly entered limit values should not be set, terminate the dialog with Cancel.

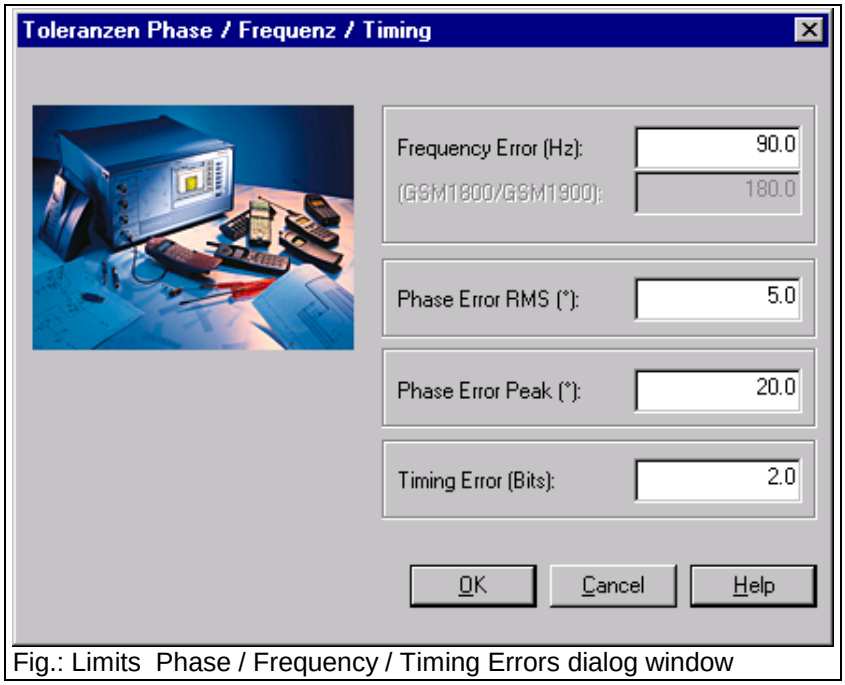


Fig.: Limits Phase / Frequency / Timing Errors dialog window

Set limits are indicated in the second and third column of the measurement report. Refer to the report section shown below.

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Frequency Error *(at BS Power -70.0 dBm, 10 Bursts)*	-90.00 Hz	90.00 Hz	-44.00 Hz	✔
Phase Error RMS	-5.00 °	5.00 °	3.10 °	✔
Phase Error Peak	-20.00 °	20.00 °	9.30 °	✔
Timing Error	-2.00 Bits	2.00 Bits	-0.50 Bits	✔

Fig.: Extract from Phase / Frequency / Timing Error measurement report

7.6.2 Average Power

You may specify your own tolerances for the average power measurement. According to GSM specifications, the limits depend on the power control level (PCL) used by the mobile for transmission to the base station (CTS). Tolerances at the highest level are narrower than those at the other levels. Enter the value for the highest level in the Tolerance 1 field, tolerances for the other PCLs in the Tolerance 2 field. The lowest power level, which was introduced with GSM phase II, is compared with the value entered for Tolerance 3. Tolerances specified for GSM900 are listed in the table below:

Power Control Level	expected output power	Tolerance
0-2	39 dBm	± 2.0 dB
3	37 dBm	± 3.0 dB
4	35 dBm	± 3.0 dB
5	33 dBm	± 3.0 dB
6	31 dBm	± 3.0 dB
7	29 dBm	± 3.0 dB
8	27 dBm	± 3.0 dB
9	25 dBm	± 3.0 dB
10	23 dBm	± 3.0 dB
11	21 dBm	± 3.0 dB
12	19 dBm	± 3.0 dB
13	17 dBm	± 3.0 dB
14	15 dBm	± 3.0 dB
15	13 dBm	± 3.0 dB
16	11 dBm	± 5.0 dB
17	9 dBm	± 5.0 dB
18	7 dBm	± 5.0 dB
19	5 dBm	± 5.0 dB

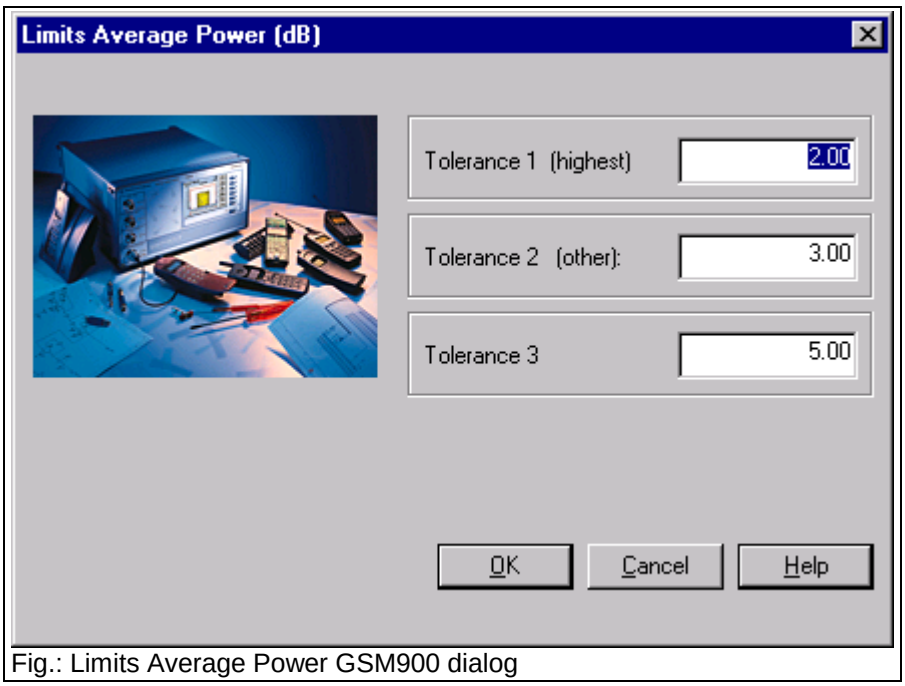


Fig.: Limits Average Power GSM900 dialog

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The maximum output power of a mobile is specified by its power class (Mobile Power Class). This information is queried by the sequence control from the DUT and influences the choice of tolerance.

Power class GSM 900	maximum output power
1	43 dBm (see note)
2	39 dBm
3	37 dBm
4	33 dBm
5	29 dBm

Originally, power class 1 and PCL 0 were fixed at 43 dBm. Since no mobiles operate in this power class, the maximum output power of a GSM900 mobile is limited to 39 dBm.

Example:
A mobile of power class 4 is to be measured. The maximum mobile output power corresponds to 33 dBm or PCL 5. The ± 2.0 dB tolerance of PCL 5 is therefore used in this case.

With GSM1800 and GSM1900, four PCL-specific tolerances can be specified. They are entered in the four fields of the Limits Average Power dialog window. The modified dialog window is displayed when one of the two networks is selected in the Configure Network dialog window.

Power control level (PCL)	expected output power	Tolerance
0	30 dBm	± 2.0 dB
1	28 dBm	± 3.0 dB
2	26 dBm	± 3.0 dB
3	24 dBm	± 3.0 dB
4	22 dBm	± 3.0 dB
5	20 dBm	± 3.0 dB
6	18 dBm	± 3.0 dB
7	16 dBm	± 3.0 dB
8	14 dBm	± 3.0 dB
9	12 dBm	± 4.0 dB
10	10 dBm	± 4.0 dB
11	8 dBm	± 4.0 dB
12	6 dBm	± 4.0 dB
13	4 dBm	± 4.0 dB
14	2 dBm	± 5.0 dB
15	0 dBm	± 5.0 dB

PCLs 29, 30 and 31 defined by GSM1800 are not supported by the CTSgo program.

29	36 dBm	± 2.0 dB
30	34 dBm	± 2.0 dB
31	32 dBm	± 2.0 dB

PCLs 30 and 31 defined in GSM1900 are not supported by the CTSgo program.

30	33 dBm	± 2.0 dB
31	32 dBm	± 2.0 dB

As with GSM900, the highest mobile power level is weighted with Tolerance 1.
Power classes of GSM1800 and GSM1900 can be obtained from the two tables below. Power classes which are not supported appear on a dark background.

Power class GSM 1800	maximum output power
1	30 dBm
2	24 dBm
3	36 dBm

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Power class GSM 1900	maximum output power
1	30 dBm
2	24 dBm
3	33 dBm

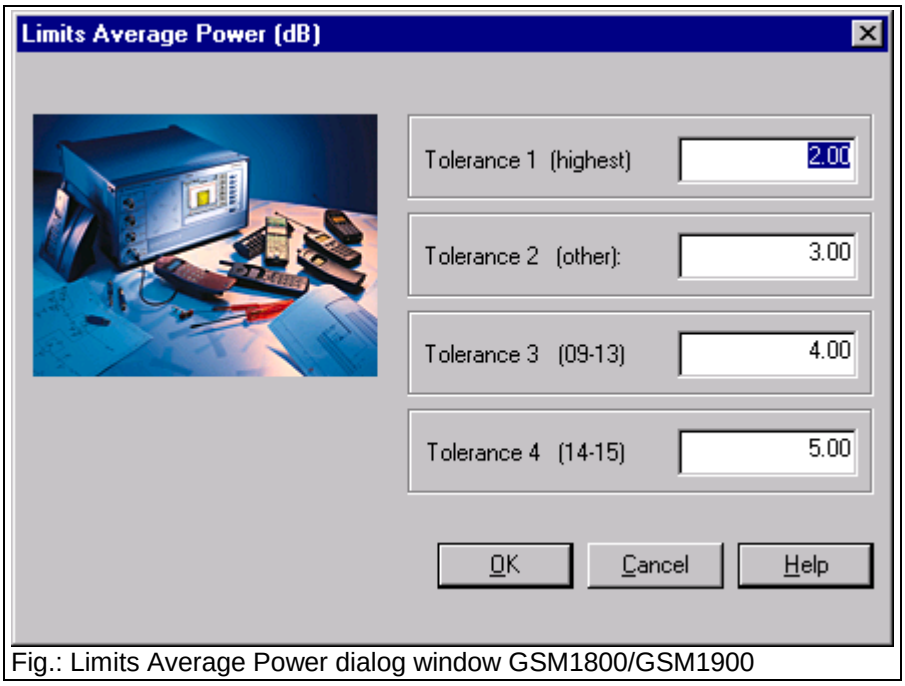


Fig.: Limits Average Power dialog window GSM1800/GSM1900

Entered values are set by pressing OK. If the entered limit values should not be set, terminate the dialog with Cancel.

Set limits are indicated in the second and third column of the measurement report. This can be seen in the following extract from a measurement report.

Average Power MS *(at BS Power -70.0 dBm)*	31.00 dBm	35.00 dBm	32.30 dBm	✔
Power Time Template			passed	✔

Fig.: Extract from measurement report: Average power / power ramp

Since power ramp tolerance evaluation is performed according to GSM specifications, the values cannot be changed by CTSgo. The finding of CTS is transferred to the PC as a Passed or Failed message.

7.6.3 BER Measurements

This command opens the Limits BER dialog window where the tolerances for the bit error rate (BER) are set. BER measurements are receiver measurements in which bits from a random generator sent by the CTS are received by the mobile, demodulated and looped back at the RF. The CTS compares the received bit sequence with the sent one. The bit sequence is channel-coded to GSM, ie the bits are assigned to different classes.

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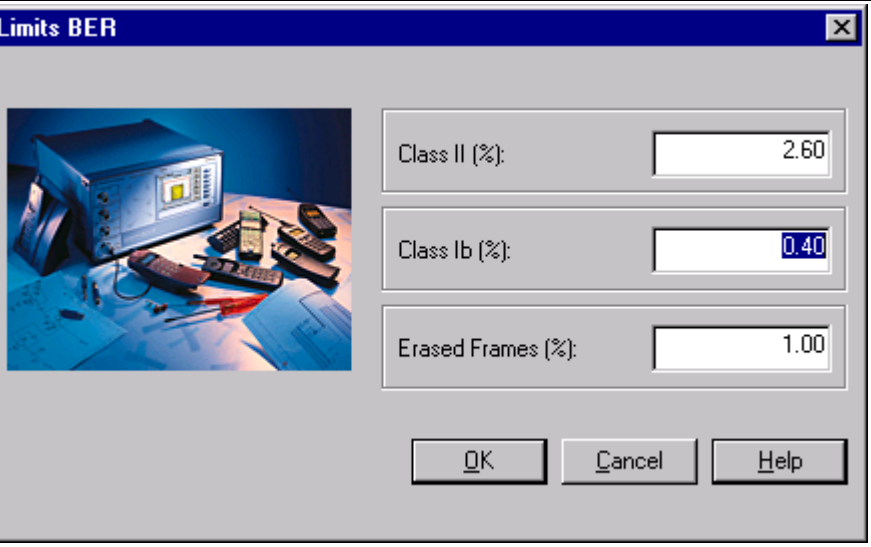


Fig.: Limits BER dialog window

Class II, the maximum permissible BER of which is to be specified in the first input field, contains unprotected bits. These bits normally transfer data that do not seriously impair transmission when the bits are lost. Bits of class Ib are protected, ie they can be restored by means of error correction. Enter the maximum permissible BER of class Ib in the second field. The bits are organized in frames for the employed BER measurement. This test method is also called residual bit error rate (RBER). If large errors occur within a frame, the respective frames are erased. The tolerance for frame erasure (EFR) can be entered in the third field.
The BER largely depends on the CTS output power used for this measurement. The output power can be set in the Configure Test Set window. You may have to know and enter the path attenuation between CTS and DUT, as even minor variations of the mobile input level may cause considerable changes of BER near the maximum sensitivity of the mobile. the number of frames used for the BER measurement should be entered in the Test Parameters dialog window.

BER Class Ib *(at BS Power -102.0 dBm, 50 Frames)*		0.40 %	0.00 %	✔
BER Class II		2.60 %	0.08 %	✔
BER Erased Frames		1.00 %	0.00 %	✔

Fig.: Extract from measurement report: BER measurements

The selected upper limits for the BER are indicated in the third column of the measurement report (see above).

7.6.4 RXQual /RXLev

RXQual and RXLev are measurements performed by the mobile. Measurement results are sent cyclically to the base station (CTS) in the form of measurement reports. The RXQual measurement informs on the receive quality of the mobile. Enter the maximum permissible RXQual in the first input field. Each RXQUal corresponds to a specific BER which can be seen from the table below.

Value of RXQual	Receive quality of signal (BER)
0	< 0.2%
1	> 0.2% to <0.4%
2	> 0.4% to <0.8%
3	> 0.8% to <1.6%
4	> 1.6% to <3.2%
5	> 3.2% to <6.4%
6	> 6.4% to <12.8%
7	> 12.8%

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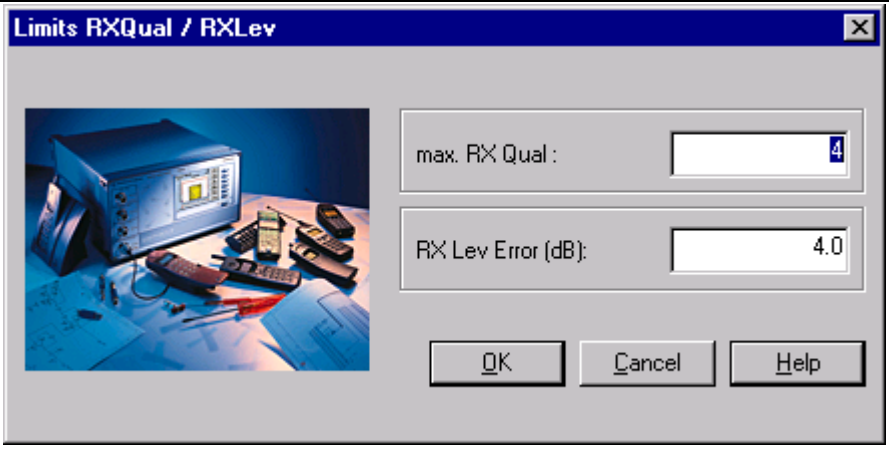


Fig.: Limits RXQual / RXLev dialog window

RXLev is the power received by the mobile and signaled to the base station as values from 0 to 63.

RXLev value	Signal strength (dBm)
63	> -48 dBm
62	-49 dBm to -48 dBm
61	-50 dBm to -49 dBm
...	...
...	...
2	-109 dBm to -108 dBm
1	-110 dBm to -109 dBm
0	below -110 dBm

The RXLev test evaluates the deviation of RXLev from the RF output power of CTS specified in the test set window. To give an example, a received RXLev value of 8 is interpreted as -102.5 dBm. Tolerances should not be too narrow because of the low resolution of this measurement.

RX Qual *(at BS Power -102.0 dBm)*		4.00	0.00	✔
RX Lev	-106.00 dBm	-98.00 dBm	-102.50 dBm	✔

Fig.: Extract from measurement report: RXQual / RXLev

To allow symmetrical tolerance evaluation, the base-station power for BER should be specified to 0.5 dB. An example is given below:

BS power for BER:	-89.5 dBm
Tolerance:	2.0 dB
Upper tolerance limit:	-87.5 dBm (RXLev =23)
Lower tolerance limit:	-91.5 dBm (RXLev =19)

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7.7 Limits Menu in the DECT Autotest

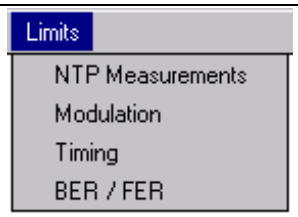


Fig.: Limits menu in the DECT autotest

With the items in the Limits menu, the upper and lower limits for the results are set. The settings made here influence all subsequently generated measurement reports. Tolerances of already stored measurement reports will not be influenced by these settings. Set limits are displayed in the second and third column of the measurement report.

Note:
It is recommended to store the settings in the form of a configuration file.

7.7.1 NTP Measurements

This dialog window permits to define tolerances for Normal Transmit Power (NTP) measurements. The NTP is the average power in the active part of the burst. Entered values are set by pressing OK. If newly entered limit values should not be set, terminate the dialog with Cancel.

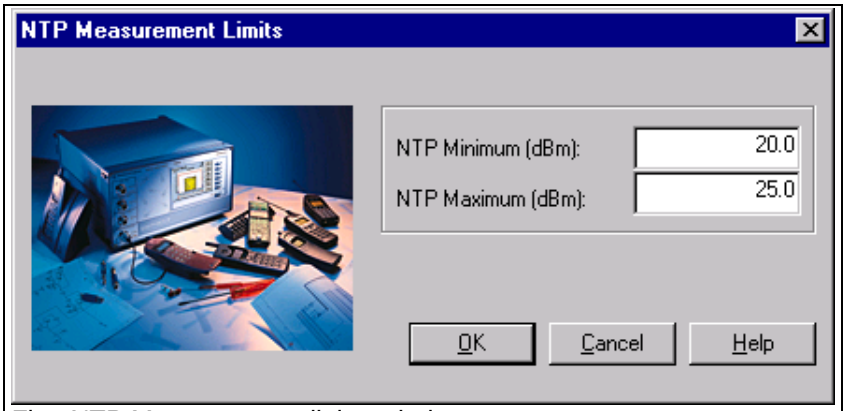


Fig.: NTP Measurement dialog window

Set limits are indicated in the second and third column of the measurement report. Refer to the report section shown below.



Fig.: Extract from the NTP measurement report

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7.7.2 Modulation

This dialog permits to define the tolerance limits for the B-field modulation, the frequency offset and the frequency drift. Entered values are set by pressing OK. If newly entered limit values should not be set, terminate the dialog with Cancel.

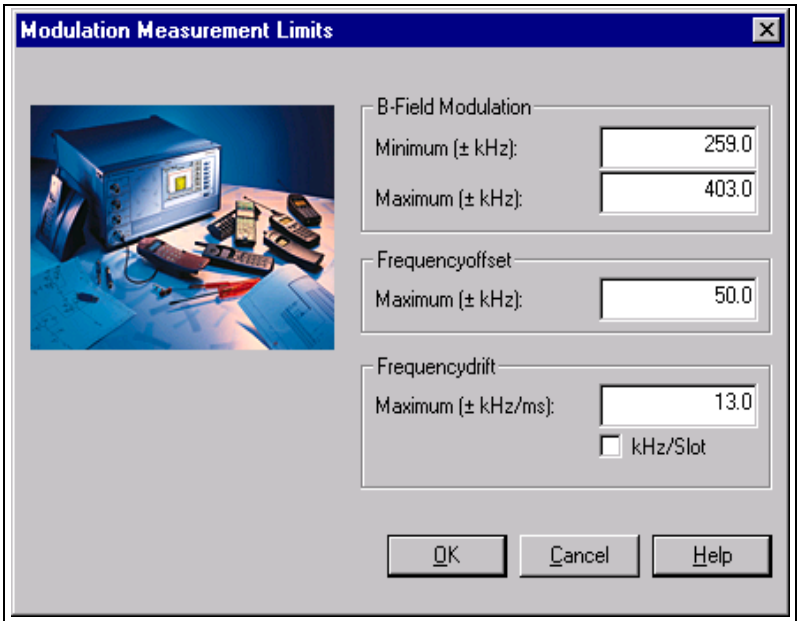


Fig.: Limits Modulation dialog

Set limits are indicated in the second and third column of the measurement report. Refer to the report section shown below.

Frequency Offset *(at RF Level -73.0 dBm, 4 Bursts)*	-50.00 kHz	50.00 kHz	9.32 kHz	✔
B-Field Modulation (-Max.)	-403.00 kHz	-259.00 kHz	-338.87 kHz	✔
B-Field Modulation (+Max.)	259.00 kHz	403.00 kHz	370.26 kHz	✔
Frequencydrift	-13.00 kHz/ms	13.00 kHz/ms	0.00 kHz/ms	✔

Fig.: Extract from the Modulation measurement report

Notes:
Data type Fig31 is always used for the CTSgo measurements. Within the B-field, this implies a number of 0/1s bit sequences, then a number of set bits (1s bits), followed by a number of set bits (0s bits) and a final 0/1s bit sequence. On the average, this figure contains as many bits that are set as bits that are not set in the B-field. If the arithmetic mean of the frequency offsets was generated, the result would correspond to the center frequency in the ideal case. The deviation is the frequency offset measured. Starting from this frequency offset, the maximum and the minimum deviation in the B-field will then be measured, with no differentiation being made between positive and negative deviation.
The unit of the frequency drift can be entered in the respective box in kHz/slot. Otherwise, the output will be in kHz/ms.

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7.7.3 Timing

This dialog permits to define the tolerance limits for the jitter and timing measurements. The entered values are set by pressing OK. If newly entered values should not be set, terminate the dialog with Cancel.

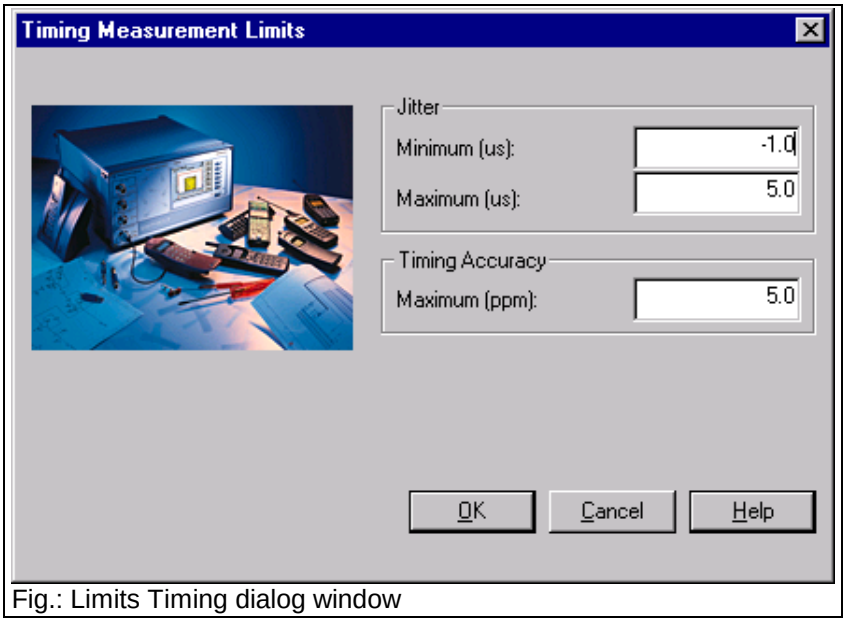


Fig.: Limits Timing dialog window

Set limits are indicated in the second and third column of the measurement report. Refer to the report section shown below.

Timing Accuracy *(at RF Level -73.0 dBm, 32 Bursts)*		5.00 ppm	4.81 ppm	✔
Jitter (-Max.)	-1.00 us		-0.72 us	✔
Jitter (+Max.)		5.00 us	1.59 us	✔

Fig.: Extract from the Timing measurement report

Note:
Theoretically, the interval between two transmit bursts of a fixed part is ten milliseconds. The measured deviation from this ideal value constitutes the timing. To be able to perform this measurement correctly, it is necessary to average over several bursts. In parallel to the average-value generation, the minimum and maximum time interval between two bursts is determined. The difference between minimum/maximum and average value is referred to as negative/positive jitter.

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7.7.4 BER / FER

This dialog permits to define the upper limit for the bit error rate (BER) and frame error rate (FER) measurements. Note that the entry is made in parts per million (ppm). The entered values are set by pressing OK. If the newly entered tolerance values should not be set, terminate the dialog with Cancel.

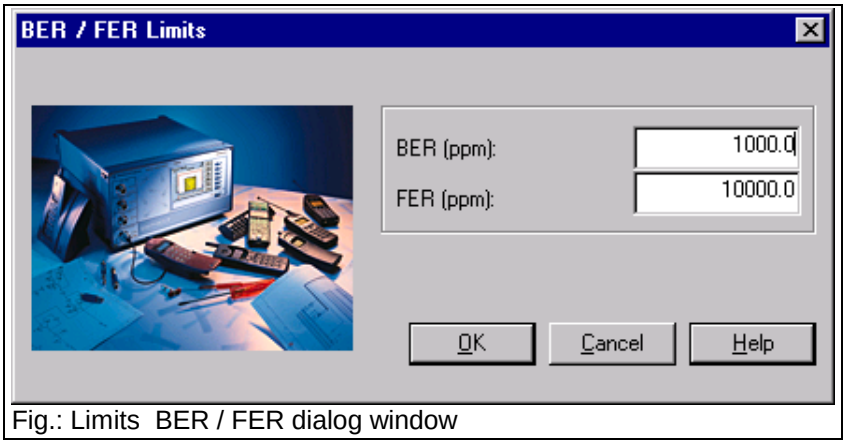


Fig.: Limits BER / FER dialog window

Set limits are indicated in the second and third column of the measurement report. Refer to the report section shown below.



Fig.: Extract from the BER / FER measurement report

Note:
The bit error rate is measured in loop mode of the fixed part or portable part. Sent and received bits are compared with each other. If more than 25% of the bits of a frame are faulty, this frame is declared to be invalid. These invalid frames are taken into account in the **F**rame **E**rror **R**ate and not in the BER.

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7.8 Window Menu

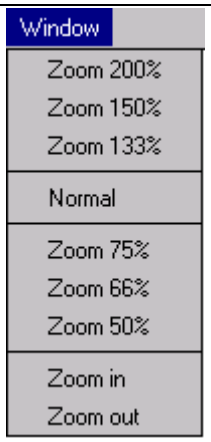


Fig.: Window menu

The Windows menu is only active in the report display mode. In this window, the display can be adapted to your requirements. The current size of the display is indicated in the status bar.

7.8.1 Zoom 200%

Popup menu Report display

This command expands the result display to 200% of the standard size.

7.8.2 Zoom 150%

Popup menu Report display

This command expands the result display to 150% of the standard size.

7.8.3 Zoom 133%

Popup menu Report display

This command expands the result display to 133% of the standard size.

7.8.4 Normal

Popup menu Report display

With this command, the result window is displayed in its normal size (100%).

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7.8.5 Zoom 75%

Popup menu Report display

This command reduces the result display to 75% of the standard size.

7.8.6 Zoom 66%

Popup menu Report display

This command reduces the result display to 66% of the standard size.

7.8.7 Zoom 50%

Popup menu Report display

This command reduces the result display to 50% of the standard size.

7.8.8 Zoom in

Popup Menu Report display

With this command, the size of the current result display is expanded by 10%.

7.8.9 Zoom out

Popup menu Report display

With this command, the current result display is reduced by 10%.

7.9 Help Menu



Fig.: Help menu

7.9.1 Contents



This command calls the online help of CTSgo. You can obtain information on CTSgo by means of the online help without having to refer to this manual. Information is provided in a Windows-typical form and available as a separate file in the program directory of CTSgo. The online help can be accessed without having to call CTSgo. Individual pages of the help information may be printed if required.

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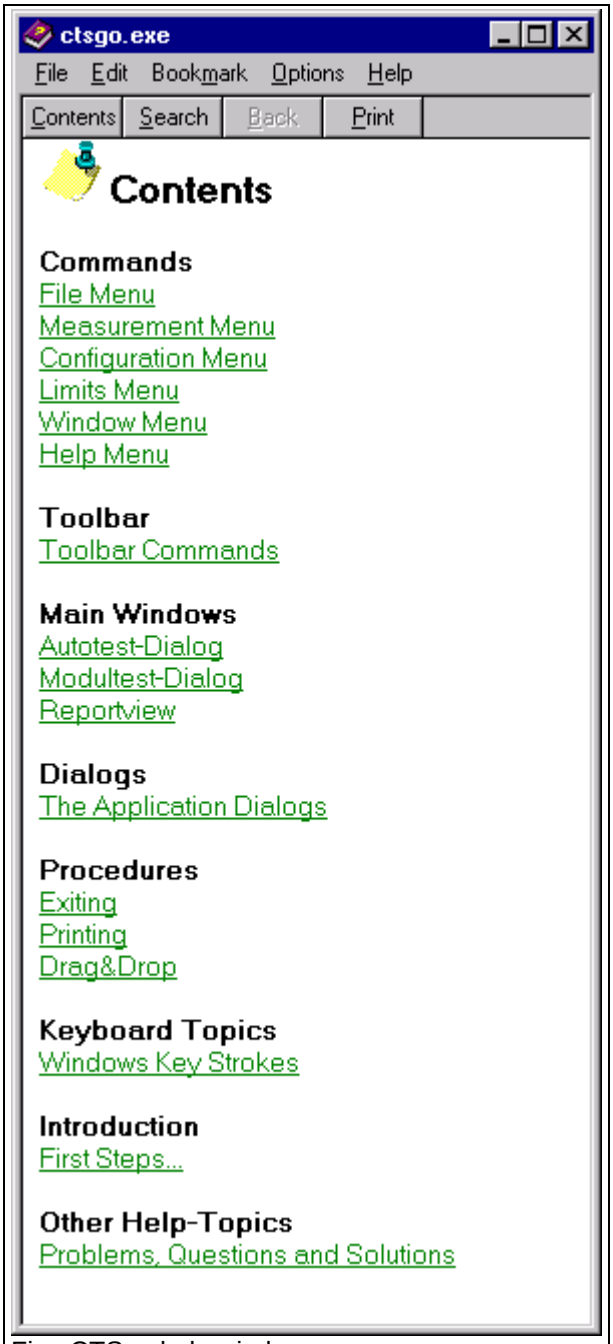


Fig.: CTSgo help window

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7.9.2 Using the Online Help

This command calls the online help of the employed operating system. The help is platform-specific and depends on the installation of the operating system. It also includes instructions on the use of the help files. General help topics of Windows can also be called.

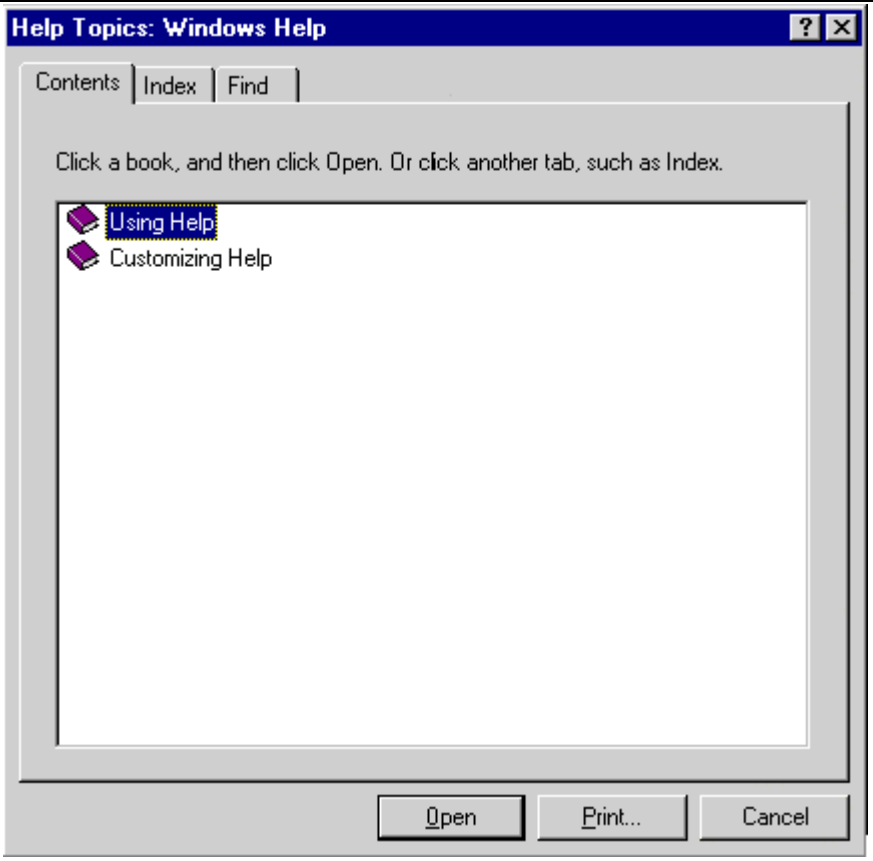


Fig.: Help topics of operating system

7.9.3 Info About

This command opens a small dialog window where the current CTSgo version is displayed. The platform-specific version of the program is also indicated.



Fig.: Info about CTSgo dialog window

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8 GSM Measurement Report

The measurement reports generated by the autotest provide a clear overview of measurement results. This section describes the layout of the measurement reports.

8.1 Header of Measurement Report

The header of the measurement report contains all static settings of the measurement, eg set input and output attenuation, CTS output power during location update and the selected BCCH channel. Below this line are signaling parameters like the IMSI (**I**nternational **M**obile **S**ubscriber **I**dentity) of the SIM card used, the IMEI (**I**nternational **M**obile **E**quipment **I**dentity) of the measured mobile, power class of the mobile and its revision level. The CTS identification is indicated in another line. Its purpose is to facilitate the assignment of the measurement report to the instrument used. The configuration used for the measurement is also indicated.

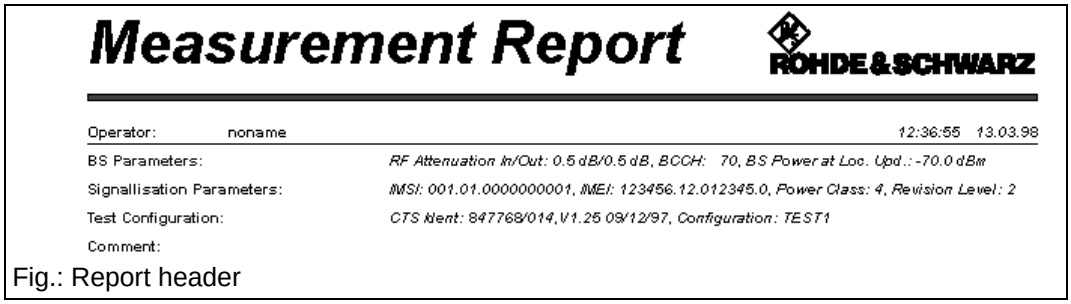


Fig.: Report header

The header also contains general information such as date and time of completion of the measurement, the operator's name and a comment line. The top of the header shows the title Measurement Report and next to it at the right a logo. In contrast to all other information, these two elements are also printed on the subsequent pages. The Rohde & Schwarz logo printed at the right can be replaced by another one. When items in the report are to be changed for further measurements, select Report Settings in the Measurement menu.

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8.2 Output of Measurement Information in the Report

When a call is set up by the mobile, the call number is entered in the measurement report. You can implement a simple keyboard test.

Dialed Number *(1. Connect)*		1234567890	✔

Fig.: Display of call number

The information on the individual measurements is indicated in five columns. The first column describes the measurement and, if required, certain measurement conditions, eg the number of bursts or frames or the CTS output power used.

Test Condition:	Lower Limit	Upper Limit	Measured Value	P/F
Testset: 1 (TCH: 62, Power Control Level: 5)				
Frequency Error *(at BS Power -70.0 dBm, 10 Bursts)*	-90.00 Hz	90.00 Hz	-44.00 Hz	✔
Phase Error RMS	-5.00 °	5.00 °	3.10 °	✔
Phase Error Peak	-20.00 °	20.00 °	9.30 °	✔
Timing Error	-2.00 Bits	2.00 Bits	-0.50 Bits	✔
Average Power MS *(at BS Power -70.0 dBm)*	31.00 dBm	35.00 dBm	32.30 dBm	✔
Power Time Template			passed	✔
BER Class Ib *(at BS Power -102.0 dBm, 50 Frames)*		0.40 %	0.00 %	✔
BER Class II		2.60 %	0.08 %	✔
BER Erased Frames		1.00 %	0.00 %	✔
RX Qual *(at BS Power -102.0 dBm)*		4.00	0.00	✔
RX Lev	-106.00 dBm	-98.00 dBm	-102.50 dBm	✔

Fig.: Output of measurement information in the report

Limits used for obtaining the decision Passed / Failed are indicated in the next two columns. A gray bar is shown if there is no upper or lower limit for the measurement. For instance, setting a lower limit for a BER measurement would not make sense. The measured value is indicated in column four. Values for passed tests are displayed in green and a hook appears in the last column. Red values indicate that the test failed and a red bar is displayed in column five. Tests not performed are displayed in blue in column four. This may happen when synchronization is lost during the measurement. Information on the power control level (PCL) and employed channel or the associated test set are indicated in the first column instead of the modified parameters. This additional information is written in italics.

You can include a simple echo test in the measurement, the result of which is indicated below.

Echotest *(at BS Power -70.0 dBm)*		passed	✔

Fig.: Display of echo test

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8.3 Summary of Results in the Measurement Report

A summary of test results is given on the last page of each measurement report together with the number of passed or failed tests. The total measurement time including the waiting times for operator actions is also specified. Any loss of synchronization is also indicated here together with the name of the measurement in which the loss occurred.

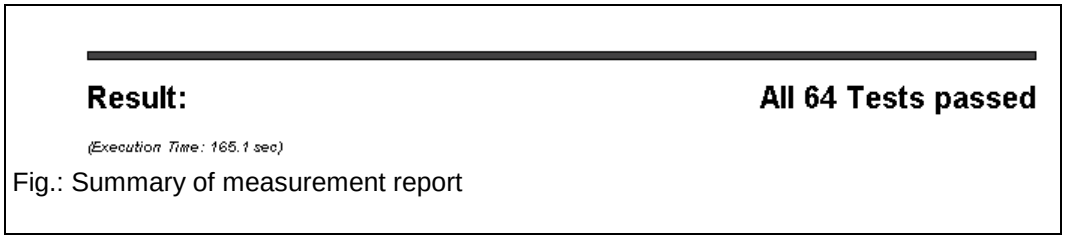


Fig.: Summary of measurement report

8.4 Appendix to Measurement Report

The graphics display of the power ramp and the phase curve within the burst are appended to the measurement report.

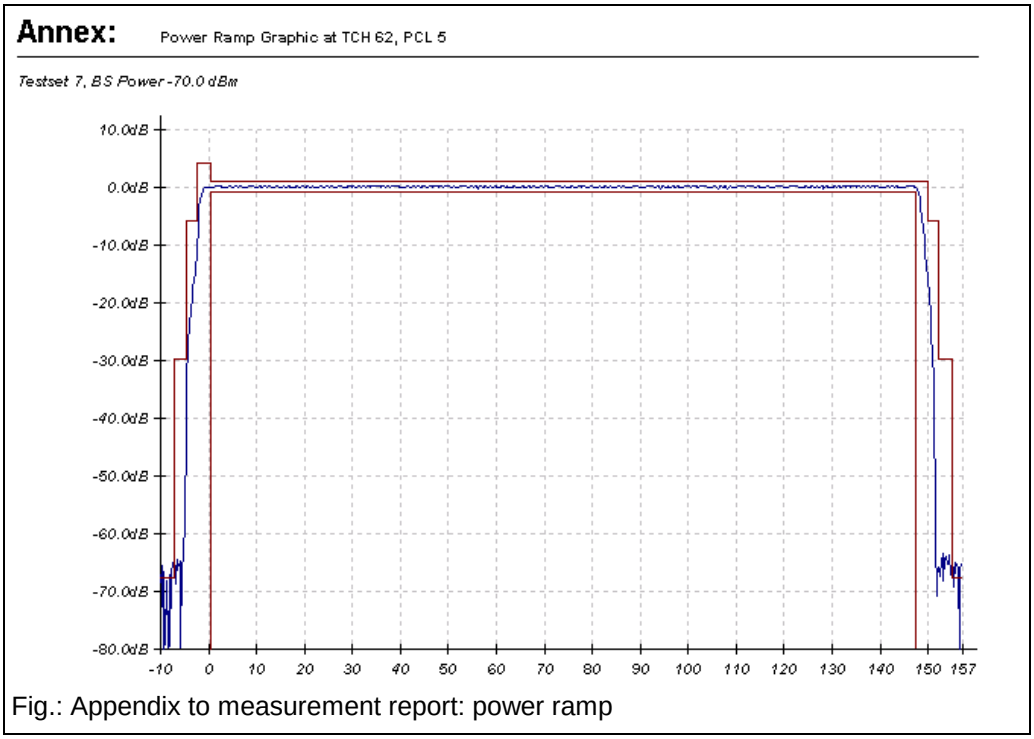


Fig.: Appendix to measurement report: power ramp

The curve is shown in blue, the tolerance mask is recorded in red.

Notes:
The tolerance mask is defined at various points A to H. In the case of GSM900, different criteria are valid in point A for the rising and falling edge. The points depend on network and power control level. Some points are assigned both relative and absolute values. The relative values are relative to the average power in the useful part of the ramp. In GSM, the criterion that can be met more easily is always valid.

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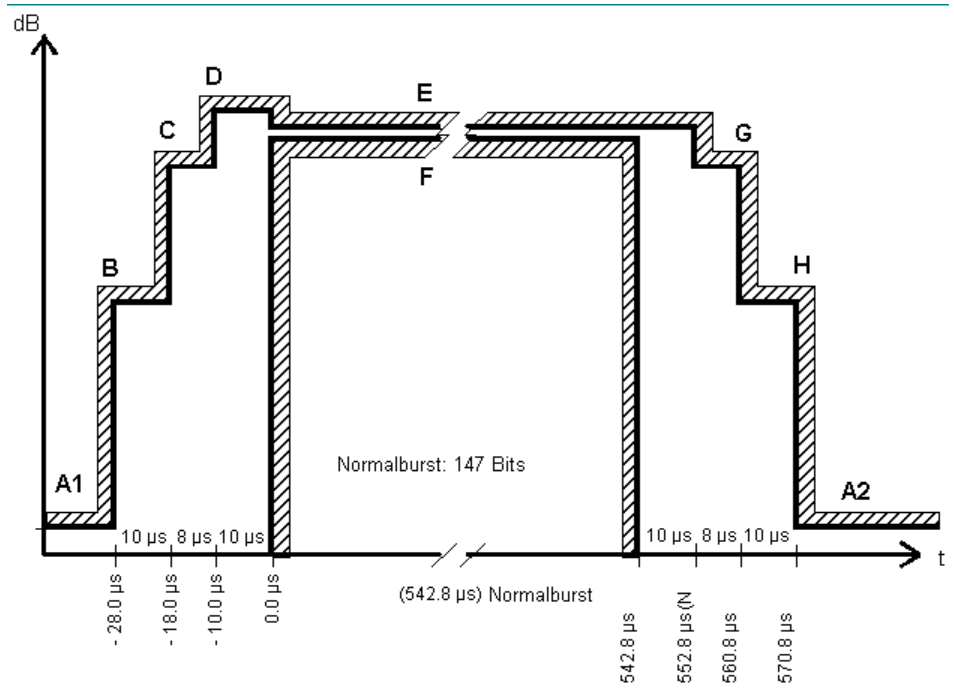


Fig.: GSM Power Time Template

The limit lines used by CTSgo in the display of the power time template can be obtained from the following tables. According to GSM specifications, the reference point (0.0 µs) is positioned in the middle of the bit length of bit 0. The evaluation of the tolerance mask is always performed by the CTS and not by CTSgo. The tolerance lines only serve for information.

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Point	relative	absolute
A1	-59.0 dB	-36.0 dBm
B	-30.0 dB	-17.0 dBm
C	-6.0 dB	
D	4.0 dB	
E	1.0 dB	
F	-1.0 dB	
G	-6.0 dB	
H	-30.0 dB	-17.0 dBm
A2	-59.0 dB	-54.0 dBm

GSM 900 PCL 5-15

Point	relative	absolute
A1	-59.0 dB	-36.0 dBm
B	-30.0 dB	-17.0 dBm
C	-4.0 dB	
D	4.0 dB	
E	1.0 dB	
F	-1.0 dB	
G	-4.0 dB	
H	-30.0 dB	-17.0 dBm
A2	-59.0 dB	-54.0 dBm

GSM 900 PCL 16

Point	relative	absolute
A1	-59.0 dB	-36.0 dBm
B	-30.0 dB	-17.0 dBm
C	-2.0 dB	
D	4.0 dB	
E	1.0 dB	
F	-1.0 dB	
G	-2.0 dB	
H	-30.0 dB	-17.0 dBm
A2	-59.0 dB	-54.0 dBm

GSM 900 PCL 17

Point	relative	absolute
A1	-59.0 dB	-36.0 dBm
B	-30.0 dB	-17.0 dBm
C	-1.0 dB	
D	4.0 dB	
E	1.0 dB	
F	-1.0 dB	
G	-1.0 dB	
H	-30.0 dB	-17.0 dBm
A2	-59.0 dB	-54.0 dBm

GSM 900 PCL 18 and 19

Point	relative	absolute
A1	-48.0 dB	-48.0 dBm
B	-30.0 dB	-20.0 dBm
C	-6.0 dB	
D	4.0 dB	
E	1.0 dB	
F	-1.0 dB	
G	-6.0 dB	
H	-30.0 dB	-20.0 dBm
A2	-48.0 dB	-48.0 dBm

GSM 1800/1900 PCL 0-10

Point	relative	absolute
A1	-48.0 dB	-48.0 dBm
B	-30.0 dB	-20.0 dBm
C	-4.0 dB	
D	4.0 dB	
E	1.0 dB	
F	-1.0 dB	
G	-4.0 dB	
H	-30.0 dB	-20.0 dBm
A2	-48.0 dB	-48.0 dBm

GSM 1800/1900 PCL 11

Point	relative	absolute
A1	-48.0 dB	-48.0 dBm
B	-30.0 dB	-20.0 dBm
C	-2.0 dB	
D	4.0 dB	
E	1.0 dB	
F	-1.0 dB	
G	-2.0 dB	
H	-30.0 dB	-20.0 dBm
A2	-48.0 dB	-48.0 dBm

GSM 1800/1900 PCL 12

Point	relative	absolute
A1	-59.0 dB	-36.0 dBm
B	-30.0 dB	-17.0 dBm
C	-2.0 dB	
D	4.0 dB	
E	1.0 dB	
F	-1.0 dB	
G	-2.0 dB	
H	-30.0 dB	-17.0 dBm
A2	-59.0 dB	-54.0 dBm

GSM 1800/1900 PCL 13 to 15

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The second graphics of the measurement report shows the phase error for each quarter bit in the useful part of

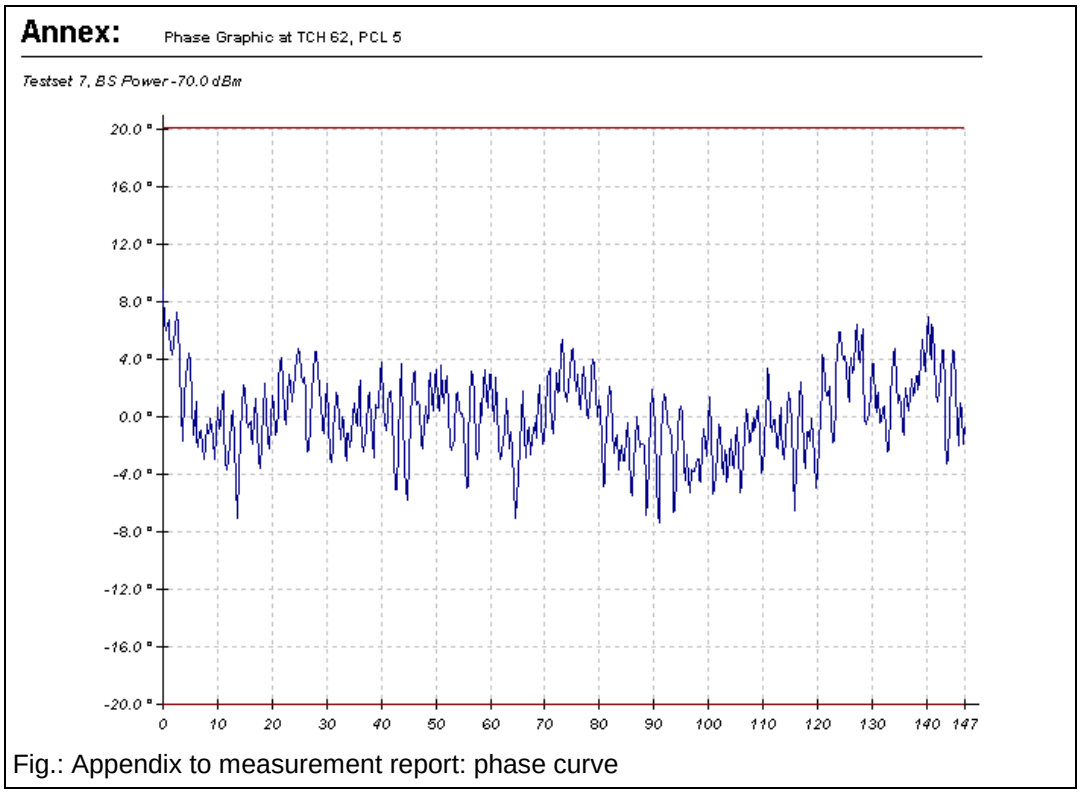


Fig.: Appendix to measurement report: phase curve

the GSM burst. Depending on the upper limit of the phase error selected in the CTSgo configuration, a red tolerance line is drawn in at this point.

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9 DECT Measurement Report

The measurement reports generated by the autotest provide a clear overview of measurement results. This section describes the layout of measurement reports.

9.1 Header of Measurement Report

The header of the measurement report contains all static settings of the measurement, eg set input and output attenuation, channel and slot of dummy carrier for the PP test and the selected RFPI (**R**adio **F**ixed **P**art **I**dentity) for the fixed part and the portable part test. The CTS identification is output in another line. Its purpose is to facilitate the assignment of the measurement report to the instrument used. The configuration used for the measurement is also indicated.

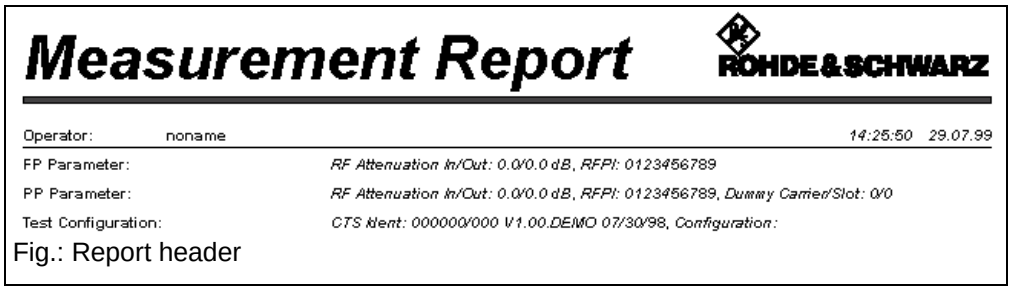


Fig.: Report header

The header also contains general information such as date and time of completion of the measurement, the operator's name and a comment line. The top of the header shows the title Measurement Report and next to it at the right a logo. In contrast to all other information, these two elements are also printed on the subsequent pages. The Rohde & Schwarz logo printed at the right can be replaced by another one. When items in the report are to be changed for further measurements, select Report Settings in the Measurement menu.

9.2 Output of Measurement Information in the Report

The information on the individual measurements is indicated in five columns. The first column describes the measurement and, if required, certain measurement conditions, eg the number of bursts or frames or the CTS output power used.

Test Condition:	Lower Limit	Upper Limit	Measured Value	P/F
FP-Testset 1 (Channel: 0, Slot 2, Offset 0.0)				
NTP *(at RF Level -73.0 dBm, 4 Bursts)*	20.00 dBm	25.00 dBm	20.35 dBm	✔
Power Time Template			passed	✔
Frequency Offset *(at RF Level -73.0 dBm, 4 Bursts)*	-50.00 kHz	50.00 kHz	4.60 kHz	✔
B-Field Modulation (-Max.)	-403.00 kHz	-259.00 kHz	-318.27 kHz	✔
B-Field Modulation (+Max.)	259.00 kHz	403.00 kHz	266.18 kHz	✔
Frequencydrift	-13.00 kHz/ms	13.00 kHz/ms	0.00 kHz/ms	✔
Timing Accuracy *(at RF Level -73.0 dBm, 32 Bursts)*		5.00 ppm	2.17 ppm	✔
Jitter (-Max.)	-1.00 us		-0.01 us	✔
Jitter (+Max.)		5.00 us	0.69 us	✔
Long-term BER *(at RF Level -73.0 dBm, 100 Frames)*		1000.00 ppm	46.40 ppm	✔
Long-term FER		10000.00 ppm	805.00 ppm	✔

Fig.: Output of measurement information in the report

Limits used for obtaining the decision Passed / Failed are indicated in the next two columns. A gray bar is shown if there is no upper or lower limit for the measurement. For instance, setting a lower limit for a BER measurement would not make sense. The measured value is indicated in column four. Values for passed tests are displayed in green and a hook appears in the last column. Red values indicate that the test failed and a red bar is displayed in column five. Tests not performed are displayed in blue in

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column four. This may happen when synchronization is lost during the measurement. Information on used slot), employed channel and the channel offset or the associated test set are indicated in the first column instead of the modified parameters. This additional information is written in italics.

You can include a simple echo test in the measurement, the result of which is indicated below.

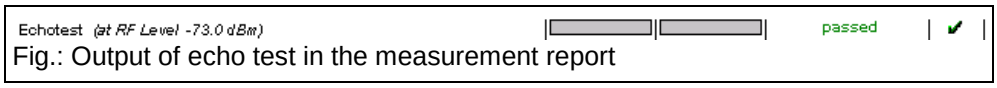


Fig.: Output of echo test in the measurement report

9.3 Summary of Measurements in the Measurement Report

A summary of test results is given on the last page of each measurement report together with the number of passed or failed tests. The total measurement time including the waiting times for operator actions is also specified. Any loss of synchronization is also indicated here together with the name of the measurement in which the loss occurred.

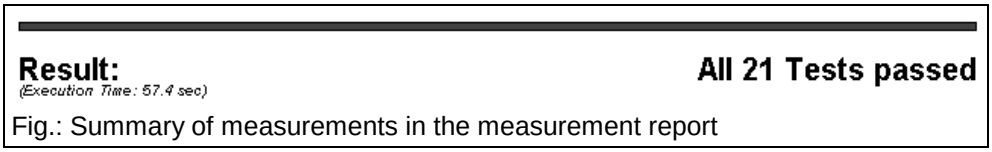


Fig.: Summary of measurements in the measurement report

9.4 Appendix to Measurement Report

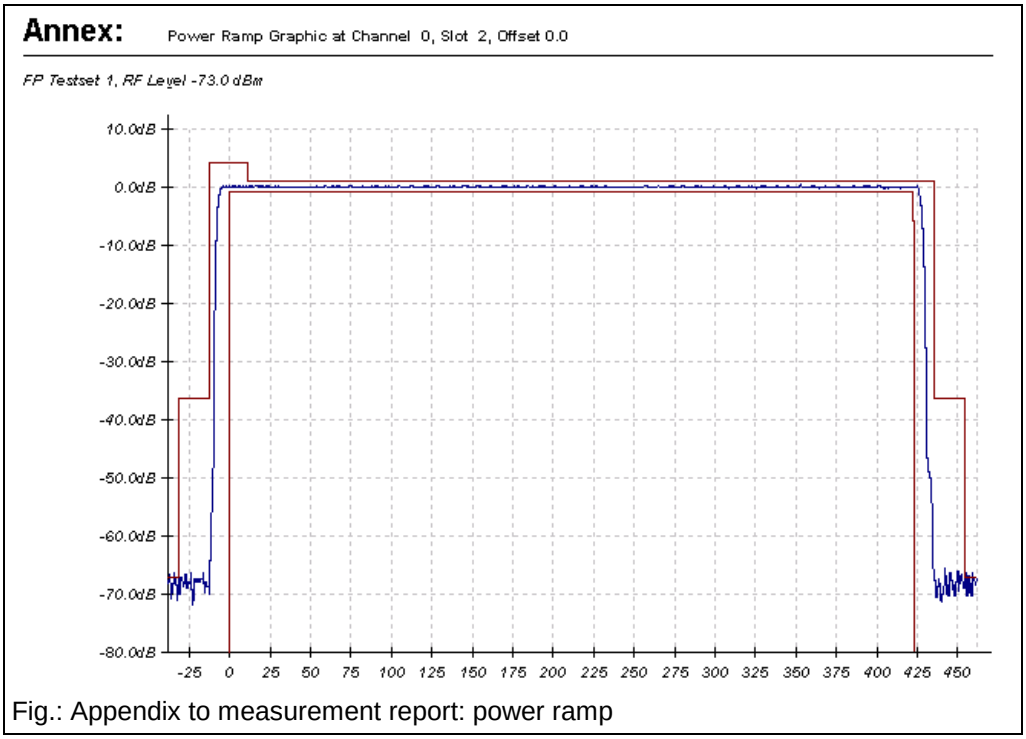


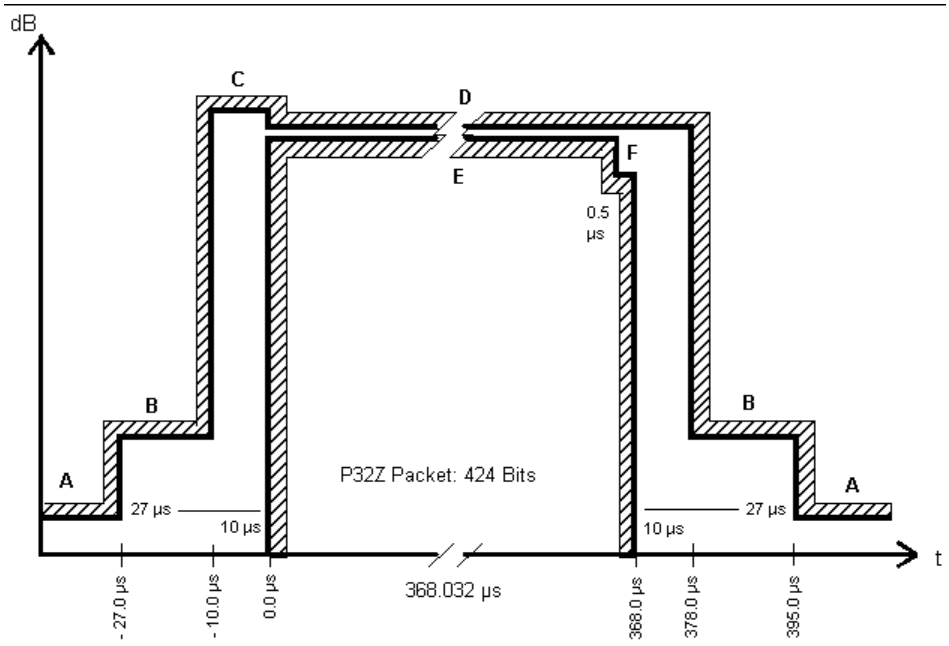
Fig.: Appendix to measurement report: power ramp

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The graphics display of power ramp and modulation within the burst is appended to the measurement report.

The curve display is shown in blue. The tolerance mask is recorded in red.

Note:
The tolerance mask is defined at various points A to F.



DECT Power Time Template

The limit lines used by CTSgo in the display of the DECT power time template can be obtained from the following table.

Point	relative	absolute
A		20.0 nW
B		25.0 uW
C	4.0 dB	
D	1.0 dB	
E	-1.0 dB	
F	-6.0 dB	

The evaluation of the tolerance mask is always performed by CTS and not by CTSgo. The tolerance lines only serve for information.

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The second graphics display of the measurement report shows the modulation within the burst. The modulation used during the measurement is always Fig31. Recording starts at bit position -38. It can be clearly seen that still no burst is being received by the tester. Then follows the sync field including the preamble for time synchronization between FP and PP. This field is followed by the A-field, which differs from the surrounding fields in longer 0s and 1s sequences. The longest part is the B-field with the long 1s and 0s bit sequence in its middle that is typical for Fig31. The burst is terminated by the X-field (CRC). The end of the burst is reached at bit position 424. However, recording only stops at bit position 462.
The frequency offset signaled by the CTS is displayed with a yellow line in the graphics. The tolerance fields for the B-field modulation are marked by two red lines.

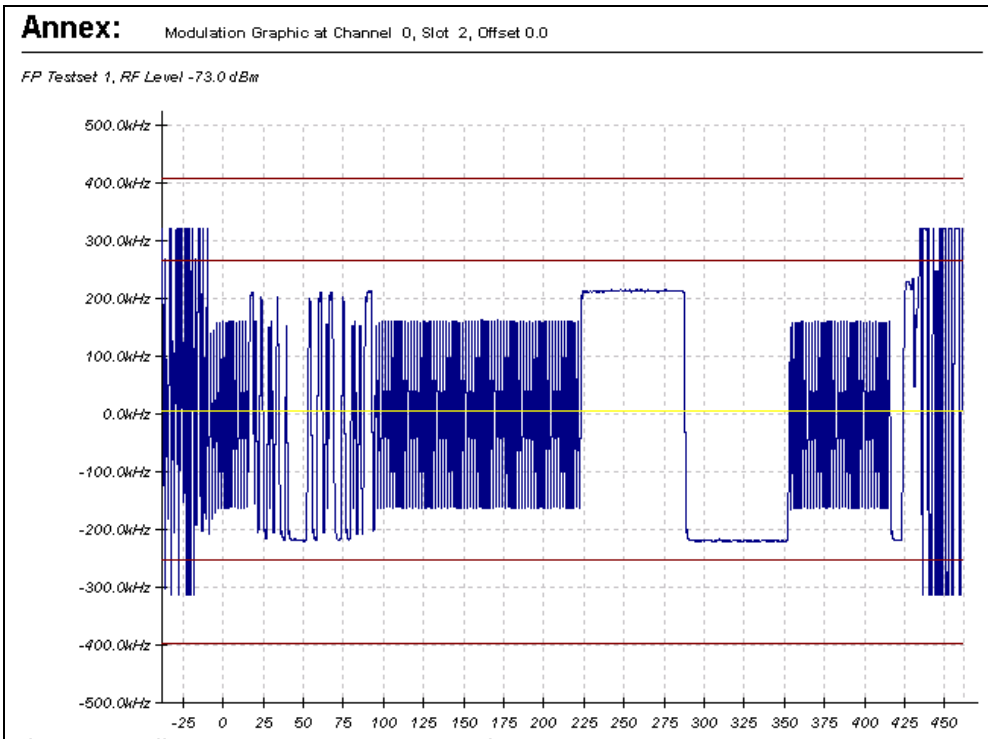


Fig.: Appendix to measurement report: phase curve

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10 Drag & Drop Support

The program supports the implemented drag & drop function of Windows in two ways. Drag & drop allows the user to move a selected file of a folder across the main window of an application with the left mouse key held down and to release the key when the desired position is attained.

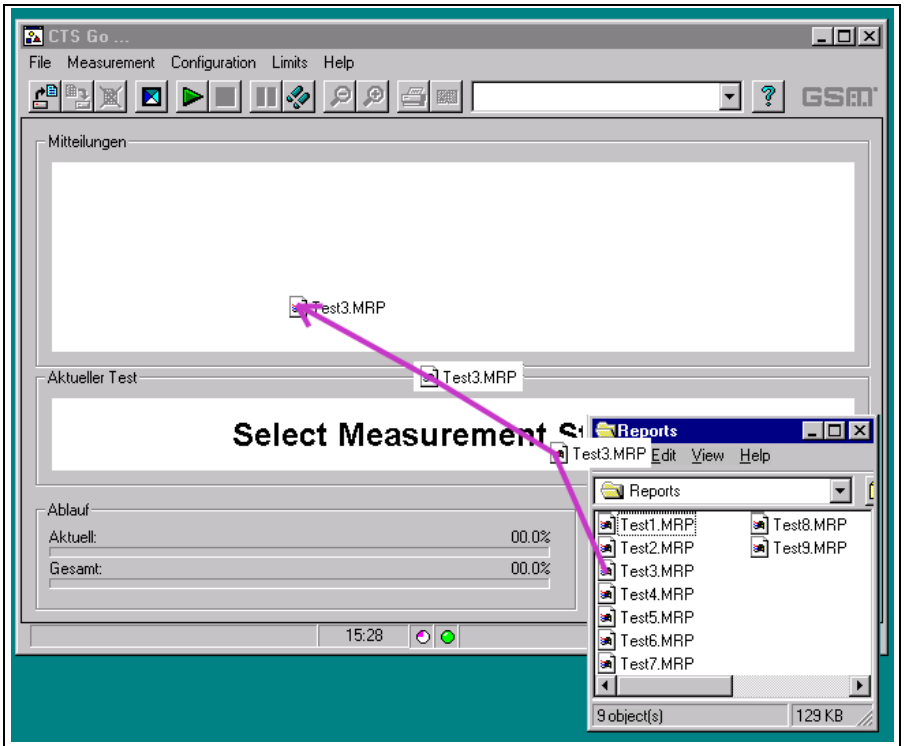


Fig.: Drag & Drop

The measurement report files (.MRP) can be moved to the main window. After this the measurement report is loaded provided the sequence control is in the stop mode. This function is available in all operating modes of CTSgo.
Configuration files (*CFG) can also be loaded in this way. Drag & drop may be a great help particularly when several files should be viewed in succession.

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11 Exchanging Measurement Report Data

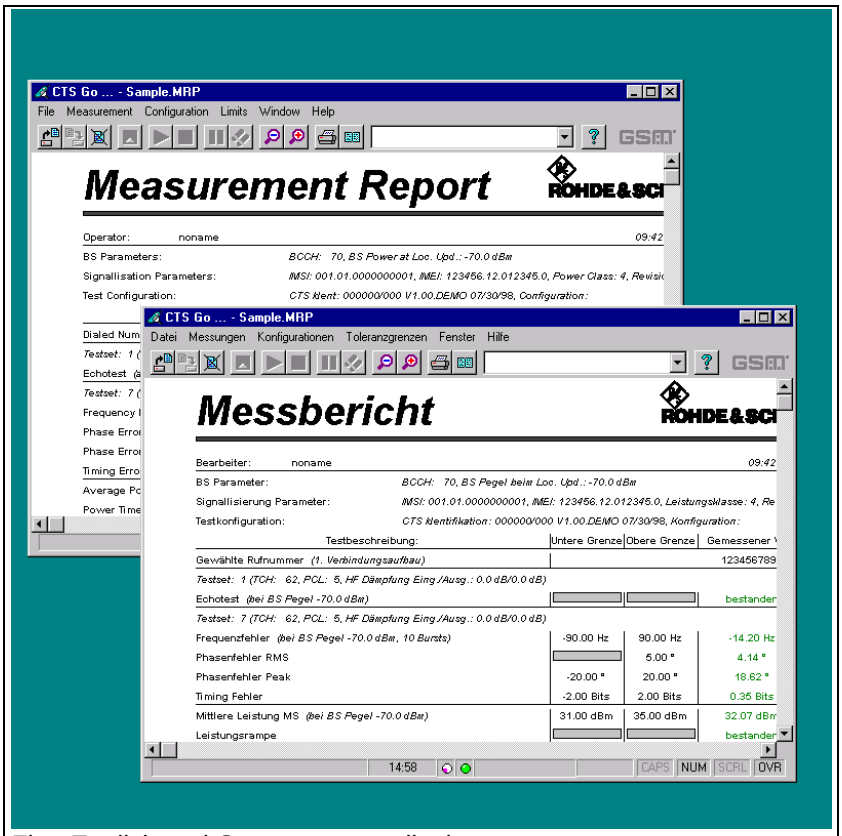


Fig.: English and German report display

CTSgo does not store country-specific information or texts in the measurement report files. If you have performed measurements with the English version of CTSgo and want to view the test results with the German version, window labeling as well as the information on date and time will be adapted to the desired language.
During the export of measurement results, the number format will be adapted to the country-specific standard. The transfer of these files may cause problems when the data are imported to spreadsheet programs, for instance. If data are to be transferred across country borders, it is advisable to send the measurement report and export the data on the target platform.

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12 Examples of Application

The procedure for configuring the autotest will be explained with the aid of two examples. Read through these examples if you are still not at ease with the operation of CTSgo.

Before starting the examples, the following steps should be performed:

- Open the Configuration menu and select the Remote Port option. Enter remote-control parameters in the Remote Control Port (RS232) dialog window according to the settings in the CTS.
- Open the Measurement menu and select Report Settings. Enter your name and, if required, a comment in the Measurement Report Settings window. Activate the option “Display Report after the Tests”. If necessary, change the logo displayed on the measurement reports.

12.1 Simple GSM Echo Test

During this measurement, a call should be set up and an echo test performed. The CTS should set up a call to the GSM-1800 mobile. The call should be cleared down by the user. The mobile is connected to the CTS via an antenna coupler, the attenuation of the coupler is approx. 7 dB in both directions.

- Open the Configuration menu and select Network. Activate GSM1800 in the Configure Network dialog window. Enter a power of –70 dBm for the location update. Close the window with OK.
- Select the Test Parameters command in the Configuration menu. The Configure Test Parameters dialog window is opened. Enter 512 for the BCCH. Enter 7.0 dB for input and output attenuation according to the settings of the antenna coupler. Close the dialog window with OK.
- Open the Select Tests dialog window by choosing Select Tests in the Configuration menu. Check First Connection and Test Set 1. All other boxes should be empty. Confirm your settings with OK.
- Open the Configuration menu, select First Connect and activate Call from Base Station (CTS) in the Configure First Connect dialog window. Confirm the settings with OK.
- Open the Configuration menu and select Test Set 1. Enter 62 for the TCH channel in the Configure Test Set 1 window. Activate 10 in the TCH Power Levels field. Enter –70.0 dBm for the Standard BS Power. Activate Echotest in the Measurements field. Close the dialog window with OK.
- Select First Disconnect in the Configuration menu and activate Release from Mobile in the Configure First Disconnect dialog window. Confirm the settings with OK.
- Move your mouse to the center of the autotest window, press the righthand mouse key and hold it down. With the key held down place the mouse cursor on Save Configuration in the popup menu and release the key. Enter a name, eg ECHOTEST.CFG in the Save Configuration dialog window and select the directory for the file to be stored.
- Start the measurement by a click on the Start icon in the toolbar.

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12.2 Extended GSM Test

In our second example, and extended test of a GSM900 mobile is to be performed. After a first call has been set up by CTS, all kind of GSM transmitter measurements are to be performed in channels 1, 62 and 124 at the PCLs 5, 10 and 15. Statistical averaging over several bursts should not be performed and the CTS output level should be –70 dBm. With these measurements terminated, the call is to be cleared down by the CTS. The second call should be set up by the user and an echo test performed on channel 62. The CTS output level of –60 dBm should be reduced for the subsequent BER measurement over 50 frames. RXLev and RXQual of the mobile should also be checked. The call should be released again by the user. The mobile is connected to the CTS by means of an RF cable taken from a vehicle installation set; the cable loss is 0.5 dB.

- Open the Configuration menu and select Network. Activate GSM900 in the Configure Network dialog window. enter a power of –70 dBm for the location update. Terminate the dialog with OK.
- Select the Test Parameters command in the Configuration menu. The Configure Test Parameters dialog window is opened. Enter 31 for the BCCH. Enter 0.5 dB for input and output attenuation according to the settings of the antenna coupler. Close the dialog window with OK.
- Open the Select Tests dialog window by choosing Select Tests in the Configuration menu. Check First Connection, Test Set 1, Test Set 2, Test Set 3. All other boxes should be empty. Confirm your settings with OK.
- Open the Configuration menu, select First Connect and activate Call from Base Station (CTS) in the Configure First Connect dialog window. Confirm the settings with OK.
- Open the Configuration menu and select Test Set 1. Enter 2 as TCH channel in the Configure Test Set 1 window. Activate the boxes “5“, “10“ and “15“ in the TCH Power Levels fields. Enter –70.0 dBm for BS Power Standard. Check the boxes Frequency Error, Phase Error, Timing, Average Burst Power and Power Ramp in the Measurements field. All other boxes in the Measurement field should be empty. Close the dialog window by pressing OK.
- Repeat this step for Test Set 2 but enter 62 for the TCH channel.
- The procedure for Test Set 3 is the same as described for test set 1 but enter TCH channel 124.
- Select First Disconnect in the Configuration menu. Activate Release from Basestation (CTS) in the Configure first Disconnect dialog window. Confirm the selection with OK.
- Open the Configuration menu, select the Second Connect item and activate Call from Mobile in the Configure second Connect dialog window. Confirm the settings with OK.
- Open the Configuration menu and select Test Set 7. Enter 62 as TCH channel. Check box 10 in the TCH Power Level field and enter –70.0 dBm for BS Power Standard. Enter –102.5 dBm for BS POWER BER. Check BER class Ib, BER class II, BER EFR, RXQual, RXLev and Echotest in the Measurement field. All other boxes of the Measurement field should be empty. Close the dialog window with OK.
- Select Second Disconnect in the Configuration menu and activate Release from Mobile in the Configure second Connect dialog window. Confirm the settings with OK.
- Open the windows for the commands in the Limits menu one after the other; check and change the limits for the individual measurements if you are not satisfied with the default values.

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- Open the File menu and select Save Configuration. Enter a name, eg ENDTEST.CFG in the Save Configuration dialog window and select the directory where the file should be stored.
- Open the Measurement menu and click on Start.

12.3 DECT Test

In our third example, a DECT set consisting of a fixed part and a portable part is to be measured. The RFPI of the set is not known. It is completely sufficient to check one channel in our measurement. Neither RF connectors nor an antenna coupler is available. Therefore, we cut off an RF cable where an N-type connector is connected at one end. There, we uncover about 4 centimeters of the inner conductor and strengthen it by soldering. This cable end is attached to the fixed part or portable part at the place where the antenna is positioned using adhesive tape. We do not open the casing, since we only want to get a rough idea about whether this set works or not. A measurement of the normal transmit power in manual CTS mode resulted in an attenuation of approx. 10 dB at the portable part and approx. 12 dB at the fixed part.

- Open the Configuration menu and call PP Base settings, enter an input and output attenuation of 10 dB each. 0 is entered for the carrier and slot of the dummy bearer. For the Q-packages we keep the default values of “000003FF0000“ for Q0, „003041108008“ for Q3, „006F0F000000“ for Q6 and „03060306“ for QMUX. Then terminate the dialog by pressing OK.
- Open the Configuration menu and call FP Base Settings. Enter an input and output attenuation of 12 dB each. Check the boxes “Accept detected RFPI” and “Use detected RFPI in PP Test“. For the PMID we keep the default value of “EBE8D“. Enter 0 as antenna. Close the dialog window by pressing OK.
- Open the Configuration menu and the Select Tests dialog window. Activate the boxes FP Test, FP Test Set 1, PP Test and PP Test Set 1. All other boxes must be empty. Confirm your settings by means of OK.
- Open the Configuration menu and call FP Test Set 1. Enter the carrier 0, slot 2 and offset 0.0. Enter an RF Level of –70.0 dBm in the RX Measurements field. Select the BER and FER measurement using the boxes. Enter 100 for the number of frames. Enter an RF Level of –65.0 dBm in the TX Measurements field. The number of bursts for power and modulation measurements must be 4, the number of bursts in the timing measurement 32. Select all boxes of the TX Measurements field except Echotest. Close the dialog with OK.
- Open the Configuration menu and call PP Test Set 1. Enter carrier 0, slot 2 and offset 0.0. Enter an RF level of –70.0 dBm in the RX Measurements field. Select BER and FER measurement using the boxes. Enter 100 for the number of frames. Enter an RF level of –65.0 dBm in the TX Measurements field. The number of bursts for power and modulation measurements should be 4, the number of bursts in the timing measurement 32. Select all boxes of the TX Measurements field except Echotest. Close the dialog window using OK.
- Call the commands of the Limits menu one after the other and vary the tolerance limits of the individual measurements if you are not satisfied with the default values.
- Open the File menu and select Save Configuration. Enter a name, eg DECTTEST.CFG in the Save Configuration dialog window and select the directory where the file is to be stored.
- Open the Measurement menu and click on Start.

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13 Working with Different User Profiles

CTSgo allows for two different user profiles, the configurator and the operator profile. The operator mainly focuses on loading configurations and then starting the test. In order to prevent surrounding base stations from disturbing the measurements, the operator can change the settings of the BCCH and TCH channels. In the DECT test, he can enter the RFPI. In the case of configurations starting with the letters “UNIV“ he can as well change the attenuations, provided these configuration files are part of the current directory of CTSgo. In general, both the DECT and GSM parameters are stored or loaded simultaneously in the case of configuration files.

13.1 The Configurator Profile

The configurator is entitled to overwrite all configurations, set tolerance limits and define the extent of the tests. When configuration files are loaded they are not checked for changes. If CTSgo is to be used by a configurator, the directory, where the executable CTS_GO.EXE file is stored, must also contain a valid file “CTS_GO.ULV“ .

13.2 The Operator Profile

The operator is only entitled to overwrite channel entries of the test sets, enter his name into the measurement reports and determine the directory for automatic storage of the measurement reports. He is not entitled to set tolerance limits and define the extent of the tests. When configuration files are loaded, they are checked for modifications. If the contents of the configuration file does not correspond to the version defined by the configurator, the configuration file cannot be loaded and a warning is output on the screen. The input fields and the menu items that must not be changed are displayed as inactive. The operator profile is automatically set if the directory, where the executable CTS GO.EXE file is stored, does not contain a valid “CTS_GO.EXE“ file.

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14 Integrating Operator-specific Hints

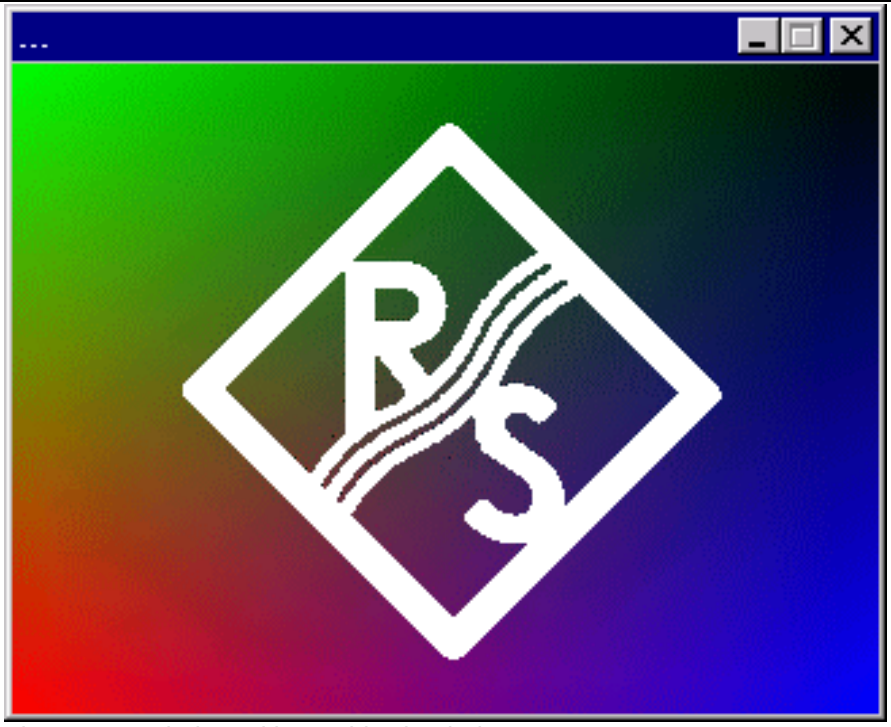


Fig.: Popup window with graphics loaded

When it is called up for the first time, CTSgo generates two further configuration files “CTS_GO.DS1“ and “CTS_GO.DS2“ . The file “CTS_GO.DS1“ refers to the GSM autotest, “CTS_GO.DS2“ to the DECT autotest. These configuration files permit to integrate the output of additional information in the test run. In general, a differentiation is to be made between popup windows for text display and popup windows for graphics display. The graphics should not be too large, a size of 200x200 to 320x240 pixels is recommended. The graphics should not be overwritten in each test point, as this would reduce the measurement rate. The graphics display remains active until a new entry is found in the sequence or the test run terminated. The input of an invalid file name is ignored. If the word HINT is entered under Filename, the output window will also be cleared. Normally, the entry “Animated“ is followed by 0. However, you can also create a bitmap with an animation consisting of four partial pictures. If you wish a partial picture size of 320x240 pixels, your file must have 1280x240 pixels. The first partial picture displayed will then be loaded with an offset of 0 pixel and a width of 320 pixels, the second partial picture with an offset of 320 pixels and the same width, the third one with an offset of 640 and the last partial picture with an offset of 960 pixels.

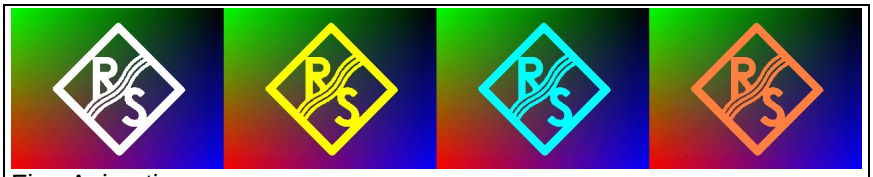


Fig.: Animation sequence

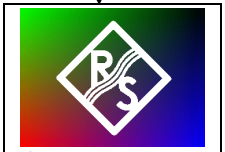


Fig.:
Single picture of sequence

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14.1 The Section Everytime

This section contains 9 entries. The individual entries are displayed shortly after the start of the autotest in the order Text1/Filename1, Text2/Filename2 and Text3/Filename3. If several graphics displays are to be shown one after the other, it is recommended to define the popup window for text as well, since otherwise the second graphics, for instance, would immediately overwrite the first one. Only the popup windows of the text entry can stop the sequence control. These popup windows appear each time the autotest has been started.

[Everytime]	
Text1	Text
Filename1	Path to graphics file in BMP format
Animated1	1 = Graphics animated, 0 = Graphics not animated
Text2	Text
Filename2	Path to graphics file in BMP format
Animated2	1 = Graphics animated, 0 = Graphics not animated
Text3	Text
Filename3	Path to graphics file in BMP format
Animated3	1 = Graphics animated, 0 = Graphics not animated

14.2 The Section Daily

This section contains 9 entries. The individual entries are displayed shortly after the start of the autotest in the order Text1/Filename1, Text2/Filename2 and Text3/Filename3. If several graphics displays are to be indicated one after the other, it is recommended to define the popup window for text as well, since otherwise the second graphics, for instance, would immediately overwrite the first one. Only the popup windows of the test entry can stop the sequence control. These popup windows appear only once a day after the start of the autotest; no further output will be made on this day.

[Daily]	
Text1	Text
Filename1	Path to graphics file in BMP format
Animated1	1 = Graphics animated, 0 = Graphics not animated
Text2	Text
Filename2	Path to graphics file in BMP format
Animated2	1 = Graphics animated, 0 = Graphics not animated
Text3	Text
Filename3	Path to graphics file in BMP format
Animated3	1 = Graphics animated, 0 = Graphics not animated

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14.3 The Section Monthly

This section contains 9 entries. The individual entries are displayed shortly after the start of the autotest in the order Text1/Filename1, Text2/Filename2 and Text3/Filename3. If several graphics displays are to be indicated one after the other, it is recommended to define the popup window for text as well, since otherwise the second graphics, for instance, would immediately overwrite the first one. Only the popup windows of the text entry can stop the sequence control. These popup windows appear only once a month after the autotest has been started for the first time in this month; no further outputs will be made in this month.

[Monthly]	
Text1	Text
Filename1	Path to graphics file in BMP format
Animated1	1 = Graphics animated, 0 = Graphics not animated
Text2	Text
Filename2	Path to graphics file in BMP format
Animated2	1 = Graphics animated, 0 = Graphics not animated
Text3	Text
Filename3	Path to graphics file in BMP format
Animated3	1 = Graphics animated, 0 = Graphics not animated

14.4 The Section Topic

This section contains three entries. The entry „Description“ corresponds to the output in the output field of the autotest. This only serves for identification and cannot be overwritten. The graphics display in the respective popup window does not influence the sequence control. The graphics is displayed until a new entry is found in the sequence or the test run is terminated. If an invalid file name is entered, the output window will also be cleared.

[Topic00] etc.	
Description	Name of single step in sequence control
Filename	Path to graphics file in BMP format
Animated	1 = Graphics animated, 0 = Graphics not animated

14.5 The Section TestsPassed

This section contains 2 entries. If all tests are passed, the respective graphics is displayed. It is recommended not to combine this mode with the display mode “Display Report after the Tests“.

[TestsPassed]	
Filename	Path to graphics file in BMP format
Animated	1 = Graphics animated, 0 = Graphics not animated

14.6 The Section TestsFailed

This section contains 2 entries. If at least one test has failed, the respective graphics is displayed. It is recommended not to combine this mode with the display mode “Display Report after the Tests“.

[TestsFailed]	
Filename	Path to graphics file in BMP format
Animated	1 = Graphics animated, 0 = Graphics not animated

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15 Adapting the Appearance of CTSgo

The user-defined graphics integration described before is also possible in a large display field of the main dialog instead of in a popup window. For this purpose, bit 15 must be set in the initialization file “CTS_GO.INI“ in the Application Settings section for Options.

[Application Settings]	
Options	Bit 15 = 1 (corresponds to 08000_{hex})

Since the size of the main dialog can be varied, the ideal size of the graphics file cannot be specified in greater detail. The graphics display is always increased or reduced to a size that fits exactly into the output window. The graphics should not be overwritten in each test point, as otherwise the measurement rate would be reduced. The graphics display remains active until a new entry is found in the sequence or the test run is terminated.
If the dialog window is not increased, kindly use the values for the resolution 640x480 pixels. Approximate reference values can be obtained from the following table.

Screen size	BMP Graphics
640x480 pixels	496x139 pixels
800x600 pixels	756x215 pixels
1024x768 pixels	980x327 pixels

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16 Problems, Questions and Solutions

16.1 Components Missing Signaled upon Program Startup

In addition to executable EXE files, the program contains runtime libraries (“DLLs“) which are loaded upon program start. These runtime libraries are first searched for in the specified current directory of CTSgo and then, if required, in the Windows system directory. Check whether the files specified in section Software Components are available in your PC. If necessary, install the CTSgo software again.

16.2 Serial Interface Cannot be Opened

The serial interface specified in your configuration is opened when CTSgo is started. This interface must not be used for other programs or the mouse.

16.3 CTS Cannot be Remote-Controlled

Compare settings of CTSgo and CTS. Check whether the employed cable meets the specified requirements.

16.4 Program Signals Timeout

When setting the remote-control interface you can specify how long the CTSgo program is to wait for a message from the CTS before it signals a timeout. with long measurements, eg a BER measurement with a large number of frames, this waiting period may have to be extended.



Abb.: Timeout warning

16.5 Serial Data Transmission Impaired by Mouse Movements

Problems may occur when the serial mouse is connected for instance to COM1 and CTSgo operated via serial interface COM3. PCs often use the same hardware interrupt for COM1 and COM3 or COM2 and COM4. Interactions between these two interfaces cannot be excluded in this case. Check the constellation of your PC with the aid of the Windows system control. Refer to the Windows manual for more detailed information on the responsible device manager.

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16.6 Location Update Cannot be Performed

For a correct location update, the C0 carrier power received by the mobile must be sufficiently high. Increase the base-station power (CTS) for the location update in the Configure Network dialog. A test SIM card should be used in addition. Check also whether the mobile to be tested complies with the network setting.

16.7 Synchronization Lost

The user-selected CTS output power may be too low and outside the sensitivity of your mobile. Increase the CTS output power for the respective test step. The output power is entered in the Configure Test Set dialog window. It is also possible that the user-defined attenuation values are not correct.

16.8 Level Measurements Frequently out of Tolerance

The CTS considers the set attenuation in the level calculation. For this reason, the attenuation must be accurately set.

16.9 Measurement Report Cannot be Loaded

The format of the selected measurement report is illegal. The file is either invalid or the report has been saved with a previous version of CTSgo. In this case, the measurement report has to be converted.

16.10 Drag & Drop not Working

Check that CTSgo is in the stop mode.

16.11 Program Cannot be Configured

Check that CTSgo is in the stop mode.

16.12 Generator Settings are not Immediately Performed

The CTSgo program requires a certain time period for settings in the module test. Observe the indication in the CTSgo status bar. A change from the “red lamp“ to the “green lamp“ indicates that the settings are completed.

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16.13 Can Several CTSs be Controlled from a PC ?

Several CTSs can be controlled from a PC if a sufficient number of free serial interfaces is available. To avoid interactions of the individual interfaces, a separate interrupt has to be used by each interface. With CTSgo a selection can only be made between the serial interfaces COM1 to COM4. Proper functioning of the individual CTSgo sessions largely depends on the capacity of the PC used. Note that during each session the initialization file CTS_GO.INI in the current directory is overwritten. To avoid this, CTSgo should be copied into several directories and these copies started only once.

16.14 Can CTSgo be Performed in the Background?

CTSgo can be performed in the background without problems. It may happen, however, that the other programs require so much computing power that serial data transmission is impaired.

16.15 Can Configuration Files be Read or Printed?

Configuration files have the format of Windows 3.x initialization files. Thus they can be read and if necessary printed. All configuration files are of identical format and available in English irrespective of the CTSgo version used. Each entry consists of a section designation in square brackets and entries with values after an equals sign. As is shown in the following example, the values can be directly read.

```
[Test Set 1]

GSM 900 TCH Channel=62
```

In the case of some entries, different options are determined by numerical entries.

[Application Settings] Mode=	GSM Autotest 1	GSM Module test 2	DECT Autotest 3
[Network] Type=	GSM 900 1	GSM 1800 2	GSM 1900 3
[Connect 1] / [Connect 2] Type=	Call from mobile 1	Call from base station (CTS) 2	
[Disconnect 1] / [Disconnect 2] Type=	Call release from mobile 1	Call release from base station (CTS) 2	

Other entries are available in coded form. Such entries are described in the following. Individual entries are OR-linked bit by bit and stored (eg $40_{hex} + 80_{hex} = C0_{hex}$).

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[Selected Tests]	Key=
First Connect	0001_{hex}
Test Set 1	0002_{hex}
Test Set 2	0004_{hex}
Test Set 3	0008_{hex}
Test Set 4	0010_{hex}
Test Set 5	0020_{hex}
Test Set 6	0040_{hex}
Second Connect	0080_{hex}
Test Set 7	0100_{hex}
Test Set 8	0200_{hex}
Test Set 9	0400_{hex}
Test Set 10	0800_{hex}
Test Set 11	1000_{hex}
Test Set 12	2000_{hex}

[Test Set x]	Measurements=
Frequency error	00001_{hex}
Phase error	00002_{hex}
Timing	00004_{hex}
Average burst power	00008_{hex}
Power ramp	00010_{hex}
BER class Ib	00020_{hex}
BER class II	00040_{hex}
BER EFR	00080_{hex}
RX Qual	00100_{hex}
RX Lev	00200_{hex}
Echo test	00400_{hex}
Graphics Template	00800_{hex}
Graphics Phase	01000_{hex}

[Test Set x]	TCH Power Levels =
PCL 0	00001_{hex}
PCL 1	00002_{hex}
PCL 2	00004_{hex}
PCL 3	00008_{hex}
PCL 4	00010_{hex}
PCL 5	00020_{hex}
PCL 6	00040_{hex}
PCL 7	00080_{hex}
PCL 8	00100_{hex}
PCL 9	00200_{hex}
PCL 10	00400_{hex}
PCL 11	00800_{hex}
PCL 12	01000_{hex}
PCL 13	02000_{hex}
PCL 14	04000_{hex}
PCL 15	08000_{hex}
PCL 16	10000_{hex}
PCL 17	20000_{hex}
PCL 18	40000_{hex}
PCL 19	80000_{hex}

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[DECT Selected Tests]	Key=
FP Tests	0001_{hex}
FP Test Set 1	0002_{hex}
FP Test Set 2	0004_{hex}
FP Test Set 3	0008_{hex}
FP Test Set 4	0010_{hex}
FP Test Set 5	0020_{hex}
FP Test Set 6	0040_{hex}
PP Tests	0080_{hex}
PP Test Set 7	0100_{hex}
PP Test Set 8	0200_{hex}
PP Test Set 9	0400_{hex}
PP Test Set 10	0800_{hex}
PP Test Set 11	1000_{hex}
PP Test Set 12	2000_{hex}

[DECT Test Set x]	Measurements=
NTP	00001_{hex}
Power ramp	00002_{hex}
Graphics Template	00004_{hex}
Frequency offset	00008_{hex}
B-field Modulation	00010_{hex}
Graphics Modulation	00020_{hex}
Frequency drift	00040_{hex}
Timing	00080_{hex}
Jitter	00100_{hex}
Echo test	00200_{hex}
BER	00400_{hex}
FER	00800_{hex}

It is not recommended to change the values manually as in this case the CTSgo software may not run correctly.

16.16 Can Configuration Overwriting be Avoided?

Stored configuration files should be protected against overwriting. The best thing to do so is to write-protect these files in the operating system. To this end, open the Windows Explorer or the file manager, click on the file and select Properties. Check the Read only box.

16.17 Can Default Values be Loaded?

Terminate CTSgo and delete the initialization file “CTS_GO.INI“. When the program is started again, default values will be loaded. Note that thus all values are reset, even your own settings.

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17 Other Features

17.1 Debugging

CTSgo can prepare a protocol for all the data transferred via the serial interface. To activate this features, the command line for program call can be extended to “CTS_GO.EXE /SERPROT“.
To this end, add “/SERPROT” to the entry in the Destination field of the link. When Windows 95 / 98 / NT is used, click on the program icon and select Properties via a popup menu using the right mouse key.

Note:
Program icons of the start menu bar for Windows 95 / 98 / NT 4.0 are displayed when the Windows directory is changed. Open the Profiles folder and then the Start Menu folder. Lower-level folders have the same format as the Start menu bar. For more detailed information refer to the Windows manual.

As an alternative, Debug=1 can be entered in the [Remote] section of initialization file CTS_GO.INI with the aid of an editor.

17.2 Demo Feature

CTSgo can simulate a measurement without a CTS being connected. Measured values are generated in a random generator. To activate this feature, the command line for program call-up can be extended to CTS_GO.EXE /DEMO.

As an alternative, Demo=1 can be entered in the [Remote] section of initialization file CTS_GO.INI.

17.3 Generate Code Feature

CTSgo can also save the command sequence to be sent to the CTS in the file GENERATE.IEE. To do so, Generate Code=1 can be entered in the [Remote] section of initialization file CTS_GO.INI with the aid of an editor.

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List of Error Messages

The following list contains all error messages for errors occurring in the instrument. The meaning of negative error codes is defined in SCPI, positive error codes mark errors specific of the instrument.

The table contains the error code in the left-hand column. In the right-hand column the error text being entered into the error/event queue or being displayed is printed in bold face. Below the error text, there is an explanation as to the respective error.

SCPI-Specific Error Messages

No Error

Error code	Error text in the case of queue poll Error explanation
0	**No error** This message is output if the error queue does not contain any entries.

Command Error - Faulty command; sets bit 5 in the ESR register.

Error code	Error text in the case of queue poll Error explanation
-100	**Command Error** The command is faulty or invalid.
-101	**Invalid Character** The command contains an invalid sign. Example: A header contains an ampersand, "SOURCE &".
-102	**Syntax error** The command is invalid. Example: The command contains block data the instrument does not accept.
-103	**Invalid separator** The command contains an impermissible sign instead of a separator. Example: A semicolon is missing after the command.
-104	**Data type error** The command contains an invalid value indication. Example: ON is indicated instead of a numeric value for frequency setting.
-105	**GET not allowed** A Group Execute Trigger (GET) is within a command line.
-108	**Parameter not allowed** The command contains too many parameters. Example: Command `CONFigure:REGen:FREQency` permits only one fraquency indication.

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Contiuation: Command Error

Error code	Error text in the case of queue poll Error explanation
-109	**Missing parameter** The command contains too few parameters. Example: The command `CONFigure:RFGen:FREQuency` requires a frequency indication.
-111	**Header separator error** The header contains an impermissible separator. Example: the header is not followed by a "White Space", "`*ESE255`"
-112	**Program mnemonic too long** The header contains more than 12 characters.
-113	**Undefined header** The header is not defined for the instrument. Example: `*XYZ` is undefined for every instrument.
-114	**Header suffix out of range** The header contains an impermissible numeric suffix. Example: `SOURce3` does not exist in the instrument.
-120	**Numeric data error** The command contains a faulty numeric parameter.
-121	**Invalid character in number** A number contains an invalid character. Example: An "A" in a decimal number or a "9" in an octal number.
-123	**Exponent too large** The absolute value of the exponent is greater than 32000.
-124	**Too many digits** The number includes too many digits.
-128	**Numeric data not allowed** The command includes a number which is not allowed at this position. Example: The command `SOURce:RFGen:SELect` requires indication of a text parameter.
-131	**Invalid suffix** The suffix is invalid for this instrument. Example: nHz is not defined.
-134	**Suffix too long** The suffix contains more than 12 characters.
-138	**Suffix not allowed** A suffix is not allowed for this command or at this position of the command. Example: The command `*RCL` does not permit a suffix to be indicated.
-141	**Invalid character data** The text parameter either contains an invalid character or it is invalid for this command. Example: write error with parameter indication; `SOURce:RFGen:SELect STT1.`
-144	**Character data too long** The text parameter contains more than 12 characters.
-148	**Character data not allowed** The text parameter is not allowed for this command or at this position of the command. Example: The command `*RCL` requires a number to be indicated.

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Continuation: Command Error

Error code	Error text in the case of queue poll Error explanation
-151	**Invalid string data** The command contains a faulty string. Example:An END message has been received prior to the terminating apostrophe.
-158	**String data not allowed** The command contains a valid string at a position which is not allowed. Example: A text parameter is set in quotation marks, `SOURce:RFGen:SELect "SETting1"`
-161	**Invalid block data** The command contains faulty block data. Example: An END message was received prior to reception of the expected number of data.
-168	**Block data not allowed** The command contains valid block data at an impermissible position. Example:
-171	**Invalid expression** The command contains an invalid mathematical expression. Example: the expression contains mismatching parentheses.
-178	**Expression data not allowed** The command contains a mathematical expression at an impermissible position. Example:
-180	**Macro error** A faulty macro has been defined, or an error has occurred during execution of a macro.

Execution Error - Error on execution of a command; sets bit 4 in the ESR register

Error code	Error text in the case of queue poll Error explanation
-200	**Execution error** Error on execution of the command.
-221	**Settings conflict** There is a conflict between setting of parameter value and instrument state. Example: External attenuation has been set in a state other than IDLE.
-222	**Data out of range** The parameter value lies out of the permissible range of the instrument. Eample: The command *RCL only permits entries in the range from 0 to 50.
-223	**Too much data** The command contains too many data. Example: The instrument does not have sufficient storage space.
-241	**Hardware missing** The command cannot be executed due to missing hardware. Example: An option is not fitted.

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Device Specific Error; sets bit 3 in the ESR register

Error code	Error test in the case of queue poll Error explanation
-300	**Device-specific error** SM3-specific error not defined in greater detail.
-350	**Queue overflow** This error code is entered in the queue instead of the actual error code if the queue is full. It indicates that an error has occurred but not been accepted. The queue can accept 5 entries.

Query Error - Error in data request; sets bit 2 in the ESR register

Error code	Error text in the case of queue poll Error explanation
-400	**Query error** General error occurring when data are requested by a query.
-410	**Query INTERRUPTED** The query has been interrupted. Example: After a query, the instrument receives new data before the response has been sent completely.
-420	**Query UNTERMINATED** The query is incomplete. Example: The instrument is addressed as a talker and receives incomplete data.
-430	**Query DEADLOCKED** The query cannot be processed. Example: The input and output buffers are full, the instrument cannot continue operation.
-440	**Query UNTERMINATED after indefinite response** A query is in the same command line after a query which requests an indefinite response.

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1 List of Commands / Remote Control

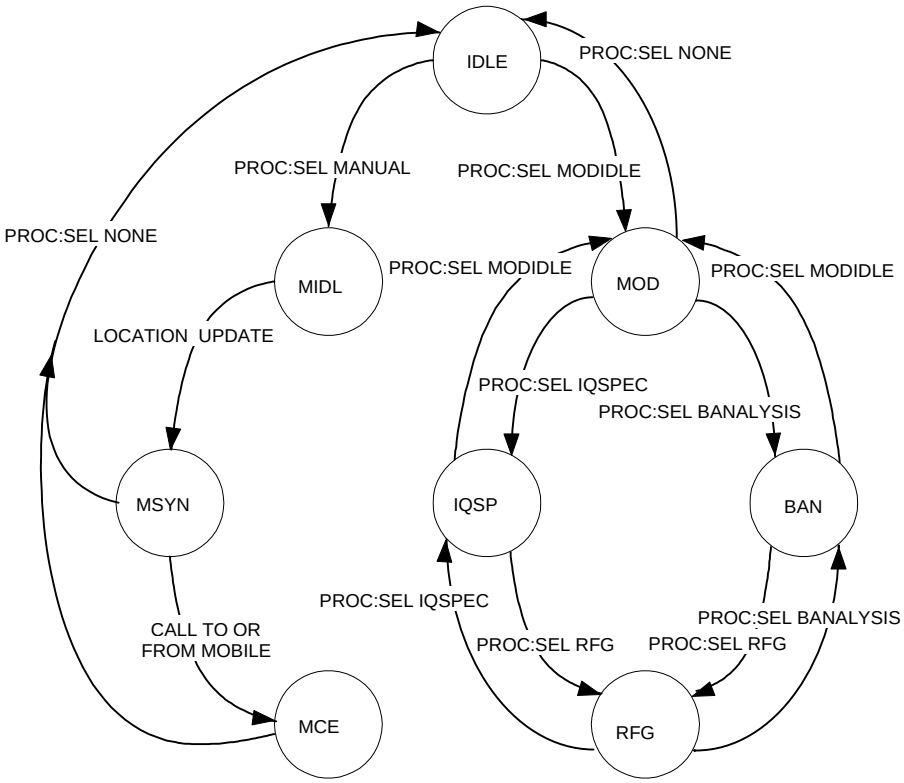
1.1 General Information

1.1.1 States

In the description of the commands, the following abbreviations are used for indication of the permissible states:

IDLE: ..Initial state of the CTS; is also achieved by means of PROCedure:SELect[:TEST] NONE.
MIDL: MS test selected (BCCH is generated)
MSYN: MS test: Synchronised (Location update is finished)
MCE: MS test: Call established
MOD: Module test in idle state
IQSP: IQ-spectrum active
RFG: RF generator active
BAN: Burst Analysis active
ALL: All states (IDLE, MIDL, MSYN, MCE, MOD, IQSP, BAN, or RFG)

The following diagram explains the individual transitions of states:



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1.1.2 DCS1800 (GSM1800)

If DCS1800 is the desired network type, the switch over must be made by means of CONFigure:NETWork DCS1800 before changing the configuration set-up. After the switch over, all commands act on the DCS1800 data set, without switch over the GSM data set is used.

1.1.3 DCS1900 (GSM1900)

If DCS1900 is the desired network type, switchover using CONFigure:NETWork DCS1900 must be made prior to changing the configuration set-up.

1.1.4 GSM850 (GSM850)

If GSM850 is the desired network type, switchover using CONFigure:NETWork GSM850 must be made prior to changing the configuration set-up.

1.1.5 Note

<numeric_value> denotes a numeric value; MAXimum or MINimum can be indicated as well unless stated otherwise.
If <numeric_value> may contain a unit, indicating the unit is optional. The value is always returned without a unit.

Some commands allow ON and OFF instead of a value (for activating or deactivating the associated parameter). Specification of a value (numeric_value) implies a transition to ON. If OFF is set at the time of a query, OFF will be returned instead of the value.

<value> denotes a character from a list; only list entries are permissible.

All commands are structured analogously to the SCPI description, i.e. the upper-case letters indicate the short form of the command; the CTS only accepts this short form as an abbreviation (according to SCPI), otherwise the long form is to be used.

Commands encapulated in square brackets, [:COMMand], are optional words that do not have to be included.

1.1.6 Error Recovery

If no value is existing with queries or the value is invalid, NAN is returned instead of the value. An overflow of the value is indicated by INF, a missing input signal by means of NINF.

If the CTS is not in the right state to be able to carry out the command, SCPI error -221, "Settings conflict" is generated. No value is returned in the case of queries.
The permissible state is indicated in the following table in the column "state".

If, however, an option to execute a command is missing, SCPI error -241, "Hardware missing" is displayed. No result is returned either in the case of a query.
The option necessary to execute the command is entered in the tables under "option".

1.1.7 RESET Values

Unless otherwise specified, the values given in the column "Default:", are the factory default values of the CTS.

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1.2 Settings

1.2.1 Input and Output

External attenuation at the output RF In/Out

Syntax:	*GSM850:* source:correction:loss:low:agsm <value> source:correction:loss:mid:agsm <value> source:correction:loss:high:agsm <value> *GSM900:* source:correction:loss:low:gsm <value> source:correction:loss:mid:gsm <value> source:correction:loss:high:gsm <value> *GSM1800:* source:correction:loss:low:pcn <value> source:correction:loss:mid:pcn <value> source:correction:loss:high:pcn <value> *GSM1900:* source:correction:loss:low:pcs <value> source:correction:loss:mid:pcs <value> source:correction:loss:high:pcs <value>			*Arfcn Range:* 128 – 169 170 – 210 211 – 251 975 - 1023 and 0 – 30 31 – 78 79 – 124 512 – 635 636 – 759 760 – 885 512 – 611 612 – 711 712 – 810
Value range:	GSM850/GSM900 / GSM1800 / GSM1900: 0.0 … +30.0 (unit: dB)			**Default:** 0.0 dB
State: Set: IDLE Query: ALL		**Option:** none	With Query	**Note:** Positive values refer to an attenuation, (N1)

External attenuation at the input RF In/Out

Syntax:	*GSM850:* source:correction:loss:low:agsm <value> source:correction:loss:mid:agsm <value> source:correction:loss:high:agsm <value> *GSM900* sense:correction:loss:low:gsm <value> sense:correction:loss:mid:gsm <value> sense:correction:loss:high:gsm <value *GSM1800:* sense:correction:loss:low:pcn <value> sense:correction:loss:mid:pcn <value> sense:correction:loss:high:pcn <value> *GSM1900:* sense:correction:loss:low:pcs <value> sense:correction:loss:mid:pcs <value> sense:correction:loss:high:pcs <value>			*Arfcn Range:* 128 – 169 170 – 210 211 – 251 975 - 1023 and 0 – 30 31 – 78 79 – 124 512 – 635 636 – 759 760 – 885 512 – 611 612 – 711 712 – 810
Value range:	GSM850/GSM900 / GSM1800 / GSM1900: 0.0 … +30.0 (unit: dB)			**Default:** 0.0 dB
State: Set: IDLE Query: ALL		**Option:** none	With Query	**Note:** Positive values refer to an attenuation, (N1)

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External attenuation at RF Out 2

Syntax:	source2:correction:loss:magnitude <value>			
Value range:	GSM850/GSM900 / GSM1800 / GSM1900: 0.0 … +30.0 (unit dB)			**Default:** 0.0 dB
State: Set: IDLE Query: ALL		**Option:** B7	With Query	**Note:** Positive values refer to an attenuation, (N1)

Coupler Usage

Syntax:	SOURce:CORRection:LOSS:COUPler <value>		
Value range:	OFF ON		**Default:** OFF
State: IDLE	**Option:** none	With Query	Entered attenuations have no influence in position OFF.

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1.2.2 Signalling and RF Parameters

1.2.2.1 Signalling Parameters of the Mobile Station

International Mobile Subscriber Identity (IMSI)

Syntax:	SENSe:SIGNalling:IDENtity:IMSI?		
Return:	<string> (max. 15 characters)		
State: MSYN, MCE	**Option:** none	Query only	**Note:** (N2)

International Mobile Equipment Identity (IMEI)

Syntax:	SENSe:SIGNalling:IDENtity:IMEI?		
Return:	<string> (max. 15 characters)		
State: MSYN, MCE	**Option:** none	Query only	**Note:** (N2)

Revision level of mobile

Syntax:	SENSe:SIGNalling:IDENtity:MS:REVision:LEVel?		
Return:	PH1 PH2		
State: MSYN, MCE	**Option:** none	Query only	

Receiving level at Mobile Station (RXLEV)

Syntax:	SENSe:SIGNalling:RXLev?		
Return:	0 ... 63		
State: MCE	**Option:** none	Query only	**Note:** (N2)

Quality of Reception at Mobile Station (RXQUAL)

Syntax:	SENSe:SIGNalling:RXQual?		
Return:	0 ... 7		
State: MCE	**Option:** none	Query only	**Note:** (N2)

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Dialled number

Syntax:	SENSe:SIGNalling:DNUMber?		
Return:	<string> (max. 20 digits) or "- - -"		
State: MCE	**Option:** none	Query only	**Note:** (N2)

Frequency Band

Syntax:	SENSe:SIGNalling:FREQuency:BAND:CURRent? SENSe:SIGNalling:FREQuency:BAND:SECOnd?			
Return:	P-GSM900 (arfcn: 0 - 124) E-GSM900 (arfcn: 975 - 1023) R-GSM900 (arfcn: 955-974) GSM1800 (arfcn: 512 - 885) GSM1900 (arfcn: 512 - 810) GSM850 (arfcn: 128 - 251) Invalid - No frequency information on second network available (only GSM900/GSM1800 mobiles provide frequency information).			**Default:** DUM
State: MSYN, MCE	**Option:** none	Query only	**Note:** Current: Frequency information on current network	

Power Class

Syntax:	SENSe:SIGNalling:POWEr:CLASs:CURRent? SENSe:SIGNalling:POWEr:CLASs:SECOnd?		
Return:	GSM850: 1… 5 GSM: 1… 5 GSM1800: 1… 2 GSM1900: 1… 2		
State: MSYN, MCE	**Option:** none	Query only	**Note:** Current: Power Class information on current network Second: Power Class information on a second network

Measured power of mobile (peak value)

SENSe:POWer:MS? is used to measure the transmitter power of the mobile. SENSe:SIGNalling:POWer:LEVel? indicates the nominal value.

Syntax:	SENSe:POWer:MS?		
Return:	RF In Out: (0.0 + ext. att.) ... (+39 + ext. att.) (unit: Dbm)		
State: MCE	**Option:** none	Query only	

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1.2.2.2 Signalling Parameters for CTS

Mobile Country Code

Syntax:	CONFigure:SIGNalling:IDENtity:MCC <numeric_value>			
Value range:	GSM 0 ... 999 GSM850 0 ... 999 DCS1800: 0 ... 999 DCS1900: 0 ... 999			**Default:** 1
State: Set: IDLE Query: ALL	**Option:** none	With Query		

Mobile Network Code

Syntax:	CONFigure:SIGNalling:IDENtity:MNC <numeric_value>			
Value range:	GSM 0 ... 99 GSM850 0 ... 999 DCS1800: 0 ... 99 DCS1900: 0 ... 999			**Default:** 1
State: Set: IDLE Query: ALL	**Option:** none	With Query		

Network Colour Code

Syntax:	CONFigure:SIGNalling:IDENtity:NCC <numeric_value>			
Value range:	GSM 0 ... 7 GSM850 0 ... 7 DCS1800: 0 ... 7 DCS1900: 0 ... 7			**Default:** 0
State: Set: IDLE Query: ALL	**Option:** none	With Query		

Location Area Code

Syntax:	CONFigure:SIGNalling:IDENtity:LAC <numeric_value>			
Value range:	GSM 0 ... 7 GSM850 0 ... 7 DCS1800: 0 ... 65535 DCS1900: 0 ... 65535			**Default:** 1
State: Set: IDLE Query: ALL	**Option:** none	With Query		

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Channel number (ARFCN) for CCCH

Syntax:	CONFigure:CHANnel:CCCH:ARFCn <numeric_value>			
Value range:	GSM: 1 ... 124 GSM850: 128 ... 251 DCS1800: 512 ... 885 DCS1900: 512 ... 810		**Default:**	GSM: 70 GSM850: 128 DCS1800: 512 DCS1900: 512
State: Set: IDLE Query: ALL	**Option:** none	With Query		

Initial Channel number (ARFCN) for TCH

Syntax:	CONFigure:CHANnel[:TCH]:ARFCn <numeric_value>			
Value range:	GSM: 1 ... 124 GSM850: 128 ... 251 DCS1800: 512 ... 885 DCS1900: 512 ... 810		**Default:**	GSM: 60 GSM850: 128 DCS1800: 885 DCS1900: 610
State: Set: IDLE, MIDL, MSYN Query: ALL	**Option:** none	With Query		

Initial Transmitter power of the TCH in the used timeslot

Syntax:	CONFigure:CHANnel[:TCH][:POWer][:USED] <numeric_value>			
Value range:	(N3)		**Default:**	-75.0 dBm
State: Set: IDLE, MIDL, MSYN Query: ALL	**Option:** none	With Query		

Basic power setting for location update and link set-up of mobile station

Syntax:	CONFigure:POWer:MS <numeric_value>			
Value range:	GSM: 13 ... 39 GSM850: 13 ... 39 DCS1800: 10 ... 30 DCS1900: 10 ... 30		**Default:**	GSM: 13 GSM850: 13 DCS1800: 10 DCS1900: 10
State: ALL	**Option:** none	With Query	**Note:** Units are dBm	

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Networks for dualband handover

Syntax:	CONFigure:SIGNalling:HANDover:NETWORK <value>	
Value range:	**Current Network GSM900** SING | handover not permitted, channel change in GSM900 D180 | handover possible between GSM900 & GSM1800 D190 | handover possible between GSM900 and GSM1900 MULTI | handover possible between GSM900/1800 or GSM900/1900. (MS permitting) **Current Network GSM850** SING | handover not permitted, channel change in GSM900 D190 | handover possible between GSM850 & GSM1900 MULTI | handover possible between GSM900/1800 or GSM900/1900. (MS permitting) **Current Network GSM1800** SING | handover not permitted, channel change in GSM1800 D180 | handover possible between GSM900 and GSM1800 MULTI | handover possible between GSM900/1800 or GSM900/1900. (MS permitting) **Current Network GSM1900** SING | handover not permitted, channel change in GSM1900 D85 | handover possible between GSM1900 and GSM850 D190 | handover possible between GSM900 and GSM1900 MULTI | handover possible between GSM900/1800 or GSM900/1900. (MS permitting)	**Defaults:** **GSM900** SING **GSM850** SING **GSM1800** SING **GSM1900** SING

State: Set: IDLE Query: ALL	**Option:** none	With Query	**Note:**

Checking the dualband handover with GSM900/GSM1800

Syntax:	CONFigure:SIGNalling:HANDover:CHECK <value>	
Value range:	SLOW | with handover check of the mobile FAST | without handover check of the mobile	**Default:** SLOW

State: Set: IDLE Query: ALL	**Option:** none	With Query	**Note:** The selected setting is taken into account when a handover between GSM900 and GSM1800 is selected

Dualband handover mode

Syntax:	CONFigure:SIGNalling:HANDover:MODE <value>	
Value range:	BCCH | with control channel after handover LEVEL | without control channel after handover	**Default:** LEVEL

State: Set: IDLE Query: ALL	**Option:** none	With Query	**Note:**

Handover is initiated by using Change of channel for TCH.

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Configure access classes bit mask

Syntax:	CONFigure:SIGNalling:ACLAss[?]			
Value range:	Decimal: 0-65535 Hexadecimal: 0-FFFF			Default: 00
State: IDLE		Option: none	With query	Note: The value represents the bit mask for 16 classes. Example: decimal value 31 (hex #H1F) corresponds to bit mask 0000 0000 0001 1111 and classes 0,1,2,3,4 will be barred from access.

Configurable SMS message

Syntax:	configure:sms?			
Value range:	Message content or “No Message”			**Default:**
State: Set: ALL Query: ALL		**Option:** none	With Query	Returns the SMS message content sent by the MS to the CTS and resets it to “No Message”

Syntax:	configure:user:sms[?]			
Value range:	Message content			**Default:**
State: Set: ALL Query: ALL		**Option:** none	With Query	Set the SMS message content to be sent from the MS to the CTS.

Syntax:	procedure:set:sms:oa:length[?]			
Value range:	2 - 12			**Default:** 2
State: Set: ALL Query: ALL		**Option:** none	With Query	Set the length of the TP Originator field of the SMS message to be sent from the CTS to the MS

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1.2.3 Network and Test Mode

Network

Syntax:	CONFigure:NETWork[:TYPE] <value>			
Value range:	GSM | G09 | GSM850 | G08 | DCS1800 | G18 | PCS1900 | G19			**Default:** GSM
State: Set: IDLE Query: ALL	**Option:** none	With Query	A Query returns G09, G18 or G19	

Test Mode

Syntax:	PROCedure:SELect[:TEST] <string>				
Value range:	NONE | No test mode (initial state) MIDL | MS-test MODidle | Module test IQSPec | IQ-spectrum BANalysis | Burst Analysis RFG | Rf generator				**Default:** NONE
State: (NONE): MIDL, MOD (MIDL): NONE (MODIDLE): IDLE, IQSP, BAN (IQSPEC): MOD, RFG (BANALYSIS): MOD, RFG (RFG): IQSP, BAN	**Option:** none none B7 B7 B7 B7	With Query	**Note:** Use the command STATus:DEVice? to query the state of the CTS.		

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1.2.4 Call Set-up and Release

Call set-up from the CTS to the mobile (call)

Syntax:	PROCedure:CALL:TOMS		
State: MSYN	**Option:** none	No Query	

Call release from the CTS to the mobile (Release)

Syntax:	PROCedure:RELease:TOMS		
State: MCE	**Option:** none	No Query	

Change of channel for TCH

Syntax:	PROCedure:SET:ARFCn <numeric_value>		
Value range:	GSM: 1 ... 124 *[975 … 1023] **[955 … 974] GSM850 128 … 251 DCS1800: 512 ... 885 DCS1900: 512 ... 810		**Default:** this command takes the current value for the Initial Channel number (ARFCN) for TCH (C.7)
State: MCE	**Option:** none	With query	**Note**: * Available for Mobile Stations which support E-GSM. ** Available for Mobile Stations which support R-GSM.

Power change (Mobile Station, used timeslot only)

Syntax:	PROCedure:SET:POWer:MS <numeric_value>		
Value range:	GSM: 5 ... 15 | Power Control Level GSM850: 5 ... 15 | Power Control Level DCS1800: 0 ... 13* | Power Control Level DCS1900: 0 ... 13 | Power Control Level		
State: MCE	**Option:** none	With Query	**Note:** always returns the power control level (PCL), (N2) * Max values may change for PHASEI and PHASEII mobiles

Power change (CTS) in unused timeslot

Syntax:	CONFigure:BSSig:POWer <numeric_value> or PROCedure:SET:POWer:CMD[:USED] <numeric_value>		
Value range:	(N3)		
State: MCE	**Option:** keine	With Query	

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1.3 Burst Analysis Settings

Channel number (ARFCN) and Frequency

Syntax:	CONFigure:CHANnel:BANalysis:ARFCn <numeric_value>				
Value range:	GSM: -75 ... 450 GSM850: 128 ... 251 DCS1800: 461 ... 1511 DCS1900: -239 ... 811			**Default:**	GSM: 65 GSM850: 251 DCS1800: 711 DCS1900: 661
State: BAN	**Option:** B7	With Query			

Syntax:	CONFigure:CHANnel:BANalysis:ARFCn:FREQuency <numeric_value>				
Value range:	GSM: 875 ... 980 GSM850: 824 ... 894 DCS1800: 1700 ... 1910 DCS1900: 1700 ... 1910	(in steps of 0.2 MHz) (in steps of 0.2 MHz) (in steps of 0.2 MHz) (in steps of 0.2 MHz)		**Default:**	GSM: 903 MHz GSM850: 869 MHz DCS1800: 1750 MHz DCS1900: 1880 MHz
State: BAN	**Option:** B7	With Query			

Training Sequence Codes

Syntax:	CONFigure:CHANnel:BANalysis:TSC <numeric_value>			
Value range:	0 ... 8			**Default:** 0
State: BAN	**Option:** B7	With Query		

Expected power (of mobile station)

Syntax:	CONFigure:BANalysis:POWer:EXPected <numeric_value>			
Value range:	-15.0 ... +39.0 dBm			**Default:** 0.0 dBm
State: BAN, IQSP	**Option:** B7	With Query	**Note:** (N3)	

Trigger mode

Syntax:	CONFigure:BANalysis:TRIGger:MODE <value>			
Value range:	POWer | Triggering on rising signal edge FREerun Triggering without edge detection			**Default:** POW
State: BAN	**Option:** B7	With Query		

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1.4 RF Generator Settings

Channel number

Syntax:	CONFigure:RFGen:CHANnel[:CW| <numeric_value>			
Value range:	GSM: -175 ... 300 GSM850: 127...757 DCS1800: 511... 1436 DCS1900: -139 ... 811			**Default:** GSM: 1 GSM850: 127 DCS1800: 486 DCS1900: 611
State: RFG	**Option:** B7	With Query		

Frequency

Syntax:	CONFigure:RFGen:FREQuency[:CW|:FIXed] <numeric_value>			
Value range:	GSM: 900.0 ... 995.0 MHz (in steps of 0.2 MHz) GSM850: 869.0 ... 995.0 MHz (in steps of 0.2 MHz) DCS1800: 1800.0 ... 1990.0 MHz (in steps of 0.2 MHz) DCS1900: 1800.0 ... 1990.0 MHz (in steps of 0.2 MHz)			**Default:** GSM: 935.2 MHz GSM850: 869.0 MHz DCS1800: 1800.0 MHz DCS1900: 1950.0 MHz
State: RFG	**Option:** B7	With Query	**Note:** The input value is adapted to the step size indicated when the parameter is set.	

Frequency offset

Syntax:	CONFigure:RFGen:FREQuency:OFFSet <numeric_value>			
Value range:	-100.009 ... 100.009 kHz			**Default:** 0.0 Hz
State: RFG	**Option:** B7	With Query		

Type of modulation

Syntax:	CONFigure:RFGen:DM:FORMat <value>			
Value range:	0 ... 7			**Default:** 0
State: RFG	**Option:** B7	With Query	**Note:** Modulation must be in state dummy.	

Modulation

Syntax:	CONFigure:RFGen:DM:MODE <value>			
Value range:	OFF No modulation DUM Dummy burst with selected midamble AM Amplitude Modulation			**Default:** DUM
State: RFG	**Option:** B7	With Query		

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Ramping Mode

Syntax:	CONFigure:RFGen:RAMPing:STATe <value>		
Value range:	ON OFF	Signal with power ramping Permanent signal	**Default:** OFF
State: RFG	**Option:** B7	With Query	

Output level

Syntax:	CONFigure:RFGen:POWer <numeric_value>		
Value range:	(-110.0 - ext. att.) ... (-50.0 - ext. att.) dBm		**Default:** -50.0 dBm
State: RFG	**Option:** B7	With Query	

RF Generator Level

Syntax:	CONFigure:RFGen:LEVel <value>		
Value range:	ON OFF	Switched on Switched off	**Default:** ON
State: RFG	**Option:** B7	With Query	

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1.5 Measurement, Analysis and Result Query

1.5.1 BER

1.5.1.1 Tolerances for the BER

Value for class-Ib Rate

Syntax:	CONFigure:LIMit:BER:CLIB:RATE		
Value range:	0.0 ... 100.0		**Default:** 0.4
State: ALL	**Option:** none	With Query	

Value for class-II Rate

Syntax:	CONFigure:LIMit:BER:CLII:RATE		
Value range:	0.0 ... 100.0		**Default:** 2.6
State: ALL	**Option:** none	With Query	

Values for erased frames Rate

Syntax:	CONFigure:LIMit:BER:EFRames:RATE		
Value range:	0.0 ... 100.0		**Default:** 1.0
State: ALL	**Option:** none	With Query	

Number of frames to be sent

Syntax:	CONFigure:BER:FRAMestosend <numeric_value>		
Value range:	1 ... 499		**Default:** 100
State: ALL	**Option:** none	With Query	

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Maximal number of events

Syntax:	CALCulate:LIMit:BER:CLIB:MEVents? CALCulate:LIMit:BER:CLII:MEVents? CALCulate:LIMit:BER:EFRames:MEVents?		
Return:	0 ... 65868 (Class IB) 0 ... 38922 (Class II) 0 ... 499 (Erased Frames)		
State: ALL	**Option:** none	Query only	**Note:** The values are derived from "Frames to send" and thus cannot be set.

Maximal number of samples to be sent and test time

The maximal number of samples sent in the test is derived from the value for "Frames to send". These values are only reached in the test if the errors do not exceed the tolerances.

Syntax:	CALCulate:BER:CLIB:MSAMples? CALCulate:BER:CLII:MSAMples? CALCulate:BER:EFRames:MSAMples? CALCulate:BER:TEST:TIME?		
Return:	1320 ... 65868 (Class IB) 780 ... 38922 (Class II) 10 ... 499 (Erased Frames) 0.20 ... 9.98 (Test time, seconds)		
State: ALL	**Option:** none	Query only	**Note:** The values are derived from "Frames to send" and thus cannot be set.

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1.5.1.2 BER Measurement

Measured values of class Ib

Syntax: Execute new measurement and signal result Read result only	READ[:SCALar]:BER:CLIB[:BER]? READ[:SCALar]:BER:CLIB:RBER? FETCh[:SCALar]:BER:CLIB[:BER]? FETCh[:SCALar]:BER:CLIB:RBER?		
Return:	BER and RBER: 0 ... 100 (Unit: %)		
State: MCE	**Option:** none	Query only	**Note:** No default values, (N4) If a read is performed on BER, all subsequent fetches will return BER values until a RBER read is carried out. The same applies for RBER

Measured values of class II

Syntax: Execute new measurement and signal result Read result only	READ[:SCALar]:BER:CLII[:BER]? READ[:SCALar]:BER:CLII:RBER? FETCh[:SCALar]:BER:CLII[:BER]? FETCh[:SCALar]:BER:CLII:RBER?		
Return:	BER and RBER: 0 ... 100 (Unit: %)		
State: MCE	**Option:** none	Query only	**Note:** No default values, (N4) If a read is performed on BER, all subsequent fetches will return BER values until a RBER read is carried out. The same applies for RBER

Measured values of erased frames

Syntax: Execute new measurement and signal result Read result only	READ[:SCALar]:BER:EFRames[:FER]? FETCh[:SCALar]:BER:EFRames[:FER]?		
Return:	BER and RBER: 0 ... 100 (Unit: %)		
State: MCE	**Option:** none	Query only	**Note:** No default values, (N4)

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1.5.2 Power

1.5.2.1 Tolerances for Power

Resetting to default values

Syntax:	CALCulate:LIMit:POWer[:TEMPlate]:CLEar		
State: ALL	**Option:** none	No Query	**Note:** Resets the GSM, GSM850, DCS1800 and DCS1900 tolerances

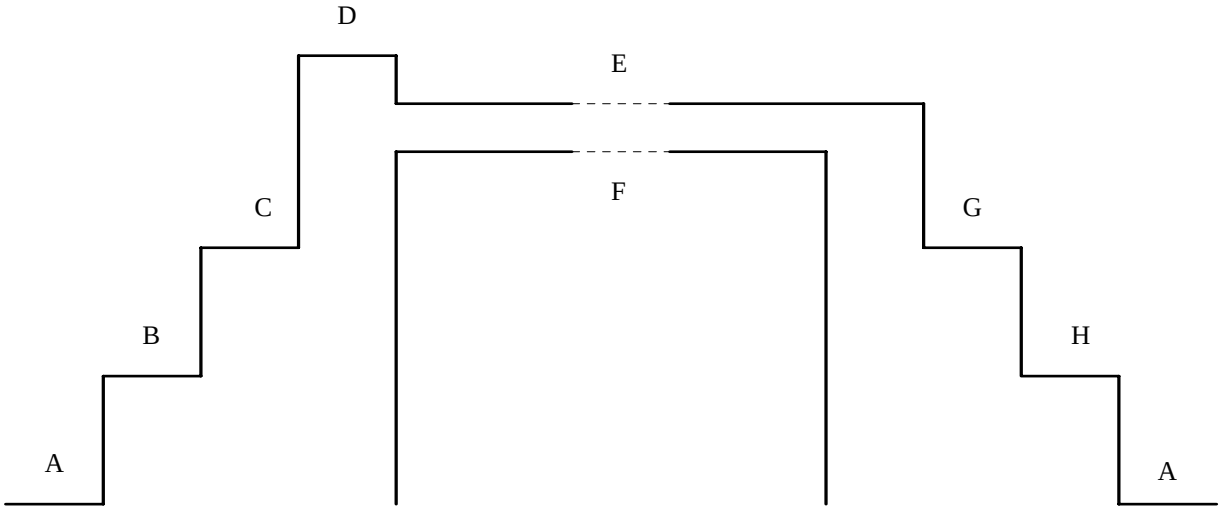
Tolerances for average power in the power time template

Syntax:	CALCulate:LIMit:POWer[:TEMPlate]:TOLerance1[:DATA] <numeric_value> CALCulate:LIMit:POWer[:TEMPlate]:TOLerance2[:DATA] <numeric_value>			
Value range:			Deviation from expected value	**Default:**
	GSM and GSM850:			GSM:
	CALC:LIM:POW:TOL1	0.0 ... +9.9 dB	with maximum power control level	TOL1 +2.0 dB
	CALC:LIM:POW:TOL2	0.0 ... +9.9 dB	with all other power control levels	TOL2 +3.0 dB
	DCS1800 and DCS1900:			DCS1800:
	CALC:LIM:POW:TOL1	0.0 ... +9.0 dB	with maximum power control level	TOL1 +3.0 dB
	CALC:LIM:POW:TOL2	0.0 ... +9.0 dB	up to power control level 8	TOL2 +3.0 dB
				DCS1900:
				TOL1 +3.0 dB
				TOL2 +4.0 dB
State: ALL	**Option:** none	With Query	**Note:** The deviations always apply symmetrically about the expected value	

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Tolerances for power time template

The level designations used in the power time template for the command CALCulate:LIMit:POWer[:TEMPlate][:DATA] can be obtained from the following illustration:



Syntax:	CALCulate:LIMit:POWer[:TEMPlate][:DATA] <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>		
Value range:	-100.0 ... 0.0 dBm -100.0 ... 0.0 dB -100.0 ... 0.0 dB -100.0 ... 0.0 dB 0.0 ... +20.0 dB 0.0 ... +5.0 dB -5.0 ... 0.0 dB -100.0 ... 0.0 dB -100.0 ... 0.0 dB	Absolute level at A Relative level at A Relative level at B Relative level at C Relative level at D Relative level at E Relative level at F Relative level at G Relative level at H	**Default:** GSM: -36.0 dBm GSM850: -36.0 dBm DCS1800: -47.0 dBm DCS1900: -47.0 dBm -45.0 dB -30.0 dB -6.0 dB +4.0 dB +1.0 dB -1.0 dB -6.0 dB -30.0 dB
State: ALL	**Option:** none	With Query	

Query for observance of the tolerances for average power

Syntax:	CALCulate:LIMit:POWer[:TEMPlate]:TOLerance:MATChing?		
Return:	(MATC | NMAT | INV)		
State: MCE	**Option:** none	Query only	**Note:** returns the result from the last measurement, (N5), (N6)

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Query for observance of the tolerances of the power/time template

Syntax:	CALCulate:LIMit:POWer[:TEMPlate]:MATChing?		
Return:	MATC | in Tolerance NMAT | out of Tolerance INV | no measurement result available NRAM | no ramping NTSC | no valid TSC found OUT | Out of dynamic range TEAR | falling edge of ramp too early THIG | value of Phase/Frequency error too high TLAT | rising edge of ramp too late TLON | Burst too long TSH Burst too short		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** returns the result from the last measurement, (N5), (N6)

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1.5.2.2 Power Measurement

Average power of the burst

Syntax: Execute new measurement and signal result Read result only	READ[:SCALar]:BURSt:POWer:AVERage? FETCh[:SCALar]:BURSt:POWer:AVERage?		
Return:	<value> (unit: dBm)		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** No default values, (N5)

Power values of the burst

Syntax: Execute new measurement and signal result Read result only	READ:ARRay:BURSt:POWer? FETCh:ARRay:BURSt:POWer?		
Return:	<value> {, <value>} (unit: dB)		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** No default values, (N5)

Peakvalue of the power

Syntax: Execute new measurement and signal result	SENSe:POWer:PEAK?		
Return:	<value> (unit: dBm)		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** No default values, (N5)

Power Measurement Mode Status

Syntax:	SENSe:MODuletest:MEASurement:MODE?		
Value range:	"SENSITIVE" "NORMAL"		**Default:** "NORMAL"
State: MOD	**Option:**	Only query	**Note**:

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Sensitive Power Measurement Offset

Syntax:	CONFigure:MODuletest:SPM:OFFSet[?]		
Value range:	-10 dB +10 dB		**Default:** 2 dB
State: MOD	**Option:**		**Note**: This value can also be adjusted automatically by the SPM calibration routine.

Calibration Routine Start

Syntax:	PROCedure:CALibrate:SPM?		
Value range:	"CALIBRATION_OK", "CALIBRATION_FAILED_WRONG_FREQUENCY", "CALIBRATION_FAILED_INVALID_SIGNAL", "CALIBRATION_FAILED_UNSTABLE_SIGNAL"		**Default:**
State: MOD	**Option:**	Only query	**Note**: This command starts the SPM calibration routine.

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1.5.3 Phase and Frequency Errors

1.5.3.1 Tolerances for Phase and Frequency Errors

Resetting to default values

Syntax:	CALCulate:LIMit:PHFR:CLEar		
State: ALL	**Option:** none	No Query	**Note:** Sets the GSM,GSM850, DCS1800 or DCS1900 tolerances

Tolerances for phase and frequency error

Syntax:	CALCulate:LIMit:PHFR:TOLerance[:DATA] <numeric_value>, <numeric_value>, <numeric_value>			
Value range:	0.0 ... 100.0 deg (Peak phase error) 0.0 ... 25.0 deg (RMS phase error) GSM: 0 ... 200 Hz (Frequency error) GSM850: 0 ... 200 Hz (Frequency error) DCS1800: 0 ... 400 Hz DCS1900: 0 ... 400 Hz			**Default:** 20.0 deg 5.0 deg GSM: 90 Hz GSM850: 90 Hz DCS1800: 180 Hz DCS1900: 180 Hz
State: ALL	**Option:** none	With Query		

Query for observance of tolerances

Syntax:	CALCulate:LIMit:PHFR:TOLerance:MATChing?		
Return:	(MATC | NMAT | INV), (Peak phase error) (MATC | NMAT | INV), (RMS phase error) (MATC | NMAT | INV) (Frequency error)		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** Supplies the result for the last measurement, (N5), (N6)

Query for observance of the tolerances (average and maximum value measurement)

Syntax:	CALCulate:LIMit:PHFR:TOLerance:MATChing:AVERage? CALCulate:LIMit:PHFR:TOLerance:MATChing:MAXimum?		
Return:	(MATC | NMAT | INV), (Peak phase error) (MATC | NMAT | INV), (RMS phase error) (MATC | NMAT | INV) (Frequency error)		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** Supplies the result for the last measurement, (N5), (N6)

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1.5.3.2 Test Parameters for Phase and Frequency Error Measurements

Number of bursts for average- and maximum-value measurements

Syntax:	CALCulate:LIMit:PHFR:AVERage		
Value range:	1 ... 999		**Default:** 10
State: ALL	**Option:** none	With Query	

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1.5.3.3 Phase Error Measurement

Total phase error of a burst

Syntax: Execute new measurement and signal result Read result only	RMS: READ[:SCALar]:BURSt:PHASe:ERRor:RMS? Peak: READ[:SCALar]:BURSt:PHASe:ERRor:PEAK? RMS: FETCh[:SCALar]:BURSt:PHASe:ERRor:RMS? Peak: FETCh[:SCALar]:BURSt:PHASe:ERRor:PEAK?		
Return:	<value> (current, unit: °) <value> (average, unit: °) <value> (maximum, unit: °)		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** No default values, (N5)

Phase error values of the burst

Syntax: Execute new measurement and signal result Read result only	READ:ARRay:BURSt:PHASe:ERRor? FETCh:ARRay:BURSt:PHASe:ERRor?		
Return:	<value> {, <value>} (unit: °)		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** No default values, (N5)

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1.5.3.4 Frequency Error Measurement

Total frequency error of a burst

Syntax: Execute new measurement and signal result Read result only	READ[:SCALar]:BURSt:FREQuency:ERRor? FETCh[:SCALar]:BURSt:FREQuency:ERRor?		
Return:	<value> (current, unit: Hz) <value> (average, unit: Hz) <value> (maximum, unit: Hz)		
State: MCE, RFG, BAN	**Option:** none	Query only	**Note:** No default values, (N5)

1.5.4 Timing Measurement

Syntax: Execute new measurement and signal result Read result only	READ[:SCALar]:BURSt:TIMing:ERRor? FETCh[:SCALar]:BURSt:TIMing:ERRor?		
Return:	<value> (unit: Bit)		
State: MCE	**Option:** none	Query only	**Note:** No default values, (N5)

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1.5.5 IQ Spectrum Measurement

1.5.5.1 Settings for IQ Spectrum Measurement

Channel number (ARFCN) and Frequency

Syntax:	CONFigure:CHANnel:IQSPectrum:ARFCn <numeric_value>		
Value range:	GSM: -74 ... 449 GSM850: 128 ... 251 DCS1800: 462 ... 1510 DCS1900: -238 ... 810	**Default:**	GSM: 50 GSM850: 251 DCS1800: 711 DCS1900: 661
State: ALL	**Option:** B7	With Query	

Syntax:	CONFigure:CHANnel:IQSPectrum:ARFCn:FREQuency <numeric_value>		
Value range:	GSM: 875.2 ... 989.8 (in steps of 0.2 MHz) GSM850: 824.2 ... 893.8 (in steps of 0.2 MHz) DCS1800: 1800.2 ... 1989.8 (in steps of 0.2 MHz) DCS1900: 1700.2 ... 1909.8 (in steps of 0.2 MHz)	**Default:**	GSM: 903 MHz GSM850: 869 MHz DCS1800: 1750 MHz DCS1900: 1880 MHz
State: ALL	**Option:** B7	With Query	

Signal setting

Syntax:	CONFigure:IQSPectrum:MODE <value>		
Value range:	CW | Continuous signal BURSt Pulsed signal	**Default:** BURSt	
State: IDLE, MOD	**Option:** B7	With Query	

Bandwidth

Syntax:	CONFigure:IQSPectrum:BANDwidth[:RESolution] <value>		
Value range:	B4 | Bandwidth 4 kHz B10 | Bandwidth 10 kHz B20 | Bandwidth 20 kHz B50 | Bandwidth 50 kHz B100 Bandwidth 100 kHz	**Default:** B4	
State: IDLE, MOD	**Option:** B7	With Query	

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Average value

Syntax:	CONFigure:IQSPectrum:AVERage[:COUNt] <value>		
Value range:	<value> 1 … 50		**Default:** 1
State: IDLE, MOD	**Option:** B7	With Query	

1.5.5.2 Measurements

Spectrum measurement

Syntax: Execute new measurement and signal result	READ:ARRay:IQSPectrum?		
Read result only	FETCh:ARRay:IQSPectrum?		
Return:	<value> {, <value>} (unit: dB; maximum 300 values, -150 kHz -> +150 kHz)		
State: IQSP	**Option:** B7	Query only	**Note:** No default value

Measurement of reference power

Syntax: Execute new measurement and signal result	READ[:SCALar]:IQSPectrum:POWer[:REFerence]?		
Read result only	FETCh[:SCALar]:IQSPectrum:POWer[:REFerence]?		
Return:	<value> (unit: dBm)		
State: IQSP	**Option:** B7	Query only	**Note:** No default value

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1.5.6 GPRS and BLER Measurement

Enable/disable GPRS

Syntax:	CONFigure:GPRS:STATe?		
Value range:	ON, OFF		**Default**: OFF
State: IDLE	**Option:** K4	With query	**Note:**

GPRS Signalling State

Syntax:	SENSe:GPRS:SIGNalling:STATe?		
Value range:	ATTACHED, NOT ATTACHED		**Default:**
State: MSYN	**Option:** K4	Only query	**Note**:

Configure Uplink State Flag (USF)

Syntax:	CONFigure:SIGNalling:IDENtity:USF?		
Value range:	0 - 7		**Default:** 0
State: IDLE,MSYN	**Option: K4**	With query	**Note:**

Configure Routing Area Code (RAC)

Syntax:	CONFigure:SIGNalling:IDENtity:RAC?		
Value range:	0 - 255		**Default:** 0
State: IDLE,MSYN	**Option:** K4	With query	**Note:**

Configure GPRS Coding Scheme

Syntax:	CONFigure:GPRS:BLER:CODIngscheme[?]		
Value range:	CS1 CS2 CS3 CS4		**Default:** CS1
State: IDLE,MSYN	**Option:** K4	With query	**Note**:

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Configure number of blocks for the BLER measurement

Syntax:	CONFigure:GPRS:BLER:BLOCkstosend[?]		
Value range:	10 - 9999		**Default: 1000**
State: IDLE,MSYN	**Option:** K4	With query	**Note:**

GPRS BLER measurement on/off

Syntax:	CONFigure:GPRS:BLER:State[?]		
Value range: ON,OFF			**Default:**
State: MSYN	**Option:** K4	With query	**Note**: This command does establish and release TBF and changes the state of the instrument to BLER.

Measured values of the error rate

Syntax: Execute new measurement and signal result Read result only	READ:GPRS:BLER:ERROrrate[?] FETCh:GPRS:BLER:ERROrrate[?]		
Value range:	0 ... 100 (Unit: %)		**Default:**
State: BLER	**Option:** K4	With query	**Note**: If a read is performed on BLER, all subsequent fetches will return error rate value until a BLER read is carried out.

Measured values of the data rate

Syntax: Execute new measurement and signal result Read result only	READ:GPRS:BLER:DATArate[?] FETCh:GPRS:BLER:DATArate[?]		
Value range:			**Default:**
State: BLER	**Option:** K4	With query	**Note**: If a read is performed on BLER, all subsequent fetches will return data rate value until a BLER read is carried out.

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1.6 Miscellaneous

1.6.1 Internal Instrument State

Current instrument state

Syntax:	STATus:DEVice?		
Return:	IDLE | Idle (initial state) MIDL | MS test: Idle MSYN | MS test: Synched MCE | MS test: Call established MOD | Module test Idle IQSP | IQ-spectrum BAN | Burst Analysis RFG RF generator		**Default:** IDLE
State: ALL	**Option:** none	Query only	

1.6.2 Mobile Station Details

Query for Mobile Stations Extended GSM capabilities

Syntax:	CALCulate:MOBILE:EGSM:STATus?		
Return:	NSUP Not Supported SUPP Supported		
State: MSYN or MCE	**Option:** none	Query only	**Default:** NSUP

Query for Mobile Stations Dual Band capabilities

Syntax:	CALCulate:MOBILE:DBHO:STATus?		
Return:	NSUP Not Supported SUPP Supported		
State: MSYN or MCE	**Option:** none	Query only	**Note:** Capability for 850/ 900 / 1800MHz only. **Default:** NSUP

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Query for Mobile Stations Enhanced Full Rate capabilities

Syntax:	CALCulate:MOBILE:EFRC:STATus?		
Return:	NSUP Not Supported SUPP Supported		
State: MCE	**Option:** none	Query only	**Default:** NSUP

Query for Mobile Stations Half Rate capabilities

Syntax:	CALCulate:MOBILE:HRC:STATus?		
Return:	NSUP Not Supported SUPP Supported		
State: MCE	**Option:** none	Query only	**Default:** NSUP

MS HSCSD multislot capabilities

Syntax:	SENSe:GPRS:HSCSd:CLASs?		
Value range:	"-" - parameter is not available “A(B Dn/C Up/D Sum” , where A is a number of uplink slots B is a number of downlink slots C is a multislot class number D is maximum available number of slots		**Default:**
State: MSYN	**Option:** K4	Only query	**Note:**

MS GPRS multislot capabilities

Syntax:	SENSe:GPRS:GPRS:CLASs?		
Value range:	"-" - parameter is not available “A(B Dn/C Up/D Sum”, where A is a number of uplink slots B is a number of downlink slots C is a multislot class number D is maximum available number of slots		**Default:**
State: MSYN	**Option:** K4	Only query	**Note:**

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MS RGSM status

Syntax:	CALCulate:MOBIle:RGSM:STATus?			
Value range:	NSUP – not supported SUPP – supported			**Default:**
State: MSYN		**Option:** none	Only query	**Note:**

1.6.3 Write to Hard Disk

Write Settings to Hard Disk

Syntax:	PROCedure:SET:WRIte:HD?			
Return:	ON OFF	All changes are saved to hard disk No new changes are saved to hard disk		
State: ALL		**Option:** none	With Query	**Note:** Not effected by *RST. **Default:** ON

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1.7 Specified Commands

1.7.1 Mandatory Commands

Clear Status

Syntax:	*CLS		
State: ALL	**Option:** none	No Query	

Standard Event Status Enable

Syntax:	*ESE <numeric_value>		
Value range:	0 ... 255		**Default:** 0
State: ALL	**Option:** none	With Query	**Note:** MAXimum and MINimum impermissible

Standard Event Status Register

Syntax:	*ESR?		
Return:	0 ... 255		
State: ALL	**Option:** none	Query only	

Identification Query

Syntax:	*IDN?		
Return:	ROHDE&SCHWARZ, CTSzz, .ssssss/sss, xx.xx yy.yy.yy (zz is the model no., eg 55, 60 or 65 ssssss/sss is the serial number of the testset, eg 123456/789 xx.xx is the software version, eg V 1.00 yy.yy.yy is the date, eg 18.10.93)		
State: ALL	**Option:** none	Query only	

Individual Status Query

Syntax:	*IST?		
Return:	0 | 1		
State: ALL	**Option:** none	Query only	

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Operation Complete

Syntax:	*OPC		
Return:	1 (return only in the case of query)		
State: ALL	**Option:** none	With Query	**Note:** Also influences the OPC bit in the event status register

Parallel Poll Enable Register Enable

Syntax:	*PRE <numeric_value>			
Value range:	0 ... 255			**Default:** 0
State: ALL	**Option:** none	With Query	**Note:** MAXimum and MINimum impermissible	

Power-on Status Clear

Syntax:	*PSC <numeric_value>			
Value range:	-32767 ... 32767			**Default:** 1
State: ALL	**Option:** none	With Query	**Note:** MAXimum and MINimum impermissible	

Service Request Enable

Syntax:	*SRE <numeric_value>			
Value range:	0 ... 255			**Default:** 0
State: ALL	**Option:** none	With Query	**Note:** MAXimum and MINimum impermissible	

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Status Byte Query

Syntax:	*STB?		
Return:	0 ... 255		
State: ALL	**Option:** none	Query only	

Wait-to-Continue

Syntax:	*WAI		
State: ALL	**Option:** none	No Query	

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1.8 Remarks

1.8.1 (N1)

-) The transmitter power is adapted, if necessary (see also (N3)).

-) The input may be overdriven if an external amplifier is connected.

-) The settings have only influence on the <default mobile>. It should be selected previously.

1.8.2 (N2)

During signalling, RXLEV, RXQUAL and POWER LEVEL are automatically polled by the mobile at regular intervals and thus updated.
The measurement for SENSe:POWer:MS? also runs automatically as soon as the connection is set up.

1.8.3 (N3)

-) The value is valid irrespective of the output and is automatically adapted to the output on transition to the MIDL state, which may cause the value range to be shifted.

-) The value applies to the currently set timeslot of the TCH.

-) For the value range see Manual Operation, section 2.

1.8.4 (N4)

Using a READ command, a new measurement is started and the desired value(s) returned. The result of this measurement can be repeatedly read by using a FETCh query without performing a new measurement. The FETCh command should only be used after a read has been executed otherwise initialisation values will be returned.

1.8.5 (N5)

After calling of a READ command, all scalar measurement results (average power, RMS and peak phase error and frequency error) are calculated and the desired value is returned; the remaining measurement results can be fetched using FETCh or CALCulate. However, if the measurement is made via READ:ARRay, the scalar values are available in addition to the selected field values. The measurement of the field values of the power (READ:ARRay:BURSt:POWer?) and phase error (READ:ARRay:BURSt:PHASe:ERRor?) are mutually exclusive, i.e. after READ:ARRay:BURSt:POWer? it is **not** possible to fetch the phase errors by means of FETCh:ARRay:BURSt:PHASe:ERRor?. The timing is measured when the power field values are measured, but **not** when the phase error is measured.

1.8.6 (N6)

The results of the tolerance query have the following meaning:

MATC:	The measurement result observes the configured limit values
NMAT:	The measurement result does not observe the configured limit values
INV:	No measurement result is available

1.8.7 (N7)

If a READ measurement command cannot be performed, the CTS will return NAN (Not A Number), to indicate a non-valid result. A FETCh command will also return NAN either after a non-valid measurement or if no measurement has been performed previously.

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MS Power Charts

Mobile Power Classes

Power Class	GSM 900		DCS 1800		PCS 1900	
	Max. Peak Power (W)	dBm	Max. Peak Power (W)	dBm	Max. Peak Power (W)	dBm
1	20	+43	1	+30	1	+30
2	8	+39	0.25	+24	0.25	+24
3	5	+37	---	---	2	+33
4	2	+33	---	---	---	---
5	0.8	+29	---	---	---	---

Mobile Power Control Levels

Power Control Level	Peak Power (dBm)		
	GSM 900	DCS 1800	PCS 1900
0	+43	+30	+30
1	+41	+28	+28
2	+39	+26	+26
3	+37	+24	+24
4	+35	+22	+22
5	+33	+20	+20
6	+31	+18	+18
7	+29	+16	+16
8	+27	+14	+14
9	+25	+12	+12
10	+23	+10	+10
11	+21	+8	+8
12	+19	+6	+6
13	+17	+4	+4
14	+15	+2	+2
15	+13	0	0
16 to 29			reserved
30			+33
31			+32

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Rx_LEV Values

The reported Rx_LEV values for received signal level are as follows:

Rx_LEV	Received Signal Level	Rx_LEV	Received Signal Level
0	Less than -110 dBm	33	-78 dBm to -77 dBm
1	-110 dBm to -109 dBm	34	-77 dBm to -76 dBm
2	-109 dBm to -108 dBm	35	-76 dBm to -75 dBm
3	-108 dBm to -107 dBm	36	-75 dBm to -74 dBm
4	-107 dBm to -106 dBm	37	-74 dBm to -73 dBm
5	-106 dBm to -105 dBm	38	-73 dBm to -72 dBm
6	-105 dBm to -104 dBm	39	-72 dBm to -71 dBm
7	-104 dBm to -103 dBm		
8	-103 dBm to -102 dBm	40	-71 dBm to -70 dBm
9	-102 dBm to -101 dBm	41	-70 dBm to -69 dBm
		42	-69 dBm to -68 dBm
10	-101 dBm to -100 dBm	43	-68 dBm to -67 dBm
11	-100 dBm to -99 dBm	44	-67 dBm to -66 dBm
12	-99 dBm to -98 dBm	45	-66 dBm to -65 dBm
13	-98 dBm to -97 dBm	46	-65 dBm to -64 dBm
14	-97 dBm to -96 dBm	47	-64 dBm to -63 dBm
15	-96 dBm to -95 dBm	48	-63 dBm to -62 dBm
16	-95 dBm to -94 dBm	49	-62 dBm to -61 dBm
17	-94 dBm to -93 dBm		
18	-93 dBm to -92 dBm	50	-61 dBm to -60 dBm
19	-92 dBm to -91 dBm	51	-60 dBm to -59 dBm
		52	-59 dBm to -58 dBm
20	-91 dBm to -90 dBm	53	-58 dBm to -57 dBm
21	-90 dBm to -89 dBm	54	-57 dBm to -56 dBm
22	-89 dBm to -88 dBm	55	-56 dBm to -55 dBm
23	-88 dBm to -87 dBm	56	-55 dBm to -54 dBm
24	-87 dBm to -86 dBm	57	-54 dBm to -53 dBm
25	-86 dBm to -85 dBm	58	-53 dBm to -52 dBm
26	-85 dBm to -84 dBm	59	-52 dBm to -51 dBm
27	-84 dBm to -83 dBm		
28	-83 dBm to -82 dBm	60	-51 dBm to -50 dBm
29	-82 dBm to -81 dBm	61	-50 dBm to -49 dBm
		62	-49 dBm to -48 dBm
30	-81 dBm to -80 dBm	63	Greater than -48 dBm
31	-80 dBm to -79 dBm		
32	-79 dBm to -78 dBm		

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Rx_QUAL Values

The reported Rx_QUAL values for received signal level are as follows:

Rx_QUAL Value	Bit Error Rate Range	Mean Value
0	< 0.2 %	0.14 %
1	0.2 to 0.4 %	0.28 %
2	0.4 to 0.8 %	0.57 %
3	0.8 to 1.6 %	1.13 %
4	1.6 to 3.2 %	2.26 %
5	3.2 to 6.4 %	4.53 %
6	6.4 to 12.8 %	9.05 %
7	> 12.8 %	18.10 %

Reference Sensitivity Levels

MS Reference Sensitivity	dBm
GSM mobile class 1, 2, 3	-104
GSM handportable class 4 & 5	-102
DCS 1800 class 1 & 2	-100
DCS 1800 class 3	-102
PCS 1900 all classes	-102

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