2854S/2855S *Digital Analyzers*

Digital testers for PCM and data applications up to 140 Mbit/s including mux/demux

- **PCM and data pattern generator and error detector from 50 bit/s to 140 Mbit/s**

- **Demultiplex and hierarchical errors and alarms monitoring**

- **Generate and monitor test patterns, framed or unframed, at all hierarchical levels within 8, 34 and 140 Mbit/s signals**

- **All data test interfaces as standard: RS-232, X.21, V.35, RS-449 (V.36) (2855S), codirectional, contradirectional with EUROCOM optional (2854S and 2855S)**

- **Data interface and analog channel access**

- **G.821, G.921, G.826, 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 2855S Digital Communications Analyzer extends the capabilities of the 285X series of analyzers to include support of the latest service offerings from PTTs world-wide.

Testability from data communications interfaces to high speed digital links and multiplexes at 2, 8, 34, and 140 Mbit/s in a single portable and battery operated unit provides unrivalled flexibility for support of modern digital and data networks and equipment. The 2854S Digital Transmission Analyzer provides most of this functionality but limits the data test capability to Codirectional and Contra-directional interfaces.

This Data Sheet, therefore, contains only those capabilities and specifications which are incremental to 2850B and 2851.

PCM Framing Systems

2854S and 2855S are able to generate and receive all commonly used framing systems up to 140 Mbit/s for the European digital hierarchy. North American rates are also available to 6 Mbit/s.

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

Thus 2854S and 2855S 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), 34368 and 139264 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 × 64 kbit/s can be tested where they are carried within T1, 704, 2048, 8448, 34368 and 139264 kbit/s digital signals. All systems and n × 64 kbit/s cross connect switches are catered for with the flexibility of contiguous and non-contiguous channel selection.

Tributary Testing

2048 kbit/s tributaries within 8448 kbit/s digital signals, 2048 and 8448 kbit/s tributaries within 34368 kbit/s digital signals, and 2048, 8448 and 34368 kbit/s tributaries within 139264 kbit/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 CCITT Recommendations, for example inter-computer links, tests can be performed 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, third and fourth 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 140 Mbit/s. Data test interfaces provided are RS-232, X.21, RS-449 (V.36), V.35 (2855S), codirectional and contradirectional (2854S and 2855S). DTE is standard, DCE optional.

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 × 64 kbit/s and other rates.

IN-SERVICE AND OUT-OF-SERVICE MEASUREMENTS

2854S and 2855S are equally suited to both installation and in-service maintenance measurements at rates up to 140 Mbit/s. Interfaces are provided to enable the receiver to be connected to a number of network points at varying impedances and signal sensitivities, including the provision of automatic equalisation (automatic line build out, ALBO) at 2048 kbit/s.

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, 34368 and 139264 kbit/s signals. At the same time selected 64 kbit/s or n × 64 kbit/s channels, or 2048, 8448 or 34368 kbit/s tributaries, can be monitored for pattern errors, whilst analog channels can be monitored using the loudspeaker. Both Channel Associated and DTMF Signaling 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, 34368 and 139264 kbit/s digital signals. Analog access is possible only at 1544 and 2048 kbit/s, or within 2048 tributaries of 8448, 34368 and 139264 kbit/s signals.

Drop and Insert

In addition to checking error performance of selected 64 kbit/s and n × 64 kbit/s channels with transmitter and receiver operating independently, a Drop and Insert configuration can be adopted for 704, 2048 and 1544 kbit/s systems so that 64 kbit/s and n × 64 kbit/s channels can be tested with minimum disruption of service to other in-traffic channels.

External Access

Access is provided on front panel connectors to selected transmit and receive channels, at both analog and digital levels, for first, second, third and fourth order digital signals. Thus, if required, external analog or digital test equipment can be connected to make specific channel measurements beyond the capability of 2854S and 2855S.

TERMINAL EQUIPMENT TESTING

2854S and 2855S 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, 8448 and 34368 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.

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)

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.

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

As 2850B, 2851 PLUS

34368 kbit/s - G.751 asynchronous

139264 kbit/s - G.751 asynchronous

Permitted combinations of bit rates

2048 & 8448 & 34368 & 139264 kbit/s or
704 & 2048 & 8448 & 34368 & 139264 kbit/s or
1544 & 2048 & 8448 & 34368 & 139264 kbit/s or
704 & 2048 & 8448 & 1544 & 3152 & 6312 & 34368 &
139264 kbit/s.

AIS

Unframed all ones signal

CLOCK SOURCE

Internal, external or derived from the received signal

Internal

34 and 140 Mbit/s

Accuracy

±2 ppm from 0° C to 55° C

Offset

±100 ppm

External

Unframed and Multiplex Clock

BNC connector

Range

6 MHz to 160 MHz

Interface

Sine or square wave (ECL/TTL)

Impedance

50 Ω

CLOCK OUTPUT

TTL or ECL into 75 Ω

LINE CODES

CMI, AMI (50% duty cycle), HDB3, NRZ

MAIN OUTPUTS

34 and 140 Mbit/s

Unbalanced

Impedance

75 Ω

Peak Voltage

34 Mbit/s

1.0 V ±0.1 V

140 Mbit/s

0.5 ±0.05 V

Space Voltage

0 V ±10% peak

NRZ DIGITAL OUTPUT

34 and 140 Mbit/s

Unframed only with external clock

Frequency Range

6 to 160 Mbit/s

Level

TTL or ECL to 50 Mbit/s

ECL above 50 Mbit/s

Connector

Data - main digital output BNC

Clock - BNC on rear panel

TEST PATTERNS

Insertion

Single Channel

Selected 64 kbit/s channel of framed signal at 2048 kbit/s or 8448 kbit/s (G.744).

Selected 64 kbit/s channel of 2048 kbit/s tributary.(8, 34 and 140 Mbit/s output), or 8448 kbit/s (G.744) tributary (34 and 140 Mbit/s output).

n x 64 kbit/s Channel

Selected n x 64 kbit/s channel of framed signal at 2048 kbit/s or 8448 kbit/s (G.744).

Selected n x 64 kbit/s channel of 2048 kbit/s tributary (8, 34 and 140 Mbit/s output).

Channel distribution can be contiguous or non-contiguous.

2048 kbit/s Tributary

Selected 2048 kbit/s tributary (8, 34 and 140 Mbit/s output)

8448 kbit/s Tributary

Selected 8448 kbit/s tributary (34 and 140 Mbit/s output)

34368 kbit/s Tributary

Selected 34368 kbit/s tributary (140 Mbit/s output)

Unframed

Unframed signal

PRBS

34 and 140 Mbit/s

2^{15} -1, 2^{18} -1, 2^{20} -1, 2^{23} -1, 2^{25} -1, 2^{28} -1, 2^{31} -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 and 140 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 (not at 34 or 140 Mbit/s).

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, inserted into single channel. This facility is available for 704 and 2048 kbit/s systems only.

FILL PATTERNS

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

PRBS, 2^{15} -1

User programmable 8 bit word

34 and/or 8 and/or 2 Mbit/s tributaries

All 1s, All 0s, PRBS, Alternating 10

Copy of 2 or 8 or 34 Mbit/s test signal

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), 34 and 140 Mbit/s (G.751) and 8448 kbit/s (G.744) tributaries within 34 and 140 Mbit/s.

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 adaptor cable 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), 34 and 140 Mbit/s (G.751)

Range

0.3 to 3.4 kHz

Encoding

A-law for 2048 kbit/s

μ-Law for 1544 kbit/s

Impedance

600 Ω balanced

Max Input Level

+3 dBm0

ERROR INJECTION

34 and 140 Mbit/s

Target

Test Pattern

Framing

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.

There is no injection into CMI line code at 140 Mbit/s.

Injection Mode

Singly

By keypress

Fixed rate

34 Mbit/s

3×10^{-2} to 1×10^{-8} (pattern and code)

3×10^{-2} to 1×10^{-7} (frame)

140 Mbit/s

3×10^{-3} to 1×10^{-9} (pattern)

3×10^{-3} to 1×10^{-7} (frame)

ACCESS TO STRUCTURE BITS

34 and 140 Mbit/s

Frame alignment strategy

Change unassigned, distant, and alarm bits

PCM RECEIVER INTERFACE

FRAMING AND BIT RATES

As Transmitter

Permitted combinations of bit rates

As Transmitter

Frequency Tolerance

As 2850B, 2851 PLUS

34368 kbit/s

±60 ppm

139264 kbit/s

±60 ppm

LINE CODES

As Transmitter

DIGITAL INPUT

Connector

BNC

Impedance

75 Ω unbalanced

NRZ DIGITAL INPUT

34 and 140 Mbit/s

Unframed only

Frequency Range

6 to 160 Mbit/s

Level

TTL or ECL to 50 Mbit/s, ECL above 50 Mbit/s

Connector

Data - main digital output BNC
Clock - BNC on rear panel

INPUT MODES AND SENSITIVITY

34 and 140 Mbit/s

Terminated

Terminates the line

Sensitivity

±1 V (34 Mbit/s), ±0.5V (140 Mbit/s), nominal

+3 dB -12 dB cable attenuation

+3 dB -18 dB linear attenuation

Monitor

Connects to a protected monitor point

Sensitivity

Nominal attenuation of 15, 20, 26 and 30 dB

+3 dB -6 dB cable attenuation

+3 dB -12 dB linear attenuation

Maximum total attenuation 38 dB

TEST PATTERNS

Source

Single Channel

Selected 64 kbit/s channel of framed signal at 2048 kbit/s or 8448 kbit/s (G.744).

Selected 64 kbit/s channel of 2048 kbit/s tributary. (8, 34 and 140 Mbit/s input), or 8448 kbit/s (G.744) tributary (34 and 140 Mbit/s input).

n x 64 kbit/s Channel

Selected n x 64 kbit/s channel of framed signal at 2048 kbit/s or 8448 kbit/s (G.744).

Selected n x 64 kbit/s channel of 2048 kbit/s tributary (8, 34 and 140 Mbit/s input).

Channel distribution can be contiguous or non-contiguous.

2048 kbit/s Tributary

8448 kbit/s Tributary

Selected 2048 kbit/s tributary (8, 34 and 140 Mbit/s input).

Selected 8448 kbit/s tributary (34 and 140 Mbit/s input).

34368 kbit/s Tributary

Selected 34368 kbit/s tributary (140 Mbit/s input)

Unframed

Unframed signal

PRBS

34 and 140 Mbit/s

2^{15} -1, 2^{18} -1, 2^{20} -1, 2^{23} -1, 2^{25} -1, 2^{28} -1, 2^{31} -1

Repetitive Word

Any word which repeats over a 24 bit (34 and 140 Mbit/s only), 16 bit or 8 bit sequence.

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), 34 and 140 Mbit/s (G.751) and 8448 kbit/s (G.744) tributaries within 34 and 140 Mbit/s.

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 adaptor cable accessory)

NRZ (TTL level)

Frame or AIS alarm detected

All 1's transmitted

Signal loss detected

Outputs are off

Clock output

64 kHz (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), 34 and 140 Mbit/s (G.751).

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.

UNASSIGNED FRAMING BITS

The state of the unassigned bits is displayed

DATA TEST INTERFACES

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

As 2851 (2855S only)

TEST PATTERNS

As 2851

ERROR INJECTION

As 2851

ALARMS

As 2851

SYNC OUTPUTS

As 2851

ERRORS OUTPUT

As 2851

MEASUREMENTS

ERROR TYPES

PCM Interfaces

Line Code Errors (Bipolar Violations)

Pattern Errors

Framing Errors

CRC Errors

Data Interfaces

Pattern Errors

Line Code Errors

Measured on input signal

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 x 64 kbit/s channel, or unframed.

CRC Errors

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

MAIN PARAMETERS

As 2851

ADDITIONAL PARAMETERS

As 2851

G.821 ERROR PERFORMANCE

As 2851

STORED RESULTS

As 2851

PROPAGATION DELAY

34 and 140 Mbit/s

Range

Up to 8 seconds

Resolution

1 bit

4 bits at 140 Mbit/s

Update rate

Typically up to 8 seconds

SIGNALING

BIT RATE MEASUREMENT

The bit rate is measured every other second and displayed to the nearest 1 Hz, or 4 Hz at 140 Mbit/s

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

34 and 140 Mbit/s

Range

+3 to -40 dB

Accuracy

+3 to -30 dB

±2 dB

-30 to -40 dB

±3 dB

2 CHANNEL SYNCHRONIZATION MEASUREMENT

As 2851

GENERAL CHARACTERISTICS

As 2851 except

IEEE-488 (Option)

Used for remote control or printer operations.

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

Safety

Conforms with the requirements of EEC Council Directive 73/23/EEC and Standard IEC/EN 61010-1 : 1993
Complies with IEC 348, HD401 for class 1 portable equipment and is for use in a pollution degree 2 environment. The instrument is designed to operate from an installation category 1 or 2 supply.

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

80 VA maximum

DC Operation (Option)

48 V

   Range ±36 to ±60 V

Battery Operation (Option)

Operating time

   1½ hours with backlight timeout of 5 minutes for temperature range of 17 to 27°C

Charge time

   15 hours

Temperature range for full nominal charge

   10 to 30°C

Temperature range for full nominal discharge

   0 to 50°C

Limit range of operation

   Charge

     0 to 35°C

   Discharge

     0 to 50°C

Weight of battery

   2.7 kg

INSTRUMENT DIMENSIONS AND WEIGHT

Height	Width	Depth	Weight
197 mm	345 mm	477 mm	8 kg

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers

Versions

2854S	Digital Transmission Analyzer
2855S	Digital Communications Analyzer

Supplied Accessories

43129/003	Supply Lead
41690/485	Stowage Cover
46884/604	Audio Jack Plug (Quantity 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
46882/128	Operating Manual
46882/127	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
54311/121	RS-232 Lead - male to male - 25 way D-Type - 1.5 m
54311/122	X.21 Lead - male to male - 15 way D-Type - 1.5 m
54311/147	RS-449 Lead - male to male - 37 way D-Type - 1.5 m
82520	RS-449 to RS-530 adapter lead, 1.5 m, male to male
54311/148	V.35 Lead - male to male - 37 way D-Type - 1.5 m
54311/130	Co/contradirectional Test Lead - 15 way D-Type
43129/189	IEEE-488 Lead
46662/387	RS-232 Null Modem (female to male)
54717/040	Scriptos Printer
54311/216	RS-232 special lead Scriptos to 2854/2855
46662/620	Scriptos paper 10 pack
46883/805	Signal Lead balanced (CF-CF)
54311/210	Signal Lead unbalanced (BNC-BNC)
46662/388	BNC to 1.6/5.6 adaptor
46884/402	D-Type connector 25 way
46662/192	Transit Case
46662/499	Soft Carrying Case
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

Note that 2854S does not provide RS-232, X.21, RS-449 and V.35 test interfaces

Option	Allowed Combinations				Description
01	★	★	★	★	2, 8, 34 and 140 Mbit/s Framed and Mux/Demux
02		★			Add 1544 kbit/s (T1)
03			★		Add 704 kbit/s
04				★	Add 704 kbit/s, T1, T1C, T2 (No ALBO)
08	†	†	†	†	French key panel
09	†	†	†	†	1.6/5.6 Connectors 15
12	†	†	†	†	Battery
13	†	†	†	†	IEEE-488
19	†	†	†	†	DC Input - ±36 to ±60 V (includes cable)
22	†	†	†	†	EUROCOM D/1 IB6
25	†				EUROCOM D/1 IB5 & IB6
26	†	†	†	†	V.11 data rate to 9 Mbits/s

★ Basic options.
† Additional options.