TTC INTERCEPTOR® 147

Communications Analyser

TTC™

Complete 2M Testing and handheld convenience.

Installing and maintaining 2M and data circuits in the field requires the right tools. The INTERCEPTOR 147 Communications Analyser was specifically designed to meet this challenge by providing innovative and powerful testing features in an easy-to-use, rugged package.

The INTERCEPTOR 147 Communications Analyser offers a complete set of in-service and out-of-service 2M tests and measurements to evaluate circuit performance and isolate problems. The inclusion of five standard data interfaces allows full span testing at subrate access points as well as a mux/demux mode which allows for wrapping around multiplexers and NTUs. Advanced network synchronisation and VF analysis add to the unit's versatility.

Set-ups are simplified because the INTERCEPTOR 147 Communications Analyser automatically configures to the signal under test. Status indicators, result LEDs, and summary categories provide an instant view of instrument set-up and circuit activity, making problem isolation quick and easy.

The powerful testing capabilities of the unit, combined with field ruggedness, and a weight of just 1.84 kg (4 pounds), make the INTERCEPTOR 147 Communications Analyser ideal for any field service situation.

Highlights

- **Supports Five Data Communications Interfaces**
  V.11 (RS-449), V.24 (RS-232), V.35/306, X.21, and 64 kbps codirectional, to provide synchronous and asynchronous testing.

- **Live 2M Testing**
  Thoroughly test 2M, Nx64 kbps, and GSM 16 kbps subrate services. Insert monitor and test patterns on any selected timeslot without affecting live traffic.

- **Test Subrate and Data Applications**
  Enables synchronous and asynchronous testing and DTE and DCE emulation rates from 50 bps to 2M.

- **Reduce Set-up Time**
  Auto-configuration instantly determines the framing and pattern, while the active TIMESLOTS display simplifies monitoring of channel call activity and loading.

- **Qualify VF, Data, and CAS**
  Monitor CAS signalling, data, and VF traffic using ABCD bit display, receive byte display, and built-in speaker.

- **Synchronise Network Timing**
  With Timing Analysis option, use standard pattern slip and frequency deviation measurements to diagnose faulty network timing.

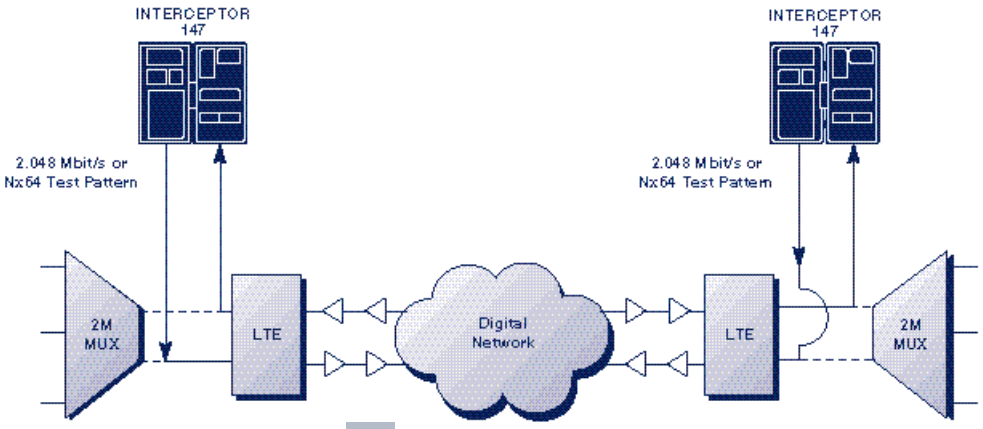
- **Test Switches and Cross-Connects**
  Configure the transmitter and receiver for different timeslots when testing through switches and cross-connects.

TTC's INTERCEPTOR 147 is a rugged field instrument.

- **Long-Term Testing**
  Remote control, automatic printing, and histogram capabilities allow unattended testing and long-term collection of data.

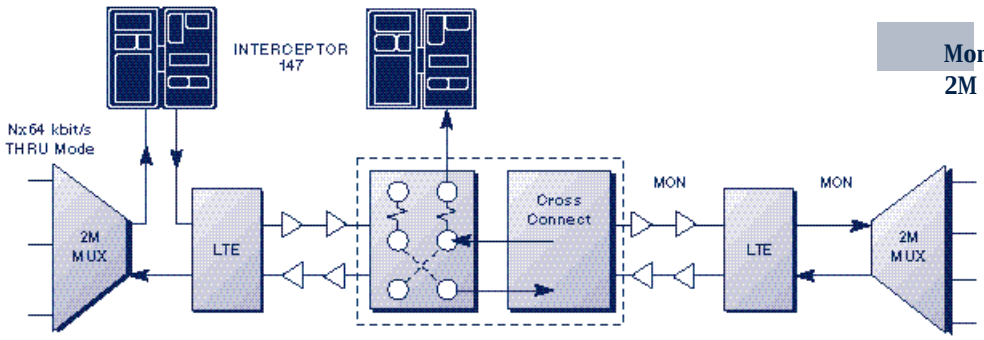
- **Control Loopbacks**
  Euro ISDN Loopcodes provides control of loopbacks in the NTE and LTE.

- **Hand-Held Convenience**
  Rugged and lightweight, ideal for the mobile technician.



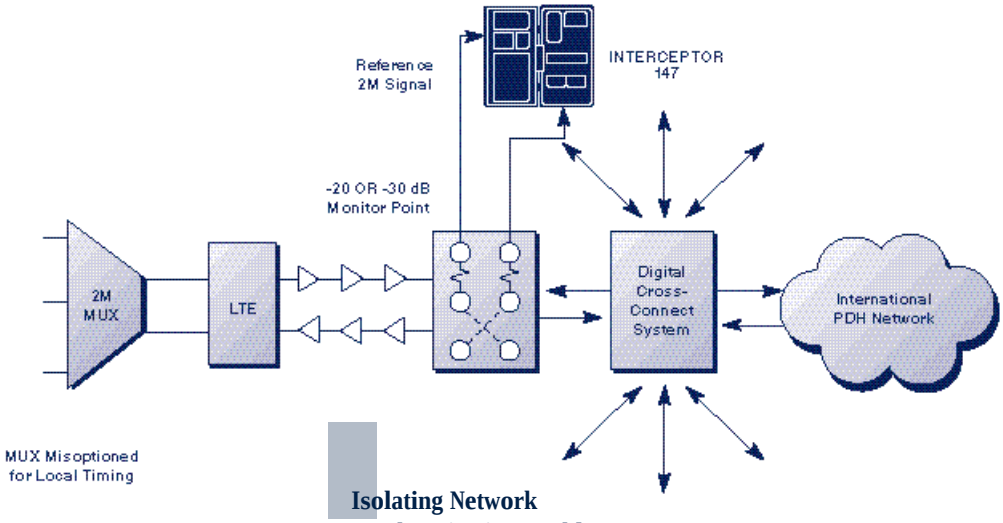
Installing and Commissioning Full and Subrate 2M Service

Installing and Commissioning Full and Subrate 2M Service. Thoroughly test 2M, Nx64 kbps, and GSM 16 kbps subrate services. Performance can be measured according to ITU-T recommendations G.821, G.826 and M.2100. Isolate problems resulting from timeslot delays, faulty line equipment, and misoptioned cross-connects, multiplexers and NTUs quickly and easily.



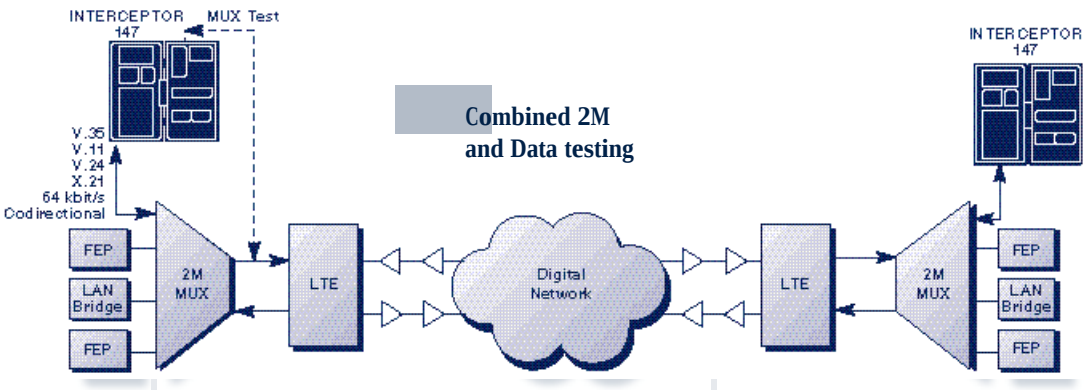
Monitoring Live 2M Circuits

Monitoring Live 2M Circuits. Monitoring live 2M circuits is simple with the INTERCEPTOR 147 Communications Analyser. Automatically determine the framing and pattern present on the circuit. The front panel LEDs immediately display the status of the line and show results at a glance. In-service measurements such as receive level, CRC errors, alarm status, receive frequency, timing slips (optional), and M.2100 analysis verify circuit quality without disrupting live traffic. ABCD bits can be monitored and voice timeslots can be dropped to the speaker to hear sound quality.



Isolating Network Synchronisation Problems

Isolating Network Synchronisation Problems. When combined with the Timing Analysis option, the INTERCEPTOR 147 Communications Analyser easily detects synchronisation problems. Advanced measurements such as frame slip, bit slip, and received frequency allow quick identification of differential timing problems that cause buffer overflow and clock variations. Because the INTERCEPTOR Timing Analysis option allows for a large variable frequency offset (±20,000 ppm), network elements can be stress tested to isolate and correct marginal sources.



Combined 2M and Data testing

Combined 2M and Data testing. The addition of five data interfaces to the INTERCEPTOR 147 Communications Analyser enables it to test virtually anywhere in the 2M network. It can replace a DTE or DCE (such as a multiplexer, host computer, NTU or PBX), providing the flexibility to fully test the network in various configurations. Tests can be performed end-to-end, using loopbacks (LL, RL), using mux mode to wrap around a multiplexer, or in thru mode. This capability offers maximum flexibility to sectionalise and locate problems in- or out-of-service. Round trip delay is also measured to verify circuit routing and buffering.

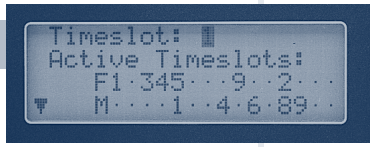
Qualify VF, Data, and CAS. Monitor CAS signalling data and VF traffic using ABCD bit display, receive byte display, and built-in speaker. Variable rate tone insertion and VF peak, level, and frequency measurements thoroughly test and verify transmission for fax and voice applications.

Test Subrate and Data Applications. Enables synchronous and asynchronous testing and DTE and DCE emulation rates from 50 bps to 2M. For wrap-around testing of network components, mux/demux mode simultaneously tests from 2M and data interface access points. Signalling status indicator, lead control, and delay measurement make for a complete solution for testing at the DTE/DCE interface.

Timing Analysis Option

With this option, the INTERCEPTOR 147 Communications Analyser becomes an indispensable tool for locating timing discrepancies between equipment and networks. Bit slip and Frame slip measurements differentiate between controlled and uncontrolled timing slippage. Transmit frequency offset stress tests to locate marginal components and the cause of network timing slips.

Active Timeslot Display

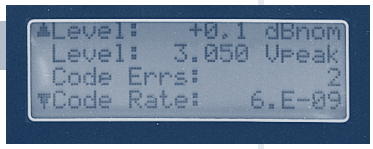


A glance at the screens shows traffic loading on all timeslots. The display distinguishes between idle and active timeslots and identifies FAS and MFAS framing.

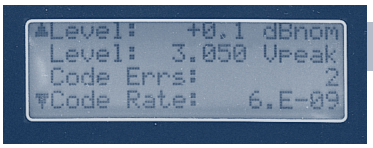
Mux Mode

With mux mode, the INTERCEPTOR 147 Communications Analyser can be configured to transmit from a data interface and receive the signal at a 2M, or fractional (Nx64 or Nx56 kbps) service, or transmit from a 2M service and receive at a data interface.

2M Level Measurement



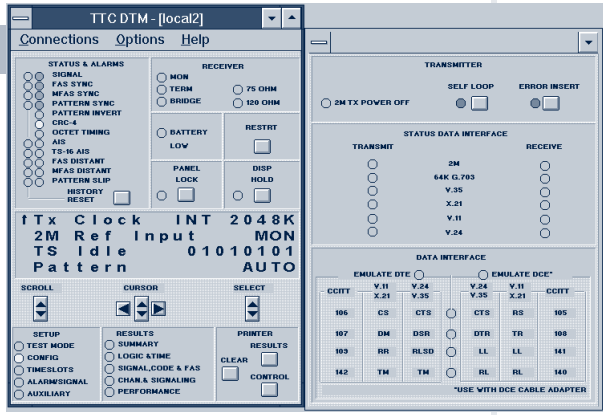
Measure the output level at 2M transmitters to isolate faulty equipment. Monitor the signal level at receivers to check for excessive cable attenuation.



Broadcast Mode

Test pattern or tone can be repeated on every timeslot with the INTERCEPTOR 147 Communications Analyser. This is particularly beneficial when used in conjunction with another Nx64 or data interface test instrument.

DTM Remote Control



Extend the reach of experienced technicians by using the INTERCEPTOR 147 Communications Analyser as a remote test probe. DTM software enables any PC to remotely control multiple units.

Measurements

Summary

Bit Errors, Code Errors, FAS Errors, MFAS Errors, CRC Errors, Pattern Losses, Pattern Slips, Received Frequency Deviation (ppm)

Logic and Time

Receive Pattern, Bit Errors, Bit Error Rate, Pattern Sync Losses, Pattern Slips, Elapsed Seconds, Test Seconds, Date, Time, Signal Lead Delay, Round Trip Delay, Character Errors (V.24 Async Only)

Signal, Code, and Frame

Received Frequency, Receive Frequency Deviation (ppm), Received Level (dB nom), Received Level (V peak), Code Errors, Code Error Rate, FAS Errors (Word or Bit), FAS Error Rate (Word or Bit) MFAS Errors, MFAS Error Rate, CRC-4 Errors, CRC-4 Error Rate, FAS Word, NFAS Word, MFAS Word, CRC-4 Word, REBE, Sa6 Bits, Bit Slip (timing analysis option), Frame Slip (timing analysis option)

Channel and Signalling

Active Timeslots, Received ABCD Signalling, Receive Byte, VF Frequency, VF Peak Code, VF Signal Level

[G.821, G.826 and M.2100 Performance Analysis]
[Euro ISDN Loopcodes]
[Euro ISDN Sa6 Message Display]

2M Specifications

Operating Modes

Framing: (ITU-T G.704)
- FAS, FAS-CRC, MFAS, MFAS-CRC, Unframed

2M Channel Access:
- 64 kbps, 56 kbps, 16 kbps timeslot access
- Contiguous or non-contiguous Nx64 or Nx56 kbps timeslots

Channel Associated Signalling Analysis:
- Display ABCD bits, Print signalling changes, Insert ABCD bits

Transmitter

Clock Sources:
- Internal (±5 ppm)
- Recovered
- Offset ±20,000 ppm in 1 ppm steps (timing analysis option)
- External (timing analysis option)

Encoding:
- HDB3, AMI

Output Connectors/Levels:

120 Ω balanced:
- (ITU-T G.703)

75 Ω unbalanced:
- 1.6/5.6 or BNC (ITU-T G.703)
- Serial 8-Pin DIN

Generator

Fixed Patterns:
- Mark, Space, 1:1, 1:3, 1:4, Program, Byte

Pseudorandom Patterns:
- 2^6-1, 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1

Other Patterns:
- QRSS, Delay

Tone:
- Variable 300 Hz to 3000 Hz, and +3 dB to -20 dB

Logic, FAS, Code Error Insertion:
- Single, 10-3, 5x10-3 rate

Receiver

Input Sensitivity:

Terminate - Cable Compensation:
- 0 dB to -22 dB

Bridge - Cable Compensation:
- +6 dB to -22 dB

Monitor - Resistive Attenuation:
- -18 dB to -30 dB

Input Impedance:

Terminate or monitor:
- 120 Ω balanced
- 75 Ω unbalanced

Bridge: >2000 Ω

Indicators

Signal, FAS Sync, MFAS Sync, Pattern Sync, Pattern Invert, CRC-4, AIS, TS-16 AIS, FAS Distant, MFAS Distant, Pattern Slip, Octet Timing, Control Leads

2M Signal Analysis:

Frequency Measurement Range:
- 56 kHz to 2.048 MHz (±5 ppm)

VF:
- Peak Code: -127 to +127
- Channel Level: -60 to +3 dBm (±0.5 dBm)

2M:
- Peak Voltage: 0 to 7 V (±3%)
- Level: -36 to 7.4 dBnom (±0.3 dBnom)

Datacom Specifications

V.11 (RS-449) Data Interface (Adapter cable required)

Data Rates:

Terminated and Unterminated (RS-422/423):
- Synchronous: 300 bps to 2.048 Mbps
- Synthesised: 50 bps to 2.048 Mbps in 1 bps steps (timing analysis option)

Receivers:

Termination Resistance (specified with fail-safe networks):
- 100 Ω, > 7000 Ω for signalling

Input Impedance:
- >5000 Ω (RCV DATA, RCV CLK, EXT TX CLK)

Input Threshold:
- ±0.2 V (A vs. B)

Loopback Support:
- Local (LL) and Remote (RL)

V.35/306 Data Interface (Adapter Cable Required)

Data Rates:
Synchronous:
300 bps to 2.048 Mbps
Synthesised:
50 bps to 2.048 Mbps in 1 bps steps (timing analyses Option)
Clock and Data Tolerances:
Delay, SCT to SD:
Approximately 70 ns typical
Skew, SCTE to SD:
Approximately 20 ns typical
Balanced Receivers:
Load Resistance:
100 Ω
Generator Impedance:
Less then 100 Ω
Loopback Support:
Local (LL) and Remote (RL)

X.21 Data interface[1]

Data Rates:
Synchronous:
300 bps to 2.048 Mbps
Synthesised:
50 bps to 2.048 Mbps in 1 bps steps
(timing analysis option)
Receivers:
Termination Resistance (specified with fail-safe networks):
100 Ω, >5000 Ω for signalling
Input Impedance:
>8000 Ω (RCV DATA, RCV CLK, EXT TX CLK)
[1]Physical Interface V.11 access only, does not provide X.21 call establishment procedures.

V.24 (RS-323) Data Interface

Signal Format:
Bipolar, unbalanced
Timing Modes:
Asynchronous, Synchronous
Data Rates:
Asynchronous:
300 bps to 19.2 kbps (in accordance with ITU-T V.24 and EIA RS-232)
Synchronous:
300 bps to 64 kbps (in accordance with ITU-T V.24 and EIA RS-232)
Synthesised:
50 bps to 2.048 Mbps in 1 bps steps
(timing analysis option)
Loopback Support:
Local (LL) and Remote (RL)

ITU-T G.703 64 kbps Codirectional Interface (Adapter Cable Required)

General:
Transmit rate:
64 kHz ± 5ppm
Pulse Shapes:
Conform to masks in CCITT Recommendation G.703
Pulse Level: 1.0 V ± 0.1 V
Octet Code Format:
Alternate block inversion with bipolar violations for octet timing
Input Impedance:
Term:
120 Ω
Bridge:
1000 Ω minimum
Input Signal Level:
+6 dB to -9 dB (in reference to nominal signal level)
Code format (256k baud):
Binary One:
1100
Binary Zero:
1010
Pulse Width:
Single Pulse:
3.9 µs
Double Pulse:
7.8 µs

General

Program Storage:
Store and recall up to 10 complete instrument configurations
Non-volatile Memory:
Store front-panel switch setting, entries, and auxiliary settings
Remote Control:
V.24 IEEE 488.2 Syntax
TTC's DTM remote control software capability

Printer Controls

Results Print:
Time, date, results listing
Controls Print:
Time, date, test configuration
Connector:
Serial 8-Pin DIN - 25-pin "D" Subminiature, adapter cable provided
Printouts:
Timed, Event and Histogram

Physical and Environmental

Size:
9.1 cm (3.6 in) high, 11.4 cm (4.5 in) wide, 21.8 cm (8.6 in) deep
Weight:
1.8 kg (4lbs.)
Operating Temperature:
0° to 45°C (32° to 113°F)
Storage Temperature:
40° to 70° C (-40° to 158°F)
Power Requirements:
6.0 Watts maximum
Internal Battery:
Type: Sealed lead acid
Operation: 3 - 6 hours (Depending on mode)
Charging Time: 8 hours

Product Information

Model No.	Description
147	2 Mbps and Data Analyser Includes: AC adapter, printer cable adapter

Options

Model No.	Description
147-1	Timing Analysis Option (includes±50, ±100 and ± 20,000 ppm Transmit Frequency Offset)
147-2	1.6/5.6 Connectors

Accessories

Model No.	Description
PR40A	V.24 Serial Printer
42136	Technician's Soft Case
43203	Large Technician's Case
IADP-EU	AC Adapter for Europe
IADP-UK	AC Adapter for United Kingdom
IADP-AU	AC Adapter for Australia
IADP-US	AC Adapter for United States

A variety of cables are also available.

NOTE: Specifications, terms, and conditions are subject to change without notice.

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OPTIMIZING NETWORK PERFORMANCE

ISO 9001 CERTIFIED

CE

Y2K COMPLIANT