Issue Number 3

Advanced Network Testing

The magazine for ANT-20 users – The standard test platform for PDH, SDH, SONET and ATM PVC/SVC networks

Dear Reader:

Now that we've finished evaluating your responses to Issue No. 1, we can proudly report that the results were overall very positive.
Thanks to everyone for responding!
As far as article rankings go, you're most interested in "upgrades and options", followed by "applications".
This issue is sure to please, with news on software release 6.6, SDH-Pro16 and the new CATS software. When there's something new - we'll keep you posted.

Jochen Hirschinger

Year 2000 Statement for ANT-20

The turn of the millennium is looming ahead, and along with it the Year 2000 (Y2K) problem. Is the ANT-20 ready? Of course!

- All instruments previously delivered can be updated free of charge to a Y2K-compliant software version. For software versions prior to 5.X, this is version 5.6.3, and for versions 6.X, this is currently version 6.5.
- All subsequent software versions (above 6.5) are guaranteed Y2K-compliant.

For an official statement on all Wandel & Goltermann products, visit our Web site at www.wg.com/news/y2k_statement.html or see our customer information magazine "bits" number 81.

Upgrades and Options

Applications and Background

Frequently Asked Questions

Published by:
Wandel & Goltermann GmbH & Co.
Elektronische Metechnik
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Printed in Germany

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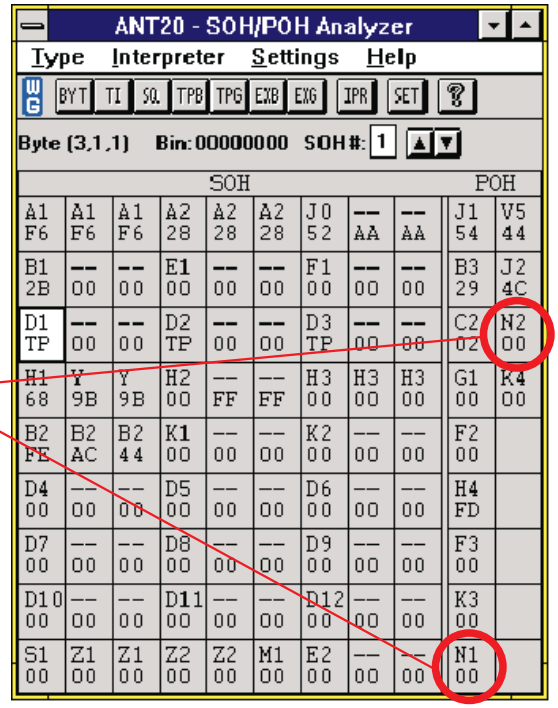
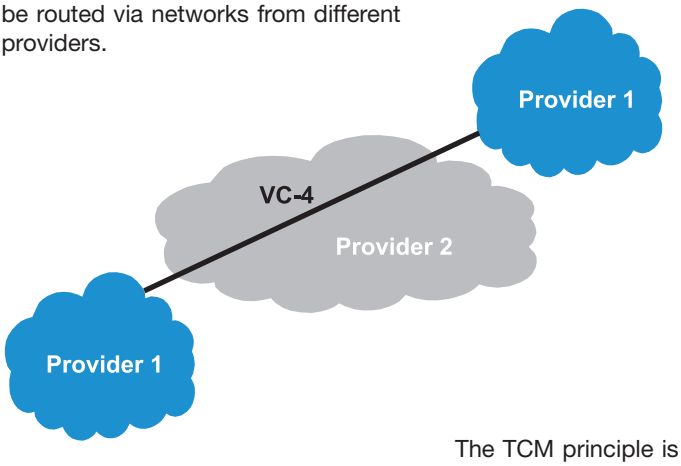
Wandel & Goltermann
Communications Test Solutions

Tandem Connection Monitoring: Who Caused the Impairment?

Global liberalization in the telecom sector has lead to a virtual mushrooming of new network operators and service providers. International joint ventures and new urban network operators are increasing the degree of entanglement as more and more communications resources are leased.
Larger network operators control huge networks of their own, but smaller network operators find it more economical to lease their network resources. The result is that complete SDH paths can be routed via networks from different providers.



Here you will find the N1/N2 bytes in the overhead.

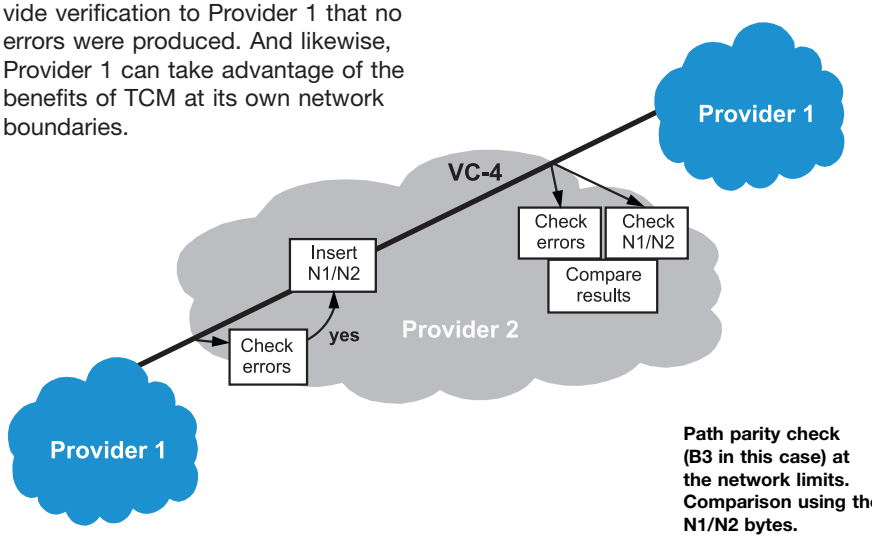


Provider 1 leases transmission capacity (a transparent STM-1/VC-4 "leased line") from Provider 2 to connect two subnetworks.

Smooth operation is the rule. But when faults and impairments do occur, the going gets tough. Who guarantees transmission quality? Who is responsible if end users complain of insufficient end-to-end quality of service? Otherwise stated: Whodunit? SDH technology has a way of dealing with such issues. It is known as tandem connection monitoring (TCM). TCM is a method for monitoring the performance of a subsection of an SDH path. This is particularly useful if the path is routed via networks from different providers – see the above example. For example, Provider 2 can define its part of the path as the sublink to be monitored – this is known as the TCM sublayer. The N1/N2 bytes of the POH are used for this purpose.

The TCM principle is as follows: Where the path passes from one network into another, the path parity errors (B3) are checked (by Provider 2 in our example). The result is entered into the N1/N2 fields. Before the path is returned to Provider 1, the path parity error check is performed again, with the result being compared with the N1/N2 entry. If the result agrees, then Provider 2 did not cause any additional errors.
This means that Provider 2 is always aware if and when errors are introduced into a leased path, and can even provide verification to Provider 1 that no errors were produced. And likewise, Provider 1 can take advantage of the benefits of TCM at its own network boundaries.

TCM is a relatively new field within SDH technology, and most systems manufacturers are still developing TCM-ready network elements. We have only sketched out the basic principles here. In all actuality, more is happening: A complete protocol is flowing back and forth in the N bytes between TCM sinks and TCM sources. Within the TCM sublayer, there are TCM-specific alarms such as TC-REI, TC-AIS, etc. See the next issue of our newsletter for more details on how the ANT-20 can help you when installing and accepting TCM links.

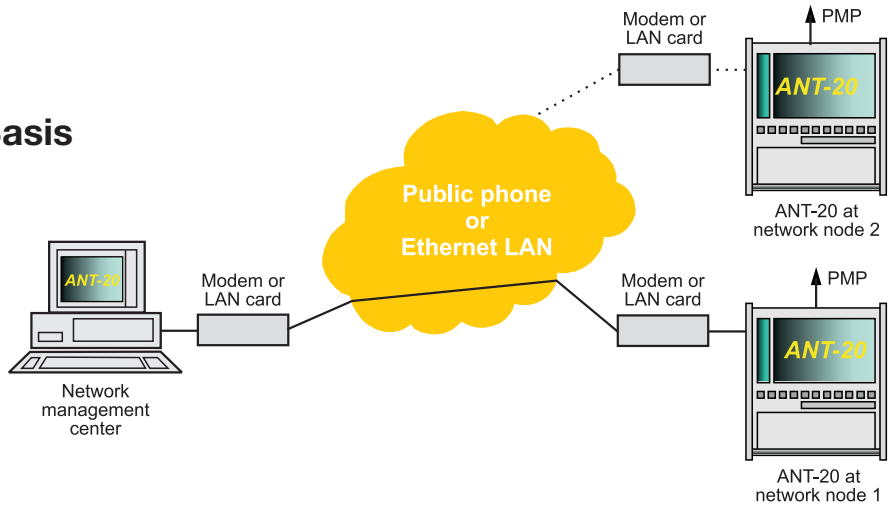


Path parity check (B3 in this case) at the network limits. Comparison using the N1/N2 bytes.

In the last issue, we had a look at the subject of monitoring. Now we will consider another aspect:

Remote Operation as a Basis for Automatic Monitoring

Remote operation has proven very useful for long-term monitoring and for building monitoring systems. The user interface of a remotely situated ANT-20 is replicated on a local PC via a modem, network card, ISDN modem or cell phone. You can then operate the instrument just like you do locally. To obtain as much measurement information as possible during a test interval, we recommend using as many analysis windows as possible simultaneously. For instance, the ANT-20 can perform G.826 analysis, pointer analysis, anomaly/defect analysis and jitter analysis all at once. Simultaneous evaluation of anomalies and defects can show when and why a G.826 analysis ran aground, for instance. This saves much time compared to a number of single measurements running in sequence. The figure illustrates the following scenario: ANT-20s are placed at various network nodes, where each instrument is connected to a protected monitor point (PMP). By using test point scanners at the nodes, it is possible to connect a single ANT-20 to multiple PMPs. Via remote operation, a user at a network management center can now connect to each ANT-20.



Remote operation: Via a modem or LAN card, the ANT-20's user interface is replicated on a PC.

Thanks to Frank Kaplan, Wandel & Goltermann, Germany

New Features in CATS Version 3.5

A new version of WG CATS (CVI Applications Test Sequencer) is now available. Users of earlier versions are entitled to a free update. If you don't already have CATS, request the demo software from your nearest WG sales company.

Simplified user interface

- Less buttons / more color for easier operation
- Test cases can now be selected from a list
- Faster log-in procedure: No password required in default mode
- Sample sequences have been simplified

Looping function

Looping of VCs, *VTs*, *physical access points* enables identical tests for different physical signals or signals embedded in a higher hierarchy level. Sample sequences for looping: i_list.squ and a_list.squ

New test cases

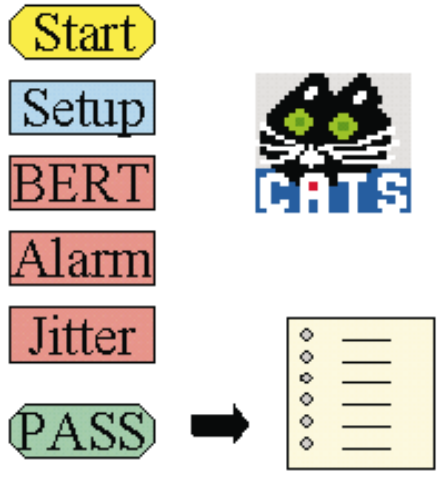
- Show bitmap (interactive, e.g. to show cabling or UUT information)
- Editable entry table for user data (e.g. name, site, batch#)
- Read / evaluate clock offset
- Read / evaluate optical level
- G.826 long-term measurements

Support of O.172 pointer sequences with active & cool-down periods

Sample CATS sequence available to check tributary jitter vs. pointer sequences as described in ITU-T Recommendation O.172. Sequence: i_O_172.squ

The new CATS version supports even more ANT-20 features:

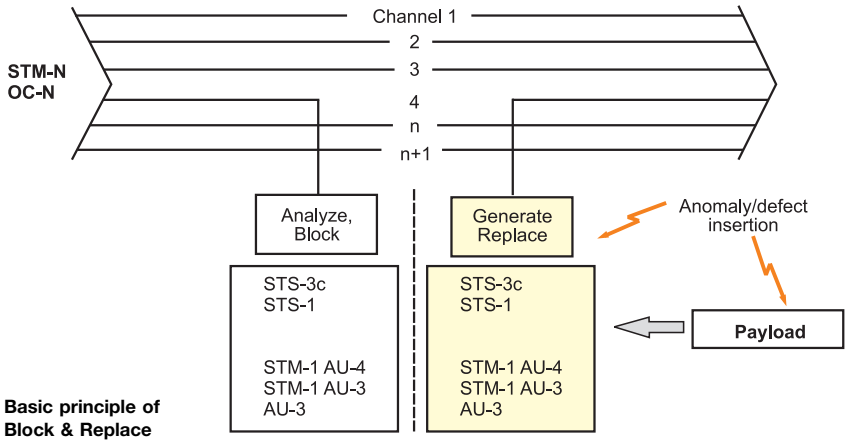
- APS measurement
- STM-16 jitter measurements (MTJ, JTF, jitter)
- OC-12c support



Attention all ANT-20 users: Please note that the demo version of CATS is preinstalled on e v e r y ANT-20. Look for the icon under Windows to call up the software. Unlike the full version, the demo version does not allow you to store modified or newly created sequences.

Block & Replace

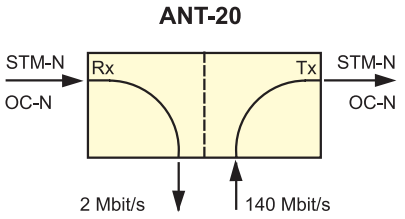
The Block & Replace feature was added to the *Drop & Insert option* (BN 3035/90.20) starting with software version 6.5. This helps to test the integrity of synchronous fiber rings and in conjunction with the *Extended Overhead Analysis option* (BN 3035/90.15) offers a complete solution for ring testing.



Basic principle of Block & Replace

What's the difference between *Block & Replace* and *Drop & Insert*?

Drop & Insert lets you drop a plesiochronous tributary signal from a synchronous signal and output it on the Tx auxiliary jack of the ANT-20. An external plesiochronous tributary signal from the Rx auxiliary jack can be inserted into the synchronous signal as well. Here, the **receiver and transmitter are independent**, and the complete SOH is regenerated in the ANT-20.



Example of Drop & Insert

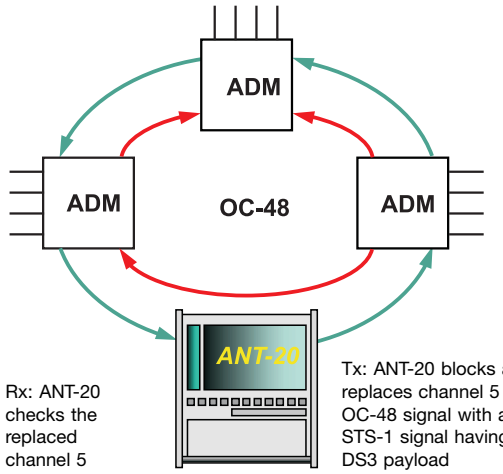
With Block & Replace, the ANT-20 works in Through mode. A synchronous tributary (e.g. STM-1 in STM-16) is replaced by an internally generated signal with SOH, POH and high-order payload.

Typical Block & Replace applications

- Testing of fiber switching in a faulty path (stimulation of an APS switching procedure)
- Testing of an isolated channel in the synchronous ring signal (continuity check)
- Error/alarm insertion into the payload and tributary
- Checking for proper ADM configuration (channel check)
- Testing of the link from the ring to the customer and vice versa

Example: Continuity Check

The ANT-20 is looped into an OC-48 ring. It blocks a channel (e.g. channel 5) of the OC-48 signal and replaces it with an internally generated STS-1 signal with DS3 as the payload, which contains, e.g., a PRBS 15. On the receiving end, the ANT-20 checks the replaced channel using the check sequence contained in DS3. It thus tests simultaneously the entire ADM configuration (channel table).



Rx: ANT-20 checks the replaced channel 5

Tx: ANT-20 blocks and replaces channel 5 of the OC-48 signal with an STS-1 signal having a DS3 payload

Ring test with Block & Replace

	Drop & Insert	Block & Replace
Transport signal	Synchronous signal (optical or electrical)	Synchronous signal (optical or electrical)
Drop/Insert	PDH signal	Synchronous tributary
Drop & Insert via auxiliary jacks	Yes	No
SOH and POH	SOH and POH internally generated	SOH and POH of replaced tributary are newly generated, but everything else flows through (as in Through mode)
Rx/Tx independent	Yes	No (Through mode)
Error insertion in	Payload, SOH, POH	Payload, SOH, POH

The *Drop & Insert* option basically contains the following subfunctions:

- Drop & Insert (for PDH signals in SDH or in MUX structures)
- Through mode (including jitter insertion, error insertion, overhead manipulation)
- Block & Replace

SDH-Pro16: An STM-16 Solution at a Bargain Price

This special version of the ANT-20 is tailored to STM-16 applications. The basic mainframe functions (PDH, SDH) are identical to those of the ANT-20E, including STM-1/4/16 optical interfaces. In case of further expansion, the instrument is very easy to configure. Why? The main functions required for testing STM-16 systems are packaged as two options: *SDH Power Tools* and *Jitter/Wander up to STM-16*. By bundling these items, we can offer the SDH-Pro16 product line at a more attractive price than the ANT-20E. However, further expansion towards ATM or SONET is not planned.

ANT-20E	SDH-Pro16
PDH, SDH, SONET, ATM	PDH, SDH
up to 2.5 Gbit/s	up to 2.5 Gbit/s
flexible configuration	tailored to STM-16, option bundles
standard price	special price

For more information, see the data sheet, which can be downloaded at www.ant-20.wg.com

New: Special DWDM Laser for ANT-20

DWDM systems are fed by extremely accurate laser sources using a predetermined wavelength spacing. ITU-T Recommendation G.692 contains a list of possible wavelengths, providing an orientation standard for systems manufacturers. Customers have expressed an interest in fitting the ANT-20 with an extremely accurate laser source of this type. We are now equipped to handle this need with the option *Optics STM-16/OC- 48 15xy nm, BN 3035/90.39*. A single selectable laser generates the desired wavelength from the list in G.692. Lasers with 42 different wavelengths between 1530.33 and 1560.61 nm are available, e.g. 1531.12 nm (195.8 THz). Wavelength switching is not possible.

Frequently Asked Questions Focus: ATM

The ANT-20's BAG *(Broadband Analyzer/Generator)* module consists of three virtual instruments:

ATM Test Control is the main center for configuration and online control of measurements.

ATM Test Results provides QoS results, and in SVC mode also information about signalling and the receiver status.

ATM Channel Explorer is a tool for monitoring an ATM link. In Activity Scan mode, for example, all virtual ATM channels used during the measurement are listed with useful information.

In the ATM Test Control window, you can choose between *Idle Cells* and *Unassigned Cells* as Stuffing. What's the difference?

Idle Cells are generated by the transmission medium (physical layer) if less ATM user cells are transmitted than provided by the bandwidth capacity. Example:

STM-1 physical interface: 155.52 Mbit/s
Maximum bandwidth for ATM cells: 149.76 Mbit/s
Bandwidth used: 100 Mbit/s
Bandwidth occupied by *Idle Cells*: 49.76 Mbit/s

Idle Cells are used to link the user data rate – which is flexible in ATM – to the transmission rate. Technically speaking, *Idle Cells* are just a bit pattern generated by the physical layer.

Unassigned Cells have the same purpose, but are inserted by the ATM layer. They are not allocated to a virtual connection, i.e. a higher layer application. In actual practice, *Unassigned Cells* are used less and less.

Unlike *Unassigned Cells*, *Idle Cells* are not forwarded to the ATM layer. The following table shows the exact ATM header values:

ATM header fields	Value for Idle Cells (in HEX)	Value for Unassigned Cells
GFC (Generic Flow Control)	0	Field is available to ATM layer
VCI (Virtual Channel Identifier)	0	0
VPI (Virtual Path Identifier)	0	0
PTI (Payload Type Identifier)	0	Field is available to ATM layer
CLP (Cell Loss Priority)	1	0

Frequently Asked Questions
Focus: ATM

What's the purpose of the *AGE* button in the *ATM Channel Explorer*?

During a Channel Explorer session:

- SVC ATM connections can be dynamically established and cleared down on the observed link;
- Nothing can be transmitted for a very long time on PVC ATM connections.

If the AGE (Aging) button is pressed, all unused ATM connections (for which the current bandwidth was equal to zero for 30 seconds) are not displayed. If you are interested in only those channels which currently transport ATM traffic, the AGE function will provide you with greater clarity. When the AGE button is deactivated, all channels used during the measurement remain in the list. The advantage of this is that you can determine the VCI/VPI address range used during the measurement. But it is sometimes possible for a VCI/VPI to be assigned more than once (i.e. by multiple connections) during long-term monitoring of an SVC link. The power of the AvBW display (average bandwidth) is limited in this case.

What do *CLP1-BW* and *CI-BW* mean in the *ATM Channel Explorer*?

CLP1-BW *(Cell Loss Priority 1 Bandwidth)* shows the percentage of cells in a connection in which the CLP bit in the header is set to "1", meaning lower priority. If a user transmits more cells than are allowed in the traffic contract, network elements can tag cells, i.e. set the CLP for non-compliant cells to "1".

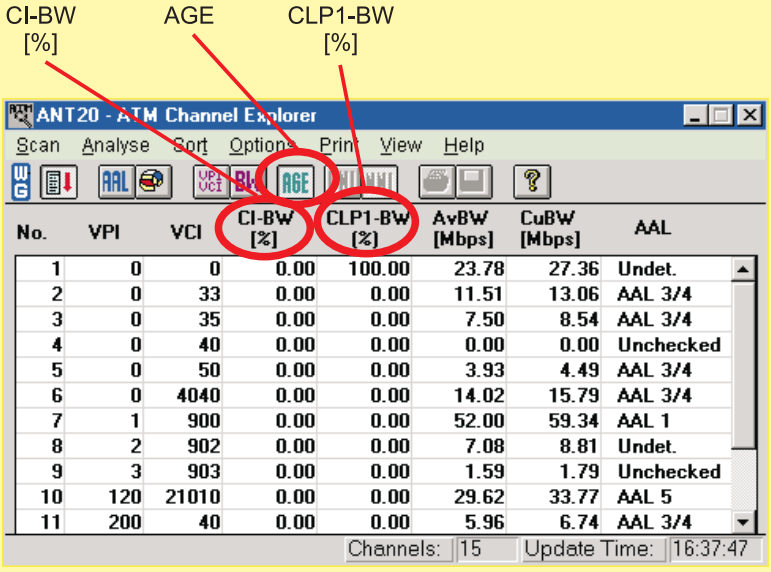
CI stands for *Congestion Indication*. The *CI* bit is located in the *PTI* field (*Payload Type Identifier*) of the ATM header. A switch that transmits cells with *CI=1* is in an overload situation. This situation can be provoked by one or more non-compliant connections. If during long-term monitoring the CI percentage for a connection is not equal to zero, the switch was in an overload situation at some point. CLP1 and CI can occur simultaneously (but not necessarily). If an ATM connection has a CI percentage, this does not necessarily mean that it is non-compliant; the overload situation can also be caused by other connections. And vice versa, increasing CLP1 percentages do not necessarily mean that the switch is overloaded; they only indicate that a subscriber is non-compliant, for example.

What do LPAC and NCS stand for in the ATM Test Results window?

LPAC means *Loss of Performance Assessment Capability*. This state is described in ITU-T Recommendation O.191 (ATM QoS measurements) and is a major QoS parameter. When this state occurs, it is not possible to determine network performance parameters based on ATM cells. Reasons for this include major disruptions at the physical layer such as Loss of Signal (*LOS*). The *LPAC* state is generally reached if no test cells are received for more than 10 seconds long. Example: During the *LPAC* state, test cells are lost, but they do not enter into the *Cell Loss Ratio* (*CLR*). The ANT-20 halts the *CLR* measurement during the *LPAC* state and resumes it when normal operation returns.

NCS stands for *Not Connected Seconds*. This is time during which no connection exists. Examples:

- The time the ANT-20 needs in SVC *Calling* mode to set up the connection;
- The time the ANT-20 waits in SVC *Called* mode until it is called. During this time, the test sets cannot receive any test cells and thus cannot evaluate the QoS.



CI	Congestion Indication
CLP	Cell Loss Priority
CLR	Cell Loss Ratio
GFC	Generic Flow Control
LOS	Loss of Signal
LPAC	Loss of Performance Assessment Capability
NCS	Not Connected Seconds
PTI	Payload Type Identifier
PVC	Permanent Virtual Circuit
QoS	Quality of Service
SVC	Switched Virtual Circuit
VCI	Virtual Channel Identifier
VPI	Virtual Path Identifier

Calling, Called and *Self Call:* Three Modes for Testing ATM SVCs

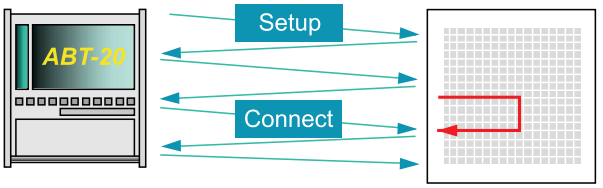
SVCs (Switched Virtual Circuits) can be tested with the ANT-20's BAG (Broadband Analyzer/Generator) module on one end or end-to-end.

Self Call

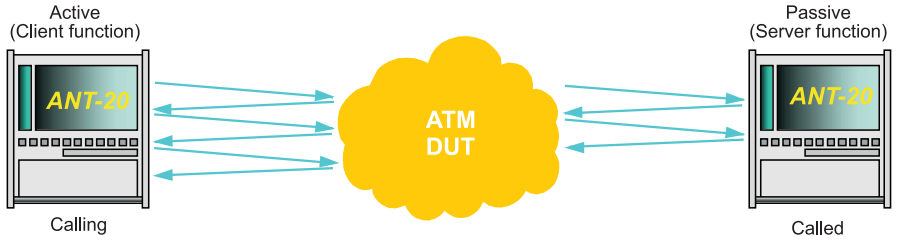
The ANT-20 simulates the behavior of a terminal and emulates the signalling. Using a signalling protocol (e.g. UNI 3.1, Q.2931), the instrument establishes a connection back to itself. It then uses this connection to perform a QoS test.

Calling* and *Called

Two (or more) ANT-20s can be used to perform end-to-end tests. One ANT-20 in *Calling* mode initiates the connection. During the SVC QoS measurement, it acts as a test *client*. Another ANT-20 in *Called* mode waits until it is called by a *Calling* instrument. During the SVC QoS measurement, it acts as a test *server*. Once the connection is established, the instruments send each other test cells and evaluate them on their respective ends.



Signalling emulation with *Self Call*



Signalling emulation with *Calling* and *Called* – End-to-end

In *Called* mode, the ANT-20 with the BAG module can accept up to four calls simultaneously. Test scenarios involving five ANT-20/BAGs are thus possible.

Coming December 1998: Software Version 6.6 – What's New?

New jitter features

- Jitter measurement versus time
- Step button for increment/decrement Tx jitter
- Tx tributary offset for mapping jitter measurement

New SDH/SONET features

- Generation of user defined overhead byte sequences
- Generation of burst errors
- Extended automatic scan
- Inverse patterns

New SONET/DS1/DS3 features

- FEAC-DS3 analysis: Now all commands can be analyzed
- FEAC-DS3 insertion: all FEAC commands (plain text entry)
- Loopback individual DS1 channels within a DS3 signal using FEAC
- Separate insertion of P and CP parity errors

Also:

- Expansion TCM: alarm, error and trace evaluation (part of Extended Overhead Analysis, BN 3035/90.15)

For details, see www.ant-20.wg.com

New: Software Update Service

You want to ensure that your ANT-20(E) is always equipped with the very latest software? The *Software Update Service* provides this. It gives you the right to the latest software for the instrument for a period of one, two or three years. Automatic shipment is done by the *distribution point* – a person who is responsible in the appropriate Sales Company.

Feedback/Subscription

(free of charge)

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Tell us what you think! Article ranking, issue no. 3

	Very interesting	Moderately interesting	Boring	Comments
The publication in general	☐	☐	☐	_____
Upgrades and Options	☐	☐	☐	_____
Tandem Connection Monitoring	☐	☐	☐	_____
Remote Operation	☐	☐	☐	_____
Block & Replace	☐	☐	☐	_____
Calling, Called and Self Call	☐	☐	☐	_____
Frequently Asked Questions	☐	☐	☐	_____

What topics would you like to see more of in "Advanced Network Testing"? _____

_____

Other comments: _____

_____