

DVB-H

Digital Standard for

R&S[®]Signal Generators

Operating Manual



1008.0970.12 – 11

This document describes the following software options:

- R&S®AFQ-K52
1401.5858.02
- R&S®AMU-K52/-K252
1402.9557.02, 1402.9505.02
- R&S®SMATE-K52
1404.7800.02
- R&S®SMBV-K52/-K252
1415.8148.xx, 1415.8348.xx
- R&S®SMJ-K52/-K252
1404.2106.02, 1409.2406.02
- R&S®SMU-K52/-K252
1408.7010.02, 1408.7510.02
- R&S®SFU-K252
2115.2343.02

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The following abbreviations are used throughout this manual: R&S®AMU is abbreviated as R&S AMU, &S®AFQ is abbreviated as R&S AFQ, R&S®SMATE is abbreviated as R&S SMATE, R&S®SMBV is abbreviated as R&S SMBV, R&S®SMJ is abbreviated as R&S SMJ, R&S®SMU is abbreviated as R&S SMU, R&S®WinIQSIM2 is abbreviated as R&S WinIQSIM2

Basic Safety Instructions

Always read through and comply with the following safety instructions!

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

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or, if expressly permitted, also in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for any 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.

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

Symbols and safety labels

							
Notice, general danger location Observe product documentation	Caution when handling heavy equipment	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Be careful when handling electrostatic sensitive devices

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

Tags and their meaning

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



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



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



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



indicates the possibility of incorrect operation which can result in damage to the product.

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 in personal injury or material damage.

Operating states and operating positions

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

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

Electrical safety

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

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with an earthing contact and protective earth connection.
3. 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.
4. If the product does not have a power switch for disconnection from the AC supply network, the plug of the connecting cable is regarded as the disconnecting device. In such cases, always ensure 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 network. If products without power switches are integrated into racks or systems, a disconnecting device must be provided at the system level.
5. 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, you can ensure that the cable will not be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.
6. 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).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages $V_{\text{rms}} > 30 \text{ V}$, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the 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 licensed electrician.
13. 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 anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.

Basic Safety Instructions

14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1. Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.
2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.
2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

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

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

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.

2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal

1. If products or their components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
2. If handling the product releases hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

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. Nuestro sistema de garantía de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el certificado de conformidad adjunto de la UE y ha salido de nuestra planta en estado impecable según los estándares técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las indicaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

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

Informaciones elementales de seguridad

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

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

Símbolos y definiciones de seguridad

							
Aviso: punto de peligro general Observar la documentación del producto	Atención en el manejo de dispositivos de peso elevado	Peligro de choque eléctrico	Advertencia: superficie caliente	Conexión a conductor de protección	Conexión a tierra	Conexión a masa	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)

					
Tensión de alimentación de PUESTA EN MARCHA / PARADA	Indicación de estado de espera (Standby)	Corriente continua (DC)	Corriente alterna (AC)	Corriente continua / Corriente alterna (DC/AC)	El aparato está protegido en su totalidad por un aislamiento doble (reforzado)

Palabras de señal y su significado

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



PELIGRO identifica un peligro inminente con riesgo elevado que provocará muerte o lesiones graves si no se evita.



ADVERTENCIA identifica un posible peligro con riesgo medio de provocar muerte o lesiones (graves) si no se evita.



ATENCIÓN identifica un peligro con riesgo reducido de provocar lesiones leves o moderadas si no se evita.



AVISO indica la posibilidad de utilizar mal el producto y, como 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 del producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

Estados operativos y posiciones de funcionamiento

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

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

Seguridad eléctrica

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

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de conexión como interruptor. En estos casos se deberá asegurar que el enchufe siempre sea de fácil acceso (de acuerdo con la longitud del cable de conexión, 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 colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión $U_{\text{eff}} > 30 \text{ V}$ se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.

12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.
17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados, los llamados alérgenos (p. ej. el níquel). Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación", punto 1.

5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).

Reparación y mantenimiento

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

Baterías y acumuladores o celdas

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

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Mantener baterías y celdas fuera del alcance de los niños. En caso de ingestión de una celda o batería, avisar inmediatamente a un médico.
5. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.

Informaciones elementales de seguridad

6. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
7. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
8. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

Transporte

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

Eliminación

1. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
2. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

Qualitätszertifikat

Certificate of quality

Certificat de qualité

Certified Quality System
ISO 9001

Certified Environmental System
ISO 14001

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde&Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde&Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO9001 und ISO14001 zertifiziert.

Der Umwelt verpflichtet

- ▮ Energie-effiziente, RoHS-konforme Produkte
- ▮ Kontinuierliche Weiterentwicklung nachhaltiger Umweltkonzepte
- ▮ ISO 14001-zertifiziertes Umweltmanagementsystem

Dear Customer,

You have decided to buy a Rohde&Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards. The Rohde&Schwarz quality management system is certified according to standards such as ISO9001 and ISO14001.

Environmental commitment

- ▮ Energy-efficient products
- ▮ Continuous improvement in environmental sustainability
- ▮ ISO 14001-certified environmental management system

Cher client,

Vous avez choisi d'acheter un produit Rohde&Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde&Schwarz a été homologué, entre autres, conformément aux normes ISO9001 et ISO14001.

Engagement écologique

- ▮ Produits à efficience énergétique
- ▮ Amélioration continue de la durabilité environnementale
- ▮ Système de gestion de l'environnement certifié selon ISO 14001

Customer Support

Technical support – where and when you need it

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

Up-to-date information and upgrades

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

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1 Preface

1.1 Documentation Overview

The user documentation for the R&S Signal Generator consists of the following parts:

- Online Help system on the instrument,
- "Quick Start Guide" printed manual,
- Documentation CD-ROM with:
 - Online help system (*.chm) as a standalone help,
 - Operating Manuals for base unit and options,
 - Service Manual,
 - Data sheet and specifications,
 - Links to useful sites on the R&S internet.

Online Help

The Online Help is embedded in the instrument's firmware. It offers quick, context-sensitive access to the complete information needed for operation and programming. The online help contains help on operating the R&S Signal Generator and all available options.

Quick Start Guide

The Quick Start Guide is delivered with the instrument in printed form and in PDF format on the Documentation CD-ROM. It provides the information needed to set up and start working with the instrument. Basic operations and an example of setup are described. The manual includes also general information, e.g., Safety Instructions.

Operating Manuals

The Operating Manuals are a supplement to the Quick Start Guide. Operating Manuals are provided for the base unit and each additional (software) option.

These manuals are available in PDF format - in printable form - on the Documentation CD-ROM delivered with the instrument. In the Operating Manual for the base unit, all instrument functions are described in detail. Furthermore, it provides an introduction to remote control and a complete description of the remote control commands with programming examples. Information on maintenance, instrument interfaces and error messages is also given.

In the individual option manuals, the specific instrument functions of the option are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the R&S Signal Generator is not included in the option manuals.

These manuals can also be orderd in printed form (see ordering information in the data sheet).

Service Manual

The Service Manual is available in PDF format - in printable form - on the Documentation CD-ROM delivered with the instrument. It describes how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the instrument by the replacement of modules.

This manual can also be orderd in printed form (see ordering information in the data sheet).

Release Notes

The release notes describe new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.

1.2 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
File names, commands, program code	File names, commands, coding samples and screen output are distinguished by their font.
<i>Input</i>	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

2 Introduction

The R&S Signal Generator enables you to generate signals in accordance with the DVB-H (Digital Video Broadcasting - Transmission System for Handheld Terminals) standard.

2.1 Modulation System DVB-H

The following block diagram shows the components of the DVB-H transmission system.



In this release, only the high-priority input is available.

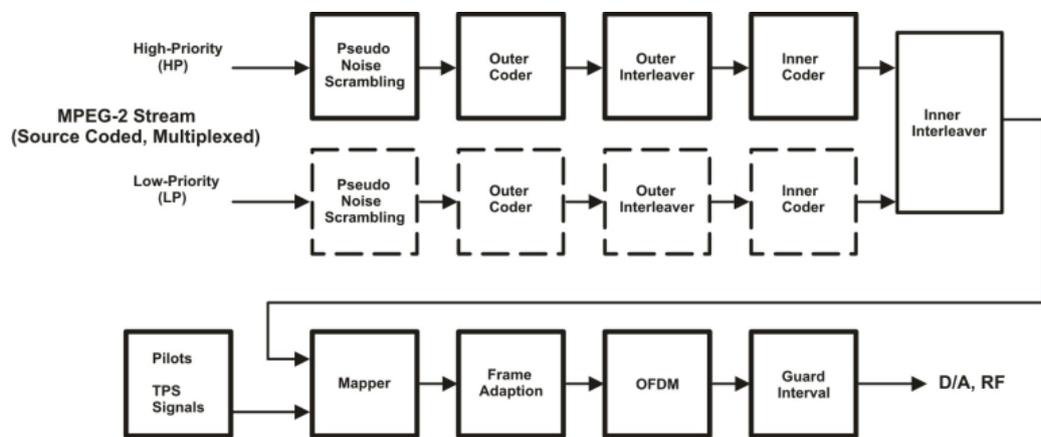
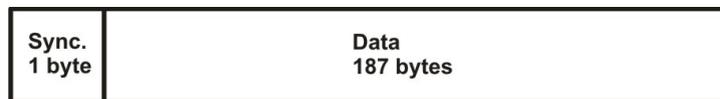


Fig. 2-1: Components of the Transmission System DVB-H

2.1.1 Pseudo Noise Scrambler

The MPEG-2 transport packet stream is organized in fixed packet length of 188 bytes. This includes 187 data bytes and one sync byte.

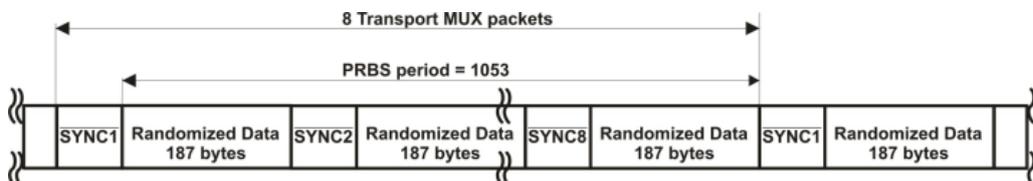


The data packets of the input stream are transformed to a Pseudo Random Binary Sequence (PRBS) in order to obtain a bit sequence that has a positive effect on the transmitted RF spectrum.

The PRBS polynomial is specified as: $1 + x^{14} + x^{15}$

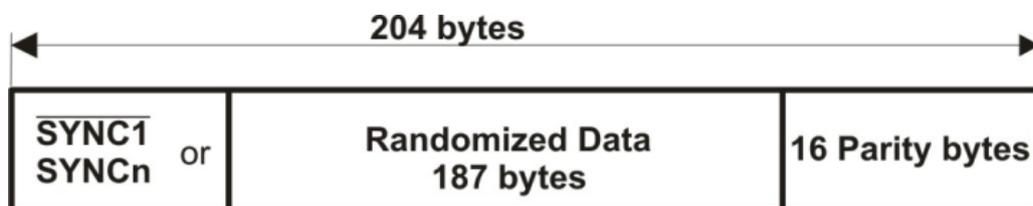
The PRBS generator is loaded with the sequence "100101010000000" at the start of every eight transport packet. To provide an initialization signal for the descrambler, the sync byte of the first transport packet in a group of eight packets is bit-wise inverted from 0x47 to 0xb8, whereas the sync bytes of the next seven packets remain 0x47. After that,

the PRBS generator runs continuously through the eight packets with a PRBS period of 1503 bytes (8 packets * 188 bytes - 1sync byte).



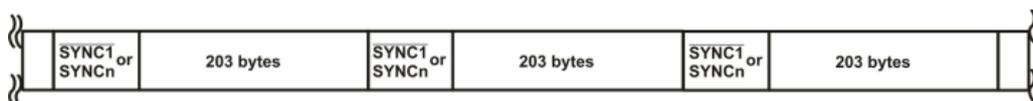
2.1.2 Outer Coder

The outer coder is a Reed-Solomon encoder RS (204,188, t = 8). The RS coding is applied to each randomized transport packet (188 byte) to generate an error protected packet with a length of 204 bytes (188 randomized transport packets + 16 parity bytes). With this RS code up to eight erroneous bytes can be detected in the transport stream packet and corrected.



2.1.3 Outer Interleaver

The outer interleaver is a convolutional interleaver with I = 12 branches. Each branch "j" is a FIFO shift register with depth j x 17 cells = 204 bytes.



2.1.4 Inner Coder

The inner coder is a punctured convolution code, based on a mother convolutional code of rate 1/2 with 64 states. The inner coder encodes the input data, punctures certain bits to obtain higher code rates, and serializes the I/Q symbols to be transmitted. The integrated puncturer removes bits from the redundant data stream. Puncturing slightly impairs the characteristics of the code. The code rates that can be set are 1/2, 2/3, 3/4, 5/6 and 7/8. The code rate can be selected according to the required transmission characteristics of the system.

Table 2-1: Puncturing pattern and transmitted sequence after conversion for the possible code rates

Code Rates r	Puncturing Pattern	Transmitted Sequence (after parallel-to-serial conversions)
1/2	X:1 Y:1	X_1Y_1
2/3	X:10 Y:11	$X_1Y_1Y_2$
3/4	X:101 Y:110	$X_1Y_1Y_2X_3$
5/6	X:10101 Y:11010	$X_1Y_1Y_2X_3Y_4X_5$
7/8	X:1000101 Y:1111010	$X_1Y_1Y_2Y_3Y_4X_5Y_6X_7$

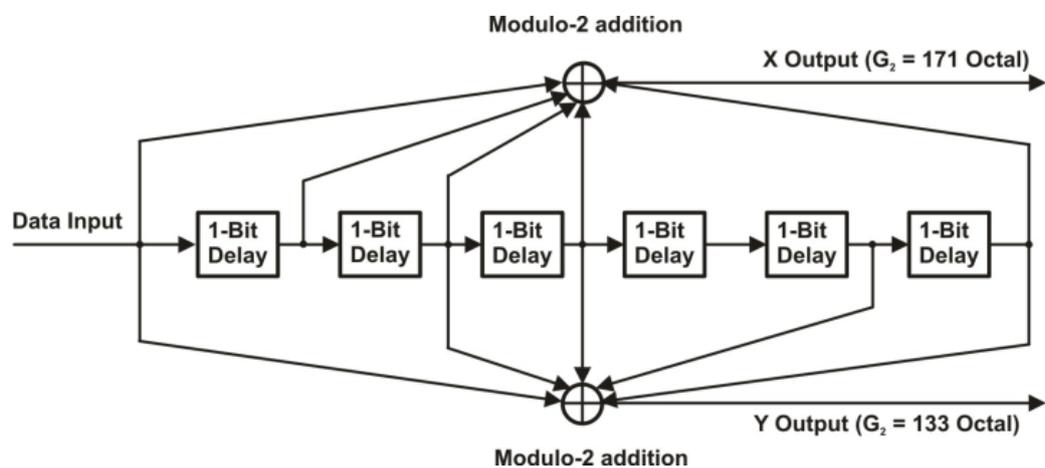


Fig. 2-2: Mother convolutional code rate of 1/2

2.1.5 Inner Interleaver

The inner interleaver consists of a bit-wise interleaving followed by symbol interleaving. Both interleaving processes are block based.

In non-hierarchical mode, the input bit stream for the bit-wise interleaving is multiplexed into v sub-streams depending on the modulation mode with v representing the number of bits/symbol:

Modulation Mode	Sub-Stream v
QPSK	2
16-QAM	4
64-QAM	6

In hierarchical mode, the high priority stream is demultiplexed into two sub-streams and the low priority stream is demultiplexed into v-2 sub-streams.

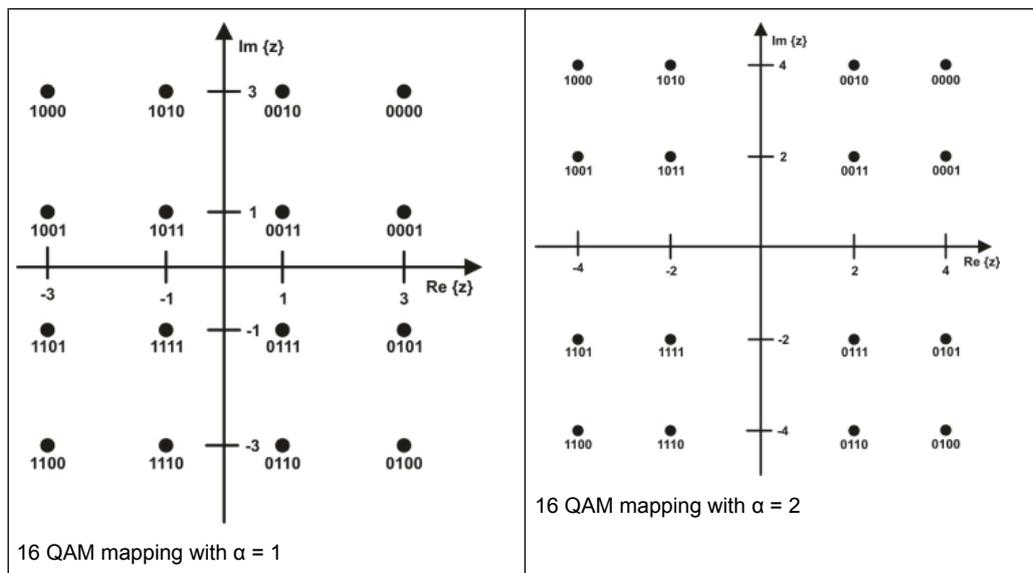
The outputs of the v bit interleavers are grouped to form the digital data symbols, such that each symbol of v bits will consist of exactly one bit from each of the v interleavers.

The purpose of the symbol interleaver is to map v bit words onto 1512 (2K mode), 3024 (4K mode), or 6048 (8K mode) active carriers per OFDM symbol. The symbol interleaver acts on blocks of 1512 (2K mode), 3024 (4K mode), or 6048 (8K mode) data symbols. Furthermore, for the interleaver is an in-depth mode available for 2K and 4K in which the interleaver always maps the v bit words onto 6048. This is described in detail in [chapter 2.2.1, "4K Mode and In-Depth Interleavers"](#), on page 12.

2.1.6 Mapper

All data carriers in one OFDM symbol are modulated using either QPSK, 16-QAM, or 64-QAM.

Additionally, for the hierarchical mode, non-uniform 16-QAM and non-uniform 64 QAM constellations are available with different values for parameter α . α is the minimum distance separating two constellation points carrying different HP-bit values divided by the minimum distance separating any two constellation points. For non-hierarchical transmission, the constellation is shaped as if α is 1.



2.1.7 Frame Adaption

The transmitted signal is organized in super-frames. Each super-frame consists of 4 frames.

Each frame contains scattered pilot cells, continual pilot carriers, and TPS carriers. The pilots can be used for frame synchronization, frequency synchronization, time synchronization, channel estimation, and transmission mode identification.

Each frame consists of 68 OFDM symbols. Each symbol consists of a guard interval and a useful part. The symbols in an OFDM frame are numbered from 0 to 67.

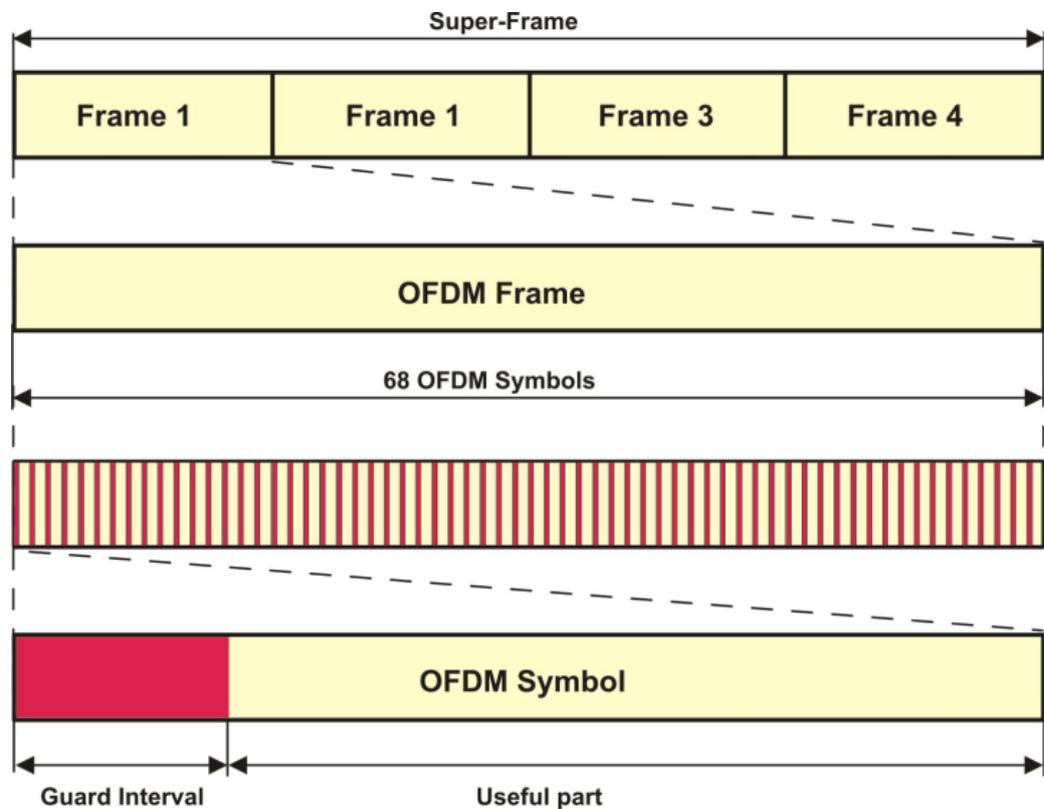


Fig. 2-3: OFDM frame structure

Each OFDM symbol is constituted by a set of carriers. The number of carriers depends on the OFDM mode:

OFDM Mode	No. of Carriers
2K	1705
4K	3409
8K	6817

2.1.8 Transport Parameter Signalling

The Transport Parameter Signalling (TPS) carriers are used to signalling parameters related to the transmission scheme. The TPS is transmitted parallel on 17 TPS carriers for the 2K mode, 34 carriers for the 4K mode, and 68 carriers for the 8K mode. Every TPS carrier in the same symbol conveys the same differentially encoded information bit.

The TPS parameter bits are described in "TPS Table" on page 26.

2.2 Extensions to DVB-T

The Digital Video Broadcasting - Handheld (DVB-H) standard is based on the earlier standard DVB-T, which is used for terrestrial digital broadcasting.

DVB-H provides features to meet the specific requirements for handheld, mobile terminals such as:

- power off some part of the reception chain to increase the battery duration
- ease access to the services when receivers switching to the next cell
- mitigate the effects of man-made noise and severe mobile multipath channels on the receiving capabilities
- offer sufficient flexibility and scalability to allow reception of services at various speeds
- offer the flexibility to be used in various transmission bands and channel bandwidths

The basic technical extensions that make it possible to receive digital video broadcasting services on handheld terminals are:

- 4K Mode and In-Depth Interleavers
- Time-Slicing
- Forward Error Correction for Multiprotocol Encapsulated Data (MPE-FEC)

2.2.1 4K Mode and In-Depth Interleavers

The additional 4K mode is a trade-off between transmission cell size and mobile reception capabilities to improve network planning flexibility. The 4K mode is suitable for single transmitter operation and for small and medium single frequency networks (SFN). It provides a Doppler tolerance allowing very high speed reception. The mobile reception is faster compared to the 8K mode and the cell size is bigger compared to the 2K mode.

The additional in-depth interleavers increase the flexibility of the interleaving for the 2K and 4K mode. The depth of the inner interleaver is enlarged to four consecutive OFDM symbols (2K) or to two consecutive OFDM symbols (4K).

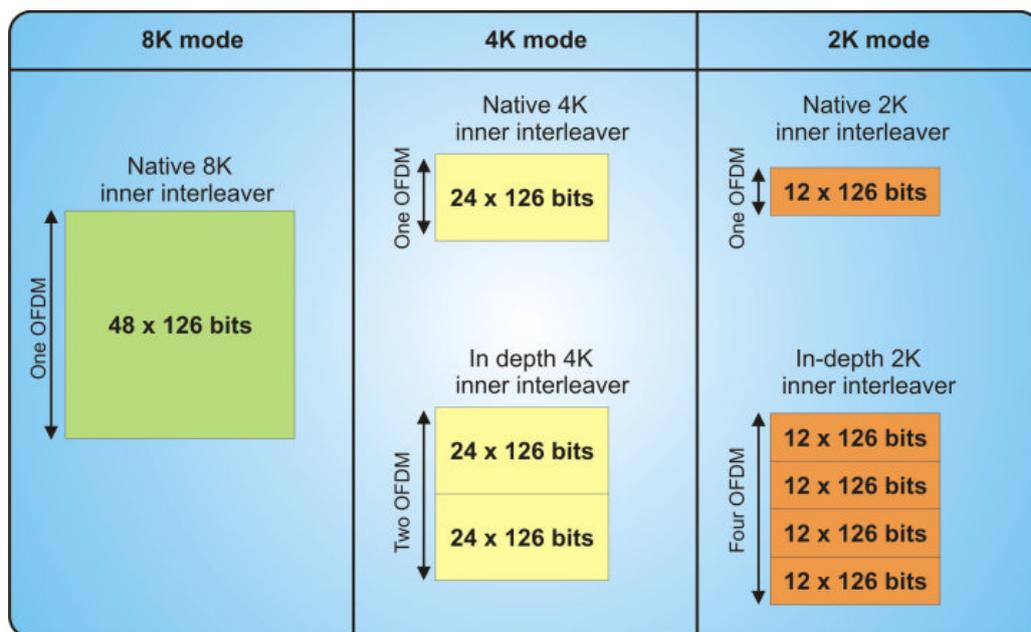


Fig. 2-4: In-Depth Interleaver for 2K and 4K Mode

2.2.2 Time-Slicing

The time-slicing module provided with DVB-H reduces the average power consumption of the receiving handheld terminals and enables smooth and seamless service handover.

IP datagramms are transmitted as data bursts in small time slots using a significantly higher instantaneous bit rate compared to traditional streaming bit rates. During the off times (between the bursts), the receiving handheld is inactive and therefore using less power.

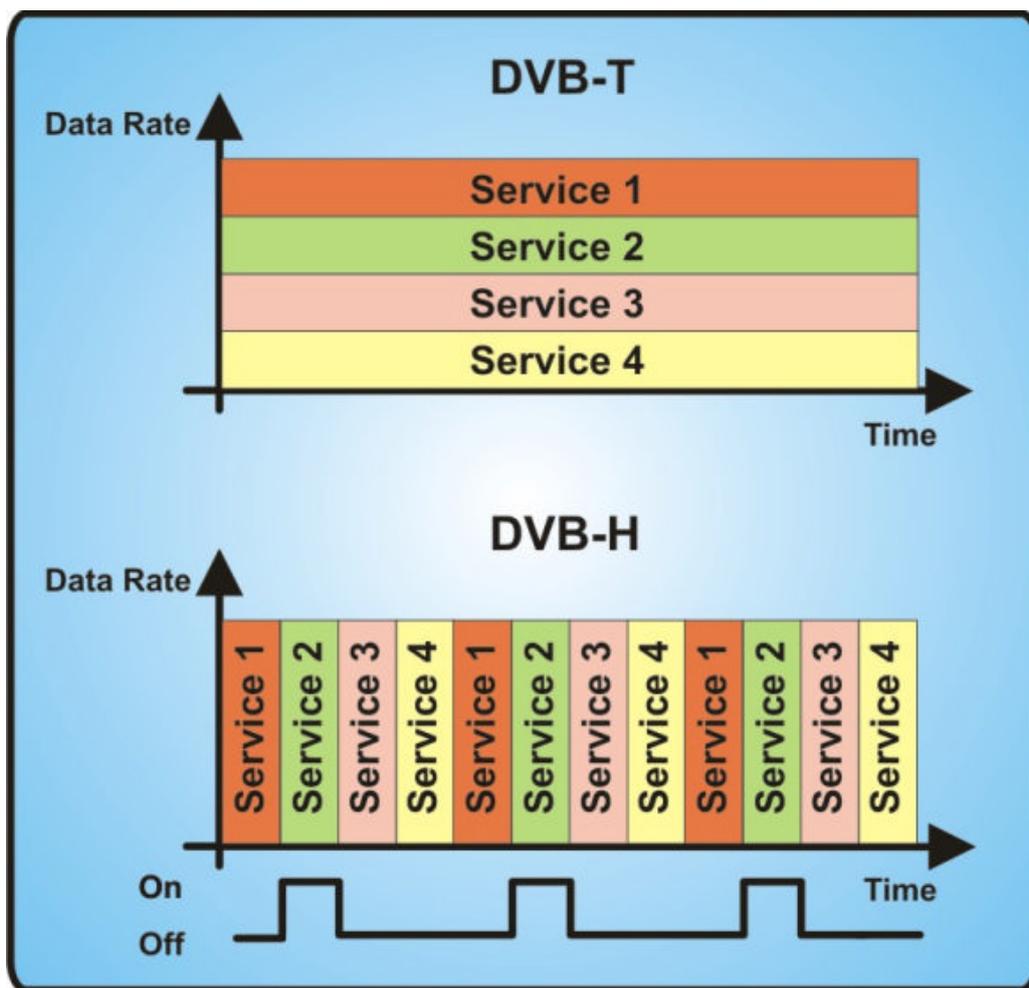


Fig. 2-5: DVB-H Time-Slicing

The point of time when the next burst is transmitted (Δt) is indicated within the burst currently being received.

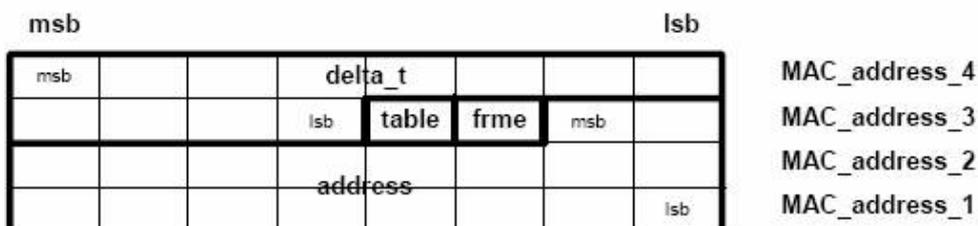


Fig. 2-6: Next Burst Indication

Time-slicing enables a handheld receiver to stay active only for a fraction of time, that is, when the burst is transmitted. Note that while the receiver is inactive between the bursts, the transmission stream is constantly on, that is, the transmission stream is never interrupted. Between the off times of a particular service, other services are transmitted in bursts in a sequence.

In addition, time-slicing allows to use the receiver to monitor neighbouring cells during the off times. Performing the cell switching during an off time enables a smooth and seamless service handover.



Time-slicing is mandatory for DVB-H.

2.2.3 Forward Error Correction for Multiprotocol Encapsulated Data (MPE-FEC)

The MPE-FEC module provided with DVB-H improves the carrier-to-noise (C/N) performance and the Doppler performance in mobile channels and improve the tolerance to impulse interference.

This is accomplished by adding an additional Reed-Solomon code (RS 255,191) in conjunction with a block interleaver. The MPE-FEC module provides a specific frame structure; the MPE-FEC frame. The MPE-FEC frame consists of an application data table (ADT) with 191 columns for the IP datagramms and an Reed-Solomon data table (RDT) with 61 columns for the Reed-Solomon parity information.

The IP datagramms are introduced vertically column-by-column. Empty cells and columns are padded with zeros. The RS code is coded line-by-line: For each row of 191 IP datagramm bytes the 64 parity bytes are calculated, using the RS code. This provides a virtual interleaving effect, because all RS data bytes are calculated from the IP datagramms.

After the coding is finished, the IP datagramms are encapsulated and transmitted in an MPE section and the parity information data of each column in the RDT table are transmitted in an MPE-FEC section.

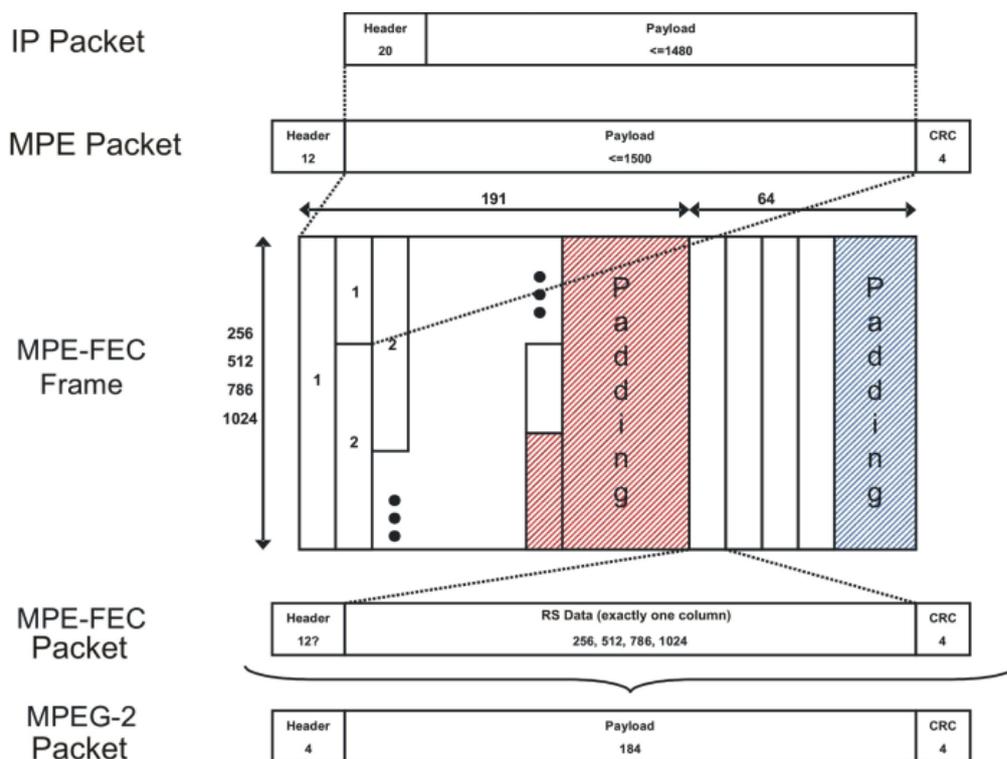


Fig. 2-7: MPE-FEC Packet/Frame Structure

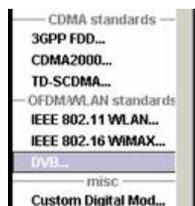
Transmitting the IP datagrams and parity information data in separate sections allows the receiver to choose whether to use the MPE-FEC feature or not. If the MPE-FEC decoder is not implemented or if the feature is not activated in the receiver, the transmitted MPE-FEC sections with the parity information data are ignored, that is, only the payload with the IP datagrams is taken under consideration.



MPE-FEC is optional for DVB-H.

3 DVB-H User Interface

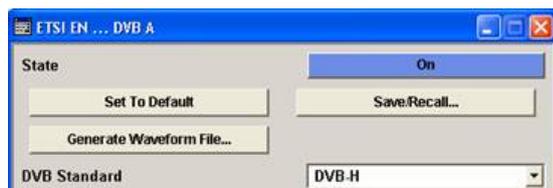
The menu for setting the DVB-H digital standard is either called from the baseband block or from the menu tree under "Baseband."



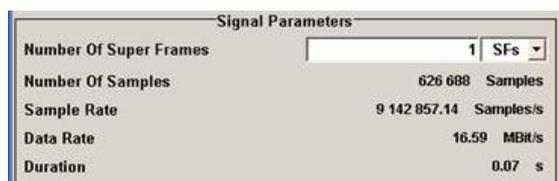
3.1 General Settings for DVB-H Signals

The menu is split into several sections for configuring the standard.

The upper menu section is where the DVB-H digital standard is selected, enabled, and reset, and where the generated waveform file can be selected.



In the "Signal Parameters" section, the number of super-frames can be selected and signal relevant parameters are displayed, if a signal is being generated.



The buttons in the lower menu section lead to submenus to configure the system and setting the filter, trigger, and clock parameters.



State

Activates or deactivates the DVB 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 DVB-H signal is generated according to the performed settings.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:STATe](#) on page 46

Set To Default

Calls the default settings.

Parameter	Value
State	Not affected by Set to default
Number of Super-Frames	1
Hierarchy Mode	Non-hierarchical
HP Sorce	PN 23
Filter Type	Cosine
Clipping	OFF
Trigger Mode	Auto
Cell Identification	ON
Time-Slicing	ON
ID [4 hex]	0000
MPE-FEC	OFF
PN Scrambler	ON
Outer Coder	ON
Outer Interleaver	ON
Inner Coder	ON
Rate	1/2
Inner Bit Interleaver	ON
Inner Symbol Interleaver	ON
Inner Interleaver Mode	Native
TX Mode	2 K
OFDM/RF Bandwidth	8 MHz
Modulation	QPSK
Alpha	1
Guard Inerval	1/8

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:PRESet](#) on page 44

Save/Recall...

Calls the "Save/Recall" dialog.

From the "Save/Recall" dialog, the "File Select" windows for saving and recalling DVB-H configurations and the "File Manager" is called.

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

The complete settings in the DVB-H menu are saved and recalled.

"Recall DVB-H Setting" Opens the "File Select" window for loading a saved DVB-H configuration.

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

"Save DVB-H Setting" Opens the "File Select" window for saving the current DVB-H 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.

The "Fast Save" checkbox determines whether the instrument performs an absolute or a differential storing of the settings. Enable this function to accelerate the saving process by saving only the settings with values different to the default ones. "Fast Save" is not affected by the "Pre-set" function.

"File Manager" Calls the "File Manager".
The dialog is used to copy, delete, and rename files and to create new directories.

SCPI command:

[:SOURce<hw>] :BB:DVB:SETTing:CATalog on page 44

[:SOURce<hw>] :BB:DVB:SETTing:LOAD on page 45

[:SOURce<hw>] :BB:DVB:SETTing:STORe on page 45

[:SOURce<hw>] :BB:DVB:SETTing:STORe:FAST on page 45

[:SOURce<hw>] :BB:DVB:SETTing:DELete on page 44

Generate Waveform File...

Calls the "Generate Waveform" dialog. This dialog is used to store the current DVB-H signal as ARB signal in a waveform file.

This file can be loaded in the ARB menu and processed as multicarrier or multisegment signal.

The file name is entered in the submenu. The file is stored with the predefined file extension *.wv. The file name and the directory it is stored in are user-definable.

SCPI command:

[:SOURce<hw>] :BB:DVB:WAVeform:CREate on page 46

DVB Standard

Selects the DVB standard to be used to generate the modulation signal.

Note: In this release only DVB-H is available.

SCPI command:

[:SOURce<hw>] :BB:DVB:STANdard on page 45

Number of Super Frames

Sets the number of the transmitted super-frames. Each super-frame consists of four OFDM frames.

SCPI command:

[:SOURce<hw>] :BB:DVB: { DVBH | DVBT } :SFRames on page 47

Number of Samples

Displays the number of the transmitted samples.

SCPI command:

[:SOURce<hw>] :BB:DVB: { DVBH | DVBT } :SAMPle:LENGth on page 47

Sample Rate

Displays the sample rate.

SCPI command:

[:SOURce<hw>] :BB:DVB: { DVBH | DVBT } :SAMPle:RATE on page 47

Data Rate

Displays the data rate.

SCPI command:

[:SOURce<hw>] :BB:DVB: { DVBH | DVBT } :DRATe on page 46

Duration

Displays the signal duration.

SCPI command:

[:SOURce<hw>] :BB:DVB: { DVBH | DVBT } :DURation on page 46

System Configuration...

Calls the System Configuration menu for configuring the DVB-H system.

The hierarchy mode and the data source are displayed next to the button.

The menu is described in [chapter 3.2, "System Configuration"](#), on page 21.

SCPI command:

n.a.

TPS Settings...

Calls the "TPS Settings" menu for setting the TPS parameters and viewing the status of the parameter bits.

The menu is described in [chapter 3.3, "TPS Settings"](#), on page 25.

SCPI command:

n.a.

Filtering/Clipping

Calls the menu for setting baseband filtering and clipping. The current filter and the clipping state are displayed next to the button.

The menu is described in [chapter 3.4, "Filter/Clipping Settings"](#), on page 29.

SCPI command:

n.a.

Trigger/Marker

(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 [chapter 3.5, "Trigger/Marker/Clock Settings"](#), on page 32.

The currently selected trigger mode and trigger source are displayed next to the button.

SCPI command:

n.a.

Execute Trigger

(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.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:EXECute](#) on page 53

Arm

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

Stops signal generation manually. This button appears only with "Running" signal generation in the "Armed_Auto" and "Armed_Retrigger" trigger modes.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:ARM:EXECute](#) on page 53

Clock

(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 [chapter 3.5.4, "Clock Settings"](#), on page 39.

SCPI command:

n.a.

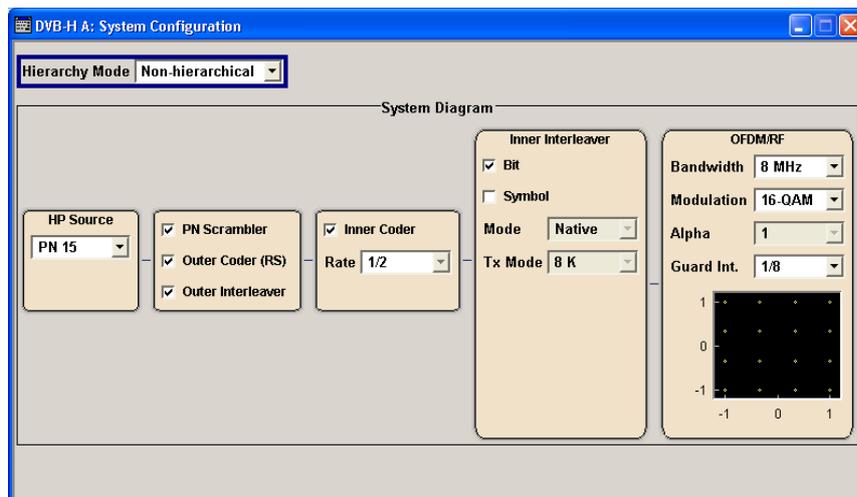
3.2 System Configuration

The "System Configuration" menu allows to configure the DVB system. The DVB system is displayed in form of a block diagram including all parameters necessary to configure the system.

The system diagram depends on the hierarchy mode which is selected in the "Hierarchy Mode" field.



In this release only the non-hierarchical mode is available.



Hierarchy Mode

Selects the hierarchy mode.

Note: In this release only the non-hierarchical mode is available.

"Hierarchical" Both inputs are used. The inputs are identical and simply differ in the prioritization.

"Non-hierarchical" Only the high priority input is used.

SCPI command:

```
[ :SOURce<hw> ] :BB:DVB: { DVBH | DVBT } :HMODE on page 66
```

HP/LP Source

Selects the data source.

SCPI command:

```
[ :SOURce<hw> ] :BB:DVB: { DVBH | DVBT } [ :HP | LP ] :DATA on page 66  
[ :SOURce<hw> ] :BB:DVB: { DVBH | DVBT } [ :HP | LP ] :DATA:DSElection  
on page 66
```

PN Scrambler

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.

For details, refer to [chapter 2.1.1, "Pseudo Noise Scrambler"](#), on page 7.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: {DVBH|DVBT} [ :HP|LP ] :PNSCrambler [ :STATE ]  
on page 68
```

Outer Coder (RS)

Activates/deactivates the outer coder. The outer coder applies a Reed-Solomon error correction code to the PRBS data stream. For details, refer to [chapter 2.1.2, "Outer Coder"](#), on page 8.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: {DVBH|DVBT} [ :HP|LP ] :OCODer [ :STATE ]  
on page 67
```

Outer Interleaver

Activates/deactivates the outer convolutional interleaver. For details, refer to [chapter 2.1.3, "Outer Interleaver"](#), on page 8.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: {DVBH|DVBT} [ :HP|LP ] :OINTerleaver [ :STATE ]  
on page 67
```

Inner Coder

Activates/deactivates the inner coder. The inner coder is a punctured convolutional error-correcting coder. For details, refer to [chapter 2.1.4, "Inner Coder"](#), on page 8.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: {DVBH|DVBT} [ :HP|LP ] :ICODer [ :STATE ]  
on page 67
```

Rate

Selects the code rate of the inner coder. A number of incoming bits (m) to be encoded is transformed into an bit symbol (containing n -bits), where m/n is the code rate. For details, refer to [chapter 2.1.4, "Inner Coder"](#), on page 8.

Note: This field is available only if the inner code state is set to active.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: {DVBH|DVBT} [ :HP|LP ] :ICODer:RATE on page 67
```

Inner Bit Interleaver

Activates/deactivates the inner bit interleaver. For details, refer to [chapter 2.1.5, "Inner Interleaver"](#), on page 9.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: {DVBH|DVBT} :IINTerleaver:BIT [ :STATE ]  
on page 68
```

Inner Symbol Interleaver

Activates/deactivates the inner symbol interleaver. For details, refer to [chapter 2.1.5, "Inner Interleaver"](#), on page 9.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: { DVBH | DVBT } :IINTERLEAVER:SYMBOL [ :STATE ]  
on page 69
```

Inner Interleaver Mode

Selects the inner interleaver mode. Interleaver mode In-depth is available only for transmission mode 2K and 4K. For details, refer to [chapter 2.1.5, "Inner Interleaver"](#), on page 9.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: { DVBH | DVBT } :IINTERLEAVER:SYMBOL:MODE  
on page 68
```

Inner Interleaver Tx Mode

Selects the transmission mode. This setting determines the number of the OFDM sub-carriers. For transmission mode 8K, the in-depth interleaver mode is not available. For details, refer to [chapter 2.1.5, "Inner Interleaver"](#), on page 9.

Note: Transmission mode 4K is only available for DVB-H.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: { DVBH | DVBT } :IINTERLEAVER:SYMBOL:TMODE  
on page 68
```

OFDM/RF Bandwidth

Selects the system bandwidth.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: { DVBH | DVBT } :OFDM:BWIDTh on page 69
```

OFDM/RF Modulation

Selects the constellation for the OFDM modulation. For details, refer to [chapter 2.1.6, "Mapper"](#), on page 10.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: { DVBH | DVBT } :OFDM:MODUlation on page 69
```

OFDM/RF Alpha

Selects the alpha value. This value is used to shape the constellation of the modulation. For non-hierarchical mode, this value is always 1 and can not be changed. For details, refer to [chapter 2.1.6, "Mapper"](#), on page 10.

Note: The values in the list are selectable only if Hierarchical is selected in the Hierarchy Mode field and a modulation type other than QPSK is selected. In this release only the Non-hierarchical mode is available.

SCPI command:

```
[ :SOURCE<hw> ] :BB:DVB: { DVBH | DVBT } :OFDM:ALPHa on page 69
```

OFDM/Rf Guard Int

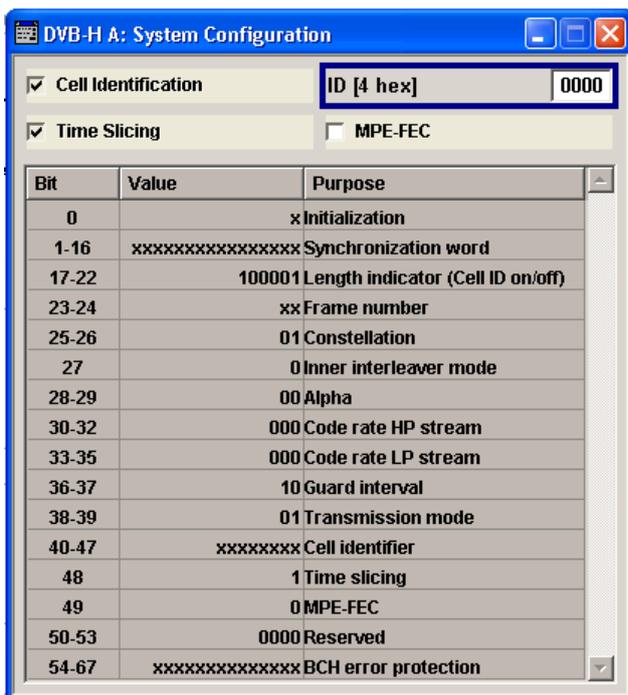
Selects the value for the guard interval. The guard interval extends the length of the transmitted symbol. The guard intervals are given as fractions of a symbol period.

SCPI command:

```
[ :SOURce<hw> ] :BB:DVB: { DVBH | DVBT } :OFDM:GINTerval on page 69
```

3.3 TPS Settings

The "TPS Settings" menu allows to select the bits to transmit via the TPS signal and displays the status of the parameter bits.



Cell Identification

Activates/deactivates the TPS cell identification. If activated, the cell from which the signal comes from is identified.

SCPI command:

```
[ :SOURce<hw> ] :BB:DVB: { DVBH | DVBT } :TPS:ID:STATe on page 70
```

ID [4 hex]

Sets the cell ID for cell identification. The cell ID identifies the cell from which the signal is transmitted. This value is read by the receiver only if Cell Identification is activated.

SCPI command:

```
[ :SOURce<hw> ] :BB:DVB: { DVBH | DVBT } :TPS:ID:PATTern on page 70
```

Time Slicing

Indicates the status of the time-slicing bit. If activated, the average power consumption of the terminal is reduced. Time-slicing information has to be included in the transport stream and is not generated by this application. Time slicing is always on for DVB-H and always off for DVB-T.

For details, refer to [chapter 2.2.2, "Time-Slicing"](#), on page 13.

SCPI command:

`[:SOURce<hw>] :BB:DVB: { DVBH | DVBT } :TPS:TSLicing [:STATe]` on page 71

MPE FEC

Activates/deactivates the multiprotocol encapsulation forward error correction bit. MPE-FEC must be performed in the transport stream and is not provided by this application.

For details, refer to [chapter 2.2.3, "Forward Error Correction for Multiprotocol Encapsulated Data \(MPE-FEC\)"](#), on page 15.

SCPI command:

`[:SOURce<hw>] :BB:DVB: { DVBH | DVBT } :TPS:MFEC [:STATe]` on page 70

TPS Table

The TPS parameter bit table displays the status of the transmitted TPS parameter bits.

Bit	Value	Purpose
0		x Initialization
1-16	xxxxxxxxxxxxxxxx	Synchronization word
17-22	100001	Length indicator (Cell ID on/off)
23-24	xx	Frame number
25-26	10	Constellation
27	0	Inner interleaver mode
28-29	00	Alpha
30-32	000	Code rate HP stream
33-35	000	Code rate LP stream
36-37	10	Guard interval
38-39	01	Transmission mode
40-47	xxxxxxx	Cell identifier
48	1	Time slicing
49	1	MPE-FEC
50-53	0000	Reserved
54-67	xxxxxxxxxxxxxxxx	BCH error protection

For DVB-H, the following TPS signalling information is transmitted:

Bit number	Format	Purpose
0	0/1	Initialization bit for the differential 2-PSK modulation. The modulation of the TPS initialization bit is derived from the PRBS sequence
1-16		Bits 1 to 16 of the TPS are the synchronization words for the TPS blocks in the super-frames:
	0011010111101110	Synchronization word for the first and the third TPS block in each super-frame
	11001010000100001	Synchronization word for the second and the fourth TPS block in each super-frame

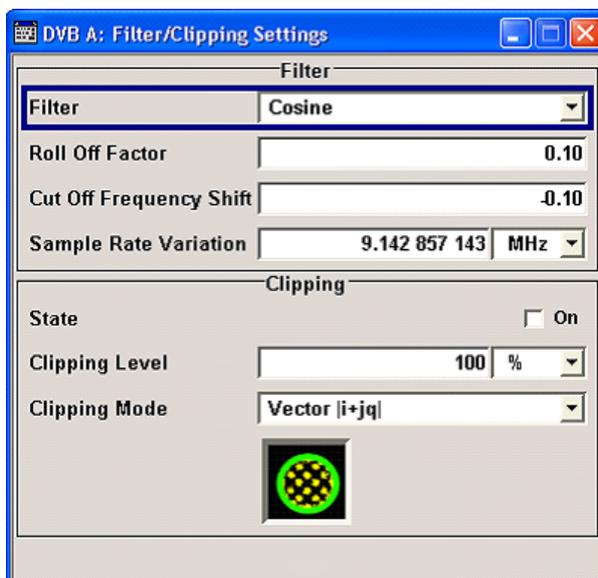
Bit number	Format	Purpose
17-22		The first 6 bits of the TPS information is used as a TPS length indicator to signal the number of used bits of the TPS:
	010111	Cell Identification is not transmitted (23 TPS bits in use)
	011111	Cell Identification information is transmitted (31 TPS bits in use)
	100001	Cell Identification information is transmitted for DVB-H (33 TPS bits in use)
23-24		Indicates the frame in the super-frame. Four frames constitute a super-frame.
	00	Frame 1 in the super-frame
	01	Frame 2 in the super-frame
	10	Frame 3 in the super-frame
	11	Frame 4 in the super-frame
25-26		Indicates the constellation
	00	QPSK
	01	16-QAM
	10	64-QAM
	11	Reserved
27		Indicates the interleaver mode. The in-depth interleaver can be used for 2K and 4K transmission mode. For transmission mode 8K, only the native interleaver shall be used:
	0	The native interleaver is used
	1	The in-depth interleaver is used
28-29		Indicates the hierarchical transmission and the value of the Alpha-factor
	00	Transmission in non-hierarchical mode
	01	Alpha = 1
	10	Alpha = 2
	11	Alpha = 4
30-32		Indicates the code rate for the HP transmission stream
	000	1/2
	001	2/3
	010	3/4
	011	5/6
	100	7/8

Bit number	Format	Purpose
	101	reserved
	110	reserved
	111	reserved
33-35		Indicates the code rate for the LP transmission stream
	000	1/2
	001	2/3
	010	3/4
	011	5/6
	100	7/8
	101	reserved
	110	reserved
	111	reserved
36-37		Indicates the value for the guard interval
	00	1/32
	01	1/16
	10	1/8
	11	1/4
38-39		Indicates the transmission mode
	00	2K mode
	01	8K mode
	10	4K mode
	11	reserved
40-47	Cell_id	32 bits are used for the cell ID. Every frame contains eight bits. The eight bits are used to identify the cell from which the signal comes from.
48		Indicates the usage of time-slicing
	0	Time-slicing is not used
	1	At least one elementary stream uses time-slicing
49		Indicates the usage of MPE-FEC
	0	MPE-FEC is not used
	1	At least one elementary stream uses MPE-FEC
50-53	reserved	
54-67	xxxxxxxxxxxxxxxx	BCH Error Protection

3.4 Filter/Clipping Settings

To access this dialog, select "Main Menu > Filter/Clipping".

The baseband filter, sample rate variation and clipping are defined in this menu.



3.4.1 Filter Settings

Filter

Sets the baseband filter.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:FILTer:TYPE](#) on page 51

Roll Off Factor / BxT

Sets the filter parameter.

The filter parameter offered ("Roll Off Factor" or "BxT") depends on the currently selected filter type. This parameter is preset to the default for each of the predefined filters.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:FILTer:PARAMeter:APCO25](#) on page 49

[\[:SOURce<hw>\]:BB:DVB:FILTer:PARAMeter:COSine](#) on page 49

[\[:SOURce<hw>\]:BB:DVB:FILTer:PARAMeter:GAUSS](#) on page 49

[\[:SOURce<hw>\]:BB:DVB:FILTer:PARAMeter:PGAuss](#) on page 50

[\[:SOURce<hw>\]:BB:DVB:FILTer:PARAMeter:RCOSine](#) on page 50

[\[:SOURce<hw>\]:BB:DVB:FILTer:PARAMeter:SPHase](#) on page 51

Cut Off Frequency Shift

(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.

SCPI command:

`[:SOURce<hw>] :BB:DVB:FILTER:PARAMeter:COsine:COFS` on page 49

Cut Off Frequency Factor

(available for filter parameter Lowpass only)

Sets the value for the cut off frequency factor. The cut off frequency of the filter can be adjusted to reach spectrum mask requirements.

SCPI command:

`[:SOURce<hw>] :BB:DVB:FILTER:PARAMeter:LPASs` on page 50

`[:SOURce<hw>] :BB:DVB:FILTER:PARAMeter:LPASSEVM` on page 50

Sample Rate Variation

Sets the sample rate of the signal. A variation of this parameter only affects the ARB clock rate; all other signal parameters remain unchanged.

SCPI command:

`[:SOURce<hw>] :BB:DVB:SRATE:VARiation` on page 53

Impulse Length

(For WinIQSIM2 only)

Displays the number of filter tabs. If the check box is activated, the most sensible parameter values are selected. The value depends on the coherence check. If the check box is deactivated, the values can be changed manually.

SCPI command:

`[:SOURce<hw>] :BB:DVB:FILTER:ILENgtH:AUTO` on page 48

`[:SOURce<hw>] :BB:DVB:FILTER:ILENgtH` on page 48

Oversampling

(For WinIQSIM2 only)

Determines the upsampling factor. If the check box is activated, the most sensible parameter values are selected. The value depends on the coherence check. If the check box is deactivated, the values can be changed manually.

SCPI command:

`[:SOURce<hw>] :BB:DVB:FILTER:OSAMpling:AUTO` on page 48

`[:SOURce<hw>] :BB:DVB:FILTER:OSAMpling` on page 48

3.4.2 Clipping Settings

The settings for clipping are collected in the "Clipping" section.

DVB-H signals may have a quite high crest factor (~ 11dBm) because of high amplitude variations that come along with OFDM signals having a noise-like spectrum. High crest factors entail two basic problems:

- The nonlinearity of the power amplifier (compression) causes intermodulation which expands the spectrum (spectral regrowth).

- Since the level in the D/A converter is relative to the maximum value, the average value is converted with a relatively low resolution. This results in a high quantization noise.

Both effects increase the adjacent-channel power.

Since clipping the signal not only changes the peak value but also the average value, the effect on the crest factor is unpredictable.

The following pictures demonstrate the affect of clipping with vector mode ($|i+jq|$), using the default signal configuration with a PN23 input sequence.

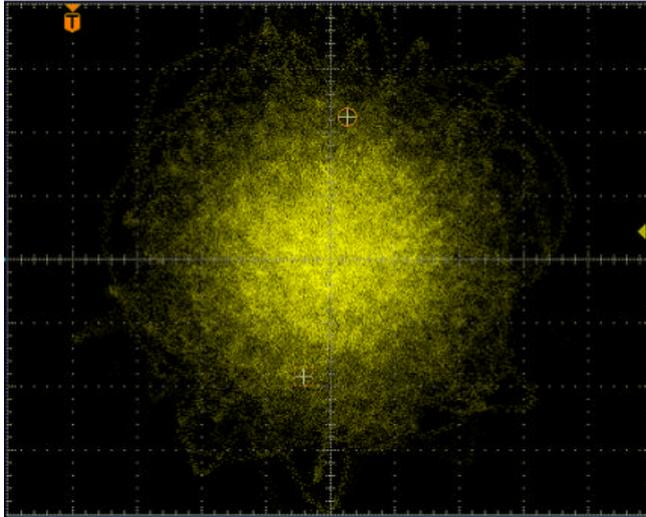


Fig. 3-1: Constellation diagram of the signal without clipping, shows the level mapping

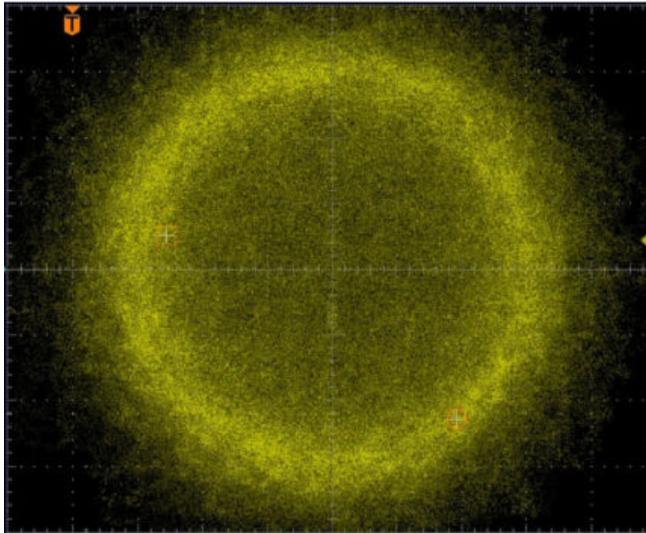


Fig. 3-2: Constellation diagram with clipping level 10 %, vector mode ($|i+jq|$)

Clipping State

Switches baseband clipping on and off.

Baseband clipping is a very simple and effective way of reducing the crest factor of the signal.

With baseband clipping, the signal level is limited to a settable value ("Clipping Level"). This level is specified as a percentage of the highest peak value. Since clipping is done prior to filtering, the procedure does not influence the spectrum. The EVM however increases.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:CLIPping:STATe](#) on page 52

Clipping Level

Sets the limit for clipping.

This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:CLIPping:LEVel](#) on page 51

Clipping Mode

Selects the clipping method. A graphic illustration of the way in which these two methods work is given in the menu.

"Vector $|i + q|$ " The limit is related to the amplitude $|i + q|$. The I and Q components are mapped together, the angle is retained.



"Scalar $|i| + |q|$ " The limit is related to the absolute maximum of all the I and Q values $|i| + |q|$.



The I and Q components are mapped separately, the angle changes.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:CLIPping:MODE](#) on page 52

3.5 Trigger/Marker/Clock Settings

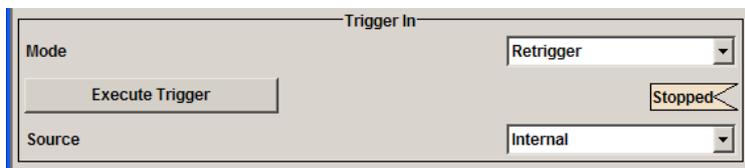


The trigger, clock, and marker delay functions are available for R&S SMx and R&S AMU instruments only.

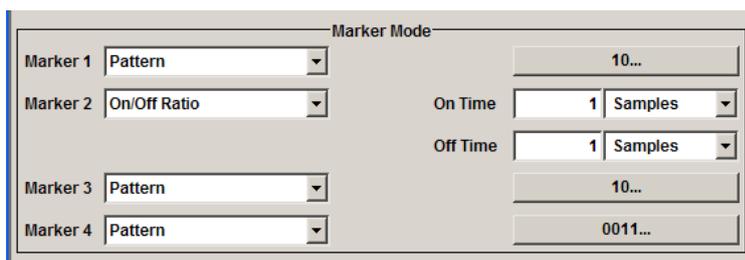
To access this dialog, select "Main Menu > Trigger/Marker".

The "Trigger In" section is where the trigger for the signal is set. Various parameters will be provided for the settings, depending on which trigger source - internal or external - is

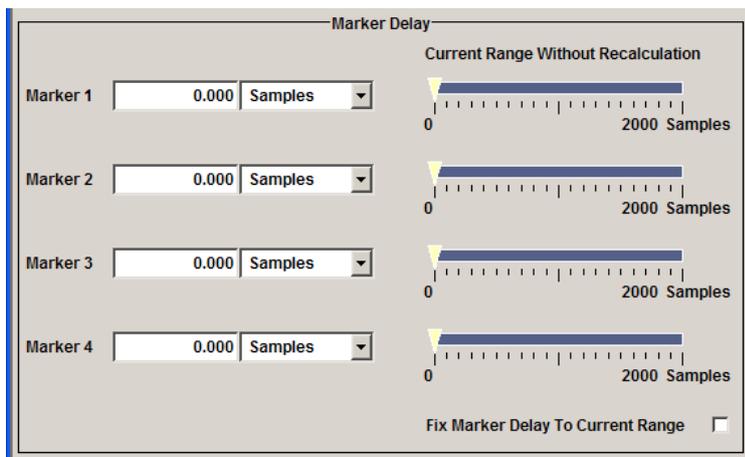
selected. The current status of signal generation ("Running" or "Stopped") is indicated for all trigger modes.



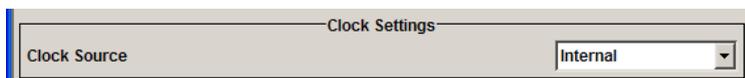
The "Marker Mode" section is where the marker signals at the MARKER output connectors are configured.



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



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



The buttons in the last section lead to submenu for general trigger, clock and mapping settings.



3.5.1 Trigger In



The trigger functions are available for R&S SMx and R&S AMU instruments only.

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

Trigger Mode

Selects trigger mode.

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

"Auto"	The signal is generated continuously.
"Retrigger"	The signal is generated continuously. A trigger event (internal or external) causes a restart.
"Armed_Auto"	The signal is generated only when a trigger event occurs. Then the signal is generated continuously. Button "Arm" stops signal generation. A subsequent trigger event (internal with "Execute Trigger" or external) causes a restart.
"Armed_Retrigger"	The signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes a restart. Button "Arm" stops signal generation. A subsequent trigger event (internal with "Execute Trigger" or external) causes a restart.
"Single"	The 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.

SCPI command:

[\[:SOURCE<hw>\]:BB:DVB\[:TRIGGER\]:SEQUENCE](#) on page 58

Signal Duration Unit

Defines the unit for the entry of the length of the signal sequence to be output in the "Single" trigger mode.

SCPI command:

[\[:SOURCE<hw>\]:BB:DVB:TRIGGER:SLUNIT](#) on page 56

Signal Duration

Defines the length of the signal sequence to be output in the "Single" trigger mode.

It is possible to output deliberately just part of the signal, an exact sequence of the signal, or a defined number of repetitions of the signal.

SCPI command:

[\[:SOURCE<hw>\]:BB:DVB:TRIGGER:SLNGTH](#) on page 56

Running/Stopped

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

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

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:RMODE](#) on page 55

Arm

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

Stops signal generation manually. This button appears only with "Running" signal generation in the "Armed_Auto" and "Armed_Retrigger" trigger modes.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:ARM:EXECute](#) on page 53

Execute Trigger

(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.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:EXECute](#) on page 53

Trigger Source

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".
- "Internal
(Baseband A/
B)" (two-path instruments only)
The trigger event is executed by the trigger signal from the second path
- "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 connector.
The polarity, the trigger threshold and the input impedance of the TRIGGER input can be set in the "Global Trigger/Clock Settings" dialog.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:SOURce](#) on page 56

Sync. Output to External Trigger

(enabled for Trigger Source External)

Enables/disables output of the signal synchronous to the external trigger event.

For R&S SMBV instruments:

For one or two or more R&S SMBVs configured to work in a master-slave mode for synchronous signal generation, configure this parameter depending on the provided system trigger event and the properties of the output signal. See the table below for an overview of the required settings.

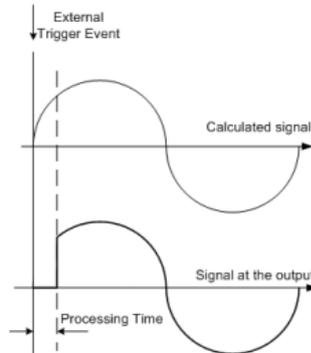
Table 3-1: Typical Applications

System Trigger	Application	"Sync. Output to External Trigger"
Common External Trigger event for the master and the slave instruments	All instruments are synchronous to the external trigger event	ON
	All instruments are synchronous among themselves but starting the signal from first symbol is more important than synchronicity with external trigger event	OFF
Internal trigger signal of the master R&S SMBV for the slave instruments	All instruments are synchronous among themselves	OFF

"On"

Corresponds to the default state of this parameter.

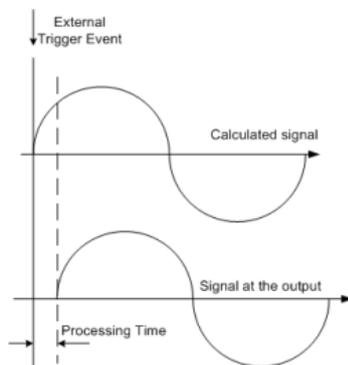
The signal calculation starts simultaneously with the external trigger event but because of the instrument's processing time the first samples are cut off and no signal is outputted. After elapsing of the internal processing time, the output signal is synchronous to the trigger event.



"Off"

The signal output begins after elapsing of the processing time and starts with sample 0, i.e. the complete signal is outputted.

This mode is recommended for triggering of short signal sequences with signal duration comparable with the processing time of the instrument.



SCPI command:

`[:SOURce<hw>] :BB:DVB:TRIGger:EXTErnal:SYNChronize:OUTPut`
on page 54

Trigger Delay

Sets the trigger signal delay in samples on external triggering or on internal triggering via the second path.

Sets the trigger signal delay in samples on external triggering.

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

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

SCPI command:

`[:SOURce<hw>] :BB:DVB:TRIGger [:EXTErnal<ch>] :DELay` on page 57
`[:SOURce<hw>] :BB:DVB:TRIGger:OBASeband:DELay` on page 54

Trigger Inhibit

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, the trigger inhibit can be set separately for each of the two paths.

SCPI command:

`[:SOURce<hw>] :BB:DVB:TRIGger [:EXTErnal<ch>] :INHibit` on page 57
`[:SOURce<hw>] :BB:DVB:TRIGger:OBASeband:INHibit` on page 55

3.5.2 Marker Mode

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

The R&S SMBV supports only two markers.

Marker Mode

Selects a marker signal for the associated "MARKER" output.

- "Restart" A marker signal is generated at the start of every sequence length loop.
- "Super Frame Start" A marker signal is generated at the start of every super-frame period.
- "Frame Start" A marker signal is generated at the start of each frame.
- "Pulse" A regular marker signal is generated. The pulse frequency is defined by entering a divider. The frequency is derived by dividing the sample rate by the divider. The input box for the divider opens when "Pulse" is selected, and the resulting pulse frequency is displayed below it.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:DIVider](#) on page 62

[\[:SOURce<hw>\]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:FREQuency](#)

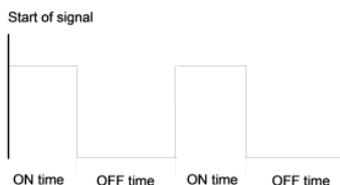
on page 62

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

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:OUTPut<ch>:PATtern](#) on page 61

- "ON/OFF Period" 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.



SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:OUTPut<ch>:ONTime](#) on page 61

[\[:SOURce<hw>\]:BB:DVB:TRIGger:OUTPut<ch>:OFFTime](#) on page 61

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:TRIGger:OUTPut<ch>:MODE](#) on page 60

3.5.3 Marker Delay

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



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

The R&S SMBV supports only two markers.

Marker x Delay

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

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

SCPI command:

`[:SOURce<hw>] :BB:DVB:TRIGger:OUTPut<ch>:DELay` on page 59

Current Range without Recalculation

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

The delay can be defined by moving the setting mark.

SCPI command:

`[:SOURce<hw>] :BB:DVB:TRIGger:OUTPut<ch>:DELay:MINimum` on page 60

`[:SOURce<hw>] :BB:DVB:TRIGger:OUTPut<ch>:DELay:MAXimum` on page 60

Fix marker delay to current range

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

SCPI command:

`[:SOURce<hw>] :BB:DVB:TRIGger:OUTPut:DELay:FIXed` on page 59

3.5.4 Clock Settings

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



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

Sync. Mode

(for R&S SMBV only)

Selects the synchronization mode.

This parameter is used to enable generation of very precise synchronous signal of several connected R&S SMBVs.

Note: If several instruments are connected, the connecting cables from the master instrument to the slave one and between each two consecutive slave instruments must have the same length and type.

Avoid unnecessary cable length and branching points.

- "None" The instrument is working in stand-alone mode.
- "Sync. Master" The instrument provides all connected instrument with its synchronisation (including the trigger signal) and reference clock signal.



- "Sync. Slave" The instrument receives the synchronisation and reference clock signal from another instrument working in a master mode.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:CLOCK:SYNChronization:MODE](#) on page 65

Set Synchronization Settings

(for R&S SMBV only)

Performs automatically adjustment of the instrument's settings required for the synchronization mode, selected with the parameter "Synchronization Mode".

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:CLOCK:SYNChronization:EXECute](#) on page 64

Clock Source

Selects the clock source.

- "Internal" The internal clock reference is used to generate the sample clock.
- "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 +/-2 % (see data sheet).
The polarity of the clock input can be changed with the aid of "Global Trigger/Clock Settings".
In the case of two-path instruments this selection applies to path A.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:CLOCK:SOURce](#) on page 64

Clock Mode

Enters the type of externally supplied clock.

- "Sample" A sample clock is supplied via the CLOCK connector.
- "Multiple Sample" A multiple of the sample clock is supplied via the CLOCK connector; the sample clock is derived internally from this.

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:CLOCK:MODE](#) on page 63

Clock Multiplier

Enters the multiplication factor for clock type "Multiple".

SCPI command:

[\[:SOURce<hw>\]:BB:DVB:CLOCK:MULTIplier](#) on page 63

Measured External Clock

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

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

SCPI command:

CLOC:INP:FREQ?

3.5.5 Global Settings

The buttons in this section lead to submenu for general trigger, clock and mapping settings.

This settings are available for R&S SMx and R&S AMU instruments only.

Global Trigger/Clock Settings

Calls the "Global Trigger/Clock/Input Settings" dialog.

This dialog is used among other things for setting the trigger threshold, the input impedance and the polarity of the clock and trigger inputs.

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

The parameters in this menu affect all digital modulations and standards, and are described in chapter "Global Trigger/Clock/Input Settings" in the Operating Manual.

User Marker / AUX I/O Settings

Calls the "User Marker AUX I/O Settings" menu, used to map the connector on the rear of the instruments.

See also "User Marker / AUX I/O Settings" in the Operating Manual.

4 Remote-control commands

The commands in the `SOURce:BB:DVB` subsystem are described in three sections, separated into general remote commands, commands for system configuration and TPS settings.

SOURce<hw>

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

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

- `SOURce[1]` = path A
The keyword `SOURce` is optional and can be omitted
- `SOURce2` = path B
The keyword `SOURce` is mandatory, i.e. the command must contain the keyword with suffix 2.

OUTPut<ch>

The numeric suffix to `OUTPut` distinguishes between the available markers.

Only two markers are available for the R&S SMBV, i.e. the allowed values for the suffix are 1 or 2.

Placeholder <root>

For commands that read out or save files in the default directory, the default directory is set using command `MMEM:CDIRectory`. The examples in this description use the placeholder `<root>` in the syntax of the command.

- `D:\` - for selecting the internal hard disk of Windows instruments
- `E:\` - for selecting the memory stick which is inserted at the USB interface of Windows instruments
- `/var/<instrument>` - for selecting the internal flash card of Linux instrument, where `<instrument>` is the instrument name, e.g. `smbv`.
- `/usb` - for selecting the memory stick which is inserted at the USB interface of Linux instrument.

4.1 General 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.

4.1.1 Primary Commands

<code>[:SOURce<hw>]:BB:DVB:PRESet</code>	44
<code>[:SOURce<hw>]:BB:DVB:SETTing:CATalog</code>	44

<code>[:SOURce<hw>]:BB:DVB:SETTING:DELeTe</code>	44
<code>[:SOURce<hw>]:BB:DVB:SETTING:LOAD</code>	45
<code>[:SOURce<hw>]:BB:DVB:SETTING:STORE</code>	45
<code>[:SOURce<hw>]:BB:DVB:SETTING:STORE:FAST</code>	45
<code>[:SOURce<hw>]:BB:DVB:STANdard</code>	45
<code>[:SOURce<hw>]:BB:DVB:STATe</code>	46
<code>[:SOURce<hw>]:BB:DVB:WAVeform:CREate</code>	46
<code>[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:DRATe</code>	46
<code>[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:DURation</code>	46
<code>[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:SAMPLe:LENGth</code>	47
<code>[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:SAMPLe:RATE</code>	47
<code>[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:SFRames</code>	47

`[:SOURce<hw>]:BB:DVB:PRESet`

The command produces a standardized default for the DVB-H standard. The settings correspond to the *RST values specified for the commands.

Example: `BB:DVB:PRESet`
resets all the DVB-H settings to default values.

Usage: Event

`[:SOURce<hw>]:BB:DVB:SETTING:CATalog?`

This command reads out the files with DVB-H settings in the default directory. The default directory is set using command `MMEM:CDIRectory`. Only files with the file extension `*.DVB` will be listed.

Return values:
<Catalog> string

Example: `MMEM:CDIR ' <root>\user\DVB '`
sets the default directory to `<root>\user\DVB`.
`BB:DVB:SETTING:CAT?`
reads out all the files with DVB-H settings in the default directory.
Response: 'DVB_1', 'DVB_2'
the files `DVB_1` and `DVB_2` are available.

Usage: Query only

`[:SOURce<hw>]:BB:DVB:SETTING:DELeTe <Delete>`

This command deletes the selected file with DVB-H 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 `*.DVB` will be deleted.

Setting parameters:
<Delete> string

Example: `BB:DVB:SETT:DEL '<root>\user\DVB'`
deletes the specified file with DVB-H settings.

Usage: Setting only

[:SOURCE<hw>]:BB:DVB:SETTING:LOAD <Load>

This command loads the selected file with DVB-H 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 `*.DVB` will be loaded.

Setting parameters:

<Load> string

Example: `BB:DVB:SETT:LOAD 'DVB_1'`
loads file 'DVB_1'.

Usage: Setting only

[:SOURCE<hw>]:BB:DVB:SETTING:STORE <Store>

This command stores the current DVB-H 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. DVB-H settings are stored as files with the specific file extensions `*.DVB`.

Setting parameters:

<Store> string

Example: `BB:DVB:SETT:STOR 'DVB_1'`
stores the current DVB-H settings into file 'DVB_1'.

Usage: Setting only

[:SOURCE<hw>]:BB:DVB:SETTING:STORE:FAST <Fast>

Parameters:

<Fast> 0 | 1 | OFF | ON

*RST: ON

[:SOURCE<hw>]:BB:DVB:STANDARD <Standard>

The command selects the DVB standard to be used.

Note:

In this release only DVB-H is available.

Parameters:

<Standard> DVBH | DVBT

*RST: DVBH

Example: `BB:DVB:STAN DVBH`
selects the DVB-H standard to be used.

[:SOURce<hw>]:BB:DVB:STATe <State>

The command activates modulation in accordance with the DVB-H 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.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: OFF

Example: `BB:DVB:STAT ON`
activates modulation in accordance with the DVB-H standard.

[:SOURce<hw>]:BB:DVB:WAVeform:CREate <Create>

This command creates a waveform using the current settings of the "DVB-H" menu. The file name is entered with the command. The file is stored with the predefined file extension *.wv. The file name and the directory it is stored in are user-definable.

Setting parameters:

<Create> string

Example: `M MEM:CDIR '<root>\user\waveform'`
sets the default directory to <root>\user\waveform.
`BB:DVB:WAV:CRE 'DVB_1'`
creates the waveform file `DVB.wv` in the default directory.

Usage: Setting only

[:SOURce<hw>]:BB:DVB:{DVBH|DVBT}:DRATe?

The command queries the data rate.

Return values:

<Drate> float

Example: `BB:DVB:DVBH:DRAT?`
queries the data rate.

Usage: Query only

[:SOURce<hw>]:BB:DVB:{DVBH|DVBT}:DURation?

The command queries the signal duration.

Return values:

<Duration> float

Example: BB : DVB : DVBH : DUR ?
queries the signal duration.

Usage: Query only

[:SOURce<hw>] : BB : DVB : { DVBH | DVBT } : SAMPlE : LENGth ?

The command queries the number of the transmitted samples.

Return values:
<Length> integer
Range: 1 to 128

Example: BB : DVB : DVBH : SAMP : LENG ?
queries the number of the transmitted samples.

Usage: Query only

[:SOURce<hw>] : BB : DVB : { DVBH | DVBT } : SAMPlE : RATE ?

The command queries the sample rate.

Return values:
<Rate> float

Example: BB : DVB : DVBH : SAMP : RATE ?
queries the sample rate.

Usage: Query only

[:SOURce<hw>] : BB : DVB : { DVBH | DVBT } : SFRames <Sframes>

The command sets the number of super-frames to be transmitted.

Parameters:
<Sframes> float
Range: 1 to 100
*RST: 1

Example: BB : DVB : DVBH : SFR 50
sets the number of the transmitted super-frames to 50.

4.1.2 Filter Settings

[:SOURce<hw>] : BB : DVB : FILTer : ILENGth 48
 [:SOURce<hw>] : BB : DVB : FILTer : ILENGth : AUTO 48
 [:SOURce<hw>] : BB : DVB : FILTer : OSAMpling 48
 [:SOURce<hw>] : BB : DVB : FILTer : OSAMpling : AUTO 48
 [:SOURce<hw>] : BB : DVB : FILTer : PARAmeter : APCO25 49
 [:SOURce<hw>] : BB : DVB : FILTer : PARAmeter : COSine 49
 [:SOURce<hw>] : BB : DVB : FILTer : PARAmeter : COSine : COFS 49

<code>[:SOURce<hw>]:BB:DVB:FILTer:PARAmeter:GAUSSs.....</code>	49
<code>[:SOURce<hw>]:BB:DVB:FILTer:PARAmeter:LPASSs.....</code>	50
<code>[:SOURce<hw>]:BB:DVB:FILTer:PARAmeter:LPASSEVM.....</code>	50
<code>[:SOURce<hw>]:BB:DVB:FILTer:PARAmeter:PGAuss.....</code>	50
<code>[:SOURce<hw>]:BB:DVB:FILTer:PARAmeter:RCOSine.....</code>	50
<code>[:SOURce<hw>]:BB:DVB:FILTer:PARAmeter:SPHase.....</code>	51
<code>[:SOURce<hw>]:BB:DVB:FILTer:TYPE.....</code>	51

`[:SOURce<hw>]:BB:DVB:FILTer:ILENgth <llength>`

The command sets the impulse length (number of filter tabs).

Parameters:

`<llength>` float
 Range: 1 to 128
 Increment: 1
 *RST: 10

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

`[:SOURce<hw>]:BB:DVB:FILTer:ILENgth:AUTO <Auto>`

The command activates/deactivates the impulse length state. If activated, the most sensible parameter values are selected. The value depends on the coherence check.

Parameters:

`<Auto>` 0 | 1 | OFF | ON
 *RST: ON

Example: `BB:DVB:FILT:ILEN:AUTO ON`
 the most sensible parameters are selected automatically.

`[:SOURce<hw>]:BB:DVB:FILTer:OSAMpling <Osampling>`

The command sets the upsampling factor.

Parameters:

`<Osampling>` float
 Range: 1 to 32
 *RST: 32

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

`[:SOURce<hw>]:BB:DVB:FILTer:OSAMpling:AUTO <Auto>`

The command activates/deactivates the upsampling factor state. If activated, the most sensible parameter values are selected. The value depends on the coherence check. If deactivated, the values can be changed manually.

Parameters:

<Auto> 0 | 1 | OFF | ON
 *RST: ON

Example:

BB:DVB:FILT:OSAM:AUTO ON
 the most sensible parameters are selected automatically.

[[:SOURce<hw>]:BB:DVB:FILT:PAR:APCO25 <Apco25>

The command sets the roll-off factor for filter type APCO25.

Parameters:

<Apco25> float
 Range: 0.05 to 0.99
 Increment: 0.01
 *RST: 0.20

Example:

BB:DVB:FILT:PAR:APCO25 0.2
 sets the roll-off factor to 0.2 for filter type APCO25.

[[:SOURce<hw>]:BB:DVB:FILT:PAR:COSine <Cosine>

The command sets the roll-off factor for the Cosine filter type.

Parameters:

<Cosine> float
 Range: 0 to 1.0
 Increment: 0.01
 *RST: 0.10

Example:

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

[[:SOURce<hw>]:BB:DVB:FILT:PAR:COSine:COFS <Cofs>

The command sets the "cut off frequency shift" value for the Cosine filter type.

Parameters:

<Cofs> float
 Range: -1 to 1
 Increment: 0.01
 *RST: -0.1

Example:

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

[[:SOURce<hw>]:BB:DVB:FILT:PAR:GAUSS <Gauss>

The command sets the B x T for the Gauss filter type.

Parameters:

<Gauss> float
 Range: 0.15 to 2.5
 Increment: 0.01
 *RST: 0.5

Example:

BB:DVB:FILT:PAR:GAUS 0.5
 sets B x T to 0.5 for the Gauss filter type.

[:SOURce<hw>]:BB:DVB:FILT:PAR:LPASs <Lpass>

The command sets the cut off frequency factor for the Lowpass (APC opt.) filter type.

Parameters:

<Lpass> float
 Range: 0.05 to 2.0
 Increment: 0.01
 *RST: 0.5

Example:

BB:DVB:FILT:PAR:LPAS 0.5
 the cut of frequency factor is set to 0.5.

[:SOURce<hw>]:BB:DVB:FILT:PAR:LPASSEVM <Lpassevm>

The command sets the cut off frequency factor for the Lowpass (EVM opt.) filter type.

Parameters:

<Lpassevm> float
 Range: 0.05 to 2.0
 Increment: 0.01
 *RST: 0.5

Example:

BB:DVB:FILT:PAR:LPAS 0.5
 the cut of frequency factor is set to 0.5.

[:SOURce<hw>]:BB:DVB:FILT:PAR:PGAuss <Pgauss>

The command sets the B x T for the Pure Gauss filter type.

Parameters:

<Pgauss> float
 Range: 0.15 to 2.5
 Increment: 0.01
 *RST: 0.5

Example:

BB:DVB:FILT:PAR:GAUS 0.5
 sets B x T to 0.5 for the Pure Gauss filter type.

[:SOURce<hw>]:BB:DVB:FILT:PAR:RCOSine <RCosine>

The command sets the roll-off factor for the Root Cosine filter type.

Parameters:

<RCosine> float
 Range: 0 to 1.0
 Increment: 0.01
 *RST: 0.22

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

[:SOURce<hw>]:BB:DVB:FILT:PAR:SPHase <Sphase>

The command sets the B x T for the Split Phase filter type.

Parameters:

<Sphase> float
 Range: 0.15 to 2.5
 Increment: 0.01
 *RST: 2.00

Example: BB:DVB:FILT:PAR:SPH 0.5
 sets B x T to 0.5 for the Split Phase filter type.

[:SOURce<hw>]:BB:DVB:FILT:TYPE <Type>

The command selects the filter type.

Parameters:

<Type> RCOSine | COSine | GAUSs | LGAuss | CONE | COF705 |
 COEQUALizer | COFEQUALizer | C2K3x | APCO25 | SPHase |
 RECTangle | PGAuss | LPASs | LPASSEVM | DIRac | ENPShape |
 EWPSHape
 *RST: GAUSs

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

4.1.3 Clipping Settings

[:SOURce<hw>]:BB:DVB:CLIPping:LEVel.....51
 [:SOURce<hw>]:BB:DVB:CLIPping:MODE.....52
 [:SOURce<hw>]:BB:DVB:CLIPping:STATE.....52

[:SOURce<hw>]:BB:DVB:CLIPping:LEVel <Level>

The command sets the limit for level clipping. This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Parameters:

<Level> float
 Range: 1 PCT to 100 PCT
 Increment: 1 PCT
 *RST: 100

Example:

```
BB:DVB:CLIP:LEV 80
sets the limit for level clipping to 80% of the maximum level.
BB:DVB:CLIP:STAT ON
activates level clipping.
```

[:SOURce<hw>]:BB:DVB:CLIPping:MODE <Mode>

The command sets the method for level clipping.

Parameters:

<Mode> VECTOR | SCALAR
VECTOR
 The reference level is the amplitude $|i+jq|$.
SCALAR
 The reference level is the absolute maximum of the I and Q values.
 *RST: VECTOR

Example:

```
BB:DVB:CLIP:MODE VECT
sets the amplitude as reference level.
```

[:SOURce<hw>]:BB:DVB:CLIPping:STATE <State>

The command activates level clipping. The value is defined with the command `:BB:DVB:CLIPping:LEVel`, the mode of calculation with the command `:BB:DVB:CLIPping:MODE`.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: OFF

Example:

```
BB:DVB:CLIP:STAT ON
activates level clipping.
```

4.1.4 Trigger Settings



The trigger settings are available for R&S SMx and R&S AMU instruments only.

EXTernal<ch>

The numeric suffix to `EXTernal<ch>` distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

<code>[:SOURce<hw>]:BB:DVB:SRATe:VARiation</code>	53
<code>[:SOURce<hw>]:BB:DVB:TRIGger:ARM:EXECute</code>	53
<code>[:SOURce<hw>]:BB:DVB:TRIGger:EXECute</code>	53
<code>[:SOURce<hw>]:BB:DVB:TRIGger:EXTernal:SYNChronize:OUTPut</code>	54
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OBASeband:DELay</code>	54
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OBASeband:INHibit</code>	55
<code>[:SOURce<hw>]:BB:DVB:TRIGger:RMODE</code>	55
<code>[:SOURce<hw>]:BB:DVB:TRIGger:SLUNit</code>	56
<code>[:SOURce<hw>]:BB:DVB:TRIGger:SLEngth</code>	56
<code>[:SOURce<hw>]:BB:DVB:TRIGger:SOURce</code>	56
<code>[:SOURce<hw>]:BB:DVB:TRIGger[:EXTernal<ch>]:DELay</code>	57
<code>[:SOURce<hw>]:BB:DVB:TRIGger[:EXTernal<ch>]:INHibit</code>	57
<code>[:SOURce<hw>]:BB:DVB[:TRIGger]:SEQuence</code>	58

`[:SOURce<hw>]:BB:DVB:SRATe:VARiation <Variation>`

The command 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.

Parameters:

<code><Variation></code>	float
	Range: 400 Hz to 40 MHz
	*RST: 0.001 Hz

Example:

`BB:DVB:SRAT:VAR 40 MHz`
sets the output sample rate to 40 MHz.

`[:SOURce<hw>]:BB:DVB:TRIGger:ARM:EXECute`

The command stops signal generation for trigger modes "Armed Auto" and "Armed Retrigger". A subsequent internal or external trigger event restart signal generation.

Example:

`BB:DVB:TRIG:ARM:EXEC`
stops signal generation for trigger modes "Armed Auto" and "Armed Retrigger".

Usage:

Event

`[:SOURce<hw>]:BB:DVB:TRIGger:EXECute`

The command executes a trigger. The internal trigger source must be selected using the command `SOUR:BB:DVB:TRIG:SOUR INT` and a trigger mode other than "AUTO" must be selected using the command `SOUR:BB:DVB:TRIG:SEQ`.

Example: `BB:DVB:TRIG:SOUR INT`
 sets internal triggering.
 `BB:DVB:TRIG:SEQ RETR`
 sets Retrigger mode, i.e. every trigger event causes signal generation to restart.
 `BB:DVB:TRIG:EXEC`
 executes a trigger.

Usage: Event

[:SOURce<hw>]:BB:DVB:TRIGger:EXTernal:SYNChronize:OUTPut <Output>

(enabled for "Trigger Source" External)

Enables/disables output of the signal synchronous to the external trigger event.

For R&S SMBV instruments:

See also "[Sync. Output to External Trigger](#)" on page 35 for a detailed description of the applications of this setting.

Parameters:

<Output> 0 | 1 | OFF | ON

ON

The signal calculation starts simultaneously with the external trigger event but because of the instrument's processing time the first samples are cut off and no signal is outputted. After elapsing of the internal processing time, the output signal is synchronous to the trigger event.

OFF

The signal output begins after elapsing of the processing time and starts with sample 0, i.e. the complete signal is outputted. This mode is recommended for triggering of short signal sequences with signal duration comparable with the processing time of the instrument.

*RST: ON

Example: `BB:DVB:TRIG:SOUR EXT`
 sets external triggering.
 `BB:DVB:TRIG:EXT:SYNC:OUTP ON`
 enables synchronous output to external trigger

[:SOURce<hw>]:BB:DVB:TRIGger:OBASeband:DELay <Delay>

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

Parameters:

<Delay> float
 Range: 0 to 65 535 samples
 Increment: 1 sample
 *RST: 0

Example:

BB:DVB:TRIG:SOUR OBAS
 sets for path A the internal trigger executed by the trigger signal from the second path (path B).
 BB:DVB:TRIG:OBAS:DEL 50
 sets a delay of 50 symbols for the trigger.

[:SOURCE<hw>]:BB:DVB:TRIGGER:OBASband:INHIBIT <Inhibit>

The command 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.

Parameters:

<Inhibit> float
 Range: 0 to 67 108 863 samples
 Increment: 1 sample
 *RST: 0 samples

Example:

BB:DVB:TRIG:SOUR OBAS
 sets for path A the internal trigger executed by the trigger signal from the second path (path B).
 BB:DVB:TRIG:INH 200
 sets a restart inhibit for 200 samples following a trigger event.

[:SOURCE<hw>]:BB:DVB:TRIGGER:RMODE?

The command queries the current status of signal generation for all trigger modes with DVB-H modulation on.

Return values:

<Rmode> STOP | RUN
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:DVB:TRIG:ARM:EXECUTE (armed trigger modes only).

Example: BB:DVB:TRIG:SOUR EXT
sets external triggering via the TRIGGER 1 connector.
BB:DVB:TRIG:MODE ARET
selects the Armed_Retrigger mode
BB:DVB:TRIG:RMOD?
queries the current status of signal generation.
Response:
RUN
the signal is generated, an external trigger was executed.

Usage: Query only

[:SOURce<hw>]:BB:DVB:TRIGger:SLUNit <Slunit>

Defines the unit for the entry of the length of the signal sequence to be output in the "Single" trigger mode.

Parameters:

<Slunit> FRAME | SEQUENCE
*RST: SEQUENCE

Example: BB:DVB:TRIG:SLUN SEQ

[:SOURce<hw>]:BB:DVB:TRIGger:SLENGth <Slength>

The command defines the length of the signal sequence to be output in the "Single" trigger mode (SOUR:BB:DVB:SEQ SING). The unit is defined with command SOUR:BB:DVB:TRIG:SLUNit. It is then possible to output deliberately just part of the frame, an exact sequence of the frame, or a defined number of repetitions of the frame.

Parameters:

<Slength> float
Range: 0 to 2³²-1 (4 294 967 295) samples
*RST: 1 sequence length

Example: BB:DVB:SEQ SING
sets trigger mode Single.
BB:DVB:TRIG:SLUN FRAM
sets unit frames for the entry of sequence length.
BB:DVB:TRIG:SLEN 200
sets a sequence length of 200 frames. The current frame will be output 200 times after the next trigger event.

[:SOURce<hw>]:BB:DVB:TRIGger:SOURce <Source>

The command selects the trigger source.

Parameters:

<Source>

INTernal | EXTernal | BEXTernal | OBASeband

INTernal

Triggering is executed by means of the Trigger command :BB:DVB: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).

*RST: INTernal

Example:

```
BB:DVB:TRIG:SOUR EXT
```

executes triggering by means of the signal on the TRIGGER 1 connector.

[:SOURce<hw>]:BB:DVB:TRIGger[:EXTernal<ch>]:DELay <Delay>

The command 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.

Parameters:

<Delay>

float

Range: 0.0 to 65535.0

Increment: 1 sample

*RST: 0.0

Example:

```
BB:DVB:TRIG:SOUR EXT
```

sets an external trigger via the TRIGGER 1 connector.

```
BB:DVB:TRIG:DEL 50
```

sets a delay of 50 symbols for the trigger.

[:SOURce<hw>]:BB:DVB:TRIGger[:EXTernal<ch>]:INHibit <Inhibit>

The command 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.

Parameters:

<Inhibit> float
 Range: 0 to 67 108 863 samples
 Increment: 1 sample
 *RST: 0

Example:

BB:DVB:TRIG:SOUR EXT1
 selects an external trigger via the TRIGGER 1 connector.
 BB:DVB:TRIG:INH 200
 sets a restart inhibit for 200 samples following a trigger event.

[:SOURce<hw>]:BB:DVB[:TRIGger]:SEQuence <Sequence>

The command selects the trigger mode.

Parameters:

<Sequence> AUTO | RETRigger | AAUTo | ARETrigger | SINGLE

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:DVB: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:DVB: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:DVB:TRIG:SLen`). Every subsequent trigger event causes a restart.

*RST: AUTO

Example:

BB:DVB: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.

4.1.5 Marker Settings

This section lists the remote control commands, necessary to configure the markers.



The marker delay settings are available for R&S SMx and R&S AMU instruments only.

<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut:DELay:FIXed</code>	59
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:DELay</code>	59
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:DELay:MAXimum</code>	60
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:DELay:MINimum</code>	60
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:MODE</code>	60
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:OFFTime</code>	61
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:ONTime</code>	61
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PATTern</code>	61
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:DIVider</code>	62
<code>[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:FREQuency</code>	62

`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut:DELay:FIXed <Fixed>`

The command 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.

Parameters:

<Fixed> 0 | 1 | OFF | ON
 *RST: OFF

Example:

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

`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:DELay <Delay>`

The command defines the delay between the signal on the marker outputs and the start of the signal, expressed in terms of samples. Command `BB:DVB: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.

Parameters:

<Delay> float
 Range: 0 to (2²⁴ - 1) samples
 *RST: 0

Example:

`BB:DVB:TRIG:OUTP2:DEL 16000`
 sets a delay of 16000 samples for the signal on connector MARKER 2.

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:DELay:MAXimum?

The command queries the maximum marker delay for setting :BB:DVB:TRIG:OUTP:DEL:FIX ON.

Return values:

<Maximum> float

Example:

BB:DVB:TRIG:OUTP:DEL:FIX ON

restricts the marker signal delay setting range to the dynamic range.

BB:DVB:TRIG:OUTP:DEL:MAX?

queries the maximum of the dynamic range.

Response:

20000

the maximum for the marker delay setting is 20000 samples.

Usage: Query only

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:DELay:MINimum?

The command queries the minimum marker delay for setting :BB:DVB:TRIGger:OUTPut:DELay:FIXed ON.

Return values:

<Minimum> float

Example:

BB:DVB:TRIG:OUTP:DEL:FIX ON

restricts the marker signal delay setting range to the dynamic range.

BB:DVB:TRIG:OUTP:DEL:MIN?

queries the minimum of the dynamic range.

Response:

0

the minimum for the marker delay setting is 0 symbols.

Usage: Query only

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:MODE <Mode>

Defines the signal for the selected marker output.

Parameters:

<Mode> REStart | SFRAme | FRAMe | PULSe | PATTern | RATio | TRIGger | SFRAMe

REStart

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

SFRAMe

A marker signal is generated at the start of every super-frame period.

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.

*RST: REStart

Example:

```
BB:DVB:TRIG:OUTP2:MODE FRAME
selects the frame marker signal on output MARKER 2.
```

```
[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:OFFTime <Offtime>
```

```
[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:ONTime <Ontime>
```

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

Parameters:

<Ontime> float
 Range: 1 to 2²⁴-1 (16 777 215) samples
 Increment: 1 sample
 *RST: 1

Example:

```
BB:DVB:TRIG:OUTP2:ONT 2000
sets an ON time of 2000 samples for marker 2.
```

```
[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PATTern <Pattern>
```

The command defines the bit pattern used to generate the marker signal.

Parameters:

<Pattern> 32 bit pattern
 *RST: 0

Example: `BB:DVB:TRIG:OUTP2:PATT #H39FE0000,32`
sets the bit pattern.
`BB:DVB:TRIG:OUTP2:MODE PATT`
activates the marker signal according to a bit pattern on output MARKER 2.

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:DIVider <Divider>

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

Parameters:

<Divider> float
Range: 2 to 1024
Increment: 1
*RST: 0

Example: `BB:DVB:TRIG:OUTP2:PULS:DIV 2`
sets the divider for the marker signal on output MARKER 2 to the value 2.
`BB:DVB:TRIG:OUTP2:FREQ?`
queries the resulting pulse frequency of the marker signal.
Response:
66 000
the resulting pulse frequency is 66 kHz.

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:FREQuency?

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

Return values:

<Frequency> float

Example: `BB:DVB:TRIG:OUTP2:PULS:DIV 2`
sets the divider for the marker signal on output MARKER 2 to the value 2.
`BB:DVB:TRIG:OUTP2:MODE PULS`
enables the pulsed marker signal.
`BB:DVB:TRIG:OUTP2:FREQ?`
queries the resulting pulse frequency of the marker signal.
Response:
66 000
the resulting pulse frequency is 66 kHz.

Usage: Query only

4.1.6 Clock Settings

This section lists the remote control commands, necessary to configure the clock.



The clock settings are available for R&S SMx and R&S AMU instruments only.

<code>[:SOURce<hw>]:BB:DVB:CLOCK:MODE</code>	63
<code>[:SOURce<hw>]:BB:DVB:CLOCK:MULTiplier</code>	63
<code>[:SOURce<hw>]:BB:DVB:CLOCK:SOURce</code>	64
<code>[:SOURce<hw>]:BB:DVB:CLOCK:SYNChronization:EXECute</code>	64
<code>[:SOURce<hw>]:BB:DVB:CLOCK:SYNChronization:MODE</code>	65

`[:SOURce<hw>]:BB:DVB:CLOCK:MODE <Mode>`

The command enters the type of externally supplied clock (`BB:DVB: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:DVB: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.

Parameters:

`<Mode>` `SAMP | MSAMP`
 `*RST: SAMP`

Example:

`BB:DVB:CLOC:MODE MSAM`
 sets the type of externally supplied clock.

`[:SOURce<hw>]:BB:DVB:CLOCK:MULTiplier <Multiplier>`

The command specifies the multiplier for clock type "Multiple Sample" (`:BB:DVB: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.

Parameters:

`<Multiplier>` `float`
 `Range: 1 to 64`
 `Increment: 1`
 `*RST: 4`

Example: `BB:DVB:CLOC:SOUR EXT`
 selects the external clock source. The clock is supplied via the CLOCK connector.
`BB:DVB: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:DVB:CLOC:MULT 12`
 the multiplier for the external clock rate is 12.

[:SOURce<hw>]:BB:DVB:CLOCK:SOURce <Source>

The command selects the clock source.

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

Parameters:

<Source>

INTERNAL | EXTERNAL | AINTERNAL

INTERNAL

The internal clock reference is used.

EXTERNAL

The external clock reference is supplied to the CLOCK connector. Commands `:BB:DVB:CLOCK:MODE` and `:MULTIPLIER` are used to enter the type of the external clock.

*RST: INTERNAL

Example:

`BB:DVB:CLOC:SOUR EXT`
 selects the external clock source. The clock is supplied via the CLOCK connector.
`BB:DVB: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:DVB:CLOC:MULT 12`
 the multiplier for the external clock rate is 12.

[:SOURce<hw>]:BB:DVB:CLOCK:SYNCHRONIZATION:EXECute

Performs automatic adjustment of the instrument's settings required for the synchronization mode, set with the command `BB:DVB:CLOC:SYNC:MODE`.

Example:

`BB:DVB:CLOC:SYNC:MODE MAST`
 the instrument is configured to work as a master one.
`BB:DVB:CLOC:SYNC:EXEC`
 all synchronization's settings are adjusted accordingly.

Usage:

Event

[:SOURce<hw>]:BB:DVB:CLOCK:SYNChronization:MODE <Mode>

Selects the synchronization mode.

This parameter is used to enable generation of very precise synchronous signal of several connected R&S SMBVs.

Note:

If several instruments are connected, the connecting cables from the master instrument to the slave one and between each two consecutive slave instruments must have the same length and type.

Avoid unnecessary cable length and branching points.

Parameters:

<Mode>

NONE | MASTer | SLAVe

NONE

The instrument is working in stand-alone mode.

MASTer

The instrument provides all connected instrument with its synchronisation (including the trigger signal) and reference clock signal.

SLAVe

The instrument receives the synchronisation and reference clock signal from another instrument working in a master mode.

*RST: NONE

Example:

BB : DVB : CLOC : SYNC : MODE MAST

the instrument is configured to work as a master one.

4.2 System Configuration

This subsystem contains commands regarding the system configuration of the DVB signal.

[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:HMODE.....	66
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}[:HP LP]:DATA.....	66
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}[:HP LP]:DATA:DSELection.....	66
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}[:HP LP]:ICODer:RATE.....	67
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}[:HP LP]:ICODer[:STATe].....	67
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}[:HP LP]:OCODer[:STATe].....	67
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}[:HP LP]:OINTerleaver[:STATe].....	67
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}[:HP LP]:PNSCrambler[:STATe].....	68
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:IINTerleaver:BIT[:STATe].....	68
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:IINTerleaver:SYMBol:MODE.....	68
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:IINTerleaver:SYMBol:TMODE.....	68
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:IINTerleaver:SYMBol[:STATe].....	69
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:OFDM:ALPHa.....	69
[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:OFDM:BWIDth.....	69

[\[:SOURce<hw>\]:BB:DVB:{DVBH|DVBT}:OFDM:GINTerval.....69](#)
[\[:SOURce<hw>\]:BB:DVB:{DVBH|DVBT}:OFDM:MODulation.....69](#)

[:SOURce<hw>]:BB:DVB:{DVBH|DVBT}:HMODE <Hmode>

The command selects either to use one path or both path with different prioritization.

Note:

In this release only the non-hierarchical mode is available.

Parameters:

<Hmode> NHierarchical | NHIErarchical | HIERarchical | HIErarchical
 *RST: NHIErarchical

Example:

BB : DVB : DVBH : HMOD NHI
 selects the non-hierarchical mode to be used. Only path one is used, that is, no prioritization is necessary.

[:SOURce<hw>]:BB:DVB:{DVBH|DVBT}[:HP|LP]:DATA <Data>

The command selects the data source to be used.

Parameters:

<Data> PAC0 | PAC1 | PN15 | PN23 | DLISt
ZERO
 Internal 0 is used.
ONE
 Internal 1 is used.
PN15/23
 PRBS data as per CCITT with period lengths between 29-1 and 223-1 is generated internally.
DLISt
 Internal data from a TS file is used.
 *RST: PN23

Example:

BB : DVB : DVBH : HP : DATA PN23
 selects PN23 as data source.

[:SOURce<hw>]:BB:DVB:{DVBH|DVBT}[:HP|LP]:DATA:DSElection <Dselection>

The command selects the TS file for the data source selection.

The lists are stored as files with the fixed file extensions *.gts, *.ts, or *.trp 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.

Parameters:

<Dselection> string

Example: BB:DVB:DVBH:HP:DATA DLIS
selects the data list as the data source.
MMEM:CDIR '<root>\Lists\DVB\TestData'
selects the directory for the data lists.
BB:DVB:DVBH:HP:DATA:DSEL 'dvb_1'
selects the file dvb_1 as the data source. This file must be in the
directory <root>\Lists\DVB\TestData and have the file
extension *.gts, *.ts, or *.trp.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}[:HP|LP]:ICODer:RATE <Rate>

The command selects the code rate of the inner coder.

Parameters:

<Rate> CR1D2 | CR2D3 | CR3D4 | CR5D6 | CR7D8
*RST: CR12

Example: BB:DVB:DVBH:HP:ICOD:RATE CR1D2
sets the rate to CR1D2.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}[:HP|LP]:ICODer[:STATE] <State>

The command activates/deactivates the inner coder.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: ON

Example: BB:DVB:DVBH:HP:ICOD ON
activates the inner coder.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}[:HP|LP]:OCODer[:STATE] <State>

The command activates/deactivates the outer coder (RS).

Parameters:

<State> 0 | 1 | OFF | ON
*RST: ON

Example: BB:DVB:DVBH:HP:OCOD:STAT ON
activates the outer coder.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}[:HP|LP]:OINTerleaver[:STATE] <State>

The command activates/deactivates the outer interleaver.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: ON

Example: `BB:DVB:DVBH:HP:OINT ON`
activates the outer interleaver.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}[:HP|LP]:PNSCrambler[:STATE] <State>

The command activates/deactivates the PN scrambler.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: ON

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

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:IINTERleaver:BIT[:STATE] <State>

The command activates/deactivates the inner bit interleaver.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: ON

Example: `BB:DVB:DVBH:IINT:BIT ON`
activates the inner bit interleaver.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:IINTERleaver:SYMBOL:MODE <Mode>

The command selects the inner interleaver mode.

Parameters:

<Mode> NATive | NATive | IDEPth
NATive
The interleaver interleaves the bits over one OFDMA symbol.
IDEPth
The interleaver interleaves the bits over two (4K transmission mode) or four (2K transmission mode) OFDMA symbols.
*RST: NATive

Example: `BB:DVB:DVBH:IINT:SYMB:MODE NAT`
sets the inner interleaver mode to "Native".

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:IINTERleaver:SYMBOL:TMODE <Tmode>

The command selects the transmission mode.

Parameters:

<Tmode> T2K | T4K | T8K
*RST: T2K

Example: `BB:DVB:DVBH:IINT:SYMB:TMOD T2K`
sets the transmission mode to T2K.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:IINTERLEAVER:SYMBOL[:STATE] <State>

The command activates/deactivates the inner symbol interleaver.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: ON

Example: `BB:DVB:DVBH:IINT:SYMB ON`
activates the inner symbol interleaver.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:OFDM:ALPHA <Alpha>

The command selects the α value. This value is used to shape the constellation of the modulation. For DVB-H, this value is always 1.

Parameters:

<Alpha> 1 | 2 | 4
*RST: 1

Example: `BB:DVB:DVBH:OFDM:ALPH 1`
sets the α value to 1.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:OFDM:BWIDTh <Bwidth>

The command selects the system bandwidth.

Parameters:

<Bwidth> 5 | 6 | 7 | 8
*RST: 8 MHz

Example: `BB:DVB:DVBH:OFDM:BWID 8`
sets the OFDM bandwidth to 8 MHz.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:OFDM:GINTerval <Ginterval>

The command selects the OFDM/RF guard interval.

Parameters:

<Ginterval> GI1D4 | GI1D8 | GI1D16 | GI1D32
*RST: GI1D8

Example: `BB:DVB:DVBH:OFDM:GINT GI1D8`
sets the OFDM guard interval to 1/8 of the symbol period.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:OFDM:MODulation <Modulation>

The command selects the constellation for the OFDM modulation.

Parameters:

<Modulation> QPSK | QAM16 | QAM64
 *RST: QPSK

Example:

BB : DVB : DVBH : OFDM : MOD QAM16
 selects 16-QAM as the constellation for the OFDM modulation.

4.3 TPS Settings

This subsystem contains commands regarding the TPS settings of the DVB signal.

[:SOURce<hw>]:BB:DVB:{DVBH DVBT}:TPS:ID:PATtern.....	70
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[:SOURce<hw>]:BB:DVB:{DVBH|DVBT}:TPS:ID:PATtern <Pattern>

The command sets the pattern for cell identification.

Parameters:

<Pattern> integer
 Range: 0000 to FFFF
 *RST: 0000

Example:

BB : DVB : DVBH : TPS : ID : PATT 0000
 sets the cell identification to 0000.

[:SOURce<hw>]:BB:DVB:{DVBH|DVBT}:TPS:ID:STATe <State>

The command activates/deactivates the TPS cell identification.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: ON

Example:

BB : DVB : DVBH : TPS : ID : STAT ON
 activates the TPS cell identification.

[:SOURce<hw>]:BB:DVB:{DVBH|DVBT}:TPS:MFEc[:STATe] <State>

The command activates/deactivates the multiprotocol encapsulation forward error correction bit.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: ON

Example: `BB:DVB:DVBH:TPS:MFEC:STAT ON`
activates the multiprotocol encapsulation forward error correction bit.

[:SOURCE<hw>]:BB:DVB:{DVBH|DVBT}:TPS:TSLicing[:STATE]?

The command queries the state of the time-slicing bit. Time slicing is always on for DVB-H and always off for DVB-T.

Return values:

<State> 0 | 1 | OFF | ON

Example: `BB:DVB:DVBH:TPS:TSL?`
queries the state of the time-slicing.

Usage: Query only

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