Supplement

Digital Standard DAB / T-DMB

R&S® SMU-K53
1400.6209.02

R&S® SMJ-K53
1400.6309.02

R&S® SMATE-K53
1400.6409.02

R&S® AMU-K53
1402.9957.02

ROHDE & SCHWARZ
Test and Measurement Division

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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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 producieran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Contents- Digital Standard DAB/T-DMB

Digital Standard DAB/T-DMB

The R&S Signal Generator enables you to easily generate signals in accordance with the Digital Audio Broadcasting (DAB)/Terrestrial Digital Multimedia Broadcasting (T-DMB) standard. The generated signals are compliant with ETSI EN 300 401 standard.

Via the user-friendly graphical interface of R&S Signal Generator, you can adjust several DAB signal parameters. You are enable to generate a signal corresponding to one of the four standard transport modes, Transmission Mode I, II, III or IV. You can also choose to enable or disable channel coding, time interleaving and/or pseudo noise scrambling.

The R&S Signal Generator allows you to choose between different data sources. You can either use some of the predefined data sources (two different pseudo noise sequences, fixed all "0", fixed all "1") or you can use your own ETI (Ensemble Transport Interface) compliant source file. To create an ETI compliant source file, you can for instance use the R&S STI Ensemble Mux DM001 or the R&S ETI Builder. However, the ETI source file must fulfill some prerequisites.

Introduction - DAB/T-DMB

The DAB system is designed for delivery of high-quality digital audio programs and data services for mobile, portable and fixed reception from terrestrial or satellite transmitters in the Very High Frequency (VHF)/Ultra High Frequency (UHF) frequency bands as well as for distribution through cable networks.

The DAB system is designed to provide spectrum and power efficient techniques in terrestrial transmitter network planning, known as the Single Frequency Network (SFN) and the gap-filling technique. The DAB system is suitable for satellite as well as hybrid/mixed terrestrial/satellite broadcasting, using a simple, nearly omni-directional receiving antenna. The DAB system meets the required sharing criteria with other radio communication services.

DAB Network

The figure bellow illustrates the outline of a DAB network.
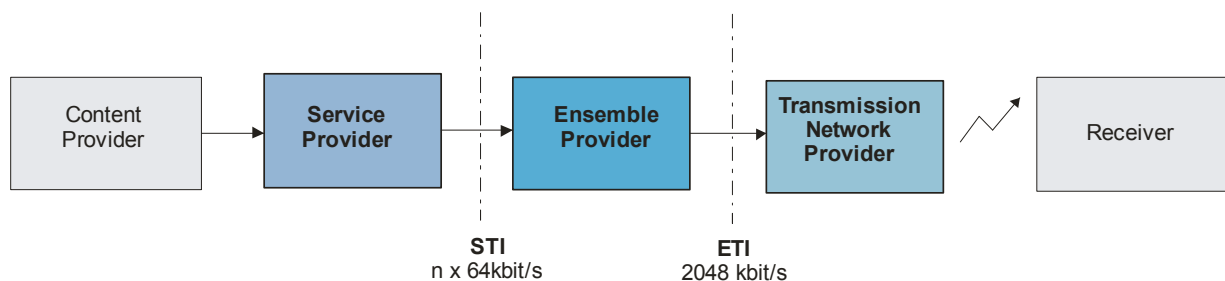
Figure 1   DAB network

The DAB network has three main parts: the service or service component provider, the multiplex or ensemble provision and the transmission network provision.

The interfaces between these there blocks are scope of ETSI standards. The STI (Service Transport Interface) is defined to provide a standardized way of transporting DAB service components, service information and control messages in a DAB collection network.

The Ensemble Transport Interface (ETI) links the Multiplexer of the Ensemble Provider with the transmitters of the Transmission Network Provider.

DAB Transmission System

The following block diagramm shows the components of the DAB transmission system.

CIF	Common Interleaved Frames	FIC	Fast Information Chanennel	OFDM	Orthogonal frequency	TII	Transmitter Identification
DAB	Digital Audio Broadcast	FIB	Fast Information Block		division multiplexing		Information
ETI	Ensemble Transport Interface	MSC	Main Service Channel	SI	Service Information	PN	Pseudo Noise
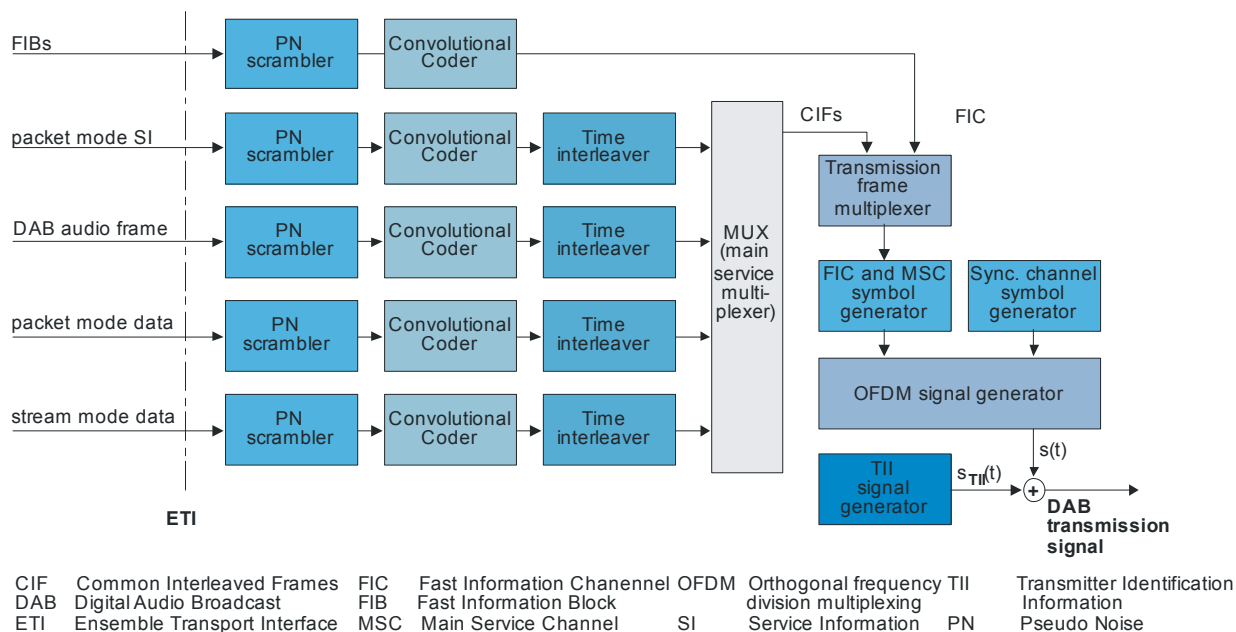
Figure 2   Components of the Transmission System DAB

The DAB transmission signal is defined as the sum of two signals; the main signal s (t) and an optional signal s_{TII} (t) as illustrated in the figure above.

Transport Mechanisms

The DAB system is designed to carry several digital audio signals together with data signals. Audio and data signals are considered to be service components which can be grouped together to form services. The DAB system transmission frame consists of three different channels:

◆ Main Service Channel (MSC)
◆ Fast Information Channel (FIC)
◆ Synchronization Channel

Transmission channels

The MSC is a time-interleaved data channel used to carry the audio and data service components, together with possible supporting and additional data service components. The MSC is divided into a number of sub-channels. Each of the sub-channels is individually convolutionally coded with equal or unequal error protection. Each sub-channel may carry one or more service components.

The FIC is a non time-interleaved data channel with fixed equal error correction. FIC carries information about the organization of the MSC sub-channels, such as information on the multiplex structure and, when necessary, its reconfiguration. Optionally FIC may include service information, conditional access management information and data service.

The Synchronization Channel provides a phase reference and is used internally for demodulator functions such as transmission frame synchronization, automatic frequency control, transmitter identification, and channel state estimation.

The Synchronization channel, the Fast Information Channel and the Main Service Channel form a transmission frame (see figure below). The MSC occupies the major part of the transmission frame.
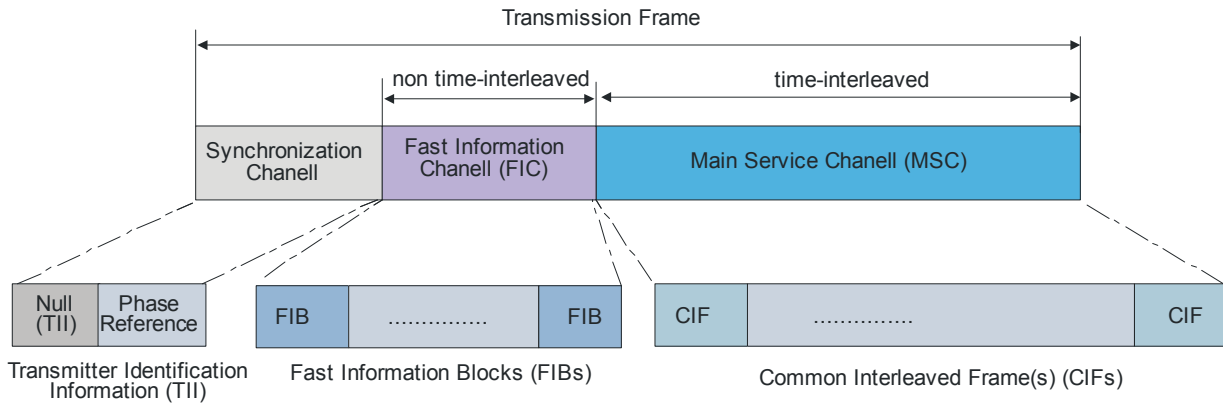
Figure 3   DAB transmission frame

Each transmission frame is divided into a sequence of OFDM symbols, each symbol consisting of a number of carriers.

The Fast Information Block (FIB) and the Common Interleaved Frame (CIF) are introduced in order to provide transmission mode independent data transport packages associated with the FIC and MSC respectively.

The data, carried in the MSC, is divided at source into regular 24 ms bursts corresponding to the sub-channel data capacity of each CIF. The CIF contains 55 296 bits, divided at 864 capacity units, 64 bits each.

Fast Information Block (FIB) is a data burst of 256 bits. The sequence of FIBs is carried by the Fast Information Channel FIC. The structure of the FIB is common to all transmission modes.

The synchronization channel symbols comprise the null symbol and the phase reference symbol. The null symbols are also used to allow a limited number of OFDM carriers to convey the Transmitter Identification Information (TII).

Transport Modes

Transmission mode is specific set of transmission parameters (e.g. number of carriers, OFDM symbol duration). Four transmission modes (i.e. I, II, III and IV) are defined to allow the system to be used for different network configurations and a range of operating frequencies. Depending on the transport mode, the transmission frame has different organization and length, i.e. the transmission frame is specific to the four transmission modes.

The table below gives the transmission frame duration and the number of FIBs and CIFs which are associated with each transmission frame for the four transport modes.

Transport Mode	Duration of transmision frame	Number of FIBs per transmission frame	Number of CIFs per transmission frame	Number of carriers	Carrier Spacing
I	96 ms	12	4	1536	1 KHz
II	24 ms	3	1	384	4 KHz
III	24 ms	4	1	192	8 KHz
IV	48 ms	6	2	768	2 KHz

Table 1   Transmission Mode Characteristics

Pseudo Noise (PN) Scrambling

Prior to convolution encoding, the transmitted signal can be scrambled by a modulo-2 addition with a pseudo-random binary sequence (PRBS).

The PRBS polynomial is of degree 9 and specified as $P(X) = x^9 + x^5 + 1$.

The initialization word is applied in such a way that the first bit of the PRBS is obtained when the outputs of all shift register stages are set to value "1".

Convolutional Coding

The process of convolution coding is applied at the output of each PN scrambler. The channel encoding process is based on punctured convolutional coding, which allows both equal and unequal error protection. Unequal error protection (UEP) is designed for audio services, equal error protection (EEP) for audio and data services. The sampling frequency is respectively 48 kHz and 24 kHz.

The convolutional coder is a punctured convolution code, based on a mother convolutional code with constraint length 7 and rate 1/4.

The generator polynomials are $G_1 = (1,0,1,1,0,1,1)$, $G_2 = (1,1,1,1,0,0,1)$, $G_3 = (1,1,0,0,1,0,1)$ and $G_4 = (1,0,1,1,0,1,1)$.

To avoid the need for additional signaling overhead, the data in the FIC are encoded with fixed, equal channel coding, with a constant 1/3 coding rate.

The puncturing procedures applied for the coding in the MSC is a combination of protection profile and protection level. There are number of permissible protection profiles defined for each of the allowed bit rates. Each protection profile is associated with a protection level. Protection level 1 is the highest level within the same profile.

Error protection	Protection Profile	Bit rate	Protection Level	Code Rate
UEP	four different protection profiles	14 different bit rates	1, 2, 3, 4, 5	0,34..0,75 (64 different data rates - protection level combinations)
EEP	A	Multiples of 8 kbit/s	1-A	1/4
			2-A	3/8
			3-A	1/2
			4-A	3/4
	B	Multiples of 32 kbit/s	1-B	4/9
			2-B	4/7
			3-B	2/3
			4-B	4/5

Time Interleaving

Time interleaving is applied prior to block generation at the output of each convolutional encode contributing to the sub-channels in the MSC. It is not applied to the FIC.
The time interleaving process covers 16 CIFs, 24ms each. This results in an overall processing delay of 384ms.

DAB Menu

The menu for setting the DAB digital standard is either called from the baseband block or from the menu tree under **Baseband**.
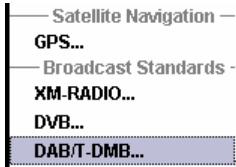
General Settings for DAB Signals

The menu is split into three main sections for configuring the standard.

The upper menu section is where the DAB digital standard is enabled and reset.

In the Data Source section, the data source file and the ETI file can be selected and source file relevant parameters can be set.

The buttons in the lower menu section lead to submenus to configure the system and setting the filter, trigger, and clock parameters.
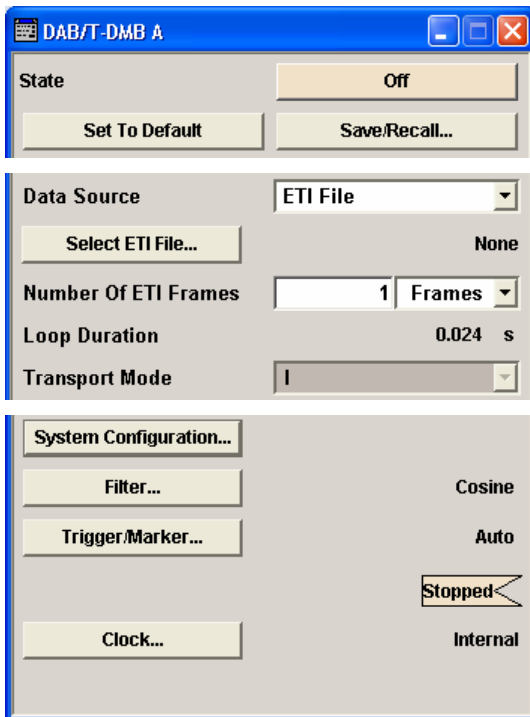
State – DAB   Activates or deactivates the DAB standard.

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

The DAB signal is generated according to the performed settings.

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

Set To Default - DAB   Calls the default settings.

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

Parameter	Value
State	Off
Data Source	PN15
Transport Mode	I
Pseudo Noise Scrambler	On
Coder	On
Interleaver	On
Filter	Cosine
Sample Rate Variation	2.048 MHz
Trigger Mode	Auto
Marker Mode	Frame Start
Clock	Internal

Save/Recall... - DAB   Calls the **Save/Recall** menu.

From the **Save/Recall** menu, the **File Select** windows for saving and recalling DAB configurations and the **File Manager** is called.

DAB configurations are stored as files with the predefined file extension ***.DAB**. The file name and the directory they are stored in are user-definable.

The complete settings in the **DAB** menu are saved and recalled.

Recall DAB   Opens the **File Select** window for loading a saved
Setting   DAB configuration.

The configuration of the selected (highlighted) file is loaded by pressing the **Select** button.

Remote-control command:
MMEM:CDIR 'F:\DAB'
SOUR:BB:DAB:SETT:CAT?
Response: 'DAB_1', 'DAB_2'
SOUR:BB:DAB:SETT:LOAD "DAB_1"

Save DAB Setting	Opens the **File Select** window for saving the current DAB 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_list\DAB'`
	`SOUR:BB:DAB:SETT:STOR "DAB_1"`

File Manager	Calls the **File Manager**.
	The **File Manager** is used to copy, delete, and rename files and to create new directories.
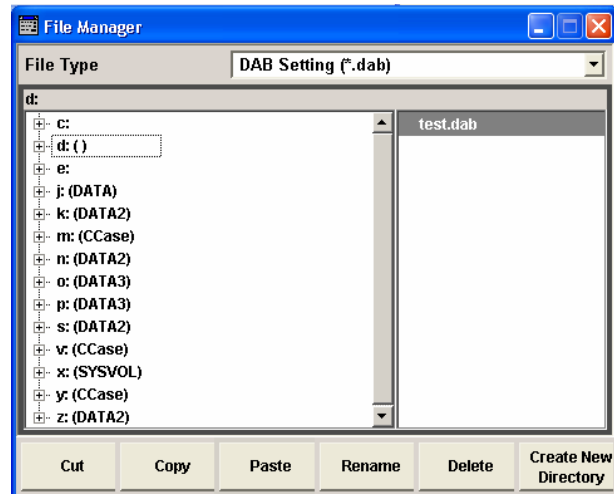
Remote-control command:
`MMEM:CDIR 'D:\DAB'`
`SOUR:BB:DAB:SETT:DEL "DAB_1"`

Data Source - DAB	Selects the data source to be used to generate the modulation signal.
All 0 **All 1**	0 or 1 data is generated internally.
	Remote-control command: `SOUR:BB:DAB:DATA ALL0`
PN15 **PN23**	PRBS data in accordance with the IUT-T with period lengths between 2^9-1 and $2^{23}-1$ are internally generated.
	Remote-control command: `SOUR:BB:DAB:DATA PN23`
ETI File	Uses data from an ETI file. The ETI file can be selected via the **Select ETI File** button.
	Remote-control command: `SOUR:BB:DAB:DATA ETI`

Select ETI File - DAB   This menu option is available only if the data source is set to ETI File. Calls the menu for selecting the ETI (Ensemble Transport Interface) file.

> *Note:*
> *The ETI File must fulfill the following prerequisites:*
> *- ETI file compliant with ETI (NI, G.703)*
> *- Frame duration 24 ms (48 KHz sampling rate)*
> *- Constant multiplex cofiguration*
> *- Same stream configuration of all the frames*
> *- 15 streams maximum.*

A scrambled ETI file is an encrypted ETI file with an extension *.xeti. The file is generated with the R&S ETI Builder software tool and can only be used (or decrypted respectively) with the DAB/T-DMB option SMx-K53.
The R&S ETI Builder is a freeware tool designed to build own DAB ensembles with mp2 audio content in ETI format.
For more information, refer to the description "Creation of ETI Files for DAB testing with R&S SMU, R&S SMJ and R&S SMATE" on the Rohde&Schwarz Internet page.

Remote-control command:
SOUR:BB:DAB:DAT:DSEL 'test.eti'

Number of ETI Frames - DAB   This menu option is available only if the data source is set to ETI File. Enters the desired sequence lenght in form of frames.

Remote-control command:
SOUR:BB:DAB:EFR 10

Loop Duration - DAB   This menu option is available only if the data source is set to ETI File. Displays the sequence length.

Remote-control command:
SOUR:BB:DAB:LDUR?

Transport Mode - DAB   Selects the transport mode.. Selecting of transport mode is only enabled for data source other then ETI files.
For ETI data source files this field is read only. The transport mode is read from the ETI file.

Remote-control command:
SOUR:BB:DAB:DATA PN15
SOUR:BB:DAB:TMOD I

System Configuration… - DAB   Calls the **System Configuration** menu for configuring the DAB system.

The menu is described in section "*System Configuration - DAB*", page 10.

Remote-control command: n.a.

Filter … - DAB	Calls the menu for setting baseband filtering. The current filter is displayed next to the button.
	The menu is described in section "*Filter Settings- DAB*", page 11.
	Remote-control command: n.a.

Trigger - Marker - DAB	**(Trigger for R&S SMx and R&S AMU instruments only)**
	Calls the menu for selecting the trigger mode and trigger source, for configuring the marker signals, and for setting the time delay of an external trigger signal.
	This menu is described in section "*Trigger-Marker-Clock - DAB*", page 13.
	The currently selected trigger mode and trigger source are displayed next to the button.
	Remote-control command: n.a.

Execute Trigger - DAB	**(R&S SMx and R&S AMU instruments only)**
	Executes the trigger manually.
	A manual trigger can be executed only if an internal trigger source and a trigger mode other than **Auto** have been selected.
	Remote-control command: SOUR:BB:DAB:TRIG:EXEC

Arm - DAB	**(R&S SMx and R&S AMU instruments only)**
	Stops signal generation manually.
	The **Arm** button is displayed only if the trigger modes **Armed Retrigger** or **Armed Auto** have been selected.
	Remote-control command: SOUR:BB:DAB:TRIG:ARM:EXEC

Clock - DAB	**(R&S SMx and R&S AMU instruments only)**
	Calls the menu for selecting the clock source and for setting a delay.
	This menu is described in section "*Trigger-Marker-Clock - DAB*", page 13.
	Remote-control command: n.a.

System Configuration - DAB

The **System Configuration** menu allows to configure the DAB system.
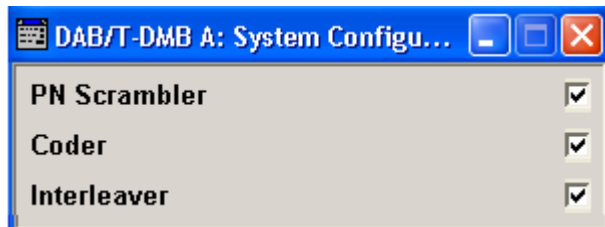
PN Scrambler - DAB

Activates/deactivates the PN scrambling. The data packets of the incoming transport stream are transformed to a Pseudo Random Binary Sequence (PRBS) in order to obtain a bit sequence that has a positive effect on the transmitted RF spectrum.
This feature is enabled for ETI data source files only.

Remote-control command:
SOUR:BB:DAB:PNSC OFF

Coder - DAB

Activates/deactivates the coder. The coder applies a Reed-Solomon error correction code to the PRBS data stream.
This feature is enabled for ETI data source files only.
If the convolutional encoder is switched off, the number of bits delivered from the coder in enabled state is now fetched from the scrambler and therefore from data source. So please keep in mind that the data framing is not valid anymore.

Remote-control command:
SOUR:BB:DAB:COD OFF

Interleaver - DAB

Activates/deactivates the convolutional interleaver.
This feature is enabled for ETI data source files only.
After turning on the standard, the MSC values are not valid during the first 16 CIFs, because of the time interleaver's depth.

Remote-control command:
SOUR:BB:DAB:ILE OFF

Filter Settings- DAB

The **Filter Settings** menu is reached via the **DAB** main menu.

The filter parameters are defined in this menu.
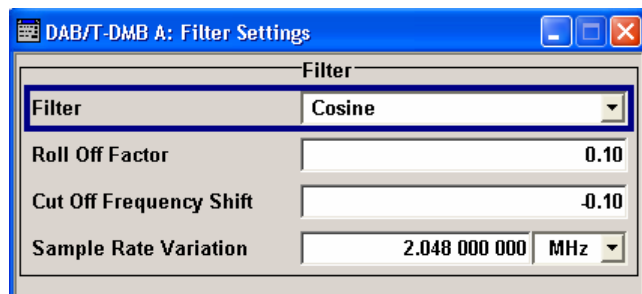
In the **Filter** section, the settings are made for the baseband filter.

Filter - DAB	Selects the baseband filter.
	This opens a selection window containing all the filters available to the instrument.
	Remote-control command: `SOUR:BB:DAB:FILT:TYPE RCOS`
Roll Off Factor or BxT - DAB	Enters the filter parameters.
	The filter parameter offered (**Roll Off Factor** or **BxT**) depends on the currently selected filter type. This parameter is always set to the default for each of the predefined filters.

	Remote-control commands:
	`SOUR:BB:DAB:FILT:PAR:APCO25 0.2`
	`SOUR:BB:DAB:FILT:PAR:COS 0.10`
	`SOUR:BB:DAB:FILT:PAR:GAUS 0.5`
	`SOUR:BB:DAB:FILT:PAR:PGA 0.5`
	`SOUR:BB:DAB:FILT:PAR:RCOS 0.35`
	`SOUR:BB:DAB:FILT:PAR:SPH 2`

Cut Off Frequency Shift - DAB	**(This feature is available for filter parameter Cosine only)**
	Sets the value for the cut off frequency shift. The cut off frequency of the cosine filter can be adjusted to reach spectrum mask requirements.
	Remote-control command: `SOUR:BB:DAB:FILT:PAR:COS:COFS 0.35`
Cut Off Frequency Factor - DAB	**(This feature is available for filter parameter Lowpass only.)**
	Sets the value for the cut off frequency factor. The cut off frequency of the lowpass filter can be adjusted to reach spectrum mask requirements.
	Remote-control command: `SOUR:BB:DAB:FILT:PAR:LPAS 0.5`

Sample Rate Variation - DAB

Sets the sample rate variation.

A variation of this parameter only affects the ARB clock rate, all other signal parameters remain unchanged. If the sampling rate in the frame configuration menu is changed, this parameter is reset to the chosen sampling rate.

Remote-control command:
`SOUR:BB:DAB:SRAT:VAR 250000`

Trigger-Marker-Clock - DAB

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 can be reached via the **DAB** main menu.

The **Trigger In** section is where the trigger for the DAB signal is set. Various parameters are 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 the marker signal delay is 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** button leads to a submenu for mapping configuration.
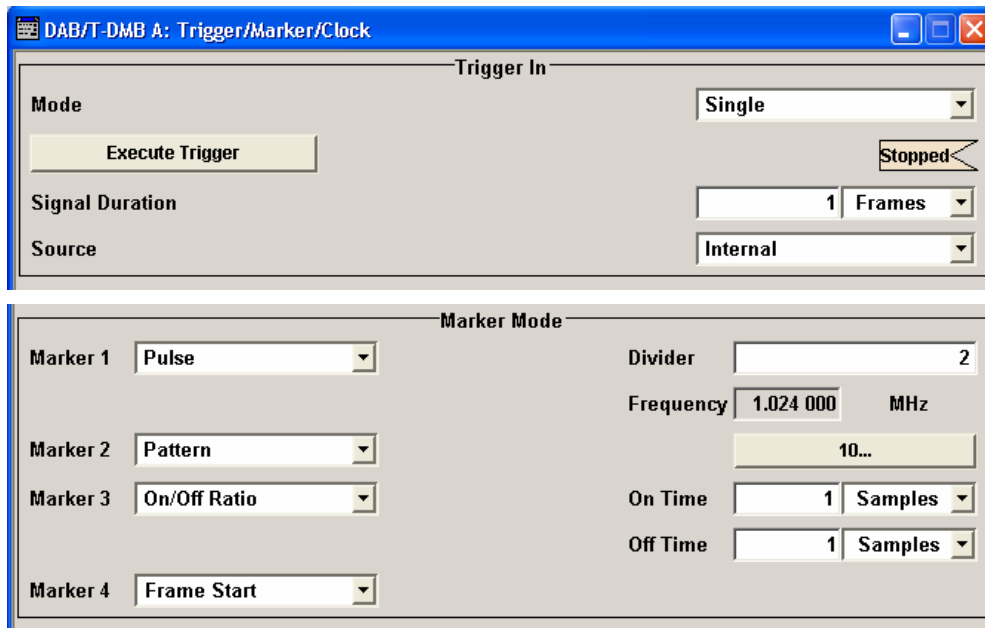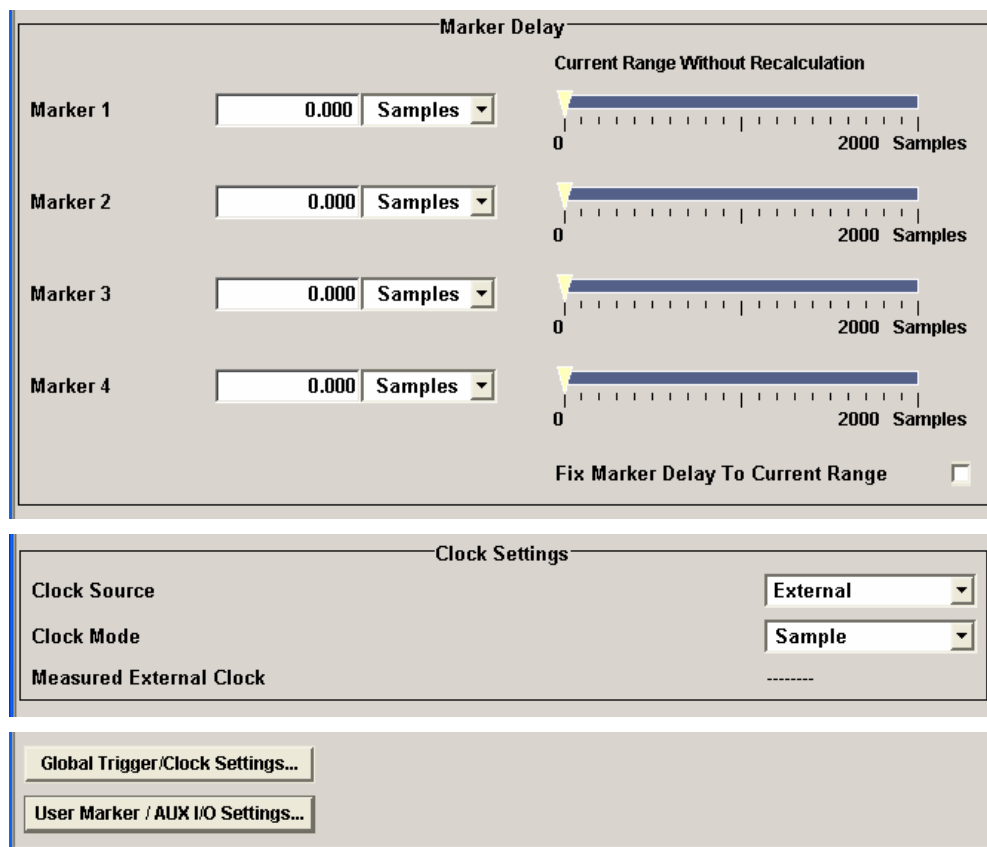
The **Trigger In** section is where the trigger for the DAB signal is set. The current status of the signal generation is displayed for all trigger modes.

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

Selects the trigger mode.

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

Auto   The DAB signal is generated continuously.

Remote-control command:
SOUR:BB:DAB:SEQ AUTO

Retrigger   The DAB signal is generated continuously. A trigger event (internal or external) causes a restart.

Remote-control command:
SOUR:BB:DAB:SEQ RETR

Armed Auto   The DAB signal is generated only when a trigger event occurs. Then the signal is generated continuously.

Clicking the button **Arm** stops signal generation. A subsequent trigger event (internal with **Execute Trigger** or external) causes a restart.

Remote-control command:
SOUR:BB:DAB:SEQ AAUT

	Armed Retrigger	The DAB signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes a restart.
		Clicking the button **Arm** stops signal generation. A subsequent trigger event (internal with **Execute Trigger** or external) causes a restart.
		Remote-control command: `SOUR:BB:DAB:SEQ ARET`
	Single	The DAB signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified at **Signal Duration**. Every subsequent trigger event (internal with **Execute Trigger** or external) causes a restart.
		Remote-control command: `SOUR:BB:DAB:SEQ SING`

Signal Duration - DAB   **(R&S SMx and R&S AMU instruments only)**

Enters the length of the signal sequence to be output in the **Single** trigger mode.Selection is enabled only in **Single** trigger mode.

Remote-control command:
`SOUR:BB:DAB:TRIG:SLEN 2000`

Running - Stopped - DAB   **(R&S SMx and R&S AMU instruments only)**

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

Remote-control command:
`SOUR:BB:DAB:TRIG:RMOD?`
Response: RUN

	Running	The DAB modulation signal is generated; a trigger was (internally or externally) initiated in triggered mode.
		If **Armed Auto** or **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 - DAB   **(R&S SMx and R&S AMU instruments only)**

Stops 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:DAB:TRIG:ARM:EXEC`

Execute Trigger - DAB   **(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:DAB:TRIG:SOUR INT
SOUR:BB:DAB:SEQ RETR
SOUR:BB:DAB:TRIG:EXEC
```

Trigger Source - DAB   **(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:DAB:TRIG:SOUR 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:DAB:TRIG:SOUR OBAS
```

External (TRIGGER 1 / 2)   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:DAB:TRIG:SOUR EXT|BEXT
```

Trigger Delay - DAB   **(R&S SMx and R&S AMU instruments only)**

Sets the trigger signal delay in samples on external triggering (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:DAB:TRIG:EXT:DEL 3
SOUR:BB:DAB:TRIG:OBAS:DEL 3
```

Trigger Inhibit - DAB   **(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 samples.

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

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

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

Remote-control command:
```
SOUR:BB:DAB:TRIG:EXT1:INH 1000
SOUR:BB:DAB:TRIG:OBAS:INH 1000
```

The marker output signal for synchronizing external instruments is configured in the **Marker Settings** section **Marker Mode**.

Marker Mode - DAB   Selects a marker signal for the associated MARKER output.

Restart	A marker signal is generated at the start of every sequence length loop.This marker mode is enabled for ETI files only.

	Remote-control command:
	`SOUR:BB:DAB:DATA ETI`
	`SOUR:BB:DAB:DATA:DSEL 'test.eti'`
	`SOUR:BB:DAB:TRIG:OUTP1:MODE REST`

Frame Start	A marker signal is generated at the start of every DAB frame.
	Remote-control command: `SOUR:BB:DAB:TRIG:OUTP1:MODE FRAM`
Pulse	A marker pulse is generated continuously according to the frequency and frequency divider.
	Remote-control command: `SOUR:BB:DAB:TRIG:OUTP1:MODE PULS`
Pattern	A marker signal is generated due to a bit pattern given by the user. Each bit represents a sample and can be switched on or off.

	Remote-control command:
	`SOUR:BB:DAB:TRIG:OUTP1:MODE PATT`
	`SOUR:BB:DAB:TRIG:OUTP1:PATT`
	`#H39FE0000,32`

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
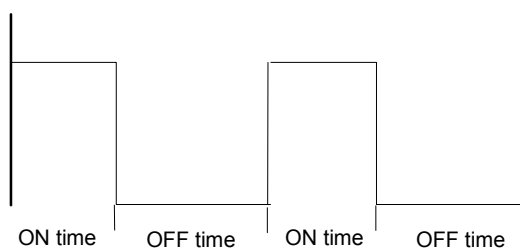
ON time   OFF time   ON time   OFF time

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

On Time	1	Samples ▼
Off Time	1	Samples ▼

Remote-control commands:
```
SOUR:BB:DAB:TRIG:OUTP1:MODE RAT
SOUR:BB:DAB:TRIG:OUTP1:OFFT 200
SOUR:BB:DAB:TRIG:OUTP1:ONT 200
```

Divider - DAB **(This field is available for marker mode Pulse only)**

Sets the divider for the pulsed marker signal in the setting pulse mode. The pulse frequency is derived by dividing the symbol rate by the divider.

Remote-control command:
```
SOUR:BB:DAB:TRIG:OUTP1:PULS:DIV 2
```

Frequency - DAB **(This field is available for marker mode Pulse only)**

Displays the pulse frequency of the pulsed marker signal. The pulse frequency is derived by dividing the symbol rate by the divider.

Remote-control command:
```
SOUR:BB:DAB:TRIG:OUTP1:PULS:FREQ?
```

Pattern - DAB **(This field is available for marker mode Pattern only)**

Sets the bit pattern used to generate the marker signal.

Remote-control command:
```
SOUR:BB:DAB:TRIG:OUTP1:PATT ##H39FE0000,32
```

The **Marker Delay** section can be used to set a delay for the markers.

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

Marker Delay - DAB	**(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 signal.

The input is expressed as a number of samples.

If the setting "**Fix Marker Delay to Current 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:DAB:TRIG:OUTP2:DEL 2`

Current Range without Recalculation- DAB	**(R&S SMx and R&S AMU instruments only)**

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

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

Fix Marker Delay To Current Range - DAB	**(R&S SMx and R&S AMU instruments only)**

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

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

The clock source is selected in the **Clock Settings** section.

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

Clock Source - DAB	**(R&S SMx and R&S AMU instruments only)**

Selects the clock source.

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

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

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

The sample rate must be correctly set to an accuracy of $\pm 2\,\%$ (see data sheet).

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

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

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

(This feature is available for the external clock source only)

Selects the type of externally supplied clock.

Sample	A sample clock is supplied via the CLOCK connector.
	Remote-control command: `SOUR:BB:DAB:CLOC:MODE SAMP`
Multiple Sample	A multiple of the sample clock is supplied via the CLOCK connector. The sample clock is derived internally from this. The value range is 1 to 64.
	The **Clock Multiplier** field provided allows the multiplication factor to be entered.
	Remote-control command: `SOUR:DAB:CLOC:MODE MSAM`

Clock Multiplier - DAB **(R&S SMx and R&S AMU instruments only)**

(This feature is available for the external clock source only)

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

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

Measured External Clock - DAB **(R&S SMx and R&S AMU instruments only)**

(This feature is available for the external clock source only)

Displays 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 - DAB **(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 trigger inputs TRIGGER 1/2.

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*".

Remote-control command: n.a.

User Marker/AUX I/O Settings – DAB

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

Calls the **User Marker/AUX I/O** menu. This menu is used for mapping configuration.

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

Remote-control command: n.a.

SOURce:BB:DAB-Subsystem- Remote-control commands

The commands in the SOURce:BB:DAB subsystem are described in two sections, separated into general remote commands and commands for system configuration.

SOURce:BB:DAB - General Remote-Control Commands

This subsystem contains commands for the primary and general settings of the DAB standard. These settings concern activation and deactivation of the standard, filter, clock, and trigger settings.

The commands for setting the system configuration and the TPS parameter bits are described in a separate section.

The numerical suffix at SOURce distinguishes between path A and path B for two-path instruments:

SOURce<1> = path A

SOURce<2> = path B

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

Command	Parameter	Default Unit	Comments
[SOURce<[1]	2>:]BB:DAB:CLOCk:MODE	SAMP	MSAMp		
[SOURce<[1]|2>:]BB:DAB:CLOCk:MULTiplier	1... 64		
[SOURce<[1]	2>:]BB:DAB:CLOCk:SOURce	EXTernal	INTernal		
[SOURce<[1]|2>:]BB:DAB:DATA	ALL0	ALL1	PN15	PN23	ETI		
[SOURce<[1]|2>:]BB:DAB:DATA:DSELection	<file_name>		
[SOURce<[1]|2>:]BB:DAB:DATA:EFRames	1..10000		
[SOURce<[1]|2>:]BB:DAB:ETI:CATalog			Query only
[SOURce<[1]|2>:]BB:DAB:FILTer:ILENgth	1...128		
[SOURce<[1]|2>:]BB:DAB:FILTer:OSAMpling	1...32		
[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:APCO25	0.05 ... 0.99		
[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:COSine	0.05 ... 0.99		
[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:COSine:COFS	0.05 ... 2.0		
[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:GAUSs	0.15 ... 2.50		
[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:LPASs	0.05 ... 2.0		
[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:PGAus	0.15 ... 2.5		
[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:RCOSine	0.05 ... 0.99		
[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:SPHase	0.15 ... 2.5		

Command	Parameter	Default Unit	Comments
[SOURce<[1]|2>:]BB:DAB:FILTer:TYPE	RCOSine | COSine | GAUSs | LGAuss | PGAuss | CONE | COF705 | COEQualizer | COFequalizer | C2K3x | APCO25 | SPHase | RECTangle | LPASs | DIRac | ENPShape | EWPShape		
[SOURce<[1]|2>:]BB:DAB:LDURation?			Query only
[SOURce<[1]|2>:]BB:DAB:PRESet			No query
[SOURce<[1]|2>:]BB:DAB:SEQuence	AUTO | RETRigger | AAUTo | ARETrigger | SINGle		
[SOURce<[1]|2>:]BB:DAB:SETTing:CATalog?			Query only
[SOURce<[1]|2>:]BB:DAB:SETTing:DELete	<file_name>		
[SOURce<[1]|2>:]BB:DAB:SETTing:LOAD	<file_name>		
[SOURce<[1]|2>:]BB:DAB:SETTing:STORe	<file_name>		
[SOURce<[1]|2>:]BB:DAB:SRATe:VARiation	400 Hz ... 40 MHz	Hz (c/s)	
[SOURce<[1]|2>:]BB:DAB:STATe	ON | OFF		
[SOURce<[1]|2>:]BB:DAB:TMODe	I | II | III | IV		
[SOURce<[1]|2>:]BB:DAB:TRIGger:ARM:EXECute			No query
[SOURce<[1]|2>:]BB:DAB:TRIGger:EXECute			No query
[SOURce<[1]|2>:]BB:DAB:TRIGger[:EXTernal<[1]|2>]:DELay	0 ...65 535 samples		
[SOURce<[1]|2>:]BB:DAB:TRIGger[:EXTernal<[1]|2>]:INHibit	0 ... (2^32 - 1) samples		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OBASeband:DELay	0 ...65 535 samples		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OBASeband:INHibit	0 ... (2^32 - 1) samples		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:DELay	0 ... (2^32 - 1) samples		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut:DELay:FIXed	ON | OFF		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:DELay:MAXimum?			Query only
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:DELay:MINimum?			Query only
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:MODE	REStart | FRAMe | PULSe | PATTern | RATio		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:OFFTime	0 ...(2^24 - 1) samples		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:ONTime	0 ...(2^24 - 1) samples		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:PATTern	#B0,1 ... #B111...1,32		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:PULSe:DIVider	2...1024		
[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:PULSe:FREQuency		Hz	Query only
[SOURce<[1]|2>:]BB:DAB:TRIGger:RMODe	RUN | STOP		Query only
[SOURce<[1]|2>:]BB:DAB:TRIGger:SLENgth	0 ... 10000	frames	
[SOURce<[1]|2>:]BB:DAB:TRIGger:SOURce	EXTernal | INTernal | BEXTernal | OBASeband		

[SOURce<[1]|2>:]BB:DAB:CLOCk:MODE   SAMP | MSAMp   E -

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

Enters the type of externally supplied clock (`BB:DAB:CLOCk:SOURce EXTernal`). When `MSAM` is used, a multiple of the sample clock is supplied via the CLOCK connector and the sample clock is derived internally from this. The multiplier is entered with the command `BB:DAB:CLOCk:MULTiplier`.

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:DAB:CLOC:MODE MSAM`
                      'sets the type of externally supplied clock.

*RST value	Resolution	SCPI
SAMP	-	Device-specific

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

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

Specifies the multiplier for clock type **Multiple Sample** (`BB:DAB:CLOCk:MODE MSAMp`) 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:DAB:CLOC:SOUR EXT`
                      'selects the external clock source. The clock is supplied via the CLOCK connector.

                      `BB:DAB:CLOC:MODE MSAM`
                      'selects clock type **Multiple Sample**, i.e. the supplied clock has a rate which is a multiple of the sample rate.

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

*RST value	Resolution	SCPI
4	1	Device-specific

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

Note:

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

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.

Parameters:	**INTernal**
	The internal clock reference is used.
	EXTernal
	The external clock reference is supplied to the CLOCK connector. Commands :BB:DAB:CLOCk:MODE and :MULTiplier are used to enter the type of the external clock.
Example:	BB:DAB:CLOC:SOUR EXT
	'selects the external clock source. The clock is supplied via the CLOCK connector.
	BB:DAB:CLOC:MODE MSAM
	'selects clock type **Multiple Sample**, i.e. the supplied clock has a rate which is a multiple of the sample rate.
	BB:DAB:CLOC:MULT 12
	'the multiplier for the external clock rate is 12.

*RST value	Resolution	SCPI
INTernal	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:DATA ALL0 | ALL1 | PN15 | PN23 | ETI

Sets the data source. To set the data source to ETI file, the existing of *.eti file is required, otherwise an error is returned. An ETI File is select using the command BB:DATA:DSELection.

Parameters:	**ALL0, ALL1**
	0 or 1 data is generated internally.
	PN15, PN23
	PRBS data in accordance with the IUT-T with period lengths between 29-1 and 223-1 are internally generated.
	ETI File
	Uses data from an ETI file. The ETI file can be selected via the Select ETI File button.
Example:	BB:DAB:DATA PN15
	'selects PN15 as data source.
	BB:DAB:DATA:DSELection 'test.eti'
	'selects the file 'test.eti' as data source.
	BB:DAB:DATA ETI
	'sets the data source to ETI file.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:DATA:DSELection <file name>

Selects the ETI file for the data source selection.

The ETI files are stored as files with the fixed file extensions ***.eti** in a directory of the user's choice. The directory applicable to the following commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Note:
  The ETI File must fulfill the following prerequisites:
  - ETI file compliant with ETI (NI, G.703)
  - Frame duration 24 ms (48 KHz sampling rate)
  - Constant multiplex cofiguration
  - Same stream configuration of all the frames
  - 15 streams maximum.

Example: `MMEM:CDIR 'D:\DAB'`
             'selects the directory for the ETI files.

             `BB:DAB:DATA:DSEL 'test.eti'`
             'selects the file '`test.eti`' as the data source. This file must be in the directory `D:DAB` and have the file extension *.eti.

             `BB:DAB:DATA ETI`
             'selects the ETI files as the data source.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:EFRames 1 ... 10000

Sets the desired sequence lenght in form of ETI frames. This command is enabled only if the data source is set to ETI File.
The allowed minimum value of this parameter deppends on the transport mode of the ETI file. For istanse, for transport mode I with 96 ms transmission frame duration, minimum 4 frames must be selected.

Example: `BB:DAB:DATA:DSEL 'test.eti'`
             'selects the file '`test.eti`' as the data source. This file must be in the directory `D:DAB` and have the file extension *.eti.

             `BB:DAB:DATA ETI`
             'selects the ETI files as the data source.
             `BB:DAB:EFR 50`
             'sets the number of the transmitted ETI-frames to 50.

*RST value	Resolution	SCPI
1		Device-specific

[SOURce<[1]|2>:]BB:DAB:ETI:CATalog?

Reads out the files with ETI File 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 ***.eti** will be listed.

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

Example: `MMEM:CDIR 'D:\DAB'`
         'sets the default directory to `D:\DAB`.

                      `BB:DAB:ETI:CAT?`
         'reads out all the files with ETI file settings in the default directory.

                      Response: `"'test.eti','dab.eti'"`
         'the files `'test.eti'` and `'dab.eti'` are available.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:FILTer:ILENgth 1...128

Note:
    This command is available for WinIQSIM2 only.

Sets the impulse length (number of filter tabs).

Example: `BB:DAB:FILT:ILEN 10`
         'sets the number of filter tabs to 10.

*RST value	Resolution	SCPI
10	1	Device-specific

[SOURce<[1]|2>:]BB:DAB:FILTer:OSAMpling 1...32

Note:
    This command is available for WinIQSIM2 only.

Sets the upsampling factor.

Example: `BB:DAB:FILT:OSAM 32`
         'sets the upsampling factor to 32.

*RST value	Resolution	SCPI
32	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:APCO25 0.05 ... 0.99

Sets the roll-off factor for filter type APCO25.

Example: `BB:DAB:FILT:PAR:APCO25 0.2`
         'sets the roll-off factor to 0.2 for filter type APCO25.

*RST value	Resolution	SCPI
0.20	0.01	Device-specific

[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:COSine 0.05 ... 0.99

Sets the roll-off factor for the Cosine filter type.

Example: BB:DAB:FILT:PAR:COS 0.35
                'sets the roll-off factor to 0.35 for filter type Cosine.

*RST value	Resolution	SCPI
0.35	0.01	Device-specific

[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:COSine:COFS 0.05 ... 2.0

Sets the "cut off frequency shift" value for the Cosine filter type.

Example: BB:DAB:FILT:PAR:COS:COFS 0.35
                'sets the "cut of frequency shift' value to 0.35.

*RST value	Resolution	SCPI
0.5		Device-specific

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

Sets the BxT for the Gauss filter type.

Example: BB:DAB:FILT:PAR:GAUS 0.5
                'sets BxT to 0.5 for the Gauss filter type.

*RST value	Resolution	SCPI
0.5	0.01	Device-specific

[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:LPASs 0.05 ... 2.0

Sets the cut off frequency factor for the Lowpass filter type.

Example: BB:DAB:FILT:PAR:LPAS 0.5
                'the cut of frequency factor is set to 0.5.

*RST value	Resolution	SCPI
0.5	0.01	Device-specific

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

Sets the BxT for the Pure Gauss filter type.

Example: BB:DAB:FILT:PAR:GAUS 0.5
                'sets BxT to 0.5 for the Pure Gauss filter type.

*RST value	Resolution	SCPI
0.5	0.01	Device-specific

[SOURce<[1]|2>:]BB:DAB:FILTer:PARameter:RCOSine 0.05 ... 0.99

Sets the roll-off factor for the Root Cosine filter type.

Example: BB:DAB:FILT:PAR:RCOS 0.22
                    'sets the roll-off factor to 0. 22 for filter type Root Cosine.

*RST value	Resolution	SCPI
0.22	0.01	Device-specific

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

Sets the BxT for the Split Phase filter type.

Example: BB:DAB:FILT:PAR:SPH 0.5
                    'sets BxT to 0.5 for the Split Phase filter type.

*RST value	Resolution	SCPI
2.00	0.01	Device-specific

[SOURce<[1]|2>:]BB:DAB:FILTer:TYPE RCOSine | COSine | GAUSs | LGAuss | PGAuss | CONE | COF705 | COEQualizier | COFequilizer | C2K3| APCO25 | SPHase | RECTangle | LPASs | DIRac | ENPShape | EWPShape

Selects the filter type. The filter types are described in Chapter 4, Section "*Baseband Filter - Custom Digital Mod*"..

The *RST value depends on the currently selected physical layer mode. It is GAUSs if layer mode is OFDM and COSine for layer mode CCK or PBCC.

Example: BB:DAB:FILT:TYPE RCOS
                    'sets the filter type RCOSine.

*RST value	Resolution	SCPI
GAUS/ COSine	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:LDURation?

Queries the sequence length of ETI file (loop duration).

The command is a query command and therefore does not have an *RST value.

Example: BB:DAB:LDUR?
                    'queries the loop duration.

*RST value	Resolution	SCPI
-		Device-specific

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

Produces a standardized default for the DAB standard. The settings correspond to the *RST values specified for the commands.

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

Example: BB:DAB:PRES
                      'resets all the DAB settings to default values.

*RST value	Resolution	Dependencies	SCPI
-	-	All DAB settings are preset. An overview is provided by Table in section "General Settings for DAB Signals".	Device-specific

[SOURce<[1]|2>:]BB:DAB:TMODe I | II | III | IV

Selects the transport mode.. Depending on the transport mode selected, signal with different sequence length will be generated.

Transport mode selection is not enabled for ETI data source files; transport mode is a read only field for these files. The transport mode is read from the ETI file.

Parameters: **I**
                         transport mode I, i.e. sequence length 96 ms.

                         II
                         transport mode II, i.e. sequence length 24 ms.

                         III
                         transport mode III, i.e. sequence length 24 ms.

                         IV
                         transport mode IV, i.e. sequence length 48 ms.

Example: BB:DAB:DATA PN15
                      'selects PN15 as data source.

                      BB:DAB:TMOD II
                      'sets the transport mode to Tx Mode II, i.e. sequence length 24ms.

*RST value	Resolution	SCPI
I	-	Device-specific

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

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

Selects the trigger mode.

Parameters: **AUTO**
       The modulation signal is generated continuously.

      RETRigger
       The modulation signal is generated continuously. A trigger event (internal or external) causes a restart.

      AAUTo
       The modulation signal is generated only when a trigger event occurs. After the trigger event the signal is generated continuously, signal generation is stopped with command SOUR:BB:DAB:TRIG:ARM:EXEC and started again when a trigger event occurs.

      ARETrigger
       The modulation signal is 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:DAB:TRIG:ARM:EXEC and started again when a trigger event occurs.

      SINGle
       The modulation 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:DAB:TRIG:SLEN). Every subsequent trigger event causes a restart.

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

*RST value	Resolution	SCPI
AUTO	-	Device-specific

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

Reads out the files with DAB 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 ***.DAB** will be listed.

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

Example: MMEM:CDIR 'D:\DAB'
      'sets the default directory to D:\DAB.

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

      Response: "'DAB_1','DAB_2'"
      'the files 'DAB_1' and 'DAB_2' are available.

*RST value	Resolution	SCPI
-	-	Device-specific

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

This command deletes the selected file with DAB 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 ***.DAB** will be deleted.

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

Example: `BB:DAB:SETT:DEL 'D:\DAB'"`
                  'deletes the specified file with DAB settings.

*RST value	Resolution	SCPI
-	-	Device-specific

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

This command loads the selected file with DAB 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 ***.DAB** will be loaded.

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

Example: `BB:DAB:SETT:LOAD 'DAB_1'`
                  'loads file 'DAB_1'.

*RST value	Resolution	SCPI
-	-	Device-specific

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

This command stores the current DAB 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. DAB settings are stored as files with the specific file extensions ***.DAB**.

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

Example: `BB:DAB:SETT:STOR 'test.DAB'`
                  'stores the current DAB settings into file '`test`'.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:SRATe:VARiation   400 Hz ... 40 MHz

Enters the output sample rate.

A variation of this parameter only affects the ARB clock rate, all other signal parameters remain unchanged. If the sampling rate in the frame configuration menu is changed, this parameter is reset to the chosen sampling rate.

Example: `BB:DAB:SRAT:VAR 40 MHz`
                  'sets the output sample rate to 40 MHz.

*RST value	Resolution	SCPI
2.048 MHz	0.001 Hz	Device-specific

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

Activates modulation in accordance with the DAB standard. Activating this standard deactivates all the other digital standards and digital modulation modes (in case of two-path instruments, this affects the same path).

Example: BB:DAB:STAT ON
                    'activates modulation in accordance with the DAB standard.

*RST value	Resolution	Dependencies	SCPI
OFF	-	BB:DAB:STAT ON deactivates the other standards and digital modulation.	Device-specific

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

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

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:DAB:TRIG:ARM:EXEC
                    'stops signal generation for trigger modes **Armed Auto** and **Armed Retrigger**.

*RST value	Resolution	SCPI
-	-	Device-specific

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

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

Executes a trigger. The internal trigger source must be selected using the command SOUR:BB:DAB:TRIG:SOUR INT and a trigger mode other than **AUTO** must be selected using the command SOUR:BB:DAB:TRIG:SEQ.

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

Example: BB:DAB:TRIG:SOUR INT
                    'sets internal triggering.

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

                    BB:DAB:TRIG:EXEC
                    'executes a trigger.

*RST value	Resolution	SCPI
-		Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger[:EXTernal<[1]|2>]:DELay 0 ... 65 535 samples

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

Specifies the trigger delay (expressed as a number of samples) 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:DAB:TRIG:SOUR EXT`
　　　　　　　　　　'sets an external trigger via the TRIGGER 1 connector.

　　　　　　　　　　`BB:DAB:TRIG:DEL 50`
　　　　　　　　　　'sets a delay of 50 symbols for the trigger.

*RST value	Resolution	SCPI
0 samples	1 sample	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger[:EXTernal<[1]|2>]:INHibit 0 ...(2^32-1) samples

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

Specifies the number of samples 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:DAB:TRIG:SOUR EXT1`
　　　　　　　　　　'selects an external trigger via the TRIGGER 1 connector.

　　　　　　　　　　`BB:DAB:TRIG:INH 200`
　　　　　　　　　　'sets a restart inhibit for 200 samples following a trigger event.

*RST value	Resolution	SCPI
0 samples	1 sample	Device-specific

SOURce<[1]|2>:]BB:DAB:TRIGger:OBASeband:DELay 0 ... 65 535 samples

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

Specifies the trigger delay (expressed as a number of samples) for triggering by the trigger signal from the second path.

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

　　　　　　　　　　`BB:DAB:TRIG:OBAS:DEL 50`
　　　　　　　　　　'sets a delay of 50 symbols for the trigger.

*RST value	Resolution	SCPI
0 samples	1 sample	Device-specific

SOURce<[1]|2>:]BB:DAB:TRIGger:OBASband:INHibit 0 ...(2^32-1) samples

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

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

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

   `BB:DAB:TRIG:INH 200`
   'sets a restart inhibit for 200 samples following a trigger event.

*RST value	Resolution	SCPI
0 samples	1 sample	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:DELay 0 .. (2^32 - 1) samples

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

Defines the delay between the signal on the marker outputs and the start of the signal, expressed in terms of samples. Command `BB:DAB: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:DAB:TRIG:OUTP2:DEL 16000`
   'sets a delay of 16000 samples for the signal on connector MARKER 2.

*RST value	Resolution	SCPI
0		Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut:DELay:FIXed ON | OFF

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

Restricts the marker delay setting range to the current range. In this range the delay can be set without restarting the marker and signal. If a delay is entered in setting ON but is outside this range, the maximum possible delay is set and an error message is generated.

The numeric suffix in `OUTPut` has no significance for this command, since the setting always affects every marker.

Example: `BB:DAB:TRIG:OUTP:DEL:FIX ON`
   'restricts the marker signal delay setting range to the current range.

*RST value	Resolution	SCPI
OFF	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:DELay:MAXimum?

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

Queries the maximum marker delay for setting `:BB:DAB:TRIG:OUTP:DEL:FIX ON`.

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

Example: `BB:DAB:TRIG:OUTP:DEL:FIX ON`
'restricts the marker signal delay setting range to the dynamic range.

`BB:DAB:TRIG:OUTP:DEL:MAX?`
'queries the maximum of the dynamic range.

Response: `"20000"`
'the maximum for the marker delay setting is 20000 samples.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:DELay:MINimum?

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

Queries the minimum marker delay for setting `:BB:DAB:TRIGger:OUTPut:DELay:FIXed ON`.

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

Example: `BB:DAB:TRIG:OUTP:DEL:FIX ON`
'restricts the marker signal delay setting range to the dynamic range.

`BB:DAB: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:DAB:TRIGger:OUTPut<[1]...4>:MODE   RESTart | SFRame | FRAME | PULSe | PATTern | RATio

Defines the signal for the selected marker output..

Parameters: **RESTart**
A marker signal is generated at the start of every sequence length loop.
Restart mode is available only for ETI data source.

FRAMe
A marker signal is generated at the start of every frame.

PULSe
A marker pulse is generated continuously according to the frequency and frequency divider.

PATTern
A marker signal is generated due to a bit pattern given by the user. Each bit represents a sample and can be switched on or off.

RATio

A regular marker signal that is defined by an ON/OFF ratio is generated. A period lasts one ON and OFF cycle.
The ON time and OFF time are each expressed as a number of samples and are set in an input field which opens when On/Off Ratio is selected.

Example: BB:DAB:TRIG:OUTP2:MODE FRAME
                        'selects the frame marker signal on output MARKER 2.

*RST value	Resolution	SCPI
FRAMe	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:OFFTime   1 ... 2^24 - 1 (16 777 215) samples

Sets the number of samples in a period (ON time + OFF time) during which the marker signal in setting SOURce:BB:DAB:TRIGger:OUTPut:MODE RATio on the marker outputs is OFF.

Example: BB:DAB:TRIG:OUTP2:OFFT 2000
                        'sets an OFF time of 2000 samples for marker signal 2.

*RST value	Resolution	SCPI
1 sample	1	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:ONTime   1 ... 2^24 - 1 (16 777 215) samples

Sets the number of samples in a period (ON time + OFF time) during which the marker signal in setting SOURce:BB:DAB:TRIGger:OUTPut:MODE RATio on the marker outputs is ON.

Example: BB:DAB:TRIG:OUTP2:ONT 2000
                        'sets an ON time of 2000 samples for marker 2.

*RST value	Resolution	SCPI
1 sample	1	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:OUTPut<[1]...4>:PATTern   #B0,1...B111...1.32

Defines the bit pattern used to generate the marker signal.

Example: BB:DAB:TRIG:OUTP2:PATT #H39FE0000,32
                        'sets the bit pattern.

                        BB:DAB: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:DAB:TRIGger:OUTPut<[1]...4>:PULSe:DIVider   -2...1024

Sets the divider for the pulsed marker signal in the setting
SOURce:BB:DAB:TRIGger:OUTPut:MODE PULSe. The pulse frequency is derived by dividing the symbol rate by the divider.

Example: BB:DAB:TRIG:OUTP2:PULS:DIV 2
                    'sets the divider for the marker signal on output MARKER 2 to the value 2.

                    BB:DAB: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:DAB:TRIGger:OUTPut<[1]...4>:PULSe:FREQuency?

Queries the pulse frequency of the pulsed marker signal in the setting
:BB:DAB:TRIGger:OUTPut:MODE PULSe. The pulse frequency is derived by dividing the symbol rate by the divider. The divider is defined with command :BB:DAB:TRIG:OUTP:PULS:DIV.

Example: BB:DAB:TRIG:OUTP2:PULS:DIV 2
                    'sets the divider for the marker signal on output MARKER 2 to the value 2.

                    BB:DAB:TRIG:OUTP2:MODE PULS
                    'enables the pulsed marker signal.

                    BB:DAB: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
-	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:RMODe

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

Queries the current status of signal generation for all trigger modes with DAB modulation on.

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

Parameter: **RUN**
                    the signal is generated. A trigger event occurred in the triggered mode.

                    STOP
                    the signal is not generated. A trigger event did not occur in the triggered modes, or signal generation was stopped by the command
                    BB:DAB:TRIG:ARM:EXECute (armed trigger modes only).

Example: `BB:DAB:TRIG:SOUR EXT`
                'sets external triggering via the TRIGGER 1 connector.

                `BB:DAB:TRIG:MODE ARET`
                'selects the Armed_Retrigger mode

                `BB:DAB:TRIG:RMOD?`
                'queries the current status of signal generation.

                Response: `"RUN"`
                'the signal is generated, an external trigger was executed.

*RST value	Resolution	SCPI
-	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:SLENgth   1 … 10000 frames

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

Defines the length of the signal sequence in frames to be output in the **Single** trigger mode
(`SOUR:BB:DAB:SEQ SING`).

Example: `BB:DAB:SEQ SING`
                'sets trigger mode Single.
                `BB:DAB:TRIG:SLEN 200`
                'sets a sequence length of 200 frames. The current frame will be output 200 times after the next trigger event.

*RST value	Resolution	SCPI
1 sequence length	-	Device-specific

[SOURce<[1]|2>:]BB:DAB:TRIGger:SOURce   INTernal | EXTernal | BEXTernal | OBASeband

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

Selects the trigger source.

Parameter: **INTernal**
                Triggering is executed by means of the Trigger command
                `BB:DAB:TRIGger:EXECute` or *TRG 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 trigger signal from the second path (two-path instruments only).

Example: `BB:DAB:TRIG:SOUR EXT`
                'executes triggering by means of the signal on the TRIGGER 1 connector.

*RST value	Resolution	SCPI
INTernal	-	Device-specific

SOURce:BB:DAB – System Configuration

This subsystem contains commands regarding the system configuration of the DAB standard.

Command	Parameter	Default Unit	Comments
[SOURce<[1]|2>:]BB:DAB:PNSCrambler[:STATe]	ON | OFF		
[SOURce<[1]|2>:]BB:DAB:CODer[:STATe]	ON | OFF		
[SOURce<[1]|2>:]BB:DAB:ILEaver[:STATe]	ON | OFF		

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

Activates/deactivates the PN scrambler.
This feature is enabled for ETI data source files only.

Example: BB:DAB:PNSC:STAT ON
                             'activates the PN scrambling, that is, transforming the data packets of the incoming transport stream to a Pseudo Random Binary Sequence (PRBS).

*RST value	Resolution	SCPI
ON	-	Device-specific

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

Activates/deactivates the coder..
This feature is enabled for ETI data source files only.

Example: BB:DAB:CODer:STATe OFF
                             'deactivates the coder. The number of bits is now fetched from the scrambler and therefore from data source. So please keep in mind that the data framing is not valid anymore.

*RST value	Resolution	SCPI
ON	-	Device-specific

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

Activates/deactivates the interleaver.
This feature is enabled for ETI data source files only.

Example: BB:DAB:ILE:STAT ON
                             'activates the outer interleaver. After turning on the standard, the MSC values are not valid during the first 16 CIFs, because of the time interleaver's depth.

*RST value	Resolution	SCPI
ON	-	Device-specific

Alphabetical List of Commands

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