



ROHDE & SCHWARZ

Test and Measurement
Division

Software Manual

Software for Phase Noise Measurement

**for R&S FSQ, R&S FSU, R&S FSP, R&S ESPI, R&S
FSIQ, R&S ESIB and R&S FSE with R&S FSE-B15 or
external PC with WINDOWS**

R&S FS-K4

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Dear Customer,

throughout this manual FSQ, FSU, FSP, ESPI, FSE, FSIQ and ESIB is generally used as an abbreviation for the instruments R&S FSQ, R&S FSU, R&S FSP, R&S FSEA, R&S FSEB, R&S FSEK, R&S FSEM, R&S ESPI, R&S FSIQ, and R&S ESIB. The Software for Phase Noise Measurement R&S FS-K4 is abbreviated as FS-K4.



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



Safety Instructions

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

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

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

Symbols and safety labels

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

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

Safety Instructions

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

Tags and their meaning

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| DANGER | This tag indicates a definite hazard carrying a high risk of death or serious injury if not avoided. |
| WARNING | This tag indicates a possible hazard carrying a medium risk of death or (serious) injury if not avoided. |
| CAUTION | This tag indicates a hazard carrying a low risk of minor or moderate injury if not avoided. |
| ATTENTION | This tag indicates the possibility of incorrect use that can cause damage to the product. |
| NOTE | This tag indicates a situation where the user should pay special attention to operating the product but which does not lead to damage. |

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

Basic safety instructions

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

Safety Instructions

4. If products/components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.
6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer/operator is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
8. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.
10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.
12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.
13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, this can result in sparks, fire and/or injuries.
15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
16. For measurements in circuits with voltages $V_{\text{rms}} > 30 \text{ V}$, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
18. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.

Safety Instructions

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



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



Informaciones de seguridad

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los standards de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestra sección de gestión de la seguridad de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el comprobante de conformidad adjunto según las normas de la CE y ha salido de nuestra planta en estado impecable según los standards técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las informaciones, 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 solamente fue elaborado para ser utilizado en la industria y el laboratorio o para fines de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda ser dañada. El uso del producto fuera de sus fines definidos o despreciando las informaciones de seguridad del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado dentro de las instrucciones de la correspondiente documentación de producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos profundos y conocimientos parciales del idioma inglés. Por eso se deberá tener en cuenta de exclusivamente autorizar para el uso del producto a personas peritas o debidamente minuciosamente instruidas con los conocimientos citados. Si fuera necesaria indumentaria de seguridad para el uso de productos de R&S, encontrará la información debida en la documentación del producto en el capítulo correspondiente.

Símbolos y definiciones de seguridad

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

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

Informaciones de seguridad

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

Palabras de señal y su significado

| | |
|-------------|--|
| PELIGRO | Identifica un peligro directo con riesgo elevado de provocar muerte o lesiones de gravedad si no se toman las medidas oportunas. |
| ADVERTENCIA | Identifica un posible peligro con riesgo medio de provocar muerte o lesiones (de gravedad) si no se toman las medidas oportunas. |
| ATENCIÓN | Identifica un peligro con riesgo reducido de provocar lesiones de gravedad media o leve si no se toman las medidas oportunas. |
| CUIDADO | Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo. |
| INFORMACIÓN | Indica una situación en la que deberían seguirse las instrucciones en el uso del producto, pero que no consecuentemente deben de llevar a un daño del mismo. |

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

Informaciones de seguridad elementales

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

Informaciones de seguridad

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

Informaciones de seguridad

12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).
14. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.
16. En las mediciones en circuitos de corriente con una tensión de entrada de $U_{\text{eff}} > 30 \text{ V}$ se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos de la EC950/EN60950.
18. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.
19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.
21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir corto circuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
23. Los productos R&S no están protegidos contra el agua si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente para el usuario o de daños en el producto lo cual también puede llevar al peligro de personas.
24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

Informaciones de seguridad

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

Certified Quality System

DIN EN ISO 9001 : 2000

DIN EN 9100 : 2003

DIN EN ISO 14001 : 2004

DQS REG. NO 001954 QM UM

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Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Managementsystems entwickelt, gefertigt und geprüft.

Das Rohde & Schwarz Managementsystem ist zertifiziert nach:

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DIN EN ISO 14001:2004

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ROHDE & SCHWARZ

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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.

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- ◆ National Websites

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A full description of each menu command and dialogue box.

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Qualitätszertifikat

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde & Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO 9001 und ISO 14001 zertifiziert.

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ROHDE & SCHWARZ

Support Center

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Fax: +49 89 41 29 137 77

E-mail: CustomerSupport@rohde-schwarz.com

Für technische Fragen zu diesem Rohde & Schwarz-Gerät steht Ihnen die Hotline der Rohde & Schwarz Vertriebs-GmbH, Support Center, zur Verfügung.

Unser Team bespricht mit Ihnen Ihre Fragen und sucht Lösungen für Ihre Probleme.

Die Hotline ist Montag bis Freitag von 8.00 bis 17.00 Uhr MEZ besetzt.

Bei Anfragen außerhalb der Geschäftszeiten hinterlassen Sie bitte eine Nachricht oder senden Sie eine Notiz per Fax oder E-Mail. Wir setzen uns dann baldmöglichst mit Ihnen in Verbindung.



Um Ihr Gerät stets auf dem neuesten Stand zu halten, abonnieren Sie bitte Ihren persönlichen Newsletter unter

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Sie erhalten dann regelmäßig Informationen über Rohde & Schwarz-Produkte Ihrer Wahl, über Firmware-Erweiterungen, neue Teiler und Applikationsschriften.

Should you have any technical questions concerning this Rohde & Schwarz product, please contact the hotline of Rohde & Schwarz Vertriebs-GmbH, Support Center.

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You can reach the hotline Monday through Friday from 8:00 until 17:00 CET.

If you need assistance outside office hours, please leave a message or send us a fax or e-mail. We will contact you as soon as possible.



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As a subscriber, you will receive information about your selection of Rohde & Schwarz products, about firmware extensions, new drivers and application notes on a regular basis.



ROHDE & SCHWARZ

1 Installation Instructions

The following paragraphs describe how to install the FS-K4 software for phase noise measurement, and how to remove it.

For a step-by-step introduction to using the product please see the section entitled "How to use FS-K4" in this manual, or on-line help.

Installing FS-K4 on PCs

FS-K4 is designed to work with Windows 9x (95, 98 and ME), Windows NT, Windows 2000 and Windows XP. Please make sure that one of these operating systems is installed before continuing.

To control your Spectrum Analyzer from a PC using FS-K4, you must first install a GPIB interface card in your computer, and then connect the PC and Spectrum Analyzer using a GPIB Cable. FS-K4 supports the following cards:

| Supplier | Model |
|----------------------|--|
| Rohde & Schwarz | PS-B4 model 04 |
| National Instruments | PCI/IIA, AT-GPIB/TNT (PnP), AT-GPIB/TNT, PCI-GPIB, PCMCIA-GPIB |

Rohde & Schwarz cannot guarantee or provide support for FS-K4 when used with any other manufacturer's GPIB interface products.

Before running FS-K4 please use the setup and self-test software, supplied with the card, to ensure that all driver settings are set to their default 'factory' condition, and that the board is functioning correctly. Please consult the documentation supplied with the card to learn how to do this.

FS-K4 Software Setup

To install FS-K4, proceed as follows:

1. Start Microsoft Windows

It is strongly recommended that you exit all Windows programs that may be running now. This includes anti-virus software, office suite toolbars, information management software, etc. If you want to check the Setup disks for viruses, do it now and then exit the anti-virus software.

2. Insert the installation disk in drive A.
3. Click the Start button, and then click Run.
4. Type a:\setup and press ENTER.

A message box will appear announcing that, "FS-K4 Setup is preparing the InstallShield® Wizard which will guide you through the rest of the setup process."

5. The Welcome screen will then appear, reminding you once again to exit all Windows programs in case they interfere with the Setup process. If necessary choose the Cancel button, exit any Windows programs, and go back to step 2. Otherwise, choose the Next button to continue.
6. Setup will then ask where you want to install FS-K4. It will suggest a default location, but you may change this if required by choosing the Browse button and selecting a new destination. Choose the Next button to continue.

7. Setup will then copy files from the Setup Disks to your hard disk.

Files are copied into the Windows System directory as well as the destination you selected for FS-K4. Some of these files may already be present on your hard drive, in which case the Setup Disk's file is only copied if it is newer than the Hard Drive's file. During this process, three gauges will show: the progress of each file as it is copied, the progress of each disk, and how much space is available on the destination drive.

Once all files have been copied, a new Start menu folder, called FS-K4, will be created containing the following shortcuts:



FS-K4 - runs the application



Help - displays the on-line help without running the application

8. Finally, a message box will be displayed informing you that the installation is complete. Press the Finish button to exit Setup.

9. Don't forget to re-start your anti-virus software once installation is complete.

Removing the Software

If at any time you need to remove FS-K4 from your PC or Spectrum Analyzer, simply follow the instructions below.

1. Start Microsoft Windows,
2. Click *Start*,
3. Point to *Settings*,
4. Click to *Control Panel*,
5. Double-click *Add/Remove Programs*,
6. Select FS-K4 in the list of programs that can be automatically removed
7. Click *Add/Remove*
8. Follow the instructions presented by the UNinstallShield® Wizard.

Installing FS-K4 on FSIQ, ESIB and FSE with FSE-B15 Option

If your spectrum analyzer (FSIQ, ESIB or FSE with FSE-B15) is suitably configured, no external PC will be required for phase noise measurements and your analyzer will constitute an independent phase noise test set.

FS-K4 is designed to work with firmware version 2.x or higher. If your Spectrum Analyzer is fitted with an earlier version, please ask your Rohde & Schwarz representative to arrange for an upgrade.

If you want to run FS-K4 on your FSE Spectrum Analyzer, you must have the FSE-B15 Computer Option fitted. If you do not already have this option, please ask your Rohde & Schwarz representative for details.

The installation of the FS-K4 described below requires the administrator login. The user name is "Administrator", the password for the administrator login is 894129 for the instrument.

On power-up following the installation under the administrator identification, the NT login window is displayed (no autologin). The user name entry is to be replaced by "instrument" and "instrument" as the according password. This change re-enables the autologin.

FS-K4 Software Setup

To install FS-K4 on the FSIQ, ESIB or FSE with FSE-B15 option proceed as follows:

1. First connect the keyboard and mouse, and turn on the spectrum analyzer
2. Wait until the spectrum analyzer has initialized
3. Press the ALT and Print Screen/Sys Rq keys together. The analyzer display will switch to computer mode, showing the Windows screen
4. Insert the installation disk in drive A.
5. Now follow the same instructions as described in "Installing FS-K4 on PCs" sub-section "FS-K4 Software Setup" from step 3.

Note: *You can switch the display back to Spectrum Analyzer mode, by pressing ALT + Print Screen again.*

Installing FS-K4 on FSQ, FSU, FSP or ESPI Analyzers running Windows NT

If your FSQ, FSU, FSP or ESPI analyzer is suitably configured, no external PC will be required for phase noise measurements and your analyzer will constitute an independent phase noise test set.

To install and operate the FS-K4 software a PS/2 keyboard is necessary e.g. PSP-Z2 (Order No. 1091.4100.02). When using other type of keyboards without built-in roll-key it is recommended to connect a PS/2 mouse to the rear of the analyzer. Do not connect keyboard and mouse with the power switched on.

Prior to the installation of FS-K4 the internal connections between FS-K4 and the analyzer must be ensured:

- **Installation of network card driver** (with built-in option FSP-B16 this is already included in the installation of option)
- **Installation of TCP/IP network protocol**
- **Installation of RSIB interface libraries.**

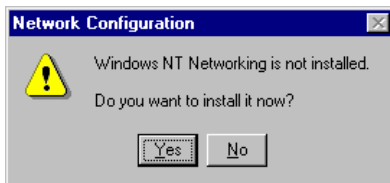
Note: *The WINDOWS NT files required for the installation of network drivers, protocols and services are located in the "C:\V386" directory.*

Installation of the network card driver for analyzers without the LAN interface option

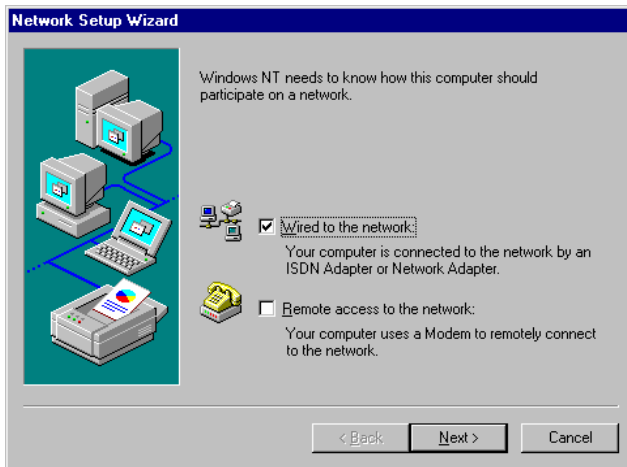
The basic prerequisite for the installation of the TCP/IP protocol is that a network card driver is built in. In the absence of such a card a so-called loopback adapter takes over for the missing function. The adapter is part of the Windows NT.

The installation procedure is as follows after the power-up of the analyzer and start of the firmware:

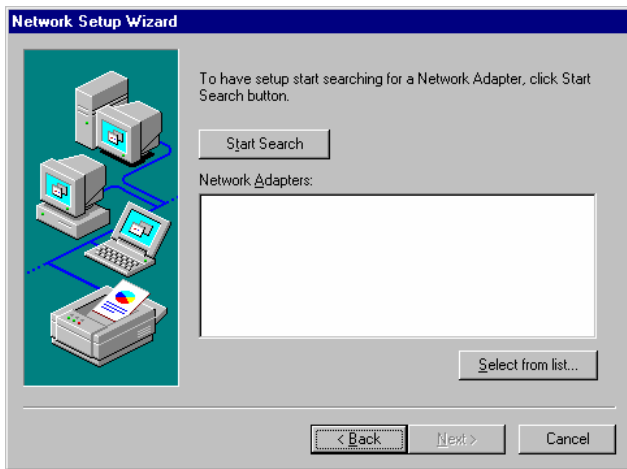
- Open the start menu of Windows NT with the key combination <CTRL>-<ESC> .
- Select menu items SETTINGS – CONTROL PANEL – NETWORK.



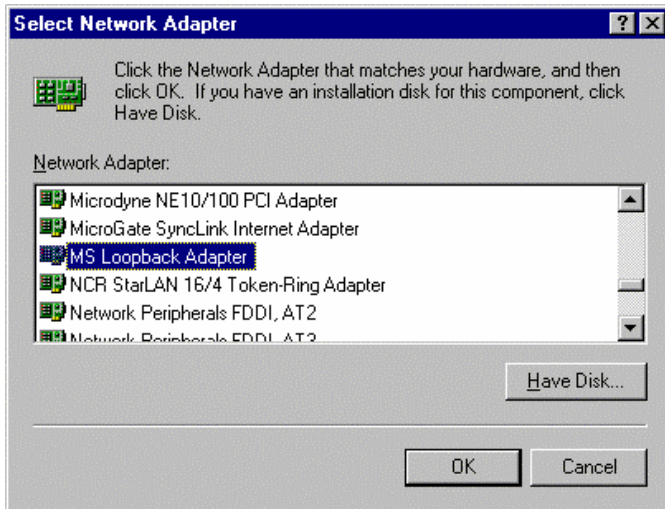
-
- Answer the question "Do you want to install it now?" with "Yes".
-



- Leave the presetting "Wired to the network" unchanged and confirm with "NEXT".

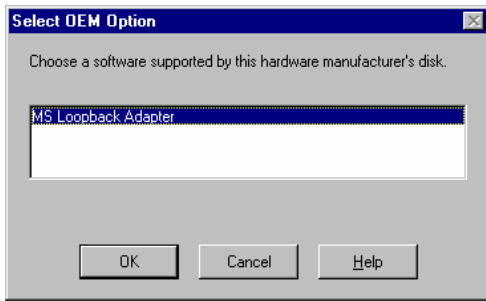


- Choose a network card by clicking "Select from list".

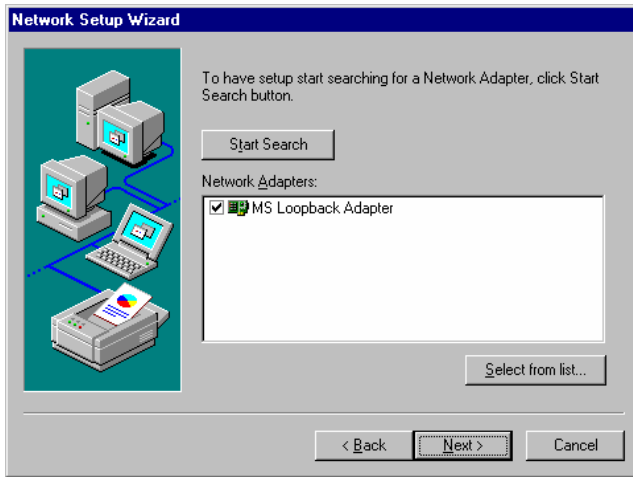


The OEM options appear.

- Click MS Loopback Adapter and confirm with OK.

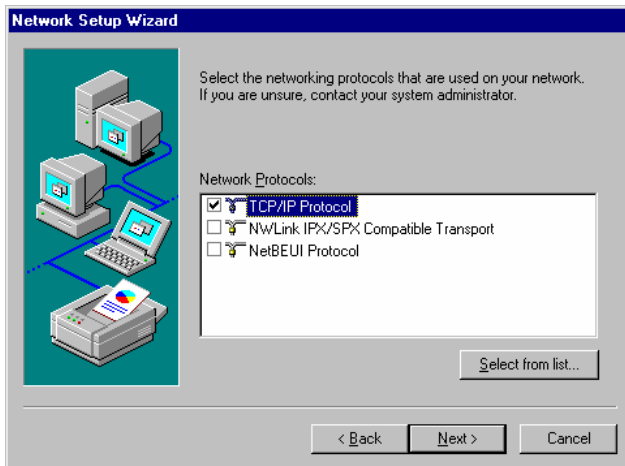


- If "Loopback" has already been selected, this select box appears:
- Confirm "MS Loopback Adapter" with "OK".



- Leave dialog with "MS Loopback Adapter" selected using "NEXT".

Installation of TCP/IP network protocol

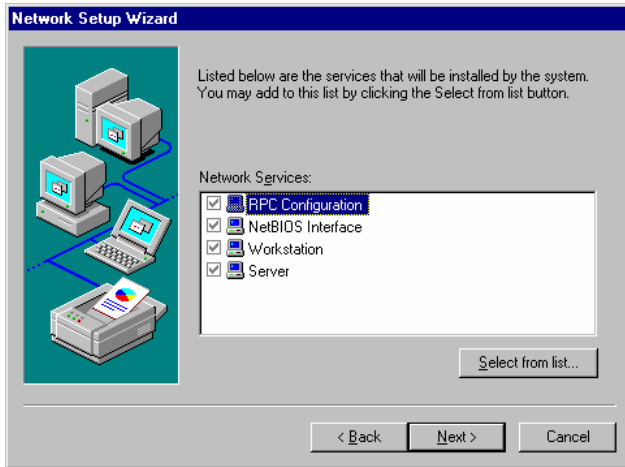


- Select TCP/IP protocol and confirm with "NEXT".

Selection of network services

To be able to use the network resources it is necessary to install the corresponding services.

Note: *The network administrator knows which services are to be installed.*



➤ The selected services cannot be changed when installing for the first time.

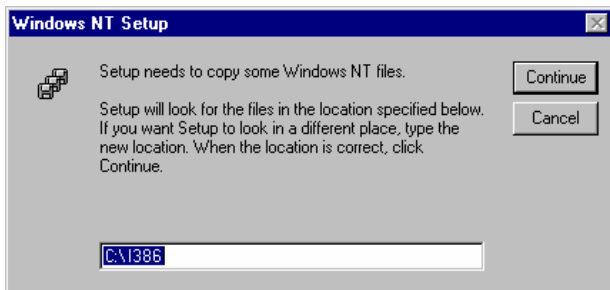
Further services may be added after the installation.

➤ Continue with "NEXT".

Termination of the installation

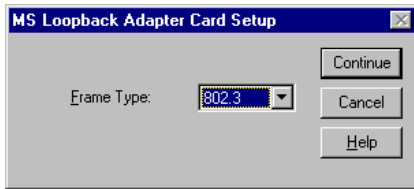


➤ Initiate installation by clicking "NEXT".



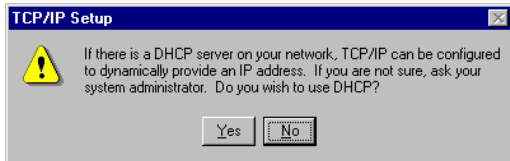
➤ Enter drive "C:\I386" and click "Continue".

A message box for selecting the frame type is opened.



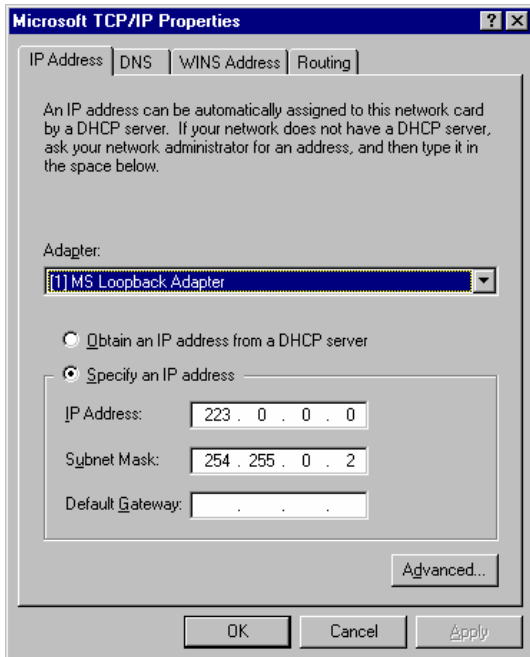
- Select Frame Type "802.3" and confirm with "Continue".

The dialog for selecting the TCP/IP properties is opened.



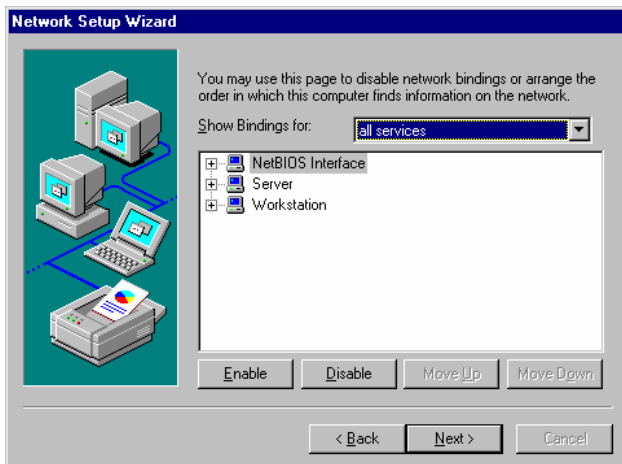
- Answer the question on the use of DHCP with "No".

The TCP/IP protocol is now installed.

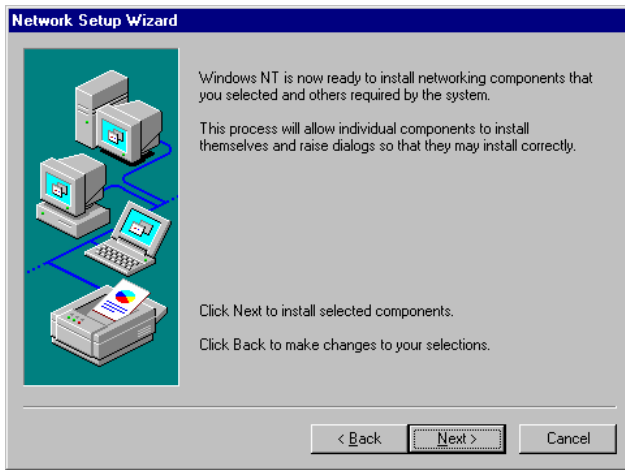


- Do not change the selection of "Adapter".
- Click "Specify an IP address".
- Enter IP address "223 . 0 . 0 . 0" and Subnet Mask "254 . 255 . 0 . 2".
- Leave dialog with OK.

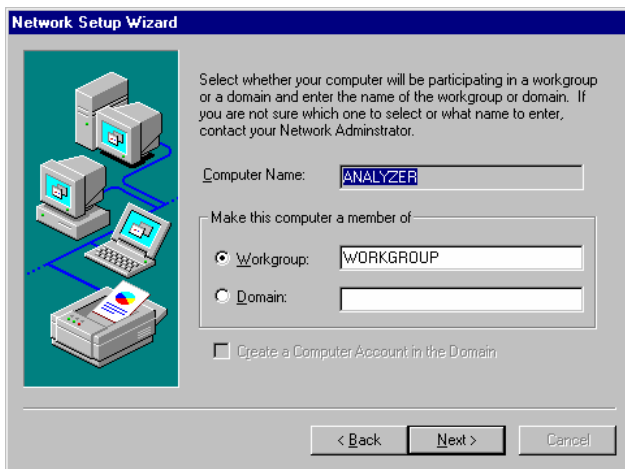
The Network Bindings display is opened.



- Do not change the setting and leave dialog with "Next".



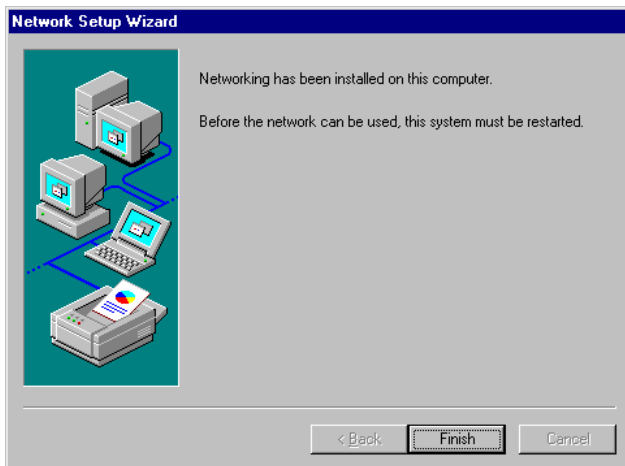
- Initiate the installation by clicking "Next".



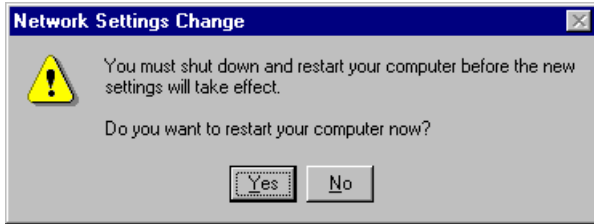
- The preset computer and workgroup names "ANALYZER" and "WORKGROUP" can be confirmed with "NEXT".

Note:

The computer name in Windows network must be unambiguous.



- Terminate installation by clicking "Finish".

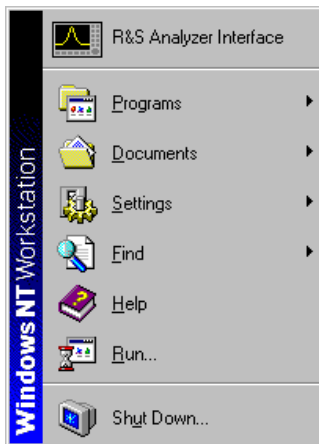


- Answer the query "You must shutdown..." with "No" since after the installation of the network driver the "Service Pack 5" from Windows NT must be installed again.

- Close Control Panel by entering <ALT><F4>.

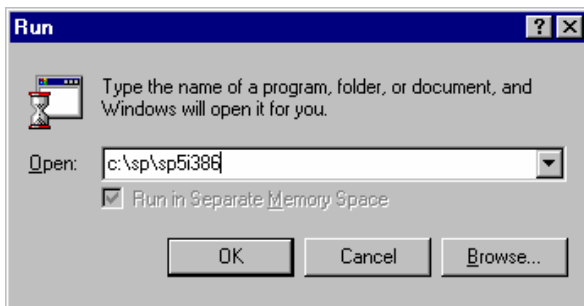
Re-installation of Service Pack

The installation of the Service Pack has to be repeated to avoid error messages "One or more services could not be started..." occurring during booting.



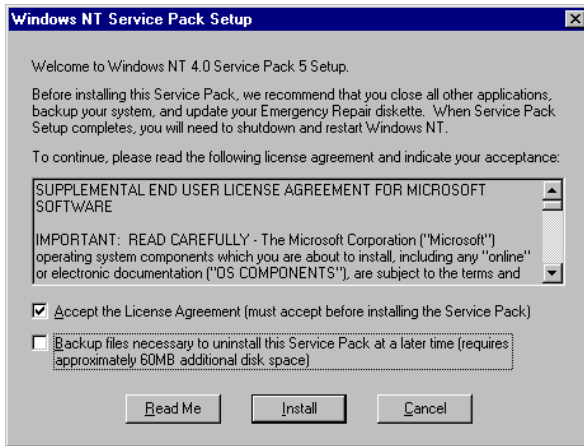
- Open the start menu of Windows NT with the key combination <CTRL><ESC>.
- Select item "RUN".

The input field for the program to be executed appears.



- Enter the command "C:\SP\SP5i386" conclude with OK.

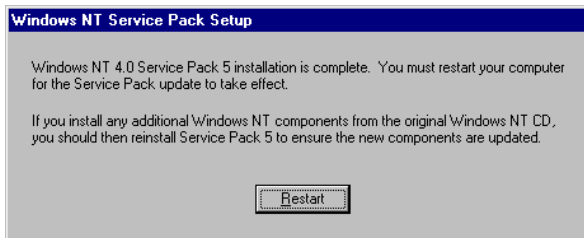
The installation of the Service Pack begins with the unpacking of the associated files.



- Answer the question on user license agreement with "Accept the License Agreement..."
- Remove marking at "Backup files necessary..." and conclude with "Install".

The files of the Service Pack are now installed.

Note:
Backup of the files replaced by the Service Pack is not required.



Once the installation is complete the request for restarting the instrument appears.

- Click the "Restart" button.

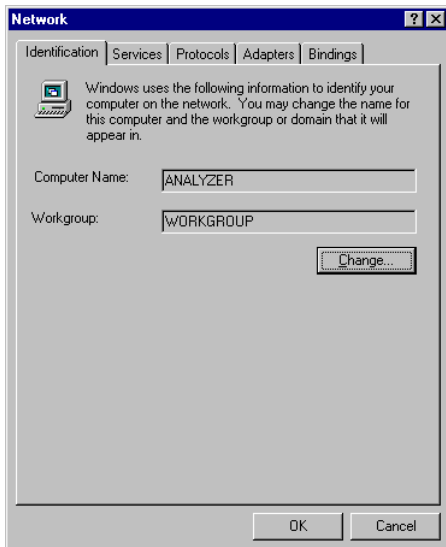
The instrument carries out a restart.

The installation of the network card driver is thus completed. Next, the FS-K4 software must be installed (see chapter "FS-K4 Software Setup on FSQ, FSU, FSP or ESPI").

Installation of the network driver for instruments with the LAN interface option

If the FSP-B16 option is built into the instrument, the basic condition for operating the FS-K4 is already effective. What remains to do is to ensure that the TCP/IP protocol has a correct configuration:

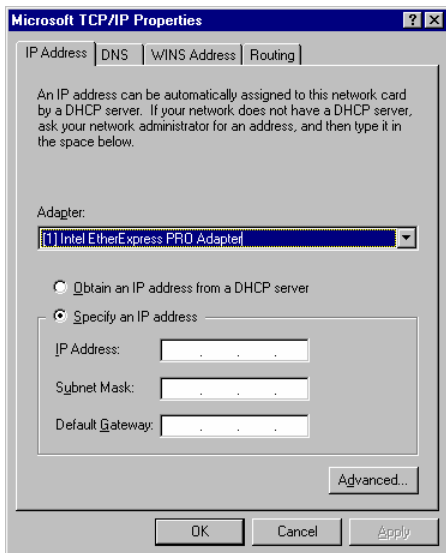
- Open the start menu of Windows NT with the key combination <CTRL>-<ESC>.
- Select menu items **SETTINGS – CONTROL PANEL – NETWORK.**



- Select the tag "Protocols".

The "Network Setup Wizard" appears.

- Select "TCP/IP Protocol".



- Leave the selection "Adapter" unchanged.
- Click "Specify an IP address".
- Enter the IP Address and Subnet Mask assigned to the instrument. This address is given by the network administrator.
- Leave dialog with OK.

FS-K4 Software Setup

- Insert the program diskette in drive A.
- Open the Windows NT start menu with <CTRL><ESC> and select "RUN".
- Enter the command "A:\SETUP" and terminate it with <ENTER> or by clicking "OK". The installation program of the FS-K4 is started and takes you through the subsequent installation.
- Follow the installation instructions on the screen.
- After the installation is completed, close the FS-K4 program group with <ALT><F4>.
- Open the Windows NT Explorer (via the start menu, see above) and copy the files D:\R_S\INSTR\RSIB\RSIB.DLL and D:\R_S\INSTR\RSIB\RSIB32.DLL into the directory C:\WINNT\SYSTEM32.
- Close the Windows NT Explorer with <ALT><F4>.

Starting FS-K4

- Open the Windows NT start menu with <CTRL><ESC>.
- Start FS-K4 by selecting the sequence PROGRAMS – FS-K4 – FS-K4 with the cursor or mouse (terminate entry with <ENTER> when using the cursor keys).
- FS-K4 is started and its window is opened.

Switchover of screen between FS-K4 and analyzer

- Press the key combination <ALT><TAB>, if necessary several times, to select "R&S Analyzer Interface" or "FS-K4"

Closing FS-K4

- Select the **Exit** command from the **File** menu or press the key combination <ALT><F4>.

Before the program is shut down, you are given the opportunity to save all settings including test results. If you would like to save, click the button Yes.
Software FS-K4 is thus closed down.

Installing FS-K4 on FSQ, FSU, FSP or ESPI Analyzers running Windows XP

To install and operate the FS-K4 software a PS/2 keyboard is necessary e.g. PSP-Z2 (Order No. 1091.4100.02). When using other type of keyboards without built-in roll-key it is recommended to connect a PS/2 mouse to the rear of the analyzer. Do not connect keyboard and mouse with the power switched on.

Prior to the installation of FS-K4 there are no additional steps necessary since the instruments are preconfigured to work with the FS-K4 software.

FS-K4 Software Setup

- Insert the program diskette in drive A.
- Open the Windows XP start menu with <CTRL><ESC> and select "RUN".
- Enter the command "A:\SETUP" and terminate it with <ENTER> or by clicking "OK". The installation program of the FS-K4 is started and takes you through the subsequent installation.
- Follow the installation instructions on the screen.
- After the installation is completed, close the FS-K4 program group with <ALT><F4>.

Starting FS-K4

- Open the Windows XP start menu with <CTRL><ESC>.
- Start FS-K4 by selecting the sequence ALL PROGRAMS – FS-K4 – FS-K4 with the cursor or mouse (terminate entry with <ENTER> when using the cursor keys).
- FS-K4 is started and its window is opened.

Switchover of screen between FS-K4 and analyzer

- Press the key combination <ALT><TAB>, if necessary several times, to select "R&S Analyzer Interface" or "FS-K4".

Closing FS-K4

- Select the **Exit** command from the **File** menu or press the key combination <ALT><F4>.

Before the program is shut down, you are given the opportunity to save all settings including test results. If you would like to save, click the button Yes.

Software FS-K4 is thus closed down.

2 How to Use FS-K4

When measuring with FS-K4 there are three basic steps to work through:

1. Creating an Analyzer Setup, i.e., defining the sweep parameters and, if required, the limit line (p23),
2. Making a Measurement, i.e., performing the sweep, analyzing and storing the results (p27),
3. Generating a Report (p29)

Creating an Analyzer Setup

A complete Analyzer Setup consists of the following components:

1. Sweep Setup Defines how each measurement should be made such as signal frequency and level, offset start and stop frequencies, display reference level and range, and report configuration.
2. Limit Line Defines the maximum allowed noise level for each frequency in the measurement band.

In order to make a measurement you must have a Sweep Setup, however the Limit Line is optional. You can load these components using any combination of the following methods:

1. Creating New Setup Files (p23)
2. Loading an Existing File (p25)

Once you have assembled and activated the necessary files in memory you can store the complete Analyzer Setup for later re-use, see Saving a File (p26).

Creating New Setup Files

Before starting to make measurements with FS-K4 you should build a library of setup files. Sweep Setup files are dependent on Limit Line files, so you should create them in the order shown below.

1. Creating a New Limit Line (p23)
2. Creating a New Sweep Setup (p24)

Each Sweep Setup file will also contain an embedded copy of any Limit Line file that it uses.

Note: *When measurement results are saved, copies of all the files used to make the measurement are stored in the result data file. In this way future examination of results will remain independent of any setup file modifications that occur after a measurement is made.*

Creating a New Limit Line

To create a new limit line:

1. Choose New (p31) from the file menu.
2. Select Limit Line in the New box.
3. If you want to base the new limit on an existing one, choose a file name in the Template box. To help you, the description of the selected file name is displayed in the Description box.
4. Otherwise if want to create a new limit from scratch, choose none in the Template box.
5. Choose the OK button to load the selected template and open the Limit Line (p39) editor.
6. If you have chosen to work with a template file, it will be displayed in the editor. Otherwise, the editor will be empty.

7. First, enter a name for the new limit line in the Name box. This name is used to create the file name for the limit when stored to disk. Thus it is restricted to eight characters in length and may consist only of characters which may be used in a DOS file name.
8. Now enter limit line samples into the Values table entry box.
9. To enter a new frequency in the left hand column of the table, move the highlight to the correct cell and type the new value. To specify a unit of measurement, append Hz, kHz, MHz or GHz to the value. In each case, the first letter is sufficient in either upper or lower case. To accept the new value either click on the tick button, or press the TAB key, or press the ENTER key. To reject the new value and retain the old one either click on the cross button, or press the ESCAPE key.

Note: *The ENTER and ESCAPE only behave as described above when the insertion point appears in the value entry box to the right of the tick button. Normally, the ENTER key corresponds to the highlighted button and the ESCAPE key corresponds to the Cancel button.*

1. To enter a new level in the right hand column, simply move to the correct row, type the value in dBc/Hz and accept it. There is no need to enter the unit of measurement.
2. You must enter at least two samples in ascending order of frequency with the lowest frequency at the top of the table. The total number of samples entered is shown by the Samples field.
3. If you enter an illegal or out-of-range value, a message will be displayed in the Status Bar (p54) showing the range of acceptable values
4. If you did not load a template file, choose the Activate button to turn the limit line on.
5. Finally, choose the OK button to confirm the new limit line.

You can store the new limit line for later re-use, see Saving a File (p26).

Creating a New Sweep Setup

To create a new Sweep setup:

1. Choose New (p31) from the file menu.
2. Select Analyzer Setup in the New box.
3. If you want to base the new setup on an existing one, choose a file name in the Template box. To help you, the description of the selected file name is displayed in the Description box.
4. Otherwise if you want to create a new setup from scratch, choose none in the Template box
5. Choose the OK button to load the selected template and open the Sweep Setup (p35) editor.
6. If you have chosen to work with a template file, it will be displayed in the editor. Otherwise, the editor will be pre-set to the default setup for the current Analyzer type.
7. First choose the Analyzer type and options with which the new setup will be used. This controls the range of frequencies that may be used, and the availability of FFT Filters..
8. Enter the frequency of the carrier you wish to measure in the Signal Frequency box. You can specify the unit by appending GHz, kHz, MHz or GHz. In each case, the first letter is sufficient in either upper or lower case.
9. In the Signal Level box, enter the magnitude of the carrier in dBm. This value is used to set the analyzer reference level.
10. If you do not know the precise frequency of the carrier you wish to measure, select the Verify Signal Frequency and Level box. This enables a search, within a defined frequency tolerance range relative to the specified Signal Frequency, for the carrier of greatest magnitude. The frequency and level of this carrier are then accurately measured. If the resultant level is less than the specified Signal Level less a defined Level Tolerance, the measurement is aborted. Otherwise, the resultant frequency is used in place of the specified Signal Frequency, and the measured level is used to set the analyzer reference level, overriding the value specified in the Signal Level box.
11. If enabled, enter a value in the Frequency Tolerance box. This defines the offset, either side of the specified Signal Frequency, within which the carrier is guaranteed to be. FS-K4 will search for a carrier between Signal Frequency - Frequency Tolerance and Signal Frequency + Frequency Tolerance.

- 12.If enabled, enter a value in the Level Tolerance box. This defines the offset relative to the specified Signal Level above which the carrier is guaranteed to be.
- 13.The Minimum Offset and Maximum Offset boxes allow you to select the range of frequencies to measure. Each contains a list of positive offsets from the carrier. The Maximum Offset must be greater than the Minimum Offset, and the Signal Frequency + Maximum Offset must be less than or equal to the maximum frequency of the analyzer.
- 14.The Maximum Level and Level Range boxes refer to FS-K4's Graph rather than the analyzer display. The Maximum Level is specified in dBc/Hz since the displayed data is normalized to the carrier level.
- 15.The trace may be offset by a fixed number of dBs entered in the Trace Offset box.
- 16.Optionally the trace may also be smoothed by calculating the average of samples in a sliding window, see Smoothing Window in Sweep Setup (p35) for details.
- 17.Choose the Report button to display the Report Setup (p37) dialogue box. This allows you to set initial values for various report text fields, and select which elements of the report to include. Once these values are set, choose the OK button to accept any changes
- 18.In special circumstances you can further optimize the measurement by modifying the parameters shown in the Advanced Sweep Setup (p37) dialogue box. To open this choose the Advanced button, then once new values have been set, choose the OK button to accept any changes.
- 19.Choose the OK button in the Sweep Setup dialogue box to confirm the new Sweep setup.

Loading an Existing File

To load an existing file from disk:

1. Choose Open (p31) from the file menu.
2. If you wish to load a file from a default directory, as defined in the Default Paths (p48) dialogue box, check the Jump to default directories box.
3. Otherwise, make sure that this box is unchecked.
4. Select the type of file you wish to load in the List Files of Type box.
5. If Jump to default directories is checked, FS-K4 will automatically display the contents of the chosen file type's default directory and you should skip steps 4 and 5.
6. Select the drive containing the file you want to load in the Drives box.
7. Select the directory containing the file you want to load in the Directories box.
8. Type the name of the file you want to load in the File Description box or select it in the file list box below.
9. Choose the OK button to confirm your selection and load the file.
- 10.If loading the chosen file will affect any unsaved changes to the files in memory, FS-K4 will ask if you want to save the changes. You will be asked this question for each modified file, and if you decide to save a modified file the Save As (p32) dialogue box will be displayed.
- 11.If there is measured data in memory and loading the chosen file will directly affect the way in which a measurement is made, FS-K4 will warn you that all measured data will be discarded.

Exactly how the contents of memory gets changed depends on the type of file loaded as shown in the table below:

| File of Type | Affected Memory Files |
|----------------|--|
| Limit Line | The selected limit line only. |
| Analyzer Setup | The Sweep Setup, and Limit Line are changed and any Result Data discarded. |
| Result Data | The Sweep Setup and Limit Line are changed and any Result Data discarded. Reference data if any, is loaded into the reference trace. Sweep Data is loaded into the main trace. |

If you have loaded a limit line, the file will be activated.

Saving a File

There are two ways of saving a file to disk, namely Save and Save As. Which one you use depends on whether the file has previously been named or not.

The exact contents of the saved file depends on its type as shown in the table below:

| File of Type | Contents |
|----------------|--|
| Limit Line | The selected limit line only. |
| Analyzer Setup | The current Sweep Setup and any activated Limit Line. |
| Result Data | The Sweep, the Reference Trace if any, the current Sweep Setup and any activated Limit Line. |

Saving an Unnamed File

To save a new file to disk:

1. Choose Save As (p32) from the File menu.
2. If you wish to save a file to a default directory, as defined in the Default Paths (p48) dialogue box, check the Jump to default directories box.
3. Otherwise, make sure that this box is unchecked.
4. Select the type of file you wish to save in the List Files of Type box.
5. If Jump to default directories is checked, FS-K4 will automatically display the contents of the chosen file type's default directory and you should skip steps 4 and 5.
6. Select the drive you want to save the file on in the drives box.
7. Select the directory you want to save the file in with the Directories box.
8. Type the name and description you want to save the file under in the File Description box or select an existing name from the file list box below.
9. If you are saving a Limit Line, the file name will be set to that specified in the limit editor and you will not be able to modify it. However, you can still enter a description.
10. Choose the OK button to confirm your selection and save the file.

Saving a Named File

To save a previously named file:

1. Choose Save (p32) from the File menu.
2. Select the type of file you wish to save in the File of Type box. To help you, the description of the file currently in memory is displayed in the Description box.
3. Choose the OK button to confirm your selection and save the file using the existing name and description.

Making a Measurement

Measuring with FS-K4 consists of three steps:

1. Making a Sweep Measurement (p27)
2. Using the Marker menu commands for Analyzing Sweep Results (p28)
3. Storing the results for later re-use, as described in Saving a File (p26).

In cases where the phase noise of the unit under test is comparable to the inherent phase noise of the analyzer, a two stage measurement may be used to improve the accuracy of the final result.

To make a two stage measurement:

1. First connect a reference source to the analyzer.
2. Make a Sweep Measurement as described above.
3. Choose Trace to Reference (p44) from the Sweep menu to copy the trace into the reference buffer.
4. Now connect the unit under test.
5. Make a second Sweep Measurement.
6. Choose Corrected (p41) from the View menu.
7. The application will perform a linear subtraction of the reference trace from the uncorrected trace, and plot the result.

Once a two stage measurement is complete you can

- Switch back to the uncorrected trace by choosing Uncorrected (p41) from the View menu.
- Display the reference trace by choosing Reference (p41) from the View menu. The Normal and Delta marker displays will change to include calculated level offsets from the marker level to the reference trace.

To stop using the Reference Trace:

- Choose Clear Reference (p44) in the Sweep menu.

Making a Sweep Measurement

To run a Sweep:

- Choose Start (p43) from the Sweep menu.

The Analyzer will be configured according to the current Analyzer Setup. If this fails, an information dialogue will be displayed describing the problem and the measurement will be aborted.

If the Verify Frequency and Level function is selected in the Sweep Setup (p35) dialogue box, FS-K4 will then check to see if there is a Signal within the specified Frequency and Level Tolerance ranges relative to the specified Signal Frequency and Level. If no Signal is found, or a Signal is found, which is outside the tolerance range, an information dialogue will be displayed describing the problem, and the measurement will be aborted.

After a short delay the Analyzer will start measuring and automatically uploading the Sweep results to the computer. The Status Bar (p54) message changes to read "Sweep running...(0%)", and as data is received the value inside the parentheses is updated to show the ratio of samples received to the total expected, expressed as a percentage.

The overall sweep is divided into a number of sub-bands, which are measured separately. This is optimized to provide the best combination of measurement accuracy and speed.

If the Graph is visible, data will be plotted as soon as it is received. In many cases, the Sweep will generate more samples than can be displayed. A data reduction algorithm is used to ensure that the level represented by each pixel column in the displayed trace represents the maximum value measured for the band of frequencies it represents. This data reduction process does not affect the raw data uploaded from the Analyzer; which may be viewed, once the sweep is complete, by zooming in until every pixel column represents a single raw data sample. FS-K4 can store up to 20,000 samples in memory.

If the RF Overload warning is activated whilst measuring a sub-band, the input attenuation will be increased by 10dB and the sub-band will be re-measured.

If the sweep cannot be completed for any reason, an information dialogue will be displayed describing the problem and the measurement will be aborted.

Whilst the sweep is in progress you can:

1. Use the Normal (p45) and Delta (p45) Markers. These may be turned on using the commands in the Marker menu and moved along the trace using either the keyboard cursor keys, or by positioning the mouse pointer and then clicking the left mouse button.
2. Abort the sweep by choosing Stop (p43) from the Sweep menu. An information dialogue will be displayed confirming this action and the measurement will be aborted.

Analyzing Sweep Results

The Marker menu provides a number of tools to help you examine the phase noise trace.

1. The Normal (p45) marker displays the phase noise level measured at a specific frequency.
2. The Delta (p45) marker displays the offset frequency and level relative to the Normal marker.
3. When the Delta marker is enabled, Next Marker (p45) allows you to select which marker's frequency may be varied using the mouse and/or cursor keys.
4. Use the Measure at Marker (p45) command in the Marker menu to re-measure phase noise at the current marker frequency.
5. The Zoom function allows you to view the Sweep results in greater detail, ultimately removing the effects of data compression so that the raw data is displayed.

If the marker is in Normal mode, the Zoom In (p45) command will redraw the Graph, changing the frequency span to show one tenth of the previous span, centered on the marker frequency. Zoom In may be used repeatedly until only raw data is displayed, with no data reduction. Zoom Out (p46) has the opposite effect, increasing the span by a factor of ten centered on the marker, whilst Original Diagram (p46) returns the display to the span defined by the Sweep Setup.

When the marker is in Delta mode, Zoom In changes the span to show frequencies between the reference and delta markers.

In addition, the View menu provides three extra commands for displaying calculated values for Residual Phase Modulation, Residual Frequency Modulation, and RMS Jitter respectively. When the Delta marker is enabled, the calculation is performed on the measured values lying between the two markers. Otherwise, all measured values are taken into account.

Generating a Report

There are three steps to consider when generating a measurement report:

1. Setting up the Printer (p29)
2. Previewing a Report (p29)
3. Printing a Report (p30)

You can store the Result Data for later re-use, see Saving a File (p26).

Setting up the Printer

To setup the printer:

1. Choose Print Setup (p34) from the File menu.
2. Select the output device you want to use in the Printer box.
3. In the orientation box, select Portrait.
4. FS-K4 is designed to print reports in portrait mode. Use of other formats may lead to unpredictable results.
5. If you are using an HP Laser Jet type printer, choose the Options button to display the Options dialogue box. Select Line Art in the Dithering box then choose the OK button to accept the changes. Finally choose the OK button in Print Setup to accept the changes.

Note: *Some drivers such as the HP Plotter cannot be selected from FS-K4. In this case you should use the Printer Setup command in Print Manager's Options menu.*

Previewing a Report

To preview a report before printing:

1. Choose Print Preview (p33) from the File menu.
2. The Print Preview window will appear showing how a report would appear with the current report setup and measurement results.
3. To view the following page, choose the Next button.
4. Choose the Previous button to go back one page.
5. To change the report setup choose the Setup button.
6. The Preview Setup (p33) dialogue will be displayed allowing you to customize the report for the current unit under test. For example, you may enter the Make, Model, and Serial Number. When you save your measurement results, these changes will be saved in the Result Data file. However, they will not affect the Sweep Setup, so when you start a new Sweep measurement, any changes made here will be lost. If you want to make permanent changes, use the Sweep Setup editor and then save the Analyzer Setup.
7. Choose Print to send the report to a printer.
8. Choose the Close button to exit the Print Preview window.

Printing a Report

To print a report without using Print Preview :

- Choose Print (p34) from the File menu.

The "Printing in progress" message box will appear containing a small picture of a printer, a page counter, and a Cancel button. As the print job progresses, sheets of paper will appear to feed through the printer and the counter will increment.

If Print Manager is enabled, FS-K4 will print the Test Report immediately and Print Manager will handle any problems with the printer.

Otherwise, the speed of report generation will be governed by the printer and Windows will handle any problems directly.

Choosing the Cancel button will abort the report generation process, however you may have to clear the Print Manager or printer buffer.

3 Menu Commands

This chapter describes all menu commands and their dialogue boxes. The menus are arranged as in the menu bar (p53).

File Menu

The File menu comprises the commands used for creating, opening, saving, printing files and for exiting FS-K4.

New command (File Menu)

Use this command to create new Analyzer Setups, and Limit Lines, or to load an existing Analyzer Setup prior to making a new measurement. In each case you can select a template file on which to base the new file or measurement. You can open an existing file with the Open (p31) command.

Dialogue Box Options

New

Select the type of new file you want to create.

| | |
|-----------------------|--|
| Measurement | Loads a Analyzer Setup and prepares for a new Sweep. |
| Analyzer Setup | Loads a template file and opens the Analyzer Setup editor. |
| Limit Line | Loads a template file and opens the Limit Line editor. |

Use Template

Select the name of the template file you want to use for the new file or measurement. FS-K4 lists template files, which are stored at the locations defined in the Default Paths (p48) dialogue box, and stored in your FS-K4.INI file. If you select *none* as the template for a new Limit file, the editor will be empty. On selecting *none* for a new Analyzer Setup, the editor will be filled with the default settings for the Analyzer.

Description

Whenever a file is saved, a long description may be entered at the right hand side of the File Description box in the Save As dialogue box. This information is read from the template file you select in the Use Template box and displayed in the Description box.

Open command (File Menu)

Use this command to open an existing Analyzer Setup, Limit Line, or Result Data file. You can create new files with the New (p31) command.

Dialogue Box Options

File Description

Type or select the filename you want to open. This box lists file names and descriptions of the files with the extension you select in the List Files of Type box.

List Files of Type

Select the type of file you want to open.

| | |
|-----------------------------------|--|
| Analyzer Setup (*.set) | Lists all the files saved with the .SET extension. |
| Result Data | Lists all the files |

| | |
|-------------------|--------------------------------|
| (* .dat) | saved with the .DAT extension. |
| Limit Line | Lists all the files |
| (* .lim) | saved with the .LIM extension. |

Note: See *Jump to default directories below*.

Drives

Select the drive on which FS-K4 stores the file that you want to open.

Directories

Select the directory in which FS-K4 stores the file you want to open.

Jump to default directories

Enables automatic setting of the default drive and path each time you change to a different file type using the List Files of Type box.

Save command (File Menu)

Use this command to save an active file with its current name and description. When you save a new file for the first time, FS-K4 displays the Save As dialogue box so you can name the file. If you want to change the name or description of an existing file before you save it, choose the Save As (p32) command.

Dialogue Box Options

File of Type

Select the type of file you want to save.

| | |
|-----------------------|--|
| Analyzer Setup | Saves the current Analyzer Setup file. |
| Result Data | Saves the current Result Data file. |
| Limit Line | Saves the current Limit Line file. |

Description

Whenever a file is saved, a long description may be entered at the right hand side of the File Description box in the Save As dialogue box. This information for current file, of the type you select in the File of Type box, is displayed in the Description box.

Save As command (File Menu)

Use this command to save, name and describe the active file of a specified data type.

Note: To save a file with its existing name and description, use the Save (p32) command.

Dialogue Box Options

File Description

Type a new filename in the left hand box to save a file with a different name.

Use the current name, or select a name in the list to save a file with an existing filename.

A filename can contain up to eight characters and an extension of up to three characters. FS-K4 adds the extension for the data type you specify in the List Files of Type box. Filenames for Limit files must be defined using the corresponding editor and cannot be modified by the Save As dialogue box.

Type a new file description or modify an existing one in the right hand side of the box.

List Files of Type

Select the type of file you want to open.

| | |
|-----------------------|---------------------|
| Analyzer Setup | Lists all the files |
|-----------------------|---------------------|

| | |
|-----------------------|---------------------------------------|
| (*<i>.set</i>) | saved with the <i>.SET</i> extension. |
| Result Data | Lists all the files |
| (*<i>.dat</i>) | saved with the <i>.DAT</i> extension. |
| Limit Line | Lists all the files |
| (*<i>.lim</i>) | saved with the <i>.LIM</i> extension. |

Note: See *Jump to default directories below*.

Drives

Select the drive on which FS-K4 will store the file that you want to save.

Directories

Select the directory in which FS-K4 will store the file you want to save.

Jump to default directories

Enables automatic setting of the default drive and path each time you change to a different file type using the List Files of Type box.

Print Preview command (File Menu)

Use this command to display the print preview window, with which you can see how a report will look when you print it. FS-K4 displays each page in a reduced size. You can customize the report for the current unit under test, see Preview Setup (*p33*) dialogue box for more information.

To preview a report before printing

1. From the File menu, choose Print Preview (ALT, F, V).
2. FS-K4 displays the first page of the report.
3. To customize the report for the current unit under test, choose the Setup (ALT, S) button.
4. To view different pages in the report, use the Previous (ALT, P) and Next (ALT, N) buttons.
5. To print the report use the Print (ALT, R) button.
6. After viewing the report in print preview, you can close the print preview window by choosing the Close (ALT, C) button or pressing the ESCAPE key.

Preview Setup command (File Menu)

Use this dialogue to customize the report text and configuration for the current Unit Under Test.

Dialogue Box Options

Heading, ..., Comment 2

Type report text as required.

Titles

Includes the above text fields in the report. If the result data has been stored to a disk file, the file name and description will also be included.

Setup

Includes the Sweep Setup information in the report.

Date

Includes the time and date at which the last measurement was made in the report.

Markers

Includes the Normal and Delta Markers, if they are turned on in the main display.

Print command (File Menu)

Use this command to print reports. To specify a printer and its connection, use the Print Setup (p34) command in the File menu. Alternatively you can use the Printer Setup command in the Options menu of Print Manager. See your Windows documentation for more information.

Print Setup command (File menu)

Use this command to select a printer and connection, and specify printer settings. The settings you select become the default settings.

Dialogue Box Options

Printer

Select the printer you want to use.

Default Printer Uses the current default system printer.

Specific Printer Uses a printer selected from the list of installed devices.

Note: You install printers and configure ports through the Windows Control Panel. For information on installing printers, see your system documentation.

Orientation

Select the page orientation, Portrait or Landscape, that you want for printing.

With Portrait, the page is taller than it is wide when you view the printed document upright (the document prints lengthways on the page). With Landscape, the page is wider than it is tall when you view the printed document upright (the document prints sidewise on the page).

Paper

Select the size and source of paper you want to use.

Size Open the list and then select the size of paper you want to use.

Source Open the list, and then select the paper source you want to use.

Options

Choose this button to display the Options dialogue box, which contains additional options specific to the printer you select in the Printer box.

For more information, open the Options dialogue and select the Help command button.

Exit command (File Menu)

Use this command to end your FS-K4 session. You can also use the Close command on the application Control menu. FS-K4 prompts you to save files with unsaved changes.

Shortcuts

Mouse:



Double-click the application Control-menu button.

Keys: ALT+F4

Edit Menu

The Edit menu comprises the commands used for defining the analyzer setup parameters (sweep parameters) and the limit lines. The purpose of these settings is outlined in section „Creating an Analyzer Setup“ on page 23.

Sweep Setup command (Edit Menu)

Use this command to modify Analyzer Setup parameters.

Note: Changes that affect the validity of displayed results will cause the measurement buffers to be cleared. In this case a warning message will be displayed when the OK button is chosen.

Dialogue Box Options

Analyzer

Model

Select the type of Analyzer that this setup will be used with. This determines the range of frequencies that are available.

FSE-B2

Select this box if the setup will be used with an Analyzer equipped with the FSE-B2 7GHz Frequency Extension option. This box is only enabled for the following Analyzer models: FSEA 20, FSEA 30 and FSIQ 3.

FSE-B4

Select this box if the setup will be used with an Analyzer equipped with the FSE-B4 Low Phase Noise and OCXO option. This box is only enabled for the following Analyzer models: FSEA 20, FSEB 20, FSEM 20, and FSEK 20.

FSE-B5

Select this box if the setup will be used with an Analyzer equipped with the FSE-B5 FFT Bandwidths option. This box is only enabled for the following Analyzer models: FSEA 20, FSEB 20, FSEM 20, and FSEK 20.

Signal

Frequency

Enter the frequency of the carrier whose phase noise you wish to measure.

Specify the unit by appending GHz, kHz, MHz or GHz. In each case, the first letter is sufficient in either upper or lower case.

Level

Magnitude of carrier in dBm.

Verify Frequency

Enables a search, across a frequency tolerance range, for the carrier of greatest magnitude. Resultant carrier frequency and level are measured. If the level is within a level tolerance range, the measured values override the specified Signal Frequency and Level. Otherwise the measurement is aborted.

This should be used when carrier frequency is not known precisely and when a very small Minimum Offset is used.

Frequency Tolerance

Range, either side of Signal Frequency, within which the carrier is known to be. Specify unit as for Frequency.

Level Tolerance

Offset relative to Signal Level above which the carrier is known to be.

Display

*X-Axis**Minimum Offset*

Select the offset at which to start the sweep.

Maximum Offset

Select the offset at which to finish the sweep.

*Y-Axis**Maximum Level*

Enter the value you want at the upper extent of the Graph's level axis. Phase Noise levels are normalized to the carrier level and expressed in dBc/Hz.

Level Range

Enter the range of values you want for the Graph's level axis in dB.

Tools

Trace Offset

Enter any fixed offset in dB. This value will be added to each measured value.

Smoothing Window

The trace may be smoothed by calculating the linear average of sample values in a sliding window. Enter the width of the window as a number of samples.

The width must be a positive, odd, integer, less than 200, i.e. $0 < n < 200$, $n \bmod 2 = 1$. The default value of 1 turns smoothing off.

The smoothing algorithm used is as follows:

$$y'(s) = 10 * \text{Log}_{10} \left(\left(\sum_{x=s-\frac{n-1}{2}}^{x=s+\frac{n-1}{2}} 10^{\left(\frac{y(x)}{10}\right)} \right) \div n \right)$$

Where: s = the trace sample number, $y(s)$ = the phase noise at sample s , x = the sample offset from s , and n = the width of the sliding window. When x exceeds the boundary samples, the boundary sample is used, i.e. if the trace has samples numbering 0 to 500 then with $n = 5$ and $s = 0$ the average is calculated as:

$$y'(0) = 10 * \text{Log}_{10} \left(\left(3 * 10^{\left(\frac{y(0)}{10}\right)} + 10^{\left(\frac{y(1)}{10}\right)} + 10^{\left(\frac{y(2)}{10}\right)} \right) \div 5 \right)$$

Report

Opens the Report Setup (p37) dialogue box.

Advanced

Opens the Advanced Sweep Setup (p37) dialogue box.

Report Setup

Use this dialogue to define those parts of the report text which are independent of the Unit Under Test and to select the default report configuration.

Dialogue Box Options

Heading, ..., Comment 2

Type report text as required.

Titles

Includes the above text fields in the report. If the result data has been stored to a disk file, the file name and description will also be included.

Setup

Includes the Sweep Setup information in the report.

Date

Includes the time and date at which the last measurement was made in the report.

Markers

Includes the Normal and Delta Markers, if they are turned on in the main display.

Advanced Sweep Setup

FS-K4 measures each decade of offset from the carrier in a separate sweep. Some decades are further split into sub-bands to allow optimum use of resolution filter and main PLL bandwidths. Use this dialogue to modify the Resolution Filter Bandwidths for each sub-band. In addition you can set the number of averaging sweeps made for each sub-band, and for analyzers equipped with FFT filters you can choose between FFT or normal filters for each sub-band.

Dialogue Box Options

Settings

See Using Table Entry Boxes (*p61*) for detailed information about using this control.

From

This column lists the start frequency of each sub-band

To

This column lists the stop frequency of each sub-band

Resolution BW

This column lists the Resolution Filter Bandwidth used for each sub-band. Enter values between 1 Hz and 3 MHz in steps of 1, 2, 3 and 5. You can specify the unit by appending GHz, kHz, MHz or GHz. In each case, the first letter is sufficient in either upper or lower case.

Note: *FSQ, FSU, FSP and ESPI accept values between 10Hz and 10MHz using analogue filters, and between 1Hz and 30kHz using FFT filters, FSP and ESPI in steps of 1 and 3.*

Sweep Count

This column lists the number of sweeps to average over for each sub-band. Values must be integer, greater than zero, and odd. Default is 1.

Use FFT Filter

This column only appears when FS-K4 detects an analyzer supporting FFT filters, or when there is no analyzer attached to your PC. It allows you to choose whether to use the FFT Resolution Filter or the conventional filter for each decade.

When you enable FFT Filters for the decades starting at 10 Hz and 100 Hz, the entire decade is measured in one sweep. Accordingly the three sub bands used with normal filters are replaced with a single sub band. The Resolution Filter Bandwidth used is fixed for each sub-band, and cannot be modified.

Default

Select this button to return all settings to the following default values:

FSEx 20

| From | To | Resolution BW | Sweep Count | Use FFT Filter |
|---------|---------|---------------|-------------|----------------|
| 10 Hz | 20 Hz | 2 Hz | 1 | Off |
| 20 Hz | 40 Hz | 5 Hz | 1 | Off |
| 40 Hz | 100 Hz | 10 Hz | 1 | Off |
| 100 Hz | 200 Hz | 20 Hz | 1 | Off |
| 200 Hz | 400 Hz | 50 Hz | 1 | Off |
| 400 Hz | 1 kHz | 100 Hz | 1 | Off |
| 1 kHz | 10 kHz | 200 Hz | 1 | Off |
| 10 kHz | 30 kHz | 500 Hz | 1 | Off |
| 30 kHz | 100 kHz | 3 kHz | 1 | Off |
| 100 kHz | 1 MHz | 3 kHz | 1 | Off |
| 1 MHz | 10 MHz | 30 kHz | 1 | not available |
| 10 MHz | 100 MHz | 300 kHz | 1 | not available |
| 100 MHz | 1 GHz | 3 MHz | 1 | not available |
| 1 GHz | 10 GHz | 3 MHz | 1 | not available |

FSQ x, FSU x, FSP x, ESPI x

| From | To | Resolution BW | Sweep Count | Use FFT Filter |
|--------|--------|---------------|-------------|----------------|
| 3Hz | 10Hz | 1Hz | 1 | On |
| 10Hz | 30Hz | 1Hz | 1 | On |
| 30Hz | 100Hz | 10Hz | 1 | On |
| 100Hz | 300Hz | 10Hz | 1 | On |
| 300Hz | 1kHz | 100Hz | 1 | On |
| 1kHz | 3kHz | 100Hz | 1 | On |
| 3kHz | 10kHz | 300Hz | 1 | On |
| 10kHz | 30kHz | 300Hz | 1 | On |
| 30kHz | 100kHz | 3kHz | 1 | Off |
| 100kHz | 300kHz | 10kHz | 1 | Off |
| 300kHz | 1MHz | 30kHz | 1 | Off |
| 1MHz | 10MHz | 30kHz | 1 | Off |
| 10MHz | 100MHz | 300kHz | 1 | not available |
| 100MHz | 1GHz | 3MHz | 1 | not available |
| 1GHz | 10GHz | 10MHz | 1 | not available |

FSE_x 30, FSIQ_x, ESIB_x

| From | To | Resolution BW | Sweep Count | Use FFT Filter |
|---------|---------|---------------|-------------|----------------|
| 10 Hz | 20 Hz | 2 Hz | 1 | Off |
| 20 Hz | 40 Hz | 5 Hz | 1 | Off |
| 40 Hz | 100 Hz | 10 Hz | 1 | Off |
| 100 Hz | 200 Hz | 20 Hz | 1 | Off |
| 200 Hz | 400 Hz | 50 Hz | 1 | Off |
| 400 Hz | 1 kHz | 100 Hz | 1 | Off |
| 1 kHz | 10 kHz | 200 Hz | 1 | Off |
| 10 kHz | 60 kHz | 500 Hz | 1 | Off |
| 60 kHz | 100 kHz | 500 Hz | 1 | Off |
| 100 kHz | 200 kHz | 3 kHz | 1 | Off |
| 200 kHz | 1 MHz | 3 kHz | 1 | Off |
| 1 MHz | 10 MHz | 30 kHz | 1 | not available |
| 10 MHz | 100 MHz | 300 kHz | 1 | not available |
| 100 MHz | 1 GHz | 3 MHz | 1 | not available |
| 1 GHz | 10 GHz | 3 MHz | 1 | not available |

RBW/VBW Ratio

Select the ratio of Resolution Filter Bandwidth to Video Filter bandwidth. The default value is 10-to-1, but you can also select 1-to-1, or 1-to-10 in special circumstances.

Limit Line command (Edit Menu)

Use this command to create and modify and activate Limit Line files.

Dialogue Box Options**Name**

Type a name for the limit line.

This name will be used to identify the limit line when plotted on the Graph and when it is stored on disk or downloaded to a Analyzer. It may be up to eight characters long and can use any combination of the following: A..Z a..z 0..9 and _.

Values

Use this box to enter the limit line definition. This box has two columns for sample frequency and level respectively. Frequencies must be entered in order of magnitude with the lowest value at the top of the list. You can specify the unit by appending Hz, kHz, MHz or GHz. In each case, the first letter is sufficient in either upper or lower case. Limit values are assumed to be in dBc/ Hz, so it is not necessary to specify a unit.

You must enter at least two samples in ascending order of frequency with the lowest frequency at the top of the table. The total number of samples entered is shown by the Samples field. If you enter an illegal or out-of-range value, a message will be displayed in the Status Bar (p54) showing the range of acceptable values

See Using Table Entry Boxes (p61) for more information.

Activate/Deactivate

Changes the status of the limit line to active or not active. When active the limit line will appear on the Graph panel.

Shift Level

Opens the Shift Level (p40) dialogue box.

Insert

Inserts a new row in the Values box at the highlighted position.

Delete

Removes the highlighted row in the Values box.

Samples

Displays the number of samples that have been defined.

Maximum

Displays the maximum number of samples that can be defined. This value is always 50.

Shift Level

Use this dialogue to alter the level of all samples in the limit line by an amount that you specify.

Dialogue Box Options**Level Offset**

Type the offset value you want to use.

View Menu

The View menu comprises the commands used for customizing the screen by displaying or hiding various information panels, traces and measurement results.

Graph command (View Menu)

This command only appears when a check mark appears next to the Measurement Log (p47) command in the Options menu.

Use this command to display or hide the Graph and Markers panels.

A check mark appears next to the command name when the Graph is displayed.

For more information, see Graph (p55).

Log command (View Menu)

This command only appears when a check mark appears next to the Measurement Log (p47) command in the Options menu.

Use this command to display or hide the Log panel, which lists information about the progress of each measurement as well as reporting key values used or measured.

A check mark appears next to the command name when the Log is displayed.

For more information, see Log (p56).

Uncorrected command (View Menu)

This command is only enabled when the reference trace buffer is not empty. A measurement trace may be copied into the reference buffer using the Trace to Reference (p44) command in the Sweep menu.

Use this command to display the Uncorrected trace on the Graph panel. A check mark appears next to the command name when the Uncorrected trace is displayed. This command also hides the Corrected trace.

When this command is checked the Uncorrected trace will also appear in the Report Diagram.

Reference command (View Menu)

This command is only enabled when the reference trace buffer is not empty. A measurement trace may be copied into the reference buffer using the Trace to Reference (p44) command in the Sweep menu.

Use this command to display or hide the Reference trace on the Graph panel. A check mark appears next to the command name when the Reference trace is displayed.

When this command is checked the reference trace will also appear in the Report Diagram.

Corrected command (View Menu)

This command is only enabled when the reference trace buffer is not empty. A measurement trace may be copied into the reference buffer using the Trace to Reference (p44) command in the Sweep menu.

Use this command to display the Corrected trace on the Graph panel. A check mark appears next to the command name when the Corrected trace is displayed. This command also hides the Uncorrected trace.

When this command is checked the Corrected trace will also appear in the Report Diagram.

Residual PM command (View Menu)

Use this command to display or hide the calculated Residual Phase Modulation on the Graph panel. A check mark appears next to the command name when the Residual PM is displayed.

In Normal Marker mode, or with no markers displayed, Residual Phase Modulation is calculated using all measured values from the Minimum Offset to the Maximum Offset inclusive. In Delta Marker mode, the calculation is based on the measured samples that lie between the two markers, and is updated each time the frequency of either marker changes.

When this command is checked the Residual PM value will also appear in the Report Diagram.

Residual FM command (View Menu)

Use this command to display or hide the calculated Residual Frequency Modulation on the Graph panel. A check mark appears next to the command name when the Residual FM is displayed.

In Normal Marker mode, or with no markers displayed, Residual Frequency Modulation is calculated using all measured values from the Minimum Offset to the Maximum Offset inclusive. In Delta Marker mode, the calculation is based on the measured samples that lie between the two markers, and is updated each time the frequency of either marker changes.

When this command is checked the Residual FM value will also appear in the Report Diagram.

RMS Jitter command (View Menu)

Use this command to display or hide the calculated RMS Jitter on the Graph panel. A check mark appears next to the command name when the RMS Jitter is displayed.

In Normal Marker mode, or with no markers displayed, RMS Jitter is calculated using all measured values from the Minimum Offset to the Maximum Offset inclusive. In Delta Marker mode, the calculation is based on the measured samples that lie between the two markers, and is updated each time the frequency of either marker changes.

When this command is checked the RMS Jitter value will also appear in the Report Diagram.

Sweep Menu

The Sweep menu comprises the commands used for starting and terminating a measurement and for storing and deleting the reference trace.

Start command (Sweep Menu)

Use this command to begin a new Sweep measurement using the current Analyzer Setup file.

Note: Any displayed Sweep results will be cleared by this command.

FS-K4 starts by configuring the analyzer according to the current Analyzer Setup. If for any reason the Analyzer does not respond, an error message will be displayed describing the problem. See Communication Problems (p65) for more information.

If the Verify Frequency and Level function is selected in the Sweep Setup (p35) dialogue box, FS-K4 will then check to see if there is a Signal within the specified Frequency and Level Tolerance ranges relative to the specified Signal Frequency and Level. If no Signal is found, or a Signal is found, which is outside the tolerance range, an information dialogue will be displayed describing the problem, and the measurement will be aborted.

As soon as the Sweep starts, "Sweep running... (0%)" will appear in the Status Bar. The percentage indicator will increase each time a new block of data is displayed and is calculated as the ratio of values received to total values expected.

The overall sweep is divided into a number of sub-bands, which are measured separately. This is optimized to provide the best combination of measurement accuracy and speed. If the RF Overload warning is activated whilst measuring a sub-band, the input attenuation will be increased by 10dB and the sub-band will be re-measured. If the sweep cannot be completed for any reason, an information dialogue will be displayed describing the problem and the measurement will be aborted.

Once the Sweep is finish, "Sweep complete" appears in the Status Bar.

Stop command (Sweep Menu)

Use this command to terminate a Sweep measurement.

"Sweep aborted" will appear in the Status bar (p54), an information dialogue will be displayed confirming the action, and FS-K4 will stop the Sweep.

Mode command (Sweep Menu)

Use this command to switch repetitive Sweeping on and off and also to choose between Graph (p55) display modes Clear/Write and Max. Hold.

A sub-menu appears when this command is selected with the following options:

Clear/Write

Use this command to disable repetitive Sweeping and select Clear/Write display mode.

The Sweep will then end at the stop frequency of the Sweep.

A check mark appears next to the command name when this mode is selected.

Repeat Clear/Write

Use this command to enable repetitive Sweeping in the Clear/Write display mode.

The Sweep will then automatically re-start each time the Analyzer reaches the stop frequency of the Sweep. In Clear/Write mode, the Graph panel displays only those values measured during the current pass.

A check mark appears next to the command name when this mode is selected.

Repeat Max. Hold

Use this command to enable repetitive Sweeping in the Max. Hold display mode.

The Sweep will then automatically re-start each time the Analyzer reaches the stop frequency of the Sweep. In Max. Hold mode, the Graph displays the maximum value measured at each frequency during all passes since the Repeat Max. Hold command was used.

A check mark appears next to the command name when this mode is selected.

Trace to Reference command (Sweep Menu)

Use this command to copy the main Sweep trace into the Reference Trace Buffer.

You can then make a new measurement or load an existing Result Data file and compare the traces in the following ways:

- use the Reference (*p41*) command in the View menu to display the reference with the main trace then,
- use the Graph (*p55*) panel to compare them visually or
- use the Markers (*p56*) to compare them point by point or
- use the Corrected (*p41*) command in the View menu to display the calculated difference between the main and reference traces.

Note: *Both traces must be measured using the same Analyzer setup. The reference trace will be cleared as soon as an incompatible setup is loaded.*

Reference trace data may be stored along with other measurement results by using the Save (*p32*) command with the File of Type box set to Result Data.

Clear Reference command (Sweep Menu)

Use this command to clear the contents of the Reference Trace Buffer.

Marker Menu

The Marker menu comprises the commands used for handling the marker functions and for magnifying a selected portion of the measured spectrum.

Normal command (Marker Menu)

Use this command to display or hide the Normal marker and the Markers box, which shows the current frequency and level co-ordinates of the Graph marker(s).

A check mark appears next to the command name when the Normal marker and Marker box are displayed.

For more information, see Markers (p56) and Moving the marker (p60).

Delta command (Marker Menu)

Use this command to switch between normal and delta marker modes.

In delta mode, the Delta marker will initially appear superimposed on the Normal marker. All keyboard and mouse methods for marker positioning will apply to the Delta marker, whilst the Normal marker will remain fixed in position, see Moving the marker (p60) for details.

A check mark appears next to the command when the delta marker mode is selected.

For more information, see Markers (p56).

Next Marker command (Marker Menu)

This command is only enabled when the delta marker is active.

Use this command to toggle control of marker frequency between the Normal and Delta markers.

Measure at Marker command (Marker Menu)

Use this command to measure phase noise using the analyzer's Phase Noise Marker at the current marker frequency.

If the marker frequency is not between the analyzer's current start and stop frequencies, the sub-band containing it will be swept first using the current Analyzer Setup parameters.

This command provides a convenient method for checking Phase Noise at spot frequencies.

Note: This command is disabled whilst a Sweep measurement is running.

Zoom In command (Marker Menu)

Use this command to magnify a selected portion of the measured spectrum displayed by the Graph (p55).

This may be used when more values have been measured than can be represented on the horizontal axis due to insufficient display resolution. The frequency axis of the Graph is expanded and all traces and the limit lines are redrawn. The level axis is not affected.

You can use the Zoom In command repeatedly until all detail is visible at which point the command is disabled.

The frequency range covered by the zoom function depends on the marker mode:

Normal (p45)

The frequency axis is expanded to show 10% of the display width centered on the current marker frequency. In the vicinity of the start and stop frequencies the software performs an adaptation.

Delta (p45)

The frequency axis is expanded to show the band between the normal and delta markers

Zoom Out command (Marker Menu)

Use this command to undo the last Zoom In (p45) command.

The new display will be centered on the Normal Marker frequency. In the vicinity of the start and stop frequencies the software performs an adaptation.

You can use the Zoom Out command repeatedly until all Zoom commands have been undone and the complete measurement spectrum is displayed. If you want to undo the all Zoom commands in one go, choose the Original Diagram (p46) command.

Note: This command is only available when the Delta (p45) marker is disabled.

Original Diagram command (Marker Menu)

Use this command to undo all Zoom commands and display the complete measurement spectrum.

This command is automatically performed whenever the Start (p43) command is used to make a new Sweep measurement.

If you want to undo the last Zoom In command, choose the Zoom Out (p46) command.

Options Menu

The Options menu offers various settings specifying the Measurement Log function, the components of the display, the default paths for data files and the analyzer. All settings made in this menu can be saved to disk..

Measurement Log command (Options Menu)

Use this command to enable or disable the Measurement Log function. A check mark appears next to the command name when the Log is enabled. For more information, see Log (p56).

Display command (Options Menu)

Use this command to modify the color, style and width of various components that form the Sweep Graph display.

Dialogue Box Options

Feature

Select the component you want to change.

Note: Text style and width default to solid and 1 respectively, and cannot be modified.

Color

Select a new color for the component you select in the Feature box.

Style

Select a new style for the component you select in the Feature box.

Note: For line widths greater than 1, the style defaults to solid and cannot be modified.

Width

Select a new width for the component you select in the Feature box.

Sample

This box displays a line drawn using the current color, style and width settings.

Default

Select this button to return all color, style and width settings to the following default values:

| Feature | Color | Style | Width |
|---------------------|---------------|-------|-------|
| Border | Black | Solid | 1 |
| Vertical Grid Major | Grey | Solid | 1 |
| Vertical Grid Minor | Grey | Dot | 1 |
| Horizontal Grid | Grey | Dot | 1 |
| Text | Black | Solid | 1 |
| Trace | Blue | Solid | 1 |
| Ref. Trace | Cyan | Solid | 1 |
| Limit | Light Red | Dash | 1 |
| Normal Marker | Light Red | Solid | 1 |
| Delta Marker | Light Magenta | Solid | 1 |

Default Paths command (Options Menu)

Use this command to modify the default locations of each type of data file used by FS-K4.

Dialogue Box Options

Default directory

This field displays the current default directory for the data type you select in the Files of Type box.

Files of Type

Select the type of file whose default directory you want to modify.

| | |
|-----------------------|-----------------------|
| Analyzer Setup | Analyzer Setup files. |
| Result Data | Result Data files. |
| Limit Line | Limit Line files. |

Directories

Select the default directory in which FS-K4 will store the data type you select in the Files of Type box. The default directory will not actually change until the Set command button is selected.

Note: *To select a directory, double click on the directory name until the open folder icon is shown.*

Drives

Select the default drive on which FS-K4 will store the data type you select in the Files of Type box. The default directory will not actually change until the Set command button is selected.

Set

Select this button to copy the current drive and directory settings to the Default directory field.

Analyzer command (Options Menu)

Use this command to modify the default Analyzer type, address and start-up conditions.

Note: *At startup, FS-K4 will check to see if the analyzer it was last used with is present. If not, it checks to see if it is running on the analyzer itself. If this fails, it checks each GPIB address.*

- If no analyzer is found, FS-K4 assumes that you will connect an analyzer later, and selects the analyzer type used most recently as the default.
- If FS-K4 is running on the analyzer, it selects the internal, DDE communications method, which bypasses the GPIB, and sets this analyzer and communications method as the new default.
- Finally, if an analyzer is found at a GPIB address, it is selected as the new default.

This command allows you to override these settings when an analyzer is connected to the bus after startup.

Dialogue Box Options

Use DDE

When FS-K4 is run on the analyzer, this enables control of the analyzer without using the GPIB.

Use GPIB

When FS-K4 is not run on the analyzer, this enables control of the analyzer using the GPIB.

Address

Select the bus address of the Analyzer you want to work with. If the analyzer is connected and turned on when you start FS-K4, this value will be set automatically.

Initialize on start-up

Enables initialization of the Analyzer each time FS-K4 is started. This is equivalent to pressing the PRESET key on the front panel of the Analyzer.

Save Options command (Options Menu)

Use this command to save all Options Menu settings to disk.

Each setting is written to the FS-K4.INI file, which resides in your Windows directory. Each time you restart FS-K4, these settings will be used.

Note: *To make temporary changes, simply use the Options Menu commands to alter the settings as required, but do not use the Save Options command. Next time you start FS-K4 the temporary settings will be replaced with your normal settings.*

Help Menu

The Help Menu offers commands used for starting the FS-K4 on-line Help and obtaining information on the installed software and on product support services.

Contents command (Help Menu)

Use this command to display the opening screen of Help. From the opening screen, you can jump to various types of reference information.

Once you open Help, you can click the first button on the left in the help window whenever you want to return to the opening screen.

Search for Help on command (Help Menu)

Displays Help's Search dialogue so you can quickly find the information you need.

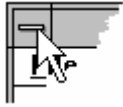
Obtaining Technical Support command

Gives details on product support services for FS-K4 available to you from Rohde & Schwarz.

About FS-K4 command (Help Menu)

Use this command to display the version number of your copy of FS-K4 for Windows, the copyright notice, Windows mode, available memory, and installed math co-processors.

Control Menu




The Control menu is located at the left end of the title bar in an application window. It comprises the commands used for modifying or closing the active application window and for switching to another application.

To display commands that control the size and position of an application window, click the application Control-menu box or press ALT+SPACEBAR.

Restore command (Control menu)

Use this command to return the active window to its size and position before you chose the Maximize or Minimize command.

Clicking  in the upper-right corner of a maximized window is the same as choosing the Restore command.

Shortcuts

Mouse: Double-click the title bar.

Move command (Control menu)

Use this command to display a four-headed arrow so you can move the active window or dialogue box with the arrow keys.



Note: This command is unavailable if you maximize the window.

Size command (Control menu)


Use this command to display a four-headed arrow so you can move the active window or dialogue box with the arrow keys.



Note: This command is unavailable if you maximize the window.


Minimize command (Control menu)

Use this command to reduce the FS-K4 window to an icon.

Clicking  in the upper-right corner of the window is the same as choosing the Minimize command.

Maximize command (Control menu)

Use this command to enlarge the FS-K4 window to fill the entire screen.

Clicking  in the upper-right corner of the window is the same as choosing the Maximize command.

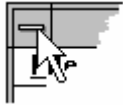
Shortcuts

Mouse: Double-click the title bar

Close command (Control menu)

Use this command to close the FS-K4 window.

Double-clicking a Control-menu box is the same as choosing the Close command.



Shortcuts

Keys: ALT+F4 closes the FS-K4 window

Switch To command (Control menu)

Use this command to display a list of all open applications. Use this "Task List" to switch to or close an application on the list.

Shortcut

Keys: CTRL+ESC

Dialogue Box Options

Task List

Select the application you want to switch to or close.

Switch To

Makes the selected application active.

End Task

Closes the selected application.

Cancel

Closes the Task List box.

Cascade

Arranges open applications so they overlap and you can see each title bar.

Note: This option does not affect applications reduced to icons.

Tile

Arranges open applications into windows that do not overlap.

Note: This option does not affect applications reduced to icons.

Arrange Icons

Arranges the icons of all minimized applications across the bottom of the screen.

4 Parts of the FS-K4 Screen

The Application Window for FS-K4 is divided into the workspace where all measured data is displayed and manipulated, and various control elements and information areas.

FS-K4 Control menu



Located at the left end of the title bar in an application window.

To display commands that control the size and position of an application window, click the application Control-menu box or press ALT+SPACEBAR.

For more information, see section „Control Menu“ on page 51.

Maximize button



Located at the right end of the title bar when the application is not maximized.

When you click the maximize button, the application window enlarges to fill the screen.

Note: *Maximized windows have no borders.*

Menu bar



File Edit View Sweep Marker Options Help

Located below the title bar, along the top of the application window, this area contains a list of FS-K4 commands.

To view all the commands in a menu, do one of the following:

Click the menu name.

Press ALT+n, where *n* is the underlined letter in the menu name. For example, press ALT+F to open the File menu.

Minimize button



Located at the right end of the title bar when the application is not minimized.

Clicking the Minimize button is the same as choosing Minimize from the application Control menu: The application window shrinks to an icon.

Restore button



Located at the right end of the title bar when the application window is minimized or maximized. Clicking the Restore button is the same as choosing Restore from the application Control menu: The application window returns to its previous size.

Status Bar



This is the area across the bottom of the application window below the workspace. It contains four fields:

Message Field

During long operations this field displays a short message describing the current activity. In certain cases this includes a counter showing the percentage of the task completed so far.

Trace Indicator

Shows the descriptions of the active traces.

Caps Lock Indicator

Shows the current status of the Caps Lock key on the keyboard. When the key is active CAPS appears, otherwise the field is empty.

Num Lock Indicator

Shows the current status of the Num Lock key on the keyboard. When the key is active NUM appears, otherwise the field is empty.

Title Bar



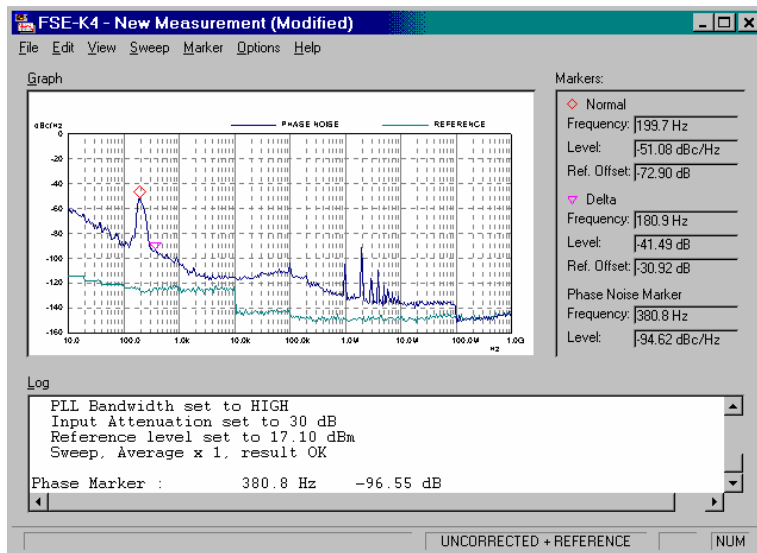
This is the area across the top of the application window between the system menu icon and the minimize, maximize and restore buttons. It displays the application name "FS-K4" and the name of the current file. FS-K4 deals with several different file types of varying degrees of importance. The title bar always displays the name of the most important data type currently in use. If the file has been altered in any way since it was loaded this will be indicated by the word **(modified)** appearing to the right of the file name.

The data types are as follows:

| Data Type | File Extension | Importance |
|----------------|----------------|------------|
| Limit Line | *.lim | Least |
| Analyzer Setup | *.set | |
| Result Data | *.dat | Most |

At start-up the default setup for the current default Analyzer is automatically loaded. This has the name "New Setup".

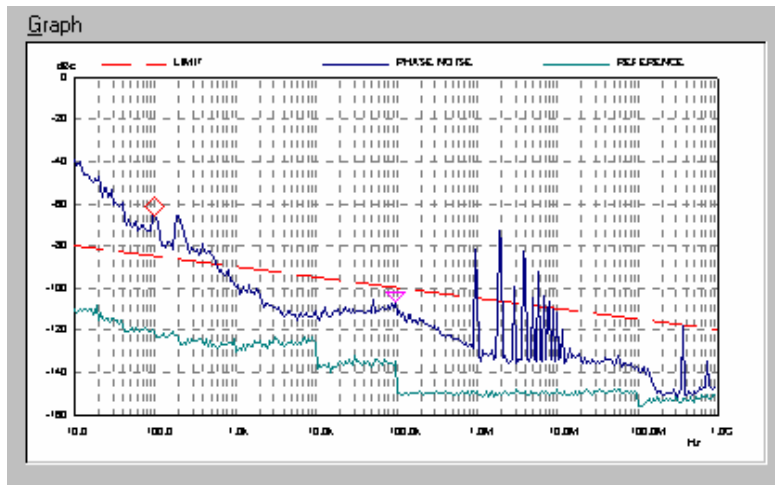
Workspace



This is the area below the menu bar in which all measured data is displayed and manipulated. It contains three areas as follows:

1. Graph (p55) area showing the sweep trace as a 2-dimensional graph,
2. Log (p56) area displaying information on the last measurement,
3. Markers (p56) area showing the current co-ordinates of the active markers.

Graph



Displayed in the top left of the workspace area, below the menu bar.

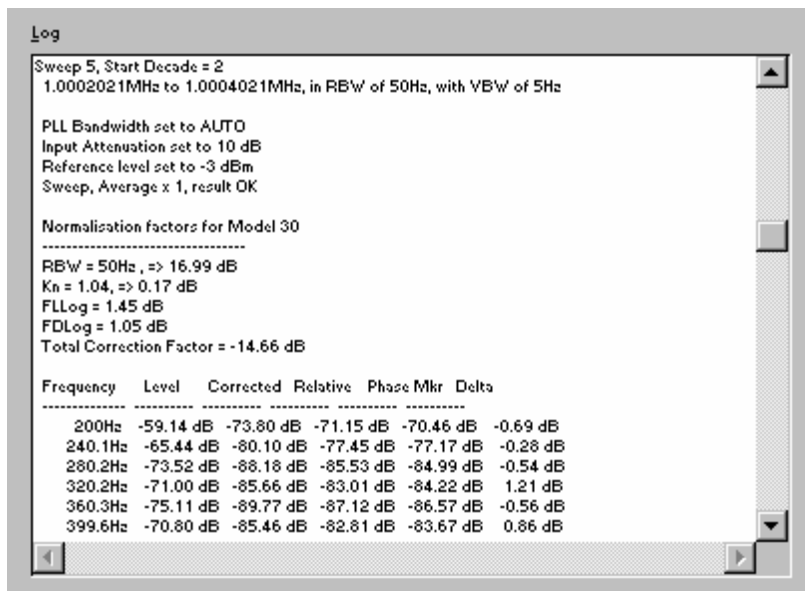
Shows sweep trace data in graphical form with, optional limit line, and calculated values of Residual PM, Residual FM, and RMS Jitter. The minimum and maximum values of each axis reflect the frequency offset and level ranges defined in the current Analyzer Setup.

A Markers area (p56) may also be displayed, which allows the precise frequency offset and phase noise of each data point to be read from the screen.

To hide or display the Graph, choose Graph from the View menu (ALT, V, G).

Hint: The Graph region scales with the application window and always fills the available space within the workspace area. In order to see the most detail, maximize the application and then use the View and Marker menu commands to hide the Log and Normal Marker.

Log



Displayed at the bottom of the workspace area, above the status bar.

Displays detailed progress and result information for the most recent sweep measurement and any subsequent Measure at Marker operations.

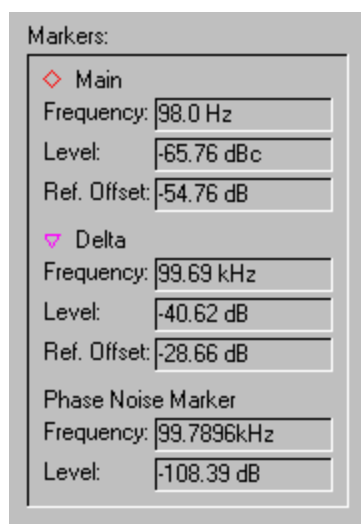
The logging function is only enabled when a tick appears next to the Measurement Log command in the Options menu (ALT, O, L).

When logging is enabled use the Log command in the View menu (ALT, V, L) to hide or display the Log region.

Log information for a sweep measurement is automatically saved and loaded with the Result Data (*.DAT) file. It is stored in a text file (*.TXT) with the same filename as the Result Data file, i.e. if you save Result Data to "MYDATA.DAT" the log information will be saved to "MYDATA.TXT".

See Log Text Files (p72) for a description of the Log file content.

Markers



Displayed in the top right of the workspace area, below the menu bar.

Shows the current co-ordinates of the Graph marker(s) and the analyzer's Phase Noise Marker.

To hide or display the Marker region, choose Normal from the Marker menu (ALT, M, N).

Note: *If the Graph is hidden using the Graph command in the View menu, the Marker region is hidden also.*

Normal 

This group of fields are always displayed when the Normal marker is enabled.

Frequency

Shows the frequency offset relative to the carrier at the current position.

Level

Shows the absolute phase noise level at the current position

Ref. Offset

This field only appears when the Reference (*p41*) trace is displayed. It shows the difference between the main and reference traces at the current position.

Delta 

This group of fields are only displayed when the Delta marker is enabled.

Frequency

Shows the frequency offset relative to the Normal marker at the current position.

Level

Shows the phase noise level offset relative to the Normal marker at the current position

Ref. Offset

This field only appears when the Reference (*p41*) trace is displayed. It shows the difference between the main and reference traces at the current position.

Phase Noise Marker

This group of fields only appears when the Measure at Marker command is used.

Frequency

Shows the frequency offset relative to the carrier at the current Phase Noise Marker position

Level

Shows the absolute phase noise level reported by the Phase Noise Marker at the current Phase Noise Marker position.

5 Keyboard and Mouse

The following chapter gives an overview of the keyboard and mouse functions which can be used for entering characters and numbers, editing text, handling markers and for various other tasks.

Deleting and inserting text

FS-K4 has numerous shortcut keys you can use to delete or insert text.

Deleting text

| To | Press |
|---|-------------------------|
| Delete one character to the left of the insertion point or selected text | BACKSPACE |
| Delete one character to the right of the insertion point or selected text | DEL |
| Delete selected text and send it to the Clipboard | CTRL + X or SHIFT + DEL |
| Reverse the last action (also known as "undo") | CTRL + Z |

Inserting text

| To | Press |
|----------------------------|-------------------------|
| Copy text to the Clipboard | CTRL + C or CTRL + INS |
| Insert Clipboard contents | CTRL + V or SHIFT + INS |

Function keys

You can use the function keys on your keyboard to perform many tasks faster.

F1

| To | Press |
|---|-------|
| Get help on the selected command, open dialogue box, or a message | F1 |

F3

| To choose | Press |
|--------------------------------------|-------|
| Sweep Setup (p35) from the Edit Menu | F3 |

F5

| To choose | Press |
|---------------------------------|-------|
| Start (p43) from the Sweep Menu | F5 |

F8

| To choose | Press |
|--------------------------------|-------|
| Stop (p43) from the Sweep Menu | F8 |

F10

| To choose | Press |
|--------------------------|-------|
| Make the menu bar active | F10 |

F11

| To choose | Press |
|------------------------------|-------|
| New (p31) from the File Menu | F11 |

F12

| To choose | Press |
|----------------------------------|--------------------|
| Save As (p32) from the File Menu | F12 |
| Open (p31) from the File Menu | CTRL + F12 |
| Save (p32) from the File Menu | SHIFT + F12 |
| Print (p34) from the File Menu | CTRL + SHIFT + F12 |

Moving the insertion point in a text entry field

To move the insertion point through a text field:



- ▶ Click the new location.



- ▶ Do one of the following.

| To move | Press |
|----------------------------|----------|
| One character to the left | ← |
| One character to the right | → |
| One word to the left | CTRL + ← |
| One word to the right | CTRL + → |
| To the end of a line | END |
| To the beginning of a line | HOME |

Moving the marker

- ▶ Position the mouse pointer over the Graph (p55) at the desired frequency and click the left mouse pointer. The marker will move to the selected frequency.



1. Press ALT + G to move focus to the Graph.
2. Use the ↑ and ↓ keys for coarse positioning of the marker.
3. Use the ← and → keys to move the marker to the desired frequency.

Re-measuring at the Marker



- ▶ Do one of the following.
 1. Position the mouse pointer over the Graph (p55) at the desired frequency.
 2. Double-click the left mouse button. If the selected frequency is outside the current analyzer settings, the sub-band containing the frequency will be re-measured. The Analyzer will then position its Phase Noise Marker at the selected frequency and the measured phase noise will be reported in the Markers panel.

Alternatively

1. Position the mouse pointer over the Graph at the desired frequency and click the left mouse button. The marker will move to the selected frequency.
2. Choose the Measure at Marker (p45) command from the Marker menu.



1. Press ALT + G to move focus to the Graph.
2. Use the ← and → keys to move the marker to the desired frequency. See Moving the marker (p60) for more information.
3. Choose the Measure at Marker (p45) command (ALT, M, M) from the Marker menu.

Selecting in a text entry field



- ▶ Do one of the following:

| To select | Do this |
|-----------|---|
| Any text | Drag across the text you want to select. You can also select any text by placing the insertion point at one end of the text you want to select, then holding down the SHIFT key, and then clicking the opposite end of the text. |
| A word | Double-click the word. |



- ▶ Do one of the following:

| To extend selection | Press |
|----------------------------|------------------|
| One character to the left | SHIFT + ← |
| One character to the right | SHIFT + → |
| One word to the left | CTRL + SHIFT + ← |
| One word to the right | CTRL + SHIFT + → |
| To the end of a line | SHIFT + END |
| To the beginning of a line | SHIFT + HOME |

Using Table Entry Boxes

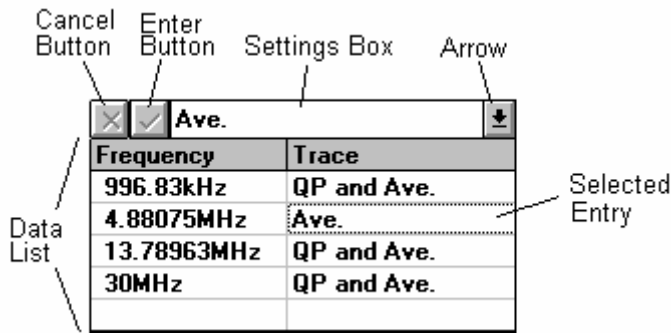
Description

A Table Entry box consists of:

The Settings box

Located at the top of the Table Entry box, this is where you make a change to the selected entry. Simply enter the new value by typing it in the Settings box. Click the Enter button

{bmc tickssel.bmp} to accept the change, or click the Cancel button {bmc crosssel.bmp} to cancel the change.



The Data list

Located at the bottom of the Table Entry box, this list shows the data that you enter into the table and allows you to select an entry to modify.

Table Entry Box Keys

Use these key combinations when the Data list has the focus:

| Press | To |
|-----------|---|
| Shift+Tab | Switch focus to the command buttons. |
| Page Down | Move down through the Data list. |
| Page Up | Move up through the Data list. |
| ↓ | Move down through each entry. |
| ↑ | Move up through each entry. |
| → | Move right and down through each entry. |
| ← | Move left and up through each entry. |
| End | Move to the right hand column. |
| Home | Move to the left hand column. |
| Alpha | Move the insertion point to the Settings box and enter a new value. |
| Tab | Move the insertion point to the Settings box. |

For on/off entries simply double click over the entry to switch between the two values.

Use these key combinations when the Settings box has the focus:

| Press | To |
|-----------|--|
| Ctrl+Z | Undo the last editing action in the current line. |
| Ctrl+C | Copy the selected text to the Clipboard. |
| Ctrl+X | Cut the selected text to the Clipboard. |
| Del | Delete the selected text without placing it on the Clipboard. |
| Ctrl+V | Paste the Clipboard contents at the insertion point. |
| Enter | Move the insertion point into the Data list and commit the entry change. |
| Shift+Tab | Switch focus to the Data list without committing the entry change. |
| Tab | Move the focus to the Data list and commit the entry change. |
| Esc | Move the focus to the Data list and cancel the entry change. |

6 Command Line Options

You can use the following switches to change the way FS-K4 behaves when you start the application.

| Switch | Argument | Description |
|--------|-----------------------|---|
| /FR | [drive][path]filename | Load the specified result data file (*.dat). If you do not specify a drive or path, FS-K4 will look in the default Result Data directory specified in the Options Default Paths dialogue box. For example /FRD:\RESULTS\MYDATA.DAT |
| /FS | [drive][path]filename | Load the specified Analyzer setup file (*.set) For example /FSD:\STANDARD\EN55022.SET |
| /LI | none | Enables listing of all GPIB operations to a file in the FS-K4 directory called GPIB.DOC. This is intended for problem solving and should not be used on a regular basis since it reduces system performance. |
| /SL | none | Forces FS-K4 to use monochrome bit maps for the tick and cross buttons in Table Entry boxes. This can make these buttons more readable on some display adapters. |

The following switches temporarily override the corresponding settings in the Options Analyzer dialogue box.

| Switch | Argument | Description |
|--------|---|---|
| /R | FSEA 20(+B2)(+B4)(+B5) FSEA 30(+B2) FSEB 20(+B4)(+B5) FSEB 30 FSEM 20(+B4)(+B5) FSEM 30 FSEK 20(+B4)(+B5) FSEK 30 FSIQ 3(+B2) FSIQ 7 FSIQ 26 FSIQ 40 ESIB 7 ESIB 26 ESIB 40 FSP 3 FSP 7 FSP 13 FSP 30 FSP 40 ESPI 3 ESPI 7 FSU 3 FSU 8 FSU 26 FSU 46 FSU 50 FSQ 3 FSQ 8 FSQ 26 | Specify a different default Analyzer type. For example /RFSEM 30 Note: the text in parentheses is optional and should only be included if the Analyzer is fitted with the corresponding option. |
| /ID | none | Disable <i>Initialize on Start-up</i> function |

7 Communication Problems

If the application fails to communicate with the Analyzer, a message box is displayed describing the problem. The following possibilities exist:

| Problem | Suggested Action |
|--|--|
| The computer is not fitted with an GPIB card. | Choose the Cancel button to ignore the problem. The application continues normally but you can only use commands that do not involve the Analyzer. |
| The interface card is not configured correctly. | Use the configuration software supplied with the interface card to set all parameters to their default condition and then choose Retry. Alternatively choose Cancel to ignore the problem and then re-configure the card at a later time and before attempting to use any Analyzer functions. FS-K4 is designed to work with the default settings as supplied with the card. |
| The Analyzer is not connected to the interface card. | Connect the Analyzer and choose Retry. Alternatively choose Cancel to ignore the problem and then connect the Analyzer before attempting to use any Analyzer functions. |
| The Analyzer is not switched on. | Turn the Analyzer on, wait for it to initialize, and then choose Retry. Alternatively choose Cancel to ignore the problem and then turn on the Analyzer before attempting to use any Analyzer functions. |
| The Analyzer bus address does not match that specified in the Options Analyzer dialogue box. | Change the Analyzer address to match that set in the Options Analyzer dialogue box and then choose Retry. Alternatively choose Cancel to ignore the problem and then modify the address in the Options Analyzer dialogue box before attempting to use any Analyzer functions. |

8 Data Storage Format

With the exception of Log Text Files, FS-K4 stores all setup and result data in the form of ASCII tab delimited files.

The first line of each file is the long description that you enter in the right hand side of the File Description box in the Save As dialogue box. The remainder consists of EntryValue pairs representing run-time options for the application. Related entries are grouped together in Sections, which start with a section name in square brackets [], and finish with [END].

There are five different types of data file as follows:

| | |
|----------------------------|---|
| Limit Line Files (p67) | Contains a Limit Line definition |
| Analyzer Setup Files (p68) | Contains definitions for a Sweep Setup and an optional Limit Line |
| Result Data Files (p70) | Complete list of measured values, definitions for the Sweep Setup used to make the measurement, and an optional Limit Line. |
| Log Text Files (p72) | Complete text of the measurement log generated during a measurement. |
| FS-K4.INI (p74) | Configuration settings |

Conventions Used in Descriptions of Data Storage Format

This section uses the following typographic conventions

| | |
|-----------------|---|
| keywords | In syntax, normal letters indicate information you must type as shown. |
| description | In syntax, letters with serifs indicate descriptive information, which you should NOT include. |
| <i>variable</i> | In syntax, italic letters can indicate placeholders for information you supply. |
| {ON OFF} | In syntax, braces and a vertical bar indicate a choice between two or more items. You must choose one of the items unless all of the items also are enclosed in angle brackets. |
| (option) | In syntax, parentheses indicate optional items. For example 'FSEA 20(+B2)(+B4)(+B5)' means the text string 'FSEA 20' plus any combination of the text strings '+B2', '+B4', and '+B5' including none of them. |
| TAB | The tab character, ASCII 9. |

Limit Line Files

These contain the following groups and entries

| Line | [Group] or Entry | Value |
|------|------------------|---|
| 1 | | <i>Long description, which you enter in the right hand side of File Description box in the Save As dialogue box</i> |
| 2 | [VERSION] | |
| 3 | VERSION | <i>Software version used to write the file, enclosed in single quotes</i> |
| 4 | [END] | |
| 5 | [LIMIT] | |

| Line | [Group] or Entry | Value |
|----------|------------------|---|
| 6 | MAX | <i>Value of limit parameter in peak vertex</i> |
| 7 | NAME | <i>Identifier entered in Name box of Limit Line dialogue box, enclosed in single quotes</i> |
| 8 | BANK | 0 |
| 9 | LENGTH | <i>Number of vertices</i> |
| 10 | VERTEX | 0 TAB <i>Frequency of first vertex</i> TAB <i>Limit value of first vertex</i> |
| 11 | VERTEX | 1 TAB <i>Frequency of second vertex</i> TAB <i>Limit value of second vertex</i> |
| ⋮ | ⋮ | ⋮ |
| 10+(n-1) | VERTEX | <i>n-1 TAB Frequency of last vertex TAB Limit value of last vertex. Where n = the number of vertices.</i> |
| 10+n | [END] | |

Analyzer Setup Files

These contain the following groups and entries

| Line | [Group] or Entry | Value |
|------|-----------------------|--|
| 1 | | <i>Long description, which you enter in the right hand side of File Description box in the Save As dialogue box</i> |
| 2 | [VERSION] | |
| 3 | VERSION | <i>Software version used to write the file, enclosed in single quotes</i> |
| 4 | [END] | |
| 5 | [RX SETUP] | |
| 6 | RX TYPE | { 'FSEA 20(+B2)(+B4)(+B5)' 'FSEA 30(+B2)' 'FSEB 20(+B4)(+B5)' 'FSEB 30' 'FSEM 20(+B4)(+B5)' 'FSEM 30' 'FSEK 20(+B4)(+B5)' 'FSEK 30' 'FSIQ 3(+B2)' 'FSIQ 7' 'FSIQ 26' 'FSIQ 40' 'ESIB 7' 'ESIB 26' 'ESIB 40' 'FSP 3' 'FSP 7' 'FSP 13' 'FSP 30' 'FSP 40' 'ESPI 3' 'ESPI 7' 'FSU 3' 'FSU 8' 'FSU 26' 'FSU 46' 'FSU 50' 'FSQ 3' 'FSQ 8' 'FSQ 26' } |
| 7 | GRID START FREQ | <i>Graph x-axis start frequency in hertz</i> |
| 8 | GRID STOP FREQ | <i>Graph x-axis stop frequency in hertz</i> |
| 9 | GRID MINLEVEL | <i>Graph y-axis minimum in dBc/ Hz</i> |
| 10 | GRID MAXLEVEL | <i>Graph y-axis maximum in dBc/ Hz</i> |
| 11 | SWEEP CENTER FREQ | <i>Signal frequency in hertz</i> |
| 12 | SWEEP FREQ TOLERANCE | <i>Signal tolerance frequency in hertz</i> |
| 13 | SWEEP LEVEL TOLERANCE | <i>Signal tolerance level in dB</i> |
| 14 | SWEEP MIN FREQ OFFSET | <i>Minimum offset frequency to be measured in hertz</i> |
| 15 | SWEEP MAX FREQ OFFSET | <i>Maximum offset frequency to be measured in hertz</i> |
| 16 | SWEEP DISPLAY REF | 0 |
| 17 | SWEEP REF LEVEL | <i>Graph y-axis maximum in dBc/ Hz</i> |
| 18 | SWEEP LEVEL RANGE | <i>Graph y-axis range in dB</i> |
| 19 | SWEEP LEVEL OFFSET | <i>Offset value to be added to all measured values in dB</i> |
| 20 | SWEEP COUPLING RATIO | { 10 1 0.1 } where 10 means 'RBW = 10 x VBW', 1 means 'RBW = VBW', and 0.1 means '10 x RBW = VBW' |

| Line | [Group] or Entry | Value |
|------|-------------------------|--|
| 21 | SWEEP SMOOTHING WINDOW | <i>Smoothing window width in number-of-samples</i> |
| 22 | SWEEP VERIFY CENTER | { 1 0 } where 1 means "Verify Signal Frequency and Level", and 0 means "Do not Verify Signal Frequency and Level" |
| 23 | REPORT HEADING | <i>User report text, enclosed in single quotes</i> |
| 24 | REPORT MEASUREMENT TYPE | <i>User report text, enclosed in single quotes</i> |
| 25 | REPORT EUT NAME | <i>User report text, enclosed in single quotes</i> |
| 26 | REPORT MANUFACTURER | <i>User report text, enclosed in single quotes</i> |
| 27 | REPORT CONDITIONS | <i>User report text, enclosed in single quotes</i> |
| 28 | REPORT OPERATOR | <i>User report text, enclosed in single quotes</i> |
| 29 | REPORT TEST SPEC | <i>User report text, enclosed in single quotes</i> |
| 30 | REPORT COMMENT 1 | <i>User report text, enclosed in single quotes</i> |
| 31 | REPORT COMMENT 2 | <i>User report text, enclosed in single quotes</i> |
| 32 | REPORT TITLES | { 1 0 } where 1 means 'Include user report text', and 0 means 'Exclude user report text' |
| 33 | REPORT DATE | { 1 0 } where 1 means 'Include measurement complete date', and 0 means 'Exclude measurement complete date' |
| 34 | REPORT SWEEP | { 1 0 } where 1 means 'Include setup information', and 0 means 'Exclude setup information' |
| 35 | LIMIT UPPER NAME | <i>Identifier entered in Name box of Limit Line dialogue box, enclosed in single quotes</i> |
| 36 | LIMIT UPPER DESCRIPTION | <i>Long description, of limit line file, which you enter in the right hand side of File Description box in the Save As dialogue box, enclosed in single quotes</i> |
| 37 | LIMIT UPPER BANK | 0 |
| 38 | SUBBAND RBW | 1 1 <i>RBW for decade 1, sub-band 1</i> |
| 39 | SUBBAND RBW | 1 2 <i>RBW for decade 1, sub-band 2</i> |
| 40 | SUBBAND RBW | 1 3 <i>RBW for decade 1, sub-band 3</i> |
| 41 | SUBBAND RBW | 2 1 <i>RBW for decade 2, sub-band 1</i> |
| 42 | SUBBAND RBW | 2 2 <i>RBW for decade 2, sub-band 2</i> |
| 43 | SUBBAND RBW | 2 3 <i>RBW for decade 2, sub-band 3</i> |
| 44 | SUBBAND RBW | 3 1 <i>RBW for decade 3, sub-band 1</i> |
| 45 | SUBBAND RBW | 4 1 <i>RBW for decade 4, sub-band 1</i> |
| 46 | SUBBAND RBW | 4 2 <i>RBW for decade 4, sub-band 2</i> |
| 47 | SUBBAND RBW | 5 1 <i>RBW for decade 5, sub-band 1</i> |
| 48 | SUBBAND RBW | 6 1 <i>RBW for decade 6, sub-band 1</i> |
| 49 | SUBBAND RBW | 7 1 <i>RBW for decade 7, sub-band 1</i> |
| 50 | SUBBAND RBW | 8 1 <i>RBW for decade 8, sub-band 1</i> |
| 51 | SUBBAND RBW | 9 1 <i>RBW for decade 9, sub-band 1</i> |
| 52 | SUBBAND SWEEPS | 1 1 <i>Sweep count for dec. 1, sub-band 1</i> |
| 53 | SUBBAND SWEEPS | 1 2 <i>Sweep count for dec. 1, sub-band 2</i> |
| 54 | SUBBAND SWEEPS | 1 3 <i>Sweep count for dec. 1, sub-band 3</i> |
| 55 | SUBBAND SWEEPS | 2 1 <i>Sweep count for dec. 2, sub-band 1</i> |
| 56 | SUBBAND SWEEPS | 2 2 <i>Sweep count for dec. 2, sub-band 2</i> |
| 57 | SUBBAND SWEEPS | 2 3 <i>Sweep count for dec. 2, sub-band 3</i> |

| Line | [Group] or Entry | Value | |
|----------|--|-------|---|
| 58 | SUBBAND SWEEPS | 3 | 1 Sweep count for dec. 3, sub-band 1 |
| 59 | SUBBAND SWEEPS | 4 | 1 Sweep count for dec. 4, sub-band 1 |
| 60 | SUBBAND SWEEPS | 4 | 2 Sweep count for dec. 4, sub-band 2 |
| 61 | SUBBAND SWEEPS | 5 | 1 Sweep count for dec. 5, sub-band 1 |
| 62 | SUBBAND SWEEPS | 6 | 1 Sweep count for dec. 6, sub-band 1 |
| 63 | SUBBAND SWEEPS | 7 | 1 Sweep count for dec. 7, sub-band 1 |
| 64 | SUBBAND SWEEPS | 8 | 1 Sweep count for dec. 8, sub-band 1 |
| 65 | SUBBAND SWEEPS | 9 | 1 Sweep count for dec. 9, sub-band 1 |
| 66 | SUBBAND FFT | 1 | 1 { 0 1 } where 0 means 'do not use FFT filter', and 1 means 'do use FFT filter' for decade 1, sub-band 1 |
| 67 | SUBBAND FFT | 1 | 2 { 0 1 } for decade 1, sub-band 2 |
| 68 | SUBBAND FFT | 1 | 3 { 0 1 } for decade 1, sub-band 3 |
| 69 | SUBBAND FFT | 2 | 1 { 0 1 } for decade 2, sub-band 1 |
| 70 | SUBBAND FFT | 2 | 2 { 0 1 } for decade 2, sub-band 2 |
| 71 | SUBBAND FFT | 2 | 3 { 0 1 } for decade 2, sub-band 3 |
| 72 | SUBBAND FFT | 3 | 1 { 0 1 } for decade 3, sub-band 1 |
| 73 | SUBBAND FFT | 4 | 1 { 0 1 } for decade 4, sub-band 1 |
| 74 | SUBBAND FFT | 4 | 2 { 0 1 } for decade 4, sub-band 2 |
| 75 | SUBBAND FFT | 5 | 1 { 0 1 } for decade 5, sub-band 1 |
| 76 | SUBBAND FFT | 6 | 1 { 0 1 } for decade 6, sub-band 1 |
| 77 | SUBBAND FFT | 7 | 1 { 0 1 } for decade 7, sub-band 1 |
| 78 | SUBBAND FFT | 8 | 1 { 0 1 } for decade 8, sub-band 1 |
| 79 | SUBBAND FFT | 9 | 1 { 0 1 } for decade 9, sub-band 1 |
| 80 | [END] | | |
| 81 | [LIMIT] Same as [LIMIT] section in Limit Line Files (p67). | | |
| 86+ n | [END] | | |

Result Data Files

These contain the following groups and entries:

| Line | [Group] or Entry | Value |
|------|------------------|---|
| 1 | | <i>Long description, which you enter in the right hand side of File Description box in the Save As dialogue box</i> |
| 2 | [VERSION] | |
| 3 | VERSION | <i>Software version used to write the file, enclosed in single quotes</i> |
| 4 | [END] | |
| 5 | [REPORT] | |
| 6 | VIEW MODE | <i>Bitmap value indicating display mode of Graph where bit 0 = Uncorrected</i> |

| Line | [Group] or Entry | Value |
|-----------|--|--|
| | | trace, bit 1 = Corrected trace, bit 2 = Reference trace, bit 3 = Residual PM, bit 4 = Residual FM, bit 7 = RMS Jitter. If the bit is set, the feature will be displayed. |
| 7 | MARKER MODE | Bitmap value indicating marker display mode where bit 0 = Delta Marker, bit 1 = Normal Marker. If the bit is set, the Marker will be displayed |
| 8 | MARKER NORMAL | Frequency of Normal Marker in hertz. |
| 9 | MARKER DELTA | Frequency of Delta Marker in hertz. |
| 10 | DATE STAMP | Date and time at which measurement was completed, enclosed in single quotes |
| 11 | SETUP NAME | File name, of analyzer setup file, which you enter in the left hand side of File Description box in the Save As dialogue box, enclosed in single quotes |
| 12 | SETUP DESCRIPTION | Long description, of analyzer setup file, which you enter in the right hand side of File Description box in the Save As dialogue box, enclosed in single quotes |
| 13 | [END] | |
| 14 | [RX SETUP] Same as [RX SETUP] section Analyzer Setup Files (p68). | |
| 89 | [END] | |
| 90 | [LIMIT] Same as [LIMIT] section in Limit Line Files (p67). | |
| 95+n | [END] | |
| 96 | [SWEEP DATA] | |
| 97 | START | Minimum offset frequency measured in hertz |
| 98 | STOP | Maximum offset frequency measured in hertz |
| 99 | TOTAL | Number of measurement points expected. This is calculated as: 1 + 499 x the number of sub-bands measured |
| 100 | MAX | Number of measurement points that will be saved. If TOTAL > 30000 then this value is 30000, otherwise it is equal to TOTAL. |
| 101 | NEXT | Index that will be used for the next measurement point received - 1. If the measurement was completed this value will be equal to MAX. |
| 102 | LAST | Index that was used for the last measurement point received. If the measurement was completed this value will be equal to MAX. |
| 103 | FACTOR | Conversion factor from expected measurement point number to saved point index. If TOTAL is equal to MAX this will be -1, otherwise it will be: -1 x (MAX/TOTAL) |
| 104 | LOGSCALE | 0 |
| 105 | SIGNAL FREQUENCY | Signal frequency measured by the Verify Signal Frequency and Level function in hertz. |
| 106 | SIGNAL LEVEL | Signal level measured by the Verify Signal Frequency and Level function in dBm. |
| 107 | VERTEX | 0 TAB Frequency of first vertex TAB Level value of first vertex TAB 0 TAB 1 |
| 108 | VERTEX | 1 TAB Frequency of second vertex TAB Level value of second vertex TAB 0 TAB 1 |
| ⋮ | ⋮ | ⋮ |
| 107+(n-1) | VERTEX | 1 TAB Frequency of last vertex TAB Level value of last vertex TAB 0 TAB 1. Where n = the number of saved points |
| 107+n | [END] | |

| Line | [Group] or Entry | Value |
|-------------|------------------|---|
| 107+(n+1) | [SWEEP DATA] | Same layout as preceding [SWEEP DATA] section. This section will only exist if the result data file includes a reference trace. When this section is included, the preceding [SWEEP DATA] section contains the reference trace data, and this section contains the uncorrected trace data. The corrected trace is not stored since it can be calculated from the uncorrected and reference traces. When this section is not included, the preceding section contains the uncorrected trace data. |
| 209+(2 x n) | [END] | |

Log Text Files

Each time a new sweep measurement is started, the log is cleared. FS-K4 then tries to initialize the analyzer and will log the result, for example:

```
Initialization
=====
```

```
Analyzer type FSEB 30+B2+B4+B5 initialized successfully.
```

If the Carrier Search function is enabled, its results will appear next. The analyzer sweeps a span of twice the Frequency Tolerance, centered on the Signal Frequency specified in the Sweep Setup dialogue. If the peak exceeds the reference level, the reference level is increased by 10dB and the sweep repeated. The peak is then accurately measured using the frequency counter and marker. For example:

```
Carrier search starting
=====
```

```
Center 100 MHz, Span 2 kHz
RBW 2 kHz, Reference level -15.00 dBm
Sweep, Max Hold x 1, result OK
Peak found at 50.0000661 MHz, 2.94 dBm
```

```
Sweep, ClearWrite x 1, result OK
```

```
Carrier found at 149.9999939 MHz, 2.94 dBm
```

If no Signal is found or if the Signal is outside the specified tolerances, the measurement will be aborted. The Reference Level and any Level Offset to be used during the Phase Noise sweep are then logged, for example:

```
Ref. Level will be set to 2.94 dBm for offsets less than 10 kHz.
Ref. Level will be set to -17.06 dBm for offsets greater than 10 kHz
```

```
Level Offset is 0.00 dB
```

Input attenuation is normally calculated to obtain a signal level of up to +5dBm at the mixer input for offsets greater than 10 kHz. However since the frequency response of the front end is not guaranteed to be flat, it is necessary to check whether any additional attenuation will be required for offsets from 10 kHz to 100 MHz. Above this, the carrier is well outside the edges of the resolution bandwidth filter and not additional attenuation is required.

A check is made to see if the RF Overload warning is activated with the calculated input attenuation. If it is activated, the attenuation is increased in 10dB steps until the overload is removed.

```
RF Overload Check starting
=====
```

```
Input Attenuation set to 0 dB
Sweep, Average x 1, result *** RF Over Range ***
Input Attenuation set to 10 dB
Sweep, Average x 1, result OK
```

Attenuation will be offset by 10 dB, in the range 10 kHz to 100 MHz

The Phase Noise measurement then starts. The overall sweep is divided into one or more sub-sweeps depending on the specified start and stop offsets. For each sub-sweep the following information is logged:

```
Start Decade Number      Sub-sweep within decade
Absolute Start Frequency Absolute Stop Frequency
Resolution Bandwidth     Video Bandwidth
Main PLL Bandwidth       Input Attenuation
Reference level          Normalization Factors
```

In addition the analyzer's Phase Noise Marker is used to measure at six points equally spaced across the sub-band and the results are listed along with the results from the sub-band and the computed difference. For example:

Sweep 1, Start Decade = 3, Sub-band = 1

```
Offsets 1kHz to 10kHz relative to 149.9999939MHz
RBW set to 200Hz
PLL Bandwidth set to HIGH, FFT Filter is ON
Input Attenuation set to 20 dB
Reference level set to 2.90 dBm
Sweep, Average x 1, result OK
```

Normalization factors for Model 7

```
-----
RBW = 200Hz , => 23.01 dB
Kn = 1.06, => 0.25 dB
FLLog = 1.45 dB
FDLog = 1.05 dB
Total Correction Factor = -20.76 dB
```

| Frequency | Level | Corrected | Relative | Phase Mkr | Delta |
|-----------|-----------|------------|------------|------------|----------|
| 1kHz | -80.89 dB | -101.65 dB | -104.59 dB | -105.79 dB | 1.20 dB |
| 2.8036kHz | -92.96 dB | -113.72 dB | -116.66 dB | -115.43 dB | -1.23 dB |
| 4.6072kHz | -86.93 dB | -107.69 dB | -110.63 dB | -115.99 dB | 5.36 dB |
| 6.4108kHz | -92.96 dB | -113.72 dB | -116.66 dB | -116.23 dB | -0.43 dB |
| 8.2144kHz | -92.96 dB | -113.72 dB | -116.66 dB | -116.59 dB | -0.07 dB |
| 10kHz | -86.93 dB | -107.69 dB | -110.63 dB | -111.10 dB | 0.47 dB |

Once the sweep is complete the following message is logged:

```
Phase Noise measurement complete
=====
```

FS-K4.INI

These contain the following groups and entries

| Line | [Group] or Entry | Value |
|------|------------------|--|
| 1 | [VERSION] | |
| 2 | VERSION | <i>Software version used to write the file, enclosed in single quotes</i> |
| 3 | [END] | |
| 4 | [SETUP] | |
| 5 | ANALYZER | { 'FSEA 20(+B2)(+B4)(+B5)' 'FSEA 30(+B2)' 'FSEB 20(+B4)(+B5)' 'FSEB 30' 'FSEM 20(+B4)(+B5)' 'FSEM 30' 'FSEK 20(+B4)(+B5)' 'FSEK 30' 'FSIQ 3(+B2)' 'FSIQ 7' 'FSIQ 26' 'FSIQ 40' 'ESIB 7' 'ESIB 26' 'ESIB 40' 'FSP 3' 'FSP 7' 'FSP 13' 'FSP 30' 'FSP 40' 'ESPI 3' 'ESPI 7' 'FSU 3' 'FSU 8' 'FSU 26' 'FSU 46' 'FSU 50' 'FSQ 3' 'FSQ 8' 'FSQ 26' } |
| 6 | METHOD | { 0 1 } where 0 means 'use GPIB', and 1 means 'use DDE' |
| 7 | INITIALIZE | { 0 1 } where 0 means 'do not initialize on start-up', and 1 means 'do initialize on start-up'. |
| 8 | ADDRESS | { 0 1 ... 31 } |
| 9 | DEFAULT PATH | 0 <i>Fully qualified path for Analyzer Setup files</i> |
| 10 | DEFAULT PATH | 1 <i>Fully qualified path for Result Data files</i> |
| 11 | DEFAULT PATH | 2 <i>Fully qualified path for Limit Line files</i> |
| 12 | GRAPHIC FORMAT | 0 <i>Bitmap value indicating color, style, and line width used to draw Graph border</i> |
| | | Where bits 0 to 3 specify the color, bits 4 to 7 specify the Style, and bits 8 to 11 specify the line width. |
| 13 | GRAPHIC FORMAT | 1 <i>Bitmap value indicating color, style, and line width used to draw Graph Vertical Grid</i> |
| 14 | GRAPHIC FORMAT | 2 <i>Bitmap value indicating color, style, and line width used to draw Graph Horizontal Grid</i> |
| 15 | GRAPHIC FORMAT | 3 <i>Bitmap value indicating color, style, and line width used to draw Graph Text</i> |
| 16 | GRAPHIC FORMAT | 4 <i>Bitmap value indicating color, style, and line width used to draw Graph Trace</i> |
| 17 | GRAPHIC FORMAT | 5 <i>Bitmap value indicating color, style, and line width used to draw Graph Ref. Trace</i> |
| 18 | GRAPHIC FORMAT | 6 <i>Bitmap value indicating color, style, and line width used to draw Graph Limit</i> |
| 19 | GRAPHIC FORMAT | 7 <i>Bitmap value indicating color, style, and line width used to draw Graph Normal Marker</i> |
| 20 | GRAPHIC FORMAT | 8 <i>Bitmap value indicating color, style, and line width used to draw Graph Delta Marker</i> |
| 21 | DDE GRAPH | 0 |
| 22 | DDE SETUP | 0 |
| 23 | DDE TEXT | 0 |
| 24 | DDE START | 0 |
| 25 | DDE STOP | 0 |
| 26 | HELPPFILE | <i>Name of help file</i> |

| Line | [Group] or Entry | Value |
|------|------------------|--|
| 27 | TMO NORMAL | { 0 1 ... 17 } Sets the normal GPIB timeout period. Default value is 12. 0 means disabled - no timeout 1 10 μ s 2 30 μ s 3 100 μ s 4 300 μ s 5 1 ms 6 3 ms 7 10 ms 8 30 ms 9 100 ms 10 300 ms 11 1 s 12 3 s 13 10 s 14 30 s 15 100 s 16 300 s 17 1000 s |
| 28 | TMO SPOLL | { 0 1 ... 17 } Sets the GPIB timeout period used during serial poll operations. Default value is 13 |
| 29 | TMO DISPLAY | { 0 1 ... 17 } Sets the GPIB timeout period used during display update operations. Default value is 13 |
| 30 | TMO INIT | { 0 1 ... 17 } Sets the GPIB timeout period used during initialization operations. Default value is 12 |
| 31 | LOG SWEEP | { 0 -1 } where 0 means 'disable Measurement Log', and -1 means 'enable measurement log' |
| 32 | [END] | |

9 Decision and Error Messages

The following table contains an alphabetical list of all decision and error messages that can be issued by FS-K4. An explanation, possible options and/or steps for error elimination are given for each message.

| Message | Explanation |
|---|--|
| | <p>➤ Error elimination</p> |
| Analyzer failed identification test at GPIB address (number) | <p>FS-K4 tried to identify the Analyzer type using the specified GPIB address, but there was no response. Either there is another device using the same address, or the Analyzer has the wrong bus address, or it is not connected to the GPIB, or it is not turned on.</p> <p>To fix the problem and try again</p> <p>➤ Check that the Analyzer is switched on, connected to the GPIB, and set to the specified bus address. Also verify that there are no other devices using the same address. Then choose the Retry button.</p> <p>To abort the Analyzer operation</p> <p>➤ Choose the Cancel button.</p> |
| Analyzer frequency range exceeded | <p>The frequency range of the specified files exceeds the capabilities of the specified Analyzer. It will not be possible to make a sweep measurement.</p> <p>To correct this problem do one of the following:</p> <p>➤ Modify the frequency range of the specified files before making a measurement.</p> <p>➤ Use a different Analyzer.</p> |
| Analyzer not found at GPIB address (number) | <p>FS-K4 tried to control the Analyzer using the specified GPIB address, but there was no response. Either the Analyzer has the wrong bus address, or it is not connected to the GPIB, or it is not turned on.</p> <p>To fix the problem and try again</p> <p>➤ Check that the Analyzer is switched on, connected to the GPIB, and set to the specified bus address. Then choose the Retry button.</p> <p>To abort the Analyzer operation</p> <p>➤ Choose the Cancel button.</p> |
| Analyzer not responding | <p>FS-K4 tried to control the Analyzer but there was no response. Either the Analyzer is not connected to the GPIB, or it is not turned on.</p> <p>To fix the problem and try again</p> <p>➤ Check that the Analyzer is switched on, and connected to the GPIB. Then choose the Retry button.</p> <p>To abort the Analyzer operation</p> <p>➤ ► Choose the Cancel button.</p> |
| Analyzer type at GPIB address (number) is not supported | <p>FS-K4 found an unsupported device type at the specified GPIB address.</p> <p>To fix the problem and try again</p> <p>➤ Choose the OK button to abort this Analyzer operation. Replace the Analyzer with one of the following:</p> <p>FSEA 20(+B2)(+B4)(+B5) FSEA 30(+B2) FSEB 20(+B4)(+B5) FSEB 30 FSEM 20(+B4)(+B5) FSEM 30 FSEK 20(+B4)(+B5) FSEK 30 FSIQ 3(+B2) FSIQ 7 FSIQ 26 FSIQ 40 ESIB 7 ESIB 26 ESIB 40 FSP 3 FSP 7 FSP 13 FSP 30 FSP 40 ESPI 3 ESPI 7 FSU 3 FSU 8 FSU 26 FSU 46 FSU 50 FSQ 3 FSQ 8 FSQ 26, where the text in parentheses is optional and should only be included if the corresponding option is fitted to your Analyzer. Then try again.</p> |
| Analyzer type does not match setup | <p>FS-K4 found that the active Analyzer is of a different type to that specified in the Sweep Setup (p35).</p> <p>To correct this error do one of the following:</p> <p>➤ Change the Sweep Setup to select the correct Analyzer type.</p> |

| Message | Explanation |
|---|--|
| | <p>➤ Error elimination</p> <p>➤ Change the Analyzer to match that specified in the Sweep Setup.</p> |
| <p>Changes to Analyzer setup will invalidate results</p> | <p>One or more of the changes you have made affect the way in which the Sweep measurement is made. Thus the measured data currently stored in memory has become invalid and will be erased.</p> <p>To continue with the new settings and erase existing results</p> <p>➤ Choose the OK button.</p> <p>To undo the changes and retain the existing results</p> <ol style="list-style-type: none"> 1. Choose the Cancel button. 2. Exit the editor by choosing the Cancel button. |
| <p>DDE Link driver software missing</p> | <p>FS-K4 was unable to find the driver software for the DDE Link. The driver files are called RSIB.DLL and RSDDE.DLL, and should have been installed in your C:\WINDOWS\SYSTEM directory, or equivalent.</p> <p>To correct this error</p> <p>➤ Copy the files from the C:\RSIB directory on the FSE hard disk to the C:\WINDOWS\SYSTEM directory. Then re-start Windows and FS-K4.</p> <p>➤ If the C:\RSIB directory is missing, contact your Rohde & Schwarz representative and ask for a firmware upgrade. Once this has been installed, re-install the FS-K4 software, by following the instructions on the disk label, and re-start FS-K4.</p> |
| <p>ERROR</p> | <p>An error condition has occurred. Please make a note of the error message and your actions leading up to it's appearance and report them to Rohde & Schwarz Services Ltd.</p> <p>To continue</p> <p>➤ Choose the OK button to continue the application.</p> |
| <p>File already exists</p> | <p>While saving a file, you typed the name of an existing file.</p> <p>To replace the existing file with the active file</p> <p>➤ Choose the Yes button.</p> <p>To retain the existing file</p> <ol style="list-style-type: none"> 1. Choose the No button. 2. Type a different name for the active file. |
| <p>File does not exist</p> | <p>You tried to open a file that does not exist.</p> <p>To correct this error do one of the following:</p> <p>➤ Make sure you typed the correct path and filename.</p> <p>➤ Type the name of a file that exists.</p> <p>➤ If a list is available, select a filename.</p> |
| <p>Filename does not follow DOS conventions</p> | <p>The name of a file or directory can have two parts: a name and an optional extension. The two parts are separated by a period. For example, MYFILE.SET is a valid filename; MYFILE is the name of a file, and .SET is the filename extension.</p> <p>The name can contain up to eight characters, and the extension can contain up to three characters.</p> <p>The name must start with either a letter or number. It can contain any uppercase or lowercase characters except the following:</p> <p>Period(.) Quotation Mark (") Slash (/) Backslash (\) Brackets ([]) Colon (:) Semicolon (;) Vertical Bar () Equal Sign (=) Comma (,)</p> <p>If you use these characters in a filename, you may get unexpected results.</p> <p>The name cannot contain any spaces.</p> <p>The following names are reserved and cannot be used for files or directories: CON, AUX, COM1, COM2, COM3, COM4, LPT1, LPT2, LPT3, PRN, and NUL.</p> |

| Message | Explanation |
|--|--|
| | <p>➤ Error elimination</p> |
| GPIB address not specified | <p>There is no GPIB address defined for the specified Analyzer type so FS-K4 is unable to establish communication.</p> <p>To correct this error</p> <p>➤ Assign a valid bus address to the specified Analyzer type using the Analyzer (<i>p48</i>) command in the Options menu, then re-try. complete.</p> |
| GPIB card missing | <p>FS-K4 was unable to find a GPIB card installed in this computer and will not be able to control an Analyzer.</p> <p>To correct this error</p> <ol style="list-style-type: none"> 1. Install and configure a supported interface card. 2. Re-run FS-K4. |
| GPIB driver did not recognize the name | <p>FS-K4 was unable to communicate with the GPIB.</p> <p>To correct this error</p> <ol style="list-style-type: none"> 1. Run the configuration software supplied with the interface card and set all parameters to their default condition. 2. Choose Retry to try again. <p>To continue without GPIB capability</p> <p>➤ Choose Cancel.</p> |
| GPIB driver software missing or out-of-date | <p>FS-K4 was unable to find the driver software for your GPIB, or the driver does not support the required functionality. The driver file is called GPIB.DLL and should have been installed in your C:\WINDOWS\SYSTEM directory, or equivalent.</p> <p>To correct this error</p> <p>➤ If the driver is missing: re-install it, from the disks supplied with your GPIB card, according to the manufacturers instructions. Then re-start Windows and FS-K4.</p> <p>➤ If the driver is out-of-date: contact your GPIB card supplier and ask for the latest release of driver software for your card and operating system. Then install it according to the manufacturers instructions, and re-start Windows and FS-K4.</p> |
| Incorrect entries | <p>You specified one or more values that are outside the capabilities of the specified Analyzer type.</p> <p>To fix the problem and try again</p> <p>➤ Correct the specified parameters.</p> <p>➤ Choose the OK command button.</p> <p>Note: <i>Refer to the documentation supplied with your Analyzer for more information concerning the range of values that may be entered.</i></p> |
| Limit definition error | <p>A limit line definition must contain a name, and at least two samples.</p> <p>To fix the problem and try again</p> <ol style="list-style-type: none"> 1. Correct the specified parameters. 2. Choose the OK command button. |
| MEASUREMENT ABORTED - Analyzer firmware does not support FFT Filter control via GPIB | <p>You enabled FFT Filters for one or more sub-bands, however the version of firmware installed on your analyzer does not support the control of FFT Filters via the GPIB.</p> <p>Please contact your Rohde & Schwarz representative and ask for a firmware upgrade. Once this has been installed, FS-K4 will allowing these settings to be used.</p> |
| MEASUREMENT ABORTED - Carrier Frequency is outside Signal Frequency Tolerance range | <p>FS-K4 has found a Signal Carrier which is either lower than the Signal Frequency - Frequency Tolerance, or greater than the Signal Frequency + Frequency Tolerance.</p> <p>To fix this problem do one of the following</p> <p>➤ Increase the Frequency Tolerance range in the Sweep Setup box.</p> <p>➤ Modify the Signal Frequency setting in the Sweep Setup box.</p> |

| Message | Explanation |
|--|--|
| | <p>➤ Error elimination</p> |
| | <p>➤ Adjust the signal generator to produce the desired output frequency.</p> |
| <p>MEASUREMENT ABORTED - Max. Peak Level is outside Signal Level Tolerance range</p> | <p>FS-K4 has found a Signal Carrier which is lower than the Signal Level - Level Tolerance.</p> <p>To fix this problem do one of the following</p> <ul style="list-style-type: none"> ➤ Increase the Level Tolerance range in the Sweep Setup box. ➤ Modify the Signal Level setting in the Sweep Setup box. ➤ Adjust the signal generator to produce the desired output level. |
| <p>MEASUREMENT ABORTED - No Signals found within Signal Frequency Tolerance range</p> | <p>FS-K4 was unable to find any Signal Carrier.</p> <p>To fix this problem and try again</p> <ol style="list-style-type: none"> 1. Check that the signal generator is producing an output at the correct frequency and level. 2. Check that the signal generator is connected to the Analyzer's RF INPUT. 3. Check that the correct Signal Frequency and Level have been specified in the Sweep Setup box. 4. Choose Start from the Sweep menu, to start a new measurement. |
| <p>MEASUREMENT ABORTED - Operator command</p> | <p>This message simply confirms that FS-K4 has responded to the Sweep menu's Stop command.</p> |
| <p>MEASUREMENT ABORTED - Sweep did not complete within expected time period</p> | <p>The sweep took longer than expected or did not start correctly. This is usually caused by a firmware problem within the Analyzer.</p> <p>To fix this problem and try again</p> <ol style="list-style-type: none"> 1. Turn the analyzer off, and then back on. 2. Wait until the analyzer has initialized, and then try making the measurement again. |
| <p>MEASUREMENT ABORTED - Sweep range exceeds analyzer maximum stop frequency</p> | <p>The Signal Frequency + Maximum Offset is greater than the maximum frequency that can be measured by the Analyzer.</p> <p>To fix this problem and try again</p> <ol style="list-style-type: none"> 1. Reduce the Maximum Offset in the Sweep Setup box. 2. Choose Start from the Sweep menu, to start a new measurement. |
| <p>Possible incorrect entries</p> | <p>You specified one or more values that may be outside the capabilities of the specified Analyzer type.</p> <p>Some Analyzers are supplied with an extended frequency range. However it is not possible to determine the upper frequency limit from the model number or installed options.</p> <p>To try measuring with the programmed values</p> <ol style="list-style-type: none"> 1. Choose the OK command button. 2. Try making a measurement by choosing Start from the Sweep menu. <p>If the programmed values exceed the Analyzer's frequency range, the measurement will be aborted.</p> <p>To modify the programmed values and try again</p> <ol style="list-style-type: none"> 1. Choose the Cancel command button in this message box. 2. Correct the specified parameters. 3. Choose the OK command button in the Sweep Setup box. <p>Note: Refer to the documentation supplied with your Analyzer for more information concerning the range of values that may be entered.</p> |
| <p>Printer not selected</p> | <p>The Print Setup dialogue was unable to initialize the selected printer.</p> <p>Some drivers such as the HP Plotter cannot be selected from FS-K4.</p> <p>To correct this error</p> <ul style="list-style-type: none"> ➤ Use the Printer Setup command in Print Manager's Options menu to select and configure the |

| Message | Explanation |
|--|--|
| | <p>➤ Error elimination</p> <p>required printer driver before printing from FS-K4.</p> |
| <p>Reference trace is not compatible with new setup</p> | <p>FS-K4 requires that the main and reference traces must contain the same frequency axis settings.</p> <p>To make reference measurements with the new setup</p> <ol style="list-style-type: none"> 1. Make a Sweep measurement with the reference signal only. 2. Choose the Trace To Reference command from the Sweep menu to copy the new reference trace into the reference buffer. |
| <p>Save changes to (file type) (filename)?</p> | <p>You quit FS-K4 or closed a file without saving changes you made to a file.</p> <p>To save the changes</p> <p>➤ Choose the Yes button.</p> <p>To discard the changes</p> <p>➤ Choose the No button.</p> <p>To continue without quitting FS-K4 or saving the changes</p> <p>➤ Choose the Cancel button.</p> |
| <p>Save option menu changes?</p> | <p>You quit FS-K4 without saving changes you made in the options menu.</p> <p>Option menu settings are stored in the FS-K4.INI file, which can be found in the main Windows directory.</p> <p>To save the changes</p> <p>➤ Choose the Yes button.</p> <p>To discard the changes</p> <p>➤ Choose the No button.</p> |
| <p>Sorry, no help available for this subject</p> | <p>➤ See, "Obtaining Technical Support" in the Help menu.</p> |

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