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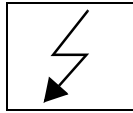
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WARNING

Warning Symbols Used on
the Product



The product is marked
with this symbol when the
user should refer to the
instruction manual in order
to protect the apparatus
against damage.



The product is marked
with this symbol to
indicate that hazardous
voltages are present



EN 60825 1991

The product is marked
with this symbol to
indicate that a laser is
fitted. The user should
refer to the laser safety
information in this manual.

OmniBER 725 Verification Manual

About This Book

This book tells you how to test the instrument to ensure that it meets the published specifications.

The selections available are presented in the following groups:

- General information including safety precautions.
- Installation and preparation for use.
- Performance tests with a test record table.
- ETSI/ANSI terms and conversion
- Overview of self tests.
- Option structure and module configuration/

The tests available will depend on the options fitted to your instrument. The examples given in this book cover all options and therefore may include selections which are not available on your instrument.

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General Information

Warranty

Agilent Technologies PRODUCT	DURATION OF WARRANTY
OmniBER 725	1 year

- 1** Agilent warrants Agilent hardware, accessories and supplies against defects in materials and workmanship for the period specified above. If Agilent receives notice of such defects during the warranty period, Agilent will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or like-new.
- 2** Agilent warrants that Agilent software will not fail to execute its programming instructions, for the period specified above, due to defects in material and workmanship when properly installed and used. If Agilent receives notice of such defects during the warranty period, Agilent will replace software media which does not execute its programming instructions due to such defects.
- 3** Agilent does not warrant that the operation of Agilent products will be uninterrupted or error free. If Agilent is unable, within a reasonable time, to repair or replace any product to a condition as warranted, customer will be entitled to a refund of the purchase price upon prompt return of the product.
- 4** Agilent products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.
- 5** The warranty period begins on the date of delivery or on the date of installation if installed by Agilent. If customer schedules or delays Agilent installation more than 30 days after delivery, warranty begins on the 31st day from delivery.
- 6** Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by Agilent, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.

General Information

Warranty

- 7** TO THE EXTENT ALLOWED BY LOCAL LAW, THE ABOVE WARRANTIES ARE EXCLUSIVE AND NO OTHER WARRANTY OR CONDITION, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED AND AGILENT SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE.
- 8** Agilent will be liable for damage to tangible property per incident up to the greater of \$300,000 or the actual amount paid for the product that is the subject of the claim, and for damages for bodily injury or death, to the extent that all such damages are determined by a court of competent jurisdiction to have been directly caused by a defective Agilent product.
- 9** TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. EXCEPT AS INDICATED ABOVE, IN NO EVENT WILL AGILENT OR ITS SUPPLIERS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE.

FOR CONSUMER TRANSACTIONS IN AUSTRALIA AND NEW ZEALAND: THE WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.

Responsibilities of the Customer

The customer shall provide:

- 1** Access to the products during the specified periods of coverage to perform maintenance.
- 2** Adequate working space around the products for servicing by Agilent personnel.
- 3** Access to and use of all information and facilities determined necessary by Agilent to service and/or maintain the products. (Insofar as these items may contain proprietary or classified information, the customer shall assume full responsibility for safeguarding and protection from wrongful use.
- 4** Routine operator maintenance and cleaning as specified in the Agilent Operating and Service Manuals.

General Information

Warranty

- 5 Consumables such as paper, disks, magnetic tapes, ribbons, inks, pens, gases, solvents, columns, syringes, lamps, septa, needles, filters, frits, fuses, seals, detector flow cell windows, etc.

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility and to the calibration facilities of other International Standards Organization members!

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent products.

Notice

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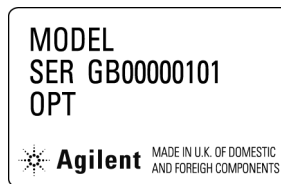
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Instruments Covered By Manual

Attached to the rear panel of the instrument is a serial number plate. The serial number plate has a two letter reference denoting country of origin (GB = Great Britain) and an eight digit serial number. The serial number is unique to each instrument and should be quoted in all correspondence with Agilent, especially when ordering replacement parts. Refer to Chapter 6 for instrument options covered.



Serial Number Plate

Storage and Shipment

The instrument may be stored or shipped in environments within the following limits:

Temperature	-20° C to +70° C -15° C to +50° C with lid printer
Altitude	Up to 4,600 meters (15,000 feet)

The instrument should also be protected from temperature extremes which could cause condensation within the instrument.

Repackaging for Shipment

Tagging for Service. If the instrument is being returned to Hewlett- Packard for service, please complete a repair tag and attach it to the instrument.

General Information

Weight and Dimensions

Original Packaging. Containers and materials identical to those used in factory packaging are available from Agilent offices. If the instrument is being returned to Agilent for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

Other Packaging. The following general instructions should be followed when repackaging with commercially available materials:

- Wrap instrument in heavy paper or plastic. If the instrument is being shipped to Agilent, attach a tag indicating the type of service required, return address, model number and full serial number.
- Use a strong shipping container. A double wall carton made of 350 pound test material is adequate.
- Use a layer of shock absorbing material 70 to 100 mm (3 to 4 inch) thick, around all sides of the instrument to provide firm cushioning and prevent movement inside the container. Protect the Front Panel controls and Rear Panel connectors with cardboard.
- Seal shipping container securely.
- Mark shipping container FRAGILE to ensure careful handling.
- In any correspondence, refer to instrument by model number and full serial number.

Weight and Dimensions

Weight: 18 kg (40 lb) fully loaded

Dimensions: 190mm (7.5in) high, 340mm (14in) wide, 420mm (17in) deep (including cover).

Safety Precautions for the Operator

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

In particular, the operator should note the following safety information:

- “Safety Symbols” on page 1-7
- “Connecting to the Power Supply” on page 2-4
- “Operating Environment” on page 2-2
- “Fuse Replacement” on page 2-3
- “Operators Maintenance” on page 1-8
- “Lifting/Carrying the OmniBER 725” on page 1-6

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, **REMOVE POWER** and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to an Agilent Sales and Service Office for service and repair to ensure the safety features are maintained.

Lifting/Carrying the OmniBER 725

Before attempting to lift or carry the instrument consider the following basic lifting techniques to help avoid personal injury.

Using both arms to lift instrument.

- Reach for the instrument - bend your knees and waist, and keep your back straight.
- GRASP the instrument firmly.
- LIFT with your legs.
- KEEP your shoulders level.

General Information

Safety Precautions for the Operator

Safety Symbols

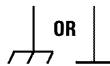
The following symbols on the instrument and in the manual indicate precautions which must be taken to maintain safe operation of the instrument



The Instruction Documentation Symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the supplied documentation.



Indicates the field wiring terminal that must be connected to earth ground before operating the equipment - protects against electrical shock in case of fault.



Frame or chassis ground terminal - typically connects to the equipment's metal frame.



Alternating current (AC)



Direct current (DC)



Indicates hazardous voltages

WARNING

Warning denotes a hazard. It calls attention to a procedure, which if not correctly performed or adhered to could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.

CAUTION



Caution denotes a hazard. It calls attention to a procedure, which if not correctly performed or adhered to could result in damage to or destruction of the instrument. Do not proceed beyond a caution note until the indicated conditions are fully understood and met.



Indicates that a laser is fitted. The user must refer to the manual for specific Warning or Caution information to avoid personal injury or damage to the product.

Operators Maintenance

WARNING

NO OPERATOR SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL. TO PREVENT ELECTRICAL SHOCK DO NOT REMOVE COVERS.

Maintenance appropriate for the operator is:

- Cabinet cleaning
- Optical Connector Cleaning
- Power supply fuse replacement
- Ensure ventilating fan cover is clean.

Cleaning

Instrument Cleaning

Clean the cabinet using a dry cloth only.

Optical Connector Cleaning

It is recommended that the optical connectors be cleaned at regular intervals using the following materials:

Description	HP Part Number
Blow Brush	9300-1131
Isopropyl Alcohol	8500-5344
Lens Cleaning Paper	9300-0761
Adhesive Tape Kit	15475-68701

CAUTION

Do not insert any tool or object into the IN or OUT ports of the instrument as damage to or contamination of the optical fibre may result.

General Information

Operators Maintenance

- 1** Recall Default settings (STORED SETTINGS 0) and remove the power from the OmniBER 725.
- 2** Remove the adapters from the IN and OUT ports. Use an 11 mm spanner to slacken the nut securing the adapter. On re-assembly tighten the nut using a torque spanner to 1.5 Nm.
- 3** Using the blow brush with the brush removed blow through the ferrule of the standard flexible connector and the adapter.

CAUTION

If the optical fibre of the fixed connector requires further cleaning this entails disassembly of the module which should only be carried out by suitably trained service personnel.

- 4** Apply some isopropyl alcohol to a piece of the cleaning paper and clean the barrel of the adapter. Using a new piece of cleaning paper, clean the face of the adapter. Repeat this operation, using a new piece of cleaning paper each time.
- 5** Lightly press the adhesive side of the tape provided against the front of the adapter, then remove it quickly - repeat twice. This removes any particles of cleaning paper which may be present.
- 6** Replace the adapters on the flexible connector.

Power Supply Fuse Replacement

See “Fuse Replacement” on page 2-3.

Removing/Inserting Modules

Modules should only be removed or inserted by trained personnel.

Statement of Compliance

This instrument has been designed and tested in accordance with IEC Publication 1010-1 + A1:1992 + A2:1995 Safety requirements for Electrical Equipment for Measurement, Control and Laboratory Use, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.



The CE mark shows that the product complies with all relevant European legal Directives.

ISM 1-A

This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.



The CSA mark is a registered trademark of the Canadian Standards Association.

Australian EMC Regulations



The C-Tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australian EMC Framework Regulations under the terms of the Radiocommunications Act of 1992.

Noise Declaration (German)

LpA<70dB

am Arbeitsplatz (operator position)

normaler Betrieb (normal position)

nach DIN 45635 pt.19 (per ISO 7779)

Electromagnetic Compatibility

This product conforms with the protection requirements of European Council Directive 89/336/EEC for Electromagnetic Compatibility (EMC).

The conformity assessment requirements have been met using the technical Construction file route to compliance, using EMC test specifications EN 55011:1991 (Group 1, Class A) and EN 50082-1:1992.

In order to preserve the EMC performance of the product, any cable which becomes worn or damaged must be replaced with the same type and specification.

See the Declaration of Conformity on pages 1-12 and 1-13.

See also “10 Base-T Lan Connection Radiated Emissions” on page 2-11.

Electrostatic Discharge:

When any electrostatic air or contact discharge is applied to the OmniBER 725 according to IEC 61000-4-2:1995, degradation of performance may be observed. Individual electrostatic discharges, as defined by this standard, may introduce a stream of bit errors into results measured by this product.

Operating the OmniBER 725 in an ESD-Controlled environment will help to remove the possibility of any bit errors being introduced.

General Information
Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN45014

Manufacturer's Name: Agilent Technologies UK Limited

Manufacturer's Address: Telecomms Networks Test Division
South Queensferry
West Lothian, EH30 9TG
Scotland, United Kingdom

Declares that the product

Product Name: OmniBER 725

Model Number: J1408A

Product Options: This declaration covers all options of the above product as detailed in TCF A-5951-9852-01.

EMC:

Conforms with the protection requirements of European Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic compatibility, against EMC test specifications EN 55011:1991 (Group 1, Class A) and EN 50082-1:1992.

As Detailed in: Electromagnetic Compatibility (EMC)
Technical Construction File (TCF) No. A-5951-9852-01

Assessed by: DTI Appointed Competent Body
EMC Test Centre,
GEC-Marconi Avionics Ltd.,
Maxwell Building,
Donibristle Industrial Park,
Hillend,
Dunfermline
KY11 9LB
Scotland, United Kingdom

Technical Report Number:6893/2200/CBR, dated 21 August 1997

Safety:

The product conforms to the following safety standards:

IEC 61010-1(1990) +A1(1992) +A2(1995) / EN 61010-1:1993
IEC 60825-1(1993) / EN 60825-1:1994
Canada / CSA-C22.2 No. 1010.1-93
USA / CFR Ch.1 1040.10

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC, and carries the CE mark accordingly.

South Queensferry, Scotland.


01 December 2000



Robert Tait
Product Regulations Manager

For further information, please contact your local Agilent Technologies sales office, agent, or distributor.

General Information
Declaration of Conformity

DECLARATION OF CONFORMITY According to ISO/IEC Guide 22 and CEN/CENELEC EN45014	
Manufacturer's Name:	Agilent Technologies UK Limited
Manufacturer's Address:	Telecomms Networks Test Division South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom
Declares that the product	
Product Name:	OmniBER 725
Model Number:	J1409A
Product Options:	This declaration covers all options of the above product as detailed in TCF A-5951-9852-01.
EMC: Conforms with the protection requirements of European Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic compatibility, against EMC test specifications EN 55011:1991 (Group 1, Class A) and EN 50082-1:1992.	
As Detailed in:	Electromagnetic Compatibility (EMC) Technical Construction File (TCF) No. A-5951-9852-01
Assessed by:	DTI Appointed Competent Body EMC Test Centre, GEC-Marconi Avionics Ltd., Maxwell Building, Donibristle Industrial Park, Hillend, Dunfermline KY11 9LB Scotland, United Kingdom
Technical Report Number:6893/2200/CBR, dated 21 August 1997	
Safety: The product conforms to the following safety standards:	
	IEC 61010-1(1990) +A1(1992) +A2(1995) / EN 61010-1:1993 IEC 60825-1(1993) / EN 60825-1:1994 Canada / CSA-C22.2 No. 1010.1-93 USA / CFR Ch.1 1040.10
The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC, and carries the CE mark accordingly.	
<i>South Queensferry, Scotland.</i>	<i>01 December 2000</i>
	 Robert Tait <i>Product Regulations Manager</i>
For further information, please contact your local Agilent Technologies sales office, agent, or distributor.	

General Information

2

Installation

Initial Inspection

WARNING

TO AVOID HAZARDOUS ELECTRICAL SHOCK, DO NOT PERFORM ELECTRICAL TESTS WHEN THERE ARE SIGNS OF SHIPPING DAMAGE TO ANY PORTION OF THE OUTER ENCLOSURE (COVERS, PANELS, METERS).

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked both mechanically and electrically. Procedures for checking electrical operation are given in Chapter 3. If the contents of the shipment are incomplete, if there is mechanical damage or defect, notify the nearest Agilent Office. If the instrument does not pass the electrical performance tests given in Chapter 3, notify the nearest Agilent office. If the shipping container is also damaged, or the cushioning material shows signs of stress, notify the carrier as well as the nearest Agilent office. Keep the shipping materials for the carrier's inspection. The Agilent office will arrange for repair or replacement without waiting for claim settlement.

Operating Environment

This instrument is designed for Indoor use only.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gasses or fumes.

This instrument may be operated in environments within the following limits:

Temperature: 0°C to +45°C
+5°C to +40°C for Jitter operation
+5°C to +35°C with lid printer

Altitude up to 3050 m (10,000 ft)

Humidity up to 95% relative humidity to 40°C, but it should be protected from temperature extremes which may cause condensation.

To ensure adequate cooling do not obstruct air vents in the instrument cabinet. Do not for example operate the instrument if it is standing on its rear feet, as air vents may be obstructed by floor covering.

CAUTION

This instrument is designed for use in Installation Category II and Pollution Degree 2 per IEC 61010-1 and IEC 60664 respectively.

CAUTION

VENTILATION REQUIREMENTS: When installing the instrument in a cabinet, the convection into and out of the instrument must not be restricted. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

Preparation for Use

WARNING

FOR CONTINUED PROTECTION AGAINST FIRE HAZARD REPLACE FUSE ONLY WITH SAME TYPE AND RATINGS (see “Fuses” on page 2-3).

WARNING

If this instrument is not used as specified, the protection provided by the equipment could be impaired. This instrument must be used in a normal condition only (in which all means for protection are intact).

Power Requirements



The OmniBER 725 Communications Performance Analyzer requires a power source of 100 V to 240 V ac at a frequency between 47 Hz and 63 Hz (nominal).

Total power consumption is 450 VA (maximum).

The fuse rating for the power source is given in the following table.

Fuses

Line Voltage	Fuse Rating	Agilent Part Number
100 V to 240 V	5 A Timed, 250 V	2110-1120

Fuse Replacement

Only the ac line fuse located at the rear of the instrument may be replaced by the operator.

WARNING

ALL OTHER FUSE REPLACEMENT SHOULD ONLY BE CARRIED OUT BY SUITABLY TRAINED SERVICE PERSONNEL AWARE OF THE HAZARDS INVOLVED.

WARNING

BEFORE REMOVING THE FUSE, THE AC LINE POWER CORD SHOULD BE DISCONNECTED FROM THE POWER SOURCE AND THE OTHER END DISCONNECTED FROM THE INSTRUMENT.

Installation
Preparation for Use

WARNING

ONLY USE A FUSE OF THE CORRECT RATING AS LISTED IN “Fuses” on page 2-3. DO NOT use repaired fuses or short-circuited fuseholders: For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type.

The fuse is removed by inserting a suitable flat bladed tool into the slot in the fuse cap and turning counter-clockwise. The cap and the fuse can then be removed and the fuse changed for another of the correct rating. The fuse rating and Agilent part number are listed in “Fuses” on page 2-3.

Connecting to the Power Supply

WARNING

This is a Safety Class I instrument (provided with a protective earthing ground, incorporated in the powercord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.

CAUTION

The Binary Interface Terminators supplied should be fitted to the binary connectors when the connectors are not in use.

CAUTION

Before switching on this instrument, make sure that the line supply voltage is in the specified ranges. Range selection is automatic.

Installation
Preparation for Use

Power Cord

WARNING

TO AVOID THE POSSIBILITY OF INJURY OR DEATH, THE FOLLOWING PRECAUTIONS MUST BE FOLLOWED BEFORE THE INSTRUMENT IS SWITCHED ON:-

WARNING

(a) Note that the protection provided by grounding the instrument cabinet may be lost if any power cable other than the three-pronged type is used to couple the ac line voltage to the instrument. Under these circumstances, the external protective earth terminal will be connected to ground.

WARNING

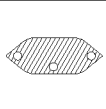
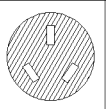
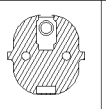
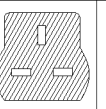
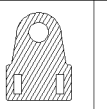
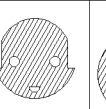
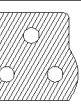
(b) If this instrument is to be energized via an auto-transformer to reduce or increase the line voltage, make sure that the common terminal is connected to the neutral pole of the power source.

WARNING

(c) The power cable plug shall only be inserted into a socket outlet provided with a protective ground contact. The protective action must not be negated by the use of an extension cord without a protective conductor (grounding).

The power cord supplied with each instrument varies with the country of destination. The following figure illustrates the standard power plug and cord configurations that are commonly used. The part number shown beneath each plug is the part number of the appropriate power cord and plug. If the appropriate power cord is not included with the instrument notify the nearest Agilent office and a replacement will be provided.

Power Cord Configurations and Part Numbers

						
8120-2104	8120-1369	8120-1689	8120-1351	8120-1378 US 8120-4753 JAP	8120-2956	8120-4211

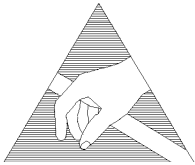
Connecting to the Network

The network connectors are located on the modules at the side of the instrument. The connections available depend on the options fitted to your instrument.

Before Connecting, note the Warning and Caution information given.

All Connectors

CAUTION



When connecting or disconnecting, ensure that you are grounded or, make contact with the metal surface of the Mainframe with your free hand to bring you, the module, and the mainframe to the same static potential.

Modules remain susceptible to ESD damage while the module is installed in the Mainframe

Additional ESD information is required when servicing see “Additional Precautions for Service Engineers” on page 2-14.

Electrical Interface Connectors

52/155 Mb/s DATA IN

SDH/SONET receiver input interface. Allows the connection of 75 Ω unbalanced STM 0/1, STS 1/3 electrical signals.

52/155 Mb/s DATA OUT

SDH/SONET transmitter output interface. Provides a 75 Ω unbalanced STM 0/1, STS 1/3 electrical output.

Jitter Mod 75 Ω IN (J1409A only)

External jitter modulated signals can be applied to this port

Demod 75 Ω OUT (J1409A only)

A demodulated jitter output port is supplied.

10M REF IN 2M REF IN

These ports allow connection of timing reference signals. Note unused external clock ports must not have a signal present.

REF OUT

Provides a 2 MHz reference Clock Output.

Installation

Connecting to the Network

CLOCK TRIGGER Reference SDH/SONET clock trigger output 51 MHz; nominal +/- 400 mV into 50 ohms.

DCC Allows the Drop and Insert of Regenerator Section (192 kb/s) and Multiplexer Section (576 kb/s) Data Communication Channels (DCC).

The following connections are available:

Pin Number	Connection
1	Shield Ground
2	Data input for Tx(-)
3	Tx Clock
4	Data Output from Rx(-)
5	NC
6	Rx Clock(-)
7	NC
8	Signal Ground
9	Data Input for Tx(+)
10	Tx Clock(+)
11	Data output from Rx(+)
12	NC
13	Rx Clock(+)
14	NC
15	NC

**PROTECTED
MONITOR POINT
INPUT**

52/155/622 Mb/s (NRZ); Line Code NRZ; Level nominal 1 V Pk-Pk into 50 ohms; SMA connector.

Installation
Connecting to the Network

Binary Interface Connectors

CAUTION

The Binary Interface Terminators supplied should be fitted to the binary connectors when the connectors are not in use.

Clock Input

Clock IN, accepts nominal square wave, 52, 155, 622, 2.5 Gb/s typically 1vp-p, SMA connector

Data Input

Data IN ,accepts nominal square wave STS 1 to STS 48 and STM-0 to STM16 data typically 1V p-p SMA connector.

Clock Output

Clock OUT, provides nominal square wave, 52, 155, 622, 2.5 Gb/s typically 1vp-p, SMA connector

Data Output

Data OUT, provides nominal square wave STS 1 to STS 48 and STM-0 to STM16 data typically 800 mV \pm 200 mV p-p, SMA connector.

Ground

GND is an SMA connector to ground

Optical Interface Connectors

For your protection, review all laser information given in this manual before installing or using the instrument.

WARNING

To prevent personal injury, avoid use that may be hazardous to others, and maintain the module in a safe condition. Ensure the information given below is reviewed before operating the module.

Laser Product Classification

All optical modules are classified as Class I (non-hazardous) laser product in the USA which complies with the United States Food and Drug Administration (FDA) Standard 21 CFR Ch.1 1040.10, and are classified as Class 1 (non-hazardous) laser products in Europe which complies with EN 60825-1 (1994).

To avoid hazardous exposure to laser radiation, it is recommended that the following practices are observed during system operation:

- **ALWAYS DEACTIVATE THE LASER BEFORE CONNECTING OR DISCONNECTING OPTICAL CABLES.**
- When connecting or disconnecting optical cables between the module and device-under-test, observe the connection sequences given below.
 - Connecting:** Connect the optical cable to the input of the device-under-test **before** connecting to the module's *Optical Out* connector.
 - Disconnecting:** Disconnect the optical cable from the module's *Optical Out* connector **before** disconnecting from the device-under-test. Always fit the fibre optic connector dust caps over the laser aperture.
- NEVER examine or stare into the open end of a broken, severed, or disconnected optical cable when it is connected to the module's *Optical Out* connector.
- Arrange for service-trained personnel, who are aware of the hazards involved, to repair optical cables.

Installation

Connecting to the Network

CAUTION

1. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
 2. Always fit the fibre optic connector dust caps on each connector when not in use. Before connection is made, *always* clean the connector ferrule tip with acetone or alcohol and a cotton swab. Dry the connector with compressed air. Failure to maintain cleanliness of connectors is liable to cause excessive insertion loss.
-

Laser Warning Symbols

The front panel of the optical module has the following label:

CLASS 1 LASER PRODUCT

NOTE

CLASS 1 LASER PRODUCT translates as follows:

Finnish - LUOKAN 1 LASERLAITE

Finnish/Swedish - KLAS 1 LASER APPARAT

This label indicates that the radiant energy present in this instrument is non-hazardous.

OPTICAL IN

Allows connection of an optical signal, wavelength 1200 to 1600 nm, at a maximum power level of -8 dBm .

CAUTION

NEVER EXCEED +3 dBm OPTICAL POWER INPUT.

Accepts STM-0, STM-1 and STM-4. Also accepts SONET signals OC-1, OC-3, OC-12, and OC-48 depending on the model and options fitted.

OPTICAL OUT

Provides an STM-0, STM-1, STM-4 or STM-16 optical signal (OC-1, OC-3, OC-12 or OC-48 SONET signals) at wavelength 1280 to 1335nm, and/or 1480 to 1580 nm, at a nominal power level of +1 dBm depending on model and options.

Cleaning Optical Connectors

See “Optical Connector Cleaning” on page 1-8

Connecting Accessories

LID Provides the output for the option 602 printer which is fitted in the cover (LID) of the instrument.

VGA Provides the output for a display monitor.

Printer
GP-IB, RS232,
PARALLEL ONLY External printer connection details are given in the Users Guide.
The port selected for external printer use is not available for remote control.

Remote Control
GP-IB, RS232,
10 BASE -T Remote control connection is given in the Remote Control Manual.
The port selected for remote control use is not available for an external printer.

10 Base-T Lan Connection Radiated Emissions

To ensure compliance with EN 55011 (1991) a category 5, FTP patch lead, RJ45 cable should be used to connect the LAN port on the processor module marked "10 Base-T".

Installation
Connecting Accessories

General Purpose Interface Bus

The OmniBER 725 Communications Performance Analyzer (Option 601) is connected to the GPIB by means of an appropriate GPIB cable. The GPIB interconnecting cables available are listed in the following table.

GPIB Interconnecting Cables

Length	Accessory Number
1 meter	10833A
2 meters	10833B
4 meters	10833C
0.5 meter	10833D

To achieve interface design performance standards, restrictions are placed on the GPIB system cable lengths. These restrictions allow the bus interface electronics to maintain correct line voltage levels and timing relationships.

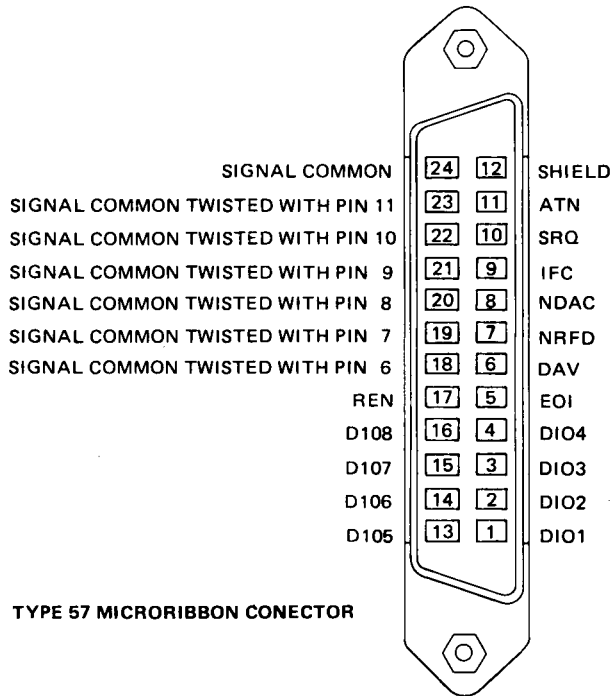
When connecting an GPIB system the following rules should be observed:

The total GPIB cable length used must be less than or equal to 20 meters (65.6 feet).

The total GPIB cable length used must be less than or equal to 2 meters (6 feet) × the total number of devices connected to the bus.

A standard GPIB connector is provided on the instrument. The connections are shown in the following figure. The mating connector part number is 1251-0293 or Amphenol 57-30240.

Installation
Connecting Accessories



GPIB Address Selection

The OmniBER 725 (Option 601) GPIB address is accessed on the OTHER display under the REMOTE CONTROL function.

The address can be set to any value between 0 and 30 inclusive.

Additional Precautions for Service Engineers

Safety Precautions

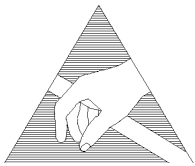
DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Sales and Service Office for service and repair to ensure the safety features are maintained.

DO NOT service or adjust alone: Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, service personnel must not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Review “Safety Precautions for the Operator” on page 1-6.

ESD Precautions

CAUTION



When making connections to the modules, review “Connecting to the Network” on page 2-6.

The module contains components sensitive to electrostatic discharge. To prevent component damage, carefully follow the handling precautions presented below.

The smallest static voltage most people can feel is about 3500 volts. It takes less than one tenth of that (about 300 volts) to destroy or severely damage static sensitive circuits. Often, static damage does not immediately cause a malfunction but significantly reduces the component’s life. Adhering to the following precautions will reduce the risk of static discharge damage.

- Keep the module in its conductive storage box when not installed in the Main-frame. Save the box for future storage of the module.
- Before handling the module, select a work area where potential static sources are minimized. Avoid working in carpeted areas and non-conductive chairs. Keep body movement to a minimum. Agilent recommends that you use a controlled static workstation.
- Handle the module by its front-panel. Avoid touching any components or edge connectors. When you install the module, keep one hand in contact with the pro-

Installation

Additional Precautions for Service Engineers

tective bag as you pick up the module with your other hand. Then, before installing the module, ensure that you are grounded or make contact with the metal surface of the Mainframe with your free hand to bring you, the module, and the mainframe to the same static potential. **This also applies whenever you connect/disconnect cables on the front-panel.**

Front Panel Soft Recovery (Cold Start)

Use the following procedure if you need to perform a front panel soft recovery (i.e. cold start) of the instrument.

Soft Recovery Procedure

- 1** Switch off the instrument.
- 2** On the instrument front panel - press and hold softkeys 0 and 4 simultaneously (the softkeys immediately below the display; key 0 is on the extreme left).
- 3** Power up the OmniBER 725 while holding the softkeys pressed.
- 4** When the LOS LED has flashed OFF and then ON again, the keys can be released.
- 5** The LOS LED will flash OFF/ON again several times (7), followed by an audible 'beep' and the display indicating 'Initializing Instrument'.
- 6** Once the initiations is complete the display will indicate:
'Firmware Revision Update'
'Default settings assumed'
Hit any key to attempt restart'
- 7** Hit any key, then wait approximately 10 seconds. The instrument should return to its default settings and normal operation.

3

Performance Tests

Introduction

The procedures given in this Section, test the OmniBER's performance using the Specifications provided, as performance standards. Tests are intended to be performed in the recommended order for a full instrument calibration check. Tests can be run individually, however it will be assumed that any preceding test would meet specifications.

Equipment Required

Equipment required for the Performance Tests is given in this Chapter. Any equipment which meets or exceeds the critical specification of the equipment listed, may be substituted. Recommended models are those typically used in Agilent Service Centers. Alternative models are also listed.

Performance Test Record

The results of the Performance Tests may be recorded on the Test Records at the end of this Chapter. The Performance Test Record lists all the tested specifications and the acceptable limits. The results recorded at incoming inspection may be used for comparison during periodic maintenance, troubleshooting or after repair or adjustment.

Calibration Cycle

This instrument requires periodic verification of performance. Depending on use and environmental conditions, the instrument should be checked approximately once every 2 years, using these Performance Tests.

Instrument Model and Option Configuration

Please refer to Chapter 6 and the instrument Specifications for information on option configuration.

Performance Tests

Introduction

Table 3-1 Recommended Test Equipment

Instrument	Critical Specification	Recommended Model
Oscilloscope	2.5 GHz Bandwidth, 1 M Ω Input Termination Telecom mask measurement capability.	HP 86100A Infinium DC A or similar
Dual Channel Oscilloscope Plug-in	For use with 86100A Oscilloscope mainframe.	HP 86112A (qty 2)
Frequency Synthesizer	75 Ω Output, Sinewave to 80 MHz, Amplitude to 3 V pk-pk at 10 kHz, 1 Hz resolution	HP 3335A opt 001 or HP 3325B & HP 8657A with 50/75 Ω matching pad
Signal Generator	Sinewave 700 kHz to 170 MHz, Amplitude 500 mV	HP 8657A
Frequency Counter	Range 0 to 200 MHz, 2 channels with accuracy <0.1ppm. (Ratio Mode)	HP 5325A opt 010 or HP 53181A opt 001
Spectrum Analyzer**	Frequency >2.5 Gb/s. Resolution bandwidth 10 Hz.	HP 8560E
Optical Coupler**	1310 and 1510 nm. 10/90% output.	15744C
Optical Power Meter and Sensor Module	Range -8 dBm to -15 dBm, Wavelength 1270-1560 nm	HP 8153A and HP 81536A
Lightwave Converter	Wavelength 1300 to 1560 nm, Conversion Gain >300 volts/watt, Frequency Response < 3 dB down at 1 GHz.	HP 11982A opt 012
Optical Attenuator	Wavelength 1200 - 1600 nm, Range 0 - 30 dB	HP 8157A or HP 8156A opt 100
Optical Attenuators	20dB	HP 8490D opt 20 (Qty 4)
FC/PC Optical Interface Connector	Unique	HP 81000FI (Qty 4)
Optical Cables	Unique	HP 11871A (Qty 2)
PDH Structured Test Set	Unique	OmniBER 718, OmniBER 719 or HP 37717C opt UKJ
75 Ω Termination	0 to 200 MHz	HP 15522-80010
T Connector	BNC to Dual BNC	HP 1250-0781
Adaptor	SMA to BNC	1250-1787 (Qty 2)
Adaptor	Type N to BNC	HP 1250-1534 (Qty 2)

Performance Tests
Introduction

Table 3-1 Recommended Test Equipment, continued

Instrument	Critical Specification	Recommended Model
Adaptor	Type N to N	HP 1250-1528 (Qty 2)
Balanced/Unbalanced Converter	110Ω balanced: 75Ω Unbalanced (nominal)	HP 15508B (Qty 2)
Blocking Capacitor	0.18uF 200V	HP 10240B

** Spectrum Analyzer/Optical Coupler are only required for the OmniBER Jitter options (J1409A only).

For J1409A instruments, see also "Equipment Required " page 3-10

Self Test Loopback Cables and Accessories

HP E4545A 3m fibre optic cable FC/CP connectors. (supplied accessory)

HP E4546A FC/CP 15 dB attenuator. (supplied accessory)

HP E1675-64210 (4 off) - Loopback SMA cables

HP 15525A 75 ohm BNC, 3 off.

DCC 15 pin loopback plug - see DCC Port Test Connections. on page 3-9.

Formatted floppy disk.

Binary Interface Terminators

CAUTION





The Binary Interface Terminators supplied with the instrument must be fitted when the Binary Interfaces are not connected (0955-1135).

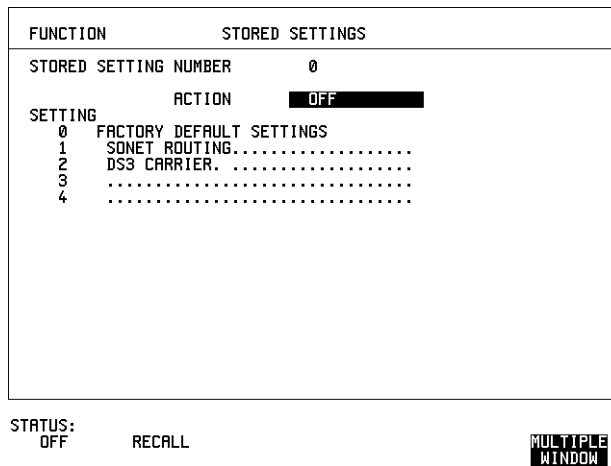
Performance Tests

Introduction

Recall Default Settings

The Performance Tests require the OmniBER to be set to a pre-defined (default) state at the beginning of each test.

- 1 Using **OTHER**, display softkeys:    and , set up the **OTHER** **STORED** **SETTINGS** display as shown.



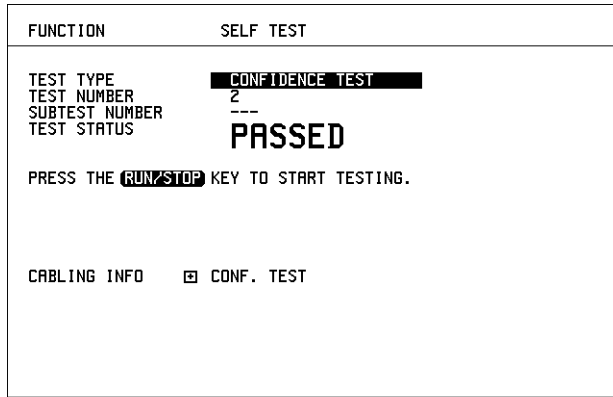
- 2 Press **RECALL** to recall the instrument default settings. The instrument display will blank for a few seconds while the settings are recalled and the status display will indicate stored settings number 0 recalled.

Self Test

Self Test

Description

Before carrying out the performance tests run Self Test to ascertain the integrity of the OmniBER. These tests take at least 1 hour to complete depending on the options fitted. Alternatively you can run Confidence Tests which only takes 2 to 3 minutes to complete. This is not a full verification but performs BER measurements with internal and external loopbacks fitted.



STATUS: ALL TESTS CPU TESTS CONF. TESTS PDH TESTS MORE **MULTIPLE WINDOW**

Run Confidence TESTS

- 1 Choose TEST TYPE **CONF. TESTS** on the **OTHER SELF TEST** display.

CAUTION

Safety precaution, care and connection cleanliness are essential to avoid optical signal degradation or damage. see Operators Maintenance in chapter 1 and see Optical Interface Connectors in chapter 2 if in doubt.
The use of air-gap attenuators is not recommended.
Failure to attenuate the optical signal could result in damage to the optical receiver.

Performance Tests

Self Test

NOTE

If the Optical Interface is a Dual Wavelength Option the **1550 nm** IN and OUT ports are not connected at this stage and can be tested later.

If any or all of these connections are not made the OmniBER will FAIL Self Test.

- 2 Make the loopback connections listed below:
 - Connect the 15 dB optical attenuator provided at the Optical OUT and then connect the attenuator output to Optical IN using the optical cable supplied with your instrument.
 - Connect Multirate Analyser IN to OUT.
 - Connect Binary Interface TRANSMIT + CLK to RECEIVER + CLK.
 - Connect Binary Interface TRANSMIT + DATA to RECEIVER + DATA.
 - Connect Binary Interface TRANSMIT + $\overline{\text{CLK}}$ to RECEIVER + $\overline{\text{CLK}}$.
 - Connect Binary Interface TRANSMIT + $\overline{\text{DATA}}$ to RECEIVER + $\overline{\text{DATA}}$.
- 3 Press **RUN/STOP** to activate the Self Test. TEST STATUS RUNNING will be displayed.
 - The information pertaining to TEST TYPE, TEST NUMBER and SUBTEST NUMBER will change as the Self Test progresses.
 - If the OmniBER is functioning correctly, after a time of 2 to 3 minutes, TEST STATUS PASSED is displayed.
 - If TEST STATUS [FAIL nnn] is displayed, check the displayed error information and check loopback connections are correct. Repeat the test and if the problem persists contact your local Agilent representative. See Chapter 5 for information.

NOTE

Each individual self test requires unique loopback connections. To obtain a list of the connections required move the highlighted cursor to CABLING INFO and press **SET**. The Loopbacks list will appear on the display. Also refer to Chapter 5 for Self Test connection information.

Performance Tests

Self Test

FUNCTION	SELF TEST
TEST TYPE	PDH TESTS
TEST NUMBER	3
SUBTEST NUMBER	---
TEST STATUS	RFADV

PDH SELFTEST - CABLING INFORMATION

PAYLOAD MODULE CONNECTIONS :

- CONNECT PDH OUT TO PDH IN (UNBALANCED DS3, 210/s, 3410/s)
- CONNECT PDH OUT TO PDH IN (BALANCED 210/s)
- CONNECT MUX TO DEMUX (BALANCED DS1)
- CONNECT MUX TO DEMUX (UNBALANCED 210/s)

STATUS:

**MULTIPLE
WINDOW**

Run ALL TESTS

- 1 Choose TEST TYPE **ALL TESTS** on the **OTHER SELF TEST** display.
- 2 Insert a formatted disk into the instrument disk drive.
- 3 Make the loopback connections listed below:
Connect the 15 dB optical attenuator provided, to Optical OUT and connect the attenuator output to Optical IN.
Connect Multirate Analyser IN to OUT.
Connect Binary Interface TRANSMIT + CLK to RECEIVER + CLK.
Connect Binary Interface TRANSMIT + DATA to RECEIVER + DATA.
Connect Binary Interface TRANSMIT + CLK to RECEIVER + CLK.
Connect Binary Interface TRANSMIT + DATA to RECEIVER + DATA.
- 4 Press **RUN/STOP** to activate the Self Test. TEST STATUS RUNNING will be displayed.
The information pertaining to TEST TYPE, TEST NUMBER and SUBTEST NUMBER will change as the Self Test progresses.
If the OmniBER is functioning correctly, after a time of at least 1 hour, TEST STATUS PASSED is displayed.
If TEST STATUS [FAIL nnn] is displayed, check the displayed error information and check loopback connections are correct. Repeat the test and if the problem persists contact your local Agilent representative. See Chapter 5 for information.

Performance Tests

Self Test

FUNCTION	SELF TEST
TEST TYPE	ALL TESTS
TEST NUMBER	0
SUBTEST NUMBER	---
TEST STATUS	READY
PRESS THE RUN/STOP KEY TO START TESTING.	
CABLING INFO	<input checked="" type="checkbox"/> ALL

STATUS:
ALL TESTS CPU TESTS CONF. TESTS PDH TESTS MORE **MULTIPLE WINDOW**

1550 nm Dual Wavelength Tests:

If a Dual Wavelength Optical Interface is fitted, repeat the CONFIDENCE test with 1550 nm selected.

- 1 Select 1550 nm OPTICS wavelength
- 2 Connect 1550 nm OUT to IN via 15 dB Optical Attenuator. Ensure the attenuator is inserted in the OUT port.
- 3 Run the test.

Performance Tests

Self Test

DCC Port Tests:

- 1 Select BER TESTS
- 2 Make the following connections at the Multirate Analyzer DCC port.

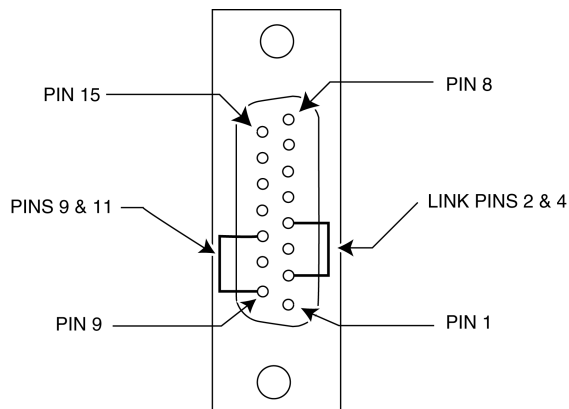


Figure 3-1

DCC Port Test Connections

- 3 Run the BER TESTS.

SDH/SONET Transmitter Clock Accuracy

Specification

Bit Rate	Accuracy
51.84 Mb/s	±4.5 ppm

Description

The test uses a Frequency Counter connected to the Multirate Analyzer module Clock Trigger output port. This output is derived from the Clock module internal 10 MHz clock oscillator providing a 51.84 MHz that is directly related to all SDH/SONET output rates.

Equipment Required

Frequency Counter : HP 5335A Option 010

Procedure

- 1** Recall the OmniBER's default settings as shown on page 3-4.
- 2** Set the Transmitter Output to SDH/SONET.
- 3** Connect the OmniBER's Multirate Analyzer module CLOCK TRIGGER port to the Frequency Counter Input A, set the input termination to 50Ω.
- 4** Adjust the Frequency Counter Trigger Level to obtain a stable reading and ensure that the Frequency Counter reads between 51.839670 MHz and 51.840230 MHz.
- 5** Disconnect all the test equipment.

External Clock/Data Reference Inputs & Clock Reference Output

Specifications

Clock Rate	Description
2.048 Mb/s MTS	Accepts timing reference as per ITU-T G.811
10 MHz Reference	Accepts 10 MHz timing reference
1.544 Mb/s BITS	Accepts DS-1 timing reference as per TA-TSY-000378
64 kb/s	Accepts 64 kb/s timing reference as per ITU-T G.703 Section 1.2.2
STM-1/STS-3 Receive	Recovers clock from received STM/STS input signal.

NOTE

The rates available are dependent on the OmniBER model and options fitted.

Description

This test verifies that signal integrity is maintained when an EXTERNAL clock is used as a reference.

Equipment Required

Synthesizer : HP 3335A option 001 (75Ω)

Communication Test Set : OmniBER 718

110Ω/75Ω Balanced to Unbalanced Converter : HP 15508B

Frequency Counter : HP 5335A Opt 010

64kb/s Test Set : HP 37732A

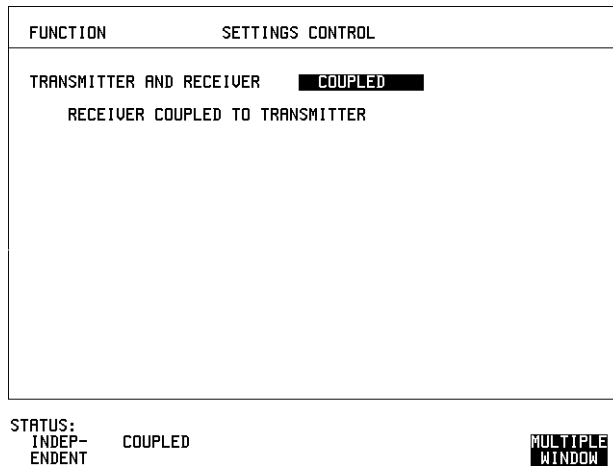
Performance Tests

External Clock/Data Reference Inputs & Clock Reference Output

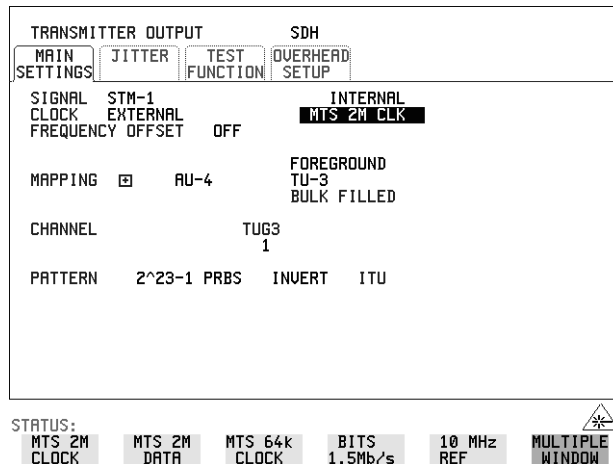
Procedure

MTS Clock - Clock Format

- 1 Connect the 52/155 Mb/s DATA OUT port to the 52/155 Mb/s DATA IN port.
- 2 Recall the OmniBER's default settings as shown on page 3-4 and set the **OTHER SETTINGS CONTROL** display as shown below.



- 3 Press **TRANSMIT** and set up the display as shown below.



- 4 Set the HP 3335A to 2.048 MHz at +10 dBm.

Performance Tests

External Clock/Data Reference Inputs & Clock Reference Output

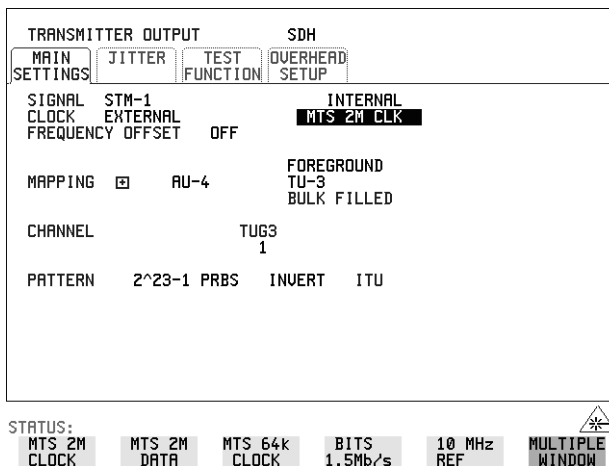
- 5 Connect the HP 3335A to the OmniBER's 75Ω 2M REF IN port on the Clock module.
- 6 Press **RESULTS**; **TROUBLE SCAN**.
- 7 Press **RUN/STOP**, check that the display reads NO TROUBLE and all the Alarm leds are off.
- 8 Press **RUN/STOP** to halt the measurement.

Clock REF OUT

- 9 Connect the Clock REF Out port to the Frequency Counter and check that a 2.048 MHz signal is present.

MTS Clock - Data

- 10 Disconnect the HP 3335A Synthesizer from the OmniBER's 75Ω 2M REF IN port.
- 11 Set the PDH/DSn Test Set to transmit a 2 Mb/s unframed signal.
- 12 Connect the PDH/DSn Test Set, 75Ω Output to the OmniBER's 75Ω 2M REF IN Port and recall the default settings as shown on page 3-4.
- 13 Set the **TRANSMIT** display as shown below.



- 14 Select CLOCK SYNC FORMAT [2 Mb/s DATA] on the SDH **TRANSMIT** Display.

Performance Tests

External Clock/Data Reference Inputs & Clock Reference Output

- 15 Press **RESULTS** **TROUBLE SCAN** then **RUN/STOP**.
- 16 Check that the **RESULTS** Display reads NO TROUBLE and all the Alarm LEDs are off. Press **RUN/STOP** to halt the measurement.
- 17 Disconnect the PDH/DSn Test Set, 75Ω 2 Mb/s PDH Output from the 75Ω 2M REF IN Port.
- 18 Connect the PDH/DSn Test Set, 120Ω 2 Mb/s PDH Output to the 120Ω 2M REF IN Port.
- 19 Change the PDH O/P termination to 120Ω on the PDH/DSn Test Set.
- 20 Press **RESULTS** **TROUBLE SCAN** then **RUN/STOP** on
- 21 .
- 22 Check that the **RESULTS** Display reads NO TROUBLE and all the Alarm LEDs are off. Press **RUN/STOP** to halt the measurement.

STM-1/STS-3 Receive Data

- 23 Disconnect the PDH/DSn Test Set Data Output from the OmniBER's 120Ω 2M REF IN port.
- 24 Disconnect the 52/155 Mb/s DATA OUT port from the 52/155 Mb/s DATA IN port
- 25 Select CLOCK SYNC [STM-1/STS-3 RECEIVE] ON the OmniBER's **TRANSMIT** display.
- 26 The SDH Clock Loss Alarm led should be lit on the OmniBER.
- 27 Set the Synthesizer frequency to 77.760 MHz and amplitude to +10 dBm.
- 28 Connect the Synthesizer to the 75Ω 52/155 Mb/s DATA IN port.
- 29 Ensure that the SDH/SONET Clock Loss Alarm Led is not lit.

NOTE

As the signal is unframed the LOF/OOF etc. alarms will be on.

10 MHz Reference

- 30 Select CLOCK SYNC [10 MHz REF] ON the OmniBER's **TRANSMIT** display.
- 31 The SDH/SONET Clock Loss Alarm led should be lit on the OmniBER.
- 32 Set the Synthesizer frequency to 10.000 MHz and amplitude to +10 dBm.

Performance Tests

External Clock/Data Reference Inputs & Clock Reference Output

33 Connect the Synthesizer to the OmniBER's 75 Ω 2M REF IN Port.

34 Ensure that the SDH/SONET Clock Loss Alarm Led is not lit.

BITS Clock

35 Select CLOCK SYNC [BITS] ON the OmniBER's **TRANSMIT** display.

36 The SDH/SONET Clock Loss Alarm led should be lit on the OmniBER.

37 Set the Synthesizer frequency to 772 kHz and amplitude to +10 dBm.

38 Connect the Synthesizer, via the Balanced to Unbalanced converter, to the OmniBER's 100 Ω BITS Clock Port.

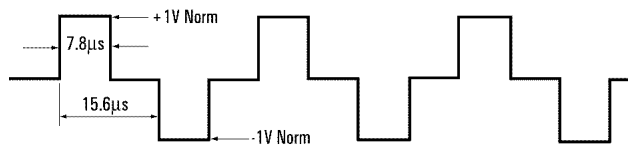
39 Ensure that the SDH/SONET Clock Loss Alarm Led is not lit.

64 kb/s Clock

40 Select CLOCK SYNC [64 kb/s] on the OmniBER's **TRANSMIT** display.

41 The SDH/SONET Clock Loss Alarm led should be lit on the OmniBER.

42 Set the 64kb/s Test Set to provide a 64kb/s Clock Signal.



Suitable 64kb/s AMI signal (into 100/120 ohms balanced)
if 64kb/s Test set is not available.
Signal must be derived from a stable synthesized source.

43 Connect the Clock Signal to the OmniBER's balanced 64K Clock input.

44 Ensure that the SDH/SONET Clock Loss Alarm Led is not lit.

45 Disconnect all the test equipment.

SDH/SONET Frequency Offsets

Specifications

Range	±999 ppm
Resolution	0.1 ppm
Accuracy	0.02 ppm

Description

The test uses a Frequency Counter connected to the Multirate Analyzer module Clock Trigger output port. This output is derived from the Clock module and is directly related to the SDH/SONET output rate. An external 10 MHz reference from a Signal Generator is used to clock the OmniBER and also provides a timebase reference for the Frequency counter. The counter measures the Clock Trigger frequency to check the offset accuracy and range.

Equipment Required

Signal Generator	: HP 8657A
Frequency Counter	: HP 5335A Opt 010
T Connector	: HP 1250-0781

Procedure

- 1 Recall the OmniBER's default settings as shown on page 3-4. Set the Transmitter Output to SDH/SONET.
- 2 Select CLOCK SYNC [10 MHz REF] on the OmniBER's **TRANSMIT** display.
- 3 Connect the HP8657A to the OmniBER's Unbalanced 75Ω 2M REF IN port on the Clock Module.
- 4 Set the Signal Generator frequency to 10.000 MHz and amplitude to +10 dBm.
- 5 Check the Clock Loss Alarm Led is not lit.
- 6 Connect the Signal Generator, Timebase OUT port (rear panel), to the counter

Performance Tests

SDH/SONET Frequency Offsets

Timebase IN port (rear panel).

- 7 Check the Counter EXT TIME BASE flag is illuminated on the front panel.
- 8 Connect the OmniBER's Multirate Analyzer module CLOCK TRIGGER port to the Frequency Counter, set input termination to 50Ω .
- 9 Adjust the Frequency Counter Trigger Level to obtain a stable reading.
- 10 The reading should be between 51.839999 - 51.840001 MHz. If not check setup and ensure the Counter is locked to the Signal Generator.
- 11 Set the OmniBER's frequency offset to the settings given in Table 3-2 and verify the frequency at each step is within the Min/Max limits.

Table 3-2 SDH/SONET Offset

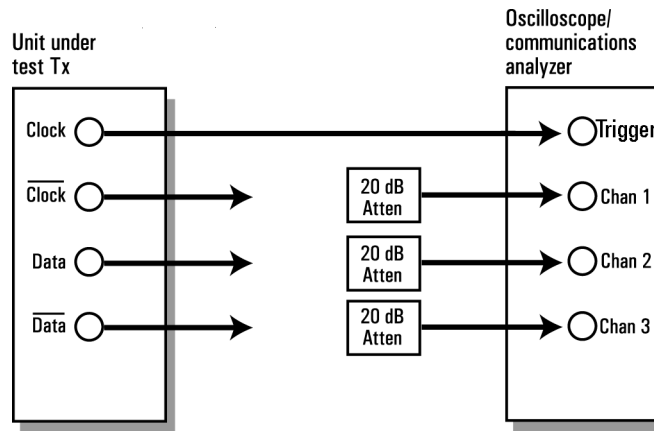
Offset (ppm)	Min Expected Frequency	Max Expected Frequency
-999ppm	51788210.8 Hz	51788212.9 Hz
-100ppm	51834814.9 Hz	51834817.1 Hz
-66.6ppm	51836546.4 Hz	51836548.5 Hz
+33.3ppm	51841725.2 Hz	51841727.3 Hz
+100ppm	51845182.9 Hz	51845185.1 Hz
+999ppm	51891787.1 Hz	51891789.2 Hz

- 12 Disconnect all the test equipment.

Binary Interfaces

Transmitter

- 1 Connect the Test Equipment as shown below:

**Figure 3-2****Binary Interfaces Transmit, Test Connections**

NOTE

Before making Transmit measurements ensure that an Oscilloscope 'CALIBRATION' has been performed on the Left-Hand and Right-Hand 86112A Oscilloscope Vertical Modules

- 2 Set the Oscilloscope controls as follows:
 - Trigger Source - Front Panel
 - Mode - Oscilloscope
- 3 Set the Unit Under Test Transmitter as follows:
 - Mode -UNFRAMED SDH
 - Signal -STM-0 BIN NORMAL
 - Frequency Offset -OFF
 - Pattern -1010

Performance Tests

Binary Interfaces

Clock Duty Cycle/Output Level/Rise-Fall Times

- 4 With only Channel 1 displayed on the Oscilloscope perform the following measurements on the CLOCK signal:

CLOCK Duty Cycle

Use the Oscilloscope Vertical Markers to measure the time between the 50% points of the waveform as shown in Figure 3-3 ie negative portion of signal.

Then readjust the right-most Vertical Marker to measure the PERIOD of the signal.

Duty Cycle is computed as the ratio of the first measured negative portion of the signal to the period of the signal eg as illustrated in Fig1 below $Duty\ Cycle = \frac{9.82ns}{19.33ns} = 51\%$

The duty cycle should be better than 40:60.

Turn off the Vertical Markers

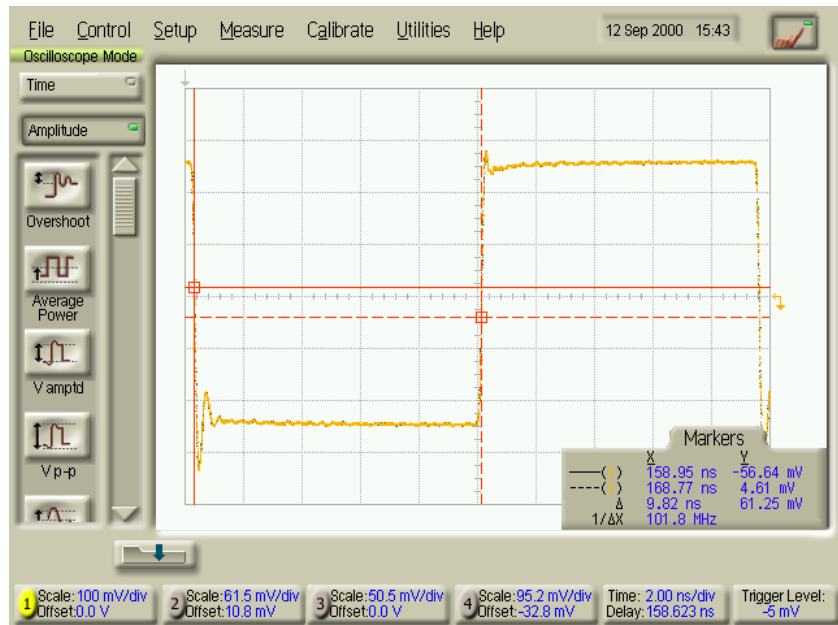


Figure 3-3

Duty Cycle Waveform

Performance Tests

Binary Interfaces

CLOCK Output Level

Enable the AMPLITUDE measurements on the Oscilloscope and press the 'Vampd' button.

Note the amplitude result and multiply by *10 (because of 20dB attenuation).

The amplitude should be between 600mV and 1.0V

CLOCK Rise/Fall Times

With TIME measurements enabled on the Oscilloscope press the 'Rise Time' button. With the Oscilloscope HORIZONTAL control set to 500pS/div adjust the HORIZONTAL vernier control to obtain a waveform as shown in Figure 3-4 .

Note: please ensure 20% & 80% points are indicated on this waveform (if not then set Threshold Definition in MEASURE->CONFIGURE MEASUREMENTS as appropriate)

The rise and fall times should be as follows:

STM0 < 2000pS

STM1 < 1920pS

STM4 < 480pS

STM16 < 120pS

Performance Tests

Binary Interfaces

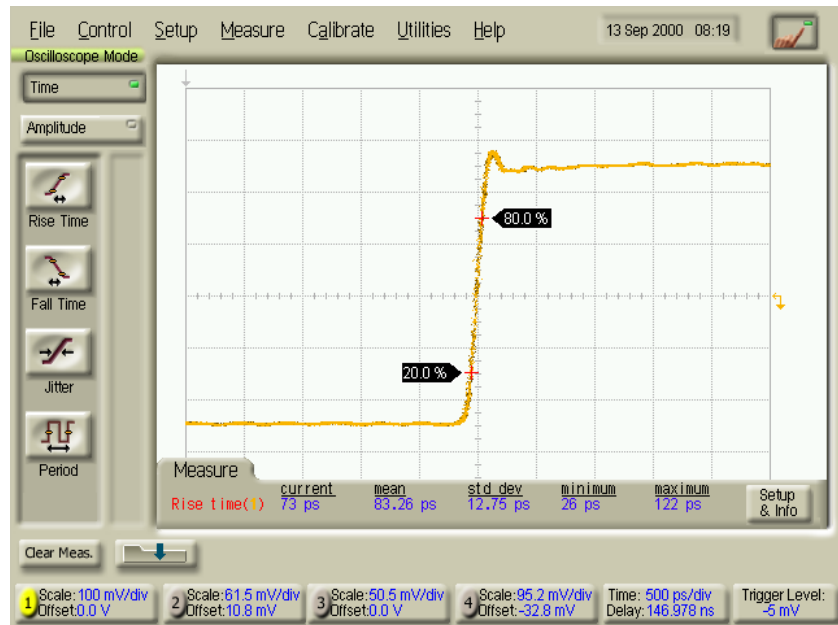


Figure 3-4 Rise Time Waveform

Press the Oscilloscope 'Fall Time' button.

Adjust the Oscilloscope HORIZONTAL vernier control to obtain a waveform as shown in Figure 3-5.

Performance Tests

Binary Interfaces

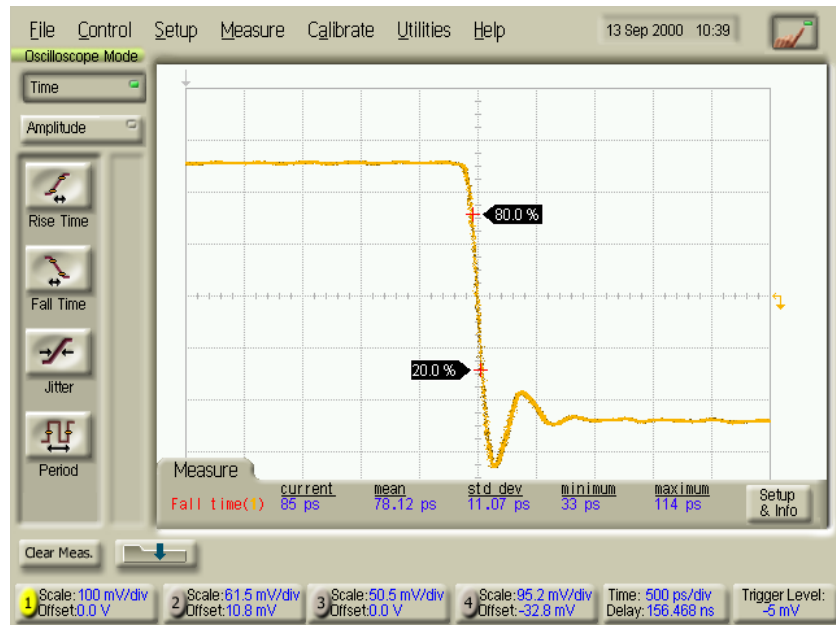


Figure 3-5

Fall Time Waveform

- 5 Disconnect CLK from the Trig on the Scope and $\overline{\text{CLK}}$ from the attenuator on CH1 on the Scope. Connect $\overline{\text{CLK}}$ to the Trig and CLK to the attenuator on CH1. Repeat step 4 for the CLK signal. Reconnect $\overline{\text{CLK}}$ to Trig and CLK to the attenuator on CH1 on the scope.
- 6 Repeat steps 1 thru 5 except change the Unit Under Test Transmit signal to STM-1 BIN at step 3 and adjust the Oscilloscope HORIZONTAL scales as appropriate for the Signal Rate selected.
- 7 Repeat steps 1 thru 5 except change the Unit Under Test Transmit signal to STM-4 BIN at step 3 and adjust the Oscilloscope HORIZONTAL scales as appropriate for the Signal Rate selected.
- 8 Repeat steps 1 thru 5 except change the Unit Under Test Transmit signal to STM-16 BIN at step 3 and adjust the Oscilloscope HORIZONTAL scales as appropriate for the Signal Rate selected.

Performance Tests

Binary Interfaces

Data Output Level/Rise-Fall Times

- 9 Reset the Unit Under Test Transmit signal to STM-0 BIN.
With Channel 3 only displayed on the Oscilloscope perform the following measurements on the DATA signal:

DATA Output Level

Enable the AMPLITUDE measurements on the Oscilloscope and press the 'Vamp_{td}' button.

Note the amplitude result and multiply by *10 (because of 20dB attenuation).

The amplitude should be between 600mV and 1.0V.

DATA Rise/Fall Times

With TIME measurements enabled on the Oscilloscope press the 'Rise Time' button. Adjust the Oscilloscope HORIZONTAL controls to obtain a suitable waveform – see Figure 3-4.

The rise and fall times should be as follows:

STM0	< 2000pS
STM1	< 1920pS
STM4	< 480pS
STM16	< 120pS

Press the 'Fall Time' button.

Adjust the Oscilloscope HORIZONTAL controls to obtain a suitable waveform – see Figure 3-5.

- 10 Repeat step 9 except using Channel 4 DATA signal.

- 11 Repeat steps 9 and 10 except change the Unit Under Test Transmit signal to STM-1 BIN at step 9 and adjust the Oscilloscope HORIZONTAL scales as appropriate for the Signal Rate selected.

Performance Tests

Binary Interfaces

- 12 Repeat steps 9 and 10 except change the Unit Under Test Transmit signal to STM-4 BIN at step 11 and adjust the Oscilloscope HORIZONTAL scales as appropriate for the Signal Rate selected.
- 13 Repeat steps 9 and 10 except change the Unit Under Test Transmit signal to STM-16 BIN at step 11 and adjust the Oscilloscope HORIZONTAL scales as appropriate for the Signal Rate selected.

Receiver

- 14 Connect the Test Equipment as shown below:

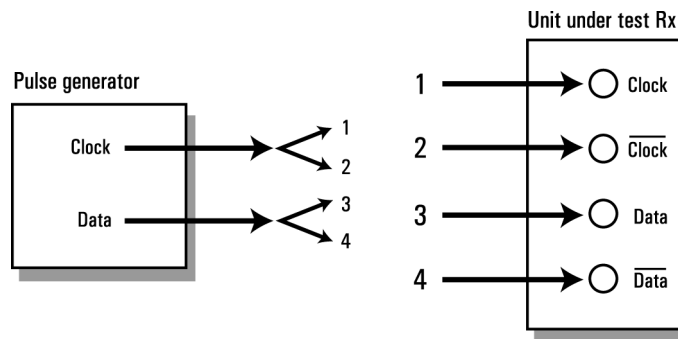


Figure 3-6

Binary Interfaces Receive, Test Connections

CAUTION

Ensure that amplitude controls on the PULSE GENERATOR are set prior to any connection to the Unit Under Test as it is possible to set amplitudes on the PULSE GENERATOR which can damage the Unit Under Test inputs.

- 15 Using the PULSE GENERATOR 'TIMEBASE' control set to 'FREQ' adjust the Freq display firstly for 51.8MHz (STM-0) \diamond GOTO step 27

Performance Tests

Binary Interfaces

155.5MHz -STM-1

622.1MHz -STM-4

2.4880GHz -STM-16

16 Set the PULSE GENERATOR 'PULSE/DATA' (Channel 2) controls as follows:

DATA/SQUAR -DATA

RZ/NRZ -NRZ

OFFS/LOW -OFFS (0.00V)

32 BIT/PRBS -PRBS

AMPL/HIGH -AMPL adjust to 0.40V (400mV)

17 Set the PULSE GENERATOR 'PULSE' (Channel 1) controls as follows:

PULSE/SQUARE -PULSE

DELAY/PHASE -DELAY adjust to -50pS (for proper Clock/Data phasing)

WIDTH/DCYC -DCYC adjust to 50%

OFFS/LOW -OFFS (0.00v)

AMPL/HIGH -AMPL adjust to 0.40V (400mV)

18 Connect the PULSE GENERATOR 'PULSE' (Channel 1) $\overline{\text{OUTPUT}}$ (Clock signal) to Unit Under Test CLOCK input.

Note: it is necessary to use Channel 1 $\overline{\text{OUTPUT}}$ signal to obtain the proper phase relationship between Clock & Data at the Unit Under Test.

Ensure PULSE GENERATOR Channel 1 $\overline{\text{OUTPUT}}$ is enabled -DISABLE OFF.

Connect the PULSE GENERATOR 'PULSE/DATA' (Channel 2) OUTPUT (Data signal) to Unit Under Test DATA input.

Ensure PULSE GENERATOR Channel 2 OUTPUT is enabled -DISABLE OFF.

Performance Tests

Binary Interfaces

19 Set the Unit Under Test Receiver as follows:

Mode -UNFRAMED SDH

Signal -STM-0 BIN NORMAL ◊ then (after making measurements at STM-0)
 -STM-1 BIN NORMAL
 -STM-4 BIN NORMAL
 -STM-16 BIN NORMAL

Pattern -PRBS23/INVERT

Ensure the Unit Under Test has gained PATTERN SYNC with NO ERRORS.

Rx Clock Sensitivity

20 Press the PULSE GENERATOR 'PULSE' –AMPL button to access the Channel 1 Amplitude display. Using the PULSE GENERATOR vernier controls adjust the Amplitude from 400mV to 200mV and ensure that PATTERN SYNC is retained and NO ERRORS appear on the Unit Under Test. Return the PULSE GENERATOR Channel 1 Amplitude to 400mV.

Note: Disregard errors which occur briefly and clear.

Rx Data Sensitivity

21 Press the PULSE GENERATOR 'PULSE/DATA'-AMPL button to access the Channel 2 Amplitude display. Using the PULSE GENERATOR vernier controls adjust the amplitude from 400mV to 200 mV and ensure that PATTERN SYNC is retained and NO ERRORS appear on the Unit Under Test. Return the PULSE GENERATOR Channel 2 Amplitude to 400mV.

Note: Disregard errors which occur briefly and clear.

Multirate Optical Interfaces

Specification (1310 nm Transmitter up to 622 Mb/s)

Wavelength	1280 nm to 1335 nm (Typical 1310 nm)
Power Output	-3.0 dBm to +2.0 dBm (Typical 0.0 dBm)
Line Coding	NRZ
Safety Class	Class 1, FDA 21 CFR Ch.1 1040.10 and EN 60825
Data Rates	51.84, 155.52, or 622.08 Mb/s (Nominal)

Specification (1310 nm Transmitter up to 2488.32 Mb/s)

Wavelength	1280 nm to 1330 nm (Typical 1310 nm)
Power Output	0.0 dBm to +3.0 dBm (Typical +1 dBm)
Line Coding	NRZ
Safety Class	Class 1, FDA 21 CFR Ch.1 1040.10 and EN 60825
Data Rates	51.84, 155.52, 622.08 or 2488.32 Mb/s (Nominal)

Specification (1550 nm Transmitter up to 622 Mb/s)

Wavelength	1480 nm to 1580 nm (Typical 1550 nm)
Power Output	-3.0 dBm to +2.0 dBm (Typical 0.0 dBm)
Line Coding	NRZ
Safety Class	Class 1, FDA 21 CFR Ch.1 1040.10 and EN 60825
Data Rates	51.84, 155.52, or 622.08 Mb/s (Nominal)

Specification (1550 nm Transmitter up to 2488.32 Mb/s)

Wavelength	1530 nm to 1570 nm (Typical 1550 nm)
Power Output	0.0 dBm to +3.0 dBm (Typical +1 dBm)
Line Coding	NRZ
Safety Class	Class 1, FDA 21 CFR Ch.1 1040.10 and EN 60825
Data Rates	51.84, 155.52, 622.08 or 2488.32 Mb/s (Nominal)

Performance Tests
Multirate Optical Interfaces

Specification (Receiver) up to 2488.32 Mb/s

Wavelength	1200 nm to 1600 nm
Maximum Input Power	-8 dBm (for BER of $1.0E^{-10}$)
Line Coding	NRZ
Sensitivity	-34 dBm (STM-0/1/4, OC-1/3/12) -28 dBm Minimum (STM-16, OC-48) (wavelength=1310/1550 nm, Modulation = 100%, Data= $2^{23}-1$, BER= $1.0E^{-10}$)
PMP Electrical Input	150mV pk-pk (Nominal) 51.84, 155.52 and 622.08 Mb/s only
PMP Impedance	Nominal 50Ω

Specification (Receiver) up to 622.08 Mb/s

Wavelength	1200 nm to 1600 nm
Maximum Input Power	-3 dBm (for BER of $1.0E^{-10}$)
Line Coding	NRZ
Sensitivity	-34 dBm (STM-0/1, OC-1/3) -28 dBm Minimum (STM-4, OC-12) (wavelength=1310/1550 nm, Modulation=100%, Data= $2^{23}-1$, BER= $1.0E^{-10}$)
PMP Electrical Input	150 mV pk-pk (Nominal), 51.84, 155.52 and 622.08 Mb/s only
PMP Impedance	Nominal 50Ω

NOTE

The rates available are dependent on the OmniBER model and options fitted.

Description

The optical power output is measured on a power meter.

The receiver sensitivity is verified by attenuating the transmitter output and checking for no errors in back-to-back mode.

The Protected Monitor Point (PMP) functionality is verified by looping the OmniBER's Optical Output to the PMP input via an Optical Attenuator and Lightwave Converter, then checking for error-free operation.

Performance Tests
Multirate Optical Interfaces

Equipment Required

Power Meter	: HP 8153A
Power Meter Sensor Module	: HP 81536A
Oscilloscope	: HP 54520A
Lightwave Converter	: HP 11982A
Optical Attenuator	: HP 8157A
FC/PC Connector Interface	: HP 81000FI (Qty. 4)
Optical Cables (qty 2)	: HP 11871A
Adaptor (SMA to BNC)	: HP 1250-1787

WARNING

Safety precautions must be observed when handling the OmniBER's Optical Modules as these generate laser signals which can cause serious injury. The guidelines below must be followed:
Check the connector configuration of the 2.5 Gb/s Fiber Optic Interfaces. If non FC/PC connectors are fitted then remove them, then fit the FC/PC connector interface.
Check for any damage to the OmniBER's Fiber Optic Interface spring loaded aperture covers and connectors. Do not power up the instrument if in any doubt about the integrity of these connectors.
Make all connections to the OmniBER's Fiber Optic Interfaces before powering up the instrument.

Procedure

- 1 Switch on the OmniBER and recall the default settings as shown on page 3-4.

1310nm - Optical Power Output

- 2 Connect the OmniBER's Optical Out Port to the HP8153A.
Ensure all optical connectors are carefully cleaned before connections are made.
Ensure that all connections are tight and that the cable has no twists.
- 3 Set up the HP 8153A as follows:
 - a. Press **PARAM** key to display wavelength [λ]
 - b. Using **←**, **→**, **↑** and **↓** keys, set the wavelength to 1310nm.
 - c. Press **PARAM** key to display Time [t]
 - d. Using **←**, **→**, **↑** and **↓** keys, set the time to 200mS.

Performance Tests

Multirate Optical Interfaces

- e. Press **PARAM** key to display REF.
 - f. Using **←**, **→**, **↑** and **↓** keys, set the REF to 0.000 dBm.
 - g. Press **PARAM** key to display CAL.
 - h. Using **←**, **→**, **↑** and **↓** keys, set the CAL to 0.000 dBm.
 - i. Press the **ZERO** key on the Power Meter to calibrate - the Power Meter is now ready.
- 4 Press **MODE** to select the Power Level measurement on the HP 8153A.
 - 5 Press **TRANSMIT** | **SDH** or **SONET** , and select SIGNAL [STM-0 OPT] or [OC-1].
 - 6 Check the HP 8153A Power Meter reading is between 0 dBm and +3 dBm (Typically +1 dBm) for a 37718A. Or is between -3 dBm and +2dBm (Typically +0 dBm) for a 37718B/C.
 - 7 Press **TRANSMIT** | **SDH** or **SONET** and select SIGNAL [STM-1 OPT] or [OC-3].
 - 8 Check the HP 8153A Power Meter reading is between 0 dBm and +3 dBm (Typically +1 dBm) for a 37718A. Or is between -3 dBm and +2dBm (Typically +0 dBm) for a 37718B/C.
 - 9 **HP 37718A/B only.** Press **TRANSMIT** | **SDH** or **SONET** , and select SIGNAL [STM-4 OPT] or [OC-12].
 - 10 **HP 37718A/B only.** Check the HP 8153A Power Meter reading is between 0 dBm and +3 dBm (Typically +1 dBm) for a 37718A. Or is between -3 dBm and +2dBm (Typically +0 dBm) for a 37718B/C.
 - 11 **HP 37718A only.** Press **TRANSMIT** | **SDH** or **SONET** and select SIGNAL [STM-16 OPT] or [OC-48].
 - 12 **HP 37718A only.** Check the HP 8153A Power Meter reading is between 0 dBm and +3 dBm (Typically +1 dBm) for a 37718A.

Optical Receiver Sensitivity

- 13 Recall the OmniBER's default settings as shown on page 3-4.
- 14 Set the Optical Attenuator to ATTEN 15 dB, WAVELENGTH 1310 nm; CAL=0; ENB ON. Connect the Optical Attenuator between the Power Meter and the OmniBER's Optical Out port (ensure that all connections are tight and that the cable has no twists).
- 15 Press **TRANSMIT** | **SDH** or **SONET** and select SIGNAL [STM-0 OPT] or [OC-1].
- 16 Adjust the Optical Attenuator to obtain a reading of -34 dBm on the Power Meter.

Performance Tests

Multirate Optical Interfaces

- 17 Recall the OmniBER's default settings as shown on page 3-4.
- 18 Disconnect the Optical Attenuator Output from the HP 8153A and connect to the OmniBER's Optical IN Port. Ensure all optical connectors are carefully cleaned before connections are made. Ensure that all connections are tight and that the cable has no twists.
- 19 Press **OTHER** then **SETTINGS CONTROL** and select TRANSMITTER AND RECEIVER [COUPLED].
- 20 Press **TRANSMIT** | **SDH** or **SONET** and select SIGNAL [STM-0 OPT] or [OC-1].
- 21 Press **RESULTS** | **TROUBLE SCAN** then **RUN/STOP** to start a measurement.
- 22 After 5 minutes check that NO TROUBLE is displayed on the **RESULTS** display.
- 23 Repeat steps 16 through 22, substituting SIGNAL [STM-1 OPT] or [OC-3] in steps 18 & 23.
- 24 **HP 37718A/B only.** Repeat steps 16 through 22, substituting SIGNAL [STM-4 OPT] or [OC-12] in steps 18 & 23. If 37718B/C then adjust the Optical Attenuator to obtain a reading of -28 dBm on the Power Meter
- 25 **HP 37718A only.** Repeat steps 16 through 22, substituting SIGNAL [STM-16 OPT] or [OC-48] in steps 18 & 23 and -28 dBm in step 19.

PMP Electrical Input

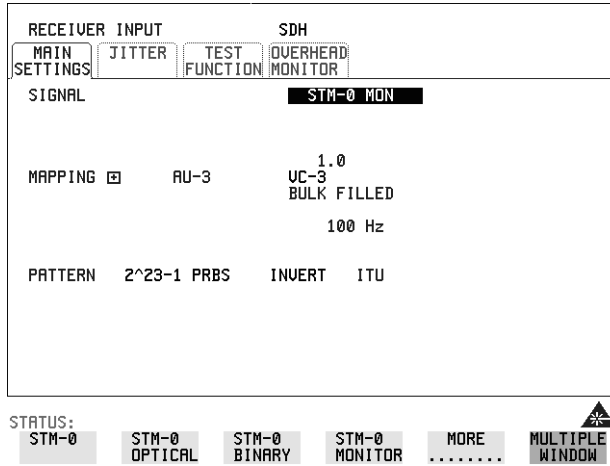
- 26 Recall the OmniBER's default settings as shown on page 3-4.
- 27 Disconnect the optical cable from the OmniBER's Optical IN port and connect to the HP 11982A Lightwave Converter input.
- 28 Connect the output from the Lightwave Converter to the Oscilloscope using the SMA/BNC adaptor and 50 Ω BNC cable.
- 29 Press **TRANSMIT** | **SDH** or **SONET** and select SIGNAL [STM-0 OPT] or [OC-1].
- 30 Press **AUTOSCALE** on the Oscilloscope and adjust the Timebase and Range to obtain an STM-0/OC-1 waveform.
- 31 Measure the amplitude of the waveform using the Oscilloscope and adjust the Optical Attenuator until the amplitude is 150mV pk-pk.
- 32 Disconnect the output of the Lightwave Converter from the Oscilloscope and

Performance Tests

Multirate Optical Interfaces

connect instead to the OmniBER's Optical Module Monitor input.

- 33 Press **RECEIVE** and set up the display as shown below.



- 34 Press **RESULTS** **TROUBLE SCAN** then **RUN/STOP** to start the measurement.
- 35 After 5 minutes, check that NO TROUBLE is displayed on the **RESULTS** display. Press **RUN/STOP** to stop the measurement.
- 36 Recall the OmniBER's default settings as shown on page 3-4.
- 37 Repeat steps 28 to 36 but with [STM-1 OPT] or [OC-3] selected on the OmniBER's **TRANSMIT** and **RECEIVE** displays.
- 38 Recall the OmniBER's default settings as shown on page 3-4.
- 39 Repeat steps 28 to 36 but with [STM-4 OPT] or [OC-12] selected on the OmniBER's **TRANSMIT** and **RECEIVE** displays.

Procedure 1550 nm - Optical Power Output

- 40 Repeat steps 1 through 12 substituting 1550nm for 1310nm.

Optical Receiver Sensitivity

- 41 Repeat Steps 13 through 25 substituting 1550nm for 1310nm.

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

Specifications

Please refer to the SDH Tx/Rx Jitter Specifications given in the Specifications document provided.

Description

The OmniBER's Transmitter SDH Output is looped to the SDH Input and the signal is also monitored on the Spectrum Analyzer. The OmniBER's Jitter modulation frequency is set to a Jitter Amplitude/Frequency check point for the selected SDH Rate and the Spectrum Analyzer set to observe the displayed spectrum centered at half this bit rate. The OmniBER's jitter Modulation amplitude is adjusted to known modulation levels using **Carrier to Sideband Ratio**, **Bessel Null** and **Peak Deviation** methods for reference. The jitter Amplitude (UI pk-pk) displayed on the OmniBER's Transmitter and Receiver is checked to ensure it is within specified limits. The test is repeated for various Jitter Amplitude/Frequency points to check the TX and RX ranges.

The Optical SDH rates are tested in a similar way. In this case the OmniBER's Optical Transmit signal is split using an optical coupler. Part is looped back via an Optical Attenuator to the OmniBER's Receiver. The split signal is passed through an O/E Converter to provide an electrical version of the signal for Spectrum Analysis.

Because the SDH Data signal is scrambled this is switched off to observe the spectral components at half bit rate. A special Calibration test signal is selected which sets the output pattern to alternating 1/0.

WARNING

Safety precautions must be observed when handling the OmniBER's Optical Modules as these generate laser signals which can cause injury. The guidelines below must be followed:

Check the connector configuration of the Fiber Optic Interfaces. If these are fitted with a connector interface other than FC/PC then remove the existing connector interface and fit the FC/PC connector interface.

Check for any damage to the OmniBER's Fiber Optic Interface spring loaded aperture covers and connectors. Do not power up the instrument if in any doubt about the integrity of these connectors.

Equipment Required

Spectrum Analyzer	: HP 8560E
Optical Coupler	: HP 15744C
O/E Converter	: HP 11982A
Optical Attenuator	: HP 8156A*
Synthesizer	: HP 3335B Opt 001
Oscilloscope	: HP 54520A
75Ω/50Ω Matching Pad	: HP 11825B
75Ω Power Splitter	: SUHNER 4901.02A
75Ω Termination	: HP 15522-80010
Blocking Capacitor	: HP 10240B

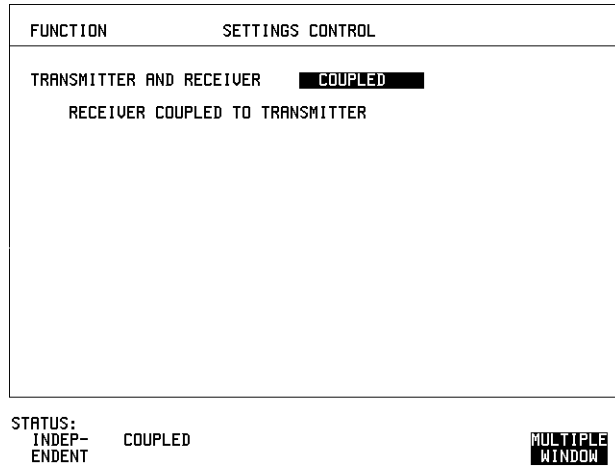
* Note the 15dB optical attenuator accessory E4546A (supplied with your instrument) is NOT suitable for this purpose.

- 1 Recall the OmniBER's default settings as shown on page 3-4.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

- 2 Set up the OmniBER's **OTHER** display as shown below.



Procedure

STM-0e Electrical Transmit/Receive SDH Jitter Amplitude Accuracy

- 3 Connect up the equipment as shown in Figure 3-7.

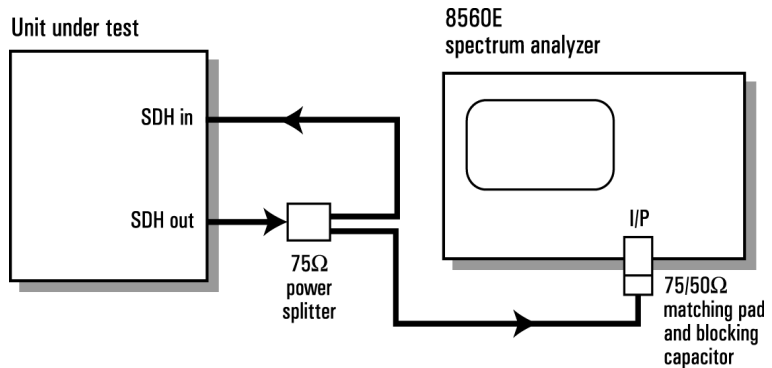


Figure 3-7

STM-0e Electrical Transmit/Receive Test Setup

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

- 4 Select **TRANSMIT** and set up the OmniBER's display as shown below. Set up for STM-0 E CMI with bulk loading.

TRANSMITTER OUTPUT		SDH	
MAIN SETTINGS	JITTER	TEST FUNCTION	OVERHEAD SETUP
SIGNAL	STM-0	X-CON	INTERNAL
CLOCK	INTERNAL		
FREQUENCY OFFSET	OFF		
MAPPING	<input checked="" type="checkbox"/> AU-3		BACKGROUND UC-3 BULK FILLED
PATTERN	2^23-1 PRBS	INVERT	ITU

STATUS:



- 5 Select **TRANSMIT** **JITTER** and ensure Jitter is set to OFF.

TRANSMITTER OUTPUT		SDH	
MAIN SETTINGS	JITTER	TEST FUNCTION	OVERHEAD SETUP
JITTER / WANDER		JITTER	OFF
JITTER			

STATUS:



Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

- 6 Select RECEIVER INPUT SETTINGS [JITTER] and set up as shown below.

RECEIVER INPUT		SDH	
MAIN SETTINGS	JITTER	TEST FUNCTION	OVERHEAD MONITOR
MEASUREMENT TYPE	JITTER		
SIGNAL FREQUENCY	52Mb/s		
RECEIVER RANGE	1.6 UI		
HIT THRESHOLD	1.00 UI		
FILTER	LP+HP2		
FILTER VALUES	20kHz HP2 400kHz LP		

STATUS:



- 7 Select **RESULTS** and set for SDH Jitter, Short Term. (Ensure the Timing Control is set for I Sec Manual)
Set to Multiple Window to allow observation of TX/RX Jitter and Results pages.

TRANSMITTER OUTPUT		SDH	
MAIN SETTINGS	JITTER	TEST FUNCTION	OVERHEAD SETUP
SIGNAL	STM-0	X-CON	INTERNAL
CLOCK	INTERNAL		
FREQUENCY OFFSET	OFF		
MAPPING	<input checked="" type="checkbox"/> AU-3	BACKGROUND VC-3	FOREGROUND BULK FILLED
PATTERN	2^23-1 PRBS	INVERT	ITU

RECEIVER INPUT		SDH	
MAIN SETTINGS	JITTER	TEST FUNCTION	OVERHEAD MONITOR
MEASUREMENT TYPE	JITTER		
SIGNAL FREQUENCY	52Mb/s		
RECEIVER RANGE	1.6 UI		
HIT THRESHOLD	1.00 UI		
FILTER	LP+HP2		
FILTER VALUES	20kHz HP2 400kHz LP		

RESULTS		JITTER		SHORT TERM	
+VE PEAK	0.095UI				
-VE PEAK	0.120UI				
PEAK-PEAK	0.215UI				
RMS	0.081UI				
FILTERS	20kHz HP2 400kHz LP				
ELAPSED TIME	00d 00h 05m 36s				

FUNCTION		SETTINGS CONTROL	
TRANSMITTER AND RECEIVER	COUPLED		
RECEIVER COUPLED TO TRANSMITTER			

STATUS:



Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

- 8 Press RUN.
Check that there are no SDH result errors and that the Received Jitter results are:
< 0.050 UI p-p
- 9 Press STOP to halt measurement. Change Receiver Filter to LP+HP1. Press RUN and check that the Received Jitter results are:
< 0.050 UI p-p

Press STOP to halt measurement.

- 10 Select **OTHER** display and CALIBRATION and set up PATTERN to ALT as shown below.

FUNCTION	CALIBRATION
CALIBRATION ITEM	PATTERN
TX STM-0/1 ELECT.	ALT

STATUS: STORED SETTINGS FLOPPY LOGGING MORE MULTIPLE
SETTINGS CONTROL DISK WINDOW

Note to access CALIBRATION pages you must enter code 1243 to gain access.

Note: Do not select or run any other **Calibration Items**.

NOTE

The receiver will show SDH errors, (LOF/OOF, PATTERN LOSS, AU-LOP), when pattern is set to ALT as there is no Framing etc. This calibration test pattern allows spectral monitoring of the jittered signal

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

- 11 Select **TRANSMIT** **JITTER** and set up the display as shown below.

TRANSMITTER OUTPUT		SDH	
MAIN SETTINGS	JITTER	TEST FUNCTION	OVERHEAD SETUP
JITTER / WANDER		JITTER	
JITTER		ON	
SIGNAL FREQUENCY		52Mb/s	
MODULATION SOURCE		INTERNAL	
JITTER CONTROL		OFF	
RANGE		20.0 UI	
MODULATION FREQUENCY		20000 Hz	
AMPLITUDE		0.10 UI	

STATUS:



- 12 Set the Spectrum Analyzer as follows:

Centre Frequency - 25.92 MHz (half bit rate being tested)

e.g. 77.76 MHz for STM-1, 311.04 MHz for STM-4, 1.24416 GHz for STM-16.

Frequency Span - 100 kHz (set to approx 5 times the Jitter frequency in step 11)

Reference Level - approx -15dBm depends splitter/optical coupler & O/E converter used.

Sweep Time - Auto.

Video Bandwidth - Auto.

Resolution Bandwidth - Auto.

- 13 Increase the Jitter Amplitude from minimum until the **Carrier to Sideband Ratio** is nearest to -15.97dB. This should be at approx 0.20 UI p-p. Use the Spectrum Analyzer dB/Div and delta marker measurement to aid measurement. Note for STM-1e use - 22.07db = 0.10 UI p-p and for optical SDH rates use - 15.97db = 0.20 UI p-p.

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

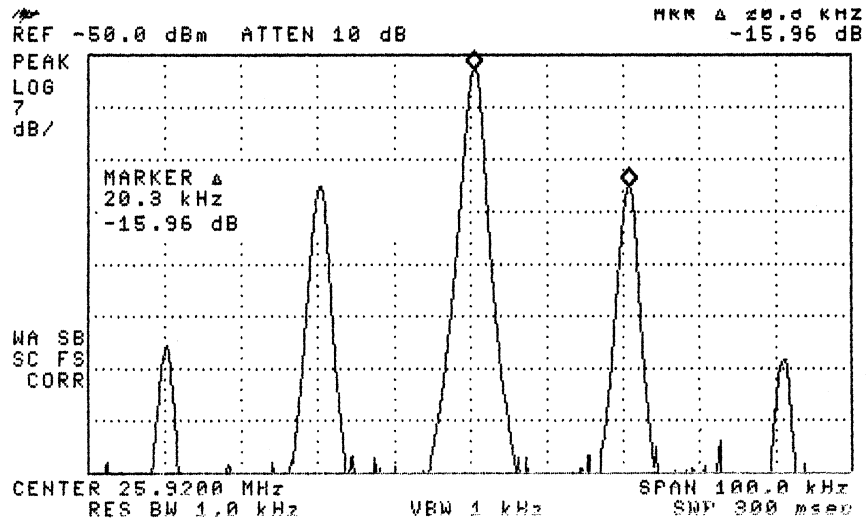


Figure 3-8 Carrier to Sideband Ratio Example

NOTE Compensate the measurement if necessary to balance any difference between the upper and lower sideband amplitudes.

NOTE To optimize amplitude for checking the Receiver Accuracy it may be necessary to use an external modulation source to give better amplitude resolution. Set the OmniBER to accept an External modulation source and set the synthesizer to the same jitter frequency as used for Internal modulation. Adjust the level from minimum until the Carrier/Sideband amplitude is within 0.10 dB of the required difference.

14 Set the Calibration Pattern to OFF. Check that there are no SDH errors.

15 Select **RESULTS**. Press RUN to start measurement.
 Check the TX Jitter UI p-p setting is between 0.16 and 0.24 UI p-p
 Check the RX Jitter results are between 0.125 and 0.275 UI p-p.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

NOTE

If using Multiple Display window ensure RESULTS display is selected before running measurement.

- 16** Press STOP to halt measurement. Change Receiver Filter to LP+HP2.
- 17** Set the Calibration Pattern to ALT
- 18** Change the Jitter Frequency to 200 kHz and adjust the Spectrum Analyzer span to approx 5 times the Jitter frequency. Adjust the OmniBER's Transmit Jitter amplitude if necessary for a **Carrier to Sideband Ratio** is nearest to -15.97dB. This should be at approx 0.20 UI p-p. Use the Spectrum Analyzer dB/Div and delta marker measurement to aid measurement. Note for STM-1e use - 22.07db = 0.10 UI p-p and for optical SDH rates use - 15.97db = 0.20 UI p-p.
- 19** Set the Calibration Pattern to OFF. Check that there are no SDH errors.
- 20** Select **RESULTS** . Press RUN to start measurement.
Check the TX Jitter UI p-p setting is between 0.16 and 0.24 UI p-p
Check the RX Jitter results are between 0.125 and 0.275 UI p-p.
Press STOP to halt measurement.
- 21** Set the Calibration Pattern to ALT
- 22** Change the Jitter Frequency to 2.0 kHz and adjust the Spectrum Analyzer span to approx 3 times the Jitter frequency.
- 23** Adjust the OmniBER's jitter amplitude (approximately 0.91 UI) and adjust until the Carrier and first sidebands observed on the Spectrum Analyzer are the same amplitude within 0.10 dB (see Figure 3-9).

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

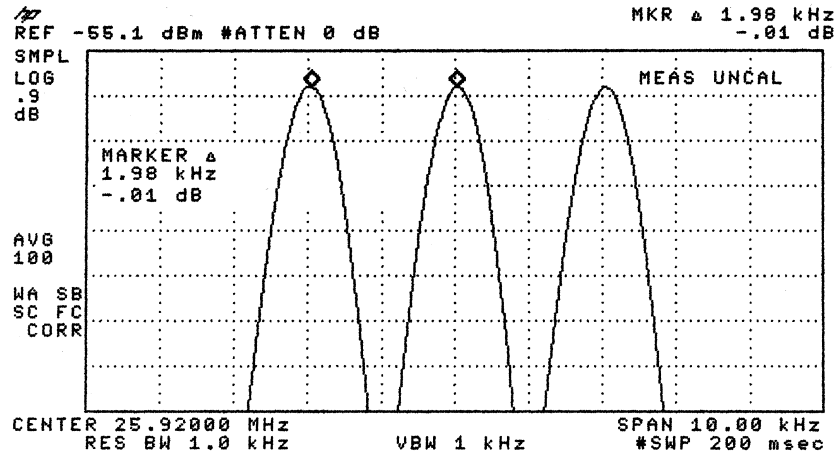
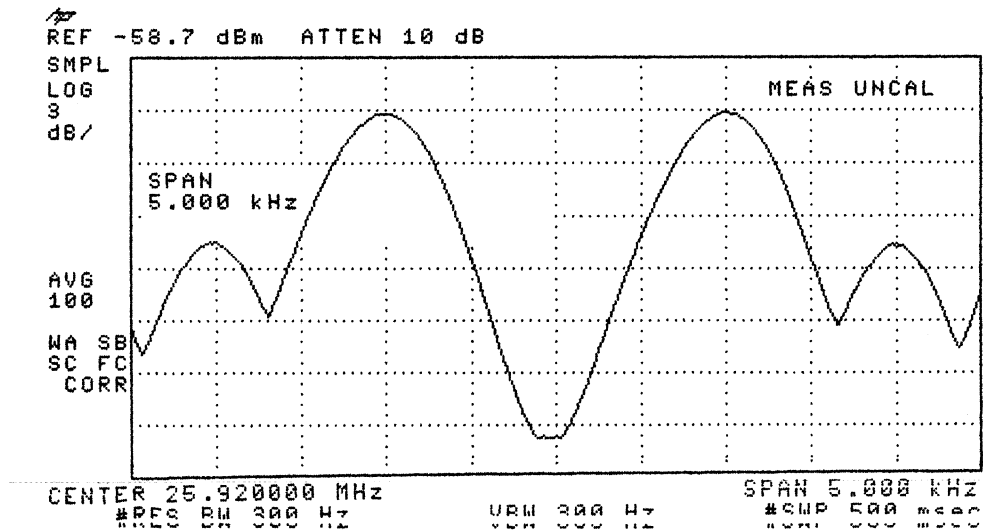


Figure 3-9 Carrier/Sideband Equal Example

NOTE

Note: Use Spectrum Analyzer dB/Div to improve Marker Resolution as necessary.

- 24 Set the Calibration Pattern to OFF. Check that there are no SDH errors.
- 25 Set Receiver Filter to LP+HP1. Select RESULTS. Press RUN to start measurement.
Check the TX Jitter UI p-p setting is between 0.82 and 1.00 UI p-p
Check the RX Jitter results are between 0.796 and 1.024 UI p-p.
Press STOP to halt measurement.
- 26 Set the Calibration Pattern to ALT.
- 27 Change the Receiver Range to 16UI.
- 28 Change the Jitter Frequency to 1 kHz and adjust the Spectrum Analyzer span to approx 5 times the Jitter frequency.
- 29 Adjust the OmniBER's jitter amplitude (approximately 3.52 UI) until the 2nd Bessel Null is observed on the Spectrum Analyzer i.e 2nd dip in the carrier level (see Figure 3-10).

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)**Figure 3-10****Second Bessel Null Example**

- 30** Set the Calibration Pattern to OFF. Check that there are no SDH errors.
NOTE :- The hits led will be on if the hits threshold on the jitter receiver is exceeded.
- 31** Ensure the Receiver Filter to LP+HP1. Select **RESULTS** . Press RUN to start the measurement.
Check the TX Jitter UI p-p setting is between 3.30 and 3.74 UI p-p
Check the RX Jitter results are between 3.174 and 3.866 UI p-p.
Press STOP to halt measurement.
- 32** Set the Calibration Pattern to ALT
- 33** Change the Jitter Frequency to 800 Hz and adjust the Spectrum Analyzer span to approx 5 times the Jitter frequency.
- 34** Adjust the OmniBER's jitter amplitude (approximately 7.52 UI) until the 4th **Bessel Null** is observed on the Spectrum Analyzer i.e 4th dip in the carrier level (see Figure 3-10). For STM-1 use 7.52 4th null, STM-4 use 11.52 UI, 6th null. For STM-16 use 9.52 UI, 5th null.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

- 35 Set the Calibration Pattern to OFF. Check that there are no SDH errors.
- 36 Set the Receiver Filter to LP+HP1. Select **RESULTS** . Press RUN to start the measurement.
Check the TX Jitter UI p-p setting is between 7.10 and 7.94 UI p-p.
Check the RX Jitter results are between 6.756 and 8.164 UI p-p.
- 37 Press STOP to halt measurement.
- 38 Set the Calibration Pattern to ALT
- 39 Change the Transmit Jitter Range to LF 20 UI and Receiver Measurement Type to EXTENDED.
- 40 Change the Jitter Frequency to 50Hz and Jitter Amplitude to 20UI p-p.

NOTE

Set the Spectrum Analyzer Span to approx 7 kHz and adjust Bandwidth & Sweep Time controls as necessary. Measure the peak to peak deviation of the carrier using markers. Adjust the Jitter Amplitude until the deviation at the amplitude peaks is 2.90 ± 0.07 kHz.

NOTE

It may be necessary to use an external modulation source to give better amplitude resolution to optimise the measurement . The OmniBER is set to accept External modulation source and the synthesizer is set to the same jitter frequency as used for Internal modulation and the level is fine adjusted to the desired frequency span.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

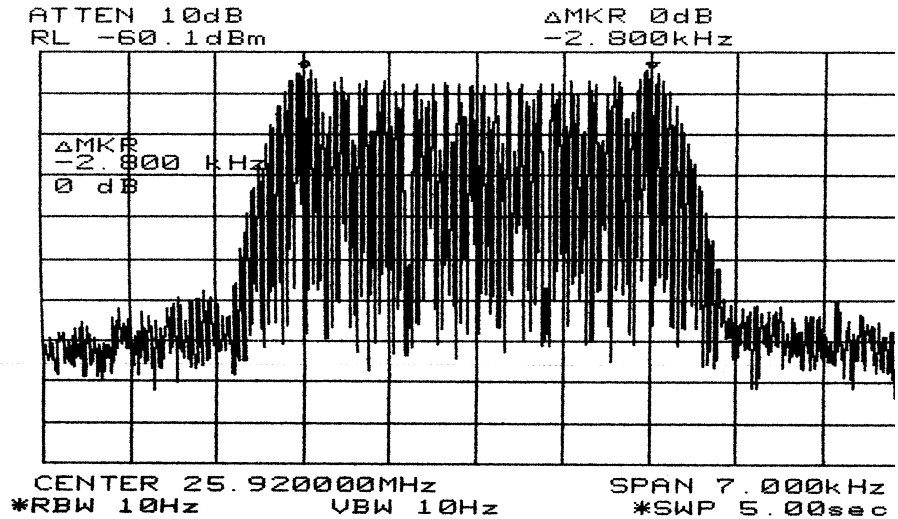


Figure 3-11

Peak Deviation Example

	Centre Freq	Span	BW	Sweep	Δ Freq kHz
For STM-1	77.76 MHz	7 kHz	10 Hz	8 seconds	4.95 +/-0.5
For STM-4	311.04 MHz	24 kHz	10 Hz	12 seconds	20.3 ±0.25
For STM-16	1.24416 GHz	90 kHz	10 Hz	33 seconds	82.3 ±0.5

- 41** Set the Calibration Pattern to OFF. Check that there are no SDH errors
- 42** Select **RESULTS**. Press RUN to start measurement.
Check the Transmit Display is between 18.80 and 21.20 UI p-p
Check the RX Jitter results are between 18.550 and 21.450 UI p-p.
Press STOP to halt measurement.
- 43** Set Jitter to OFF.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

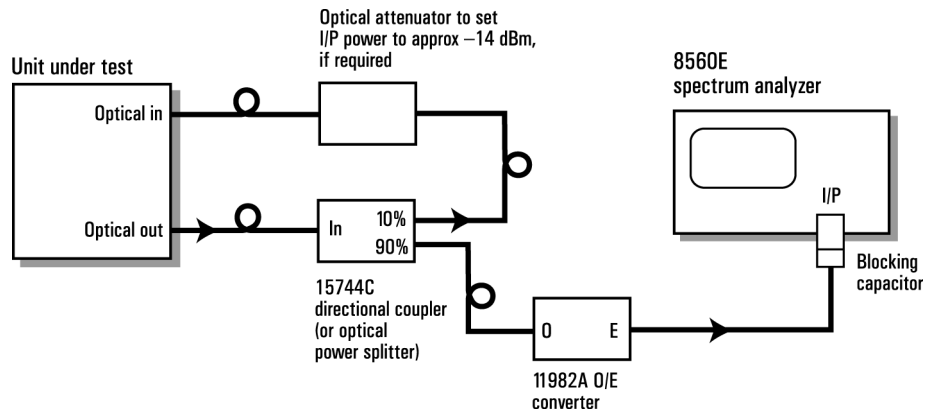
STM-1 electrical

44 Repeat steps 6 to 43 using the information in the Table below for STM-1 electrical

STEP	TX Range	RX Range	RX Filter	Tx UI p-p	Tx Freq	TX Result MIN p-p	TX Result MAX p-p	RX Result MIN p-p	RX Result MAX p-p
6-8	OFF	1.6UI	LP+HP2	OFF	OFF	OFF	OFF	N/A	0.050
9	OFF	1.6UI	LP+HP1	OFF	OFF	OFF	OFF	N/A	0.050
13-15	20	1.6UI	LP+HP1	0.1	65 kHz	0.06	0.14	0.043	0.157
16-20	LP+HP2		650 kHz		0.06	0.14	0.043	0.157	
22-25	LP+HP1		0.91		6.5K	0.82	1.00	0.796	1.024
27-31	16UI		3.52		4K	3.30	3.74	3.174	3.866
33-37				7.52	2.5 kHz	7.10	7.94	6.756	8.164
39-43	50	64	FIXED	33	50Hz	30.82	35.18	28.35	37.65

Optical Transmit/Receive SDH Jitter Accuracy

45 Connect the equipment as shown below.

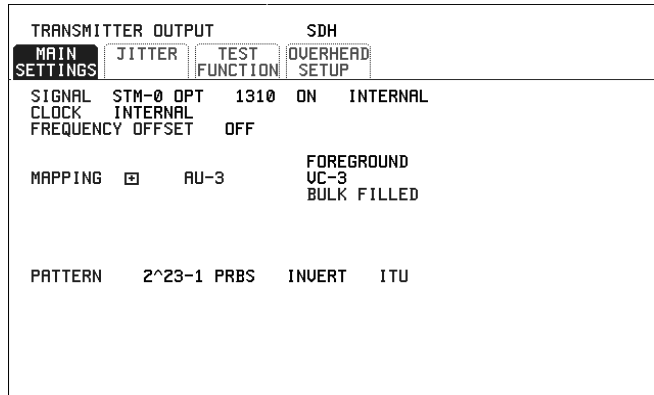


SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

Figure 3-12

Optical Transmit/Receive SDH Jitter Test Setup

46 Set up the OmniBER's **TRANSMIT** display as shown below.



STATUS:



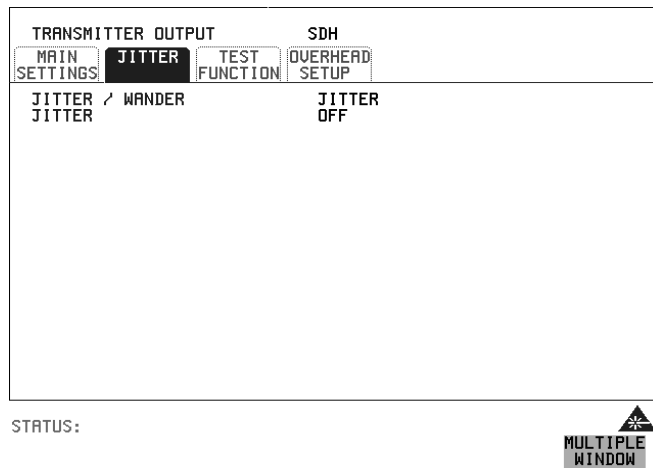
NOTE

Use the available wavelength 1310/1550nm. Where both are fitted select 1310nm.

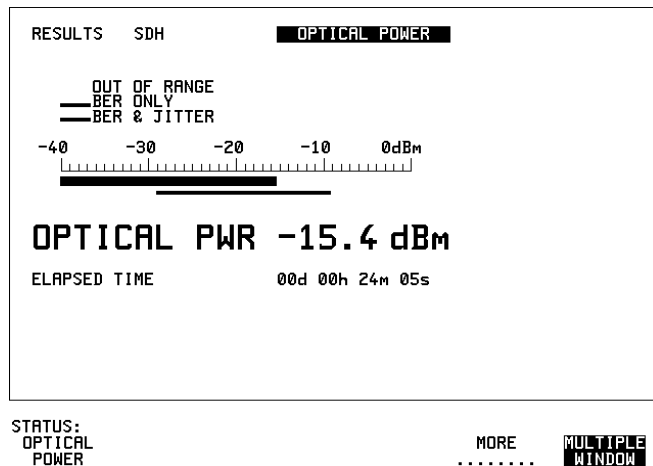
47 Select **TRANSMIT** **JITTER** and ensure Jitter is set to OFF and Calibration Pattern is set to OFF.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)



- 48** Check the Optical Power measurement Results and adjust the Optical Attenuation as necessary for Received optical power within the BER & JITTER range. Record the Optical power reading.



STM-0 Optical

- 49** Repeat steps 6 to 43 using the information in the Table below for STM-0 Optical Rate.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

STEP	Tx Range	RX Range	RX Filter	Tx UI p-p	Tx Freq	TX Result MIN p-p	TX Result MAX p-p	RX Result MIN p-p	RX Result MAX p-p
6-8	OFF	1.6UI	LP+HP2	OFF	OFF	OFF	OFF	N/A	0.050
9	OFF	1.6UI	LP+HP1	OFF	OFF	OFF	OFF	N/A	0.050
13-15	20	1.6UI	LP+HP1	0.2	20 kHz	0.16	0.24	0.125	0.275
16-20			LP+HP2		200 kHz	0.16	0.24	0.125	0.275
22-25			LP+HP1	0.91	2.0 kHz	0.82	1.00	0.796	1.024
27-31		16UI		3.52	1.0 kHz	3.30	3.74	3.174	3.866
33-37				7.52	800 Hz	7.10	7.94	6.756	8.164
39-43	LF 20	64	FIXED	20	50Hz	18.80	21.20	18.55	21.45

STM-1 Optical

50 Repeat steps 6 to 43 using the information in the Table below for STM-1 Optical Rate.

STEP	TX Range	RX Range	RX Filter	Tx UI p-p	Tx Freq	TX Result MIN p-p	TX Result MAX p-p	RX Result MIN p-p	RX Result MAX p-p
6-8	OFF	1.6UI	LP+HP2	OFF	OFF	OFF	OFF	N/A	0.050
9	OFF	1.6UI	LP+HP1	OFF	OFF	OFF	OFF	N/A	0.050
13-15	20	1.6UI	LP+HP1	0.2	65 kHz	0.16	0.24	0.125	0.275
16-20			LP+HP2		650 kHz	0.16	0.24	0.125	0.275
22-25			LP+HP1	0.91	6.5K	0.82	1.00	0.796	1.024
27-31		16UI		3.52	4K	3.30	3.74	3.174	3.866
33-37				7.52	2.5 kHz	7.10	7.94	6.756	8.164
39-43	50	64	FIXED	33	50Hz	30.82	35.18	28.35	37.65

STM-4 Optical

51 Change Transmit/Receive Rate to STM-4 Optical with AU4-4C Mapped Bulk Filled 2²³ PRBS Payload. Check and adjust the optical power as necessary. Ensure Jitter is OFF and Calibration Pattern is OFF, then repeat steps 6 to 43

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

using the information in the Table below for STM-4.

STEP	Tx Range	RX Range	RX Filter	Tx UI p-p	Tx Freq	TX Result MIN p-p	TX Result MAX p-p	RX Result MIN p-p	RX Result MAX p-p						
6-8	OFF	1.6UI	LP+HP2	OFF	OFF	OFF	OFF	N/A	0.070						
9	OFF	1.6UI	LP+HP1	OFF	OFF	OFF	OFF	N/A	0.070						
13-15	20	1.6UI	LP+HP1	0.2	250K	0.15	0.25	0.116	0.284						
16-20			LP+HP2		2.5M					0.15	0.25	0.111	0.291		
22-25			LP+HP1		25K					0.82	1.00	0.776	1.044		
27-31			16UI							3.52	10K	3.30	3.74	3.174	3.866
33-37										11.52	5K	10.90	12.14	10.401	12.426
39-43	200	256	FIXED	132	50Hz	124.37	139.63	113.40	150.60						

STM-16 Optical

52 .Change Transmit/Receive Rate to STM-16 Optical with AU4-16C Mapped Bulk Filled 2²³ PRBS Payload. Check and adjust the optical power as necessary. Ensure Jitter is OFF and Calibration Pattern is OFF, then repeat steps 6 to 43 using the information in the Table below for STM-16.

STEP	Tx Range	RX Range	RX Filter	Tx UI p-p	Tx Freq	TX Result MIN p-p	TX Result MAX p-p	RX Result MIN p-p	RX Result MAX p-p						
6-8	OFF	1.6UI	LP+HP2	OFF	OFF	OFF	OFF	N/A	0.070						
9	OFF	1.6UI	LP+HP1	OFF	OFF	OFF	OFF	N/A	0.070						
13-15	20	1.6UI	LP+HP1	0.2	1M	0.14	0.26	0.114	0.286						
16-20			LP+HP2		10 M					0.13	0.27	0.100	0.300		
22-25			LP+HP1		100K					0.81	1.01	0.795	1.026		
27-31			64UI							3.52	50K	3.29	3.75	3.124	3.916
33-37										9.52	25K	8.99	10.05	8.53	10.34
39-43	800	1024	FIXED	528	50Hz	499.60	556.40	451.60	604.40						

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

- 53** In the case of dual wavelength option units set to the alternative wavelength (1550nm) and repeat steps 6-9 for each rate.

External Jitter Generation and Demod Output

- 1** Add the Synthesizer and Oscilloscope to the set-up as shown below.

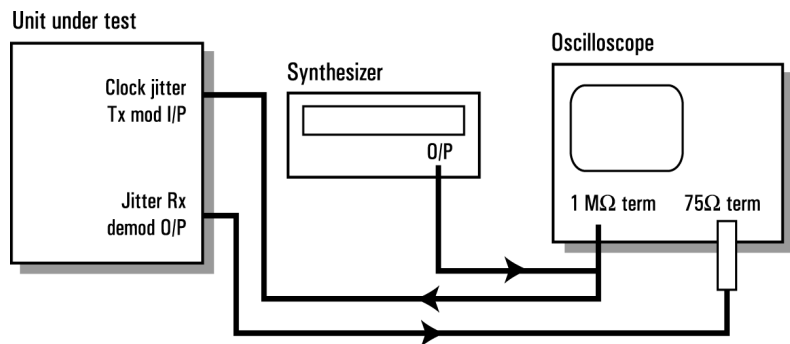


Figure 3-13

SDH External Jitter Generation and Demod Output Test Setup

- 2** Set up the OmniBER's **TRANSMIT** display as shown below.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

TRANSMITTER OUTPUT		SDH	
MAIN SETTINGS	JITTER	TEST FUNCTION	OVERHEAD SETUP
SIGNAL	STM-0 OPT	1310	ON INTERNAL
CLOCK	INTERNAL		
FREQUENCY OFFSET	OFF		
MAPPING	<input checked="" type="checkbox"/> AU-3		BACKGROUND UC-3 BULK FILLED
PATTERN	2^23-1 PRBS	INVERT	ITU

STATUS:



- 3 Select TRANSMITTER OUTPUT SETTINGS **JITTER** and set up the display as shown below.

TRANSMITTER OUTPUT		SDH	
MAIN SETTINGS	JITTER	TEST FUNCTION	OVERHEAD SETUP
JITTER / WANDER		JITTER	ON
JITTER		SIGNAL FREQUENCY	52Mb/s OPT
MODULATION SOURCE		EXTERNAL	
EXT JITTER MODULATION	0.00	UI pk-pk	

STATUS:



- 4 Select RECEIVER INPUT SETTINGS **JITTER** and set up the display as shown below.

Performance Tests

SDH Transmit/Receive Jitter Amplitude Accuracy (J1409A only)

RECEIVER INPUT		SDH		
MAIN SETTINGS	STRUCT'D PAYLOAD	JITTER	TEST FUNCTION	OVERHEAD MONITOR
MEASUREMENT TYPE	JITTER			
SIGNAL FREQUENCY	52Mb/s OPT			
RECEIVER RANGE	1.6 UI			
HIT THRESHOLD	1.00 UI			
FILTER	LP+HP1			
FILTER VALUES	100 Hz HP1 400kHz LP			

STATUS:



- 5 Set the Calibration Pattern to ALT.
- 6 Set the Spectrum Analyzer as follows:
 - Centre Frequency - 25.92 MHz (half bit rate being tested)
 - Frequency Span - 30 kHz (approx 3 times the Jitter frequency)
 - Reference Level - approx -15dBm
 - Sweep Time - Auto
 - Video Bandwidth - Auto
 - Resolution Bandwidth - Auto
- 7 Set the Synthesizer to Frequency 10 kHz and minimum Output level.
- 8 Increase the Synthesizer output level until the Carrier and first sidebands are equal as observed on the Spectrum Analyzer (see Figure 3-9).
- 9 Check that the Synthesizer amplitude waveform on the Oscilloscope is between 364 and 546 mV pk_pk.
- 10 Check that the OmniBER's Demod Output amplitude waveform on the Oscilloscope is between 756 mV and 1.075 V pk_pk.
- 11 Set the Calibration Pattern to OFF and set Jitter to OFF.

Performance Tests
Performance Test Record

Performance Test Record

<i>OmniBER 725 (J1408 and J1409A)</i>	
<i>Multirate Communications Performance Analyzer</i>	
<i>Location:</i>	<i>Serial No.:</i>
<i>Tested by:</i>	<i>Options:</i>
<i>Temperature:</i>	<i>Certified by:</i>
<i>Humidity:</i>	<i>Date:</i>

Note the test steps applicable are dependent on the instrument options and bit rates available.
 Enter N/A if a test does not apply for your instrument

Performance Test Record

Page No.	Test Description		Min	Result Actual	Max
3-5	Self Test				
3-6	Step 3	Confidence Tests		Pass/Fail	
3-7	Step 4	All Tests		Pass/Fail	
3-8	Step 3	1550 nm Tests		Pass/Fail	
3-9	Step 3	DCC Tests		Pass/Fail	
3-10	SDH/SONET Transmitter Clock Accuracy				
	Step 4:	Frequency	51.839670 MHz		51.840230 MHz
3-11	External Clock/Data Reference Inputs & Clock Reference Output				
3-13	Step 7:	2Mb/s Clock		Pass/Fail	
	Step 9:	Ref Clock Out		Pass/Fail	
3-14	Step 16:	2 Mb/s Data		Pass/Fail	
	Step 21:	2 Mb/s Data Balanced		Pass/Fail	
	Step 25:	Rx Data Clock Loss		Pass/Fail	
	Step 28:	Rx Data Clock Gain		Pass/Fail	

Performance Tests
Performance Test Record

Performance Test Record , continued

Page No.	Test Description		Result		
			Min	Actual	Max
	Step 30:	10 MHz Clock Loss		Pass/Fail	
3-15	Step 33:	10 MHz Clock Gain		Pass/Fail	
	Step 35:	BITS Clock Loss		Pass/Fail	
	Step 38:	BITS Clock Gain		Pass/Fail	
	Step 41:	64 kb/s Clock Loss		Pass/Fail	
	Step 42:	64 kb/s Clock Gain		Pass/Fail	
3-16	SDH/SONET Freq. Offsets				
	Step 5:	Clock Loss		Pass/Fail	
3-17	Step 10:	0 ppm		51.84MHz	
3-17	Step 11:	-999 ppm	51.7882108 MHz		51.7882129 MHz
	Step 11:	-100 ppm	51.8348149 MHz		51.8348171MHz
	Step 11:	-66 ppm	51.8365464 MHz		51.8365485 MHz
	Step 11:	+33 ppm	51.8417252 MHz		51.8417273 MHz
	Step 11:	+100 ppm	51.8451829 MHz		51.8451851MHz
	Step 11:	+999 ppm	51.8917871 MHz		51.8917892 MHz
3-18	Binary Interfaces				
		Transmitter Clock Tests			
		STM-0			
3-19	Step 4	Clock Duty Cycle			40:60
		Clock Output Level	600mV		1.0V
		Clock Rise Time			2000pS
		Clock Fall Time			2000pS
3-22	Step 5	Clock Duty Cycle			40:60
		Clock Output Level	600mV		1.0V
		Clock Rise Time			2000pS
		Clock Fall Time			2000pS
3-22	Step 6	STM-1			

Performance Tests
Performance Test Record

Performance Test Record , continued

Page No.	Test Description	Result		
		Min	Actual	Max
	Clock Duty Cycle			40:60
	Clock Output Level	600mV		1.0V
	Clock Rise Time			1920pS
	Clock Fall Time			1920pS
	Clock Duty Cycle			40:60
	Clock Output Level	600mV		1.0V
	Clock Rise Time			1920pS
	Clock Fall Time			1920pS
3-22	Step 7	STM-4		
	Clock Duty Cycle			40:60
	Clock Output Level	600mV		1.0V
	Clock Rise Time			480pS
	Clock Fall Time			480pS
	Clock Duty Cycle			40:60
	Clock Output Level	600mV		1.0V
	Clock Rise Time			480pS
	Clock Fall Time			480pS
3-22	Step 8	STM-16		
	Clock Duty Cycle			40:60
	Clock Output Level	600mV		1.0V
	Clock Rise Time			120pS
	Clock Fall Time			120pS
	Clock Duty Cycle			40:60
	Clock Output Level	600mV		1.0V
	Clock Rise Time			120pS
	Clock Fall Time			120pS

Performance Tests
Performance Test Record

Performance Test Record , continued

Page No.	Test Description	Min	Result Actual	Max
	Transmitter Data Tests			
	STM-0			
3-23	Step 9			40:60
	Data Output Level	600mV		1.0V
	Data Rise Time			2000pS
	Data Fall Time			2000pS
3-23	Step 10			40:60
	Data Output Level	600mV		1.0V
	Data Rise Time			2000pS
	Data Fall Time			2000pS
3-23	Step 11			
	STM-1			
	Data Duty Cycle			40:60
	Data Output Level	600mV		1.0V
	Data Rise Time			1920pS
	Data Fall Time			1920pS
	Data Duty Cycle			40:60
	Data Output Level	600mV		1.0V
	Data Rise Time			1920pS
	Data Fall Time			1920pS
3-24	Step 12			
	STM-4			
	Data Duty Cycle			40:60
	Data Output Level	600mV		1.0V
	Data Rise Time			480pS
	Data Fall Time			480pS
	Data Duty Cycle			40:60
	Data Output Level	600mV		1.0V
	Data Rise Time			480pS

Performance Tests
Performance Test Record

Performance Test Record , continued

Page No.	Test Description	Result		
		Min	Actual	Max
		Data Fall Time		480pS
3-24	Step 13	STM-16		
		Data Duty Cycle		40:60
		Data Output Level	600mV	1.0V
		Data Rise Time		120pS
		Data Fall Time		120pS
		Data Duty Cycle		40:60
		Data Output Level	600mV	1.0V
		Data Rise Time		120pS
		Data Fall Time		120pS
		Receiver Tests Normal Clock and Data		
		STM-0		
3-26	Step 20	Rx Clock Duty Cycle		40:60
3-26	Step 21	Rx Clock Sensitivity	Pass/Fail	
3-26	Step 22	Rx Data Sensitivity	Pass/Fail	
3-27	Step 23	Rx Clock to Data Skew	Pass/Fail	
3-27	Step 24	STM-1		
		Rx Clock Duty Cycle		40:60
		Rx Clock Sensitivity	Pass/Fail	
		Rx Data Sensitivity	Pass/Fail	
		Rx Clock to Data Skew	Pass/Fail	
3-27	Step 25	STM-4		
		Rx Clock Duty Cycle		40:60
		Rx Clock Sensitivity	Pass/Fail	
		Rx Data Sensitivity	Pass/Fail	
		Rx Clock to Data Skew	Pass/Fail	

Performance Tests
Performance Test Record

Performance Test Record , continued

Page No.	Test Description		Result		
			Min	Actual	Max
3-27	Step 26	STM-16			
		Rx Clock Duty Cycle			40:60
		Rx Clock Sensitivity		Pass/Fail	
		Rx Data Sensitivity		Pass/Fail	
		Rx Clock to Data Skew		Pass/Fail	
		Receiver Tests Inverted Clock and Data			
3-27	Step 27	STM-0			
		Rx $\overline{\text{Clock}}$ Duty Cycle			40:60
		Rx $\overline{\text{Clock}}$ Sensitivity		Pass/Fail	
		Rx $\overline{\text{Data}}$ Sensitivity		Pass/Fail	
		Rx $\overline{\text{Clock}}$ to $\overline{\text{Data}}$ Skew		Pass/Fail	
		STM-1			
		Rx $\overline{\text{Clock}}$ Duty Cycle			40:60
		Rx $\overline{\text{Clock}}$ Sensitivity		Pass/Fail	
		Rx $\overline{\text{Data}}$ Sensitivity		Pass/Fail	
		Rx $\overline{\text{Clock}}$ to $\overline{\text{Data}}$ Skew		Pass/Fail	
		STM-4			
		Rx $\overline{\text{Clock}}$ Duty Cycle			40:60
		Rx $\overline{\text{Clock}}$ Sensitivity		Pass/Fail	
		Rx $\overline{\text{Data}}$ Sensitivity		Pass/Fail	
		Rx $\overline{\text{Clock}}$ to $\overline{\text{Data}}$ Skew		Pass/Fail	
		STM-16			
		Rx $\overline{\text{Clock}}$ Duty Cycle			40:60
		Rx $\overline{\text{Clock}}$ Sensitivity		Pass/Fail	
		Rx $\overline{\text{Data}}$ Sensitivity		Pass/Fail	
		Rx $\overline{\text{Clock}}$ to $\overline{\text{Data}}$ Skew		Pass/Fail	

Performance Tests
Performance Test Record

Performance Test Record , continued

Page No.	Test Description		Result		
			Min	Actual	Max
3-27	Multirate Optical Interface				
		Power 1310 nm			
3-30	Step 6:	STM-0/OC-1	0 dBm (37718A) -3 dBm (37718B/C)		+3 dBm (37718A) +2 dBm (37718B/C)
	Step 8:	STM-1/OC-3	0 dBm (37718A) -3 dBm (37718B/C)		+3 dBm (37718A) +2 dBm (37718B/C)
	Step 10:	STM-4/OC-12	0 dBm (37718A) -3 dBm (37718B/C)		+3 dBm (37718A) +2 dBm (37718B/C)
	Step 12:	STM-16/OC-48	0 dBm (37718A)		+3 dBm (37718A)
		Sensitivity 1310 nm			
3-31	Step 22:	STM-0/OC-1		Pass/Fail	
	Step 23:	STM-1/OC-3		Pass/Fail	
	Step 24:	STM-4/OC-12		Pass/Fail	
	Step 25:	STM-16/OC-48		Pass/Fail	
		PMP input			
3-32	Step 35:	STM-0/OC-1		Pass/Fail	
	Step 37:	STM-1/OC-3		Pass/Fail	
	Step 39:	STM-4/OC-12		Pass/Fail	
		Power 1550nm			
3-32	Step 40:	STM-0/OC-1	0 dBm (37718A) -3 dBm (37718B/C)		+3 dBm (37718A) +2 dBm (37718B/C)
	Step 40:	STM-1/OC-3	0 dBm (37718A) -3 dBm (37718B/C)		+3 dBm (37718A) +2 dBm (37718B/C)
	Step 40:	STM-4/OC-12	0 dBm (37718A) -3 dBm (37718B/C)		+3 dBm (37718A) +2 dBm (37718B/C)
	Step 40:	STM-16/OC-48	0 dBm (37718A)		+3 dBm (37718A)
		Sensitivity 1550nm			
	Step 41:	STM-0/OC-1		Pass/Fail	
	Step 41:	STM-1/OC-3		Pass/Fail	

Performance Tests
Performance Test Record

Performance Test Record , continued

Page No.	Test Description		Min	Result	Max
				Actual	
	Step 41:	STM-4/OC-12		Pass/Fail	
	Step 41:	STM-16/OC-48		Pass/Fail	

Performance Tests
Jitter Performance Test Record (J1409A only)

Jitter Performance Test Record (J1409A only)

Agilent OmniBER 725 (J1409A only)	
Location:	Serial No.:
Tested by:	Options:
Temperature:	Certified by:
Humidity:	Date:

Performance Test Record

Page No.	Test Description		Min	Result Actual	Max
3-33	SDH Tx/Rx Jitter Amplitude Accuracy				
3-35	STM 0 Electrical				
	Step 8	No SDH result errors		Pass/Fail	
	Step 8	Jitter result			<0.050 UI p-p
	Step 9:	Jitter result			<0.050 UI p-p
	Step 14:	No SDH errors		Pass/Fail	
	Step 15:	Tx Jitter results	0.16 UI p-p		0.24 UI p-p
		Rx Jitter results	0.125 UI p-p		0.275 UI p-p
	Step 19	No SDH errors		Pass/Fail	
	Step 20	Tx results	0.16 UI p-p		0.24 UI p-p
		Rx Jitter results	0.125 UI p-p		0.275 UI p-p
	Step 24	No SDH errors		Pass/Fail	
	Step 25	Tx Jiter results	0.82UI p-p		1.00 UI p-p
		Rx Jitter results	0.796 UI p-p		1.024 UI p-p

Performance Tests
Jitter Performance Test Record (J1409A only)

Performance Test Record , continued

Page No.	Test Description		Result		
			Min	Actual	Max
	Step 30	No SDH errors		Pass/Fail	
	Step 31	Tx Jitter results	3.30 UI p-p		3.74 UI p-p
		Rx Jitter Results	3.204 UI p-p		3.836 UI p-p
	Step 35	No SDH errors		Pass/Fail	
	Step 36	Tx Jitter results	7.10 UI p-p		7.94 UI p-p
		Rx Jitter results	6.756 UI p-p		8.164 UI p-p
	Step 41	No SDH errors		Pass/Fail	
	Step 42	Tx Jitter result	18.80 UI p-p		21.20 UI p-p
		Rx Jitter result	18.550 UI p-p		21.450 UI p-p
3-46	STM1 Electrical				
	Step 8	No SDH result errors		Pass/Fail	
	Step 8	Jitter result			<0.050 UI p-p
	Step 9:	Jitter result			<0.050 UI p-p
	Step 14:	No SDH errors		Pass/Fail	
	Step 15:	Tx Jitter results	0.06 UI p-p		0.14 UI p-p
		Rx Jitter results	0.042 UI p-p		0.158 UI p-p
	Step 19	No SDH errors		Pass/Fail	
	Step 20	Tx results	0.06 UI p-p		0.14 UI p-p
		Rx Jitter results	0.042 UI p-p		0.158 UI p-p
	Step 24	No SDH errors		Pass/Fail	
	Step 25	Tx Jiter results	0.82UI p-p		1.00 UI p-p
		Rx Jitter results	0.796 UI p-p		1.024 UI p-p
	Step 30	No SDH errors		Pass/Fail	
	Step 31	Tx Jitter results	3.30 UI p-p		3.74 UI p-p
		Rx Jitter Results	3.204 UI p-p		3.836 UI p-p

Performance Tests
Jitter Performance Test Record (J1409A only)

Performance Test Record , continued

Page No.	Test Description		Result		
			Min	Actual	Max
	Step 35	No SDH errors		Pass/Fail	
	Step 36	Tx Jitter results	7.10 UI p-p		7.94 UI p-p
		Rx Jitter results	6.756 UI p-p		8.164 UI p-p
	Step 41	No SDH errors		Pass/Fail	
	Step 42	Tx Jitter result	30.82 UI p-p		35.18 UI p-p
		Rx Jitter result	28.350 UI p-p		37.650 UI p-p
3-48	STM 0 Optical				
	Step 8	No SDH result errors		Pass/Fail	
	Step 8	Jitter result			<0.050 UI p-p
	Step 9:	Jitter result			<0.050 UI p-p
	Step 14:	No SDH errors		Pass/Fail	
	Step 15:	Tx Jitter results	0.16 UI p-p		0.24 UI p-p
		Rx Jitter results	0.125 UI p-p		0.275 UI p-p
	Step 19	No SDH errors		Pass/Fail	
	Step 20	Tx results	0.16 UI p-p		0.24 UI p-p
		Rx Jitter results	0.125 UI p-p		0.275 UI p-p
	Step 24	No SDH errors		Pass/Fail	
	Step 25	Tx Jiter results	0.82UI p-p		1.00 UI p-p
		Rx Jitter results	0.796 UI p-p		1.024 UI p-p
	Step 30	No SDH errors		Pass/Fail	
	Step 31	Tx Jitter results	3.30 UI p-p		3.74 UI p-p
		Rx Jitter Results	3.204 UI p-p		3.836 UI p-p
	Step 35	No SDH errors		Pass/Fail	
	Step 36	Tx Jitter results	7.10 UI p-p		7.94 UI p-p

Performance Tests

Jitter Performance Test Record (J1409A only)**Performance Test Record , continued**

Page No.	Test Description		Min	Result Actual	Max
		Rx Jitter results	6.756 UI p-p		8.164 UI p-p
	Step 41	No SDH errors		Pass/Fail	
	Step 42	Tx Jitter result	18.80 UI p-p		21.20 UI p-p
		Rx Jitter result	18.550 UI p-p		21.450 UI p-p
3-49	STM1 Optical				
	Step 47	Optical Power dBm	N/A		N/A/
	Step 48	step 8 No SDH errors		Pass/Fail	
		step 8 Rx result	N/A		0.050 UI p-p
		step 9 Rx result	N/A		0.050 UI p-p
	Step 48	step 13-15 Tx result	0.16 UI p-p		0.24 UI p-p
		step 13-15 Rx result	0.125 UI p-p		0.275 UI p-p
		step 14 No SDH errors		Pass/Fail	
		step 18-20 Tx result	0.16 UI p-p		0.24 UI p-p
		step 18-20 Rx result	0.125 UI p-p		0.275 UI p-p
		step 19 No SDH errors		Pass/Fail	
		step 22-25 Tx result	0.82UI p-p		1.00 UI p-p
		step 22-25 Rx result	0.796 UI p-p		1.024 UI p-p
		step 24 No SDH errors		Pass/Fail	
		step 27-31 Tx result	3.30 UI p-p		3.74 UI p-p
		step 27-31 Rx result	3.174 UI p-p		3.866 UI p-p
		step 30 No SDH errors		Pass/Fail	
		step 33-37 Tx result	7.10 Ui p-p		7.94 UI p-p
		step 33-37 Rx result	6.756 UI p-p		8.164 UI p-p

Performance Tests
Jitter Performance Test Record (J1409A only)

Performance Test Record , continued

Page No.	Test Description		Min	Result Actual	Max
		step 35 No SDH errors		Pass/Fail	
		step 39-43 Tx result	30.82 UI p-p		35.18 UI p-p
		step 39-43 Rx result	28.350 UI p-p		37.650 UI p-p
		step 41 No SDH errors		Pass/Fail	
3-49	STM 4 Optical				
	Step 49	Optical Power dBm	N/A		N/A
		step 8 No SDH errors		Pass/Fail	
		step 8 Rx result	N/A		0.070 UI p-p
		step 9 Rx result	N/A		0.070 UI p-p
		step 13-15 Tx result	0.15 UI p-p		0.25 UI p-p
		step 13-15 Rx result	0.118 UI p-p		0.284 UI p-p
		step 14 No SDH errors		Pass/Fail	
		step 18-20 Tx result	0.15 UI p-p		0.25 UI p-p
		step 18-20 Rx result	0.111 UI p-p		0.291 UI p-p
		step 19 No SDH errors		Pass/Fail	
		step 22-25 Tx result	0.82 UI p-p		1.00 UI p-p
		step 22-25 Rx result	0.776 UI p-p		1.044 UI p-p
		step 24 No SDH errors		Pass/Fail	
		step 27-31 Tx result	3.30 UI p-p		3.74 UI p-p
		step 27-31 Rx result	3.174 UI p-p		3.866 UI p-p
		step 30 No SDH errors		Pass/Fail	
		step 33-37 Tx result	10.90 Ui p-p		12.14 UI p-p
		step 33-37 Rx result	10.401 UI p-p		12.426 UI p-p
		step 35 No SDH errors		Pass/Fail	

Performance Tests

Jitter Performance Test Record (J1409A only)**Performance Test Record , continued**

Page No.	Test Description		Result		
			Min	Actual	Max
		step 39-43 Tx result	124.37 UI p-p		139.63 UI p-p
	Step 49	step 39-43 Rx result	113.40 UI p-p		150.60 UI p-p
		step 41 No SDH errors		Pass/Fail	
3-50	STM 16 Optical				
	Step 50	Optical Power dBm	N/A		N/A
		step 8 No SDH errors		Pass/Fail	
		step 8 Rx result	N/A		0.070 UI p-p
		step 9 Rx result	N/A		0.070 UI p-p
		step 13-15 Tx result	0.14 UI p-p		0.26 UI p-p
		step 13-15 Rx result	0.114 UI p-p		0.286 UI p-p
		step 14 No SDH errors		Pass/Fail	
		step 18-20 Tx result	0.13 UI p-p		0.27 UI p-p
		step 18-20 Rx result	0.100 UI p-p		0.300 UI p-p
		step 19 No SDH errors		Pass/Fail	
		step 22-25 Tx result	0.81 UI p-p		1.01 UI p-p
		step 22-25 Rx result	0.795 UI p-p		1.026 UI p-p
		step 24 No SDH errors		Pass/Fail	
		step 27-31 Tx result	3.29 UI p-p		3.75 UI p-p
		step 27-31 Rx result	3.124 UI p-p		3.916 UI p-p
		step 30 No SDH errors		Pass/Fail	
		step 33-37 Tx result	8.99 Ui p-p		10.05 UI p-p
		step 33-37 Rx result	8.53 UI p-p		10.34 UI p-p
		step 35 No SDH errors		Pass/Fail	
		step 39-43 Tx result	499.60 UI p-p		556.40 UI p-p

Performance Tests
Jitter Performance Test Record (J1409A only)

Performance Test Record , continued

Page No.	Test Description		Result		
			Min	Actual	Max
		step 39-43 Rx result	451.60 UI p-p		604.40 UI p-p
		step 41 No SDH errors		Pass/Fail	
3-49	Step 53	STM-1 Optical			
		step 8 Rx result	N/A		0.050 UI p-p
		step 8 No SDH errors		Pass/Fail	
		step 9 Rx result	N/A		0.050 UI p-p
3-49	Step 53	STM-4 Optical			
		step 8 Rx result	N/A		0.070 UI p-p
		step 8 No SDH errors		Pass/Fail	
		step 9 Rx result	N/A		0.070 UI p-p
3-50	Step53	STM-16 Optical			
		step 8 Rx result	N/A		0.070 UI p-p
		step 9 Rx result	N/A		0.070 UI p-p
		step 8 No SDH errors		Pass/Fail	
3-51	SDH Ext. Jitter Generation/ Demod Output				
	Step 9	Input Tx mod.	364mV p-p		546 mV p-p
	Step 10	Demod O/P Amp	756 mV p-p		1.075 V p-p

4

Terms

This section contains a table of the current (and earlier) ETSI terms and the ANSI equivalents.

ETSI/ANSI Conversion and Equivalent Terms

Introduction

The terminology used on the instrument display can be ETSI (SDH) or ANSI (SONET) terminology. Refer to the table given in this chapter for an explanation of equivalent SDH/SONET terms.

ETSI: European Telecommunications Standards Institute.

ANSI: American National Standards Institute.

ETSI Term	ANSI Term
AU-3	STS-1 SPE + H1, H2, H3
AU-4	STS-3c SPE + H1, H2, H3
BIP (Bit Interleaved parity)	CV (Code Violation)
High Order Path (HP / HO)	STS Path
I-n Intra Office, (n=STM-n level)	Intermediate Reach (IR)
L-n.1 or L-n.2 long haul	LR long reach
Low Order Path (LP / LO)	VT Path
LP-REI	REI-V
M.S.P	A.P.S
Multiplexer Section (MS)	Line
Multiplexer Section Protection	Automatic Protection Switching
MS-AIS	Line AIS / AIS-L
MS-BIP	Line CV / CV-L

Terms

ETSI Term	ANSI Term
MS-DCC	Line DCC / DCC-L
MS-REI	Line FEBE / REI-L
MS-RDI	Line FERF / RDI-L
Multiplexer Section Overhead	Line Overhead
Network Node Interface	Line Interface
OOF	SEF (severely errored frame defect)
Path AIS / AU-AIS	AIS-P
Path REI / HP REI	REI-P
Path FERF / HP RDI	RDI-P
Path IEC / AU-IEC	IEC-P
Path Overhead	Path Overhead
Regenerator	Repeater
Regenerator Section (RS)	Section
Regenerator Section Overhead	Section Overhead
Remote Alarm Indicator	RAI
RS-DCC	Section DCC (DCC-S)
Section Overhead (SOH)	Transport Overhead (TOH)
S-n.1 or S-n.2 short haul	Short Reach (SR)
SOH	TOH
STM-m	OC-n / STS-n (where $m = n \div 3$ for $m \geq 1$)
STM-0	STS-1
STM-1	OC3c / STS-3c
STM-4	OC-12 / STS-12
STM-16	OC-48 / STS-48
Tributary Unit (TU)	Virtual Tributary (VT)

Terms

ETSI Term	ANSI Term
TU	VT
TU-11	VT 1.5
TU-12	VT 2
TU-2	VT 6
TU-3	NONE
TU BIP	VT BIP (CV-V)
TU RDI / LP-RDI	RDI-V
TUG	VT Group
TUG2	VT Group (12 columns)
TUG3	VT Group (86 columns)
TU multiframe	VT superframe
TU PATH AIS	VT AIS (AIS-V)
VC	SPE
VC4	STS3C SPE
Virtual Container (VC)	Synchronous Payload Envelope (SPE)

NOTE: VC is an ETSI abbreviation for Virtual Container and an ETSI/ANSI abbreviation for (ATM) Virtual Channel. The context of VC must therefore be taken into account when converting between standards.

5

Self Test Overview

Self Tests

This section gives an overview of the Self Tests and their function.

There are several Self Test selections. Some providing overall functional tests and others provide specific measurement hardware/functions tests.

Overall Function Self Tests

Confidence Test (test time - < 5 minutes depending on options)

Provides a quick verification of the main instrument functions using external back-to-back loopback of the instrument Transmit/Receive sections. See the Table below for a list of the subtests, and Figure 5-1 for the external loopback cabling required for this test. Use this test to provide a quick operational verification.

<u>Subtest</u>	<u>Test Function</u>
5	SDH, STM-0e Test
6	SDH, STM-0o Test
7	SDH, STM-1e Test
8	SDH, STM-1o Test
9	SDH, STM-4o Test
10	SDH, STM-16o Test
12	OPT 200 Jitter Test, SDH 622 Mb/s

Self Tests

All Tests (test time - up to 1 hour depending on options)

Provides an extensive back-to-back verification test of the instrument operation. The test uses much of the specific function tests, performing the appropriate subtest depending on options fitted. Test are run as follows.

CONFIDENCE test

CPU test

BINARY test

BER test (Note does not perform DCC port test)

JITTER test

See Tables for each of these tests for a list of the subtests and Figure 5-1 for the loopback cabling required for this test. Note a Formatted floppy disk is required as the CPU test is run as part of All Tests selection.

Use this test to provide a comprehensive operational verification.

Specific Measurement Hardware/Function Tests

CPU Tests (test time - approximately 2 minutes)

Provides a quick test of the Main and Front Panel processors. No external cabling is required, but formatted floppy disk must be installed.

<u>Subtest</u>	<u>Test Function</u>
1	Flash ROM CRC checks
2	Ram Test
3-7	Not used
8	In-Lid Printer present check, (if option 602 fitted)
9	Not used
10	Floppy disk write/read
11	Not used
12-16	Front Panel processor checks

Self Tests

Binary Test

SDH Signal Integrity Tests

<u>Subtest</u>	<u>Test Function</u>
1-2	STM-0 binary Test
3-4	STM-1 binary Test
5-6	STM-4 binary Test
7-8	STM-16 binary Test

SDH Unframed BER Tests

9	STM-0e BER Test
10	STM-0o BER Test
11	STM-0b BER Test
12	STM-1e BER Test
13	STM-1o BER Test
14	STM-1b BER Test
15	STM-4o BER Test
16	STM-4b BER Test
17	STM-16o BER Test
18	STM-16b BER Test

Framed Jitter Tests

19-20	STM-0 binary Test
21-22	STM-1 binary Test
23-24	STM-4 binary Test
25-26	STM-16 binary Test

Unframed Jitter Tests

27-28	STM-0e Test
29-30	STM-0o Test

Self Test Overview

Self Tests

31-32	STM-0b Test
33-34	STM-1e Test
35-36	STM-1o Test
37-38	STM-1b Test
39-40	STM-4o Test
41-42	STM-4b Test
43-44	STM-16o Test
45-46	STM-16b Test

BER Test (test time- approximately 20 minutes)

These tests perform extensive test of the SDH/SONET Electrical and Optical Transmit/Receive sections. Note this test is run as part of ALL TESTS with the exception of Subtest 83, DCC port test.

<u>Subtest</u>	<u>Test Function</u>
1	STM-16 MUX/DEMUX Internal Loopback
2-4	STM-0e Pulse Shape
5-8	Basic STM-0o Tx/Rx Test
7-8	Basic STM-1e Tx/Rx Test
9-10	Basic STM-1o Tx/Rx Test
11-12	Basic STM-4o Tx/Rx Test
13-14	Basic STM-16o Tx/Rx Test
15-17	STM-4o Frequency Measurement
18	STM-16o Frequency Measurement
19-20	Clock Reference Source
21-22	Optical Power Measurement
23	Overhead Byte Defaults [part 1]
24	Overhead Byte Defaults [part 2]
25	STM16o J0 Path Trace Message
26	J1 Path Trace Message

Self Test Overview

Self Tests

27	J2 Path Trace Message
28-35	SDH Error Add[RATE]/Detection
36-44	SDH Single Error Add/Detection
45	STM-16o Entire Frame Error Add/Detect
46	A1A2 Frame Error Add
47-49	PDH Payload Error Add[RATE]/Detection
50-52	PDH Payload Single Error Add/Detection
53-67	Alarm Generation/Detection
68-69	OOF Alarm Generation/Detection
70	TU-3/TU12 Mixed Payload Test
71	TU-12/TU-3 Mixed Payload Test
72	TU-3/TU-11 Mixed Payload Tests
73	TU-11/TU-3 Mixed Payload Tests
74-75	AU New Pointer Test
76-77	AU Frequency Offset Pointer Moves
78-79	TU Frequency Pointer Moves
80-81	STM-16o 140 Mb/s Payload VC Offset Test
82	TU-3 Background Pattern Test
83	DCC Port Test
84-87	Stress Test
88-99	Service Disruption Test

Self Tests

JITTER Test (J1409A ONLY)
(test time- approximately 20 minutes)

These tests apply to the Omni with Option 200 fitted. Provides extensive tests of the PDH/SDH/SONET Tx/Rx Jitter sections. Note this test is run as part of ALL TESTS.

<u>Subtest</u>	<u>Test Function</u>
1-2	Jitter Receiver Internal Loopback tests
3-47	Jitter Filter tests
50	Jitter PLL test
51-53	2Mb/s Tx/Rx Jitter Tests
54-56	8Mb/s Tx/Rx Jitter Tests
57-59	34Mb/s Tx/Rx Jitter Tests
60-62	140Mb/s Tx/Rx Jitter Tests
63-64	STM1e Tx/Rx Jitter Tests
65-66	STM1o Tx/Rx Jitter Tests
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Self Test Overview

Self Tests

145-150	STM-00 Tx/Rx Jitter tests
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157-162	STM1o Tx/Rx Jitter Tests
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169-174	STM-16 Tx/Rx Jitter Tests
175-177	Wander Tests
178	Transfer Test 155 Electrical
179	Transfer Test 2M
180	Transfer Test 2.5G

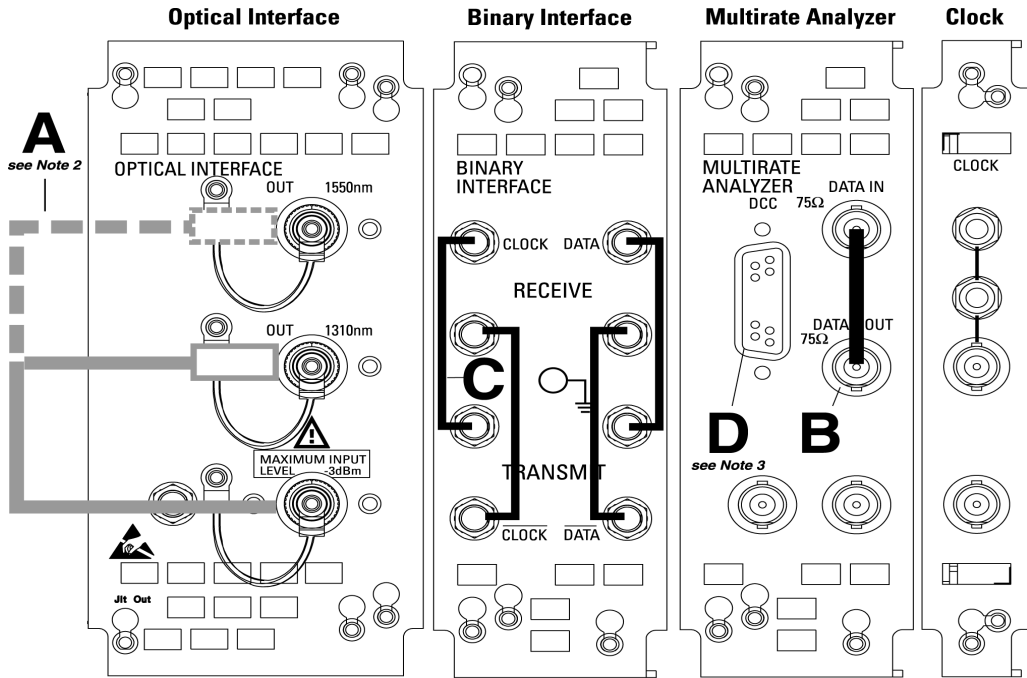
Long Gating test (test time- approximately 6 Hours)

This test performs an extended gating check of each SDH/SONET Optical rate to confirm error free operation. Test time at each rate is sufficient to ensure that the error ratio is less than 1 in 10^{12} . The test does NOT form part of ALL TESTS.

<u>Subtest</u>	<u>Test Function</u>
1	Tx/Rx STM-0o with Bulk 2^{23} Payload
2	Tx/Rx STM-1o with Bulk 2^{23} Payload
3	Tx/Rx STM-4o with Bulk 2^{23} Payload
4	Tx/Rx STM-16o with Bulk 2^{23} Payload

Self Test Overview
Self Tests

Loopbacks Required by Each Self Test



**OmniBER 725 communications performance analyzer
2.5 Gb/s dual wavelength tester**

Minimum loopbacks required by each test

TEST	A	B	C	D	E
Conf	X	X	X		
All	X	X	X		X
CPU					X
BIN			X		
BER	X	X		X	
Jitter	X	X	X		
Long gating	X				

- 15552A BNC 75Ω loopback cable
- E1675-64210 SMA loopback cable
- 4545A 3m fiber optic cable FC/PC

Note 1:
A formatted floppy disk *must* be fitted into the disk drive before running 'All' or 'CPU' self tests.

Note 2:
A 15 dB optical attenuator (4546A) *must* be fitted at the optical *output* port.

Note 3:
If running BER self tests, a loopback *must* be connected to the DCC port.

E

Self Tests

Self Test Errors

The Tests will halt if a Self Test Error is detected. A message indicating the test point being run and error detected is displayed. Check all loopback connections and re-run the test. If the problem persists and contact your local Agilent Service Office or representative. Tests should only be performed in a stable ambient environment where the instrument will not be disturbed during test.

The Self Test Error code numbering uses the following numeric format.

First Num indicates the Test being run.

CPU	1xxx
CONFIDENCE	2xxx
BINARY	8xxx
JITTER	5xxx (for Subtests<100, 20xxx (for Subtests 100+)
LONG GATING	6xxx

Note ALL TESTS uses the num from the tests it calls.

**The next digits indicate the Subtest, e.g. 415x, is Subtest 15 of Test 4 ().
(where subtests are >99 the numbering restarts)**

The last digit indicates the error type. In general these are -

- 1 = Loss of Signal
- 2 = specific for subtest
- 3 = test result too low
- 4 = test result too high
- 5 = loss of frame sync
- 6 = loss of pointer sync
- 7 = loss of pattern sync

The error codes are accompanied by appropriate error messages.

Self Test Overview

Self Tests

6

Option Structure/Module Configuration

Introduction

Agilent's OmniBER provides SDH/SONET test capability, a choice of 1310 nm and 1550 nm Optics, BER, and Jitter testing for rates up to 2.488 Gb/s.

OmniBER Mainframe

J1408 OmniBER 725 provides SDH/SONET test capability at 2.5 Gb/s and below.

SDH/SONET Options

Option 001 provides SDH only.

Option 002 provides SDH/SONET.

OPTICS Options

Option 104 provides 1310 nm Optics.

Option 105 provides 1550 nm Optics.

Option 106 provides 1310/1550 nm Dual Optics.

JITTER Option

J1409A OmniBER 725 provides jitter generation and measurement in addition to the SDH/SONET test capability of the J1408.

PRINTER Option

Option 602 provides an in-lid printer

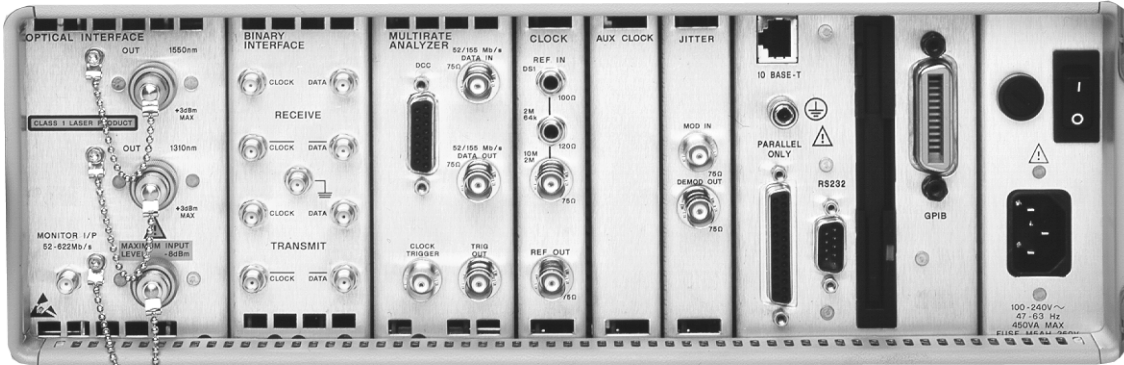
CONNECTOR Options

Option 610 provides SC Connectors

Option 611 provides ST connectors

Option Structure/Module Configuration

OmniBER 725 Option configurations



- Opt 104:** 1310 nm
- Opt 105:** 1550 nm
- Opt 106:** 1310 + 1550nm



J1409A:

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About This Edition

This is the second edition of the OmniBER 725 manual. It documents the product as of May 2002.

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In This Book

This book contains installation information and techniques for checking instrument specifications.



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