Supplement

Digital Standard GSM/EDGE

R&S® AMU-K40
1402.6106.02

R&S® AFQ-K240
1401.6302.02

R&S® SMATE-K40
1404.5107.02

R&S® AMU-K240
1402.7602.02

R&S® SMJ-K40
1404.0305.02

R&S® CMW-KW200
1203.0951.02

R&S® SMU-K40
1160.7609.02

R&S® SMJ-K240
1409.0510.02

R&S® SMU-K240
1408.5518.02

ROHDE & SCHWARZ
Test and Measurement

Dear Customer,

The Signal Generator includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/).

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Trade names are trademarks of the owners.

Grouped Safety Messages

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

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

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

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

Symbols and safety labels

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

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

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

Tags and their meaning

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

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

CAUTION   CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE   NOTICE indicates a property damage message.

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

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

Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude 2000 m above sea level, max. transport altitude 4500 m above sea level.
A tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.

2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).

3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.

4. If products/components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.

5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.

6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer/operator is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.

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

8. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.

9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.

10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.

11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.

12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.

13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).

14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, this can result in sparks, fire and/or injuries.

15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.

16. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.

17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.

18. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.

19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a license electrician.

20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.

21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.

22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.

23. Rohde & Schwarz products are not protected against penetration of liquids, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock for the user or damage to the product, which can also lead to personal injury.

24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.

25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.

26. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.

27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. Do not short-circuit batteries and storage batteries.
If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries must be recycled and kept separate from residual waste. Batteries and storage batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.

29. The product can be very heavy. Be careful when moving it to avoid back or other physical injuries.

30. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves).

31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.

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

33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the product documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.

34. Prior to cleaning, disconnect the product from the AC supply. Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluent for cellulose lacquers.

Informaciones elementales de seguridad

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

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

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

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

Símbolos y definiciones de seguridad

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

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

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

Palabras de señal y su significado

PELIGRO	Identifica un peligro directo con riesgo elevado de provocar muerte o lesiones de gravedad si no se toman las medidas oportunas.
ADVERTENCIA	Identifica un posible peligro con riesgo medio de provocar muerte o lesiones (de gravedad) si no se toman las medidas oportunas.
ATENCIÓN	Identifica un peligro con riesgo reducido de provocar lesiones de gravedad media o leve si no se toman las medidas oportunas.
AVISO	Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.
	En la documentación del producto se emplea de forma sinónima el término CUIDADO.

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

Informaciones de seguridad elementales

1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4.500 m sobre el nivel del mar. Se aplicará una tolerancia de ±10% sobre el voltaje nominal y de ±5% sobre la frecuencia nominal.

2. En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de trabajo y de prevención de accidentes. El producto solamente debe de ser abierto por personal especializado autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de la corriente conductora, control de funcionamiento).

3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se produjeran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.

4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.

5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.

6. Ciertos productos, como por ejemplo las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética.

El empresario/usuario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo aumentado de exposición a radiaciones para evitar riesgos.

7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.

8. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del producto.

9. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.

10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto. Puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro que es controlado su estado técnico de seguridad.

11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (según la medida del cable de distribución, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.

13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).

14. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.

15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.

16. En las mediciones en circuitos de corriente con una tensión de entrada de $U_{eff} > 30$ V se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).

17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos del estándar IEC950/EN60950.

18. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.

19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.

20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.

21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir cortocircuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.

22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.

23. Los productos R&S no están protegidos contra líquidos si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente para el usuario o de daños en el producto lo cual también puede llevar al peligro de personas.

24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.

25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.

26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. No cortocircuitar baterías ni acumuladores. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Las baterías y acumuladores deben reutilizarse y no deben acceder a los vertederos. Las baterías y acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de evacuación y reciclaje.

28. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.

29. El producto puede poseer un peso elevado. Muévalo con cuidado para evitar lesiones en la espalda u otras partes corporales.

30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).

31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean observadas. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.

32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo. El fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.

33. Dado el caso de que esté integrado un producto de láser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación de producto. De otra manera pondrá en peligro su salud, ya que el rayo láser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo láser.

34. Antes de proceder a la limpieza, desconecte el producto de la red. Realice la limpieza con un paño suave, que no se deshilache. No utilice de ninguna manera agentes limpiadores químicos como, por ejemplo, alcohol, acetona o nitrodiluyente.

Contents – Digital Standard GPS

Contents – Digital Standard GPS

Digital Standard GSM/EDGE

Digital Standard GSM/EDGE

Introduction - Digital Standard GSM/EDGE

The R&S Signal Generator enables you to generate signals in accordance with the GSM/EDGE standard.

GSM is a TDMA standard for cellular mobile radio networks and is used worldwide. The R&S Signal Generator is suitable as a signal generator for all GSM variants. There is no restriction regarding the use of GSM slots and EDGE slots.

The R&S Signal Generator can generate both the transmitter signal of a base station (BS) and the transmitter signal of a user equipment (UE).

Every TDMA frame consists of 8 timeslots (or simply "slots"). Each slot can be separately turned on or off. A maximum of 7 different level attenuation values can be defined and allocated separately to the 8 slots quite independently of one another.

In order to configure a slot it is necessary to define a burst type. You can choose between data bursts Normal (full rate and half rate) and EDGE; control bursts Access, Frequency Correction and Synchronization; a Dummy Burst; and bursts for test purposes, All_Data (GSM and EDGE). Not only can you generate half rate slots but you can also define multislots for HSCSD (high speed circuit switched data) and (E)GPRS (general packet radio service) configurations at the physical level, if necessary allocating multiple slots to a single connection (channel banding).

The modulation data is continuously inserted into the chosen slots (in realtime). In this fashion the data generator uses a digital signal processor to generate a data stream complete with modulation data and control signals for power ramping.

This data stream is converted into I/Q signals in the modulation encoder. In accordance with the GSM standard, the MSK modulation type is set by default to a symbol rate of 270.833 ksymb/s and Gauss filtering. The symbol rate can be changed in the R&S Signal Generator. FSK with adjustable span can also be used as the modulation type.

In accordance with the standard, in the case of EDGE slots the 8PSK modulation type is set by default to $3/8\pi$ rotation at a symbol rate of 270.833 ksymb/s and Gauss linearized filtering.

Three modes are available for configuring a GSM/EDGE signal:

- **Mode Unframed** - a signal with standard-compliant modulation parameters but without slot and frame structure is generated.

- **Mode Frame (Single)** - a signal consisting of a frame is generated; it is also possible to choose half rate bursts and to define multislots.

- **Mode Frame (Double)** - a signal consisting of two frames is generated; the frames are repeated according to a defined default.

GSM/EDGE Menu

The menu for setting the digital standard can be opened either in the **Baseband** block or in the menu tree under Baseband.
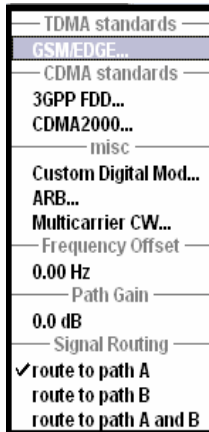
Digital Standard GSM/EDGE Main Menu

The menu offered different differs according to the mode selected. Most of the submenus and settings are available to all modes, however.

The upper part of the menu is used for turning on the GSM/EDGE digital standard and choosing the mode. The **Set to Default** button calls the default settings for the GSM/EDGE standard.

The submenus for choosing the modulation, for setting the trigger and clock parameters, and for data list management are available to all modes.

For all modes except Unframed, the submenus for saving and loading a frame and for setting the power ramping and slot attenuation are also available.

The lower part of the menu displays the chosen frame configuration, except in Unframed mode when it displays the signal configuration.

In this graphical display you can select the slot that you wish to edit. The burst editor then opens.
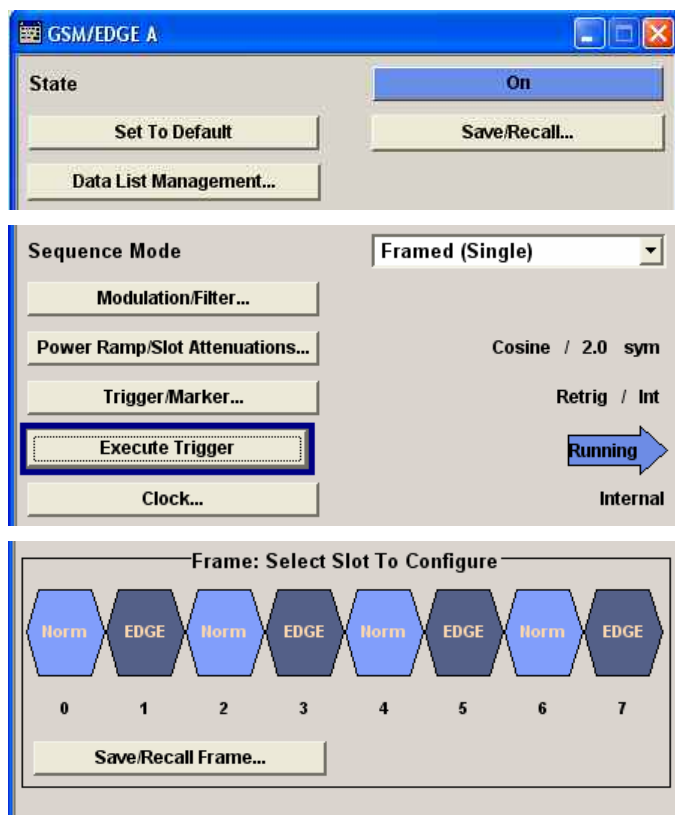
The upper part of the menu is used for turning on and resetting the GSM/EDGE digital standard and for choosing the mode.

State - GSM/EDGE

Switches the GSM/EDGE standard on/off.

Enabling this standard disables all the other digital standards and digital modulation modes (in case of two-path instruments, this affects the same path).

GSM/EDGE is a realtime system (no precalculated signal), and therefore all parameter changes (in the ON state) directly affect the output signal.

Remote-control command:
SOUR:BB:GSM:STAT ON

Set to Default - GSM/EDGE

Calls default settings. The values are shown in the following table.

Remote-control command:
SOUR:BB:GSM:PRES

Parameter	Value
State	Not affected by Set to Default
Mode	Framed (single)
Modulation	
Symbol Rate	270.833 ksymb/s
Ignore ¼...	Off
Force Dummy Bits to 1	Off
Mod. Type GSM	MSK 1bit/sym
Filter	Gauss
Filter Par. BT	0.3
Mod. Type Edge	8 PSK EDGE (3PI/8 8PSK)
Filter	Gauss linear
Trigger	
Mode	Auto
Source	Internal
Ext. Delay	0 symbols
Ext. Inhibit	0 symbols
Marker Mode	Frame
Marker Period	0 frames
Marker Delay	0 symbols
Clock	
Source	Internal
Mode	Symbol
Delay	0 symbols
Power Ramp Control	
Time	3 sym
Function	Cosine
Delay	0 symbols
Rise Offset	0 symbols
Fall Offset	0 symbols
Slot Attenuation 1...7	0 dB
Slot 0 Configuration	
Burst Type	Normal (full rate)
Slot Level	Full
Multislot	Off
Number of Slots	1
Data	PRBS 9
Use Stealing Flag	On
Stealing Flag	0
TSC	TSC 0
Slot 1-7 Configuration	
Slot Level, other settings as slot 0	Off

Save/Recall - GSM/EDGE

Calls the **Save/Recall** menu.

From the **Save/Recall** menu, the **File Select** windows for saving and recalling GSM configurations and the **File Manager** can be called.

Remote-control command: n.a.

Recall GSM setting

Opens the **File Select** window for loading a saved GSM configuration.

The configuration of the selected (highlighted) file is loaded by pressing the **Select** button.
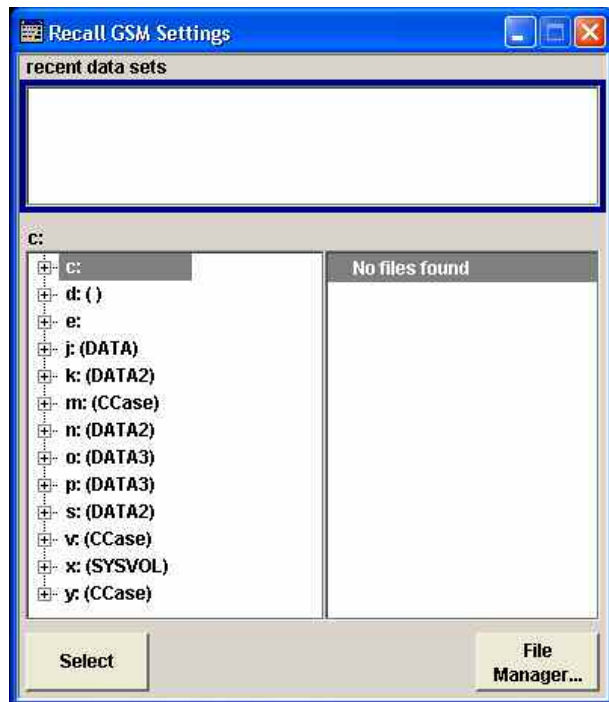
Remote-control command:
`MMEM:CDIR 'F:\gen_lists\gsm'`

`SOUR:BB:GSM:SETT:CAT?`
Response: `'gsm_1', gsm_2'`

`SOUR:BB:GSM:SETT:LOAD "gsm_1"`

Save GSM setting

Opens the **File Select** window for saving the current GSM signal configuration.

The name of the file is specified in the **File name** entry field, the directory selected in the **save into** field. The file is saved by pressing the **Save** button.
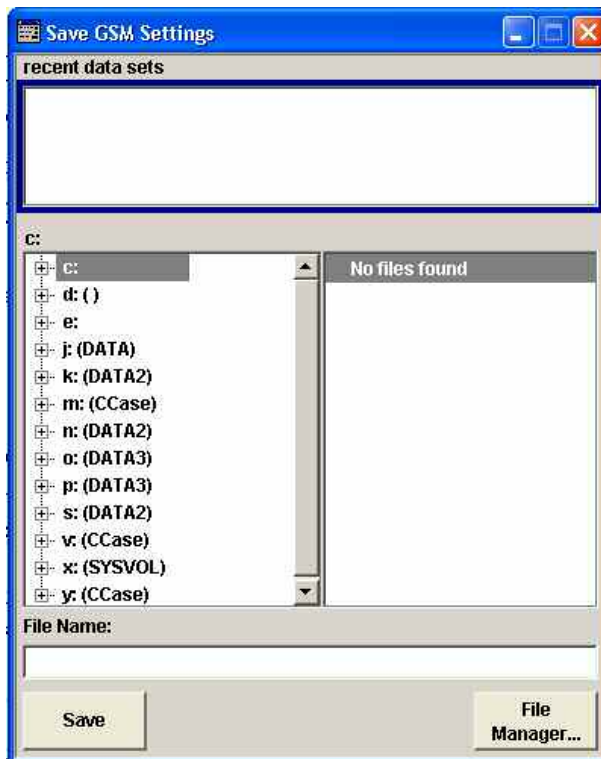
Remote-control command:
```
MMEM:CDIR 'F:\gen_lists\gsm'

SOUR:BB:GSM:SETT:STOR 'gsm_1'
```

File Manager

Calls the **File Manager**.

The **File Manager** is used to copy, delete and rename files and to create new directories.

Remote-control commands:
```
MMEM:CDIR 'F:\gen_lists\gsm'

SOUR:BB:GSM:SETT:DEL 'gsm_1'
```

Data List Management - GSM/EDGE

Calls the **Data List Management** menu. This menu is used to select and edit a data list.
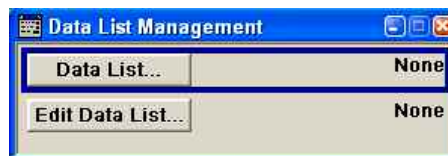
All data lists are stored as files with the predefined file extension ***.dm_iqd**. The file name and the directory they are stored in are user-definable.

The data lists must be selected as a data source in the Burst Editor.

The operation of the File Select menu for selecting a data list (**Data List...** button) and the Data List editor for editing a data list (**Edit Data List...** button) is described in detail in Chapter 3, Manual Operation.

Remote-control commands:

Note:
All data lists are generated and edited by means of the SOURce:BB:DM subsystem commands. Files containing data lists end with *.dm_iqd. The data lists are selected as a data source for a specific function in the individual subsystems of the digital standard.

Creating and editing the data list:

```
SOUR:BB:DM:DLIS:SEL "gsm"
SOUR:BB:DM:DLIS:DATA 1,1,0,1,0,1,0,1,1,1,1,0,0,0
SOUR:BB:DM:DLIS:DATA:APP 1,1,0,1,0,1,0,1,1,1,1,0,0,0
```

Selecting the data list:

```
SOUR:BB:GSM:FRAM:SLOT2:USER:SOUR:DATA DLIS
SOUR:BB:GSM:FRAM:SLOT2:USER:SOUR:DSEL "gsm"
```

The middle part of the menu is identical for all modes except Unframed, for which some of the submenus are not available.

Sequence Mode - GSM/EDGE

Selects GSM/EDGE mode.

There are three modes available:

- Unframed (see Mode Unframed - GSM/EDGE)
- Framed (single) (see Mode Framed (single) - GSM/EDGE, *page 10*)
- Framed (double) (see Mode Framed (double) - GSM/EDGE)

Remote-control command:
`SOUR:BB:GSM:MODE UNFR | SING | DOUB`

Modulation/Filter - GSM/EDGE

Calls the **Modulation/Filter** menu. The Modulation menu is used for setting the modulation and filter parameters (see section "Modulation/Filter - GSM/EDGE", page 17).

Remote-control command: n.a.

Power Ramping/Slot Attenuations - GSM/EDGE

Calls the **Power Ramping/Slot Attenuation** menu. These menu is used to set the power ramping parameters and for setting values for the level attenuation in dB (see section "Power Ramping/Slot Attenuation - GSM/EDGE ", page 19).

The currently selected ramp function and ramp time are displayed.

Remote-control command: n.a.

Trigger/Marker - GSM/EDGE

(Trigger for R&S SMx and R&S AMU instruments only)

Calls the **Trigger/Marker/Clock** menu.

This menu is used to select the trigger source, configure the marker output signals and set the time delay on an external trigger signal (see section "Trigger/Marker/Clock - GSM/EDGE", page 22).

Remote-control command: n.a.

Execute Trigger - GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Executes trigger manually. A manual trigger can be executed only when an internal trigger source and a trigger mode other than Auto have been selected.

Remote-control commands:
`SOUR:BB:GSM:TRIG INT`
`SOUR:BB:GSM:SEQ RETR`
`SOUR:BB:GSM:TRIG:EXEC`

Clock - GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Calls the **Trigger/Marker/Clock** menu. This menu is used to select the clock source (see section "Trigger/Marker/Clock - GSM/EDGE", page 22).

Remote-control command: n.a.

Mode Unframed - GSM/EDGE

In **Unframed** mode a modulation signal without slot or frame structure is generated. The modulated carrier without power ramping is often enough for initial tests, and the complete signal is not yet needed.

Since all the modulation parameters for the signal already conform to the standard, the right modulation (in this case MSK for GSM and 8PSK EDGE for EDGE), symbol rate and filter configuration are set.

This mode can be used for quick measurements of the spectrum or signal quality (e.g. EVM).

The submenus for selecting the modulation (see section "Modulation/Filter - GSM/EDGE", page 17), as well as the trigger, marker and clock (see section "Trigger/Marker/Clock - GSM/EDGE", page 22) are offered.
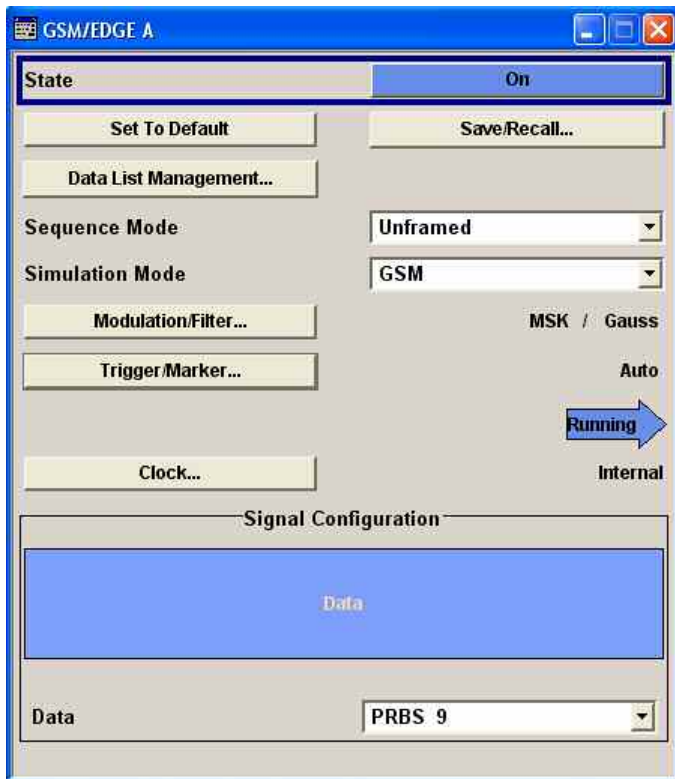
Simulation Mode - GSM/EDGE

Chooses between the GSM and EDGE standards for the signal.
The signal is generated without slot or frame structure.
For GSM the modulation that is set under **Modulation** is used.
The modulation used for EDGE is always 8PSK.

Remote-control command:
`SOUR:BB:GSM:SMOD GSM | EDGE`

The graphical display shows the signal in **Unframed** mode - no frames, no power ramping.

Data - GSM/EDGE   Selects data source.
                             You may choose from the following data sources:

All 0   0 data or 1 data is internally generated.
All 1   Remote-control command:
                             SOUR:BB:GSM:SLOT0:DATA ALL0 | ALL1

Pattern   A user-definable bit pattern wih a maximum length of 32
                             bits is internally generated.
  Pattern
                             The bit pattern is defined in the Pattern input box.
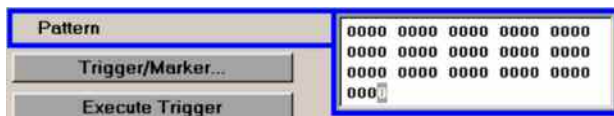
                             Remote-control command:
                             SOUR:BB:GSM:SLOT0:DATA PATT
                             SOUR:BB:GSM:SLOT0:DATA:PATT #H18F0,16

PRBS xx   PRBS data in accordance with the IUT-T with period
                             lengths between 29-1 and 223-1 are internally
                             generated.

                             Remote-control command:
                             SOUR:BB:GSM:SLOT0:DATA PN9 | PN11| ...

Data List   Internal data from a programmable data list created with
                             the aid of the data editor is used.
  Select List
                             Data lists are selected from the Select List submenu.

                             Remote-control command:
                             SOUR:BB:GSM:SLOT0:DATA DLIS
                             SOUR:BB:GSM:SLOT0:DATA:DLIS "gsm_1"

Creating and editing the data list:

```
SOUR:BB:DM:DLIS:SEL "d_list1"
SOUR:BB:DM:DLIS:DATA #B1111010101000001111....
SOUR:BB:DM:DLIS:DATA:APP #B1111010101000001111....
```

Selecting the data list:

```
SOUR:BB:TDSC:DOWN|UP:CELL1:SLOT2:CHAN5:DATA DLIS
SOUR:BB:TDSC:DOWN|UP:CELL1:SLOT2:CHAN5:DATA:DSEL "tdscdma_1"

SOUR:BB:TDSC:DOWN|UP:CELL1:SLOT2:CHAN5:DPCC:TPC:DATA DLIS
SOUR:BB:TDSC:DOWN|UP:CELL1:SLOT2:CHAN5:DPCC:TPC:DATA:DSEL "tdscdma_1"

SOUR:BB:TDSC:DOWN:CELL1:ENH:BCH:DTCH:DATA DLIS
SOUR:BB:TDSC:DOWN:CELL1:ENH:BCH:DTCH:DATA:DSEL "tdscdma_1"

SOUR:BB:TDSC:DOWN|UP:CELL1:ENH:DCH:DTCH|DCCH:DATA DLIS
SOUR:BB:TDSC:DOWN|UP:CELL1:ENH:DCH:DTCH|DCCH:DATA:DSEL "tdscdma_1"

SOUR:BB:TDSC:UP:CELL1:SLOT2:PRAC:MSG:DATA DLIS
SOUR:BB:TDSC:UP:CELL1:SLOT2:PRAC:MSG: DSEL "tdscdma_1"
```

Mode Framed (single) - GSM/EDGE

The **Framed (single)** mode generates a modulation signal which is defined by the structure of a single frame. The frame structure is repeated cyclically, but the useful data is continuously generated.
The frame structure is displayed in graphical form. Slot parameters can be defined in the burst editor, which is called when the slot is selected in the graphical display (see section "Burst Editor - GSM/EDGE", page 32). You can define half rate slots. The characteristics of each half rate slot can be defined separately. Each active slot is represented by a burst symbol. Two half rate slots occupy the space of a full rate slot. A slot in which the level has been attenuated is represented by a lower amplitude burst. Inactive slots (Slot Level = Off) are shown as a horizontal bar. If multislots have been defined, the banded slots are surrounded by a frame (slots 5 to 7 in the illustration).

When a half rate slot has been selected, two frames are generated alternately. Each frame holds one of the two half rate users:

Example:

The following configuration is set, from a frame with two slots that contain half rate users:
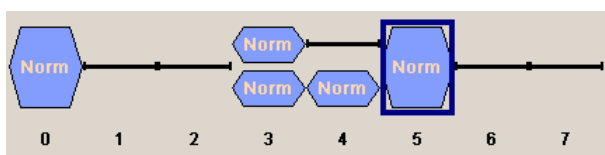
As a result, the following two frames are generated alternately:

◆   Frame with half rate user 1:
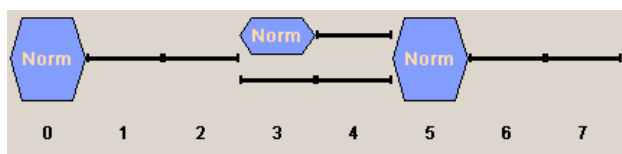
◆   Frame with half rate user 2

The following submenus are offered:

- For saving and loading a frame structure (see section "Save Recall Frame/Slots - GSM/EDGE", page 13).
- For selecting the modulation (see section "Modulation/Filter - GSM/EDGE", page 17).
- For selecting the trigger, marker and clock (see section "Trigger/Marker/Clock - GSM/EDGE", page 22).
- For power ramping and defining the attenuation (see section "Power Ramping/Slot Attenuation - GSM/EDGE ", page 19).

Save/Recall Frame …- GSM/EDGE   Call the Save/Recall Frame menu for selecting of predefined or user defined frames.
The menu is described in *"Save Recall Frame/Slots - GSM/EDGE"*.
Remote-control commands: n.a.

Mode Framed (double) - GSM/EDGE

The **Framed (double)** mode generates multiframe signals which are defined by the structure of two frames. For this purpose two frames are defined as in **Framed (single)** mode. A repetition factor is then specified for each of the two frames. Following a trigger the first frame is repeated the specified number of times, and then the second frame. The frame structures are repeated cyclically, but the useful data is continuously generated.

If one of the frames contains half rate slots (and so actually consists of 2 frames itself), the repetition factor must be a multiple of 2 (see previous section "Mode Framed (single) - GSM/EDGE".)

The frame structure of the two frames is displayed in graphical form. Slot parameters can be defined in the burst editor, which is called when the slot is selected in the graphical display (see section "Burst Editor - GSM/EDGE", page 32).

The following submenus are offered:

- For saving and loading a frame structure (see section "Save Recall Frame/Slots - GSM/EDGE", page 13).
- For selecting the modulation (see section "Modulation/Filter - GSM/EDGE", page 17).
- For selecting the trigger, marker and clock (see section "Trigger/Marker/Clock - GSM/EDGE", page 22).
- For power ramping and defining the attenuation (see section "Power Ramping/Slot Attenuation - GSM/EDGE ", page 19).

Save/Recall Frame …- GSM/EDGE	Call the Save/Recall Frame menu for selecting of predefined or user defined frames.
	The menu is described in *"Save Recall Frame/Slots - GSM/EDGE"*.
	Remote-control commands: n.a.
Frame Repetition- GSM/EDGE	Enters the number of repetitions for frame 1 or frame 2. First frame 1 is repeated the specified number of times, then frame 2, then frame 1 starts again, and so on.
	Remote-control commands:
	`SOUR:BB:GSM:FRAM1:REP 2`
	`SOUR:BB:GSM:FRAM2:REP 10`

Save Recall Frame/Slots - GSM/EDGE

The **Save/Recall Frame** menu is accessed via the **GSM/EDGE** main menu.

The **Save/Recall Slots** menu is accessed via the **Burst Editor** sub menu.

When you call the submenu using the corresponding button a box opens from which you can select the function you require:

Recall Predefined Frame
Recall User Frame
Save User Frame
File Manager...

Recall Predefined Slot
Recall User Slot
Save User Slot
File Manager...
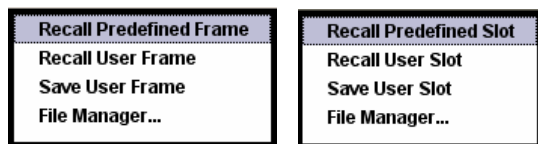
The **File Select** menus save and load (i.e. recall) user-defined frames or slots. Predefined frames or slots can also be recalled. Each menu offer access to the **File Manager** for general file management.

Predefined Frames and Slots are stored on a predefined path. This path is automatically set in the **File Select** window.

User-defined Frames and Slots are stored as files with the specific file extensions ***.gsm_fu** or ***.gsm_slu**, respectively. They can be stored in a user-determined directory and called from there.

It is not possible to use other file extensions. Attempting to do so will cause an error message. If the file extension is modified (e.g. by directly accessing the file system) the files are no longer recognized and therefore invalid.

Note:
In the following examples of commands the files are stored in the default directory which is defined by command MMEM:CDIRectory.

Recall Predefined Frame/Slot - GSM/EDGE

Calls the **File Select** menu for loading a predefined frame/slot.

The following predefined frames are available:

EDGE0:   slot 0 = On, full level, EDGE burst, all other slots off

EDGEAll: all slots On, full level, EDGE burst

GsmEdge: alternately one slot with NORMAL burst and EDGE burst

NormalBurst0:   slot 0 = On, full level, NORMAL burst (full rate), all other slots off

NormalBurstAll: all slots On, full level, NORMAL burst (full rate)

The following predefined slots are available:

GSM_NB_PN9_TSC0: NORMAL burst (full rate), full level, attenuation A1, multislot = Off, number of multislots = 1, Data = PRBS 9, Use Stealing Flag = On, TSC0, all slot-marker set to "all down".

EDGE_NB_PN9_TSC0: EDGE burst (full rate), full level, attenuation A1, multislot = Off, number of multislots = 1, Data = PRBS 9, Use Stealing Flag = On, TSC0, all slot-marker set to "all down".
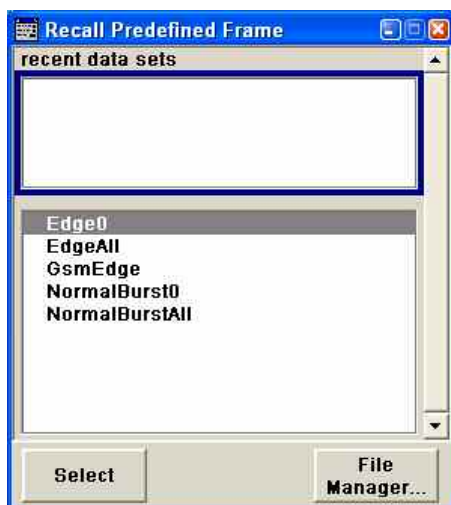
Remote-control command:
```
SOUR:BB:GSM:FRAM:PRED:CAT?
SOUR:BB:GSM:FRAM:PRED:LOAD "Edge0"
SOUR:BB:GSM:FRAM2:SLOT:PRED:CAT?
SOUR:BB:GSM:FRAM2:SLOT:PRED:LOAD 'EDGE_NB_PN9_TSC0'
```

| **Recall User Frame/Slot - GSM/EDGE** | Calls the **File Select** menu for loading a user-defined frame/slot. |
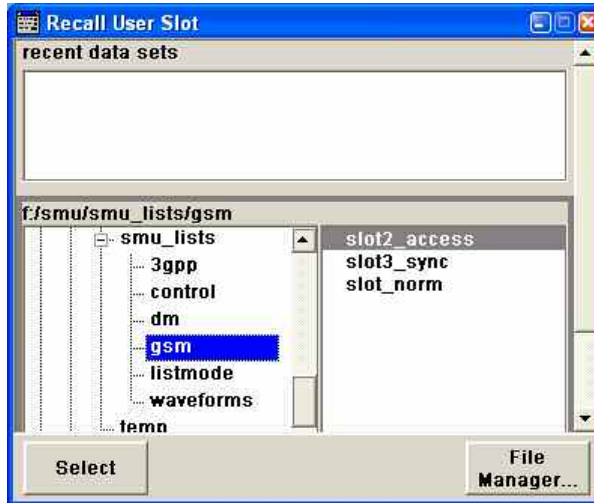
Remote-control command:
```
SOUR:BB:GSM:FRAM:ULIS:CAT?
SOUR:BB:GSM:FRAM:ULIS:LOAD "FRAM"
SOUR:BB:GSM:FRAM:SLOT:ULIS:CAT?
SOUR:BB:GSM:FRAM:SLOT:ULIS:LOAD "SLOT1"
```

| **Save User Frame/Slot - GSM/EDGE** | Calls the **File Select** menu for saving the current frame or slot settings. |
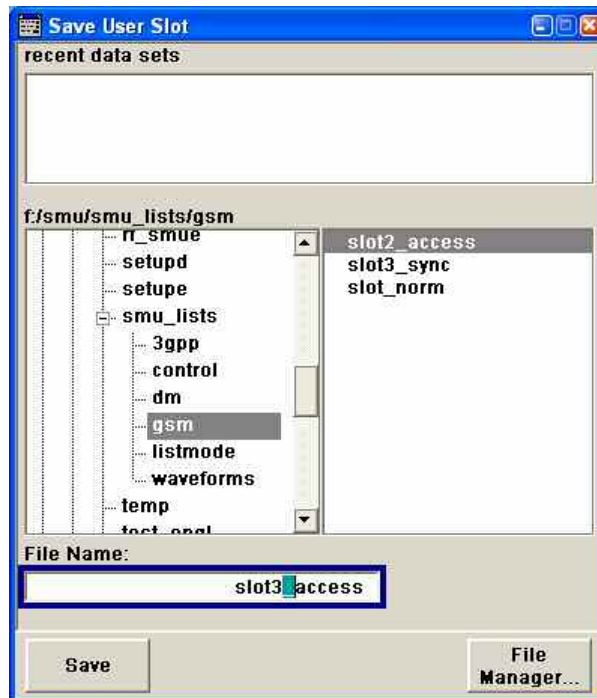
Remote-control command:
```
MMEM:MDIR 'F:\gen_lists\gsm'

SOUR:BB:GSM:FRAM:ULIS:STOR "FRAM1"
SOUR:BB:GSM:FRAM:SLOT:ULIS:STOR "SLOT1"
```

**File Manager -
GSM/EDGE**

Calls the **File Manager**.

The **File Manager** is used to copy, delete and rename files and to create new directories.

Remote-control commands:
```
MMEM:MDIR 'F:\gen_lists\gsm'

SOUR:BB:GSM:FRAM:ULIS:DEL 'd:\user\gsm\frame'
SOUR:BB:GSM:FRAM:SLOT:ULIS:DEL 'd:\user\gsm\slot'"
```

Modulation/Filter - GSM/EDGE

The **Modulation/Filter** menu is accessed via the **GSM/EDGE** main menu.
In this menu the parameters that apply separately to the GSM and EDGE standards are brought together in either the **GSM** or the **EDGE** sections. The rest of the parameters apply to both modulation types.

Symbol Rate - GSM/EDGE	Sets the symbol rate. The default value for GSM/EDGE is 270.833 33 ksymb/s. Remote-control command: `SOUR:BB:GSM:SRAT 270 kHz`
Ignore 1/4 symbol - GSM/EDGE	Selects constant slot length. This setting affects all burst types. The GSM slot has a length of 156.25 symbols. Compensation for the 1/4 symbol takes the form of an extra symbol every 4th slot. This means that some slots are 156 long and some are 157 long. Compensation takes place in the guard field of the burst (see section "Burst Editor - GSM/EDGE", page 32") If the field **Ignore 1/4 symbol (slot length 156 symbols)** is enabled, all slots are 156 symbols long. The extra ¼ symbol is omitted. The guard field for the burst always has the same length regardless of the slot index. A frame is therefore 1248 symbols long in place of 1250. Remote-control command: `SOUR:BB:GSM:ISL OFF	ON`
Force Dummy Bits to 1 - GSM/EDGE	A modulating bit stream consisting of consecutive ones is used for inactive slots (according to GSM 05.04). If this parameter is disabled, the inactive slots are filled in with 0. Remote-control command: `SOUR:BB:GSM:FONE ON`

The settings for Standard GSM are brought together in the **GSM** section.

Modulation Type GSM - GSM/EDGE	Selects modulation type for GSM signal. **MSK 1bit/symbol** Minimum Shift Keying **FSK 1bit/symbol** Frequency Shift Keying The chosen modulation is also displayed in graphical form:

     GSM with MSK or FSK

Remote-control command:

`SOUR:BB:GSM:FORM MSK | FSK2`

FSK Deviation- GSM/EDGE	Sets the deviation when selecting FSK. When MSK is selected, the deviation is set permanently to symbol_rate/4. Remote-control command: `SOUR:BB:GSM:FSK:DEV 67 KHZ`

Filter - GSM/EDGE	Displays filter for GSM signal. The filter is permanently set to GAUSS. Remote-control command: `SOUR:BB:GSM:FILT:TYPE?` Response: `GAUSS`

Filter Parameter - GSM/EDGE	Sets the BxT value for the GAUSS filter. The GSM default value is 0.3. Remote-control command: `SOUR:BB:GSM:FILT:PAR 0.3`

The settings for Standard EDGE are brought together in the **EDGE** section.

Modulation Type EDGE - GSM/EDGE	Displays modulation type for EDGE signal. The modulation type is set permanently to 8PSK EDGE ($3\pi/8$ 8PSK). Unlike the modulation types for GSM the modulation type for EDGE has 3 bits per symbol. The chosen modulation is also displayed in graphical form:

     EDGE with 8PSK

Remote-control command:

`SOUR:BB:GSM:EDGE:FORM?`

Response: `P8ED`

Filter - GSM/EDGE	Displays filter for EDGE signal. The filter is permanently set to GAUSS linearized. Remote-control command: `SOUR:BB:GSM:FILT:EDGE:TYPE?` Response: `GAUSS`

Power Ramping/Slot Attenuation - GSM/EDGE

The **Power Ramping/Slot Attenuation** menu is accessed via the **GSM/EDGE** main menu.
This menu is used to enter the settings for power ramping and level attenuation.
The **Power Ramp Control** section is used for setting the power ramp envelope.
The **Slot Attenuations (Used in Burst Editors)** section is used to define seven possible values for level attenuation. These values can be selected from the burst editor for the slot currently being edited. An eighth value is permanently set to 0 dB and corresponds to the **Slot Level Full** setting in the burst editor.
The **Power Ramping/ Level Attenuation** section is used for restricting power ramping to the baseband signal.
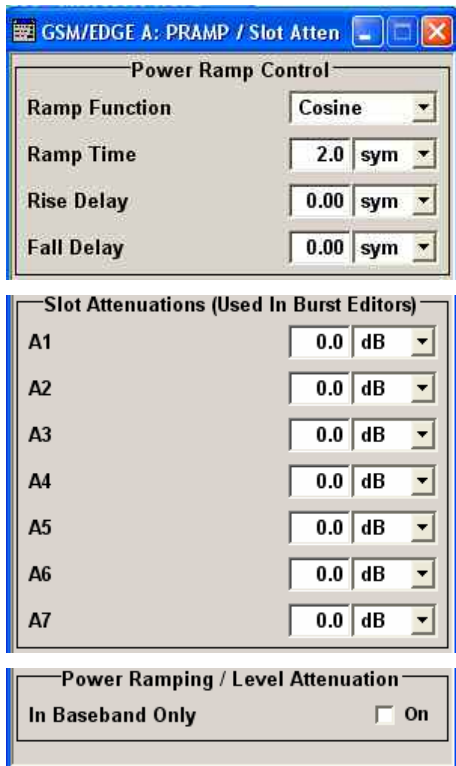
Ramp Time - GSM/EDGE	Enters the power ramping rise time and fall time for a burst. The setting is expressed in symbols.
	The transmitted power must not be switched abruptly at the start and end of a burst, because the switching operation would otherwise generate excessively strong non-harmonics; the switching operation is therefore stretched over several symbol clocks.
	Remote-control command:
	`SOUR:BB:GSM:PRAM:TIME 2.5`

Ramp Function - GSM/EDGE

Enters the form of the transmitted power during the switching operation, i.e. the shape of the rising and falling edges of the envelope.

Linear	The transmitted power rises and falls linear fashion.
	Remote-control command: `SOUR:BB:GSM:PRAM:SHAP LIN`
Cosine	The transmitted power rises and falls with a cosine-shaped edge. This gives rise to a more favorable spectrum than the **Linear** setting.
	Remote-control command: `SOUR:BB:GSM:PRAM:SHAP COS`

Rise Delay - Power Ramp Control - GSM/EDGE

Sets the offset in the rising edge of the envelope at the start of a burst. A positive value gives rise to a delay and a negative value causes an advance. The setting is expressed in symbols.

Remote-control command:
`SOUR:BB:GSM:PRAM:RDEL -1`

Fall Delay - Power Ramp Control - GSM/EDGE

Sets the offset in the falling edge of the envelope at the end of a burst. A positive value gives rise to a delay and a negative value causes an advance. The setting is expressed in symbols.

Remote-control command:
`SOUR:BB:GSM:PRAM:FDEL 1`

Slot Attenuation A1 to A7 - GSM/EDGE

Enters seven different values for level attenuation.

The burst editor can be used to set the level attenuation for the 8 slots to one of these predefined values independently of one another.

The ability to set a sequence of slots purposely to different levels (loud - soft - loud) in order to measure transmission stability is a requirement of measurement recommendation 11.21 in the latest GSM version 8.6.09.

The burst editor is likewise used to assign the **Slot Level** attribute **Attenuated** to individual slots.

Remote-control command:
`SOUR:BB:GSM:SATT2 12 dB`

**Baseband Only -
Power Ramp
Control – GSM/EDGE**

(Instruments with RF output only)

Restricts power ramping to the baseband signal.

Off	Level attenuation is effected via the attenuator stages in the RF section; only the remaining part is attenuated in the baseband. The signal is issued at the RF output with the defined level values. This setting provides the best possible dynamic for bursted signals.

Remote-control command:
`SOUR:BB:GSM:PRAM:BBON OFF`

On	Level attenuation is effected in the baseband only.

This setting is mandatory in the following cases:

-   When only the baseband signal is issued at the I/Q outputs. It is thus ensured that, with power ramping active, this signal is output with the defined level values.

-   When a baseband signal is applied to two RF paths of an two-path instrument. The RF paths having separate frequency and level settings, the remaining attenuation to be effected in the baseband would have to be different for the two paths and is therefore not possible.

-   When a bursted baseband signal (GSM/EDGE) is combined with a continuous baseband signal (e.g. 3GPP) or a noise signal and both signals are applied to one RF path of an two-path instrument. Blanking in the RF paths is not suitable, because the RF section would not only blank the bursted signal of the first baseband but also the continuous signal of the second baseband or the noise signal.

Remote-control command:
`SOUR:BB:GSM:PRAM:BBON ON`

Trigger/Marker/Clock – GSM/EDGE

Note:

   The trigger, clock, and marker delay functions are available for R&S SMx and R&S AMU instruments only.

The **Trigger/Marker/Clock** menu is used to enter settings for triggers, markers and clocks. The menu offers internal triggering as well as the two external trigger inputs TRIGGER 1 and 2. In the case of two-path instruments it also offers internal triggering by the second path.

Note:

   Additional marker settings are entered at the slot level (see section "Burst Editor – GSM/EDGE", page 32). For instance, at that level a data mask signal can be assigned to a marker connector. Such settings take effect when the marker signal "as defined in Slots" is selected.

Tip:

When synchronizing the R&S Signal Generator to an external GSM frame sync signal, the following settings are recommended:

- Trigger Mode = Armed_Auto

- Trigger Source = ExternalClock

- Clock Source = External

- Clock Mode = Fractional Symbol

- Symbol Clock Divider = 1250

The external GSM frame sync signal must be providedonly at the clock input.

The **Trigger/Marker/Clock** menu is accessed via the **GSM/EDGE** main menu.

The **Trigger In** section is where the trigger for the GSM/EDGE signal is set. Various parameters will be provided for the settings, depending on which trigger source – internal or external – is selected. The current status of signal generation (**Running** or **Stopped**) is indicated for all trigger modes.

The **Marker Mode** section is where the marker signals at the MARKER output connectors are configured.

The **Marker Delay** section is where a marker signal delay can be defined, either without restriction or restricted to the dynamic section, i.e., the section in which it is possible to make settings without restarting signal and marker generation.

The **Clock Settings** section is where the clock source is selected and – in the case of an external source – the clock type.

The **Global Trigger/Clock Settings** button leads to a submenu for general trigger and clock settings. The **User marker / AUX I/O Settings** button leads to a submenu for mapping the AUX I/O connector on the rear of the instrument.
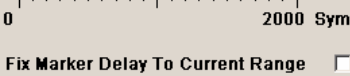
The **Trigger** section is used to configure the trigger signal for generating the GSM/EDGE signal. The current status of signal generation is indicated for all trigger modes.

**Trigger Mode –
GSM/EDGE**

(R&S SMx and R&S AMU instruments only)

Selects trigger mode.

The trigger mode determines the effect of a trigger on the signal generation.

Auto	The GSM/EDGE signal is generated continuously.
	Remote-control command: `SOUR:BB:GSM:SEQ   AUTO`
Retrigger	The GSM/EDGE signal is generated continuously. A ccurs event (internal or external) causes a restart.
	Remote-control command: `SOUR:BB:GSM:SEQ   RETR`
Armed_Auto	The GSM/EDGE signal is generated only when a trigger event ccurs. Then the GSM/EDGE signal is generated continuously.
	Button Arm stops signal generation. A subsequent trigger event (internal with Execute Trigger or external) causes a restart.
	Remote-control command: `SOUR:BB:GSM:SEQ   AAUT`
Armed_Retrigger	The GSM/EDGE signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes a restart.
	Button Arm stops signal generation. A subsequent trigger event (internal with Execute Trigger or external) causes a restart.
	Remote-control command: `SOUR:BB:GSM:SEQ ARET`
Single	The GSM/EDGE signal is output only when a trigger event occurs. Then the signal is output once in the length specified in Signal Length. Every subsequent trigger event (internal with Execute Trigger or external) causes a restart.
	Remote-control command: `SOUR:BB:GSM:SEQ SING`

Signal Duration Unit – GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Defines the unit for the entry of the length of the signal sequence to be output in the **Single** trigger mode. Available units are symbols or frames.

Remote-control commands:
`SOUR:BB:GSM:TRIG:SLUN SYMB`

Signal Duration – GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Enters the length of the signal sequence to be output in the **Single** trigger mode. The unit of the entry is defined under **Signal Duration Unit**. It is possible to output deliberately just part of the frame, an exact sequence of the frame, or a defined number of repetitions of the frame.

Remote-control commands:
`SOUR:BB:GSM:TRIG:SLEN 200`

Running – Stopped – GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Displays the status of signal generation for all trigger modes. This display appears only when GSM/EDGE modulation is enabled (**State On**).

Remote-control command:
`SOUR:BB:GSM:TRIG:RMOD?`
Response: RUN or STOP

Running	The GSM/EDGE signal is generated; a trigger was (internally or externally) initiated in triggered mode.
	If Armed_Auto and Armed_Retrigger have been selected, generation of signals can be stopped with the Arm button. A new trigger (internally with Execute Trigger or externally) causes a restart.
Stopped	The signal is not generated, and the instrument waits for a trigger event (internal or external).

Arm – GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Stops GSM/EDGE signal generation. This button appears only with **Running** signal generation in the **Armed_Auto** and **Armed_Retrigger** trigger modes.

Signal generation can be restarted by a new trigger (internally with **Execute Trigger** or externally).

Remote-control command:
`SOUR:BB:GSM:TRIG:ARM:EXEC`

**Execute Trigger –
GSM/EDGE**

(R&S SMx and R&S AMU instruments only)

Executes trigger manually. A manual trigger can be executed only when an internal trigger source and a trigger mode other than Auto have been selected.

Remote-control commands:
```
SOUR:BB:GSM:TRIG INT
SOUR:BB:GSM:SEQ RETR
SOUR:BB:GSM:TRIG:EXEC
```

**Trigger Source –
GSM/EDGE**

(R&S SMx and R&S AMU instruments only)

Selects trigger source. This setting is effective only when a trigger mode other than Auto has been selected.

Internal	The trigger event is executed by **Execute Trigger**.
	Remote-control command: `SOUR:BB:GSM:TRIG INT`

Internal (Baseband A/B)	The trigger event is executed by the trigger signal from the second path (two-path instruments only).
	Remote-control command: `SOUR:BB:GSM:TRIG:SOUR OBAN`

External (TRIGGER ½)	The trigger event is executed with the aid of the active edge of an external trigger signal. The trigger signal is supplied via the TRIGGER 1 or TRIGGER 2 connector.
	The polarity, the trigger threshold and the input impedance of the TRIGGER input can be set in the **Global Trigger/Clock Settings** menu.
	Remote-control command: `SOUR:BB:GSM:TRIG:SOUR EXT	BEXT`

External Clock	The trigger event is executed with the aid of the external clock signal. The signal is supplied via the CLOCK connector and is also used as clock.
	External Clock is only available for baseband path A and if **Clock Source = External** is selected.
	Remote-control command: `SOUR:BB:GSM:TRIG:SOUR ECL`

Trigger- External Delay – GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Sets trigger signal delay in symbols on external triggering via trigger or clock input (or on internal triggering via the second path for two-path instruments).

This enables the R&S Signal Generator to be synchronized with the device under test or other external devices.

Note:
For two-path instruments, the delay can be set separately for each of the two paths.

Remote-control command:
```
SOUR:BB:GSM:TRIG:EXT1:DEL 3
SOUR:BB:GSM:TRIG:OBAS:DEL 3
SOUR:BB:GSM:TRIG:EXT:CLOC:DEL 3
```

Trigger- External Inhibit – GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Sets the duration for inhibiting a new trigger event subsequent to triggering. The input is to be expressed in symbols.

In the **Retrigger** mode, every trigger signal causes signal generation to restart. This restart is inhibited for the specified number of symbols:

This parameter is only available on external triggering via trigger or clock input (or on internal triggering via the second path for two-path instruments).

Note:
The trigger inhibit can be set separately for each of the two paths.

Remote-control command:
```
SOUR:BB:GSM:TRIG:EXT2:INH 1000
SOUR:BB:GSM:TRIG:OBAS:INH 1000
SOUR:BB:GSM:TRIG:EXT:CLOC:INH 1000
```

The signal on the MARKER outputs is configured in the **Marker Settings** section.

Marker Mode – GSM/EDGE

Selects a marker signal for the associated MARKER output.

As defined in Slots	The marker defined for each slot separately in the burst editor is used. The name of the marker is displayed to the right of the selection. Definition of the slot marker is described in section "Slot Marker Definition – GSM/EDGE", page 43.

Remote Control Command:
```
SOUR:BB:GSM:TRIG:OUTP1:MODE SDEF
```

Slot   A slot clock with the slot period specified under **Period** is generated on the output connector. The marker signal is generated after every specified number of slots.

Period	1	Slot(s)	▾

It is important to be aware of the variation in the GSM/EDGE slot length between 156 and 157 symbols. At a slot length of 156 symbols, a period of 1 symbol and a symbol rate of 270.833 ksymb/s the clock is 0.577 ms, and at 157 symbols it is 0.580 ms

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP1:MODE  SLOT
SOUR:BB:GSM:TRIG:OUTP1:PER:SLOT 444
```

Frame   A frame clock with the frame period specified under **Period** is generated on the output connector. The marker signal is generated after every specified number of frames.

Period	1	Frame(s) ▾

A GSM/EDGE frame has 1250 symbols. At a symbol rate of 270.833 ksymb/s and a period of 1 the clock is 4.615 ms.

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP1:MODE  FRAM
SOUR:BB:GSM:TRIG:OUTP1:PER 444
```

Pulse   A regular marker signal is generated. The pulse frequency is defined by entering a divider. The frequency is derived by dividing the sample rate by the divider. The input box for the divider opens when **Pulse** is selected, and the resulting pulse frequency is displayed below it.

Divider	2
Frequency	135.416 667 kHz

The maximum pulse frequency is half the symbol rate.

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP1:MODE  PULS
SOUR:BB:GSM:TRIG:OUTP1:PULS:DIV 4
SOUR:BB:GSM:TRIG:OUTP1:PULS:FREQ?
```

Pattern   A marker signal that is defined by a bit pattern is generated. The pattern has a maximum length of 64 bits and is defined in an input field which opens when **pattern** is selected.

	1000 0000 0000 1111 1111
	1111 1111 1000 0000 0000
Period	0000 0011 1111 1111 1111
Period	

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP1:MODE PATT
SOUR:BB:GSM:TRIG:OUTP1:PATT #H8E3,12
```

ON/OFF ratio   A regular marker signal that is defined by an ON/OFF ratio is generated. A period lasts one ON and OFF cycle.

Start of signal

ON time   OFF time   ON time   OFF time
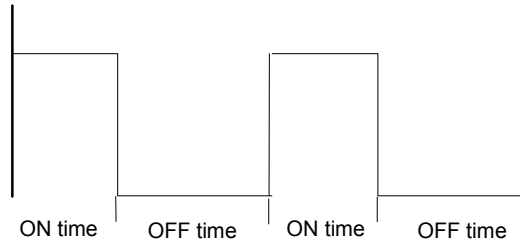
The ON time and OFF time are each expressed as a number of symbols and are set in an input field which opens when **ON/OFF ratio** is selected.

On Time	2	Sym	▼
Off Time	3	Sym	▼

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP1:MODE RAT
SOUR:BB:GSM:TRIG:OUTP1:OFFT 20
SOUR:BB:GSM:TRIG:OUTP1:ONT  20
```

The delay of the signals on the MARKER outputs is set in the **Marker Delay** section.

Note:
The marker delay functions are available for R&S SMx and R&S AMU instruments only.

Marker x Delay - GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Enters the delay between the marker signal at the marker outputs and the start of the frame or slot.

The input is expressed as a number of symbols. If the setting "**Fix marker delay to dynamic range**" is enabled, the setting range is restricted to the dynamic range. In this range the delay of the marker signals can be set without restarting the marker and signal.

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP2:DEL 2
```

Current Range without Recalculation - GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Displays the dynamic range within which the delay of the marker signals can be set without restarting the marker and signal.

The delay can be defined by moving the setting mark.

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP2:DEL:MAX?
SOUR:BB:GSM:TRIG:OUTP2:DEL:MIN?
```

Fix marker delay to current range - GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Restricts the marker delay setting range to the dynamic range. In this range the delay can be set without restarting the marker and signal.

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP:DEL:FIX ON
```

The **Clock Settings** is used to set the clock source and a delay if required.

Note:
The clock functions are available for R&S SMx and R&S AMU instruments only.

Clock Source - GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Selects the clock source.

Internal	The internal clock reference is used to generate the symbol clock.

Remote-control command:
```
SOUR:BB:GSM:CLOC:SOUR INT
```

External	The external clock reference is fed in as the symbol clock or multiple thereof via the CLOCK connector.

The symbol rate must be correctly set to an accuracy of ± 2 % (see data sheet).

The polarity of the clock input can be changed with the aid of **Global Trigger/Clock Settings**.

In the case of two-path instruments this selection applies to path A.

Remote-control command:
```
SOUR:BB:GSM:CLOC:SOUR EXT
```

Clock Mode - GSM   **(R&S SMx and R&S AMU instruments only)**

Enters the type of externally supplied clock.

Symbol	A symbol clock is supplied via the CLOCK connector.

Remote-control command:
`SOUR:BB:GSM:CLOC:MODE SYMB`

Bit	A bit clock is supplied via the CLOCK connector; the symbol clock is derived internally from this.

Remote-control command:
`SOUR:BB:GSM:CLOC:MODE BIT`

Multiple Symbol	A multiple of the symbol clock is supplied via the CLOCK connector; the symbol clock is derived internally from this.

Remote-control command:
`SOUR:BB:GSM:CLOC:MODE MSYM`

Fractional Symbol	A fraction of the symbol clock is supplied via the CLOCK connector; the symbol clock is derived internally from this.

Note:
  This selection is only available for external clock signals with a clock rate of at least 200 Hz.

Remote-control command:
`SOUR:BB:GSM:CLOC:MODE FSYM`

Symbol Clock Multiplier - GSM/EDGE   **(R&S SMx and R&S AMU instruments only)**

Enters the multiplication factor for clock type **Multiple**.

Remote-control command:
`SOUR:BB:GSM:CLOC:MULT 4`

Symbol Clock Divider - GSM/EDGE   **(R&S SMx and R&S AMU instruments only)**

Enters the divider for clock type **Fraction**.

Remote-control command:
`SOUR:BB:GSM:CLOC:DIV 4`

Measured External Clock - GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Indicates the measured frequency of the external clock signal. This enables the user to permanently monitor the frequency of the externally introduced clock.

This information is displayed only if the external clock source has been selected.

Remote-control command: `:CLOC:INP:FREQ?`

Global Trigger-Clock Settings- GSM/EDGE

(R&S SMx and R&S AMU instruments only)

Calls the **Global Trigger/Clock/Input Settings** menu. This menu is used among other things for setting the trigger threshold, the input impedance and the polarity of the clock and trigger inputs.

In the case of two-path instruments, these settings are valid for both paths.

The parameters in this menu affect all digital modulations and standards, and are described in the section "*Global Trigger/Clock/Input Settings – Setup -Environment*".

Burst Editor - GSM/EDGE

To call the burst editor, select a slot from the graphical display in the GSM/EDGE menu.

At the top of the menu the structure of the current burst type for the selected slot is displayed (in this example Normal (Half Rate)). Individual fields of the burst are colour-coded:

Field	Colour
Data, Fixed, Mixed, Stealing	white
Training Sequences: TSC, ETSC, SYNC	yellow
Tail, extended Tail	green
Guard, extended Guard	blue
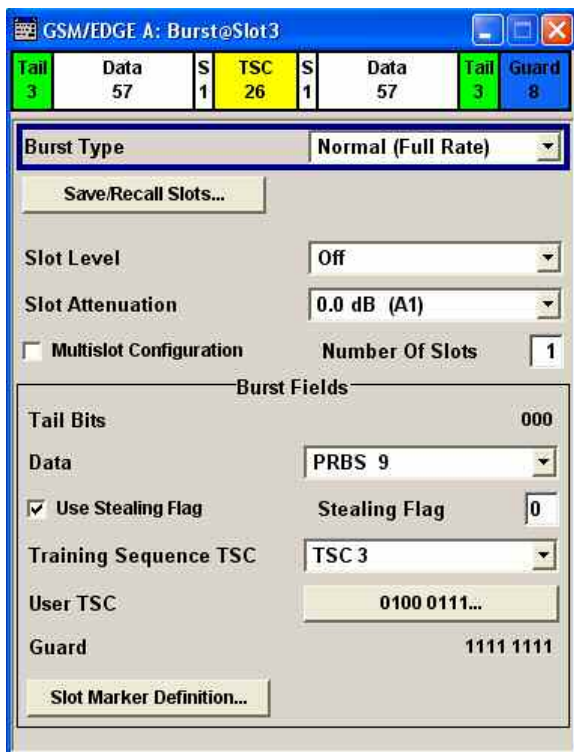
The rest of the menu displays the data contained in fields predefined by the standard for the current burst type. Data fields with variable content can be edited. The value at which they are currently set is shown on a button. Pressing the button activates the value that has been entered (in this example: User TSC). Values in fields with permanently predefined content are not highlighted in any way (in this example: Guard). The following sections list **all** possible settings and displays for the various burst types. If a setting applies only to a particular burst type, this is mentioned for the parameter concerned.

Burst Type - GSM/EDGE

Selects burst type.

Normal (Full Rate)

The useful data is transmitted in the Normal burst.
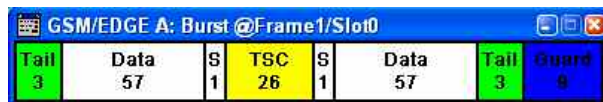
Remote-control command:
`SOUR:BB:GSM:FRAM:SLOT2:TYPE NORM`

Normal (Half Rate)

The useful data is transmitted in the Normal burst.

Half rate user 1 is transmitted in all the frames with an even index (frames 0, 2, 4, etc.) and half rate user 2 is transmitted in the frames with an odd index (frames 1, 3, etc.) (see also section "Mode Framed (single) - GSM/EDGE", page 10).
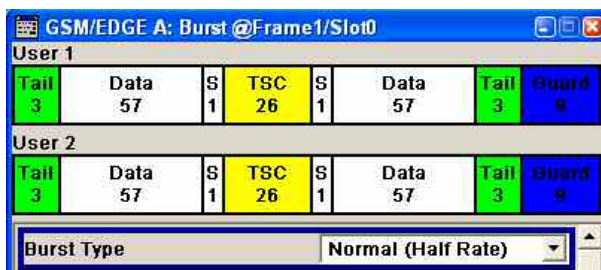
Remote-control command:
SOUR:BB:GSM:FRAM:SLOT2:TYPE HALF

EDGE   The higher bit clock associated with EDGE achieves
                     correspondingly higher data transfer rates.

                     If a frame contains an active EDGE burst, the higher bit
                     clock (3 x symbol clock) is always output on the clock
                     outputs. If the EDGE burst is removed from the frame,
                     the lower bit clock (=symbol clock) is automatically
                     output again.
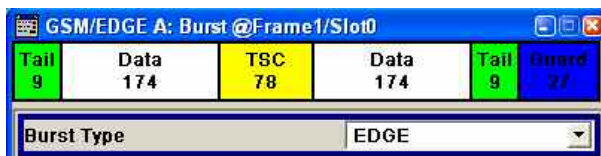
Remote-control command:
SOUR:BB:GSM:FRAM:SLOT2:TYPE EDGE

Synchronization The Synchronization burst is sent by the base station
                     only and is used for bit synchronization. For this
                     purpose it contains a 64-bit Extended Training
                     Sequence.

Remote-control command:
SOUR:BB:GSM:FRAM:SLOT1:TYPE SYNC

**Frequency
Correction**   The Frequency Correction burst is sent by the base
                     station only. The user equipment uses the burst in order
                     to synchronize with the carrier frequency and to
                     compensate for any possible Doppler effect.

Remote-control command:
SOUR:BB:GSM:FRAM:SLOT0:TYPE FCOR

Dummy   The Dummy burst is sent by the base station only. It acts as a modulation signal when there is no data burst available. This burst type is defined in the standard and has an unalterable, precisely defined data pattern.
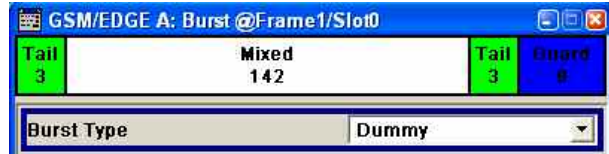
Remote-control command:
SOUR:BB:GSM:FRAM:SLOT0:TYPE DUMM

Access   This burst type is sent by a user equipment to a base station as the first burst, in order to determine the timing advance. It is used for synchronizing with the base station.
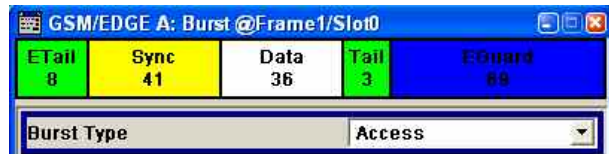
Remote-control command:
SOUR:BB:GSM:FRAM:SLOT1:TYPE ACC

All Data GSM   This and the following burst type are not defined in the standard. They serve as the output basis for defining a new burst type with user-programmable data content for test purposes.
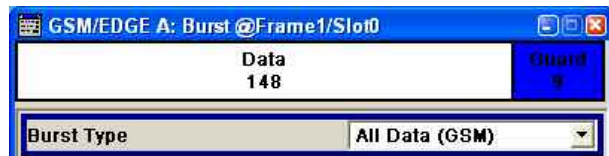
Remote-control command:
SOUR:BB:GSM:FRAM:SLOT4:TYPE ADAT

All Data EDGE
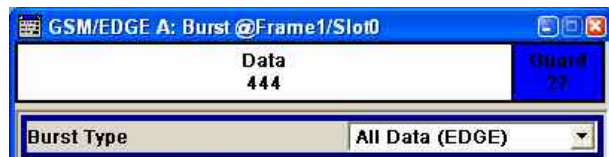
Remote-control command:
SOUR:BB:GSM:FRAM:SLOT4:TYPE AEDG

Save-Recall Slots - GSM/EDGE

Calls the **Save/Recall Slot** menu.

From the **Save/Recall Slot** menu the **File Select** windows for saving and recalling slot configurations and the **File Manager** can be called (see section "Save Recall Frame/Slots - GSM/EDGE" page 13).

```
Recall Predefined Slot
Recall User Slot
Save User Slot
File Manager...
```
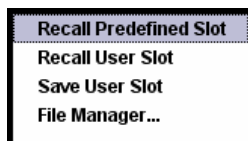
Remote-control command: n.a.

User x - GSM/EDGE

When burst type **Normal (Half Rate)** is selected the users can be set separately in menu sections User 1 and User 2.

Remote-control command: n.a.
(The user is selected by suffix in the case of
SOUR:BB:GSM:FRAM:SLOT:USER<[1]|2>)

Slot Level - GSM/EDGE

Sets the level for the selected slot.

```
Slot Level          Full            ▼
                    Off
Slot Attenuation    Attenuated
                    Full
```

Off   Attenuation is maximum. The slot is inactive.

Remote-control command:
SOUR:BB:GSM:FRAM:SLOT2:LEV OFF

Attenuated   Level is reduced by the level attenuation set in **Slot Attenuation**.

Remote-control command:
SOUR:BB:GSM:FRAM:SLOT2:LEV ATT

Full   The level corresponds to the level indicated in the display.

Remote-control command:
SOUR:BB:GSM:FRAM:SLOT2:LEV FULL

Slot Attenuation - GSM/EDGE

Selects the level attenuation for the **Slot Level Attenuated** setting. You can use the Power Ramping menu (see "Power Ramping/Slot Attenuation - GSM/EDGE ", page 19) to define seven different values for level attenuation. You may select from the values displayed.

Remote-control command:
SOUR:BB:GSM:FRAM1:SLOT2:ATT A1

You can use the **Multislot Configuration** section to switch on and configure multislot mode. This section is available only when you select Normal (Full Rate) burst and EDGE burst.

Multislot Configuration - GSM/EDGE	Enables the previously set multislot mode.

Since multislot involves connecting multiple slots to a single user channel, this configuration is possible only for Normal (Full Rate) bursts and EDGE bursts.

A number of multislot groups can be defined within a frame. These are highlighted when the frame structure is displayed in the main menu (see chapter "Mode Framed (single) - GSM/EDGE", page 10).
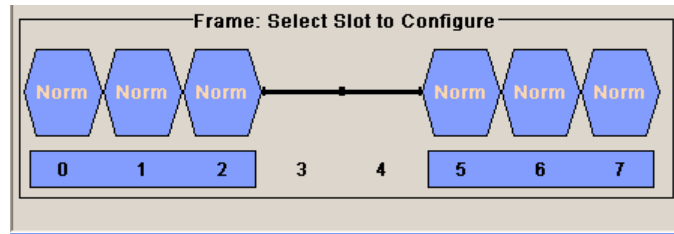
The first slot in a multislot group is the master slot. This determines the parameters of all the slots in the group. All the slots in a multislot group therefore have identical parameters.

The multislot settings are valid for all the slots in the frames of a multiframe configuration. If slots 1 and 2 are connected, for example, both these slots are connected in all the frames of the multiframe signal.

Remote-control command:
`SOUR:BB:GSM:FRAM:MULT3:STAT ON`

Number of Slots- GSM/EDGE

Defines the number of consecutive slots that will be linked to a multislot.

The multislot always starts with the current slot. The value range therefore depends on the current slot index. A maximum of 8 slots (slot 0 to slot 7) can be combined: 1 ... (8 - current index).

Remote-control command:
`SOUR:BB:GSM:FRAM:MULT3:COUN 3`

Extended Tail Bits - GSM/EDGE

Displays the data content in the "ETail" data field of the Access burst.

Extended Tail Bits fields are 8 bits long and permanently set at 0011 1010.

Remote-control command: n.a.

Tail Bits - GSM/EDGE

Displays the data content in the "Tail" data field.

The GSM Tail Bit field is 3 bits long and permanently set at 000.

The EDGE Tail Bit field is 9 bits long and permanently set at 1111 1111 1.

Remote-control command: n.a.

Data for Data Field of Slot - GSM/EDGE	Selects a data source for the DATA field.

If a burst contains multiple DATA fields, these are treated as a continuous field, and for instance a pseudo-random sequence is continued without interruption from one DATA field to the next.

You may choose from the following data sources:

All 0	0 data or 1 data is internally generated.
All 1	Remote-control command:
	`SOUR:BB:GSM:FRAM:SLOT:SOUR:DATA`
	`ALL0|ALL1`

PRBS	PRBS data in accordance with the IUT-T with period lengths between 2^9-1 and 2^{23}-1 are internally generated.

Remote-control commands:
`SOUR:BB:GSM:FRAM:SLOT:SOUR:DATA   PN9|`
`PN11| PN15| PN16| PN20 | PN21| PN23`

Pattern	A user-definable bit pattern with a maximum length of 64 bits is internally generated.

The bit pattern is defined in the **Pattern** input box.

Remote-control command:
`SOUR:BB:GSM:FRAM:SLOT:SOUR:DATA PATT`
`SOUR:BB:GSM:FRAM:SLOT:SOUR:DATA:PATT`
`#H8C,8`

Data List	Uses data from a programmable data list. The data can be generated internally with the aid of the binary editor in the R&S Signal Generator or externally by the user with the aid of any editor.

Data lists are selected from the Select List file menu.

Rem
ote-control command:
`SOUR:BB:GSM:FRAM:SLOT:SOUR:DATA DLIS`
`SOUR:BB:GSM:FRAM:SLOT:SOUR:DATA:DLIS`
`'GSM'`

Use Stealing Flag - GSM/EDGE

Sets the Use Stealing Flag feature. The setting applies to both S fields. If not used, the flag stealing bit is allocated to the data field concerned, which then becomes 58 data bits long instead of 57.

Remote-control command:
```
SOUR:BB:GSM:FRAM:SLOT2:SFL:USE ON
```

Stealing Flag - GSM/EDGE

Sets a value for the Stealing Flag feature. The setting applies to both S fields.

Remote-control command:
```
SOUR:BB:GSM:FRAM:SLOT2:SFL  0 | 1
```

Training Sequence TSC - GSM/EDGE

Selects the "Training Sequence Code".

There are 8 predefined training sequences to choose from in each case; those for GSM are 26 bits long and those for EDGE are 78 bits.
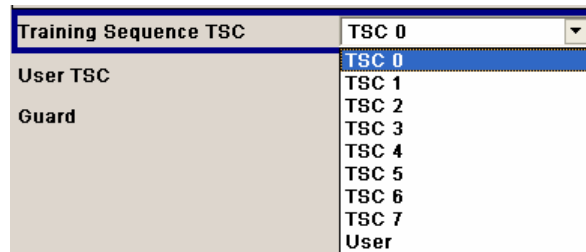
A user-defined training sequence can be created in the **User TSC** field and is then also available for selection.

Remote-control command:
```
SOUR:BB:GSM:FRAM:SLOT2:TSC:SEL  T0|...|T7|USER
```

User TSC - GSM/EDGE

Edits selected training sequence.

When a sequence has been changed, the **TSC** field displays the indication "**USER**".

When a frame/slot is saved the amended training sequence is also saved.

User-defined training sequences can be used among other things to test the reaction of receivers to interference-laden training sequences (e.g. 1 bit toggle).

Remote-control command:
```
SOUR:BB:GSM:FRAM:SLOT2:SOUR:TSC:USER #H3FFFFFF
```

Ext Training Seq ETSC - GSM/EDGE

Selects the Extended Training Sequence Code for the Synchronization burst.

Ext. Training Seq. ETSC	Standard ▼
	Standard
User ETSC	CTS
	Compact
Guard	User
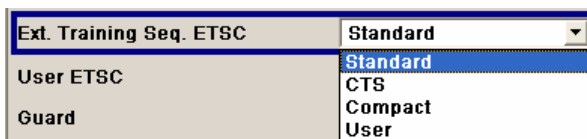
There is a choice of three predefined, 64-bit extended training sequences. Additionally a user-defined extended training sequence can be defined in the **User ETSC** field and is then also available for selection.

Remote-control command:
SOUR:BB:GSM:FRAM:SLOT2:ETSC   STAN|CTS|COMP|USER

User ETSC - GSM/EDGE

Edits selected ETSC for the Synchronization burst.

When a sequence has been changed, the **Ext Training Seq ETSC** field also displays **User** as a possible choice.

When a frame/slot is saved, the changed extended training sequence is also saved.

Remote-control command:
SOUR:BB:GSM:FRAM:SLOT2:ETSC USER
(input of pattern is only possible via manual control)

Training Sequence Sync - GSM/EDGE

Selects Training Sequence Sync for the Access burst.

Training Sequence Sync	TS 0 ▼
	TS 0
User Sync	TS 1
	TS 2
Data	User
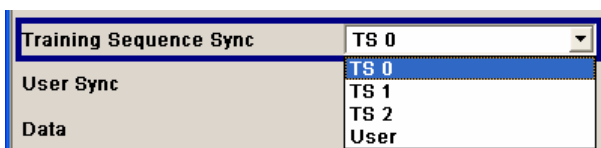
There is a choice of three predefined, 41-bit training sequences sync. Additionally a user-defined training sequence sync can be defined in the **User Sync** field and is then also available for selection.

Remote-control command:
SOUR:BB:GSM:FRAM:SLOT2:SYNC:SEL T0 |T1 | T2 | USER

User Sync - GSM/EDGE

Edits the Training Sequence Sync for the Access burst.

When a sequence has been changed, the **Training Sequence Sync** field also displays "**User**" as a possible choice.

When a frame/slot is saved the amended training sequence sync is also saved.

Remote-control commands:
SOUR:BB:GSM:FRAM:SLOT2:SYNC:SEL USER
SOUR:BB:GSM:FRAM:SLOT2:SYNC:USER #HFFFFFFFFFFF0,41

Fixed - GSM/EDGE

Selects the data content of the Fixed field in the Frequency Correction burst. There is a choice of two fixed, 142-bit data contents prescribed by the standard. The **User** data content can also be selected. This pattern can be edited in the Fixed Pattern field and must likewise be 142 bits long.
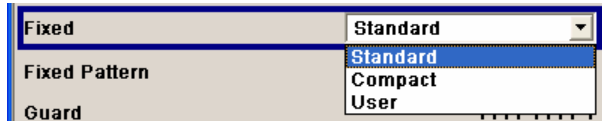
Remote-control command:
```
SOUR:BB:GSM:FRAM:SLOT2:FCOR:FIX COMP
```

Fixed Pattern - GSM/EDGE

Displays the data content of the Fixed field in the Frequency Correction burst when **Fixed Standard** or **Compact** is selected.

Enter the data content of the Fixed field in the Frequency Correction burst when **Fixed User** is selected. The pattern is 142 bits long.
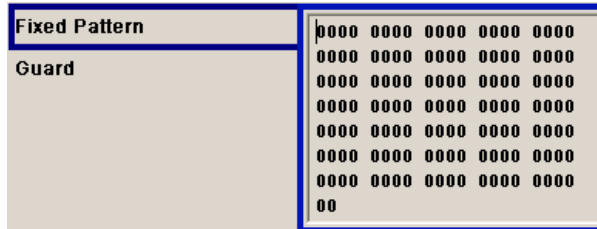
Remote-control command:
```
SOUR:BB:GSM:FRAM:SLOT2:FCOR:FIX USER
SOUR:BB:GSM:FRAM:SLOT2:FCOR:FIX:PATT #B0,142
```

Mixed - GSM/EDGE

Displays the data content of the Mixed field in the Dummy burst. It contains a fixed, 142-bit data content prescribed by the standard.
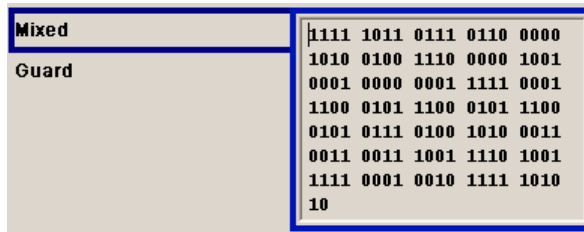
Remote-control command:
```
SOUR:BB:GSM:SLOT1:DUMM:MIX:PATT?
```

Guard - GSM/EDGE   Displays the data content of the Guard field in binary notation.

In order for a frame to contain exactly 1250 bits as prescribed in the GSM standard, the length of the Guard fields is different for different slots:

GSM:

The field length is 8 bits in slots 1, 2, 3, 5, 6, 7 and 9 bits in slots 0 and 4.

EDGE:

The field length is 24 bits in slots 1, 2, 3, 5, 6, 7 and 27 bits in slots 0 and 4.

If the field **Ignore 1/4 symbol (slot length 156 symbols)** (page 17) is enabled, all slots are 156 symbols long. The extra ¼ symbol is omitted. The guard field for the burst always has the same length regardless of the slot index. A frame is therefore 1248 symbols long in place of 1250.

Remote-control command: n.a.

Extended Guard - GSM/EDGE   Displays the data content of the Extended Guard field in the Access burst.

In order for a frame to contain exactly 1250 symbols as prescribed in the GSM standard, the length of the extended Guard fields is different for different slots:

The field length is 68 bits in slots 1, 2, 3, 5, 6, 7 and 69 bits in slots 0 and 4.

If the field **Ignore 1/4 symbol (slot length 156 symbols)** (page 17) is enabled, all slots are 156 symbols long. The extra ¼ symbol is omitted. The extended guard field for the burst always has the same length regardless of the slot index. A frame is therefore 1248 symbols long in place of 1250.

Remote-control command: n.a.

Slot Marker Definition - GSM/EDGE   Calls the menu for defining the marker signal at slot level. This menu is described below in the section "Slot Marker Definition - GSM/EDGE".

Remote-control command: n.a.

Slot Marker Definition - GSM/EDGE

To call the **Control List Editor** for defining the marker signal at slot level, use the **Slot Marker Definition** button in the burst editor of the GSM/EDGE menu.

Slot Marker Definition...

Note:
*The marker signals thus defined will only become effective if the **"As defined in slot"** marker type in the **Trigger/Marker/Clock menu** is selected.*

The structure of the selected slot (in the example, synchronization burst) is displayed in the menu header. The individual fields of the burst are colour-coded.

The available marker signals are also colour-coded. In the left **Configure Control Signal** section, each individual signal is assigned a colour; a check in the check box shows the marker for which the **"As defined in slot"** marker type has been selected.

In the next section, **Select Ramp to Edit,** the signal characteristics are graphically displayed. The ramps can be assigned the exact bit position in the signal by means of

- The schematic display of the slot above the section.

- The bit scale below the marker/control signal characteristic.

- The display of the current cursor position in the **Cursor** menu section if the cursor marks the ramp. The field at the selected position in the slot is displayed on the side. The bit position of the cursor within this field is displayed below

The ramps can be set either graphically in the **Select Ramp to Edit** section or in the table of the **Positions Marker x** section. To make the setting easy, a selection of preset ramp characteristics is offered in the **Preset Ramp Marker x** section.
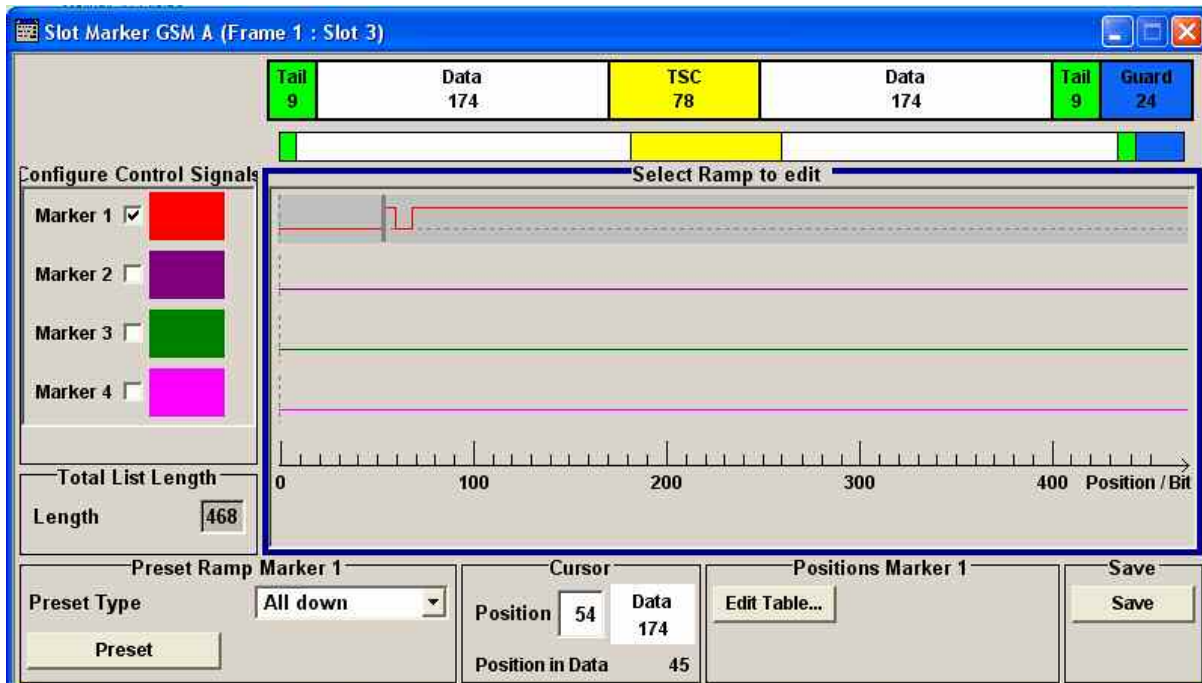
Configure Control Signal - GSM/EDGE	Displays the colour the marker has been assigned.

Displays whether the "**CList**" marker type has been selected in the Trigger/Marker/Clock menu for this marker.

Displays whether the "**As defined in Slot**" source has been selected for this marker signal in the individual setting menu.

The source can be selected here as well and will then be used in the associated menus.

Note:
The burst gate signal is only displayed and cannot be edited.

Chapter 3 describes in detail how to use the control and marker list editor.

Remote-control command:
```
SOUR:BB:GSM:TRIG:OUTP1:MODE SDEF
SOUR:BB:GSM:FRAM:SLOT0:UER1:TRIG:OUTP:TAG? "MARKER LIST
1"
Response: "0:1;59:0;64:1,70:0"
```

Select Ramp to Edit - GSM/EDGE

Graphically edit marker signals.

For this purpose, the cursor is set to the position where a ramp is required. The ramp is generated by pressing Enter (e.g. clicking on the rotary knob). Any number of ramps can be defined per marker. Each of the generated ramp positions will be saved even if the definition of another ramp produces a low/low or high/high transition. The ramps are displayed as dashed lines.

Existing ramps can be shifted after the cursor has been placed on the ramp and Enter has been pressed – it then changes colour twice. The ramp is shifted by using the cursor keys or the rotary knob. The new position is determined by pressing Enter again.

Ramps can be deleted by means of the BACK-SPACE key after the cursor has been placed on the ramp.

"Chapter 3" describes in detail how to use the control and marker list editor.

Remote-control command: n.a.

Preset Ramp - GSM/EDGE

Activates presetting for the ramp characteristic of the selected control signal. The presetting is selected with **Select Preset Type** and activated by means of the **Preset** button.

You can select from:

All Up	The marker signal is continuously high.
All Down	The marker signal is continuously low.
Ramp Up	The marker signal contains a ramp from low to high. The ramp is shifted to the center of the displayed signal area and can subsequently be shifted as required.

Ramp Down	The marker signal contains a ramp from high to low. The ramp is shifted to the center of the displayed signal area and can subsequently be shifted as required.
Ramp Up/Down	The marker signal contains a ramp from low to high and from high to low. The ramps are symmetrically shifted around the center of the displayed signal area and can subsequently be shifted as required.
Ramp Down/Up	The marker signal contains a ramp from high to low and from low to high. The ramps are symmetrically shifted around the center of the displayed signal area and can subsequently be shifted as required.

Cursor Position - GSM/EDGE

Enters the cursor position.

In the graphic display, the cursor is positioned according to the entry.

Vice versa, graphically shifting the cursor will change the displayed value.

The field at the selected position in the slot is displayed on the side. The bit position of the cursor within this field is displayed below.

"Chapter 3" describes in detail how to use the control and marker list editor.

Remote-control command: n.a.

Position Marker x- GSM/EDGE

Opens table by using the **Edit Table**... button.

The ramps of the selected signal can be edited in the table. When the table is opened, the current configuration of the selected marker/control signal is displayed.

The bit position is specified in the **Ramp Position** column, the high or low signal status in the **Ramp State** column. At the end of the list, there is always a blank row for entering new values.

The changes are accepted in the graphic display after pressing the **Accept** button.

"Chapter 3" describes in detail how to use the control and marker list editor.

Remote-control command: n.a.

Save - GSM/EDGE
Saves the settings made in the **Slot Marker** menu into a file with file name format GsmMarkSlotDefP<x>F<y>S<z>U<w>.dm_iqc, where
x the path number,
y is the Frame number,
z is the Slot number and
w ist the User number.

Remote-control command: n.a.

SOURce:BB:GSM Subsystem - Remote-Control Commands

Introduction - GSM/EDGE Remote-Control Commands

This subsystem contains the commands for setting the GSM/EDGE standards.

Note:
The R&S Signal Generator can be used to define multiframe signals. This requires the inclusion of the keyword FRAMe in the commands concerned. However, this keyword is optional in the case of single-frame signals. When the keyword is not specified the commands are compatible with the corresponding commands in the R&S SMIQ generator family (see also the list comparing R&S SMU/R&S SMIQ commands).

The numeric suffix to SOURce distinguishes between multicarrier generation for path A and path B in the case of two-path instruments:

SOURce<1> = path A

SOURce2 = path B

For two-path instruments, the keyword SOURce is optional in the case of commands for path A and can be omitted. For path B the command must contain the keyword with suffix 2.

For one-path instruments, the keyword SOURce is optional and can be omitted.

In Frame (Double) mode (`SOURce:BB:GSM:MODE DOUBle`) the suffix to FRAMe defines the frame to which the setting applies. In Frame (Single) mode the keyword FRAMe is ignored and can be omitted.

The suffix to SLOT defines the slot to which the setting applies. The 8 slots of which a frame is composed can be selected.

Important:
In case of remote control, suffix counting for slots corresponds to the suffix counting with GSM (slot 0 to slot 7). SCPI prescribes that suffix 1 is the default state and used when no specific suffix is specified. Therefore, slot 1 (and not slot 0) is selected when no suffix is specified.

When burst type HALF is selected, the suffix to USER defines the half rate user to which the setting applies. For all other burst types the keyword USER is ignored and can be omitted.

Table of commands - GSM/EDGE

Command	Parameter	Default unit	Note
[SOURce<[1]|2>:]BB:GSM:CLOCk:DIVider	1 ... 65536		
[SOURce<[1]|2>:]BB:GSM:CLOCk:MODE	BIT	SYMBol	MSYMbol	FSYMbol		
[SOURce<[1]|2>:]BB:GSM:CLOCk:MULTiplier	0 ... 64		
[SOURce<[1]	2>:]BB:GSM:CLOCk:SOURce	INTernal	EXTernal		
[SOURce<[1]|2>:]BB:GSM:EDGE:FORMat?			
[SOURce<[1]|2>:]BB:GSM:FILTer:EDGE:TYPE	LGAuss		
[SOURce<[1]|2>:]BB:GSM:FILTer:PARameter	0.15 ... 2.5		
[SOURce<[1]|2>:]BB:GSM:FILTer:TYPE	GAUSs		
[SOURce<[1]	2>:]BB:GSM:FONE	ON	OFF		

Command	Parameter	Default unit	Note
[SOURce<[1]|2>:]BB:GSM:FORMat	MSK | FSK2		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:MULTislot<0|[1]...7>:COUNt	1 ... 8		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:MULTislot<0|[1]...7>:STATe	ON | OFF		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:PREDefined:CATalog?			Query only
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:PREDefined:LOAD	"slot_name"		No query
[SOURce<[1]|2>:]BB:GSM:FRAMe:REPetitions	0 ... 500		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>:TYPE	NORMal | HALF | EDGE | SYNC | FCORrection | DUMMy | ACCess | ADATa | AEDge		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ATTenuation	A1 ... A7		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:DUMMy:MIXed:PATTern			Query only
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ETSC	STANdard | CTS | COMPact | USER		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:FCORrection:FIXed	STANdard | COMPact | USER		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:FCORrection:FIXed:PATTern	#B000...,142 .... #B111...,142		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:LEVel	ATT | FULL | OFF		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:PREDefined:CATalog?			Query only
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:PREDefined:LOAD	"slot_name"		No query
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:SFLag	0 | 1		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:SFLag:USE	ON | OFF		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:DATA	PN9 | PN11 | PN15 | PN16 | PN16I | PN20 | PN21 | PN23 | DLISt | ZERO | ONE | PATTern		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:DATA:DLISt	<dlist_name>		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:DATA:DLISt:CATalog?			Query only
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:DATA:PATTern	<bit_pattern>		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:TSC:USER	#B0,1...#B111...,26/78		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:SYNC:SELect	T0 | T1 | USER		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:SYNC:USER	#B0,1...#B111...,41		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:TRIGger:OUTPut:TAG	"MARKER LIST 1|2|3|4", <marker_list_name>		Qiery only
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:TSC:SELect	T0 ... T7 | USER		
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ULISt:CATalog?			Query only

Command	Parameter	Default unit	Note
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ULISt:DELete	"slot_name"		No query
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ULISt:LOAD	"slot_name"		No query
[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ULISt:STORe	"slot_name"		No query
[SOURce<[1]|2>:]BB:GSM:FRAMe:ULISt:CATalog?			Query only
[SOURce<[1]|2>:]BB:GSM:FRAMe:ULISt:DELete	"frame_name"		No query
[SOURce<[1]|2>:]BB:GSM:FRAMe:ULISt:LOAD	"frame_name"		No query
[SOURce<[1]|2>:]BB:GSM:FRAMe:ULISt:STORe	"frame_name"		No query
[SOURce<[1]|2>:]BB:GSM:FSK:DEViation	0.1x f(symb) ... 1.5 xf(symb)	Hz	
[SOURce<[1]|2>:]BB:GSM:ISLength	ON | OFF		
[SOURce<[1]|2>:]BB:GSM:MODE	UNFRamed | SINGle | DOUBle | MULTiframe		
[SOURce<[1]|2>:]BB:GSM:PRAMp:BBONly[:STATe]	ON | OFF		
[SOURce<[1]|2>:]BB:GSM:PRAMp:FDELay	-9 ... +9 Symbols		
[SOURce<[1]|2>:]BB:GSM:PRAMp:RDELay	-9 ... +9 Symbols		
[SOURce<[1]|2>:]BB:GSM:PRAMp:SHAPe	LINear | COSine		
[SOURce<[1]|2>:]BB:GSM:PRAMp:TIME	0.3 ... 16 Symbols		
[SOURce<[1]|2>:]BB:GSM:PRESet			No query
[SOURce<[1]|2>:]BB:GSM:SATTenuation<n>	0 ... 60 dB	dB	
[SOURce<[1]|2>:]BB:GSM:SETTing:CATalog?			Query only
[SOURce<[1]|2>:]BB:GSM:SETTing:DELete	<file_name>		
[SOURce<[1]|2>:]BB:GSM:SETTing:LOAD	<file_name>		
[SOURce<[1]|2>:]BB:GSM:SETTing:STORe	<file_name>		
[SOURce<[1]|2>:]BB:GSM:SEQuence	AUTO | RETRigger | AAUTo | ARETrigger | SINGle		
[SOURce<[1]|2>:]BB:GSM:SMODe	GSM | EDGE		
[SOURce<[1]|2>:]BB:GSM:SRATe	400 Hz ... 25 MHz	Hz	
[SOURce<[1]|2>:]BB:GSM:STATe	ON | OFF		
[SOURce<[1]|2>:]BB:GSM:TRIGger:ARM:EXECute			No query
[SOURce<[1]|2>:]BB:GSM:TRIGger:EXECute			No query
[SOURce<[1]|2>:]BB:GSM:TRIGger:EXTernal:CLOCk:DELay	0 ... 2^32-1 Symbols		
[SOURce<[1]|2>:]BB:GSM:TRIGger:EXTernal:CLOCk:INHibit	0 ... 2^32-1 Symbols		
[SOURce<[1]|2>:]BB:GSM:TRIGger[:EXTernal<[1]|2>]:DELay	0 ... 2^32-1 Symbols		
[SOURce<[1]|2>:]BB:GSM:TRIGger[:EXTernal<[1]|2>]:INHibit	0 ... 2^32-1 Symbols		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OBASeband:DELay	0 ... 2^32-1	Hz	
[SOURce<[1]|2>:]BB:GSM:TRIGger:OBASeband:INHibit	0 ... 2^32-1	Hz	
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:DELay	0 ... 1249 Symbols		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut:DELay:FIXed	ON | OFF	Hz	

Command	Parameter	Default unit	Note
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:DELay:MAXimum?			Query only
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:DELay:MINimum?			Query only
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>MODE	SDEF | FRAMe | SLOT | PULSe | PATTern | RATio		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:OFFTime	1... 2^24-1		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:ONTime	1... 2^24-1		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PATTern	<bit_pattern>		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PERiod[:FRAMe]	1 ... 2^26-1 Frames		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PERiod:SLOT	1 ... 2^26-1 Slots		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PULSe:DIVider	1 ... 2^10		
[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PULSe:FREQ?			Query only
[SOURce<[1]|2>:]BB:GSM:TRIGger:RMODe			Query only
[SOURce<[1]|2>:]BB:GSM:TRIGger:SLENgth	1 ...2^32-1 symbols		
[SOURce<[1]|2>:]BB:GSM:TRIGger:SLUNit	FRAMe | SYMBol		
[SOURce<[1]|2>:]BB:GSM:TRIGger:SOURce	INTernal | EXTernal | BEXTernal | OBASeband | ECLock		

Description of commands - GSM/EDGE

[SOURce<[1]|2>:]BB:GSM:CLOCk:DIVider　1 ... 65536

Note:
*　This command is available for R&S SMx and R&S AMU instruments only.*

The command specifies the divider for clock type **Fractional Symbols** (`:BB:GSM:CLOCk:MODE FSYM`) in the case of an external clock source.

For two-path instruments, the only numerical suffix allowed for SOURce is 1, since the external clock source is permanently allocated to path A.

Example:　　`"BB:GSM:CLOC:SOUR EXT"`
　　　　　　　'selects the external clock source. The clock is supplied via the CLOCK connector.

　　　　　　　`"BB:GSM:CLOC:MODE FSYM"`
　　　　　　　'selects clock type **Fractional Symbols**, i.e. the supplied clock has a rate which is a fraction of the symbol rate.

　　　　　　　`"BB:GSM:CLOC:DIV 2"`
　　　　　　　'the divider for the external clock rate is 2.

*RST value	Resolution	SCPI
4	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:CLOCk:MODE   BIT | SYMBol | MSYMbol | FSYMbol

Note:
    This command is available for R&S SMx and R&S AMU instruments only.

The command enters the type of externally supplied clock (`:BB:GSM:CLOCk:SOURce EXT`).

When `MSYMbol` is used, a multiple of the symbol clock is supplied via the CLOCK connector and the symbol clock is derived internally from this. The multiplier is entered with the command `:BB:GSM:CLOCk:MULTiplier`.

When `FSYMbol` is used, a fraction of the symbol clock is supplied via the CLOCK connector and the symbol clock is derived internally from this. The divisor is entered with the command `:BB:GSM:CLOCk:DIVider`. This selection is only possible for external signals with a clock rate of at least 200 Hz.

For two-path instruments, the only numerical suffix allowed for SOURce is 1, since the external clock source is permanently allocated to path A.

Example: `"BB:GSM:CLOC:MODE SYMB"`
                'selects clock type **Symbols**, i.e. the supplied clock is a symbol clock.

*RST value	Resolution	SCPI
SYMBol	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:CLOCk:MULTiplier   1 ... 64

Note:
    This command is available for R&S SMx and R&S AMU instruments only.

The command specifies the multiplier for clock type **Multiple Symbols** (`:BB:GSM:CLOCk:MODE MSYM`) in the case of an external clock source.

For two-path instruments, the only numerical suffix allowed for SOURce is 1, since the external clock source is permanently allocated to path A.

Example: `"BB:GSM:CLOC:SOUR EXT"`
                'selects the external clock source. The clock is supplied via the CLOCK connector.

                `"BB:GSM:CLOC:MODE MSYM"`
                'selects clock type **Multiple Symbols**, i.e. the supplied clock has a rate which is a multiple of the symbol rate.

                `"BB:GSM:CLOC:MULT 12"`
                'the multiplier for the external clock rate is 12.

*RST value	Resolution	SCPI
4	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:CLOCk:SOURce   INTernal | EXTernal | AINTernal

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Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command selects the clock source.

For two-path instruments, selecting EXTernal is only possible for path A, since the external clock source is permanently allocated to path A; selecting AINTernal is only possible for path B.

Parameter: **INTernal**

                                The internal clock reference is used.

                        EXTernal

                                The external clock reference is supplied to the CLOCK connector.

Example: `"BB:GSM:CLOC:SOUR EXT"`
                        'selects an external clock reference. The clock is supplied via the CLOCK connector.

                        `"BB:GSM:CLOC:MODE SYMB"`
                        'specifies that a symbol clock is supplied via the CLOCK connector.

*RST value	Resolution	SCPI
INTernal	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:EDGE:FORMat?

The command queries the modulation type in the case of EDGE. The modulation type is permanently set to 8PSK.

The command is a query command and therefore has no *RST value.

Example: `"BB:GSM:EDGE:FORM?"`
                        'queries the modulation type.

                        Response: `"P8ED"`

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FILTer:EDGE:TYPE   LGAuss

The command sets the filter type LGAuss. This is the only possible selection in the case of digital standard GSM EDGE.

Example: `"BB:GSM:FILT:EDGE:TYPE  LGA"`
                        'sets the filter type Gauss linearized.

*RST value	Resolution	SCPI
LGAuss	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FILTer:PARameter   0.15 ... 2.5

The command sets the filter parameter. For Gaussian filter the BxT is the product of the bandwidth and the symbol duration. The default value for GSM modulation is 0.3 and for Gauss Linearized (EDGE), BT = 0.3.

Example: `"BB:GSM:FILT:PAR 0.4"`
                 'sets the BT value to 0.4.

*RST value	Resolution	SCPI
0.3	0.01	Device-specific

[SOURce<[1]|2>:]BB:GSM:FILTer:TYPE   GAUSs

The command sets the filter type GAUSs. This is the only possible selection in the case of digital standard GSM.

Example: `"BB:GSM:FILT:TYPE  GAUS"`
                 'sets the filter type GAUSS.

*RST value	Resolution	SCPI
GAUSs	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FONE   ON | OFF

A modulating bit stream consisting of consecutive ones is used for inactive slots (according to GSM 05.04).
If this parameter is disabled, the inactive slots are filled in with 0.

Example: `"BB:GSM:FONE ON"`
                 'A modulating bit stream consisting of consecutive ones is used for inactive slots

*RST value	Resolution	SCPI
OFF	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FORMat   MSK | FSK2

The command selects the modulation type.

Example: `"BB:GSM:FORM FSK2"`
                 'selects the GSM modulation type FSK.

*RST value	Resolution	SCPI
MSK	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:MULTislot<0|[1]...7>:COUNt 1 ... 8

The command defines the number of slots combined in a multislot. Since multislot involves connecting multiple slots to a single user channel, this configuration is possible only for Normal (Full Rate) bursts and EDGE bursts (`SOUR:BB:GSM:FRAM:SLOT:TYPE NORM|EDGE`).

The suffix in `MULTislot` defines the first slot in a multislot group. In a multiframe configuration this setting applies to the slots in all frames.

Example:　　　　`"BB:GSM:MODE SING"`
　　　　　　　　　'selects GSM mode Frame (Single).

　　　　　　　　`"BB:GSM:SLOT0:TYPE NORM"`
　　　　　　　　　'selects the NORMal burst type for slot 0.

　　　　　　　　`... SLOT1 ... SLOT7`
　　　　　　　　　'selects burst type for slots 1 to 7 correspondingly.

　　　　　　　　`"BB:GSM:MULT0:COUN 8"`
　　　　　　　　　'defines a multislot from all 8 slots.

　　　　　　　　`"BB:GSM:MULT0:STAT ON"`
　　　　　　　　　'switches the multislot configuration on.

*RST value	Resolution	SCPI
1	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:MULTislot<0|[1]...7>:STATe ON | OFF

The command switches the multislot configuration on.

The suffix in `MULTislot` defines the first slot in a multislot group. In a multiframe configuration this setting applies to the slots in all frames.

Example:　　　　`"BB:GSM:MODE DOUB"`
　　　　　　　　　'selects GSM mode Frame (Double).

　　　　　　　　`"BB:GSM:SLOT0:TYPE NORM"`
　　　　　　　　　'selects the NORMal burst type for slot 0.

　　　　　　　　`... SLOT1 ... SLOT7`
　　　　　　　　　'selects burst type for slots 1 to 7 correspondingly.

　　　　　　　　`"BB:GSM:MULT0:COUN 8"`
　　　　　　　　　'defines a multislot from all 8 slots.

　　　　　　　　`"BB:GSM:MULT0:STAT ON"`
　　　　　　　　　'switches the multislot configuration on.

*RST value	Resolution	SCPI
OFF	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:PREDefined:CATalog?

This command reads out the files with predefined frame settings. The directory is preset, therefore a path cannot be specified.

The command is a query command and therefore has no *RST value.

Example: `"BB:GSM:FRAM:PRED:CAT?"`

'reads out all the files with predefined frame settings.

Response:

`"Edge0, EdgeAll, GsmEdge, NormalBurst0, NormalBurstAll"`
'the file names of the files with the predefined frame settings are returned

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:PREDefined:LOAD <file_name>

This command loads the selected file with predefined frame settings. The directory is pre-set, therefore a path cannot be specified.

This command triggers an event and therefore has no *RST value and no query form.

Example: `"BB:GSM:FRAM:PRED:LOAD 'Edge0'"`
'loads file 'Edge0' with the predefined frame setting 'Edge Burst in Slot 0".

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FRAMe<[1]|2>:REPetitions 1 ... 500

The command defines the number of repetitions for the selected frame in GSM mode Frame (Double).

Example: `"BB:GSM:MODE DOUB"`
'selects GSM mode Frame (Double).

`"BB:GSM:FRAM2:REP 10"`
'sets 10 repetitions for frame 2.

*RST value	Resolution	SCPI
1 / 1	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>:TYPE
NORMal | HALF | EDGE | SYNC | FCORrection | DUMMy | ACCess | ADATa | AEDGe

The command selects the burst (slot) type. The types All Data GSM (`ADATa`) and All Data EDGE (`AEDGe`) are not defined in the standard.

Example: `"BB:GSM:SLOT:TYPE DUMM"`
'selects DUMMY burst type for slot 1.

*RST value	Resolution	SCPI
NORMal	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ATTenuation A1...A7

The command selects one of seven possible values for the level attenuation. This value defines by how much the power of the selected slot with power control level `:BB:GSM:SLOT:LEV ATT` will be reduced in relation to the normal output power (attribute ...:LEVEL FULL). The seven possible values are set using the command `:SOURce:BB:GSM:SATTenuation<n>`.

Example: "`BB:GSM:MODE SING`"
                    'selects GSM mode Frame (Single).

                    "`BB:GSM:SLOT1:LEV ATT`"
                    'sets level attenuation mode for slot 1.

                    "`BB:GSM:SATT1 12dB`"
                    'sets the level attenuation for selection A1 to 12 dB.

                    "`BB:GSM:SLOT1:ATT A1`"
                    'sets the level attenuation for slot 0 to 12 dB.

*RST value	Resolution	SCPI
0 dB	0.01 dB	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:DUMMy:MIXed:PATTern?

This command outputs the bit pattern of the Mixed field of the Dummy burst. The contents of the Mixed field is fixed and specified by the standard, the length is 142 bits.

The command is a query command and therefore has no *RST value.

Example: "`BB:GSM:SLOT1:TYPE DUMM`"
                    'selects Dummy burst for slot 1.

                    "`BB:GSM:SLOT1:DUMM:MIX:PATT?`"
                    'outputs the bit pattern of the Mixed field.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ETSC
STANdard | CTS | COMPact | USER

The command selects an extended training sequence for the Synchronization burst. There is a choice of three predefined sequences STANdard | CTS | COMPact and, if defined, a USER sequence (only for selection of burst type `:BB:GSM:SLOT:TYPE SYNC`).

Example: "`BB:GSM:SLOT:TYPE SYNC`"
                    'selects Synchronization burst for slot 1.

                    "`BB:GSM:SLOT:ETSC CTS`"
                    'selects the extended training sequence CTS.

*RST value	Resolution	SCPI
STANdard	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:FCORrection:FIXed
STANdard | COMPact | USER

The command selects the content of the FIXED field for the Frequency Correction burst. There is a choice of two predefined sequences STANdard and COMPact and, if defined, a USER sequence (only for burst type selection :BB:GSM:SLOT:TYPE FCORrection).

Example: "BB:GSM:SLOT:TYPE FCOR"
                  'selects Frequency Correction burst for slot 1.

                  "BB:GSM:SLOT:FCOR:FIX COMP"
                  'selects content type COMPact for the Fixed field.

*RST value	Resolution	SCPI
STANdard	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:FCORrection:FIXed:PATTern
#B000...0,142 .... #B111...1,142

The command enters the bit pattern of the FIXED field for the Frequency Correction burst. The length is 142 bits. Superfluous bits are truncated on input. Missing bits are filled with 0. The command is valid only for the selection :BB:GSM:SLOT:FCOR:FIX USER and for burst type selection :BB:GSM:SLOT:TYPE FCOR.

Example: "BB:GSM:SLOT:TYPE FCOR"
                  'selects Synchronization burst for slot 1.

                  "BB:GSM:SLOT:FCOR:FIX USER"
                  'selects content type USER for the Fixed field.

                  "BB:GSM:SLOT:FCOR:FIX:PATT #B0,142"
                  'enters the content of the field.

*RST value	Resolution	SCPI
Bit pattern from the STANdard	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:LEVel OFF| ATT| FULL

The command defines the power control level of the selected slot.

Parameter: **OFF**
                          The slot is inactive.

                  ATT
                          The power is reduced by the amount defined using :BB:GSM:SLOT:ATT.

                  FULL
                          Full power as specified by the level setting.

Example: "BB:GSM:SLOT2:LEV FULL"
                  'selects power control level Full Power for slot 2.

*RST value	Resolution	SCPI
Slot 0: FULL	-	Device-specific
Slots 1...7: OFF		

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:PREDefined:CATalog?

This command reads out the files with predefined slot settings. The directory is pre-set, therefore a path cannot be specified.

The command is a query command and therefore has no *RST value. The numeric suffixes in all key words are irrelevant for this command.

Example: "BB:GSM:SLOT:PRED:CAT?"
          'reads out all the files with predefined frame settings.

          Response: "GSM_NB_PN9_TSC0,EDGE_NB_PN9_TSC0"
          'the files 'GSM_NB_PN9_TSC0' and 'EDGE_NB_PN9_TSC0' are available.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:PREDefined:LOAD
<file_name>

This command loads the selected file with predefined slot settings. The directory is pre-set, therefore a path cannot be specified.

This command triggers an event and therefore has no *RST value and no query form.

Example: "BB:GSM:SLOT:PRED:LOAD 'GSM_NB_PN9_TSC0'"
          'loads the settings of file 'GSM_NB_PN9_TSC0' for slot 1 in frame 1.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:SFLag 0 | 1

The command sets the Stealing Flag state (only for Normal burst :BB:GSM:SLOT:TYPE NORM).

Example: "BB:GSM:SLOT2:TYPE NORM"
          'selects NORMAL burst type for slot 2.

          "BB:GSM:SLOT2:SF 1"
          'sets the Stealing Flag for slot 2 to value 1.

*RST value	Resolution	SCPI
0	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:SFLag:USE ON | OFF

The command enables or disables the use of Stealing Flags. If not used, the Stealing Flags bits are allocated to the DATA fields (only for Normal burst :BB:GSM:SLOT:TYPE NORM).

Example: "BB:GSM:SLOT2:TYPE NORM"
          'selects NORMAL burst type for slot 2.

          "BB:GSM:SLOT2:SFL 1"
          'sets Stealing Flags for slot 2 to the value 1.

          "BB:GSM:SLOT2:SFL:USE ON"
          'enables the use of Stealing Flags for slot 2.

*RST value	Resolution	SCPI
ON	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:DATA
PN9 | PN11| PN15 | PN16 | PN20| PN21 | PN23| DLISt| ALL0| ALL1| PATTern

The command defines the data source for the DATA fields in the burst. This command is valid only when burst types that contain data fields are selected. If a burst contains multiple DATA fields, these are treated as a continuous field, and for instance data such as a pseudo-random sequence is continued without interruption from one DATA field to the next.

In **GSM Mode Unframed**, this command defines the data source for the unframed signal. The suffix in `:SLOT` has to be set to 0 (`BB:GSM:SLOT0:DATA`).

Parameter:	**PNxx**	
		The pseudo-random sequence generator is used as the data source. There is a choice of different lengths of random sequence.
	DLISt	
		A data list is used. The data list is selected with the aid of command `SOURce:BB:GSM:SLOT:DATA:DLISt`.
	ALL0|ALL1	
		Internal 0 or 1 data is used.
	PATTern	
		Internal data is used. The bit pattern for the data is defined with the aid of command `:SOURce:BB:GSM:SLOT:DATA:PATTern`.
Example:	`"BB:GSM:SLOT2:TYPE NORM"`	
		'selects NORMAL burst type for slot 2.
	`"BB:GSM:SLOT2:DATA PN15"`	
		'selects internal PRBS data with period length 2^{15}-1 as the data source for the DATA fields in the burst. The pseudo-random sequence is continued without interruption from one DATA field to the next.

*RST value	Resolution	SCPI
PN9	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:DATA:DLISt
<data list name>

The command selects a data list. This command is only valid for bursts with DATA fields. This data list is only used if it is set as the data source with the aid of command `:BB:GSM:SLOT:DATA DLIS`.

This command triggers an event and therefore has no *RST value.

Example:	`"BB:GSM:SLOT2:TYPE NORM"`	
		'selects NORMAL burst type for slot 2.
	`"BB:GSM:SLOT2:DATA DLIS"`	
		'selects internal data lists as the data source for DATA fields.
	`"BB:GSM:SLOT2:DATA:DLIS 'test'"`	
		'selects the 'test' data list. The data list is continued without interruption from one DATA field to the next.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:DATA:DLISt :CATalog?

This command reads out the data list files in the default directory. The default directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only files with the file extension ***.dm_iqd** will be listed.

The command is a query and therefore has no *RST value.

Example: "`MMEM:CDIR 'D:\user\dlist_gsm'`"
                     'sets the default directory to D:\user\dlist_gsm.

                     "`BB:GSM:SLOT2:DATA:DLIS:CAT?`"
                     'queries the available data lists in D:\user\dlist_gsm.

                     Response: "`'test_01',"test_02`"
                     'data lists "test_01' and 'test_02' are available in D:\user\dlist_gsm.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:DATA:PATT ern
#B0,1 .... #B111...1,64

The command selects the data pattern for the internal data when PATTern is selected as the data source. The length depends on the length of the data fields in the selected burst type.

Example: "`BB:GSM:SLOT2:TYPE ACC`"
                     'selects the Access burst type for slot 2. This burst type contains a 36-bit data field.

                     "`BB:GSM:SLOT2:DATA PATT`"
                     'selects Pattern as the data source.

                     "`BB:GSM:SLOT2:DATA:PATT #H801FA,20`"
                     'generates the data for the data field in the burst.

*RST value	Resolution	SCPI
0	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>][:SOURce]:TSC:USER
#B0...#B111 ,1...26/78 bits

The command specifies the user-defined training sequence code. This code is used if the USER parameter is set with the aid of the `:BB:GSM:SLOT:TSC:SEL` command described above. The length is 26 bits for `:BB:GSM:SLOT:TYPE NORMal` and 78 bits for `:BB:GSM:SLOT:TYPE EDGE`.

Example: "`BB:GSM:SLOT3:TSC:USER #H3FFFFFF`"
                     'enters the user-defined training sequence for slot 3.

*RST value	Resolution	SCPI
#H0970897	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:SYNC:SELect
T0 | T1 | USER

The command selects a training sequence (SYNC sequence) for the Access burst (only for burst type selection :BB:GSM:SLOT:TYPE ACC).

Example: "BB:GSM:SLOT1:TYPE ACC"
'selects Access burst for slot 1.

"BB:GSM:SLOT1:SYNC:SEL T1"
'selects Sync sequence T1.

*RST value	Resolution	SCPI
T0	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:SYNC:USER
#B0,1...#B111...,41

The command outputs the bit pattern of the User Sync sequence for the Access burst. The length is 64 bits. Superfluous bits are truncated on input. Missing bits are filled with 0. The command is valid only for selection :BB:GSM:SLOT:SYNC:SEL USER and for burst type selection :BB:GSM:SLOT:TYPE ACC.

Example: "BB:GSM:SLOT1:TYPE ACC"
'selects Access burst for slot 1.

"BB:GSM:SLOT1:SYNC:SEL USER"
'selects the User Sync sequence.

"BB:GSM:SLOT1:SYNC:USER #HFFFFFFFFFFF0,41"
'enters the User Sync sequence.

*RST value	Resolution	SCPI
Bit pattern from T0	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:TRIGger:OUTPut:TAG
? "MARKER LIST 1|2|3|4",<marker_list_name> §TAG?

The command queries the content of the specified marker in the selected file.

The command is a query command and therefore has no *RST value.

Example: "BB:GSM:FRAM:SLOT0:UER1:TRIG:OUTP:TAG? "MARKER LIST 1""
'queries the content of the marker list 1.

Response: "0:1;59:0;64:1,70:0"

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:TSC:SELect
T0 ... T7 | USER

The command selects the training sequence code. The values specified in GSM 5.02 are T0...T7. When USER is selected, the value specified with the aid of the `...:TSC:USER` command described next is used.

Example: `"BB:GSM:MODE SING"`
        'selects Single Frame mode.

      `"BB:GSM:SLOT2:TYPE NORM"`
        'selects Normal burst for slot 2.

      `"BB:GSM:SLOT2:TSC:SEL T3"`
        'selects training sequence code T3 for slot 2.

*RST value	Resolution	SCPI
T0	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ULISt:CATalog?

This command reads out the files with user defined slot settings in the default directory. The default directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only files with the file extension ***.gsm_slu** will be listed.

The command is a query command and therefore has no *RST value.

Example: `"MMEM:CDIR 'D:\user\slots"`
        'sets the default directory to D:\user\slots.

      `"BB:GSM:SLOT:ULIS:CAT?"`
        'reads out all the files with user defined slot settings in the default directory.

      Response: `"'test_01'"`
        'the file 'test_01' with a user defined slot setting is available.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ULISt:DELete
<file_name>

This command deletes the selected file with user defined slot settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension ***.gsm_slu** will be deleted.

This command triggers an event and therefore has no *RST value and no query form.

Example: `"BB:GSM:SLOT:ULIS:DEL 'NB'"`
        'deletes file 'NB'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ULISt:LOAD
<file_name>

This command loads the selected file with user defined slot settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension ***.gsm_slu** will be loaded.

This command triggers an event and therefore has no *RST value and no query form.

Example: `"BB:GSM:SLOT:ULIS:LOAD 'NB'"`
                 'loads file 'NB'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM[:FRAMe<[1]|2>]:SLOT<0|[1]...7>[:USER<[1]|2>]:ULISt:STORe
<file_name>

This command stores the current slot settings into the selected file. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only the file name has to be entered. User slots are stored as files with the specific file extensions ***.gsm_slu**.

This command triggers an event and therefore has no *RST value and no query form.

Example: `"BB:GSM:SLOT:ULIS:STOR 'EDGE'"`
                 'stores the current slot settings into file 'EDGE'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FRAMe:ULISt:CATalog?

This command reads out the files with user defined frame settings in the default directory. The default directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only files with the file extension ***.gsm_fu** will be listed.

The command is a query command and therefore has no *RST value.

Example: `"MMEM:CDIR 'D:\user\frames"`
                 'sets the default directory to D:\user\frames.

                 `"BB:GSM:FRAM:ULIS:CAT?"`
                 'reads out all the files with user defined frame settings in the default directory.

                 Response: `"'NB_all'"`
                 'the file 'NB_all' with a user defined frame setting is available.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FRAMe:ULISt:DELete <file_name>

This command deletes the selected file with user defined frame settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension ***.gsm_fu** will be deleted.

This command triggers an event and therefore has no *RST value and no query form.

Example:　　　　"BB:GSM:FRAM:ULIS:DEL 'NB_all'"
　　　　　　　　　　'deletes file 'NB_all'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FRAMe:ULISt:LOAD <file_name>

This command loads the selected file with user defined frame settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension ***.gsm_fu** will be loaded.

This command triggers an event and therefore has no *RST value and no query form.

Example:　　　　"BB:GSM:FRAM:ULIS:LOAD 'NB_all'"
　　　　　　　　　　'loads file 'NB_all'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FRAMe:ULISt:STORe <file_name>

This command stores the current frame settings into the selected file. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only the file name has to be entered. User Standards are stored as files with the specific file extensions ***.gsm_fu**.

This command triggers an event and therefore has no *RST value and no query form.

Example:　　　　"BB:GSM:FRAM:ULIS:STOR 'EDGE_all'"
　　　　　　　　　　'stores the current frame settings into file 'EDGE_all'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:FSK:DEViation　<numeric_value>

The command sets the modulation deviation when `:BB:GSM:FORMat FSK2` is selected. The range of values depends on the symbol rate (`:BB:GSM:SRATe`): $0.1 \times f_{Symb}$ ... $1.5 \times f_{Symb}$ (max. 10 MHZ)

The maximum deviation is 10 MHz.

Example:　　　　"BB:GSM:FORM FSK2"
　　　　　　　　　　'selects the GSM modulation type GFSK.

　　　　　　　　　　"BB:GSM:FSK:DEV 37.6 kHz"
　　　　　　　　　　'sets the FSK deviation to 37.6 kHz.

*RST value	Resolution	SCPI
67.708 kHz	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:ISLength ON | OFF

The command selects whether the 1/4 symbol of a GSM slot (length = 156.25 symbols) will be ignored (ON) or compensated for by an extra symbol every 4th slot (OFF). When ON is selected, all slots are 156 symbols long. When OFF is selected, some slots are 157 symbols long.

Example: "BB:GSM:ISL ON"

'selects a constant length of 156 symbols for all slots.

*RST value	Resolution	SCPI
OFF	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:MODE UNFRamed | SINGle | DOUBle

The command selects GSM mode.

Parameter: **UNFRamed**

Modulation signal without slot and frame structure.

SINGle

Modulation signal consisting of one frame.

DOUBle

Modulation signal in which two frames are defined and then combined by some method into a single multiframe signal.

Example: "BB:GSM:MODE SING"

'sets the **Single Frame** GSM mode. Only the commands for defining a single frame are valid.

*RST value	Resolution	SCPI
SINGle	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:PRAMp:BBONly[:STATe] ON | OFF

Note:
   This command is available for instruments with RF output only.

This command selects power ramping in the baseband only or mixed power ramping in the baseband and the RF section. The **ON** setting is mandatory if, with power ramping active, only the baseband signal is output (I/Q outputs), or, in case of two-path instruments, if a baseband signal is applied to two RF paths (RF A and RF B).

Only then can a signal with a defined, predictable level be output.

Example: "BB:GSM:PRAM:BBON ON"

'selects power ramping in the baseband only.

*RST value	Resolution	SCPI
OFF		Device-specific

[SOURce<[1]|2>:]BB:GSM:PRAMp:FDELay   - 9 ... +9 Symbols

The command sets the offset in the <u>F</u>alling edge of the ramp envelope at the end of a slot. A positive value gives rise to a ramp delay and a negative value advances the ramp. The setting is expressed in symbols.

Example: `"BB:GSM:PRAM:FDEL -1"`
                   'sets an advance of 1 symbol in the falling edge of the envelope at the end of the slot.

*RST value	Resolution	SCPI
0 symbols	1 symbol	Device-specific

[SOURce<[1]|2>:]BB:GSM:PRAMp:RDELay -9 ... +9 Symbols

The command sets the offset in the <u>R</u>ising edge of the ramp envelope at the start of a slot. A positive value gives rise to a ramp delay and a negative value advances the ramp. The setting is expressed in symbols.

Example: `"BB:GSM:PRAM:RDEL -1"`
                   'sets an advance of 1 symbol in the rising edge of the envelope at the start of the slot.

*RST value	Resolution	SCPI
0 symbols	1 symbol	Device-specific

[SOURce<[1]|2>:]BB:GSM:PRAMp:SHAPe   LINear | COSine

The command sets the edge shape of the ramp envelope.

Parameter: **LINear**
                             The transmitted power rises and falls linear fashion.

                   COSine
                             The transmitted power rises and falls in the shape of a cosine.

Example: `"BB:GSM:PRAM:SHAP LIN"`
                   'sets a cosine-shaped rise and fall to the edge.

*RST value	Resolution	SCPI
COS	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:PRAMp:TIME 0.3 ... 16.0 Symbols

The command sets the edge slope of the ramp envelope. This specifies the number of symbols over which the switching operation should be stretched when the transmitted power is turned on and off.

Example: `"BB:GSM:PRAM:TIME 6"`
                   'sets the duration of the switching operation to 6 symbols.

*RST value	Resolution	SCPI
5.0 symbols	0.1	Device-specific

[SOURce<[1]|2>:]BB:GSM:PRESet

The command sets all modulation parameters, including slot settings, to their GSM default values.
The ON status (SOURce:BB:GSM:STATe ON | OFF) is not affected by this command.

This command triggers an event and therefore has no *RST value and no query form.

Example: "BB:GSM:PRES"
                     'resets all GSM settings to default values.

[SOURce<[1]|2>:]BB:GSM:SATTenuation A1...A7

The command sets up to seven different values for level attenuation. The various values are defined
by the suffix to SATTenuation. These values are used when defining the level attenuation of
individual slots with the aid of the command SOUR:BB:GSM:FRAM:SLOT:USER:ATTenuation.

Example: "BB:GSM:MODE SING"
                     'selects GSM mode Frame (Single).

                     "BB:GSM:SLOT1:LEV ATT"
                     'sets level attenuation mode for slot 1.

                     "BB:GSM:SATT1 12dB"
                     'sets the level attenuation for selection A1 to 12 dB.

                     "BB:GSM:SLOT1:ATT A1"
                     'sets the level attenuation for slot 1 to 12 dB.

*RST value	Resolution	SCPI
0 dB	0.01 dB	Device-specific

[SOURce<[1]|2>:]BB:GSM:SETTing:CATalog?

This command reads out the files with GSM settings in the default directory. The default directory is
set using command MMEM:CDIRectory. A path can also be specified, in which case the files in the
specified directory are read. Only files with the file extension ***.gsm** will be listed.

The command is a query command and therefore has no *RST value.

Example: "MMEM:CDIR 'D:\user\dig_mod"
                     'sets the default directory to D:\user\dig_mod.

                     "BB:GSM:SETT:CAT?"
                     'reads out all the files with GSM settings in the default directory.

                     Response: "'gsm_1'

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:SETTing:DELete <file_name>

This command deletes the selected file with GSM settings. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension ***.gsm** will be deleted.

This command triggers an event and therefore has no *RST value and no query form.

Example:　　　　`"BB:GSM:SETT:DEL 'gsm_1'"`
　　　　　　　　'deletes file 'gsm_1'.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:SETTing:LOAD <file_name>

This command loads the selected file with GSM settings The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension ***.gsm** will be loaded.

This command triggers an event and therefore has no *RST value and no query form.

Example:　　　　`"BB:GSM:SETT:LOAD 'gsm_1'"`
　　　　　　　　'loads file 'gsm_1'.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:SETTing:STORe <file_name>

This command stores the current GSM settings into the selected file. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only the file name has to be entered. GSM settings are stored as files with the specific file extensions ***.gsm**.

This command triggers an event and therefore has no *RST value and no query form.

Example:　　　　`"BB:GSM:SETT:STOR 'gsm_1'"`
　　　　　　　　'stores the current GSM settings into file '`gsm_1`'.

*RST value	Resolution	SCPI
	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:SEQuence AUTO | RETRigger | AAUTo | ARETrigger | SINGle

Note:
　This command is available for R&S SMx and R&S AMU instruments only.

The command selects the trigger mode.

Parameter:　　　**AUTO**
　　　　　　　　　　The frames are generated continuously.

　　　　　　　RETRigger
　　　　　　　　　　The frames are generated continuously. A trigger event (internal or external) causes a restart.

AAUTo

The frames are generated only when a trigger event occurs. After the trigger event the signal is generated continuously. Signal generation is stopped with command `SOUR:BB:GSM:TRIG:ARM:EXEC` and started again when a trigger event occurs.

ARETrigger

The frames are generated only when a trigger event occurs. The device automatically toggles to RETRIG mode. Every subsequent trigger event causes a restart. Signal generation is stopped with command `SOUR:BB:GSM:TRIG:ARM:EXEC` and started again when a trigger event occurs.

SINGle

The signal is generated only when a trigger event occurs. After the trigger event the signal is generated once to the set sequence length (`SOUR:BB:GSM:TRIG:SLEN`). Every subsequent trigger event causes a restart.

Example: `"BB:GSM:SEQ AAUT"`
'sets the **Armed_auto** trigger mode; the device waits for the first trigger (e.g. with `*TRG`) and then generates the frames continuously.

*RST value	Resolution	SCPI
AUTO	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:SMODe GSM | EDGE

The command selects the modulation signal for the mode Unframed (`:BB:GSM:MODE UNFR`). The modulation type and filter type are set in accordance with the selection.

Example: `"BB:GSM:SMOD GSM"`
'selects a GSM modulation signal for the Unframed mode.

*RST value	Resolution	SCPI
GSM	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:SRATe 400 Hz ... 25 MHz

The command sets the symbol clock. Possible units are Hz, kHz, MHz, Sym/s, kSym/s, MSym/s.

Example: `"BB:GSM:SRAT 270.9 kHz"`
'sets the symbol clock to 270.9 kHz.

*RST value	Resolution	SCPI
270.833 kHz	0.001	Device-specific

[SOURce<[1]|2>:]BB:GSM:STATe ON | OFF

The command switches on the modulation in accordance with the GSM standard. Any other standards or digital modulation that may be in the ON state will be automatically turned OFF (in case of two-path instruments, this affects the same path).

Example: "BB:GSM:STAT ON"
                  'switches GSM modulation on.

*RST value	Resolution	Dependencies	SCPI
OFF	-	GSM:STAT ON switches off other standards and digital modulation.	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:ARM:EXECute

Note:
    This command is available for R&S SMx and R&S AMU instruments only.

The command stops signal generation for trigger modes Armed_Auto and Armed_Retrigger. A subsequent internal or external trigger event restart signal generation.

This command triggers an event and therefore has no *RST value and no query form.

Example: "BB:GSM:TRIG:SOUR INT"
                  'sets internal triggering.

                "BB:GSM:TRIG:SEQ ARET"
                  'sets Armed_Retrigger mode, i.e. every trigger event causes signal generation to restart.

                "BB:GSM:TRIG:EXEC"
                  'executes a trigger, signal generation is started.

                "BB:GSM:TRIG:ARM:EXEC"
                  'signal generation is stopped.

                "BB:GSM:TRIG:EXEC"
                  'executes a trigger, signal generation is started again.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:EXECute

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command executes a trigger. The internal trigger source must be selected using the command `:BB:GSM:TRIGger:SOURce INTernal` and a trigger mode other than `AUTO` must be selected using the command `:BB:GSM:SEQ`.

This command triggers an event and therefore has no *RST value and no query form.

Example:　　　`"BB:GSM:TRIG:SOUR INT"`
　　　　　　　　'sets internal triggering.

　　　　　　`"BB:GSM:SEQ RETR"`
　　　　　　　　'sets Retrigger mode, i.e. every trigger event causes signal generation to restart.

　　　　　　`"BB:GSM:TRIG:EXEC"`
　　　　　　　　'executes a trigger.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:EXTernal:CLOCk:DELay 0 ... 2^16-1 Symbols

Note:
   This command is available for R&S SMx and R&S AMU instruments only.

The command specifies the trigger delay (expressed as a number of symbols) for external triggering via the clock input.

This command applies only if external clock source (`BB:GSM:CLOC:SOUR EXT`) and trigger source external clock (`BB:GSM:TRIG:SOUR CLOC`) are selected.

For two-path instruments, this command applies only for baseband path A.

Example:　　　`"BB:GSM:CLOC:SOUR EXT"`
　　　　　　　　'selects the external clock source. The clock signal must be provided at the CLOCK connector.

　　　　　　`"BB:GSM:TRIG:SOUR ECL"`
　　　　　　　　'selects an external trigger by means of the external clock.

　　　　　　`"BB:GSM:TRIG:EXT:CLOC:DEL 200"`
　　　　　　　　'sets a delay of 200 symbols for the trigger.

*RST value	Resolution	SCPI
0 symbols	1 symbol	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:EXTernal:CLOCk:INHibit 0 ... 2^26-1 Symbols

Note:
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command specifies the number of symbols by which a restart is to be inhibited following a trigger event. This command applies only if external clock source (`BB:GSM:CLOC:SOUR EXT`) and trigger source external clock (`BB:GSM:TRIG:SOUR CLOC`) is selected.

For two-path instruments, this command applies only for baseband path A.

Example: `"BB:GSM:CLOC:SOUR EXT"`
> 'selects the external clock source. The clock signal must be provided at the CLOCK connector.

> `"BB:GSM:TRIG:SOUR ECL"`
> 'selects an external trigger by means of the external clock.

> `"BB:GSM:TRIG:EXT:CLOC:INH 200"`
> 'sets a restart inhibit for 200 symbols following a trigger event.

*RST value	Resolution	SCPI
0 symbols	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger[:EXTernal<[1]|2>]:DELay 0 ... 2^16-1 Symbols

Note:
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command specifies the trigger delay (expressed as a number of symbols) for external triggering. The numeric suffix to EXTernal distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

Example: `"BB:GSM:TRIG:SOUR EXT"`
> 'selects an external trigger via the TRIGGER 1 connector.

> `"BB:GSM:TRIG:DEL 200"`
> 'sets a delay of 200 symbols for the trigger.

*RST value	Resolution	SCPI
0 symbols	1 symbol for `CLOCk:SOURce EXT` 0.01 symbols for `CLOCk:SOURce INT`	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger[:EXTernal<[1]|2>]:INHibit 0 ... 2^26-1 Symbols

> *Note:*
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command specifies the number of symbols by which a restart is to be inhibited following a trigger event. This command applies only in the case of external triggering. The numeric suffix to EXTernal distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

Example: `"BB:GSM:TRIG:SOUR EXT"`
              'selects an external trigger via the TRIGGER 1 connector.

              `"BB:GSM:TRIG:INH 200"`
              'sets a restart inhibit for 200 symbols following a trigger event.

*RST value	Resolution	SCPI
0 symbols	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OBASeband:DELay 0 ... 2^32-1 Symbols

> *Note:*
> *This command is available for R&S SMx and R&S AMU two-path instruments only.*

The command specifies the trigger delay (expressed as a number of symbols) for triggering by the signal from the second path.

Example: `"BB:GSM:TRIG:SOUR OBAS"`
              'sets for path A the internal trigger executed by the signal from the second path (path B).

              `"BB:GSM:TRIG:OBAS:DEL 200"`
              'sets a delay of 200 symbols for the trigger.

*RST value	Resolution	SCPI
0 symbols	1 symbol for `CLOCk:SOURce EXT` 0.01 symbols for `CLOCk:SOURce INT`	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OBASeband:INHibit 0 ... 2^32-1 Symbols

> *Note:*
> *This command is available for R&S SMx and R&S AMU two-path instruments only.*

The command specifies the number of symbols by which a restart is to be inhibited following a trigger event. This command applies only for triggering by the second path.

Example: `"BB:GSM:TRIG:SOUR OBAS"`
              'sets for path A the internal trigger executed by the signal from the second path (path B).

              `"BB:GSM:TRIG:OBAS:INH 200"`
              'sets a restart inhibit for 200 symbols following a trigger event.

*RST value	Resolution	SCPI
0 symbols	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:DELay 0 ... 2^24-1 Symbols

> *Note:*
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command defines the delay between the signal on the marker outputs and the start of the frame/slot, expressed in terms of symbols.

Command `:BB:GSM:TRIGger:OUTPut:DELay:FIXed` can be used to restrict the range of values to the dynamic range, i.e. the range within which a delay of the marker signals can be set without restarting the marker and signal.

Example: `"BB:GSM:TRIG:OUTP2:DEL 16"`
'sets a delay of 16 symbols for the signal on connector MARKER 2.

*RST value	Resolution	SCPI
0 symbols	1 symbol	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut:DELay:FIXed ON | OFF

> *Note:*
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command restricts the marker delay setting range to the dynamic range. In this range the delay can be set without restarting the marker and signal.

The numeric suffix in `OUTPut` has no significance for this command, since the setting always affects every marker.

Example: `"BB:GSM:TRIG:OUTP:DEL:FIX ON"`
'restricts the marker signal delay setting range to the dynamic range.

*RST value	Resolution	SCPI
OFF	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:DELay:MAXimum

> *Note:*
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command queries the maximum marker delay for setting `:BB:GSM:TRIGger:OUTPut:DELay:FIXed ON`.

The command is a query only and therefore has no *RST value.

Example: `"BB:GSM:TRIG:OUTP:DEL:FIX ON"`
'restricts the marker signal delay setting range to the dynamic range.

`"BB:GSM:TRIG:OUTP:DEL:MAX"`
'queries the maximum of the dynamic range.

Response: `"2000"`
'the maximum for the marker delay setting is 2000 symbols.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:DELay:MINimum

Note:
> *This command is available for R&S SMx and R&S AMU instruments only.*

The command queries the minimum marker delay for setting `:BB:GSM:TRIGger:OUTPut:DELay:FIXed ON`.

The command is a query only and therefore has no *RST value.

Example: `"BB:GSM:TRIG:OUTP:DEL:FIX ON"`
'restricts the marker signal delay setting range to the dynamic range.

`"BB:GSM:TRIG:OUTP:DEL:MIN"`
'queries the minimum of the dynamic range.

Response: `"0"`
'the minimum for the marker delay setting is 0 symbols.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:MODE
SDEF | FRAMe | SLOT | PULSe | PATTern | RATio

The command defines the signal for the selected marker output.

Parameter: **As defined in slots**
The marker defined in the burst editor is used.

SLOT

A slot clock with the slot period specified using command `SOUR:BB:GSM:TRIG:OUTP:PER:SLOT` is generated on the output connector. The marker signal is generated after every specified number of slots. It is important to be aware of the variation in the GSM/EDGE slot length between 156 and 157 symbols. At a slot length of 156 symbols, a period of 1 symbol and a symbol rate of 270.833 ksymb/s the clock is 0.577 ms, and at 157 symbols it is 0.580 ms.

FRAMe

A frame clock with the frame period specified using command `SOUR:BB:GSM:TRIG:OUTP:PER:FRAM` is generated on the output connector. The marker signal is generated after every specified number of frames. A GSM/EDGE frame has 1250 symbols. At a symbol rate of 270.833 ksymb/s and a period of 1 the clock is 4.615 ms.

PULSe

A pulsed marker signal is generated. The pulse frequency (= symbol rate/divider) is defined with the `SOUR:BB:GSM:TRIG:OUTP:PULS:DIV` command and can be queried with the `SOUR:BB:GSM:TRIG:OUTP:PULS:FREQ?` command.

PATTern

A marker signal is generated with the aid of a user-definable bit pattern. The bit pattern is entered with the aid of command `SOURce:BB:GSM:TRIGg:OUTP:PATT`. The bit pattern is a maximum of 64 bits long.

RATio

A regular marker signal corresponding to the Time Off / Time On specifications in the commands `SOUR:BB:GSM:TRIGge:OUTP:OFFT` and `SOUR:BB:GSM:TRIGg:OUTP:ONT` is generated.

Example: `"BB:GSM:TRIG:OUTP2:MODE PULS"`
'selects the pulsed marker signal on output MARKER 2.

*RST value	Resolution	SCPI
FRAMe	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:OFFTime   1 ... 2^24-1 symbols

The command sets the number of symbols in a period (ON time + OFF time) during which the marker signal in setting `SOURce:BB:GSM:TRIGger:OUTPut:MODE RATio` on the marker outputs is OFF.

Example: `"BB:GSM:TRIG:OUTP2:OFFT 20"`
'sets an OFF time of 20 symbols for marker signal 2.

*RST value	Resolution	SCPI
1 Symbol	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:ONTime   1 ... 2^24-1 symbols

The command sets the number of symbols in a period (ON time + OFF time) during which the marker signal in setting `SOURce:BB:GSM:TRIGger:OUTPut:MODE RATio` on the marker outputs is ON.

Example: `"BB:GSM:TRIG:OUTP2:ONT 20"`
'sets an ON time of 20 symbols for marker 2.

*RST value	Resolution	SCPI
1 Symbol	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PATTern   #B0 ,1... #B111...1,32

The command defines the bit pattern used to generate the marker signal in the setting `SOURce:BB:GSM:TRIGger:OUTPut:MODE PATTern` 0 is marker off, 1 is marker on.

Example: `"BB:GSM:TRIG:OUTP2:PATT #H81,8"`
'sets a bit pattern.

`"BB:GSM:TRIG:OUTP2:MODE PATT"`
'activates the marker signal according to a bit pattern on output MARKER 2.

*RST value	Resolution	SCPI
0		Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PERiod[:FRAMe] 1... 2^26-1

The command sets the repetition rate for the frame clock at the marker outputs.

Example: `"BB:GSM:TRIG:OUTP2:MODE FRAM"`
             'sets the frame clock for the signal on connector MARKER 2.

                   `"BB:GSM:TRIG:OUTP2:PER 16"`
             'sets a period of 16 frames, i.e. the marker signal is repeated every 16th frame.

*RST value	Resolution	SCPI
1	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PERiod:SLOT 1... 2^26-1

The command sets the repetition rate for the slot clock at the marker outputs.

Example: `"BB:GSM:TRIG:OUTP2:MODE SLOT"`
             'sets the slot clock for the signal on connector MARKER 2.

                   `"BB:GSM:TRIG:OUTP2:PER:SLOT 16"`
             'sets a period of 16 slots, i.e. the marker signal is repeated every 16th slot.

*RST value	Resolution	SCPI
1	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PULSe:DIVider 2 ... 2^10

The command sets the divider for the pulsed marker signal in the setting
`SOURce:BB:GSM:TRIGger:OUTPut:MODE PULSe`. The pulse frequency is derived by dividing the symbol rate by the divider.

Example: `"BB:GSM:TRIG:OUTP2:PULS:DIV 2"`
             'sets the divider for the marker signal on output MARKER 2 to the value 2.

                   `"BB:GSM:TRIG:OUTP2:FREQ?"`
             'queries the resulting pulse frequency of the marker signal.

         Response: `"66 000"`
             'the resulting pulse frequency is 66 kHz.

*RST value	Resolution	SCPI
2	1	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:OUTPut<[1]...4>:PULSe:[FREQuency]?

The command queries the pulse frequency of the pulsed marker signal in the setting `SOUR:BB:GSM:TRIG:OUTP:MODE PULS`. The pulse frequency is derived by dividing the symbol rate by the divider. The divider is defined with command `SOUR:BB:GSM:TRIG:OUTP:PULS:DIV`.

The command is a query only and therefore has no *RST value.

Example: `"BB:GSM:TRIG:OUTP2:PULS:DIV 4"`
'sets the divider for the marker signal on output MARKER 2 to the value 4.

`"BB:GSM:TRIG:OUTP2:MODE PULS"`
'enables the pulsed marker signal.

`"BB:GSM:TRIG:OUTP2:PULS:FREQ?"`
'queries the resulting pulse frequency for the marker signal.

Response: `"33 000"`
'the resulting pulse frequency is 33 kHz.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:RMODe

Note:
This command is available for R&S SMx and R&S AMU instruments only.

The command queries the status of frame generation for all trigger modes with GSM/EDGE modulation on.

The command is a query command and therefore has no *RST value.

Parameter: **RUN**

the GSM/EDGE signal is generated. A trigger event occurred in the triggered mode.

STOP

the GSM/EDGE signal is not generated. A trigger event did not occur in the triggered modes, or signal generation was stopped by the command `:BB:GSM:TRIG:ARM:EXECute` (armed trigger modes only).

Example: `"BB:GSM:TRIG:SOUR EXT"`
'sets external triggering via the TRIGGER 1 connector.

`"BB:GSM:TRIG:MODE ARET"`
'selects the Armed_Retrigger mode.

`"BB:GSM:TRIG:RMOD?"`
'queries the status of frame generation.

Response: `"RUN"`
'the frame is generated, an external trigger was executed.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:SLENgth　　1 … (2^32-1) Symbols

Note:
　　This command is available for R&S SMx and R&S AMU instruments only.

The command defines the length of the signal sequence to be output in the **Single** trigger mode.
The unit is defined with command SOUR:BB:GSM:TRIG:SLUNit. It is possible to output deliberately just part of a frame, an exact sequence of a frame, or a defined number of repetitions of a frame.

Example:　　　`"BB:GSM:SEQ SING"`
　　　　　　　　'sets trigger mode Single.

　　　　　　　`"BB:GSM:TRIG:SLUN SYMB"`
　　　　　　　　'sets unit symbol for the entry of signal duration.

　　　　　　　`"BB:GSM:TRIG:SLEN 200"`
　　　　　　　　'sets a signal duration of 200 symbols. 200 symbols will be output after the next trigger event.

*RST value	Resolution	SCPI
1 Frame	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:SLUNit　　FRAMe | SYMBol

Note:
　　This command is available for R&S SMx and R&S AMU instruments only.

The command defines the unit for the entry of the length of the signal sequence (SOUR:BB:GSM:TRIG:SLEN) to be output in the **Single** trigger mode (SOUR:BB:GSM:SEQ SING).

Example:　　　`"BB:GSM:SEQ SING"`
　　　　　　　　'sets trigger mode Single.

　　　　　　　`"BB:GSM:TRIG:SLUN FRAM"`
　　　　　　　　'sets unit frame for the entry of signal duration.

　　　　　　　`"BB:GSM:TRIG:SLEN 2"`
　　　　　　　　'sets a signal duration of 2 frames. The current frame will be output twice after the next trigger event.

*RST value	Resolution	SCPI
FRAMe	-	Device-specific

[SOURce<[1]|2>:]BB:GSM:TRIGger:SOURce INTernal | EXTernal | BEXTernal | OBASeband | ECLock

Note:
    This command is available for R&S SMx and R&S AMU instruments only.

The command selects the trigger source.

Parameter: **INTernal**

                Triggering is executed by means of the Trigger command in the case of remote control, and by means of **Execute Trigger** in the case of manual operation.

       EXTernal

                Triggering is executed by means of the signal on the TRIGGER 1 connector.

       BEXTernal

                Triggering is executed by means of the signal on the TRIGGER 2 connector.

       OBASeband

                Triggering is executed by means of the signal from the second path (two-path instruments only).

       ECLock

                Triggering is executed by means of the signal on the CLOCK connector. This signal is also used as clock. The selection is only available if external clock source (`:BB:GSM:CLOC:SOUR EXT`) is selected. In case of two-path instruments, the selection is only available for baseband path A.

Example: `"BB:GSM:TRIG:SOUR INT"`
         'sets internal triggering.

*RST value	Resolution	SCPI
INTernal	-	Device-specific

Alphabetical List of Commands

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