

Telecommunications

2852/S & 2853/S Digital Analyzers



Desktop and rackmountable digital testers for PCM and data applications up to 34 Mbit/s including mux/demux

- PCM and data pattern generator and error detector from 50 bit/s to 34 Mbit/s
- Demultiplex and hierarchical errors and alarms monitoring
- Generate and monitor test patterns, framed or unframed, at all hierarchical levels within 8 and 34 Mbit/s signals
- All data test interfaces as standard: RS-232, X.21 (X.24), V.35, RS-449 (V.36) (2853), codirectional, contradirectional with EUROCOM optional (2852 & 2853)
- Data interface and analog channel access
- G.821, G.921, M.2100 and G.962 analysis
- Measurements include propagation delay, frequency deviation, frequency and level measurement, DTMF and CAS
- DC power and internal battery options
- Remote control via RS-232 or IEEE-488 with optional PC applications software
- 2850B and 2851 full functionality

The 2853 Digital Communications Analyzer extends the capabilities of the 2850B and 2851 series of analyzers to include support of the newer service offerings from PTTs world-wide.

Testability from data communications interfaces to high speed digital links and multiplexes at 2, 8 and 34 Mbit/s in a single portable and battery operated unit provides unrivalled flexibility for support of modern digital and data networks and equipment. The 2852 Digital Communications Analyzer provides most of this functionality but limits the data test capability to Codirectional and Contradirectional interfaces.

With the addition of DC and battery power options, a full range of field and exchange digital and data measurement requirements can be met with a choice of desktop and rack-mountable packages. A choice of RS-232 or IEEE-488 remote control completes the picture, extending remote applications from unattended monitoring to laboratory and factory test requirements.

PCM FRAMING SYSTEMS

2852 and 2853 are able to generate and receive all commonly used framing systems up to 34 Mbit/s, for both the European and North American digital hierarchies.

The instrument can be optioned as European or hybrid versions, and this includes an all bit rate version (European plus North American).

Thus 2852 and 2853 have the flexibility to address global applications, including operation in International Gateways where there is a requirement to test mixtures of European and North American traffic carried on satellite systems.

56 kbit/s and 64 kbit/s Channel Testing

Individual channels within T1, 704, 2048, 8448 (G.704/G.744 and G.742), and 34368 kbit/s can be tested at 64 or 56 kbit/s, assisting in testing and fault location within digital data networks and cross-connect switches.

n x 64 kbit/s Channel Testing

The expanding services at n x 64 kbit/s can be tested where they are carried within T1, 704, 2048, 8448 and 34368 kbit/s digital signals. All systems and n x 64 kbit/s cross-connect switches are catered for with the flexibility of contiguous and non-contiguous channel selection.

Tributary and Channel Testing

2048 kbit/s tributaries within 8448 kbit/s digital signals and 2048 and 8448 kbit/s tributaries within 34 Mbit/s digital signals can be tested to ensure correct functioning of multiplexes.

Unstructured

Where the structures on digital links do not conform to the usual ITU-T Recommendations, for example inter-computer links, they can be tested using an unframed format.

DATA INTERFACE TESTING

All commonly used data interfaces are provided as standard to give a comprehensive data test capability together with primary, second and third order PCM rate testing. Thus PCM and data circuits and equipment can be tested with one compact, fully integrated test instrument, from 50 bit/s to 34 Mbit/s. Data test interfaces provided are RS-232, X.21, RS-449 (V.36), V.35 (2853), codirectional and contra-directional (2852 and 2853). DTE is standard, DCE optional. EUROCOM D/1 is optionally available for European military network applications.

Modes

Both synchronous and asynchronous modes are possible with a wide range of standard and user programmable data rates, so that traditional data interface testing can be addressed together with modern digital data services at 64 kbit/s, n x 64 kbit/s and other rates.

REMOTE LOOPBACK

Remote loop activation and deactivation is provided for the RS-232 test interface according to ITU-T recommendation V.54 by means of control lines. This facilitates testing of data circuits automatically without the need for manual intervention.

FLEXIBLE ERROR MEASUREMENTS

Where appropriate, 2852 and 2853 have the ability to detect, simultaneously, Code Errors, Framing Errors, made Pattern Errors and CRC Errors. Further measurements are then on a selected error type, including error distribution.

Error Distribution/Histogram

The results are displayed in the form of a histogram with accumulation over 72 hours, and a maximum resolution of 1 minute. Other events such as sync loss are also stored on the histogram. All stored results are tagged with time and date, so that a comprehensive record of long term measurements is available to assist in fault localisation. A permanent record of results can also be obtained by printing a text equivalent or a facsimile of the histogram subsequent to the test. In addition the instrument can be programmed to Autoprint selected parameters on event or at timed intervals.

G.821 and G.921 Measurements with Histograms

Where availability measurements are being made on 64 kbit/s channels, results in G.821 format will be provided, while for higher rates

Annex D of G.821 is applied. In addition up to 100 day histograms are provided for each of the G.821 parameters with automatic recognition of exceeding daily limits, defined by circuit grade and length for G.821, or circuit classification for G.921. Alternatively user defined limits can be entered directly. Where short tests are required histograms can be selected up to 25, 50 or 100 hours with a resolution of 15, 30 or 60 minutes.

RESIDUAL BIT ERROR RATE

Assessment of background error performance is useful in systems subject to periodic degraded performance, such as radio or satellite systems. This measurement is a long term error rate ignoring severely errored seconds.

BURST ERROR CAPABILITY

Qualification of Burst Errors within networks, and network performance under burst error conditions is difficult to achieve. 2852 and 2853 provide comprehensive facilities to stress network equipment with test patterns injected with programmable error bursts and burst rates, while on the receive side, different burst sizes can be detected and recorded. Thus, since the errors can be injected at both logic and code level, network performance under burst conditions can be determined.

HIGH TOLERANCE TO BURST ERRORS

2852 and 2853 are particularly suited to measurements on systems subject to high error rates and burst errors, with the ability to ride through rapid fades as experienced on digital radio systems.

CRC BLOCK ERROR INJECTION TO G.962

2048 kbit/s systems with CRC for ISDN applications can register G.821 parameter events when certain CRC block error rate thresholds are exceeded. The instrument is able to check the thresholds for Severely Errored Seconds, Degraded Minutes and Errored Seconds. The thresholds can be preset for each parameter, and multiplex and other equipment can be quickly and easily checked for conformance to the G.962 Recommendation.

ISDN ERROR REPORT BIT MONITORING TO G.962

A further facility for the 2048 kbit/s systems with CRC is to carry information within the Not Frame Word bits 6, 7 and 8, on the occurrence of G.821 events (Severely Errored Seconds, Degraded Minutes and Errored Seconds), and where the events originated. The origin is determined by the position of these bits with respect to the CRC multiframe. The instrument decodes and displays this information in real time or latched mode, and can Autoprint it if required.

PROGRAMMABLE ERROR GATING

In addition to long term mean error ratio, a current error ratio measurement is available with fixed gating periods of 1, 2, 5 or 10 seconds, as well as automatic gating adjustment. Flexibility of application is thus assured, for example fade margin adjustment on digital radios.

IN-SERVICE AND OUT-OF-SERVICE MEASUREMENTS

2852 and 2853 are equally suited to both installation and in-service maintenance measurements at rates up to 34 Mbit/s. Interfaces are provided to enable the receiver to be connected to a number of network points at varying impedances and signal sensitivities.

DEMULTIPLEX MONITORING

Comprehensive and flexible in-service monitoring is provided to enable simultaneous measurement of framing and CRC errors for a complete demultiplex path for 8448 and 34368 kbit/s signals. At the same time selected 64 kbit/s or $n \times 64$ kbit/s channels, or 2048 or 8448 kbit/s tributaries, can be monitored for pattern errors, whilst analog channels can be monitored using the loudspeaker. Both Channel Associated and DTMF Signalling can be monitored within selected 2048 kbit/s tributaries, and alarms are monitored for the full demultiplex path.

CHANNEL ACCESS

Digital access is provided to transmit and receive timeslots in 704, 2048, 1544 and 8448 kbit/s (G.744) digital signals, or to 2048 kbit/s tributaries within 8448 and 34368 kbit/s digital signals. Analog access is possible only at 1544 and 2048 kbit/s, or within 2048 kbit/s tributaries of 8448 and 34368 kbit/s signals.

External Access

Access is provided to selected transmit and receive channels, at both analog and digital levels, for primary, secondary and third order digital signals. Thus, if required, external analog or digital test equipment can be connected to make specific channel measurements beyond the capability of 2852 and 2853. One example would be X.50 measurements using the 2851 Data Communication Analyzer.

TERMINAL EQUIPMENT TESTING

2852 and 2853 are able to simulate and detect alarm conditions associated with the various framing systems, so that terminal equipment can be tested for correct operation. This includes the ability to generate programmable Frame or Code Errors to check equipment thresholds.

It is also possible to test across multiplexes by inserting and monitoring test patterns within 2048 and 8448 kbit/s tributaries.

In addition, there are automatic test sequences for checking Frame and Multiframe Alignment strategy, and access is allowed to control and display the condition of all unassigned frame bits.

PROPAGATION DELAY MEASUREMENT

Delay measurements on data and PCM rate circuits are accomplished to a high level of accuracy. This is particularly important on satellite links where high values of delay are experienced and need to be measured, and for characterising networks to assist in finding unwanted loopbacks.

CHANNEL ASSOCIATED SIGNALLING

The four-bit word associated with a selected transmit channel can be controlled. In addition dialled numbers can be generated to simulate call set up.

On the receive side, the selected channel can be monitored, and dialling information displayed. The parameters associated with the dial pulses are user programmable as a mask, so that deviations will be displayed as errors.

All 30 channels of a 2048 kbit/s signal or 24 channels of a 1544 kbit/s signal can also be monitored simultaneously, for example when searching for an idle channel.

DTMF SIGNALLING

DTMF supplements channel associated signalling capability to provide a more comprehensive signalling test capability. Tone and dialling generation and monitoring facilities are provided.

DIGITAL SIGNAL LEVEL AND FREQUENCY MEASUREMENT

The frequency and amplitude of the incoming digital signal is displayed which enables early warning of degradation of the signal.

TWO CHANNEL SYNCHRONIZATION MEASUREMENT

Two primary rate digital signals can be compared for frequency synchronisation, thereby assisting in isolating network clocking problems.

OCTET SLIP DETECTION

Octet slips can be detected at the channel level of a primary rate signal, which allows the effects of frame slips introduced by network buffers to be assessed.

RS-232 REMOTE OPERATION

Remote unattended operation can be accomplished via an RS-232 port, which can also be used for local printing. Keyboard functions can be duplicated via RS-232 enabling complete remote reconfiguration and reporting of results.

IEEE-488 (GPIB)

For 2852S and 2853S IEEE-488 can be specified as an option in addition to the standard RS-232 for factory test and laboratory applications or where IEEE-488 is preferred.

ALTERNATIVE PACKAGES

Alternative packages are offered for field portable (2852 and 2853), and rack-mount (2852S and 2853S) applications.

REMOTE APPLICATIONS SOFTWARE

This optional PC based software runs on Windows 95, 98 and NT platforms. It provides full remote control, storage of results, and a comprehensive results display capability.

END-TO-END VOICE COMMUNICATION

The instrument has a loudspeaker to which can be connected a selected voice channel, via an internal Codec, from frame structures at 1544 and 2048 kbit/s. It is also possible to connect an external microphone to a selected transmit channel, thereby enabling end-to-end voice communication to be established between two 2851 instruments to assist in setting up tests.

POWER OPTIONS

In addition to mains power, options are provided for battery and DC power to cater for all operational requirements including factory, exchange and field.

SPECIFICATION

PCM TRANSMIT INTERFACE

FRAMING AND BIT RATES

Signals can be transmitted unframed or with the frame structure indicated.

Enabling option

See table at end of specification.

03, 04

704 kbit/s - 10 Channel System.

02, 04

1544 kbit/s - T1
1544 kbit/s - T1 no signalling
1544 kbit/s - T1ESF
1544 kbit/s - T1ESF no signalling
1544 kbit/s - T1DM, DDS Data Mux.

01, 06

2048 kbit/s - G.704
2048 kbit/s - G.704 no multiframe
2048 kbit/s - G.704 with CRC
2048 kbit/s - G.704 with CRC, no multiframe
2048 kbit/s - 32 frame multiframe.

04

3152 kbit/s - DS1C mode 1 synchronous
3152 kbit/s - DS1C mode 2 asynchronous.

04

6312 kbit/s - DS2 96 channels synchronous
6312 kbit/s - DS2 asynchronous
6312 kbit/s - 2048 kbit/s interworking to G.747.

01

8448 kbit/s - G.742 asynchronous
8448 kbit/s - G.745 asynchronous
8448 kbit/s - G.704/741 synchronous
8448 kbit/s - G.704/744, 120 channels, synchronous.

01, 14

34368 kbit/s - G.751 asynchronous

01, 25 also on 2851

256 kbit/s - EUROCOM D/1 IB5
512 kbit/s - EUROCOM D/1 IB5
1024 kbit/s - EUROCOM D/1 IB5.

Permitted combinations of bit rates

2048 & 8448 & 34368 kbit/s or
704 & 2048 & 8448 & 34368 kbit/s or
1544 & 2048 & 8448 & 34368 kbit/s or
704 & 2048 & 8448 & 1544 & 3152 & 6312 & 34368 kbit/s.

AIS

Unframed

All ones signal with zeros programmable at a rate of $M \times 10^{-N}$, where M is 1 to 9 and N is 2 to 7.

Framed

34368 kbit/s: All ones signal transmitted in a selected 8448 kbit/s tributary.

8448 kbit/s: All ones signal transmitted in a selected 2048 kbit/s tributary.

CLOCK SOURCE

All rates except 34 Mbit/s

Internal, external or derived from the received signal.

34 Mbit/s

Internal or external.

INTERNAL

Accuracy

± 2 ppm from 0° C to 55° C, ± 3 ppm/year.

Small Offset

All rates except 34 Mbit/s

Steps of 5 and 25 ppm to maximum of ± 150 ppm.

34 Mbit/s

Steps of 5 and 25 ppm to maximum of ± 60 ppm.

Large Offset:

(All rates except 34 Mbit/s)

Up to 3 MHz:

Steps of 2 and 8 kHz to maximum of ± 96 kHz.

Over 3 MHz:

Steps of 8 kHz to maximum of ± 96 kHz.

EXTERNAL

All rates except 34 Mbit/s

Range

1 kHz to 11 MHz.

Level

TTL square wave.

In accordance with G.703, Figure 21.

Impedance

1000 Ω .

Connector

BNC.

34 Mbit/s

Pin 13 of 15 way D-Type connector (34 Mbit/s NRZ).

Framed

34.368 MHz ± 60 ppm.

Unframed

8 to 35 MHz.

Level

0 dBm sine or square wave.

Impedance

50 Ω .

CLOCK OUTPUT

TTL via 50 Ω .

LINE CODES

AMI (50% duty cycle), HDB3, B8ZS, B6ZS, NRZ (TTL level).

MAIN OUTPUTS

Balanced

Impedance

120 Ω

Peak Voltage

0 V \pm 0.3 V.

Space Voltage

0 V \pm 0.3 V.

Unbalanced

Impedance

75 Ω .

Peak Voltage

All rates except 34 Mbit/s

2.37 V \pm 0.237 V.

34 Mbit/s

1.0 V \pm 0.1 V.

Space Voltage

All rates except 34 Mbit/s

0 V \pm 0.237 V

34 Mbit/s

0 V \pm 0.1 V

NON STANDARD

Unframed only.

Clock

Internal.

External.

Range

1 Kbit/s to 9 Mbit/s.

Steps

1 bit/s.

Line Code

NRZ.

Level (data and clock)

TTL.

Connector

Auxiliary connector, 25 way D-Type

(for pinout see end of Specification).

RZ DIGITAL OUTPUT (34 Mbit/s)

(Unframed only)

Frequency Range

0.5 to 35 Mbit/s.

Level

TTL.

Connector

15 way D-Type (see end of specification for pinout).

TEST PATTERNS

Insertion

Single Channel

Selected 64 kbit/s channel of framed signal.

Selected 64 kbit/s channel of 2048 kbit/s tributary.
(8 and 34 Mbit/s output - option 14 fitted).

n x 64 kbit/s Channel

Selected n x 64 kbit/s channel of framed signal.

Selected n x 64 kbit/s channel of 2048 kbit/s tributary.
(8 and 34 Mbit/s output - option 14 fitted).

Channel distribution can be contiguous or non-contiguous.

2048 kbit/s Tributary

Selected 2048 kbit/s tributary. (8 and 34 Mbit/s output - option 14 fitted).

8448 kbit/s Tributary

Selected 8448 kbit/s tributary. (34 Mbit/s output only - option 14 fitted).

Unframed

Unframed signal.

PRBS

$2^9 - 1$, $2^{11} - 1$, $2^{15} - 1$, $2^{20} - 1$.

Optional maximum 14 or 7 successive 0 limitation for 1544 and 3152 kbit/s systems.

Sense

True or inverted.

Mode (framed only)

8 bit

PRBS data fills all 8 bits in an octet.

7 + 1 bit

First 7 bits are PRBS and last bit is a 1.

34 Mbit/s

$2^{15} - 1$, $2^{18} - 1$, $2^{20} - 1$, $2^{23} - 1$, $2^{25} - 1$, $2^{28} - 1$.

All zeros

Continuous sequence of 0000.

All ones

Continuous sequence of 1111.

Alternating

Alternating sequence of 1010.

Word

User programmable sequence of 24 (34 Mbit/s only), 16 or 8 bits.

8+8 word

Two user programmable 8 bit sequences are alternated by an external TTL input. The changeover occurs at the end of 8 bits.

1 kHz 0 dBm0 sine wave

Digital representation of a sinusoidal signal of 1 kHz at a nominal level of 0 dBm0, coded according to A-Law. This facility is not available for 1544 kbit/s systems.

FILL PATTERNS

All other channels in single channel and n x 64 kbit/s framed operation.

PRBS

2¹⁵ -1, User programmable 8 bit word.

8 and/or 2 Mbit/s tributaries (option 14 fitted)

AIS (All 1s), PRBS, All 0s, Alternating 10, 2 or 8 Mbit/s test pattern.

EXTERNAL VOICE AND DATA

For framed and multiplex operation, an externally input 64 kbit/s data stream or a voice frequency signal can be inserted into one of the channels in the transmitted signal instead of a test pattern.

Data Input

Applies to frame structures at 704, 1544, 2048 and 8448 kbit/s (G.704/G.744).

Applies to 2048 kbit/s tributaries within frame structures at 8448 kbit/s (G.742) and 34 Mbit/s (G.751) (option 14 fitted).

Data Input Interface

Codirectional to G.703.
Contradirectional to G.703 (AMI 100% or Bipolar NRZ).
X.21, RS-449 (V.36), V.35 (using DCE cable adaptor accessory)
NRZ (TTL level).

VOICE FREQUENCY INPUT

Applies to frame structures at 1544 and 2048 kbit/s.

Applies to 2048 kbit/s tributaries within frame structures at 8448 kbit/s (G.742) and 34 Mbit/s (G.751) (option 14 fitted).

Range

0.3 to 3.4 kHz.

Encoding

A-Law for 2048 kbit/s.
 μ -Law for 1544 k/bits.

Impedance

600 Ω balanced.

Max Input Level

+3 dBm0.

DROP & INSERT

For framed operation at 704, 1544 and 2048 kbit/s the received signal is looped to the transmitter.

Note that for CRC frame structures the CRC is re-calculated before re-transmission.

64 kbit/s

A selected 64 kbit/s channel is replaced by a test pattern or by an externally input digital signal.

Audio

A selected 64 kbit/s channel is replaced by an externally input voice frequency signal (as above).

n x 64 kbit/s

A selected n x 64 kbit/s channel is replaced by a test pattern. The channel selection can be contiguous or non-contiguous.

ERROR INJECTION

Target

Test Pattern Only.
Framing Only.
CRC Only.
At 34 Mbit/s, unframed test pattern only.

Error Type

Binary

Bits are inverted before coding.

Code

Code errors are injected by changing ± 1 to 0 and 0 to ± 1 where the polarity of the inserted mark is the same as the polarity of the last mark transmitted.

Injection Mode

Singly

By keypress.

Fixed rate

Rate 3×10^{-1} to 1×10^{-7} .

34 Mbit/s

3×10^{-2} to 1×10^{-8} .

In bursts

Pseudo Random Burst with user selectable burst length of 8, 16, 32, 64, 128, 256 errors. The actual transmitted error ratio with bursts at a fixed rate is fixed rate x the number of errors in the burst eg. a burst length of 16 at a rate of 2×10^{-6} will measure 3.2×10^{-5} .

Bursts may not stay confined to the designated target type.

CRC Block Errors

To ITU-T Recommendation G.962.

Range

1 to 999 errored blocks in 1,000 or 60,000 blocks.

Threshold Presets

Programmable presets for Severely Errored Seconds, Degraded Minutes and Errored Seconds thresholds.

SIGNALING BIT CONTROL

For framing systems with Channel Associated Signaling capability:
The signaling bits can be changed.
Dialed numbers up to 20 digits can be generated.

DTMF SIGNALING

See Measurements Section.

C-BIT FRAMING

Generation of C-Bit Frame for French TRANSMIC-2G System.
Control of C-Bit Frame message bits.

ACCESS TO STRUCTURE BITS

The following tests are available, depending on the framing system selected:

Frame alignment strategy.
Multiframe alignment strategy.
Change unassigned, distant, distant multiframe and alarm bits.
Change Auxiliary Data Bits (T1 systems).
Send BELL Yellow Alarm:
Bit 2 Suppression (T1SF).
Facility Data Link message (T1ESF)

LOOPBACK (T1 SYSTEMS ONLY)

Activates and deactivates automatic remote loop equipment.

4 loopback codes, each of 3 to 16 bits (2 loop-up and 2 loop-down) can be user programmed and stored in non-volatile memory for subsequent use.

SYNC OUTPUTS

PRBS.

Polarity

Negative Pulse.

Interface

TTL.

PCM RECEIVE INTERFACE

FRAMING AND BIT RATES

As Transmitter plus 1544 kbit/s - T1SLC96 (synchronisation and channel access).

Permitted combinations of bit rates

As Transmitter.

Frequency Tolerance

704 kbit/s ± 50 ppm.
1544 kbit/s ± 130 ppm.
2048 kbit/s ± 50 ppm.
3152 kbit/s ± 30 ppm.
6312 kbit/s ± 33 ppm.
8448 kbit/s ± 30 ppm.
34368 kbit/s ± 60 ppm.

LINE CODES

As Transmitter.

DIGITAL INPUT

Connector

BNC.

Impedance

75 Ω unbalanced.

NON STANDARD

Unframed only.

Clock

External.

Range

1 kbit/s to 11 Mbit/s.

Line Code

NRZ.

Level (data and clock)

TTL.

Connector

Auxiliary connector, 25 way D-Type (see end of specification for pinout).

NRZ DIGITAL INPUT (34 Mbit/s)

Unframed only

Frequency Range

0.5 to 35 Mbit/s

Level

TTL.

Connector

15 way D-Type (see end of specification for pinout).

INPUT MODES AND SENSITIVITY

All rates except 34 Mbit/s

Terminated

Terminates the line.

Bridging

Taps onto a terminated line or unprotected monitor point.

Monitoring

Connects to a protected monitor point.

Automatic Line Equalization

Automatic Line Equalization (Automatic Line Buildout, ALBO) is provided at 2048 kbit/s for Option 01 (except when option 04 fitted) or at 1544 kbit/s for option 05 (except when option 07 fitted).

BALANCED	Terminated	Bridging
Impedance	120 Ω	>1000 Ω
Level:		
Normal	3 V +2 -6 dB	3 V +2 -6 dB
ALBO	3 V -3 -30 dB	3 V -3 -30 dB
UNBALANCED	Terminated	Bridging
Impedance	75 Ω	>1000 Ω
Level:		
Normal	2.37 V +2 -6 dB	2.37 V +2 -6 dB
ALBO	2.37 V -3 -30 dB	2.37 V -3 -30 dB
BALANCED	Monitor (-30 dB)	Monitor (-30 dB)
Impedance	120 Ω (3000 Ω)	120 Ω (1000 Ω)
Level:		
Normal	115 mV +2 -6 dB	300 mV +2 -6 dB
UNBALANCED	Monitor (-30 dB)	Monitor (-30 dB)
Impedance	75 Ω (24000 Ω)	75 Ω (680 Ω)
Level:		
Normal	75 mV +2 -6 dB	237 mV +2 -6 dB

34 Mbit/s

Terminated

Terminates the line.

Sensitivity

± 1 V +3 -12 dB cable attenuation or
-18 dB linear attenuation

Bridging

Taps onto a terminated line or unprotected monitor point.

Sensitivity

± 1 V +3 -9 dB cable attenuation or -12 dB linear attenuation

Monitor

Connects to a protected monitor point.

Sensitivity

-14, -26, -38 dB relative to nominal with range of +3 to -9 dB cable attenuation or -12 dB linear attenuation.

TEST PATTERNS

Source

Single Channel

Selected 64 kbit/s channel of framed signal.
Selected 64 kbit/s channel of 2048 kbit/s tributary.
(8 and 34 Mbit/s input - option 14 fitted).

n x 64 kbit/s Channel

Selected n x 64 kbit/s channel of framed signal.
Selected n x 64 kbit/s channel of 2048 kbit/s tributary.
(8 and 34 Mbit/s input - option 14 fitted).
Channel distribution can be contiguous or non-contiguous.

2048 kbit/s Tributary

Selected 2048 kbit/s tributary. (8 and 34 Mbit/s input - option 14 fitted).

8448 kbit/s Tributary

Selected 8448 kbit/s tributary. (34 Mbit/s input only - option 14 fitted).

Unframed

Unframed signal.

PRBS

Except 34 Mbit/s

$2^9 - 1$, $2^{11} - 1$, $2^{15} - 1$, $2^{20} - 1$.

Optional max 14 or 7 successive 0 limitation for 1544 and 3152 kbit/s systems.

Sense

True or Inverted.

Mode (framed only).

8 bit

PRBS data fills all 8 bits in an octet.

7 + 1 bit

First 7 bits are PRBS and last bit is a 1.

34 Mbit/s

$2^{15} - 1$, $2^{18} - 1$, $2^{20} - 1$, $2^{23} - 1$, $2^{25} - 1$, $2^{28} - 1$.

Repetitive Word

Any word which repeats over a 24 bit (34 Mbit/s only) or 16 bit sequence.

PATTERN SYNCHRONIZATION

Loss Criterion

PRBS

Error rate greater than 1 in 5 for each of 10 consecutive deciseconds
(1 in 10 above 5 Mbit/s).

8-bit word

Error rate greater than 1 in 10 for each of 10 consecutive deciseconds.

16-bit word

Error rate greater than 1 in 20 for each of 10 consecutive deciseconds.

24-bit word

Error rate greater than 1 in 30 for each of 10 consecutive deciseconds.

Async Message

Error rate greater than 1 in 20 for each of 10 consecutive deciseconds.

CHANNEL EXTRACT

For framed single channel and demultiplex operation a selected 64 kbit/s channel is extracted from the received signal and output as a data signal or voice frequency signal. The audio output is also available on the internal loudspeaker.

Data Output

Applies to frame structures at 704, 1544, 2048 and 8448 kbit/s (G.704/G.744).

Applies to 2048 kbit/s tributaries within frame structures at 8448 kbit/s (G.742) and 34 Mbit/s (G.751) (option 14 fitted).

Data Output Interface

Codirectional to G.703.
Contradirectional to G.703 (100% AMI or Bipolar NRZ).
X.21, RS-449 (V.36), V.35 (using DCE cable adaptor accessory)
NRZ (TTL level).

Frame or AIS alarm detected

All 1's transmitted.

Signal loss detected

Outputs are off.

Clock output

64 kHz NRZ (TTL).

Voice Frequency Output

Applies to frame structures at 1544 and 2048 kbit/s.

Applies to 2048 kbit/s tributaries within frame structures at 8448 kbit/s (G.742) and 34 Mbit/s (G.751) (option 14 fitted).

Range

0.3 to 3.4 kHz.

Decoding

A-Law for 2048 kbit/s.
 μ -Law for 1544 kbit/s.

Impedance

600 Ω balanced.

STATUS INDICATORS

A combination of LEDs and an alarm page indicate frame structure alarm conditions for the input signal and, for demultiplex operation, the tributaries selected. For Demux mode hierarchical AIS, FRAME and DISTANT alarms are ORed to the LED indicator.

Display modes

AUTORESET

LEDs show current condition and extinguish when the alarm condition clears. LEDs are ON for the length of time an alarm condition exists with a minimum of 1 sec.

LAMP LOCK

LEDs remain on after alarm clears.

LINE

ON indicates signal loss.

AIS

ON indicates signal is all 1's. All 1's is defined as signal with less than three zeros in two frame periods.

FRAME

ON indicates a loss of frame alignment.

ERRORS

ON indicates that the error rate of the major error type is greater than a threshold set by the user.

Threshold is 1×10^{-9} to 9×10^{-3} .

MF/ZEROS

ON indicates:

Loss of multiframe alignment (2048 kbit/s)

More than 31 consecutive zeros have been received (1544 kbit/s).

DIST/YELLOW

ON indicates:

Distant alarm (2048 kbit/s)

Yellow alarm (1544 kbit/s)

DMF/

ON indicates:

Distant multiframe alarm (2048 kbit/s)

ISDN error report alarm (2048 kbit/s systems for ISDN applications).

PATTERN

ON indicates loss of pattern synchronization.

REMOTE

ON indicates the instrument is under remote control and the keyboard is inoperative.

RX: CRC UNSYNC

The loss of CRC synchronisation is indicated by a message on the display.

C-BIT: UNSYNC

Loss of C-Bit framing sequence synchronization.

ALARM EXTENSION

An output is provided corresponding to an alarm condition.

Polarity

Positive for alarm.

Interface

TTL.

ERRORS OUTPUT

An output pulse is provided for each code error, pattern error, frame error, or CRC error (as selected to be the major measurement - see measurements section). (Pin 16 of auxiliary connector).

Interface

TTL.

Pulse Width

50% of bit interval.

UNASSIGNED FRAMING BITS

The state of the unassigned bits is displayed.

ISDN ERROR REPORT BITS

(to ITU-T Rec. G.962)

Applies to 2048 kbit/s CRC system with no signaling multiframe, to

G.704.

Bits monitored

Bits 4, 5, 6, 7 and 8 in Not Frame Word.

Function

Detects, displays and Autoprints occurrence of valid error alarm pulses within bits 6, 7 and 8 corresponding to Severely Errored Seconds, Degraded Minutes and Errored Seconds, and their relation to the CRC multiframe, in frame pairs.

Alarm pulses can be latched.

Bits 4 and 5 are displayed.

Changes in the state of bit 5 are Autoprinted.

ISDN ERROR REPORT BITS

Applies to 2048 kbit/s system with no signaling multiframe, to G.704.

Bits monitored

Bits 4, 5, 6, 7 and 8 in Not Frame Word.

Function

Detects, displays and Autoprints occurrence of valid error alarm pulses within bits 6, 7 and 8 corresponding to Severely Errored Seconds, Degraded Minutes and Errored Seconds. Four sets of bits 6, 7 and 8 are displayed corresponding to the four combinations of bits 4 and 5 (00, 01, 10 and 11, each of which exists for 250 ms each second).

SYNC OUTPUTS

PRBS.

Polarity

Negative pulse.

Interface

TTL.

DATA TEST INTERFACE

X.21 (X.24), RS-449 (V.36), V.35 and RS-232

2853 and 2853S only.

X.21(X.24), RS-449 (V.36), V.35

X.21 (V.11), RS-449 (V.11) and V.35 circuits are presented to a common connector. DTE interfaces are provided by supplied cables which provide the appropriate connector and electrical interface. A series of optional cables provide alternative combinations of V.10, DTE and DCE.

Codirectional, Contradirectional and EUROCOM D/1 (2850B, 2850BS, 2851 and 2851S)

	Codirectional	Contradirectional	EUROCOM D/1
Line Signal Coding Level	To ITU-T Rec. G.703	To Rec.ITU-T G.703	TO EUROCOM D/1, IB6
Bit Rate	64 kbit/s	64 kbit/s	32, 64, 128, 256, 512, 1024, 2048 kbit/s
Format	Unstructured	Unstructured	Unstructured
Transmit Timing	Internal Receiver External 2048 kbit/s	Contradirectional Input Receiver Internal Receiver External 2048 kbit/s	Internal Receiver External (EUROCOM)
Transmit Timing Output	TTL at 64 kHz	TTL at 64 kHz	TTL at bit rate
Receive Timing	Receiver	Receiver	Receiver
Connector	15 way D-Type, ISO 4903	Contradirectional Input 15 way D-Type, ISO 4903	EUROCOM 15 way D-Type, ISO 4903

Connector (instrument)

50 way type 57 female.

Cable Connectors**X.21**

15 way D-Type, ISO 4903 female.

RS-449 (V.36)

37 way D-Type, ISO 4902 female.

V.35

34 way MRAC, ISO 2593 female.

Cable recognition

Automatic recognition of the cable type plugged in.

Dedicated interface, DTE, DCE provided by means of optional cable.

RS-232

25 way D-Type female, ISO 2110.

Mode

X.21 (X.24) Synchronous.

RS-449 (V.36) Synchronous.

Asynchronous.

V.35 Synchronous.

RS-232 Synchronous.

Asynchronous.

Implementation DTE.

DCE (Option).

Electrical

X.21 V.11 (Balanced).
V.10 (Unbalanced) (Option).

RS-449 (V.36) V.11 (Balanced).
V.10 (Unbalanced) (Option).

V.35 V.35 (data and timing).
V.28 (control lines).

RS-232 V.28.

Line Code

RS-232, V-35 NRZ.

X.21, RS-449 NRZ.

(V.10, V11) Biphas Mark.
Biphase Space.

Input Impedance

X.21, RS-449 (V.36)

V.11 Terminated 120 Ω

V.11 Unterminated >3000 Ω

V.10 >3000 Ω

V.35 100 Ω

Data Rate

V.11 50 bit/s to 2.5 Mbit/s.

V.11 50 bit/s to 9 Mbit/s. (Option 26).

V.10 50 bit/s to 100 kbit/s.

V.35 50 bit/s to 2.5 Mbit/s.

RS-232 50 bit/s to 38.4 kbit/s Async.

50 bit/s to 80 kbit/s Sync.

Timing

Synchronous

Transmitter External
From DCE
Internal

Receiver External
From TX
From DTE
From DCE.

Asynchronous

Transmit 50, 75, 100, 110, 134.5,
Internal 200, 300, 600, 1200, 1800, 2000, 2400, 3600,
4800, 9600, 19200, 38400 bit/s.

Receive Receive signal.

Polarity

The polarity of the transmitter incoming and outgoing clocks and the receiver incoming clock can be selected.

Async coding

Data bits 5, 6, 7, 8

Stop bits 1, 1.5, 2

Parity Odd, even, none

Async character rate

Transmitter Selectable: low, medium, high

Receiver Up to 1000 characters/sec.

Receiver Clock Recovery

The receiver clock can be recovered from the data.

TEST PATTERNS

Sync and async.

PRBS

$2^9 - 1$, $2^{11} - 1$, $2^{15} - 1$, $2^{20} - 1$

Sense

True or inverted.

All Ones

Continuous sequence of 1111.

All Zeros

Continuous sequence of 0000.

Alternating

Alternating sequence of 1010.

Sync.**16 bit word**

User programmable sequence of 16 bits.

8 + 8 word

Two user programmable 8 bit sequences are alternated by an external TTL input. The changeover occurs at the end of 8 bits.

Async.**Fox Message**

3 messages to ITU-T Recommendation R.52.

Fox 1

International alphabet 2.

Fox 2

International alphabet 5, 96 character set.

Fox 3

International Alphabet 5, 64 character set.

User message

1 to 19 characters.

ERROR INJECTION

Singly

By key press.

Fixed rate

Rate 3×10^{-1} to 1×10^{-7} (sync only)

ALARMS

Line, Errors, Pattern.

SYNC OUTPUTS

PRBS transmit and receive.

Polarity

Negative pulse.

Interface

TTL.

ERRORS OUTPUT

An output pulse is provided for each pattern error (pin 16 of auxiliary connector).

Interface

TTL.

Pulse width

50% of bit interval.

MEASUREMENTS

ERROR TYPES

PCM Interfaces

Line Code Errors.
Pattern Errors.
Framing Errors.
CRC Errors.

Data Interfaces

Pattern Errors.
Line Code Errors
Measured on input signal rate.

Framing Errors
Measured at each hierarchical level for the demultiplex path selected.

Pattern Errors
Measured for the selected test pattern which can be a tributary, 64 kbit/s, $n \times 64$ kbit/s channel, or unframed.

CRC Errors
Measured as appropriate for selected input signal, or 2048 kbit/s tributaries.

MAIN PARAMETERS

Depends on PCM or Data Interface, Framing System and Test Mode
Number of Errors.
Long Term Mean Error Ratio (LTMER).
Total Test Time.
Number of Loss of Signal (LOS) seconds.
Number of AIS seconds.
Number of No Frame Alignment seconds.
Number of No Pattern Sync seconds.
Number of No CRC Sync seconds.

Octet Slips (Primary Rate PCM and 8448 kbit/s G.744 Systems only)

Octet slips are detected for single channel pattern measurements.

Number of positive and negative slips.

Time since last slip.

Time between last two slips.

Further measurements

One of the four error types is selected to be the basis for further measurements. The selection also controls the type of measurement presented as an error distribution with time and the source of errors routed to the rear panel ERRORS socket.

ADDITIONAL PARAMETERS

Current Error Ratio

Automatic

Error ratio measured using short term algorithm.

Fixed Gating

1, 2, 5 or 10 seconds.

Burst Measurements

Number of bursts.

Time between last two bursts.

Time since last burst.

Residual Bit Error Rate (Background Error Rate)

Long Term Mean Error Ratio excluding Severely Errored Seconds.

G.821 ERROR PERFORMANCE

Measurements

64 kbit/s channel availability measurements are made to ITU-T Recommendation G.821, while for higher rates a channel performance to G.821 Annex D is applied.

Parameters

% Available Time
Number of Errored Seconds
% Error Free Seconds
Number of Severely Errored Seconds (SES).
% Non SES.
Number of Degraded Minutes (DM).
% Non DM.
Number of Breaks.
User programmable thresholds for %ES (%Errored Seconds), %SES (%Severely Errored Seconds), %DM (%Degraded Minutes) and %US (%Unavailable Seconds). Exceeding the threshold during a test causes message. Threshold activation settable for each parameter YES/NO.

Parameter	Limit	Message
%ES	XX.XXXX	%ES > limit
%SES	XX.XXXX	%SES > limit
%DM	XX.XXXX	%DM > limit
%US	XX.XXXX	%US > limit

X=1 to 9.

G.821/G.921 HISTOGRAMS

Parameters

Errored Seconds (ES).

Severely Errored Seconds (SES).

Degraded Minutes (DM).

Breaks.

Test Length

Up to:

100 days, 100 hours, 50 hours, 25 hours.

Resolution

100 days

1 day.

100 hours

60 minutes.

50 hours

30 minutes.

25 hours

15 minutes.

Parameter Limits

Limits calculated from user entered data and applied to selected resolution of 1 day, 60, 30 or 15 minutes. Histogram bar highlighted when limit exceeded.

G.821 limits

User enters:

length in km for High Grade section of line.

length in km for Medium Grade section of line.

length in km for Local Grade section of line.

The line can be a combination of grades.

The limits for each are calculated and added.

For a Local or Medium grade block allocation user enter 1250 km.

G.821 Limits (Radio)

As for G.821 except limits are degraded for adverse propagation conditions.

G.921 limits

User enters:

length in km for Classification 1 section of line.

length in km for Classification 2 section of line.

length in km for Classification 3 section of line.

length in km for Classification 4 section of line.

The line can be a combination of all Classifications. The block allocations are calculated for each and the overall limits totalised.

G.921 Limits (Radio)

As for G.921 except limits are degraded for adverse propagation conditions.

User defined limits

User enters the day, 15, 30 or 60 minute limit directly for each parameter. The period limits are then calculated.

Display

Histogram page for each of four parameters.

Printing Results

PRINT DISPLAY prints histogram plus test equivalent of results and setup.

SHIFT PRINT DISPLAY prints results for all four parameters for complete test.

M.2100

Implementation of Interpretation for the Receive and Send Direction columns in Table B2/M.2100 for 2 Mbit/s signal (non CRC4) and 2 Mbit/s (CRC4).

User programmable thresholds S1 and S2 for ES (Errored Seconds), SES (Severely Errored Seconds) and US (Unavailable Seconds). Exceeding the threshold during a test causes message. Threshold activation settable for each parameter YES/NO.

Parameter	S1 Limit	S2 Limit	Message
ES	XXXX	XXXX	ES > S1 limit or ES > S2 limit
SES	XXXX	XXXX	SES > S1 limit or SES > S2 limit
US	XXXX	XXXX	US > S1 limit or US > S2 limit

X=1 to 9

G.826

Parameters

Number of Errored Blocks (EB).

Number of Errored Seconds (ES).

Number of Severely Errored Seconds (SES).

Number of Background Block Errors (BBE).

Errored Second Ratio (ESR).

Severely Errored Second Ratio (SESR).

Background Block Error Ratio (BBER).

Unavailable Seconds (US).

% Unavailable Seconds (%US)

% Available Seconds (%AS)

Number of Breaks.

User programmable thresholds for ESR (Errored Second Ratio), SESR (Severely Errored Second Ratio), BBER (Background Block Error Ratio) and %US (%Unavailable Seconds). Exceeding the threshold during a test causes message. Threshold activation settable for each parameter YES/NO.

Parameter	Limit	Message
ESR	X.XE-Y	ESR > limit
SESR	X.XE-Y	SESR > limit
BBER	X.XE-Y	BBER > limit
%US	X.XXXX	%US > limit

X=1 to 9, Y=2 to 8.

STORED RESULTS

Error Distribution and Histograms

The errors associated with the selected error type are stored, minute by minute, for later analysis.

Accumulation Time

72 hours.

Histogram

Page width

20 hours with a resolution of 1 hour.

20 minutes with a resolution of 1 minute.

The display is selectable from anywhere within the 72 hours.

Display

The stored results are displayed as a histogram of errors. A cursor is moved to point at any hour or any minute. The number of errors, the number of errored seconds (ES) and the number of severely errored seconds (SES) for that interval are then displayed, together with the date and time.

Intervals of loss of synchronisation and power loss are displayed on the baseline.

TEST DURATION

When a test is started all results are cleared.

Duration

Indefinite.

Timed.

Range

Programmable in the range 1 minute to 100 hours.

Tests may be stopped at any time.

PROPAGATION DELAY

Measured using a PRBS unframed test pattern to allow operation under high error rate conditions.

All rates except 34 Mbit/s**Range**

Up to 2 seconds.

Resolution

1 bit period ± 2 microseconds.

Update rate

Typically 2 seconds. Can be longer at low data rates.

34 Mbit/s**Range**

Up to 8 seconds.

Resolution

1 bit.

Update rate

Typically up to 8 seconds.

CHANNEL ASSOCIATED SIGNALING

Selected channel signaling analysis for systems incorporating channel associated signaling.

Display: Signaling Code

2048 kbit/s

Decimal and binary equivalent of current and previous signaling code

Signaling code for all 30 channels simultaneously

T1

Current and previous state of A and B bits

Signaling code for all 24 channels simultaneously

T1 ESF

Current and previous state A, B, C and D bits

Signaling code for all 24 channels simultaneously

Analysis

From a set of user entered values (signaling codes and mask limits), the last 20 dialled digits are displayed. An error indication is given if the mask limits are exceeded.

Errors

Wrong signaling code.

Dial break pulse too wide.

Dial break pulse too narrow.

Inter Dial break pulse too wide or inter digit pulse too narrow.

Inter Dial break pulse too narrow.

11 or more dial break pulses.

C-BIT FRAMING

Monitoring of C-Bit Frame for French TRANSMIC-2G system.

Display of C-Bit Frame message bits.

DTMF SIGNALING**(Dual tone multifrequency)**

DTMF tones are generated and detected within 64 kbit/s channels on 2048 kbit/s and 1544 kbit/s (T1) systems.

Tone pairs (one from each group)

Low group - 697, 770, 852, 941 Hz.

High group - 1209, 1336, 1477, 1633 Hz.

Generator

Generation of tone digits by keyboard entry.

Modes

Tone burst to preset length.

Sequence preset up to 19 digits.

Tone generated sent to loudspeaker if switched on.

Receiver

Receipt and display of valid tone digits.

No detection of short tones or other errors is provided.

BIT RATE MEASUREMENT

The bit rate is measured every second displayed to nearest 1 Hz.

Accuracy

± 5 ppm.

BIT RATE MEASUREMENT

The bit rate is measured every second or every 2 seconds (34 Mbit/s) and displayed to the nearest 1 Hz.

Accuracy

± 2 ppm ± 1 count.

DIGITAL SIGNAL LEVEL MEASUREMENT

The amplitude of the incoming digital signal is measured and displayed in Volts peak and dB relative to nominal.

All rates except 34 Mbit/s**Range**

+3 to -35 dB.

Accuracy

+3 to -10 dB.

± 1.5 dB

-10 to -20 dB.

± 2 dB

-20 to -30 dB.

± 3 dB.

34 Mbit/s

Terminated and Bridging Range

+3 to -20 dB.

Accuracy

± 1 dB.

Monitoring Range

14 dB: -10 to -34 dB

26 dB: -22 to -44 dB

38 dB: -34 to -44 dB

Accuracy

± 2 dB.

2 CHANNEL SYNCHRONIZATION MEASUREMENT

The clocks are extracted from two primary rate digital signals and compared for synchronization.

One of the inputs is used as a reference.

A sync slip is registered for each bit of relative phase shift.

Measurement

Number of slips in current second.

Total slips since start of test.

TIMING MEASUREMENT (DTE ONLY)

Time intervals between changes of control lines.

X.21

C and I.

RS-449 (V.36)

RS and CS.

V.35

RTS and CTS.

RS-232

RTS and CTS.

Range

0 to 10 seconds.

Resolution

1 ms.

PARAMETER RULES

Loss of signal (LOS)

Errors in a loss of signal (LOS) second are discarded.

Framing errors

Errors in a loss of frame (LOF) second are discarded.

Pattern errors

Pattern errors are counted up to the point when pattern synchronisation is lost. The count is suspended until synchronisation is regained.

CRC errors

Errors in any second with loss of CRC multiframe sync are discarded.

Allowed seconds

Seconds in which errors are not discarded.

Error counts

Count displays reach 999,999,999 and then stop.

Error ratios

Displayed in the form $X \times 10^Y$ where X is 1 to 9 and Y is 2 to 11.

Percentages

Calculated to 6 decimal places and displayed rounded up to 5.

Update rate

Results and displays are updated every second.

Unavailable time

A period of unavailable time begins when the error ratio in each second is worse than 1×10^{-3} (or otherwise severely errored) for ten consecutive seconds. These ten seconds are considered part of the

unavailable time. The period of unavailable time terminates when the error ratio in each second is better than 1×10^{-3} for ten consecutive seconds. These ten seconds are considered part of the available time.

Break

A period of unavailable time.

Errored Second

A second of available time in which one or more errors are detected.

Error Free Second

A second of available time in which no errors are detected.

Severely Errored Second

A second of available time in which the error ratio is worse than 1×10^{-3} . Note that a one second interval containing loss of signal or loss of synchronisation is considered to be a severely errored second.

Non Severely Errored Second

A second of available time in which the error ratio is equal to or better than 1×10^{-3} .

Degraded Minute

A one minute interval during which the error ratio is worse than 1×10^{-6} . The one minute intervals are obtained by ignoring unavailable time and severely errored seconds and consecutively grouping the remaining seconds.

Non Degraded Minute

A one minute interval (as defined above) during which the error ratio is equal to or better than 1×10^{-6} .

MEASUREMENTS

Total Test Time

A count incremented once every second that the test is in progress. Displayed as days, hours, mins, seconds.

Number of errors

The total number of errors (to date or to end of test) in the allowed seconds.

Long Term Mean Error Ratio (LTMER)

The ratio of Number of Errors to the Total Number of relevant bits.

Number of Loss of Signal (LOS) seconds

The total number of seconds in which there was no input signal.

Loss of Signal events

The number of blocks of consecutive Loss of Signal seconds.

Number of AIS seconds

The total number of seconds in which an AIS is detected.

AIS events

The number of blocks of consecutive AIS seconds. LOS seconds are not included.

Number of Loss of Frame Alignment (LOF) seconds

The total number of seconds in which a Frame Alarm is detected.

Loss of Frame events

The number of blocks of consecutive Loss of Frame seconds. LOS and AIS seconds are not included.

Number of Loss of Pattern Sync (LOP) seconds

The total number of seconds during which there is no Pattern Sync.

Loss of Pattern Sync events

The number of blocks of consecutive Loss of Pattern Sync seconds. LOS, AIS, and LOF seconds are not included.

Number of Loss of CRC Sync (LOC) seconds

The total number of seconds during which Loss of CRC Alignment (LOC) was detected.

Loss of CRC Sync events

The number of blocks of consecutive Loss of CRC Sync seconds. LOS, AIS, and LOF seconds are not included.

Short Term (Current) Error Ratio

The Auto algorithm used results in a fast attack/slow decay response which responds quickly to a rise in error ratio but falls slowly when the error ratio decreases. Also 1, 2, 5, 10 seconds gating.

Number of Bursts

The total number of bursts in the allowed seconds. A burst is defined as the detection of more than X errors in a multiframe where X may be set between 8 and 256.

Time between Last Two Bursts

The time between the last two bursts is displayed in hours, mins, secs and millisecs.

Time Since Last Burst

The time since the last burst is in hours, mins, secs and millisecs.

% Available Time

The ratio of available time to total test time.

% Unavailable Time

The ratio of unavailable to total test time.

Number of Errored Seconds

The total number of available seconds in which one or more errors were detected.

% Errored Seconds

The ratio of errored seconds to available time.

% Error Free Seconds

The ratio of error free seconds to available time.

Number of Severely Errored Seconds (SES)

Total number of SES.

% Severely Errored Seconds

The ratio of SES to available time.

% Non Severely Errored Seconds

The ratio of non SES to available time.

Number of Degraded Minutes (DM)

Total number of DM.

% Degraded Minutes

The ratio of DM to available time.

% Non Degraded Minutes

The ration of non DM to available time.

Number of Breaks

Total number of Breaks.

GENERAL CHARACTERISTICS

OPERATOR INTERFACE

The instrument is controlled via a keyboard containing a data entry keypad, dedicated keys and five soft-keys used in conjunction with a Cold Cathode Backlit Liquid Crystal Display. The 8 line by 40 character (plus graphics capability) LCD and keyboard are fully interactive providing menu and soft-key operation.

DISPLAYS

Transmit parameters.
Receive parameters.
Measurement Results including Stored Results.
RS-232C Port parameters.
Printer Type selection.
Measurement definition.
Autoprint definition.
Setup Conditions (Stored Parameters).
Current Status.

DISPLAY LANGUAGE

English, French, Italian, Spanish.
User Selectable.

AUDIBLE ALARM

Mode

ON.
OFF.

ON

Alarm sounds on detection of:
Loss of any sync/signal.
Any errored second.

LOUDSPEAKER

Selected 64 kbit/s channels can be routed to the loudspeaker. There is a volume control.

SETUP CONDITIONS (STORAGE FACILITY)

A variety of information can be stored in non-volatile memory (battery backed-up).

Last Operation

The instrument retains all setup parameters when powered down. These are reinstated when the instrument is powered up.

Configuration Stores

18 sets of transmitter/receiver/test definition parameters can be selected for storage. Each set can be recalled whenever required, and can be identified with a 12 character label.

REAL TIME CLOCK

Displays date and time.

Resolution

One second.

Accuracy

± 1 minute per week.

POWER FAIL/TEST CONTINUE

If mains power is lost during a test, the test is resumed when power returns.

Indications

Power Fail page, Autoprint output.

MULTIPLE TESTS STORAGE

6 full sets of test results can be stored for later analysis and/or printing.

PRINT TO RAM

Up to 8000 print lines can be stored in memory for subsequent scrolling on screen with full or partial print capability. Where required Print to RAM results can be stored with associated test results.

KEYBOARD LOCKOUT

The keyboard can be disabled whilst a test is running.

PRINTER FACILITIES

Page print or Autoprint printers

40 column minimum.

Page printing

Page printouts are initiated by the PRINT key and cause the whole of the current page to be printed. Graphics display pages can be printed in a text equivalent or a facsimile to a suitable printer.

Autoprinting

The printer can be set automatically to print on the occurrence of any of the following (where applicable), each event printed with its date and time and two digit identity number. A twelve character label is also printed where appropriate:

Test start and stop.

Loss and restoration of signal.

Loss and restoration of alignment.

Loss and restoration of pattern sync.

Detection of errors (ES).

Detection of burst errors.

Detection of ISDN error report alarm pulse (2048 kbit/s ISDN system).

Detection of change of state of bit 5 in Not Frame Word (2048 kbit/s ISDN system).

Detection of alarms.

Detection of octet slips.

Detection of a short term (current) error ratio, for the selected major error type, crossing a user set threshold.

Detection of change of signaling code.

Cumulative printout at preselectable intervals of 15 mins, 30 mins, 1 hour, 6 hours, 12 hours or 24 hours.

Stored results, G.821 results, and two channel synchronisation slips may be included in interval print.

Loss and restoration of power.

Printer Operation

Page printing.

Long term collection of information via the Autoprint facility.

Remote Control

Remote commands are made up from a mixture of text and data. Commands are grouped into logical sets and allow for ease of use and self-documenting control programs.

Most controls are remotely programmable.

RS-232 PORT

The RS-232 port is used for printer operations, remote control, or for duplication of the display onto a terminal.

Connector

25 way female D-type.

Electrical

To RS-232C/V.28.

IEEE-488 (Option)

2852S and 2853S only.

Used for remote control or printer operations.

LIMIT RANGE OF OPERATION

Temperature

0 to 55°C.

Safety

Conforms with the requirements of EEC Council Directive 73/23/EEC (as amended) and the product safety standard IEC/EN 61010-1 : 2001 + C1 : 2002 + C2 : 2003 for Class 1 portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an Installation Category 1 or 2 supply.

CONDITIONS OF STORAGE AND TRANSPORT

Temperature

-40 to +70°C.

Humidity

Up to 90% relative humidity (non condensing).

Altitude

Up to 2500 m (pressurized freight at 27 kPa differential).

ELECTROMAGNETIC COMPATIBILITY

Conforms with the protection requirements of the EEC Council Directive 89/336/EEC. Conforms with the limits specified in the following standards:
IEC/EN61326-1 : 1997, RF Emission Class B, Immunity Table 1, Performance Criteria B

POWER REQUIREMENTS

AC Operation

AC Voltage

230 V nominal. 190 to 264 V.

115 V nominal. 90 to 120 V.

Frequency

45 to 66 Hz.

Consumption

45 VA maximum.

DC operation (Option)

One of three options can be specified.

48 V

Range

±36 to ±60 V.

24 V

Range

±20 to ±36 V.

12 V

Range

±10 to ±18 V.

Battery operation (Option)

Operating time

7 hours or 3 hours (34 Mbit/s) with backlight timeout of 5 minutes for temperature range of 17 to 27° C.

2852 and 2853

Battery mounts under 2852 and 2853.

2852S and 2853S

Battery mounts inside 2852S and 2853S.

Weight of battery

2.7 kg.

DIMENSIONS AND WEIGHT

	Height	Width	Depth	Weight
2852 and 2853	110 mm max	353 mm	297 mm	4.5 kg

	Height	Width	Depth	Weight
2852S and 2853S	197 mm max	345 mm	477 mm	8 kg

34 Mbit/s NRZ CONNECTOR 15 way D-Type

Pin Number	Description	Function
2-8	Ground	
13	Transmit clock in	NRZ
11	Transmit clock out	NRZ
12	Transmit data out	NRZ
15	Receive clock in	NRZ
14	Receive data in	NRZ
10	Transmit clock in	HDB3/AMI-50 Ω
1, 9	Not connected	

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers

Versions

2852S	Metal Case Version.
2852	Desktop Version.
2853S	Metal Case Version.
2853	Desktop Version.

Note that 2852 and 2852S do not provide RS-232, X.21, RS-449 and V.35 test interfaces.

Supplied with

43129/003	Supply Lead.
41690/485	Stowage Cover (2852S and 2853S only)
46884/604	Audio Jack Plug (Qty 2).
46884/403	15 way D-Type connector
54311/125	X.21 Adaptor Lead / V.11, DTE.
54311/127	RS-449 Adaptor Lead - V.11, DTE.
54311/131	V.35 Adaptor Lead - DTE.
46882/177	Operating Manual.
46882/178	Introductory Guide.

Optional Accessories

46880/004	Service Manual.
54311/126	X.21 Adaptor Lead - V.10, DTE female.
54311/140	X.21 Adaptor Lead - V.11, DCE female.
54311/141	X.21 Adaptor Lead - V.10, DCE female.
54311/128	RS-449 Adaptor Lead - V.10, DTE female.
54311/142	RS-449 Adaptor Lead - V.11, DCE female.
54311/143	RS-449 Adaptor Lead - V.10, DCE female.
54311/144	V.35 Adaptor Lead - DCE, female.
54311/152	RS-232 Adaptor Lead - DCE, female.

Optional Accessories

54311/121	RS-232 Lead - male to male - 25 way D-Type - 1.5m.
54311/122	X.21 Lead - male to male - 15 way D-Type - 1.5m.
54311/147	RS-449 Lead - male to male - 37 way D-Type - 1.5m.
82520	RS-499 to RS-530 adapter lead, 1.5 m, male to male
54311/148	V.35 Lead - male to male - 34 way MRAC - 1.5m.
54311/130	Co/contradirectional Test Lead - 15 way D-Type to free end.

43129/189	IEEE-488 lead (2852S and 2853S).
46662/387	RS-232 Null Modem (female to male).
54717/040	Kyosha printer including power supply and data lead
54311/916	RS-232 special lead Scriptos to 2852/2853.
46662/620	Scriptos paper 10 pack.
46883/805	Signal Lead unbalanced (CF-CF).
54311/210	Signal Lead unbalanced (BNC-BNC).
46662/388	BNC to 1.5/5.6 adaptor.
46884/402	D-Type connector 25 way.
46662/490	Hard Carrying Case (2852 and 2853).
46662/493	Soft Carrying Case (2852 and 2853).
46662/192	Transit Case (2852S and 2853S).
54112/157	Soft Carrying Case (2852S and 2853S).
49000/002	Remote Applications Software: single user licence.
49000/003	Remote Applications Software : 20 user licence.
46883/852	Null modem (female to female).
46883/824	Gender changer (female to female).
54127/309	Rack Mount Kit (2852S and 2853S only).

Option	Allowed Combinations								Description
01	★	★	★	★	★	★	★	★	2, 8 Mbit/s framed & 34 Mbit/s unframed
02			★				★		Add 1544 kbit/s (T1).
03				★				★	Add 704 kbit/s.
04					★			★	Add 704 kbit/s, T1, T1C, T2 (No ALBO).
14						★	★	★	Add 34 Mbit/s framed & mux/demux.
08	†	†	†	†	†	†	†	†	French key panel.
09	†	†	†	†	†	†	†	†	1.6/5.6 Connectors.
15	†	†	†	†	†	†	†	†	DC Input - ± 36 V to ± 60 V (includes cable).
16	†	†	†	†	†	†	†	†	DC Input - ± 20 V to ± 36 V (includes cable).
17	†	†	†	†	†	†	†	†	DC Input - ± 10 V to ± 18 V (includes cable).
12	†	†	†	†	†	†	†	†	Battery.
13	†	†	†	†	†	†	†	†	IEEE-488 (2852S and 2853S).
22	†	†	†	†	†	†	†	†	EUROCOM D/1 IB6.
25	†					†			EUROCOM D/1 IB5 and IB6.
26	†	†	†	†	†	†	†	†	V.11 data rate to 9 Mbit/s

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