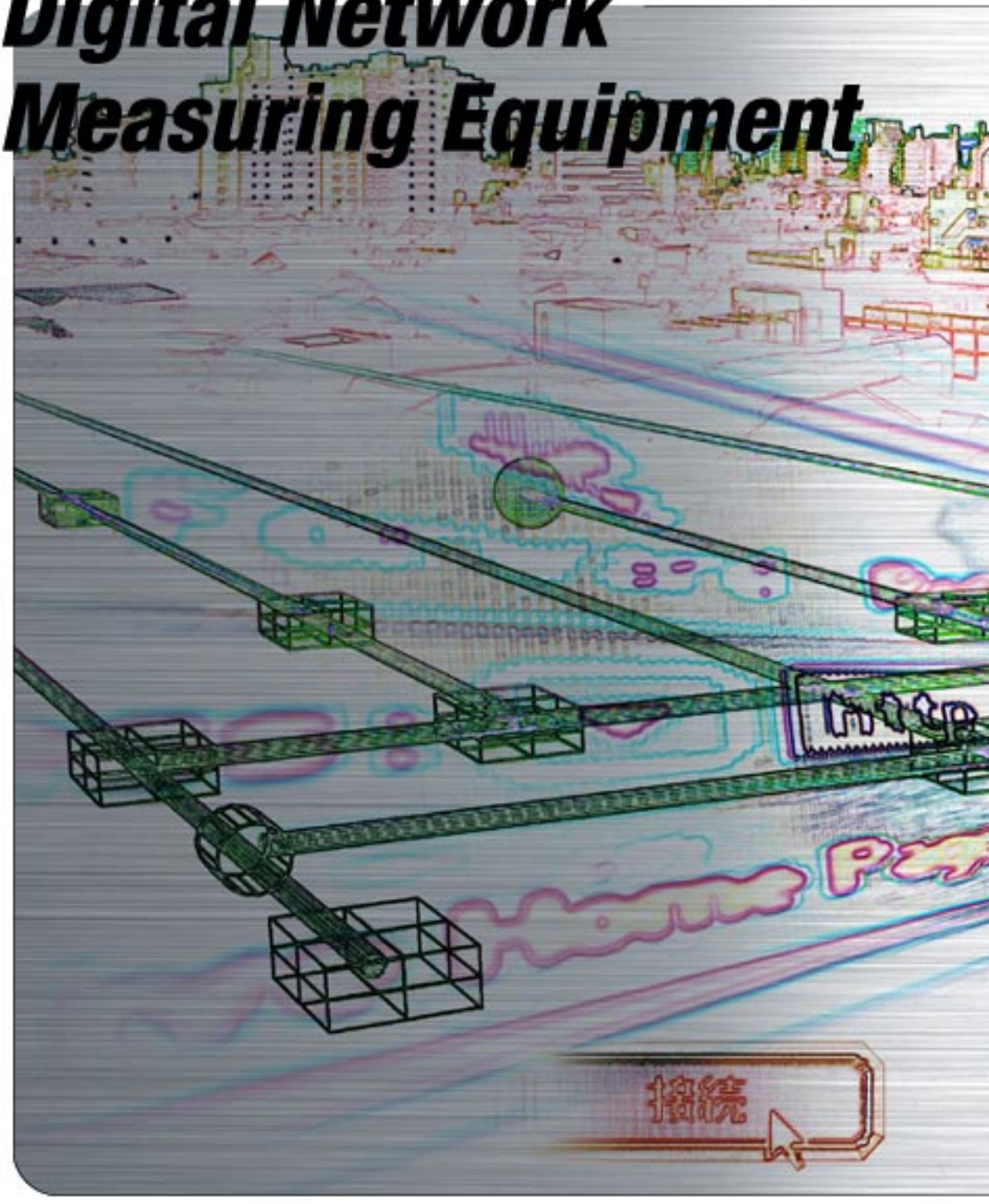
# Digital Network Measuring Equipment




ADVANTEST

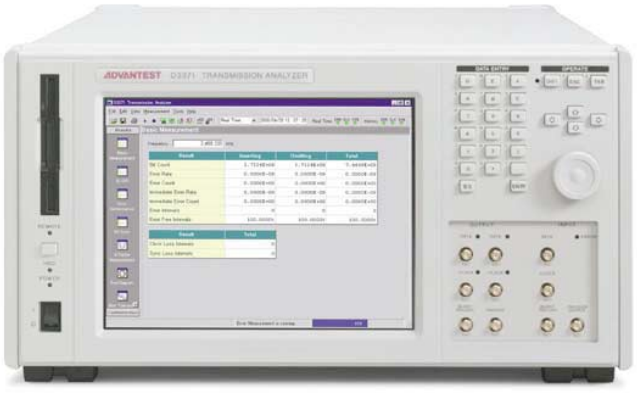
# Digital Network Measuring Equipment

*For Transmission Quality Analysis of IP Network Transmission Devices and Modules*

## D3371

- **Frequency range : 10 Mbps to 3.6 Gbps**
- **Wide range of amplitude with excellent output waveform quality.**
- **Capable for gigabit Ethernet, SONET/SDH. etc.**
- **Jitter test function for ITUT-T recommendation G958, etc.**
- **Waveform quality measurement (eye aperture/eye diagrams/ Q values.)**

NEW



## D3371
## 3.6 G Transmission Analyzer

### ■ Overview

The D3371 combines a PPG (pattern generator) for generating test patterns and an ERD (bit error detector) for measuring bit errors and other phenomena in the device under test into a single compact unit.
The D3371 is equipped with a powerful range of functions that meet the requirements of the IP Network market, including Gigabit Ethernet and SONET/SDH, supporting a full range of interfaces with optical modules and devices, and with an extensive range of test patterns for simulating real line traffic, waveform quality measurement, jitter test, and bit error analysis functions. This makes the D3371 the answer to a wide range of needs from development to production and maintenance.

### ■ Features

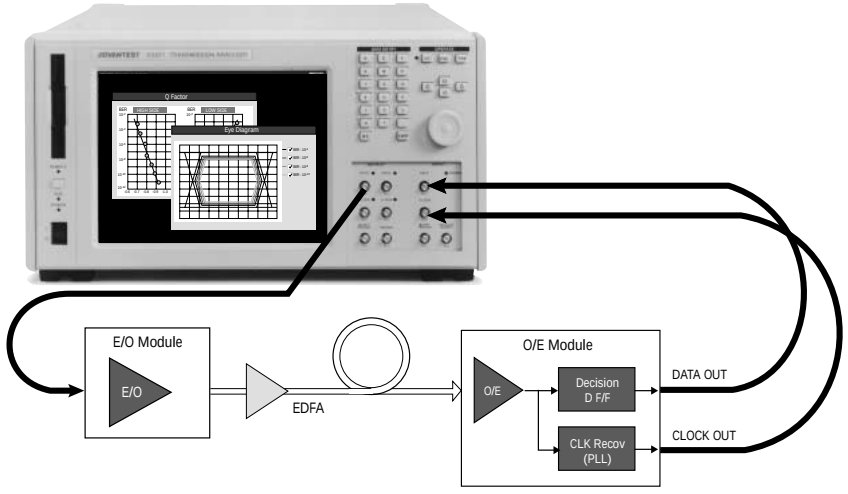
- Capable of generating various test patterns with a wide range of amplitudes, used for applications such as EA modulation LD, low amplitude devices, etc. providing output pattern waveforms of outstanding quality.
- Capable of generating various test patterns for gigabit Ethernet, SONET/SDH. etc.
- Built-in jitter test (jitter equivalent) function for ITUT-T recommendation G958, etc.
- High performance waveform quality measurement with eye aperture/eye diagrams/Q values
- Error location analysis function allowing analysis of transient response with burst data and other phenomena.
- Supports a wide range of interfaces including ECL and PECL.
- Combines PPG, ERD, and synthesizers in single unit.
- Large color touch-panel LCD and Windows-based user interface.

*For Transmission Quality Analysis of IP Network Transmission Devices and Modules*

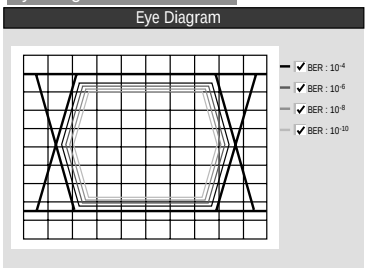
**D3371**

## Specifications

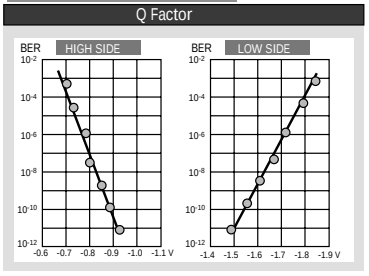
### Waveform Quality Analysis



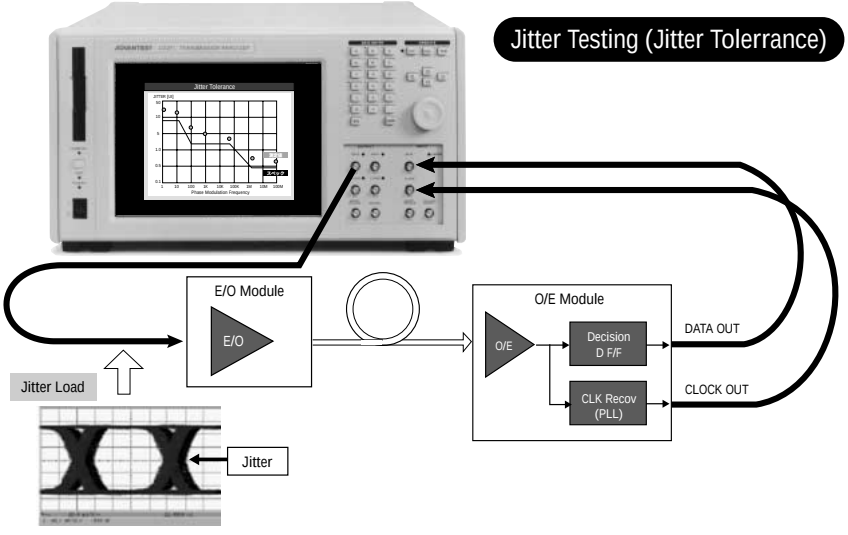

**Eye Diagram Measurement**



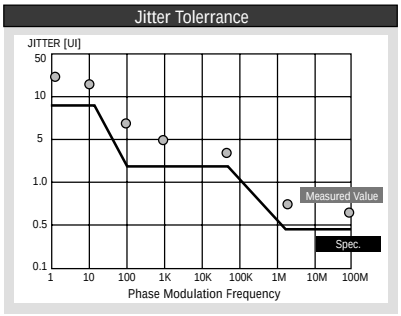

**Q Value Measurement**



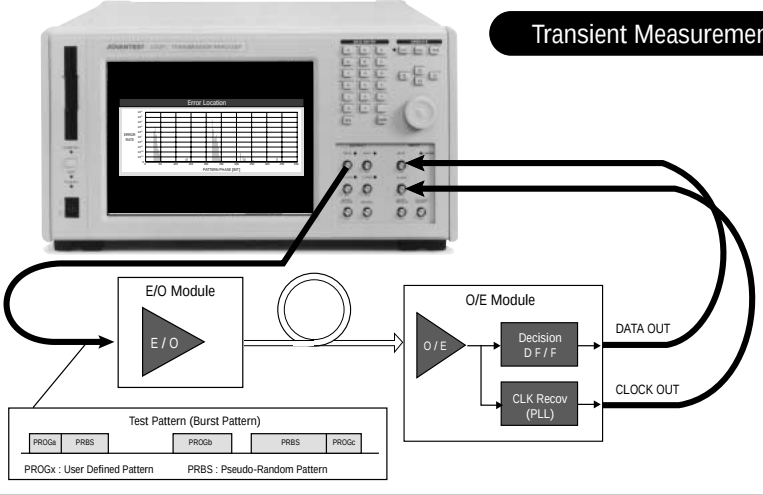

### Jitter Testing (Jitter Tolerrance)



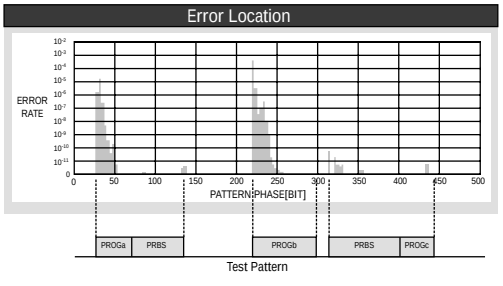

**Jitter Tolerrance Measurement**




### Transient Measurement




**Error Analysis**

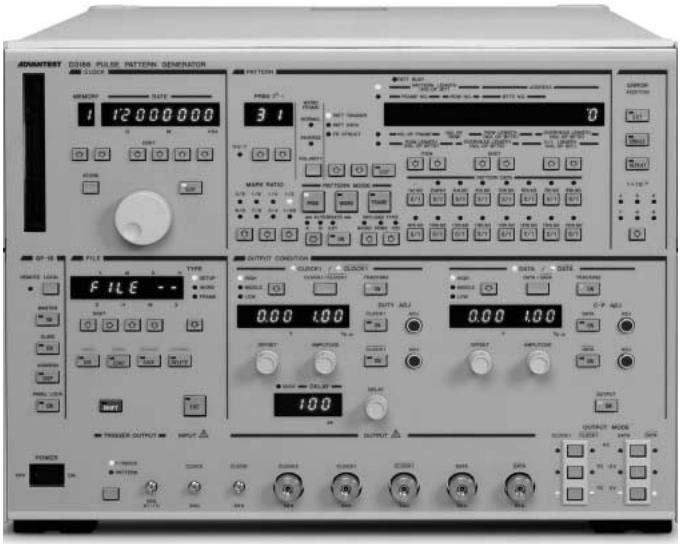


# Digital Network Measuring Equipment

## *New 12.5Gbps Pulse Pattern Generator for SDH/SONET*

## D3186

- **Excellent output waveform quality**
- **Generation of SDH/SONET frame patterns (mixed patterns) which is similar to actual data**
- **8 M-bit memory, PRBS 31.**
- **Multi-channel output : 2 data channels, 3 clock channels, and 7 sub-rate channels**
- **Cross point variable for output waveform**
- **Burst signal output**
- **3 Vp-p outputs, effective for EA modulators, etc. (option)**



## D3186
## Pulse Pattern Generator

To accommodate transmission of large-capacity information in the coming multimedia generation, ultra high-speed digital telecommunications networks are being constructed.
For evaluation and analysis of O/E and E/O modules and ultra high-speed logic devices used for multiplexers and repeaters for telecommunications systems, a signal source with high speed and high quality is necessary.
The D3186 Pulse Pattern Generator/D3286 Error Detector offers excellent waveforms with high speed and high quality and diverse error detecting functions in an operating frequency range from 150 Mbps to 12.5 Gbps.
In addition, with the 8 M-bit large capacity memory and ADVANTEST's frame pattern generation function, the D3186/D3286 is a new generation of error performance test system which is compatible with STM-1 (155.52 Mbps) to STM-64 (9.95 Gbps) in SDH/SONET.

### ■ Offers Excellent Waveform Quality

- **For Performance Evaluation of Optical Components**
  High quality for waveform is essential to evaluate the performance of laser diodes and optical components for optical telecommunication. To meet this demand, the D3186 Pulse Pattern Generator provides excellent waveforms with high speed and high quality. In addition, the D3186 has a wide cross point variable range for the output waveform that makes it easy to control the output waveform correction mark ratio.
- **Use As a Modulation Signal Source for Optical Modulators**
  When use with the Q7606A/B Lightwave Modulation Test Set from ADVANTEST, the D3186 provides a suitable modulation signal source in a chirp measurement system for optical modulators.
- **Excellent Waveform Quality**
  Through output waveform re-timing, a data output waveform with excellent eye balance, low jitter, and low distortion has been realized.

### ■ Generation of SDH/SONET Frame Patterns Close to Actual Data

- **For Evaluation of Optical Transmission Equipment and E/O and O/E Modules**
  In O/E and E/O tests of the SDH/SONET system etc, testing at the frame level is required. In addition to the large WORD memory with 8 M-bit length, the D3186 Pulse Pattern Generator is provided with an optional function to insert WORD patterns in the header section of the STM frame and arbitrary PRBS in the payload section, realizing test patterns which are very close to actual data. Of course, the D3286 error detector can measure errors at the header and payload sections separately. In addition, the D3286 powerfully supports location of cause of errors by means of the frame synchronization function and specific area error measurement function.

### ■ Applicable to Fiber Loop Testing

In long-distance transmission testing, fiber loop-based transmission evaluation is performed. In this test, bit error measurement for irregular burst condition data is essential. The D3186 pulse pattern generator can output a burst signal based on an external gate signal and the D3286 enables bit error measurement for burst condition data. This allows the fiber loop transmission test to be performed efficiently.

## New 12.5Gbps Pulse Pattern Generator for SDH/SONET

# D3186

### ■ Equipped with 8-Mbit Memory and 31-Stage PRBS

The D3186 generates up to six STM-64 frames (in the WORD pattern mode and mixed SDH pattern mode). With ATM transmission, noncontinuous data are transmitted and therefore the function to generate as long memory patterns as possible is required in evaluation using memory patterns.

### ■ Multi-Channel Output Consisting of 2 Data Output, 3 Clock Output and 7 Sub-Rate Output

In evaluation of transmission system and devices, different data and clock signals and frequency rate are required according to the scale of the system.
The D3186 outputs 12 different signals, providing comfortable measurement environment.

### ■ Variable Duty Cycle of Data Output Waveform

If the output duty cycle of the DUT characteristics decreases, a signal compensated by increased duty cycle can be input. It is also possible to decrease the duty cycle of the PPG output to evaluate DUT characteristics.

### ■ 50 Ω Output Impedance

The D3186 employs a differential amplifier with 50 Ω back termination, allowing it to retain stable output impedance of 50 Ω both in high- and low-level output conditions. Even if an optical device such as a laser diode which may lead impedance mismatching is connected, waveform deterioration caused by signal reflection due to impedance mismatching is minimized.

### ■ Output Burst Signal

When SDH and FDDI frames are generated from a PPG (pulse pattern generator) or when long-distance round-trip testing is performed, burst signal output is required. With ADVANTEST's PPGs, burst signal can be output only by feeding an external gate signal.

### ■ Built-In Clock Source (Option)

In 12-GHz/12.5GHz band, remarkably high purity (high quality) signal is required as clock source for BERTS. In transmission system testing, it is necessary to connect the signal to the clock source which is prepared as system clock.

### Specifications

**Internal Clock (optional):**
Frequency range : 150 MHz to 12 GHz (Option 10)
150 MHz to 12.5 GHz (Option 13)

**External Clock:**
Frequency range : 150 MHz to 12 GHz
150 MHz to 12.5 GHz (Option 72)
Main unit operating frequency range
: 150 MHz to 12 GHz
150 MHz to 12.5 GHz (Option 72)

**DATA, $\overline{\text{DATA}}$ output:**
Amplitude: 0.5 to 2.0 $V_{p-p}$
Offset: +2.0 V to -2.0 V (referenced to high level)
Load impedance: 50 Ω
Termination: GND mode, -2-V mode, and AC mode

**CLOCK1, $\overline{\text{CLOCK1}}$ output:**
Amplitude: 0.5 to 2.0 $V_{p-p}$
Offset: +2.0 to -2.0 V (referenced to high level)
Load impedance: 50 Ω
Termination: GND mode, -2-V mode, and AC mode

**CLOCK2:**
Amplitude: Max. 1.0 $V_{p-p}$ fixed (AC coupling)

**Output patterns:**
PRBS (pseudo random pattern): $2^N$-1, N = 7, 9, 10, 11, 15, 23, and 31
WORD (programmable pattern): Max. 8-Mbit long
SDH/SONET pattern: Max. STM-64/OC-192

**Trigger output:**
1/32 clock, pattern

**Auxiliary output:**
Data: 1/4 rate, 4 outputs
Clock: 1/4 rate, 1 output
1/2 rate, 1 output

**External storage devices:**
FDD: 2DD, 2HD (MS-DOS format)

**Options:**
OPT3186+10 : Clock source (150M to 12GHz) (Built-in)
OPT3186+10A : Clock source (150M to 12GHz) (Built-in)
(Installed at the factory)
OPT3186+13 : Clock source (150M to 12.5GHz) (Built-in)
OPT3186+13A : Clock source (150M to 12.5GHz) (Built-in)
(Installed at the factory)
OPT3186+15 : Data Output ($0.5V_{p-p}$ to $3V_{p-p}$)
OPT3186+15A : Data Output ($0.5V_{p-p}$ to $3V_{P-P}$)
(Installed at the factory)
OPT3186+72 : Main unit operating frequency range (150M to 12.5GHz)
OPT3186+72A : Main unit operating frequency range (150M to 12.5GHz)
(Installed at the factory)
OPT3186+70 : Mixed pattern generation function

# Digital Network Measuring Equipment

*New 12.5Gbps Error Detector for SDH/SONET*

## D3286

- **SDH/SONET frame synchronization suitable for system evaluation**
- **Error detection with area specification effective for SDH frame and ATM cell measurement**
- **Burst data measurement effective for Round-Trip test**
- **Auto search function which adjusts the most appropriate timing and voltage**
- **Monitor output of data and clock**
- **FD drive for storing measurement results and setup data**
- **GUI environment realizing easy and legible operating environment**

## D3286
## Error Detector

To accommodate transmission of large-capacity information in the coming multimedia generation, ultra high-speed digital telecommunications networks are being constructed.
For evaluation and analysis of O/E and E/O modules and ultra high-speed logic devices used for multiplexers and repeaters for telecommunications systems, a signal source with high speed and high quality is necessary.
D3186 Pulse Pattern Generator/D3286 Error Detector offers excellent waveforms with high speed and high quality and diverse error detecting functions in an operating frequency range from 150 Mbps to 12.5 Gbps.
In addition, with the 8 M-bit large capacity memory and ADVANTEST's unique frame pattern generation function, D3186/D3286 is a new generation of error performance test system which is compatible with STM-1 (155.52 Mbps) to STM-64 (9.95 Gbps) in SDH/SONET.

### ■ SDH/SONET Frame Synchronization Suitable for System Evaluation

With SDH/SONET equipment, frames are recognized by means of the synchronization pattern described on the SOH (section overhead).
D3286 error detector mounts the circuit for recognizing the frame synchronization signal and has the capability to set not only SDH/SONET frames but also FDDI, ATM frames and arbitrary synchronization patterns, allowing frames to be synchronized with user-specific frame patterns.

### ■ Burst Data Measurement Effective for Round-Trip Testing

In long-distance round-trip testing, inter-satellite digital transmission testing and burst data (non-continuous data) are measured. Therefore conventional error detectors cannot be used. For easy measurement of burst data, D3286 error detector is provided with the internal gate and external gate measurement modes.

### ■ Error Rate Measurement Function with Area Specification, Effective for Measurement of ATM Cell

The measurement function with area specification of D3286 makes it possible to recognize whether the error occurs on the SOH or payload (in error measurement on SDH/SONET frames); measure errors within the specified cells (in error measurement on ATM cells).

## New 12.5Gbps Error Detector for SDH/SONET

# D3286

### ■ Automatic Adjustment to the Aimed Voltage at Optimum Timing with Any Mark-Space Rate and WORD Pattern

The auto search function allows D3286 to adjust to the aimed threshold voltage at optimum timing with any mark-space rate and WORD pattern, even if an error exists. In addition, GPIB interface makes it possible to read the voltage value, reducing the time for automatic measurement and evaluation.

### ■ Detailed Analysis of Error Measurement Results

The error measurement result classification function which classifies the result into omit error and insert error, displays them and makes it easier to recognize the tendency in error occurrence of the system and device under adjustment. For example, determine whether the amount of bias is appropriate or not. This function is evaluated as powerful and effective function at development, inspection sections and production lines.

### ■ Monitor Output of Input and Clock Data Effective for Evaluation of Jitter and Waveform Quality

During bit error measurement, by observing waveforms of the device under measurement without disconnecting the cables, waveform quality can be checked and the amount of jitter measured.
The monitor output can also be used as a signal to the clock generation circuit and is effective for O/E converters and OR devices.

### ■ Simple and Convenient Operating Environment with GUI (Graphical User Interface)

To allow the user easy concentration on the desired functions, D3286 configures graphical operating environment on the monitor of a personal computer.
Mouse-oriented operation and effective screen configuration make it easier to perform key selection without mis-operation.

### ■ Built-In FDD for Storing Measurement Results and Setting Data

D3286 mounts a floppy disk drive for storing measurement results and settings (measurement conditions).

## Specifications

**Clock input:**
Frequency range: 150 MHz to 12.5 GHz
**Data input:**
Frequency range: 150 Mbps to 12.5 Gbps
Sensitivity: 100 $mV_{p-p}$ typ. (12 Gbps)
50 $mV_{p-p}$ typ. (6 Gbps)
Approx. 50 Ω
**Measurable patterns:**
PRBS (pseudo random pattern): $2^N$-1, N = 7, 9, 10, 11, 15, 23 and 31
WORD (programmable pattern): Max. 8-Mbit long
SDH/SONET pattern: Max. STM-64/OC-192
**Measurement functions:**
Bit error rate
Bit error count
Bit error interval
Bit error-free interval
Threshold EI/EFI
Error performance (conforms to CCITT G.821)
Frequency
**Measurement modes:**
Normal, external gate and burst
Area specification and error bit location (error location function) (optional)
**Timer modes:**
Single, repeat and untimed
**Synchronization modes:**
Normal synchronization and frame synchronization (selectable)
**Alarms:**
DATA : Informs a bit error.
Sound pitch varies with the amount of errors.
ALARM : Informs CLOCK interrupt, frequency reduction, pattern-out-of-synchronization, frame-out-of-synchronization and power failure.
Sound volume: Variable
**External storage devices:**
FDD: 2DD, 2HD (MS-DOS format)
**Options:**
OPT3286+70 : Mixed pattern generation function
OPT3286+72 : Main unit operating frequency range (150M to 12.5GHz)

# Digital Network Measuring Equipment

*For Evaluating the In-Service Transmission Quality of Long-Distance Optical Transmission System*

## D3281

- **Wide dynamic range (Q=10 to 34 dB)**
- **Short measurement time (3 minutes or less)**
- **Adapts to various transmission speeds by plug-in unit**
- **Clock phase can be optimized by Search-Eye-Margin function**
- **Clock phase can be controlled up to ±400 ps by 1 ps resolution.**
- **Abundant information is displayed on the LCD**

## D3281
## Q Monitor

For the realization of multimedia environment, higher speed and greater capacity transmission are required. To achieve these, optical fiber cables and optical amplifier are used to make large-capacity and long-distance transmission possible. In general, for evaluating the signal quality of digital telecommunication line, pulse pattern generator and error detector are used to measure error rate.
However, as signal quality is improved due to the development of optical telecommunications, the evaluation method by error rate has reached the limit from the viewpoint of measuring time.
To solve this problem, instead of conventional error rate, it was devised to define Q value derived from signal amplitude and noise amplitude characteristics as the index for the evaluation. D3281 Q Monitor is the measuring instrument which can evaluate signal quality of ultrahigh speed digital telecommunication line, in the range from 500 Mbps to 6 Gbps.
For the evaluation with pulse pattern generator and error detector, specific known signal is necessary, however, the Q Monitor is not restricted by signal pattern and can be used as an in-service monitor of transmission quality during actual communication.

- **On-line monitor function**
  By generating reference pattern from the object signal from optical communication cable, on-line monitoring is possible.
- **Clock recovery function**
  By installing the plug-in type clock generator, the Q Monitor adapts to various transmission speeds.
- **Wide measuring range and short measuring time**
  Dynamic range : 10 to 34 dB is realized.
  Measurement time : approx. 3 minutes per measurement

*For Evaluating the In-Service Transmission Quality of Long-Distance Optical Transmission System*

## D3281

### Specifications

**Measurement function:**
Data rate : 0.5 to 6 Gbps
Measurement function: Q value
Bit error rate
Auto correlative bit error rate
Clock frequency (Accuracy ±100 ppm)

**Q value measurement:**
Measurement range: 10 to 34 dB (using attached 0.7m input cable)
Accuracy: ±0.5 dB or less
(Refer to BERTS and Noise Attenuation Method)
Data pattern 0101....., at Q=15.5 dB, 22 dB
±0.5 dB or less
(refer to ADVANTEST standard)
23 stage PRBS, at Q=22 dB
7 stage PRBS, at Q=34 dB
Repeatability: 0.1 dB or less Standard deviation
Measurement time: 3 minutes or less repetition

**Error count :**
Count range: 0 to 1,844E19
Gate control: Internal gate (0.1 to 99.9 seconds)
Start/stop through GPIB & RS232
External gate signal
(0 to -1 V, 50Ω to ground)
Elapsed gate time: max. 9,999,999 seconds, 0.1 second step

**Input, connections :**
Input signal: 1 data input
2 selectable data inputs (OPT3281+10)
External clock input
External gate input

**Data input:**
Input amplitude: 500 mVp-p±2 dB + noise, Offset ≤ 0.5 V
Variable threshold level: -1 to +1 V / 0.5 mV step
Termination : 50Ω to ground, K type connector
Return loss ≥ 20 dB, 500 MHz to 6 GHz
≥ 10 dB, 6 GHz to 10 GHz

**External clock:**
Input waveform: sine, square wave (duty 45 to 55%)
Input amplitude: 0.5 to 1.0 Vp-p (AC coupled)
Termination : 50Ω to ground, K type connector

**Internal clock recovery plug-in unit :**
Frequency : 4.97664 GHz ±20 ppm (OPT3281+17)
5.332114 GHz ±20 ppm (OPT3281+18)
2.48832 GHz ±20 ppm (OPT3281+15)
2.666057 GHz ±20 ppm (OPT3281+16)

**Variable delay :**
Delay time : -400 to +400 ps/1 ps step

**Others :**

**Measurement control function :**
Phase adjustment for data and recovery clock or external clock (auto and manual), Threshold DC level for input data and reference data (auto and manual), Gate time, 2 data input selection (OPT3281+10)

**Display function:**
Linear / log Q value (maximum, minimum, average, standard deviation), digital display for error count, phase adjustment and other control status

**Remote control:**
GPIB and RS232: set and read out for all control functions, phase adjustment, and threshold DC level, output data of error count, Output data of Q value, Output data of Q internal information (BER vs, Vth correlation coefficient)

**General specifications:**
Operating environment : Temperature 0 to +50°C; relative humidity 85% or less
Storage environment : Temperature -20 to +60°C; relative humidity 85% or less
Power : DC -48 V DC (-41 to -68 V DC), 5 A or less
AC 100 / 120 V AC or 200 V/240V AC, 50 to 60 Hz (250 VA or less)
AC operation requires external AC adaptor.
Power consumption: DC 200 W or less
AC 250 VA or less
Outside dimensions: approx. 260 (H) × 435 (W) × 450 (D) mm
approx. 250 (H) × 424 (W) × 255 (D) mm
(Without AC adapter, handle and legs)
Mass: 20 kg or less, 13 kg or less (without AC adapter, handle and feet)

**Options:**
OPT.3281+10 2 data input
OPT.3281+17 Clock recovery plug-in unit (4.9 GHz)
OPT.3281+18 Clock recovery plug-in unit (5.3 GHz)
OPT.3281+15 Clock recovery plug-in unit (2.4 GHz)
OPT.3281+16 Clock recovery plug-in unit (2.6 GHz)
OPT.3281+40 220, 240 VAC

# Digital Network Measuring Equipment

*Optimum for Evaluation of Built-in DSU Terminal (U point: Ping-Pong)*

## D5115

- **Supports evaluation of ISDN devices and switches and IMT-2000 base stations and systems**
- **Supports optimum U point interface for evaluation of communications devices with built-in DSUs**
- **Supports multi-interface, multi-channel simultaneous monitoring and simulation functions**
- **Supports bit error rate test function that enables evaluation of line quality and other characteristics**
- **Supports LAN data transmission with Windows 95**
- **Employs platform that can flexibly respond to user needs**
- **Graphical user interface enables easy operation**
- **Supports PPP, IP translation (option)**

## D5115
## Multimedia Protocol Analyzer

### ■ Features

The D5115 multimedia protocol analyzer has the flexibility to support evaluation of ISDN devices, switches, PBXs, and communications devices with built-in DSUs (routers, terminal adapters, etc.) as well as base stations and system evaluation for the next-generation IMT-2000 mobile communications protocol.
The D5115 can be taken advantage of for a wide range of applications, including development, production, and maintenance thanks to flexible system configured to meet diverse user environments by using the unit with the interface and function modules. In addition, the D5115 features easy operation by making use of the popular GUI used in the D5112 ISDN protocol analyzer. Using the same data format enables use of the data retrieved with the D5112 as well as the simulation programs, ensuring effective employment of existing resources.

### ■ Up to four modules mountable

It can run monitor, simulation, and bit error rate test (BERT) functions simultaneously on multiple channels and multiple interfaces by selectively combining independent interface and function modules.

### ■ Simultaneous execution of multiple simulation programs

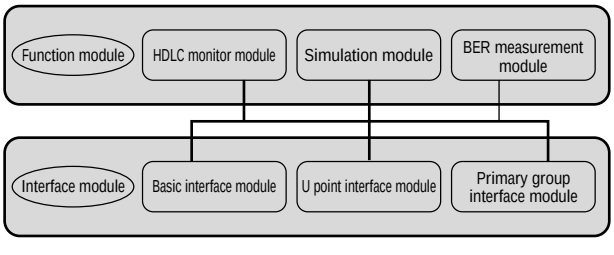
The D5115 can simultaneously execute multiple simulation programs for selected interfaces. Sample programs stored in the main unit's hard disk can be easily modified to match user needs and abnormal communication sequences and error sequences can be easily reproduced.
This function also enables line switching function between selected interfaces.

### ■ Long-term monitoring function reliably captures

A 1G hard disk is integrated into the HDLC monitor function module to reliably capture communications errors (intermittent errors) for which the time of occurrence is unknown. Since this hard disk is divided into four partitions, four-channel simultaneous long-term monitoring can be achieved. D-channel can record approximately 900,000 frames (with a maximum frame length of 256 bytes).
The D5115 can run multi-channel, multi-line long-term monitoring lasting up to several weeks depending on the amount of traffic. Moreover, data monitored over a long period can be efficiently analyzed using the search, filter, and other functions.

### ■ Enables simultaneous quality evaluation of multiple lines

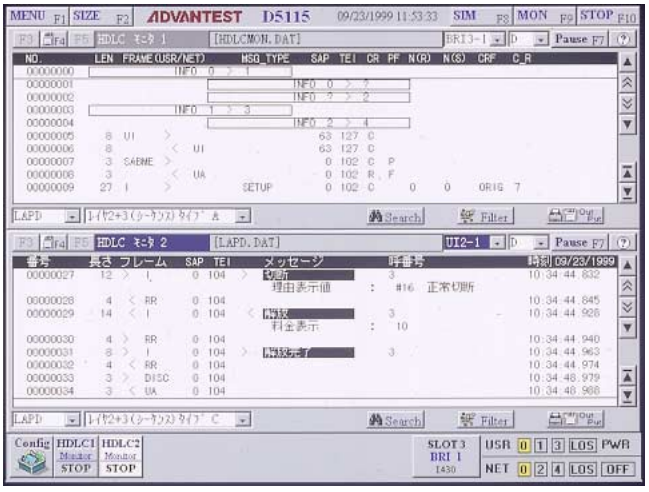
The D5115 is capable of simultaneously performing multi-interface, multi-channel bit error rate tests to effectively evaluate line quality. The BER measurement function module allows BER measurement to be performed with up to six B channels (selected interfaces) at the same time when used in combination with the selected interface module (A simulation program is unnecessary). Simultaneous execution is also available for a maximum of four basic interfaces (D, B1 and B2 channels) with a single unit. This enables bit error tests to be carried out quickly for communication devices with multiple interfaces.
When used in combination with the selected interface module, the simulation function module enables BER measurement using the selected B channel. (A simulation program is needed.)



*Optimum for Evaluation of Built-in DSU Terminal (U point: Ping-Pong)*

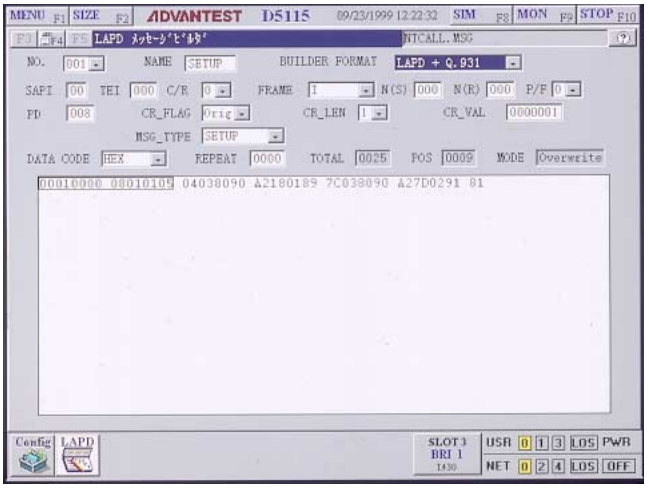
**D5115**

## ■ HDLC monitor screen (Layer 1 and sequence display)




## ■ HDLC monitor screen (Japanese detailed display)


## ■ Message builder screen (Enables easy creation and transmission of selected data)

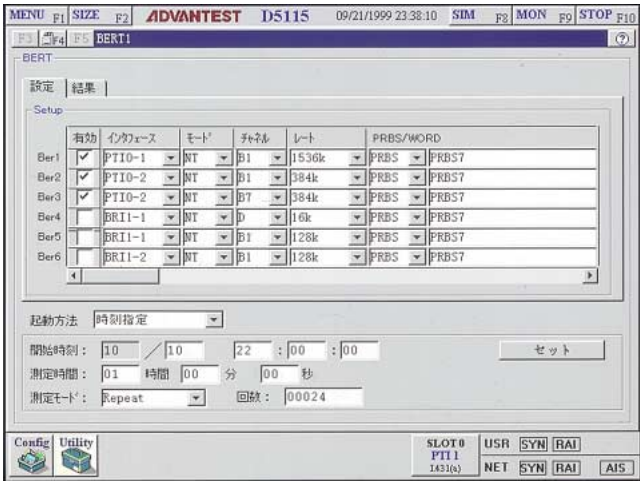



## ■ Editor screen (Selected scenario preparation/ simulation program)

| | |
|---|---|
| SIMMODE TE | TE simulation |
| LAYER 3 | Layer 2 auto-execution mode |
| FUNC MAIN ( ) | Start of program |
| PH_ACT ( ) | Layer 1 starts |
| WHILE (1) | Beginning of infinite loop |
| RECEIVE (0) | Wait until frame reception |
| IF RXMSG ( ) ==5 THEN | If call setting (5) is received, THEN execute the following |
| LINKON ( ) | Layer 2 link starts |
| CRV=RXCRV ( ) ¦H' 80' | Create send call number from receive call number |
| INSERT ("CONN",3,CRV) | Overwrite above line call number with send message reply (CONN) |
| SENDI("CONN") | Send reply (CONN) |
| WAIT (100) | Stop program for 10 seconds |
| INSERT ("DISC",3,CRV) | Overwrite call number with disconnection (DISC) message |
| SEND ("DISC") | Send disconnection (DISC) message |
| END | End of IF statement |
| IF RXMSG ( ) ==H'4D'THEN | If release (4D) is received, THEN execute the following |
| INSERT ("RELCOM",3,CRV) | Overwrite call number with release completion (RELCOM) message |
| SENDI ("RELCOM") | Send release completion (RELCOM) message |
| EXIT | Exit from WHILE loop |
| END | End of IF statement |
| END | End of infinite loop |
| RETURN | End of program |

## ■ Example of simulation function application (Enables implementation of line switching function between selected interfaces)


## ■ Bit error measurement function (Simultaneous BER measurement of six selected channels of selected interface)




BER : Bit Error Rate

# Digital Network Measuring Equipment

*Optimum for Evaluation of DSU integrated terminal (U point: Ping-Pong)*

## D5115

### Specifications

#### Main unit

**OS**: Microsoft® Windows 95® operating system
**CPU**: i486™ DX4 (100 MHz)
**Main memory:** 32MB
**Built-in FDD:** 3.5-inch (2 modes; 720kB/1.44MB)
**Built-in HDD:** 2.5-inch (1GB)
**Serial terminal:** RS-232 D-sub 9-pin
**Parallel terminal:** Centronics D-sub 25-pin
**External CRT terminal:** Analog RGB mini D-sub 15-pin
**Mouse terminal:** PS/2 type mini DIN 6-pin
**Keyboard terminal:** PS/2 type mini DIN 6-pin
**PC card:** JEIDA/PCMCIA compliant (type II × 2 or type III × 1)
**Internal standard clock:** Precision of ±5ppm
**Display function:** 10.4-inch (TFT color LCD with FL backlight, 640 × 480 dots, 256 colors)
**Power supply:** AC100V to 240V, 50/60 Hz
**Dimensions:** 355 (W) × 250 (H) × 170 (D) mm
**Mass:** Approx. less than 6.4 kg (main unit only)
*Keyboard and mouse are sold separately. Customers are requested to either supply their own or purchase from the list of Advantest accessories.

#### Applicable interface

**Basic interface module (D51101):**
**Interface:**
I.430 (ISDN basic user, network interface layer 1 specification)
I.430-a (Dedicated line user, network interface layer 1 specification)
**Number of lines:** Standard 1 line (max. 2 lines)
**Operation mode:** Monitor mode
**Simulation mode;** NT (network side)/TE (terminal side)
**Layer 1 detection:** INFO 0,1,2,3,4,LOS (loss of synchronization)
**Power supply polarity detection:** OFF/normal/reverse
**Wiring configuration setting:** Short-range passive bus/Extended passive bus/Point-to-point
**End terminal resistance setting:** OFF/50 Ω/100 Ω
**U point interface module (D51102):**
**Interface:**TCC standard JT-G961
(ISDN basic access metallic link subscriber parent transmission method)
(Ping-Pong method)
**Number of lines:** 1
**Operating mode:** Monitor mode
**Layer detection:** SIG status transition detection
**Power supply polarity detection:** OFF/normal/reverse
**Primary group interface module (1.5Mbps interface) (D51103):**
**Interface:**
I.431 (ISDN primary group speed user, network interface layer 1 specification)
I.431-a (Dedicated primary group speed user, network interface layer 1 specification)
**Number of lines:** Standard 1 line
Max. 2 lines (with OPT51103+01 installation module)
**Operating mode:** Monitor mode
Simulation mode; NT (network side)/TE (terminal side)
**Layer 1 detection:** USR; SYN, RAI, (AIS)
NET; SYN, RAI, (AIS)
**Number of channels:** Standard 2 channels, maximum 4 channels

#### Protocols

**Layer 2:** Q.921 (LAPD) Q.921-a, Q921-b, LAPB
**Layer 3:** Q.931, Q-931-a, Q-931-b, X.25
**Display format:** Layer 1/2/3 individual display or simultaneous display Japanese sequence/detailed translated display/HEX display
**Storage capacity:**
RAM; Approx. 2Mbytes/channel
HDD; Approx. 1Gbyte
**Time stamp:** Resolution 1ms (Max. recording duration: 127 days)
**Search function:** Search by specifying time, frame, pattern, or error
**Filter function:** Layer 1 information, RR non-display, display of specified TEI, SAP1, or call numbers.
**Audio monitoring function:** A-law/u-law, 32k ADPCM/64k PCM, and selected single channel audio monitor using (3.5 headphone)

**Simulation function (D51130)**
**Mode:** When combined with the basic/primary group interface: NT (network side)/TE (terminal side)
When combined with the U-point interface: LT (switching office side)
**Line switching function:** Function for switching between selected interface and selected B channel
**Loopback function:** Loop-back of selected channel
**Audio:** Audio I/O to a selected channel with accessory headset (Note 4) included (A-law/u-law, 32k ADPCM/64k PCM)
**Bit error measurement:** PRBS pattern, WORD pattern (16 bits)
**LAPD function**
**Applicable protocol:** Q.921 (LAPD), Q931, X.25 (In addition to the above protocols, optional protocols are available in the HEX input mode)
**LAPB function**
**Applicable protocol:** HDLC, X.25 (In addition to the above protocols, optional protocols are available in the HEX input mode)

**BER measurement function module (D51140)**
**Number of measurement channels:** 6
**Channel rate (bit rate)**
**Channel 1 [bps]:** 16K, 64K, 128K, 192K, 256K, 320K, 384K, 448K, 512K, 576K, 640K, 704K, 768K, 832K, 896K, 960K, 1024K, 1088K, 1152K, 1216K, 1280K, 1344K, 1408K, 1472K, 1536K
**Channel 2 to 6 [bps]:** 16K, 64K, 128K, 192K, 256K, 320K, 384K
**Measurement pattern**
**PRBS:** (2 -n-1 n=3, 4, 5, 6, 7, 9, 10, 11, 15, 17, 18, 20, 21, 22, 23, 25, 28, 29, 31)
**WORD:** Pattern length; 1 to 65,536bit

**IPV4 connection monitoring software (OPT5115+71)**
**(PPP, IP translation software)**