Specifications ANT-20 (Mainframe)

The ANT-20 Mainframe includes

- Generator and analyzer for electrical STM-1 signals allowing:
  - Simulation and evaluation in the SOH/POH
  - Generation and analysis of Anomalies and Defects
  - Pointer generator and analyzer
- Generator and analyzer for PDH BERT at 2, 8, 34 and 140 Mbit/s with framed and unframed patterns
- C12 mapping
- 1 extension slot
- Ethernet and USB interface

Generator unit

Digital outputs

Interfaces to ITU-T Recommendation G.703

75 Ω unbalanced output, adapter jack selectable from Versacon 9 adapter system

Bit rates and line codes

2048, 8448 and 34368 kbit/s	HDB3, CMI
139264 and 155520 kbit/s	CMI

120 Ω balanced output, Lemosa jack

Bit rate and line codes

2048 kbit/s	HDB3, CMI
Bit rate offset	±500 ppm
Step size	0.001 ppm

Clock

Internal clock generation

at all of the bit rates listed above.

Clock stability	±2 ppm

Synchronisation to external signals

via 75 Ω unbalanced input, BNC jack:

- Reference clock 2048 kHz and 1544 kHz
- 2048 kbit/s (HDB3), 1544 kbit/s (B8ZS) or
- Receive signal

Clock outputs

- Clock output at frequency of generator signal, approx. 400 mV (when terminated into 75 Ω), BNC jack.

2048 kHz reference clock output via trigger output

STM-1 output signal

Generation of a STM-1 signal conforming to ITU-T Recommendation G.707

Mappings

One selectable STM-1 mapping is included in the basic instrument. Other mappings can be added as needed.

Content of the selected container:

- Framed or unframed PDH test pattern
- PDH multiplex signal (with 64k/140M Mux/Demux chain option)
- External PDH signal (with D&I option)
- Test pattern without stuffing bits (bulk signal to O.181)

Content of non-selected containers	framed PRBS 2^{11}–1

The various mappings are described along with the options.

Generation of Pointer actions (Figure 1)

Generation of pointer actions at the AU and TU levels simultaneously.

- Pointer sequences to G.783 with programmable spacing
- Pointer increment/decrement (continuously repeated)
- Single pointer
- Pointer value setting with or without NDF

Trigger types: Single or continuous repeat

Content of SOH and POH bytes

The content of all bytes with the exception of B1/B2/B3 and H1 to H4 is programmable with any byte or a user defined byte-sequence p in m in n (p frames in m frames and the entire sequence repeated n times) can be inserted.

Bytes E1, E2, F1, F2, and byte groups D1 to D3 and D4 to D12:

- Transmission of a PRBS test pattern with bit error insertion (see test patterns)
- Insertion of an external data signal via V.11 interface (also for K1, K2, K3, N1 and N2)

Trace identifier

J0, J1, J2	programmable 16 byte ASCII sequence with CRC
J1, J2, additionally	programmable 64 byte ASCII sequence
H4 byte	4 or 48 byte sequence

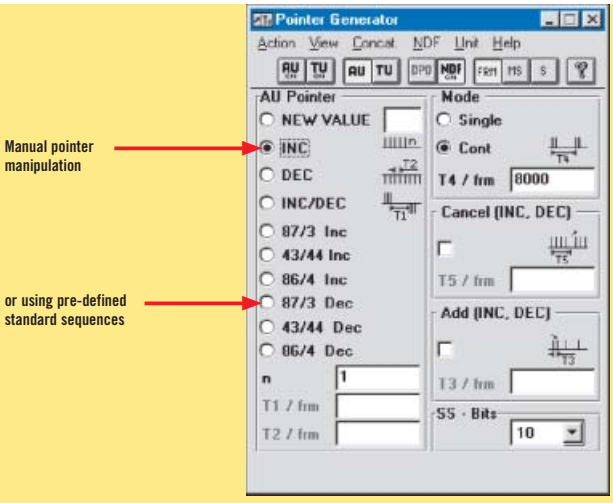

figure 1 Pointer actions

Error insertion

Error types: B1, B2, B3 parity errors, frame alignment signal errors, MS-REI, HP-REI, bit errors in test pattern, code errors (single errors)

Triggering

Single error or error ratio	2×10^{-3} to 1×10^{-10}
for B1, B3, HP-REI	2×10^{-4} to 1×10^{-10}
for bit errors	2×10^{-2} to 1×10^{-9}
Step size for mantissa and exponent	1

Burst error: m anomalies in n periods

For FAS, B1, B2, B3, MS-REI, HP-REI	m = 1 to 4.8×10^6 and n = 2 to 8001 frames or 0.2 s to 600 s

Alarm generation, dynamic

Alarm types	LOS, LOF, HP-PLM, MS-AIS, MS-RDI, AU-LOP, AU-AIS, HP-UNEQ, HP-RDI, HP-RDIEP, HP-RDIES, HP-RDIEC
m alarms in n frames	m = 1 to n–1, n_{max} = 8000

or

t1 alarm active, t2 alarm passive	t1 = 0 to 60 s, t2 = 0 to 600 s

Alarm generation, static (on/off)

Alarm types	LOS, LOF, MS-AIS, RS-TIM, MS-RDI, AU-LOP, AU-AIS, HP-UNEQU, HP-PLM, HP-TIM, HP-RDI, HP-RDIEP, HP-RDIES, HP-RDIEC

PDH output signals

Signal structures for all bit rates:

– Unframed test pattern

– Framed test pattern (to ITU-T O.150); CRC-4 selectable for 2 Mbps

Error insertion

Error types	bit errors, FAS errors, code errors (single errors)
Trigger types: Single error or error rate	1×10^{-2} to 1×10^{-9}
Step size for mantissa and exponent	1

Alarm generation, dynamic

Alarm types	LOF, RDI
m alarms in n frames	m = 1 to n–1, n_{max} = 1000

Alarm generation, static (on/off)

Alarm types	LOS, LOF, AIS, RDI

Test patterns

Pseudo-random bit sequences

PRBS: 2^{11}–1, 2^{15}–1, 2^{20}–1, 2^{23}–1, 2^{11}–1 inv., 2^{15}–1 inv., 2^{20}–1 inv., 2^{23}–1 inv.

Programmable word

Length	16 bits

Receiver unit

Digital inputs

Interfaces to ITU-T Recommendation G.703

75 Ω unbalanced input; adapter jack selectable from Versacon 9 adapter system

Bit rates and line codes

2048, 8448 and 34 368 kbit/s	HDB3, CMI
139 264 and 155 520 kbit/s	CMI

120 Ω balanced input, Lemosa jack

Bit rate and line codes

2048 kbit/s	HDB3, CMI
Clock recovery pulling range	±500 ppm

Selectable input gain

CMI coded	15 to 23 dB
B3ZS, B8ZS, HDB3, AMI coded	15 to 26 dB

Selectable adaptive equalizers for 1544, 2048, 34 368, 44 736, 51 840, 139 264 and 155 520 kbps

Monitor input for STM-1 and STM-4 NRZ signals

STM-1 and PDH receive signals

Signal structures as for generator unit

C12 mapping (2 Mbps in STM-1, AU-3/AU-4)

Modes	asynchronous, byte synchronous (floating)
Error insertion and measurement	
Additional error types	BIP2, B3 parity errors, LP-REI, LP-BIP

Alarm generation, dynamic

Alarm types	TU-LOP, TU-AIS, LP-PLM, TU-LOM, LP-UNEQ, LP-RDI, LP-RDIEP, LP-RDIES, LP-RDIEC, LP-RFI
m alarms in n frames	m = 1 to n–1, n_{max} = 8000

or

t1 alarm active, t2 alarm passive	t1 = 0 to 60 s, t2 = 0 to 600 s

Alarm generation, static (on/off) and evaluation

Alarm types	TU-LOP, TU-AIS, TU-LOM, LP-UNEQ, LP-PLM, LP-TIM, LP-RDI, LP-RDIEP, LP-RDIES, LP-RDIEC, LP-RFI
Alarm detection only	TU-NDF

Trigger output

75 Ω BNC connector, HCMOS signal level

Pulse output for received bit errors, transmit frame trigger, transmit pattern trigger or 2048 kHz reference clock

Automatic modes

Autoconfiguration

Automatically sets the ANT-20 to the input signal. The routine searches at the electrical and optical interfaces for the presence of standard PDH and STM-N signals (G.703, G.707, O.151, O.181) and the payload contents in channel 1.

Automatic SCAN function

The SCAN function permits sequential testing of all C11 or C12 channels via AU-3 or AU-4 in a SDH signal. The ANT-20 receiver checks for alarms in the receive signal, the SDH structure and all channels, and for synchronization of the selected test pattern in all channels. The results (OK/not OK) for each channel are entered in a matrix. The generator runs simultaneously and can be used to stimulate the device under test.

Automatic TROUBLE SCAN function

The TROUBLE SCAN function (figure 2) permits sequential testing of all C11 or C12 channels via AU-3 or AU-4 in a SDH signal. The ANT-20 receiver checks for alarms in the receive signal, the SDH structure and all channels. The results (OK/not OK) for each channel are entered in a matrix. A detailed alarm history can be displayed by selecting a channel from the matrix. The alarm status of individual channels can be displayed following the measurement. Only the receive channels are altered during a TROUBLE SCAN.

AutoScan function

This automatic "AutoScan" function (figure 3) allows you to rapidly check the signal structure, the mapping used, the trace identifier and the payload – even with mixed mapped signals. The ANT-20 receiver analyzes the incoming received signal and provides a clear overview of all the signals present in the composite receive signal. The variable scan depth setting allows even complex signal structures to be resolved and displayed clearly. All the displayed results can be printed out. Delay time 1 to 10 s.

Automatic SEARCH function

Channel shifts in the payload may occur when measuring complex network elements, depending on the configuration of the device under test. The SEARCH function permits rapid automatic location of the test channel (C11 or C12 with defined PRBS) in the payload of a SDH signal. The ANT-20 receiver checks for alarms in the receive signal, the SDH structure and all channels, and for synchronization of the selected test pattern in all channels. The results (OK/not OK) for each channel are entered in a matrix. An OK result indicates that the corresponding channel contains the signal searched for. Only the receive channels are altered during a SEARCH.

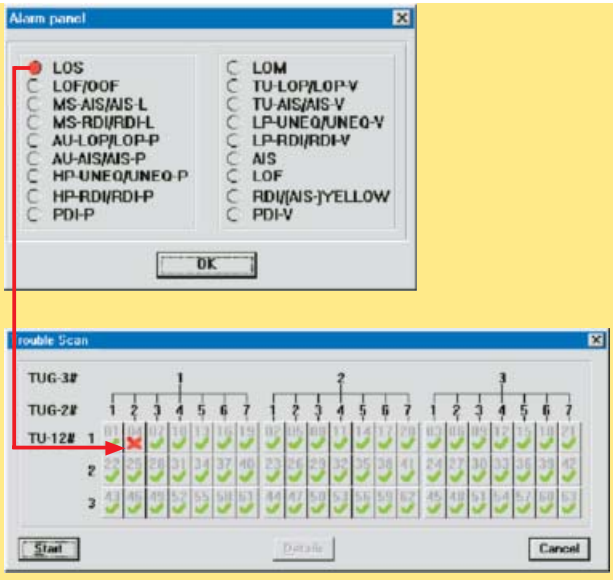

figure 2 Trouble scan

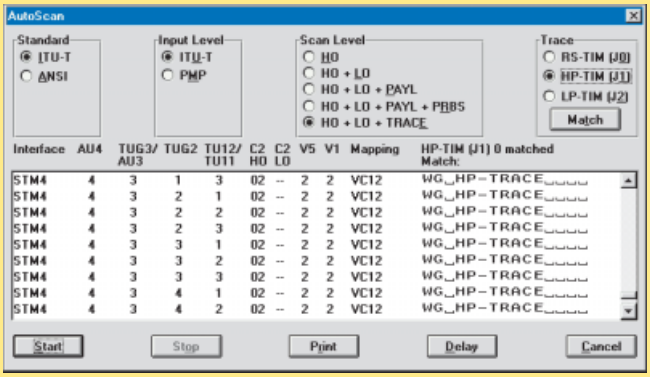

Figure 3: AutoScan

Measurement types

Error measurements

Error types	B1, B2, B3 parity errors
	MS-REI, HP-REI, bit errors in test pattern, code errors

Analysis of AU and TU pointer actions (figure 4)

Display of
- Number of pointer operations: Increment, Decrement, Sum (Increment + Decrement), Difference (Increment – Decrement)
- Pointer value

Clock frequency measurement

The deviation of the input signal clock frequency from the nominal frequency is displayed in ppm.

Alarm detection

All alarms are evaluated and displayed in parallel

Alarm types	LOS, OOF, LOF, MS-AIS, MS-RDI, RS-TIM, LTI, AU-AIS, AU-LOP, AU-NDF, HP-RDI, HP-UNEQ, HP-TIM, HP-PLM, AIS, RDI, LSS

SOH and POH evaluation

- Display of complete SOH and POH, e.g. interpretation of APS information in K1 and K2

For the bytes E1, E2, F1, F2 and byte groups D1 to D3 and D4 to D12:
- BERT using test pattern from the generator unit
- Output of the data signal via the V.11 interface (also for K1, K2, K3, N1 and N2)

For the Trace Identifier

– J0	display of 16 byte ASCII sequence
– J1, J2	display of 16 or 64 byte ASCII sequence

Measurement interval

Variable	1 second to 99 days
Measurement start	manual or automatic timer (user setting)
Measurement stop	manual or automatic timer (user setting)

Memory for errors, pointer operations and alarms

Resolution of error events and pointers	1 s
Alarm resolution	100 ms
Memory capacity	up to 1 million entries (approx. 100 days at 7 entries per minute)

Acustic Indication of Anomalies and Defects

Beeper upon any anomaly and defect.

Evaluation of PDH and SDH systems to ITU-T Recommendation G.821

ES, EFS, SES, DM and UAS are evaluated.
Pass/fail assessment based on line length allocation of 0.1 to 100%. The SES and DM thresholds are user-settable. Evaluation for higher bit rates (up to 140 Mbit/s) is obtained using a multiplex factor as per G.821, Annex D.
Measurements can be made using the following events:

PDH systems	bit errors, FAS2, FAS8, FAS34, FAS140, CRC and E bit errors
SDH systems	payload bit errors (PDH and bulk), overhead bytes E1, E2, F2, D1 to D3, D4 to D12

Evaluation to ITU-T Recommendation G.826

EB, BBE, ES, EFS, SES and UAS are evaluated.
Pass/fail assessment based on line length allocation of 0.1 to 100%.
The SES and UAS thresholds are user-settable.

In-Service Measurement (ISM)

Simultaneous in-service measurement of near end and far end of a selected path:
- Near end: B1, B2, HP-B3, LP-B3, BIP2, FAS at 140/34/8 or 2 Mbit/s, CRC-4
- Far end: HP-REI, LP-REI, E bit at 2 Mbit/s

Out of Service measurement (OOS)

Out of service measurement using bit errors in the test pattern (for PDH and SDH).

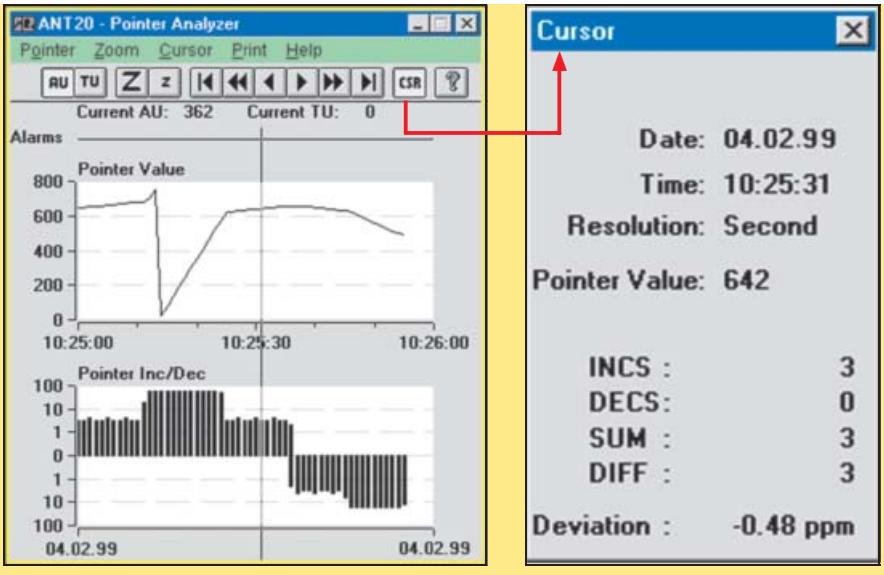

figure 4 Graphic pointers. Display showing additional evaluation of cursor position

Evaluation of PDH and SDH systems to ITU-T Recommendation M.2100

This recommendation describes requirements during line-up and maintenance (in-service) ES, EFS, SES and UAS are evaluated. Pass/fail assessment based on line length allocation of 0.1 to 100%. The UAS and BISO (bringing into service objectives) thresholds are user-settable.

ISM simultaneously for near end and far end of a selected path:

PDH systems, near end	bit errors, FAS2, FAS8, FAS34, FAS140, CRC-4
far end	E bit at 2 Mbps
SDH systems	payload bit errors (PDH and bulk), overhead bytes E1, E2, F2, D1 to D3, D4 to D12

This operating mode allows application of the "Bringing into Service" procedures as per ITU-T Rec. M.2110 and the determination of "Performance Information" as per ITU-T Rec. M.2120.

Evaluation of SDH systems to ITU-T Recommendation G.828 and G.829

The G.828 defines error performance parameters and objectives for international synchronous paths.

ES, EFS, SES, BBE, SEP and UAS are evaluated.

Pass/fail assessment based on line length allocation of 0.1 to 100%.

The SES and UAS thresholds are user-settable. The SEP can be switched off for assessment.

The recommendation G.829 defines error performance events and block structures for SDH multiplex and regenerator sections.

Evaluation of SDH systems to ITU-T Recommendation M.2101

This recommendation provides limits for bringing-into-service and maintenance of interantional SDH paths and multiplex sections.

ES, EFS, SES, BBE, SEP and UAS are evaluated.

Pass/fail assessment based on line length allocation of 0.1 to 100%.

The UAS and BISO (bringing into service objectives) thresholds are user-settable.

ISM simultaneously for near end and far end of a selected path:

PDH systems, near end	B1, B2SUM, B3, BIP8, BIP2, bit errors (TSE)
far end	MS-REI, HP-REI, LP-REI

Delay measurement

A delay measurement is used to line-up satellite hops, to test the maximum permitted latency in storage exchanges and cross-connect systems and to check the loop circuits of regenerators. The ANT-20 measures the time taken for the test pattern to be transmitted from the generator back to the receiver via the path under test.

The measurement is made on the test patterns in the selected channel, in the containers (bulk or PDH) for SDH or in the selected channel at the lowest hierarchy level of PDH multiplex systems.

To avoid ambiguities in the measurement, two measurement times are provided.

Measurement range

Bit rates from 8 to 155 Mbit/s	1 µs to 1 s
Bit rate 2 Mbit/s	10 µs to 5 s
Bit rate 64 kbit/s	100 µs to 16 s

Off-line analysis software

The software runs on standard PCs and permits comprehensive analysis of stored ANT-20 results.

After loading the results, the ANT-20 settings during the measurement and the stored results can be accessed.

Zoom and filter functions allow detailed evaluations.

The processed results can be exported in CSV format for importing into other programs such as MS Excel or MS Word for Windows for producing documentation.

Results display and instrument operation

Numerical display

Display of absolute and relative values for all error types

Intermediate results every 1 s to 99 min

Graphical display (histogram) (Figure 6)

Display of errors, pointer operations/values and alarms as bargraphs vs. time

Units, time axis seconds, minutes, 15 minutes, hours, days

Tabular display

Display of all alarm and error events with time stamp.

Result printout

ANT-20 supports a variety of dot-matrix, inkjet and laser printers (Windows Print Manager).

Printer interfaces

Serial	V.24/RS232
Parallel	Centronics/EPP/IEEE P 1284

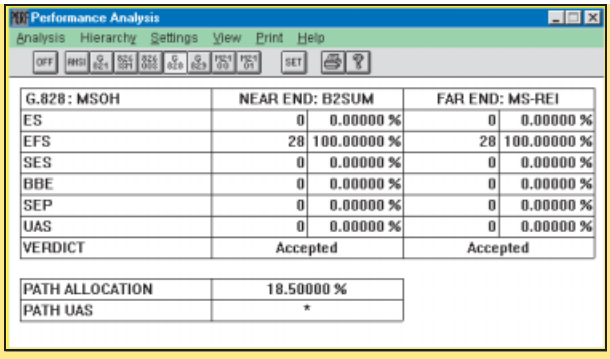

figure 5 Performance analysis to ITU-T G.828/G.829

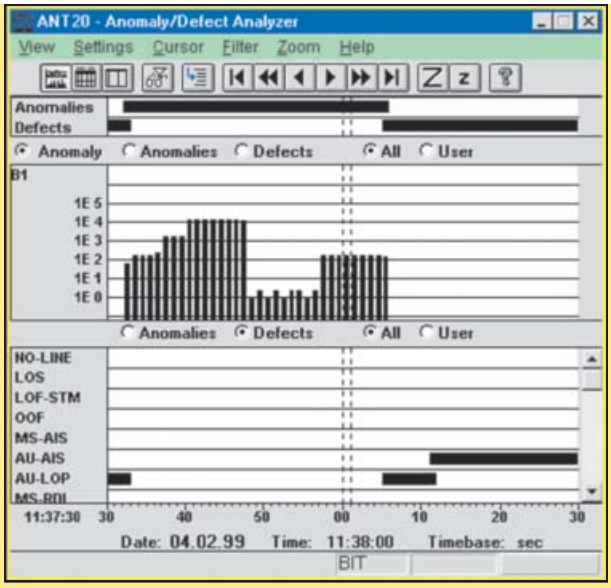

figure 6 Histogram result display

Result export

Results are stored in a database and can be processed using standard PC software.

Instrument operation

ANT-20 is operated using the standard Microsoft® Windows™ graphical user interface. Operation is menu-controlled using a trackball or optional touchscreen. A mouse can also be connected if desired.

Application selection and storage

ANT-20 includes an applications library to which customer-specific applications can be added. All applications are stored internally on the built-in hard disk drive and can be copied to any other ANT-20 via floppy disk. Easy to use filter functions allow quick selection of the desired application.

Display

A large display screen is available for the ANT-20:

Color TFT screen (touchscreen optional)	10.4″, 256 colors
Resolution	640 × 480 pixels (VGA standard)

Built-in PC

ANT-20 uses a Pentium PC as internal controller so that standard PC applications can also be run on the instrument.

RAM capacity	64 MB
Floppy drive	3.5″, 1.44 MB
Hard disk drive	6 GB (minimum)

USB interface, 10/100 Mbit/s Ethernet interface are included.

Keyboard

Full keyboard for text input, extended PC applications and future requirements. The keyboard is protected by a fold back cover.
An additional connector is provided for a standard PC keyboard.

External display connector

Simultaneous display with built-in screen interface	VGA standard

PCMCIA interface

Type	PCMCIA 2.1 types I, II and III

The PCMCIA interface provides access to GPIB, LANs, etc., via adapter cards.

Power outage function

In the event of an AC line power failure during a measurement, ANT-20 saves all data. As soon as the AC line voltage is reestablished, the measurement is resumed. Previous results are retained and the time of the power failure is recorded along with other events.

General specifications

– *Power supply*		
AC line voltage, automatic switching		100 to 127 V and 220 to 240 V
AC line frequency		50/60 Hz
Power consumption (all options fitted)		max. 230 VA
Safety class to IEC 1010-1		Class I
– *Ambient temperature*		
Nominal range of use		+5 to +40ºC (41 to 104ºF)
Storage and transport range		−20 to +70ºC (−4 to 158ºF)
– *Dimensions (w × h × d)*	in mm	approx. 320 × 350 × 170
	in inches	approx. 12.6 × 13.8 × 6.7
– *Weight*		approx. 10 kg / 22 lb