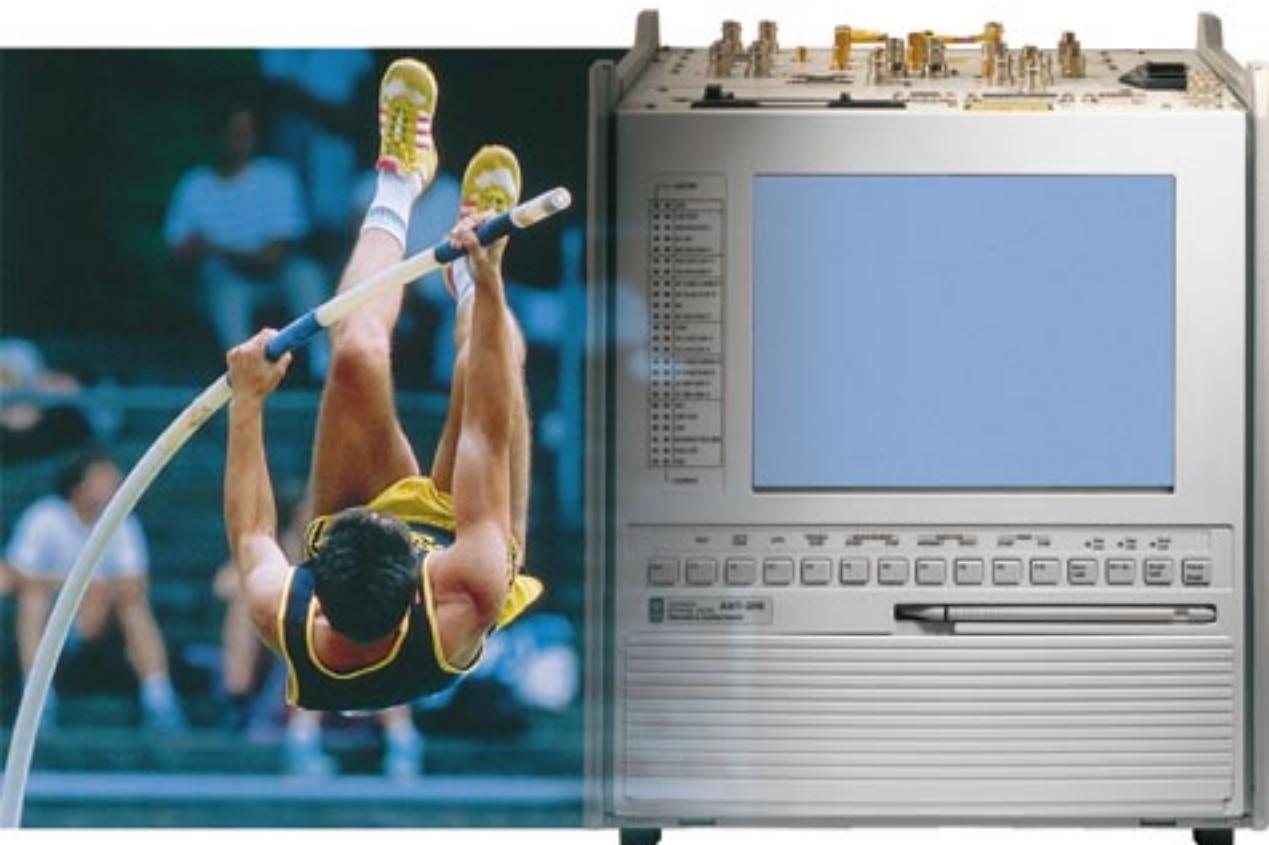




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## ANT-20: The Flexible, High-Performance Platform

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## ANT-20: At the forefront with Advanced Network Testing

### **A permanent challenge**

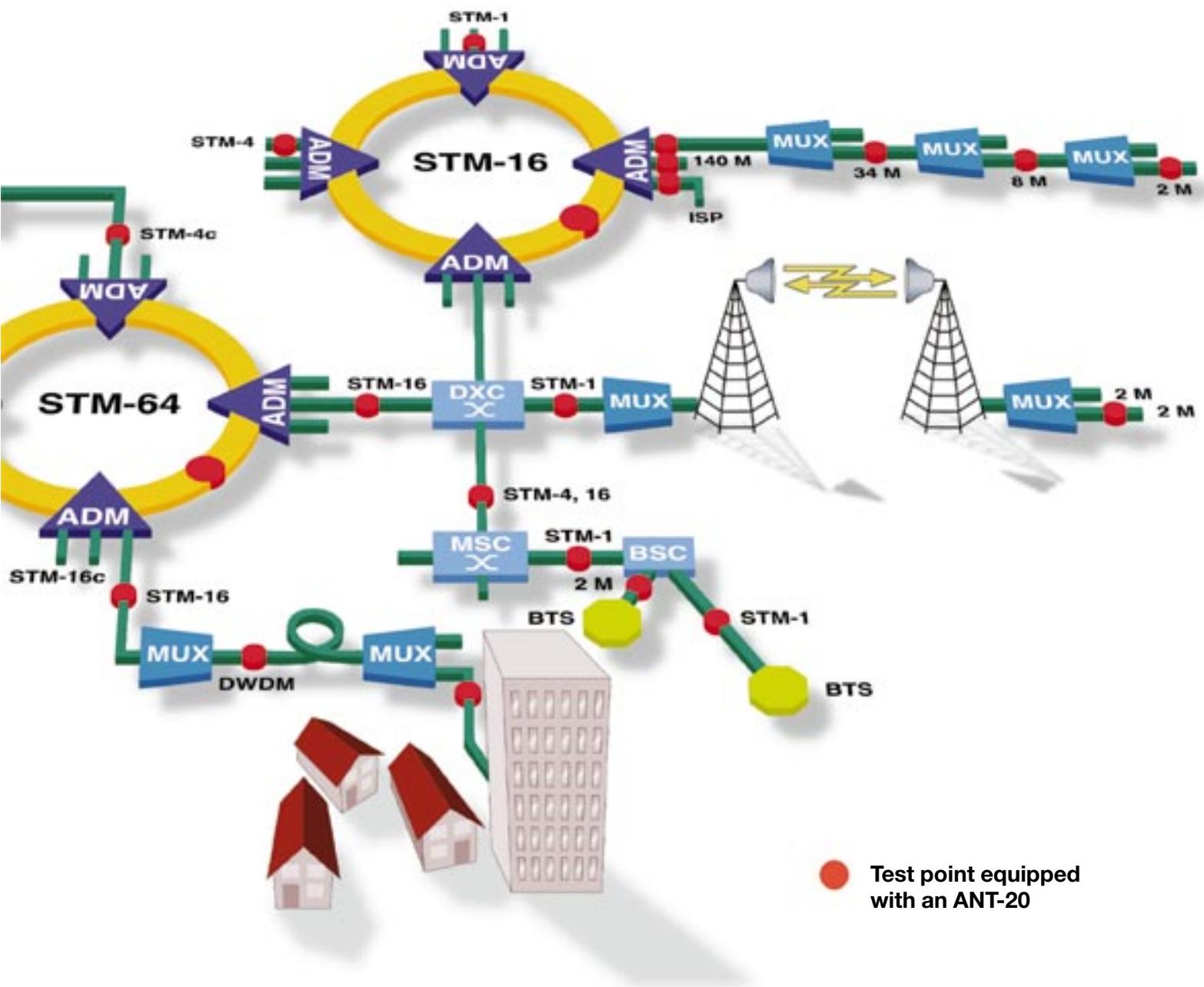
Competition is fierce in the expanding telecommunications market. Nowadays, customers demand next-to-perfect network availability, and top-notch transmission quality has become a given.

The number of service providers is growing too, and not just due to providers merging across borders. Different networks such as GSM, CATV and the Internet are converging too.

To survive on this playing field, you have to be among the best in both technological and economic terms. Our objective is to be your expert partner as you strive to meet these challenges.

### **Market leader**

With its innovative design, the ANT-20 Advanced Network Tester quickly became a market favorite, i.e. the market leader in Europe and a very popular instrument in nearly every country in the world.



● Test point equipped  
with an ANT-20

#### A design future-proofed for success

Technologies are developing rapidly. The ANT-20's flexible platform lets you keep cool in the face of immense change. Whether you are dealing with PDH, SDH, SONET and/or ATM, the ANT-20 keeps you on the safe side, always ready for new standards, higher bit rates and the intelligent system components of the future.

#### Universal applications

Application areas of the ANT-20 include development labs, conformance and functional tests in production, installation and acceptance, and even pinpoint troubleshooting of in-service networks. We work closely with systems manufacturers and network operators to define new quality standards in technical terms and to guarantee optimum ease of use.

Measurements are the epitome of flexibility. You can investigate all major quality parameters on diverse interfaces, ranging from simple bit error rate tests (BERT) to performance and pointer analysis, and covering even complex synchronization problems. The ANT-20 is a test solution you can customize to meet your own needs.

## ANT-20: Making it easy with a familiar work environment



Detailed parameter settings and test results, or simple operation? PDH, SDH, SONET with all bit rates from 1.5 Mbit/s to 2.5 Gbit/s, or ATM? Don't worry about alternatives you don't have to choose! The ANT-20 delivers sophisticated, precision test capabilities that are easy to use for *all* of the above bit rates *and* for ATM.

### Clear results presentation

You can view all results at a glance, numerically as a complete list of error values or graphically as a histogram. The Zoom function is useful for examining results from a longer test interval with different resolutions. The day or hour resolution gives you an overview, and the minute or second resolution lets you analyze critical phases. To assure the best possible accuracy, the duration of all alarms is saved with 100 ms resolution!

### Familiar environment

The built-in PC makes the ANT-20 compatible with your usual work environment. The Windows-based design makes it easier to get familiar with the software and opens up possibilities that are inconceivable with conventional test instruments. Test results are saved internally in the ANT-20 or on diskette, and can be printed in report format on any standard printer. For documentation purposes, you can use PC software such as Microsoft Excel™ or Word™. If you have a question, the built-in Help functions come in handy, delivering the technical background information you need.

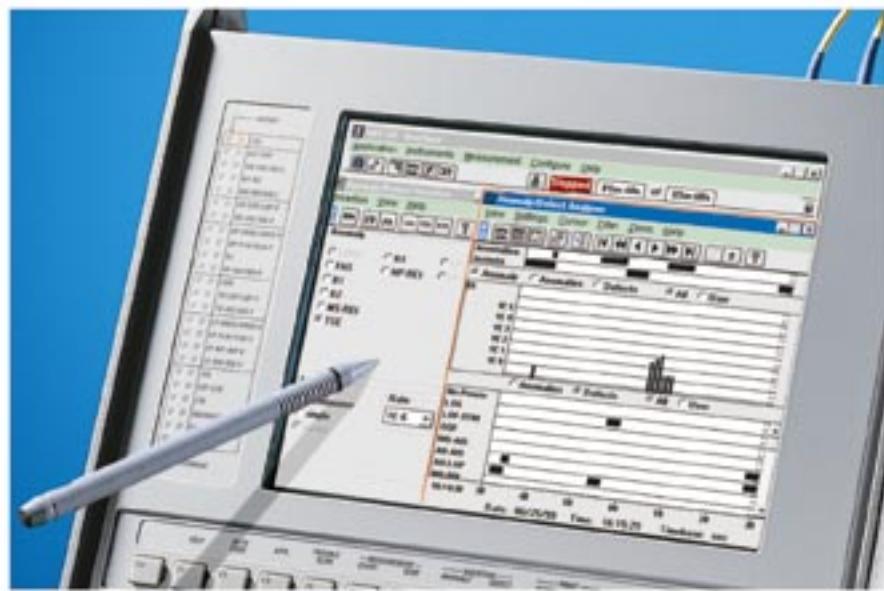


Sample customer-specific test report  
Jitter measurement, STM-1



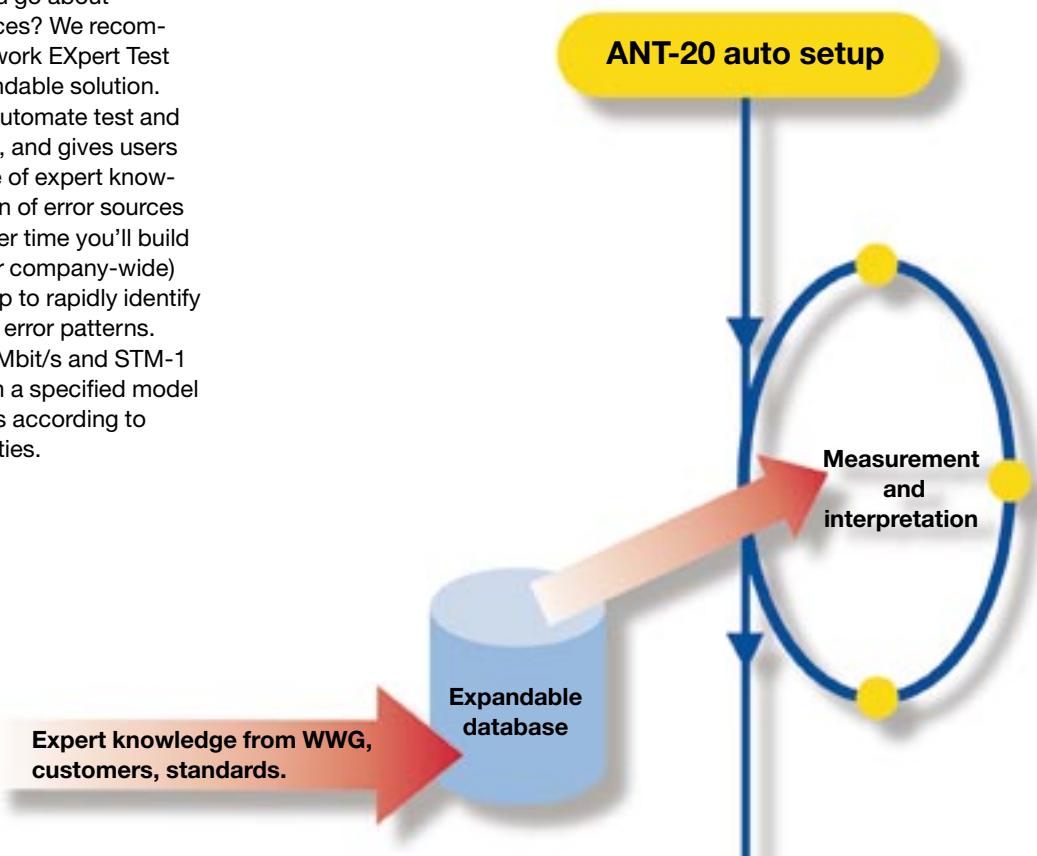
### **Large, color touchscreen**

The large color screen gives you a structured overview of all test results and helps prevent faulty settings. You can keep several windows open at once to keep everything at a glance, with no switching between menu screens. The touchscreen is ideal for field use since you can directly operate the ANT-20 with a pen or your finger right on the screen.



### **Become an expert**

How do you interpret measured parameters? How do you go about identifying error sources? We recommend NEXT, our Network EXpert Test Software as an expandable solution. It makes it easier to automate test and measurement chores, and gives users access to a database of expert knowledge. The description of error sources is easy to extend. Over time you'll build your own personal (or company-wide) database that will help to rapidly identify and correct recurrent error patterns. NEXT lets you test 2 Mbit/s and STM-1 leased lines based on a specified model and characterize lines according to their essential properties.



NEXT automatically controls all test procedures. If all results are as expected, then you get a clear PASS at the end of the test. If a fault occurs, FAIL is displayed along with all test data and a description of possible reasons and ways to correct the problem. You can expand this expert database (experiences, standards) to meet your own requirements.



**ANT-20:**  
Modular design  
allows user  
customization

**High-performance computer**  
built into ANT-20 (fixed module)  
with mouse port,  
PCMCIA interfaces A and B,  
external keyboard port,  
external monitor port,  
external printer port  
and RS-232 interface.

**PDH/SDH up to STM-4:**  
Electrical and optical interfaces  
for PDH and SDH up to STM-4  
(fixed module, various  
configurations possible)

**SDH STM-16:**  
Electrical and optical  
interfaces for  
2488 Mbit/s

**Jitter/wander at STM-16:**  
Jitter/wander generation  
and analysis at 2488 Mbit/s  
as per ITU-T O.171 and  
O.172



### **ATM BAG:**

Easy to operate BAG broadband analyzer/generator module (SVC) with ATM test controller for accepting, installing, testing and maintaining ATM systems (switched and permanent virtual connections)



**ANT-20 – Compact and handy for field work**  
Free slot for STM-16 or jitter. SDH and SONET mappings, even in combination with ATM real-time analysis work on SDH/SONET/PDH interfaces from 1.5 Mbit/s to 2.5 Gbit/s.

### **Jitter/wander up to STM-4:**

Jitter/wander generation and analysis at all bit rates up to 622 Mbit/s as per ITU-T O.171 and O.172



### **Power splitter:**

Optical power splitter for external protected monitor point



**ANT-20E – Everything you need, in a portable unit**  
With four free slots. ANT-20E can do more than the ANT-20 and is ready for future combinations of different tests.  
The most unique feature is the combination and parallel operation of all bit rates up to STM-16/OC-48 with jitter/wander up to 2.5 Gbit/s and ATM in a single unit.

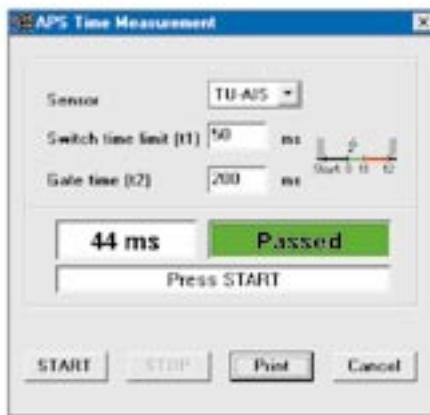


**DominoCOM ANT-20 – The blackbox**  
DominoCOM ANT-20 is ideal for use in automated test systems since it comes with remote control interfaces as a standard feature and is ready for rack installation.

The ANT-20 has everything you need to optimize your network. Some of the many possibilities are as follows.

#### Assure proper APS operation

Delayed ring switching? This can cause entire ring span or even whole rings to be taken out of operation. The ANT-20 makes it easy to measure the switch-over time from "working line" to "protection line". If faults occur, the instrument enables detailed analysis of the APS protocol procedures so you can immediately detect faulty commands.



Sample results from a switch-over time measurement



## ANT-20: Innovative functions offer ideal support

#### Assess quality on STM-4c/STM-16c lines

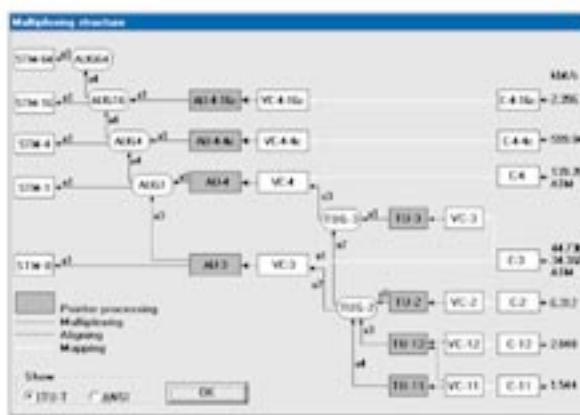
STM-16c can now be used to provide uniform bandwidths for IP and ATM. The previous limit was right around 600 Mbit/s, implemented using STM-4c. STM-16c quadruples the payload capacity to 2.4 Gbit/s. This technology is used primarily to link high-speed data networks.

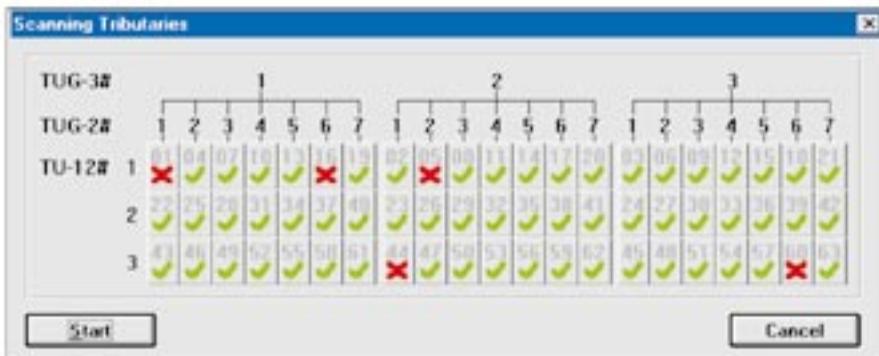
## STM-16c

However, a large bandwidth is no use if data packets have to be continually retransmitted due to transmission errors. Faulty channels are not profit-makers for service providers.

The ANT-20 supports this new technology to help you to quickly track down problems.

STM-64 networks can also be verified via the STM-16c tributary signals. When equipped with the STM-4c and STM-16c options, the ANT-20 becomes a full-featured "concatenation tester".

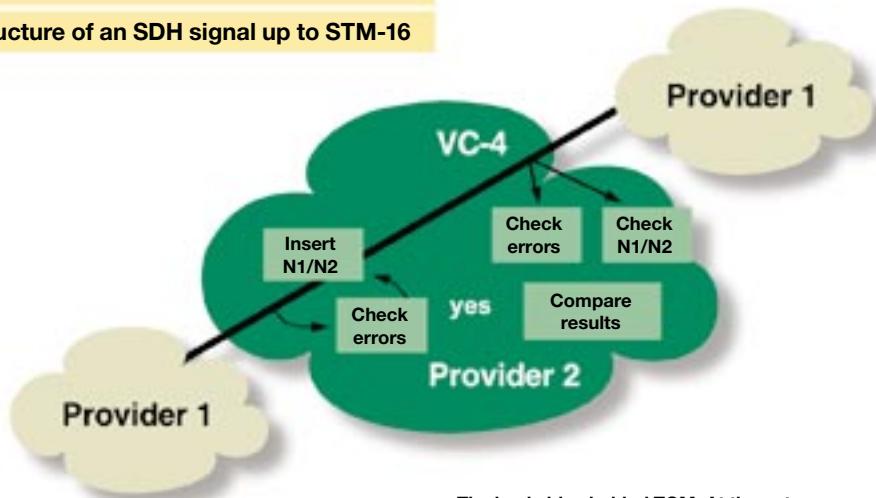




**SCAN mode:** The ANT-20 checks all channels for proper connection, synchronization and alarms in the incoming signals.

**Save time and avoid errors with automatic test functions**  
Unknown signal structure? Improper configuration? Looking manually for the right channel? The ANT-20 has automatic test modes to simplify test start-up and to provide a fast overview of four-channel systems. Using multi-stage analysis, you can view the status of individual channels with a click of the mouse.

<b>Autoconfiguration</b>	Searches for signal and unknown content
<b>SCAN</b>	Tests for error-free connection of all SDH channels
<b>Trouble SCAN</b>	Checks all incoming SDH channels for errors/alarms
<b>Search</b>	Searches for test channels in SDH signals
<b>Auto SCAN</b>	Analyzes the structure of an SDH signal up to STM-16



**The basic idea behind TCM:** At the gateway from one network to another, the path parity errors are checked. The result is entered into the N1/N2 fields. Before the path is transferred again, another parity check is performed. The result is compared with the N1/N2 entry. If they match, then no errors were inserted on the corresponding link segment.

### Guarantee transmission quality with TCM

Nowadays, complete SDH paths are routed via networks operated by different providers. What happens when errors and impairments occur? Are you responsible when customers complain about unsatisfactory quality? Who decides where the fault lies? The ITU-T defined "Tandem Connection Monitoring" to handle these cases. You can use it to monitor the performance of a sublink in an SDH path and to identify errors and verify quality in your own network.

### Check and optimize quality of service in your ATM network

You can use the ANT-20 to effectively test your ATM network and/or network elements for proper operation and quality of service (QoS). Depending on the application, the ANT-20 has test solutions for permanent virtual circuits (PVC) and switched virtual circuits (SVC).

The major applications are as follows:

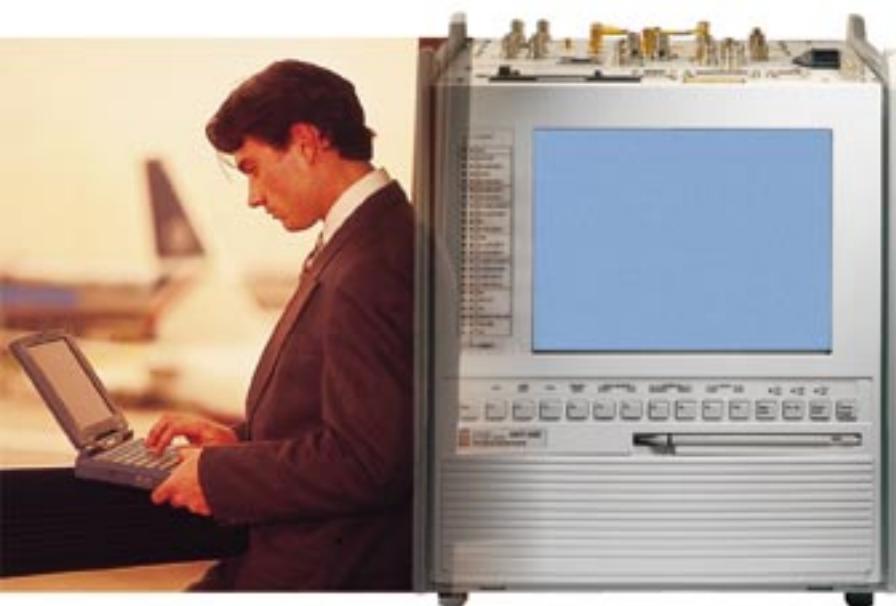
- Signaling emulation as per ATM Forum UNI 3.0/3.1 and ITU-T Q.2931/Q.2961
- SVC and PVC testing
- Automatic end-to-end testing of SVCs
- Real-time measurement of ATM QoS on four channels simultaneously
- Tests of all traffic contract parameters
- ATM terminal simulation for dial-up circuits
- Graphical evaluation using load charts



This means you can remotely operate any software installed on the ANT-20, such as the CATS test sequencer. You can control complicated and time-consuming tests from the office or from your home.

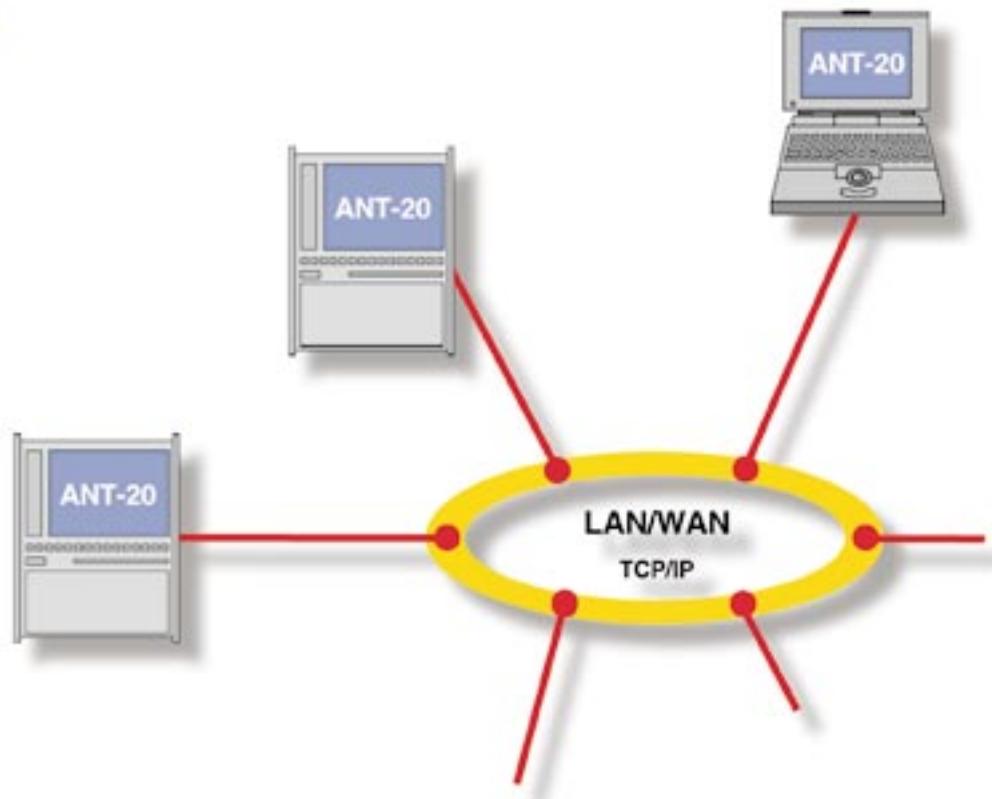
This is the basis for some time-saving applications:

- Operation of several ANT-20s from a central office, e.g. for point-to-point measurements.
- Help with on-site test problems. A specialist in the main office can monitor the user interface of the ANT-20 in parallel and give the local operator suggestions on how to solve the problem.
- Using an external test point scanner, you can switch between prepared test points from anywhere, at any time, in order to perform interactive measurements or test sequences.



## ANT-20: Simple remote operation, interactive or fully automated

Remote operation is easy with the ANT-20. All you need is a laptop and a modem or LAN connection. Thanks to the Windows-based design, you can run the same software on the ANT-20 and the laptop. The user interface you see on the laptop is identical to the one on the ANT-20.



**Save time and money through automation**

The CATS\* test sequencer is a test automation software package that runs on the ANT-20's built-in PC. It is the ideal tool for automating repetitive test procedures. It provides support in handling standard tests.

Without any programming background, you can still easily create test sequences to meet your own specific needs. A number of predefined, user-modifiable test steps are provided for your immediate use.

Test automation is particularly important when commissioning network elements and/or lines. The various measurements can be performed in sequence and documented.

The ANT-20 CATS test sequencer is just as effective for acceptance measurements and in development and production of network elements.

Once created, a test sequence can be recalled at any time. Each run of a sequence generates a file with all result data and a clear PASS/FAIL for each test step and the overall sequence.



# ANT-20: Automated test sequences with reproducible results

#### **Sample test sequence for commissioning 2 Mbit/s leased lines:**

<b>Basic settings</b>	<b>TX 2 Mbit/s CRC</b>	<b>Set TX signal structure</b>
	<b>RX 2 Mbit/s CRC</b>	<b>Set RX signal structure</b>
<b>Test of parameters</b>	<b>View Alarm</b>	<b>Check for no alarms</b>
	<b>Continuity Check</b>	<b>BERT in channel</b>
	<b>Pulling Range</b>	<b>Check pulling range (offset)</b>
	<b>Check LOS</b>	<b>Set LOS, wait for AIS</b>
	<b>Jitter Measurement</b>	<b>Measure intrinsic jitter</b>
	<b>Jitter Tolerance</b>	<b>Measure jitter tolerance</b>
	<b>Delay Measurement</b>	<b>Measure signal delay</b>
	<b>G.826 Analysis</b>	<b>G.826 analysis, 24 h</b>
<b>Test end</b>	<b>Thank You</b>	<b>End of test</b>

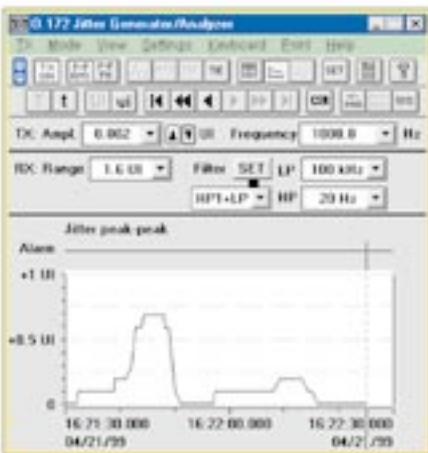
\* CATS CVI Application Test Sequencer

## ANT-20: A reliable solution for jitter and wander

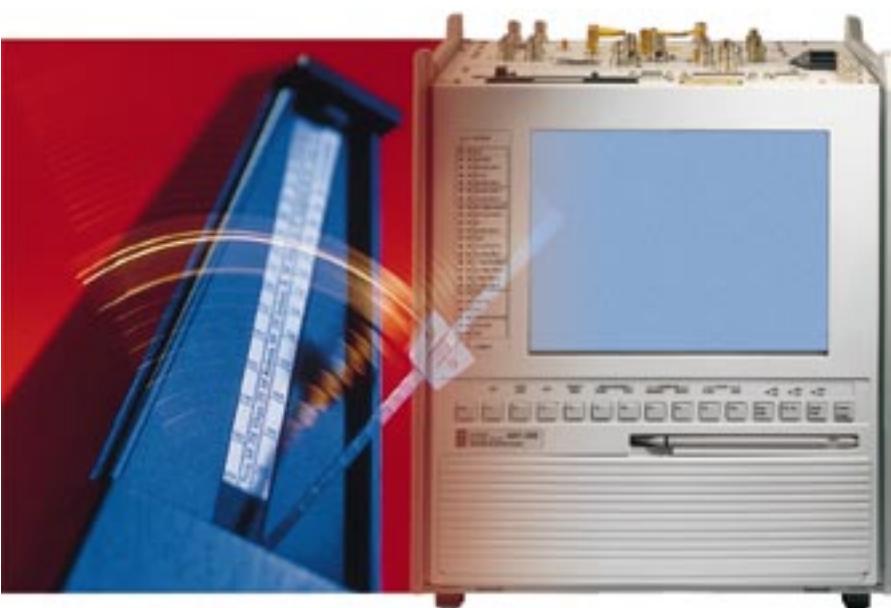
### Tight standards for synchronization

Higher bit rates, combined with synchronous technology, are making greater demands of the clock quality within networks. For quality assurance purposes, international standards have defined stringent limits for jitter and wander.

Precision test equipment lets you know immediately whether the outgoing clock quality meets these standards and how network elements respond to poor clock quality.



Wondering how the output jitter varies over time? The "Jitter vs. time" display provides an excellent overview.



### A comprehensive solution for jitter and wander

The ANT-20 can generate and analyze jitter and wander for bit rates from 1.5 Mbit/s to 2488 Mbit/s and is fully compatible with ITU-T Recommendation O.172, making the instrument the ideal solution for handling diverse tests and delivering insightful, comparable and precise results.

You can measure the following:

- Output jitter
- Maximum tolerable jitter (MTJ)
- Jitter transfer function (JTF)
- Mapping and pointer jitter (combined jitter)
- Peak-to-peak jitter, RMS jitter and jitter vs. time
- Wander generation and analysis
- MTIE/TDEV offline analysis

### Additional functions to keep you ahead

Some other cleverly conceived functions allow the ANT-20 to perform fast and reliable wander analysis.

Wander analysis results are as follows:

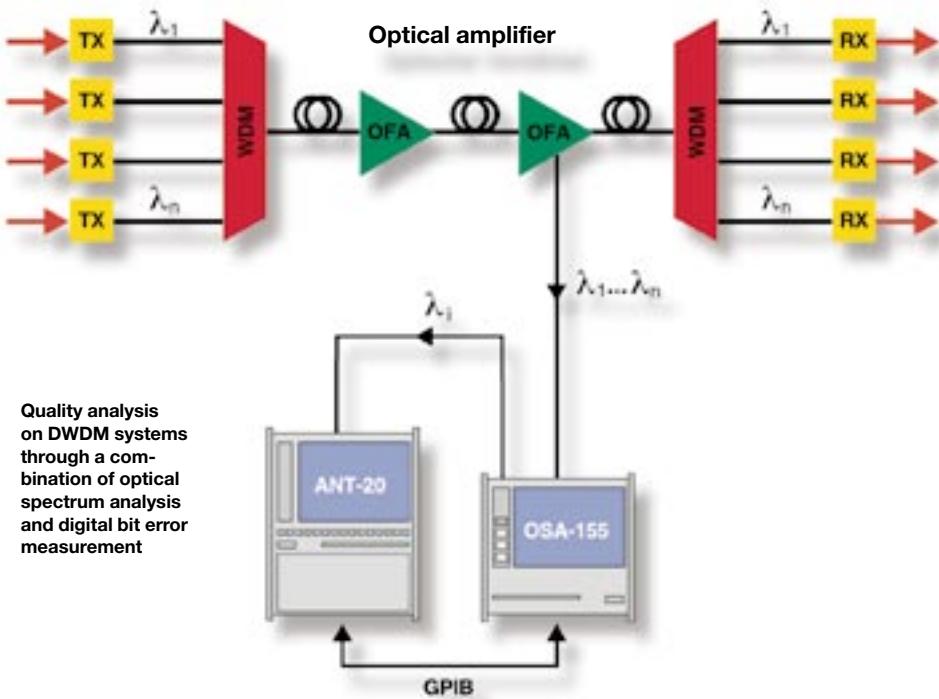
- Time interval error (TIE)
- Maximum time interval error (MTIE), based on TIE data.

With MTIE/TDEV offline analysis, you can evaluate wander results measured and stored by the ANT-20 and graphically display these results and compare them with standardized masks.

You can automate all of the jitter and wander applications using the CATS test sequencer, jitter tests being an important component of acceptance procedures.



Does clock quality fulfil the norm?  
MTIE/TDEV analysis provides the answer.



### The complete solution for DWDM systems

When combined, the ANT-20 and the OSA-155 Optical Spectrum Analyzer enable complete quality analysis of transparent DWDM systems. The OSA-155 has an external monitor output for this purpose. It selects a single DWDM channel from the whole

spectrum, which is then analyzed by the ANT-20 at the digital signal level. You can easily analyze errors at the bit, frame and alarm levels and perform jitter measurements, all in a selected channel of a multicarrier system.

### Test solutions for quality monitoring

It is time-consuming to manually setup, start and evaluate the various measurements with the OSA-155 and ANT-20. What is needed is a way to automate the individual test procedures. The CATS DWDM automation software running on the ANT-20 now handles control of the complete test procedure. Each channel is selected in sequence, the optical/transmission parameters measured and the results documented in a test report. You can edit the relevant parameters for the individual measurements as required.



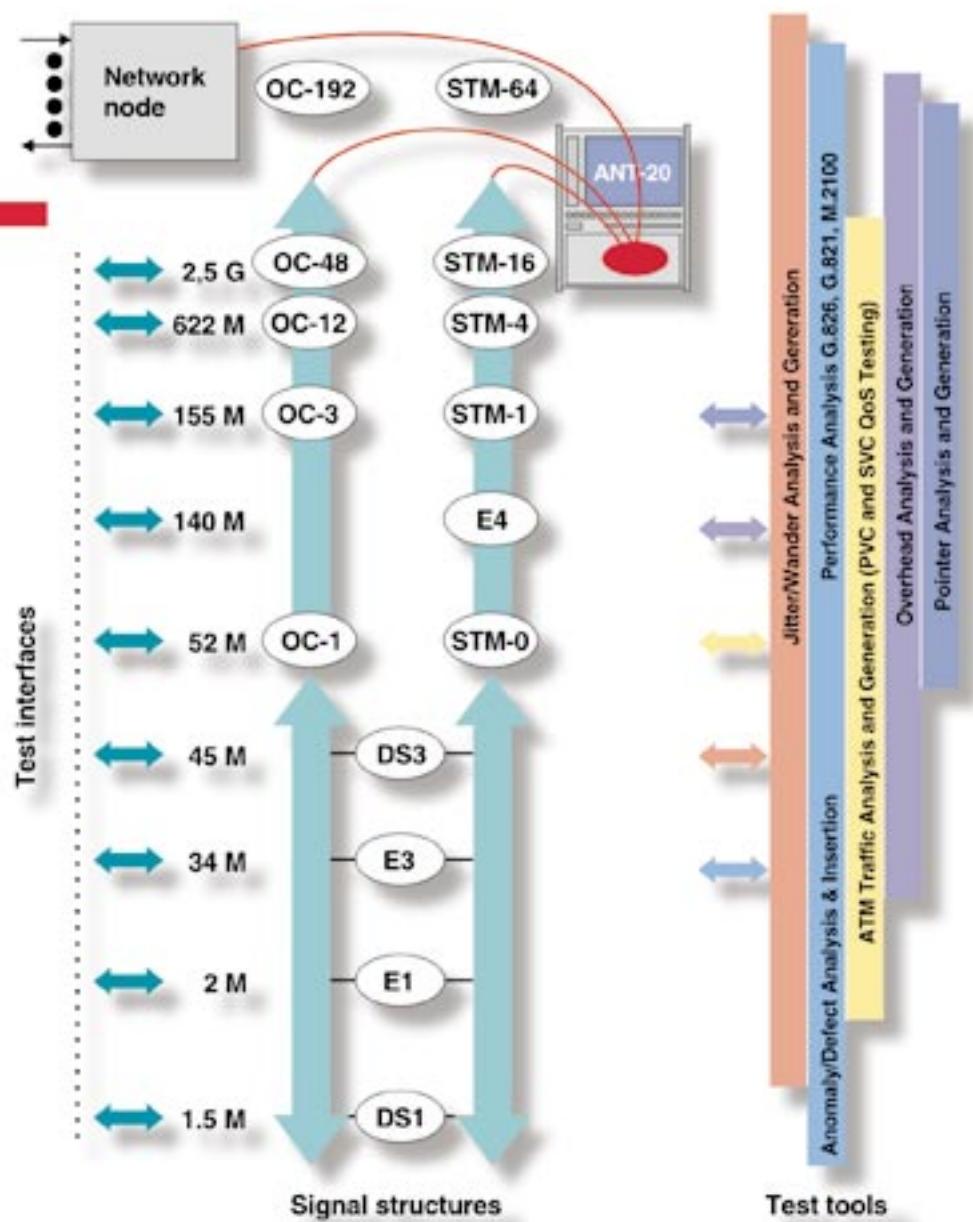
The OSA-155 DWDM Spectrum Analyzer

## ANT-20: Access to DWDM systems





## ANT-20: A pacesetter for the future



Even at 10 Gbit/s, the AN-20E can break down signal structures and analyze them down to the lowest levels.

### An overview of future trends

Recent years have seen a drastic increase in the popularity of electronic services, with a trend towards global interconnection. The Internet alone has been an incredible growth engine. To meet the new bandwidth requirements, two technologies predominate.

Time division multiplexing (TDM) of synchronous channels is used to transmit higher bit rates, while dense wavelength division multiplexing exploits the different optical windows on a fiber. The idea behind both approaches is to make optimum usage of existing optical fiber capacity.

## Staying at the forefront with innovative test solutions

As bandwidths have increased, so have the expectations made of modern test solutions:

- Integration of international standards
- Access to all interfaces in mixed network environments
- Testing of international gateways (SDH/SONET)
- Intuitive operation with easy start-up
- Automatic test procedures for rapid troubleshooting
- Optimum price/performance ratio

To meet all of your needs, we offered carefully tailored solutions based on the ANT-20 or ANT-20E. These solutions will remain at the forefront of technological development with further expansion stages such as STM-64.

## Ready for tomorrow's developments

The multiplex function for 10 Gbit/s\* is being implemented for the ANT-20E. This will enable access to all common interfaces from 2 Mbit/s up to STM-64 and DS1 up to OC-192. This includes access to all standardized mappings, and even mixed structures (e.g. DS1 in STM-1).

The multiplex function is available as a generator and/or receiver package.

Overview of functions:

- Multiplexing/demultiplexing of STM-64 and OC-192
- Insertion and analysis of anomalies and defects
- Display of all bytes in the complete SOH/POH (TOH/POH)
- Simulation and analysis of overhead bytes, internally and externally
- Path trace sequences and K1/K2 commands in the SOH/TOH
- Performance analysis as per G.826

This is how the ANT-20E achieves the broadest possible application spectrum as a portable test solution.

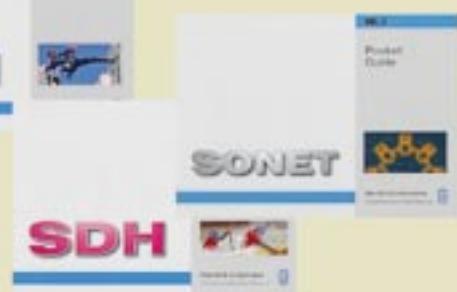
## ANT-20: Summary of documentation

### ATM:

Pocket Guide for Asynchronous Transfer Mode and ATM Testing  
E 2.99/WG1/1020



**SONET:** Pocket Guide for Synchronous Optical Networks  
E 7.98/WG1/1013



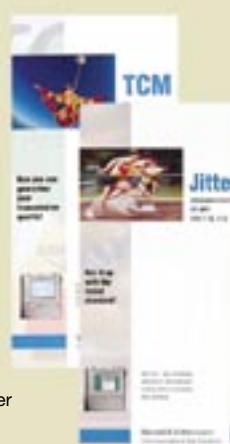
### SDH:

Pocket Guide for Synchronous Digital Hierarchy  
E 5.98/WG1/1006



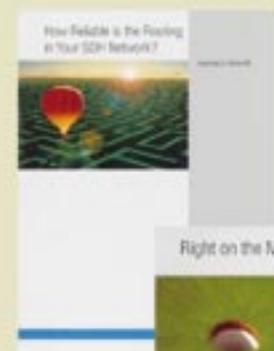
### TCM:

Tandem Connection Monitoring  
E 3.99/WG1/246



### Application Note 64:

"How reliable is the Routing in your SDH Network?" Path trace analysis in complex SDH networks – E 3.99/WG1/64



### Jitter:

Measurements as per ITU-T O.172  
E 5.99/EG1/250



### Application Note 68:

"Get an overview of synchronous networks". Use in-service measurements to assure the best network quality  
E 6.99/WG1/68

### Application Note 71:

Leading the Way with Innovative Jitter & Wander Test Solutions  
TP/EN/0071/0799/AE



### Application Note 66:

"Right on the Money". Test SONET/SDH/PDH and DWDM networks fast and efficiently with WG CATS  
E 5.99/WG1/66



**Data sheet booklet:** Advanced Network Test Solution with ANT-20, ANT-20E and DominoCOM – E 7.99/WG1/220

**Application Note 55:** "Can you be sure that there are no weak links?" ATM-SVC testing  
E 3.98/WG1/55

**Application Note 62:** "ITU-T Error Performance Recommendations". Descriptions of the ITU-T Recommendations for performance analysis  
E 02.99/WG1/62

**Advanced Network Testing (periodical):**  
ANT-20 news issue 1 to 4

**Application Note 60:** "Ring testing enhances reliability of SDH and SONET ring structures". Efficient line up of SDH and SONET ring structures – E 7.98/WG1/60

**ATM Forum Glossary**  
E 8.97/WG1/192

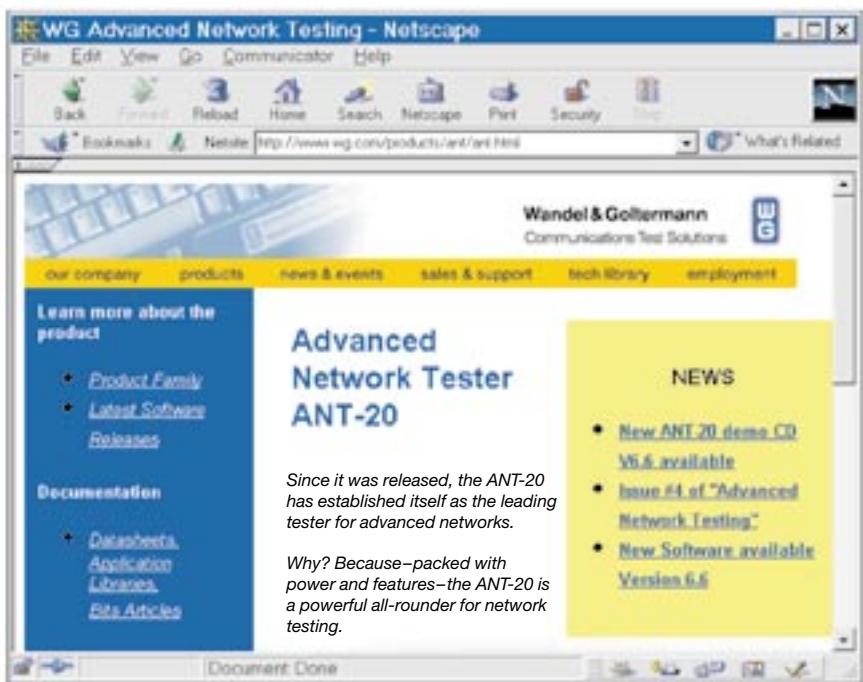
**Application Note 59:** "Conforming to the maze of network standards". ITU-T Recommendations and practical applications in PDH/SDH networks  
E 02.99/WG1/59

**ANT-20 DEMO CD** – TP/EN/CD01/0899/AE

**SDH/SONET Poster** – E 6.97/WG1/204

**ATM Poster** – E 5.97/WG1/174

\* Preliminary information



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Order no. TP/EN/B004/0899/AE

Printed in Germany

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