

ANT-20, ANT-20E Advanced Network Tester

Extended Overhead Analysis

BN 3035/90.15

Software Version 7.20

Operating Manual

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Contents

Introduction

1	Functions	I-1
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Operation

1	Recording selected bytes (Overhead Capture)	O-1
1.1	Function.	O-1
1.2	The “Byte Capture” dialog.	O-2
1.2.1	Setting the trigger conditions.	O-2
1.3	Recording results	O-3
1.3.1	Recording K1, K2 bytes, APS channel	O-3
1.3.2	Recording TCM frames	O-4
1.3.3	Recording further SOH/TOH or POH bytes.	O-5
1.3.4	Recording when defects are present.	O-5
2	Measuring the APS switching or dead time.	O-6
2.1	Function.	O-6
2.2	The “APS Time Measurement” dialog.	O-6
2.2.1	Setting the switch event	O-7
2.3	Performing an APS measurement.	O-8

Specifications

1	Overhead Capture	S-1
2	APS switching time measurement	S-2

Notes:



Introduction

1 Functions

The “Extended Overhead Analysis” option provides further useful functions for your ANT-20:

- Recording of selected Section Overhead (SDH) or Transport Overhead (SONET) bytes.
- Recording of selected Low or High Path Overhead (POH) bytes.
- Recording of TCM protocols (Tandem Connection Monitoring) in the N1 / Z6 byte (SONET) or N1 / N2 byte (SDH).
- Monitoring of TCM alarms in a separate display window.
- Error count of TCM measured values:
 - TC-IEC
 - TC-Diff (B3-IEC or BIP2-IEC)
 - TC-REI
 - TC-OEI
- Measurement of the circuit switching or dead time when Automatic Protection Switching (APS) is used.

This allows you to check simply if the APS protocol is adhered to and that the maximum permitted switching time is not exceeded.

To simplify this task, the APS codes are output in plain text when bytes K1 and K2 of the overhead are recorded.

You can also specify maximum value for the APS switching time, to provide a simple PASSED or FAILED result immediately after the measurement.

The TCM function allows you to investigate the TCM protocols received and carry out an error count and alarm monitoring.

The settings required are made using the optional dialog windows of the following virtual instruments:

- Signal Structure (APS)
- Overhead Analyzer (recording overhead bytes)

Notes:

Operation

1 Recording selected bytes (Overhead Capture)

1.1 Function



The “Capture” function is opened from the “Overhead Analyzer” window. After the byte has been selected using the cursor, the “Capture” dialog is opened using the Capture menu command.

The “Capture” function can record a single byte or two bytes simultaneously if bytes K1 and K2 are recorded.

A trigger condition is set to start the recording. When this trigger condition occurs, the instrument records all changes in the selected byte. The record includes timestamps and the contents of the byte.

If you set N1/N2 or N1/Z6 as the trigger condition, the function will look for the TCM FAS word. When it is detected, all bytes will be captured (not just the change). This allows you to capture and display complete 76 byte protocols.

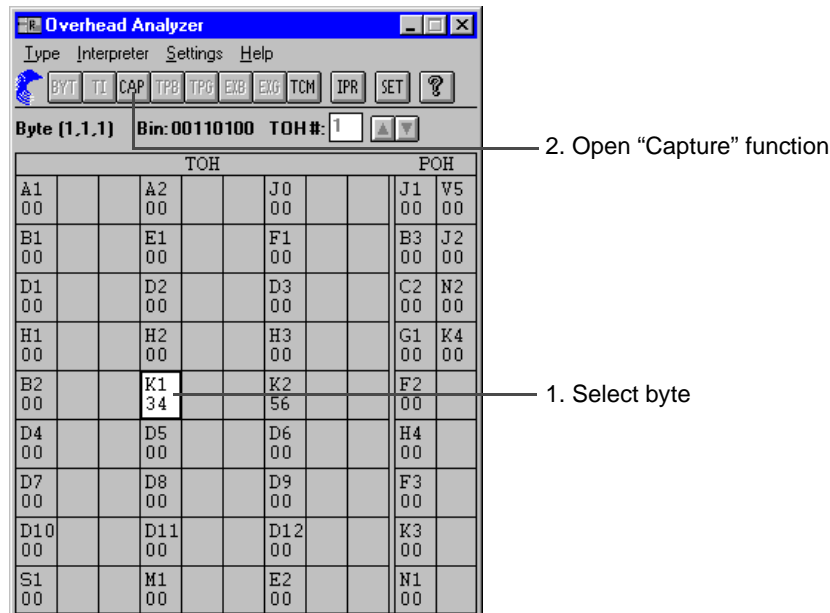


Fig. O-1 “Overhead Analyzer” window with “CAP” action button (option BN 3035/90.15)

Basic procedure

- ✓ Open the “Overhead Analyzer” window.
 - ✓ Set a SDH or SONET signal structure.
1. Mark the required overhead byte, e.g. K1.
 2. Click on the “CAP” button.
The “Byte Capture” dialog opens.

1.2 The “Byte Capture” dialog

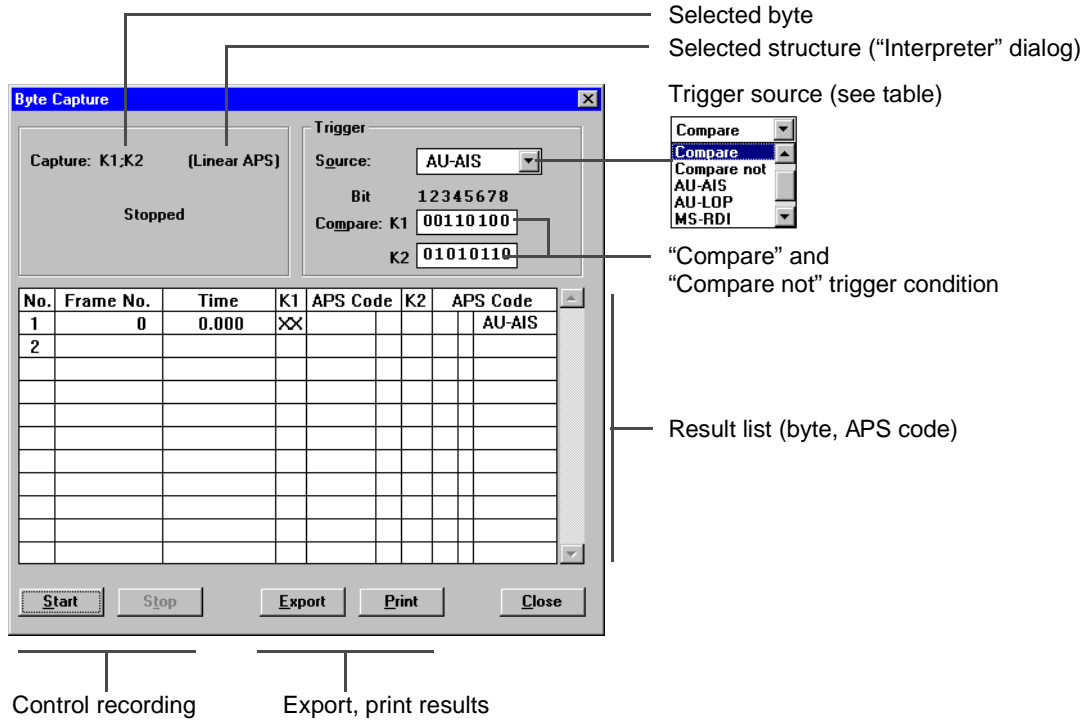


Fig. O-2 “Byte Capture” dialog of the “Overhead Analyzer” window

1.2.1 Setting the trigger conditions

The event that triggers the recording is set from the ‘Source’ list box:

Setting		Start condition
Manual		Immediately after START.
Compare		The content of the selected byte must agree with the compare value. Don't care values can be set with 'X'.
Compare not		Inverse of the Compare condition. The record starts when the value no longer agrees with the compare value.
AU-AIS	AIS-P	Start when AU-AIS or AIS-P occurs.
AU-LOP	LOP-P	Start when AU-LOP or LOP-P occurs.
MS-RDI	RDI-L	Start when MS-RDI or RDI-L occurs.
MS-AIS	AIS-L	Start when MS-AIS or AIS-L occurs.
N1/N2-TCM	N1/Z6-TCM	Starts recording TCM frames when the TCM FAS word has occurred (Tandem Connection Monitoring). Requirement: The N1/N2 or N1/Z6 byte is activated for Tandem Connection Monitoring.

Table O-1 Events available from the “Source” list box

1.3.2 Recording TCM frames

- ⇒ Click the “START” button to prepare for recording.
Recording starts as soon as the TCM FAS word is detected. Complete TCM frames are captured and displayed. The first eight bytes, which contain the TCM FAS word, are also output.

Ending the recording

- ⇒ The recording ends automatically when the buffer is full (max. 3.5 complete frames)
– or –
- ⇒ Click the “STOP” button.

Result display

No.	Frame No.	Time	IEC	AIS	REI	OEI	Binary	Hex

Labels for columns:

- No.: Item no..
- Frame No.: Decimal display
- Time: Time in hh:mm:ss.ms
- IEC: Incoming Error Count
- AIS: TCM AIS alarm indicator
- REI: TCM Remote Error Indication indicator
- OEI: Outgoing Error Indication indicator
- Binary: Binary value of N1/N2(Z6) byte
- Hex: Hexadecimal value of N1/N2(Z6) byte

Fig. O-5 TCM frame result display in the “Byte Capture” dialog window

Example

No.	Frame No.	Time	IEC	AIS	REI	OEI	Binary	Hex
1	1	00:00:00.000	0				00000011	03
2	2	00:00:00.000	0		X		00001011	0B
3	3	00:00:00.000	0			X	00000111	07

Fig. O-6 Example result

1.3.3 Recording further SOH/TOH or POH bytes

- ⇒ Click the “START” button to prepare to start the recording.
The record starts as soon as the pre-set trigger condition occurs.
The changes in the selected byte are recorded frame by frame with timestamp.

Ending the recording

- ⇒ Recording stops automatically when the buffer is full (max. 265 items)
– or –
- ⇒ Click the “STOP” button.

Result display

No.	Frame No.	Time	Hex	Binary	ASCII

Labels and their corresponding columns:

- Item no. → No.
- Time in hh:mm:ss.ms → Time
- Byte as 2-digit hexadecimal value → Hex
- Binary display → Binary
- ASCII character → ASCII

Fig. O-7 Byte capture results in “Byte Capture” dialog window

Example

No.	Frame No.	Time	Hex	Binary	ASCII
1	0	00:00:00.000	20	00100000	

Fig. O-8 Example result

1.3.4 Recording when defects are present

If the defects LOF, LOS and OOF occur, recording is interrupted.

When the defects disappear, recording resumes. The duration of the LOS defect is not measured with frame accuracy.

2 Measuring the APS switching or dead time

2.1 Function



APS stands for Automatic Protection Switching. This is a SDH network function which prevents connections from being interrupted for long periods if a line fails. If a problem occurs on the line, the circuit is automatically switched to a back-up line. The switching time must meet certain criteria. The ANT-20 checks these criteria by measuring the length of time that a certain event persists (e.g. AIS or loss of test pattern) after APS is triggered. The measured time is compared with a pre-set threshold value. This provides the basis for a simple PASSED / FAILED assessment.

“APS” measurement is invoked from the “Signal Structure” window.

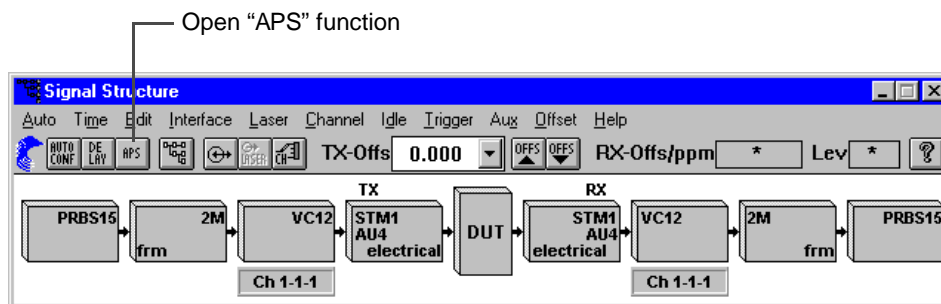


Fig. O-9 “Signal Structure” window with “APS” button (option BN 3035/90.15)

Basic procedure

- ✓ Open the “Signal Structure” window.
- ⇒ Click on the “APS” button.
- The “APS Tester” dialog opens.

2.2 The “APS Time Measurement” dialog

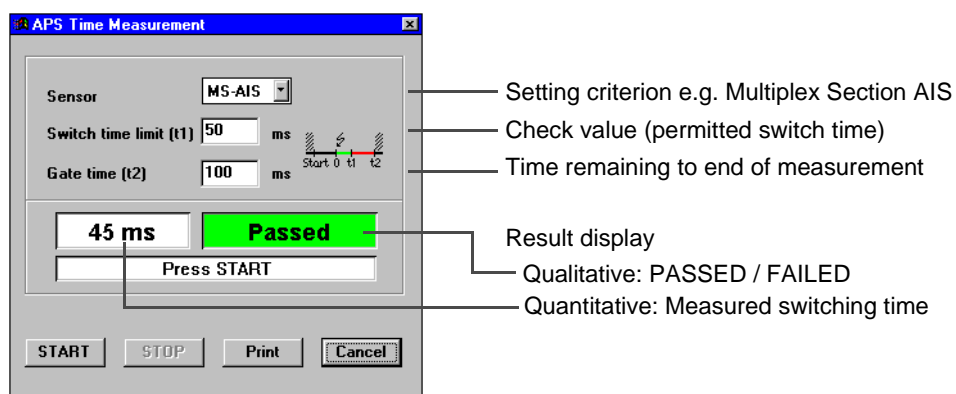


Fig. O-10 “APS Time Measurement” dialog



2.2.1 Setting the switch event

The event to be used to trigger switching and to be measured is set from the “Sensor” list box.

- MS-AIS measures the duration of a Multiplex Section Alarm.
- TSE measures the duration of loss of test pattern (PRBS).

Tip: If the sensor criterion is already present at the start of the measurement, the switching time cannot be measured. To correctly detect loss of test pattern (Sensor = TSE) the base error rate of the path should not exceed $2 \cdot 10^{-4}$.

Switch time limit (t1): Setting the check value

The measured switching time is compared with the ‘Switch Time Limit’ value on completion of the measurement. If the measured value is less than or equal to the limit, the result is PASSED. Otherwise the result is FAILED.

Gate time (t2): Setting the measurement time

The measurement begins when the sensor event first occurs. It ends when the pre-set measurement time has elapsed. This allows multiple switching to be detected.

Result and status display

The following are displayed after the end of the measurement:

- Switching time
- Status message

Display	Meaning
PASSED	Measured value \leq Switch Time Limit
FAILED (Time)	Measured value $>$ Switch Time Limit
FAILED (Signal)	A non-permitted defect occurred during the measurement which blocked the sensor (e.g. LOS or LOF when Sensor = MS-AIS)

Table O-2 Display of test result after evaluation

2.3 Performing an APS measurement

Test setup and description

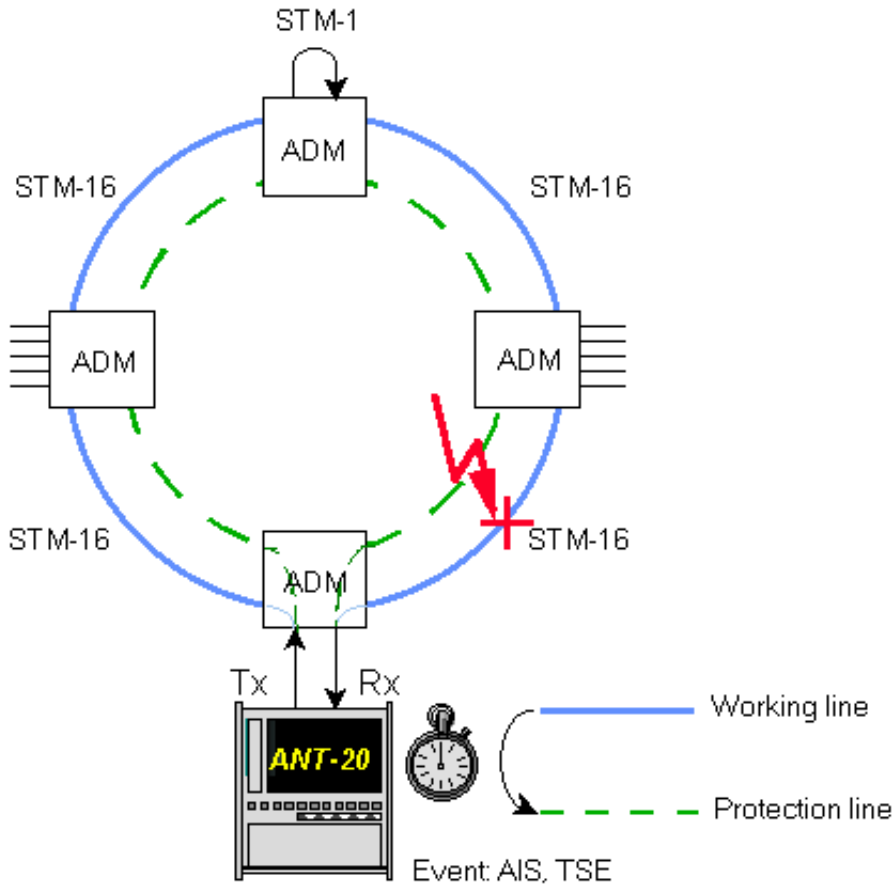


Fig. O-11 APS measurement setup

Interfaces

- Electrical balanced Rx : [12] Tx : [13]
- Electrical unbalanced Rx : [14] Tx : [15]
- Optical 52, 155, 622 Mbit/s Rx : [17] Tx : [18]

VIs required

- Signal Structure

Application settings

⇒ Add the VIs required to the list of VIs used in the Application Manager. The Application Manager should include at least the following instruments:



Fig. O-12 Application Manager after selecting the "Signal Structure" VI

Measurement

Settings

1. Click on the APS icon in the toolbar of the “Signal Structure” VI.
The “APS Time Measurement” dialog opens.

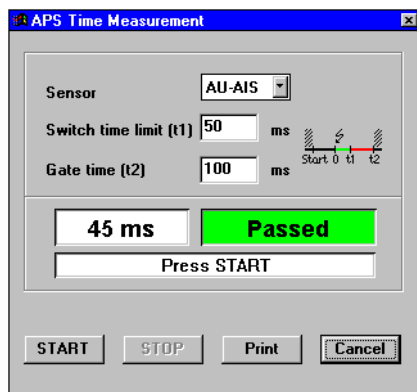


Fig. O-13 “APS Time Measurement” dialog

2. Select an event for triggering the switch operation from the “Sensor” list box.
3. Set the threshold value for the maximum switching time in the “Switch time limit (t1)” entry box.
4. Enter the overall measurement time required in the “Gate time (t2)” entry box. This is greater than the threshold value to allow detection of multiple switching.
5. Start the measurement by clicking on the “START” button.
6. Induce the switching condition, e.g. by interrupting the working line.
7. The measurement stops automatically.

Analysis

Two results are displayed after the measurement ends:

- The overall duration of the event selected from the “Sensor” list box.
- Interpretation of the measured value (see Tab. 2).

Notes:



Specifications

1 Overhead Capture

Function

The Capture function is used to record one byte of the SOH/TOH (or two bytes simultaneously when recording K1, K2) or one byte of the low/high path POH.

Capture bytes

STS-1, STM-0, STM-1, STS3, STS3c	all SOH/TOH/POH bytes
STM-4, STM-16 ¹	all SOH #1 bytes except A1, A2, B1 all POH bytes
OC-12, OC-48 ¹	all TOH #1 bytes except A1, A2, B1 all POH bytes
Buffer length	265 bytes for single byte recording 200 bytes for double byte recording
Triggering	recording starts manually or when trigger condition occurs

1 STM-16, OC-48: ANT-20/ANT-20E

Trigger events

Alarms	MS-AIS (AIS-L), AU-AIS (AIS-P), MS-RDI (RDI-L), AU-LOP (LOP-P)
Compare/Compare not	occurrence of a certain value in the capture byte or non-occurrence of this value (don't care values also possible)
N1/N2 - TCM (N1/Z6 - TCM)	all bytes including the detected FAS bytes are recorded when the TCM FAS word is detected
Resolution	frame
Time display	frame number, hh:mm:ss.ms
Maximum recording time	99 h
Result display	number, frames since trigger, time elapsed since trigger, byte value in hexadecimal, binary and ASCII codes, plain text for K1, K2 (APS)

2 APS switching time measurement

Sensor selection	MS-AIS, AU-AIS, TU-AIS, TSE, AIS-L, AIS-P, AIS-V
Resolution	1 ms
Measurement error	(see Tab. S-1)
Minimum detectable switching time	125 μ s
Maximum measurable switching time2 s
Maximum permitted base BER for TSE sensor2 E-4

Hierarchy	Sensor	Maximum error
SDH	MS-AIS, AU-AIS, TU-AIS	± 1 ms
SONET	AIS-L, AIS-P, AIS-V	± 1 ms
PDH unframed	BE	± 2 ms
PDH framed	TSE	± 2 ms + T_{sync}^1
DSn unframed	TSE	± 2 ms
DSn framed	TSE	± 2 ms + T_{sync}^1

1 T_{sync} is the frame synchronization time included in the measurement

Table S-1 Maximum measurement error

Hierarchy	T_{sync} (typ.)
E4 (140 Mbit/s)	0.1 ms
E3 (34 Mbit/s)	0.1 ms
E2 (8 Mbit/s)	1 ms
E1 (2 Mbit/s)	2 ms
DS3 (45 Mbit/s)	6 ms
DS1 SF (1.5 Mbit/s)	3 ms
DS1 ESF (1.5 Mbit/s)	6 ms

Table S-2 Typical values of T_{sync}