2842/43 Digital Communications Analyzers

Hand-held, high capability testing for 2 Mbit/s and data line systems and equipment

- ***Handheld, battery operated, data and PCM rate tester***
- ***Framed and unframed operation at 2 Mbit/s including n x 64 kbit/s***
- ***Data test interfaces: RS-232, X.21, V.35, RS-449 (V.36), codirectional, contra-directional including X.21 monitoring***
- ***Two receiver clock slip measurements***
- ***S_a bit monitoring***
- ***G.821, G.826, M.2100 analysis***
- ***Histograms for error distribution and alarms***
- ***Print from up to 8 results stores***
- ***Analog channel generation and measurement***
- ***Measurements include frequency deviation, frequency and level measurement, propagation delay, output level attenuation, and CAS***

Two instruments in one

QUICK menus allow single page set up and test for quick and easy installation and maintenance measurements.

STANDARD menus give comprehensive facilities for detailed testing, fault localisation and analysis of network systems and equipment.

General

The 2842 2 Mbit/s Transmission Analyzer is a hand-held analyzer for installation and maintenance measurements on digital 2 Mbit/s lines and equipment. The 2843 Digital Communications Analyzer adds data interface testing to this 2 Mbit/s capability. The comprehensive measurement capability is contained in a compact, battery operated package, combined with a large graphics based LCD for ease of setup and results retrieval. QUICK menus and configuration stores ensure fastest possible set up and test.

FRAMING SYSTEMS

2 Mbit/s framing systems with 30 and 31 channels, with and without CRC4, are generated and received to enable a range of tests on framing, alarms and signalling.

64 kbit/s Channel Testing

Individual channels can be tested at 64 kbit/s, assisting in testing and fault location within digital data networks and cross connect switches.

n x 64 kbit/s Channel Testing

n x 64 kbit/s channels can be tested where they are carried within 2 Mbit/s digital signals. Full flexibility is provided with both contiguous and non-contiguous channel selection.

DATA INTERFACE TESTING (2843)

2 Mbit/s and data circuits and equipment can be tested in a fully integrated test instrument, with mixed mode data and 2 Mbit/s testing possible for maximum flexibility. Data test interfaces provided are RS-232, X.21, V.35, RS-449 (V.36), codirectional and contradirectional.

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.

DATA MULTIPLEX TESTING (2843)

Independent transmitter and receiver enable connection to data and 2 Mbit/s interfaces simultaneously. This allows testing across a data multiplex to ensure integrity of data card to 2 Mbit/s path.

X.21 MONITOR

X.21 links can be monitored in-service for control line status and remote and local loop requests.

TWO RECEIVER CLOCK SLIP MEASUREMENTS

Dual receiver inputs enable connection of two 2 Mbit/s HDB3 signals for measurement of clock slips. This enables detection of incorrectly set clocking on multiplexes and other network equipment. This measurement can also be done using a network clock as the reference.

COMPREHENSIVE ERROR AND ALARM MEASUREMENTS

The 2842 and 2843 can detect simultaneously Code, Framing, Pattern and CRC Errors. Further measurements are then made on a selected error type, including G.821, G.826, M.2100 and error distribution.

Error Distribution and Alarm Histograms

The error results and alarms are displayed in the form of a histogram with accumulation up to 7 days, and resolution up to 1 second. This provides a comprehensive record of long term measurements to assist in fault localization. A permanent record of these results can be obtained by printing the histograms or a text equivalent subsequent to the test.

Full Results Printing - Print from RAM

The instrument can be programmed to Autoprint selected parameters from the full set, on event or on timed intervals.

These include errors, performance parameters, and alarms.

Alternatively up to 4000 print events per results store can be stored in memory (Print from RAM) for subsequent printing. This also removes the necessity of real time printing where subsequent analysis via a PC may prove this to be unnecessary.

G.821, G.826 and M.2100 Measurements

The usual ITU-T recommendation of G.821 for 64 kbit/s error performance measurement is applied. In addition the recommendation G.826 extends measurements to 2 Mbit/s, while M.2100 allows bringing into service measurements against programmable limits.

S_a BIT MONITORING

The status of S_a bits for 2 Mbit/s CRC-4 is displayed.

MULTIPLE TEST STORAGE

Up to 8 full sets of results can be stored for later on screen analysis or printing.

RESIDUAL BIT ERROR RATE

Assessment of background error performance is useful in systems subject to degraded error performance, such as radio or satellite systems. RBER is long term mean error rate ignoring Severely Errored Seconds.

HIGH TOLERANCE TO BURST ERRORS

2842 and 2843 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.

PROGRAMMABLE ERROR GATING

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

IN-SERVICE AND OUT-OF-SERVICE MEASUREMENTS

The instrument is equally suited to installation and maintenance measurements. Interfaces are provided to enable the receiver to be connected to a number of network points at varying impedances and sensitivities. Automatic line equalization (automatic line build out, ALBO) is also provided to enable connection to signals attenuated by long sections of line.

IN-SERVICE CHANNEL ACCESS

Access is provided to receive timeslots for both analog and digital signals.

Voice Channels

Voice channels within a 2048 kbit/s signal on either receiver can be monitored in-service (A/B Audio) and routed to an internal loudspeaker or a headphone socket for a first level check of analog level and quality.

Data Channels

64 kbit/s data channels can be routed to a V.11 interface for external measurement, for example connection of common channel signalling to a protocol analyzer.

Drop and Insert

Selected 64 or n x 64 kbit/s channels within an in-service 2048 kbit/s signal can be tested with minimum disruption of service to other in-traffic channels.

NETWORK EQUIPMENT TESTING

Multiplex Equipment

2842 and 2843 are able to simulate and detect alarm conditions associated with the various 2048 kbit/s frame structures, including full frame alignment strategy testing to G.706.

In addition the input level margin of the multiplex can be checked using the output level attenuation capability whilst frequency margin can be checked using the output frequency offset capability.

Cross Connect Switches

Cross Connect switches can be checked for switch path integrity using the 64 kbit/s or n x 64 kbit/s channel test capability.

ANALOG CHANNEL MEASUREMENTS

Analog measurements (including frequency response and linearity) are made on selected 2 Mbit/s channels. The transmitter can generate sine waves across the full audio band with frequency and level resolution of 1 Hz and 0.1 dB respectively. Measurements are made of peak code, RMS level and frequency.

PROPAGATION DELAY MEASUREMENT

Delay measurements can be made on 2048 kbit/s digital circuits 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, or for characterising networks to assist in finding unwanted loopbacks.

Where data circuits are extended from 2048 kbit/s bearers out to subscribers, the overall network to subscriber loop delay can be measured at 64 or n x 64 kbit/s from within the 2048 kbit/s signal.

CHANNEL ASSOCIATED SIGNALLING

The 4 bit word associated with a selected channel can be controlled on the transmitter. On the receiver all 30 channels can be monitored simultaneously. In addition for a selected channel the last 16 signalling word changes can be stored for later analysis. Idle and busy signalling codes can be decoded into plain English.

DIGITAL SIGNAL LEVEL AND FREQUENCY MEASUREMENT

The frequency and amplitude of the incoming digital signal are displayed to enable early warning of degradation of the signal, or to check the loss of in-station cabling to ensure it conforms to limits.

BIT SLIP DETECTION

Single, uncontrolled bit slips can be detected within framed or unframed test patterns. This allows inter and intra network clocking problems to be isolated.

OCTET SLIP DETECTION

Octet slips can be detected at the 64 kbit/s channel level of a 2048 kbit/s signal, which allows the effects of frame slips introduced by network buffers to be assessed.

EASE OF USE

The instrument is set up quickly and easily using graphics based menu selection on a large LCD, with key pad and soft keys. QUICK menus allow single page set up and results display, and commonly used instrument configurations are stored in memory to ensure minimum set up time.

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 commands enabling remote configuration and reporting of results.

POWER OPTIONS

Internal batteries give five hours operation when both transmitter and receiver are being used. Battery life is extended in monitoring applications where the transmitter can be switched off. Fast charge circuits coupled with an AC power adaptor enable recharge in only three hours.

For extended operation the AC power adaptor can be used with the batteries as standby in the event of power failure.

SPECIFICATION

2 MBIT/S TRANSMIT INTERFACE

For standard menus transmit and receive parameters are programmable separately, for QUICK menu they are tied together.

FRAMING AND BIT RATES

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

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 (Option 02, French).

CLOCK SOURCE

Internal, external or derived from the received signal

Internal

Accuracy

±1 ppm from 0°C to 55°C

±1 ppm / year

Frequency Offset

(Not available in QUICK menu)

Small

Steps of ±5 and ±50 ppm to ±150 ppm

Large

Steps of ±2 and ±10 kbit/s to ±30 kbit/s

External

	Connector
TTL	*Rx2 BNC*
Sine wave	*Rx2 BNC*
G.703 Figure 21	*Rx2 BNC*
HDB3 encoded signal to G.703	*Rx2 BNC, Rx2 RJ45*

LINE CODES

HDB3

AMI (50% duty cycle) (Not available in QUICK menu)

TEST PATTERNS

Insertion

Single Channel

Selected 64 kbit/s channel of framed signal

Channel Broadcast (Not available in QUICK menu)

All 64 kbit/s channels of framed signal

n x 64 kbit/s Channel (N x 64k Voice)

Selected n x 64 kbit/s channel of framed signal
Channel distribution can be contiguous or non-contiguous

Unframed

Unframed signal

PRBS

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

Sense

True or Inverted

Mode (framed only)

8 bit	*PRBS data fills all 8 bits in an octet, ie 64 kbit/s per channel*
7 + 1 bit	*First 7 bits are PRBS and last bit is a 1, ie 56 kbit/s per channel*

(Not available in QUICK menu)

Word

Standard Menu

32 bit word

User programmable sequence of 32 bits

QUICK Menu

Word

All 1, All 0, Alternating 10, 1000, 1110

Variable Sine Wave

Frequency Range	*1 to 3999 Hz*
Resolution	*1 Hz*
Level	*+3 to -55 dBm0*
Resolution	*0.1 dB maximum.*
Coding	*A-Law*

FILL PATTERNS

For 64 or n x 64 kbit/s operation the following patterns are used to fill all other channels

PRBS

2^{15}-1

8 bit word

User programmable sequence of 8 bits
(Not available in QUICK menu)

AIS

Mode

Enabled

Disabled

Zero injection (errors)

0, 1, 2 or 3 in 512 bits

Singly by pressing ERROR INJECT key

DROP & INSERT

(Not available in QUICK menu)

For framed operation the received signal is looped to the transmitter

Note that for CRC frame structures the CRC is recalculated before transmission

64 kbit/s

A selected 64 kbit/s channel is replaced by a test pattern.

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.

REGENERATOR LINE CURRENT LOOPTHROUGH

Line current on balanced lines can be looped through from receiver to transmitter of the instrument.

ERROR INJECTION

Target

Test Pattern Only

Framing Only

CRC Only

All

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. (Not available in QUICK menu)

Injection Mode

Singly

By keypress

Fixed rate

Standard menu

Rate M x 10-N, where M is 1 to 9 and N is 2 to 7

QUICK Menu

Rate 10-N, where N is 2 to 7

MAIN OUTPUTS

Balanced

Impedance	*120 Ω*
Peak Voltage	*3 V ±0.3 V*
Space Voltage	*0 V ±0.3 V*
Connector	*RJ45*

Unbalanced

Impedance	*75 Ω*
Peak Voltage	*2.37 V ± 0.237 V*
Space Voltage	*0 V ± 0.237 V*
Connector	*BNC*

Output Level Attenuation

(Not available in QUICK menu)

Attenuation	*6 and 10 dB*
Accuracy	*±0.5 dB*

SIGNALLING BIT CONTROL

(Not available in QUICK menu)

For framing systems with Channel Associated Signalling capability the signalling bits can be changed.

Selected Channel	*Set 4 bit word.*
All Other Channels	*Set 4 bit word.*

C-Bit Framing

(Option 02), French

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

Control of C-Bit Frame message bits.

FRAMING TESTS

(Not available in QUICK menu)

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

Frame alignment strategy

Set x in 4 consecutive frame words in error, single shot or continuously

Set x in 3 consecutive frame bits in error, single shot or continuously

Set x in 4 consecutive CRC multiframe words in error, single shot or continuously

Set x in 1000 CRC blocks in error continuously (default value is 915).

Signalling multiframe alignment strategy.

Set x in 2 consecutive multiframe words in error, single shot or continuously

Time Slot 16 (Signalling).

Set to AIS (All 1s).

Set to All 0s.

ACCESS TO STRUCTURE BITS

(Not available in QUICK menu)

Change unassigned, distant, distant multiframe and alarm bits.

2 MBIT/S RECEIVE INTERFACES

For standard menus transmit and receive parameters are programmable separately, for QUICK menu they are tied together.

FRAMING AND BIT RATES

As Transmitter.

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

Frequency Tolerance

2048 kbit/s

±50 ppm

LINE CODES

As Transmitter.

Indication of HDB3 signal present (Rx1)

AUTOCONFIGURE

The receiver Rx1 automatically configures to:

2 Mbit/s framed test pattern or unframed test pattern.

64 kbit/s channel test pattern (channel search or known channel).

n x 64 kbit/s channel test pattern (known channel).

INPUT MODES AND SENSITIVITY

Modes

Terminated	*Terminates the line.*
Bridging	*Taps onto a terminated unprotected monitor point*
Monitoring	*Connects to a protected monitor point.*

Connector

Balanced	*RJ45*
Unbalanced	*BNC*

TEST PATTERNS, Rx1

Source

Selected single, contiguous and non-contiguous n x 64 kbit/s channels of framed signal.

Unframed signal.

PRBS

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

Sense

True or Inverted

If PRBS received in opposite sense to that selected, receive pattern sense automatically changed.

Mode (framed only)

8 bit	*PRBS data fills all 8 bits in an octet, ie 64 kbit/s per channel*
7 + 1 bit	*First 7 bits are PRBS and last bit is a 1, ie 56 kbit/s per channel*

(Not available in QUICK menu)

Repetitive Word

Any word which repeats over a 32 bit sequence.

PATTERN SYNCHRONIZATION

Loss Criterion

PRBS error rate greater than 1 in 5 for each of 10 consecutive deciseconds.

CHANNEL EXTRACT

For framed single channel operation a selected 64 kbit/s channel is extracted from the received signal. Channel selection by increment and decrement keys

64 kbit/s voice, Rx1 and Rx2

Voice frequency signals are routed to the internal loudspeaker or audio output socket.

64 kbit/s data, Rx1

64 kbit/s data signals are output via a V.11 socket.

Balanced				
	Terminated	Bridging	Monitor (-15, -20, -23, -26 dB)	Monitor (-30 dB)
Impedance	120 Ω	>1000 Ω	120 Ω	120 Ω
Normal	3 V +2 to -9 dB	3 V +2 to -9 dB	3 V +2 to -9 dB relative to selected monitor point attenuation	3 V +2 to -6 dB relative to –30 dB
ALBO	3 V +2 to -30 dB			
Unbalanced				
	Terminated	Bridging	Monitor (-15, -20, -23, -26 dB)	Monitor (-30 dB)
Impedance	75 Ω	>1000 Ω	75 Ω	75 Ω
Normal	2.37 V +2 to -9 dB	2.37 V +2 to -9 dB	2.37 V +2 to -9 dB relative to selected monitor point attenuation	2.37 V +2 to -6 dB relative to –30 dB
ALBO	2.37 V +2 to -30 dB			

ALBO available only through Rx2.

AUDIO CHANNEL MEASUREMENT, Rx1

Frequency

Range *1 to 3999 Hz*

Resolution *1 Hz*

Sensitivity

RMS Level

Range *+6 to -60 dBm0*

Resolution *0.1 dB maximum*

Peak code *Positive and negative values are displayed.*

Decoding *A-Law*

VOICE FREQUENCY OUTPUT, Rx1 and Rx2

Range *0.3 to 3400 Hz*

Decoding *A-Law*

Impedance *600 Ω balanced*

STATUS INDICATORS

LEDs indicate frame structure alarm conditions

Display modes

CURRENT ALARMS

Red LEDs illuminate to indicate alarm presence and extinguish when the condition clears. LEDs respond to alarm conditions with a resolution of one second.

HISTORY

When ALARM HISTORY is pressed the CURRENT ALARM LEDs indicate alarms which have illuminated since the last time the history reset button was pressed. RESET resets the ALARM HISTORY.

	Rx1	*Rx2*
SIGNAL GOOD	√	√
For Rx1 green LED illuminates to show absence of combination of LINE, AIS, FRAME, MF, CRC and PATTERN alarms. For Rx2 green LED illuminates to show absence of combination of LINE, AIS and FRAME alarms.		
LINE	√	√
Red LED ON indicates signal loss.		
AIS	√	√
Red LED ON indicates signal is all 1's. All 1's is defined as signal with less than three zeros in two frame periods.		
For Rx1 ERRORS LED flashes on detection of errors within an AIS signal. These errors are not counted.		
FRAME	√	√
Red LED ON indicates a loss of frame alignment.		
CRC MF	√	x
Red LED ON indicates loss of CRC multiframe alignment.		
CAS MF	√	x
Red LED ON indicates loss of signalling multiframe alignment.		
DISTANT	√	x
Red LED ON indicates DISTANT alarm.		
DMF	√	x
Red LED ON indicates Distant Multiframe Alarm.		
PATTERN	√	x
Red LED ON indicates loss of pattern synchronisation.		
ERROR RATE	√	x
Red LED ON indicates that the error rate of the major error type is greater than a threshold set by the user. Threshold is 1 x 10^{-N} where N is 2 to 9.		
ERRORS	√	x
Red LED ON indicates major errors detected.		

Additional Display Indicators

(Auxiliary Alarms Page)

HDB3 SIGNAL	*Present or Not Present*	√	x
TS16 AIS	*Present or Not Present*	√	x

UNASSIGNED FRAMING BITS, Rx1

The state of the unassigned bits is displayed.

S_a Bits

The status of the S_a bits 4, 5, 6, 7 and 8 is displayed for 2 Mbit/s CRC-4 systems for each sub-multiframe.

DATA TEST INTERFACES

For standard menus transmit and receive parameters are programmable separately, for QUICK menu they are tied together, except for clock rate and source.

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

X.21, RS-449 (V.36), V.35, RS-232, Co/Contradirectional

X.21 (V.11), RS-449 (V.11), V.35 and RS-232 and Co/Contradirectional interfaces are presented to a common connector. DTE/DCE interfaces are provided by adaptor cables which provide the appropriate connector and electrical interface. The DTE/DCE switching is internal.

	Codirectional	***Contradirectional***
Line signal coding and level	To ITU-T Rec. G.703	To ITU-T Rec. G.703
Bit Rate	64 kbit/s	64 kbit/s
Format	Unstructured	Unstructured
Transmit Timing		
DTE	Receiver (from DCE) Internal External 2048 kbit/s	From DCE
DCE	Internal (to DTE) External 2048 kbit/s	Internal (to DTE) External 2048 kbit/s
Receive Timing		
DTE	Extracted from receiver signal (from DCE)	From DCE
DCE	Extracted from receiver signal (from DTE)	Internal (to DTE) External 2048 kbit/s
Pinouts		
1, 9	Transmit Data	Transmit Data
3, 11	Receive Data	Receive Data
5, 13		Transmit Clock In (from DCE)
7, 15		Receive Clock In (from DCE)
4, 12		Transmit Clock Out (to DTE)
6, 14		Receive Clock Out (to DTE)
8	Earth	Earth

X.21 -DTE/DCE

Pins	From DTE (To DCE)	Circuit	Pins	To DTE (From DCE)	Circuit
2, 9	Transmit	T	4,11	Receive	R
3, 10	Control	C	6, 13	Timing	S
8	Ground		5, 12	Indication	I
			7, 14	Byte Timing	B

RS-449 (V.36) - DTE/DCE

Pins	From DTE (To DCE)	Circuit	Pins	To DTE (From DCE)	Circuit
4,22	SD Send Data	103	6,24	RD Receive Data	104
17,35	TT Tx Timing	113	8,26	RT Rx Timing	115
19	Signal Ground		5,23	ST Send Timing	114
7,25	RS (Request To Send)	105	9,27	CS (CTS)	106
12,30	DTR (Data Terminal Ready)	108/2	11,29	DSR (Data Set Ready)	107
			13, 31	DCD (Data Carrier Detect)	109

V.35 - DTE/DCE

Pins	From DTE (To DCE)	Circuit	Pins	To DTE (From DCE)	Circuit
P,S	Transmit Data	103	R,T	Receive data	104
U,W	Transmit Timing	113	V,X	Receive timing	115
B	Signal Ground		Y,AA	Transmit timing	114
C	Request to send	105	D	Clear to send	106
H	DTR (Data Terminal Ready)	108/2	E	DSR (Data Set Ready)	107
L	Local Loop	141	F	DCD (Data Carrier Detect)	109
N	Remote Loop	140	NN	Test mode	142

RS-232 - DTE/DCE					
Pins	***From DTE (To DCE)***	***Circuit***	***Pins***	***To DTE (From DCE)***	***Circuit***
2	Transmit data	103	3	Receive data	104
24	Transmit timing	113	17	Receive timing	115
4	Request to send	105	15	Transmit timing	114
20	Data terminal ready	108	5	Clear to send	106
18	Local loop	141	6	Data set to ready	107
21	Remote loop	140	8	Receive line signal	109
7,1	Ground		25	Test mode	142

TTL (Miscellaneous connector)			
Pins		***Pins***	
1, 11	Power Feed Loopthrough	13	Transmit 2 Mbit/s or Data data out
2	Receive 2 Mbit/s or Data data input	15,23	Octet marker out (V.11)
3	Transmit 2 Mbit/s or Data clock output	17,25	64 kHz data out (V.11)
4	Earth	18	Earth
5, 14	8 kHz frame clock out (V.11)	19	Receive 2 Mbit/s or Data clock input
6	Earth	20	Rx1 recovered or receive data clock output
7, 16	64 kHz clock out (V.11)	21	Earth
8	Earth	22	External Data clock input
9, 26	Audio out (600 Ω)	24	n/c
10	Rx2 recovered clock out		
12	Earth		

Universal Connector

68 way type PCR female.

Adaptor Cable Connectors

X.21

15 way D-Type, ISO 4903.

RS-449 (V.36)

37 way D-Type, ISO 4902.

V.35

34 way MRAC, ISO 2593.

RS-232

25 way D-Type, ISO 2110.

Co/Contradirectional

15 way D-Type, ISO 4903

Cable recognition

Automatic recognition of the cable type plugged in.

TTL

(Not available in QUICK menu)

Code *NRZ*

Connector *26 way D-Type*

CONTROL LINES

Monitored control lines display current status. When HISTORY is pressed the display changes from 1 or 0 to X if the status has changed since the last time the HISTORY RESET button was pressed, or since start of test.

Control line status History can be reset.

MODE

Synchronous

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

Asynchronous

RS-449 (V.36), RS-232

IMPLEMENTATION

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

DTE.

DCE.

Electrical

X.21

V.11 (balanced)

RS-449 (V.36)

V.11 (balanced)

V.35

V.35 (data and timing)

V.28 (control lines)

RS-232

V.28

Input Impedance

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

V.11 Terminated

120 Ω

V.11 Unterminated

3000 Ω

V.35

100 Ω

Data Rate

For DTE operation using a DCE clock source, the transmitter and receiver are automatically set to the incoming clock rate.

X.21, RS-449 (V.11) (Sync)

50 bit/s to 2.5 Mbit/s

V.35 (Sync)

50 bit/s to 2.5 Mbit/s.

RS-232 (Sync)

50 bits/ to 80 kbit/s

RS-232, RS-449 (Async)

50 bit/s to 38.4 kbit/s

TTL

50 bit/s to 2.5 Mbit/s

Control Lines

X.21

DTE	***DCE***	
I (Indication)	C (Control)	Displayed as 1, 0.
C (Control)	I (Indication)	Settable to 1 or 0. (normally 1 when Transmitter On and 0 when Transmitter Off).

RS-449 (V.36)

DTE	***DCE***	
CS (Clear to send)	RS (Request to send)	Displayed as 1, 0.
RS (Request to send)	CS (Clear to send)	Settable to 1 or 0. (normally 1 when Transmitter On and 0 when Transmitter Off).
DSR (Data set ready)	DTR (Data terminal ready)	Displayed as 1, 0.
DTR (Data terminal ready)	DSR (Data set ready)	Settable to 1 or 0. (normally 1 when Transmitter On and 0 when Transmitter Off).
	DCD (Data Carrier Detect)	Settable to 1or 0.
DCD (Data Carrier Detect)		Displayed as 1, 0.

V.35

DTE	***DCE***	
CS (Clear to send)	RS (Request to send)	Displayed as 1, 0.
RS (Request to send)	CS (Clear to send)	Settable to 1 or 0. (normally 1 when Transmitter On and 0 when Transmitter Off).
DSR (Data set ready)	DTR (Data terminal ready)	Displayed as 1, 0.
DTR (Data terminal ready)	DSR (Data set ready)	Settable to 1 or 0. (normally 1 when Transmitter On and 0 when Transmitter Off.
	DCD (Data Carrier Detect)	Settable to 1or 0.
DCD (Data Carrier Detect)	LL (Local loop)	Displayed as 1, 0.
TM (Test Mode)	RL (Remote Loop)	Displayed as 1, 0.
	TM (Test mode)	Settable to 1 or 0.
LL (Local loop)		Set to 1 for V.54 loop 3 selected. Set to 0 for V.54 loop 3 deselected.
RL (Remote loop)		Set to 1 for V.54 loop 2 selected. Set to 0 for V.54 loop 2 deselected.

RS-232

DTE	***DCE***	
CTS (Clear to send)	RTS (Request to send)	Displayed as 1, 0.
DSR (Data set ready)	DTR (Data terminal ready)	Displayed as 1, 0.
RLSD (Receive line signal detect)	LL (Local loop)	Displayed as 1, 0.
TM (Test mode)	RL (Remote loop)	Displayed as 1, 0.
RTS (Request to send)	CTS (Clear to send)	Settable to 1 or 0. (normally 1 when Transmitter On and 0 when Transmitter Off).
DTR (Data terminal ready)	DSR (Data set ready)	Settable to 1 or 0. (normally 1 when Transmitter On and 0 when Transmitter Off).
	RLSD (Receive line signal detect)	Settable to 1 or 0.
	TM (Test mode)	Settable to 1 or 0.
LL (Local loop)		Set to 1 for V.54 loop 3 selected. Set to 0 for V.54 loop 3 deselected.
RL (Remote loop)		Set to 1 for V.54 loop 2 selected. Set to 0 for V.54 loop 2 deselected.

Timing

Synchronous

Transmit - DTE

From DCE

DCE input timing.

Internal

1 bit/s steps.

Receiver

Receiver clock (assumes receiver is data interface, not 2048 kbit/s)

External

TTL input.

Transmit - DCE

Internal

1 bit/s steps.

Receiver

Receiver clock

External

TTL input.

Receive - DTE

From DCE

DCE input timing

External

TTL input.

Signal

Extracted from receive signal

Receive - DCE

From Transmitter

Transmit clock (assumes transmitter is data interface, not 2048 kbit/s)

External

TTL input.

Signal

Extracted from receive signal.

DTE

From DTE

Transmit - TTL

Internal

1 bit/s steps.

Receiver

Receiver clock (assumes receiver is TTL interface, not 2048 kbit/s, and same rate as transmitter).

External

TTL input.

Receive - TTL

External

TTL input.

Signal

Extracted from receive signal.

From Transmitter

Transmit clock.

Sense

All input and output timing signals can be inverted in polarity.

Asynchronous

Transmit

Internal

50, 75, 100, 110, 134.5, 200, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 38400 bit/s.

Receive

Receive signal.

Async coding

Data bits

7, 8.

Stop bits

1, 2.

Parity

Odd, even, mark, space, none.

Async character rate

Transmitter

Selectable: low medium, high, (10, 50 and 100% maximum character rate).

Receiver

Up to 1000 character/sec.

Autoconfigure

For synchronous operation the instrument autoconfigures to the PRBS test pattern.

X.21

Lines monitored:

C and I control lines
Data line from DTE to DCE

Display current and history status of:

C and I control lines
Requests from the DTE of the DCE for LOCAL and REMOTE LOOPS.

TEST PATTERNS

Sync and async

PRBS

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

Sense

True or inverted

If PRBS is received in the opposite sense to that selected, the receive pattern sense is changed.

Sync

Standard Menu

32 bit word

User programmable sequence of 32 bits

QUICK Menu

Word

All 1, All 0, Alternating 10…, REMOTE LOOP (1100...), LOCAL LOOP (11110000...)

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 64 characters.*

(Not available in QUICK menu)

ERROR INJECTION

Singly

By keypress

Fixed rate

Standard Menu

Rate 9×10^{-2} to 1×10^{-7} (sync only)

QUICK menu

Rate 10^{-2} to 10^{-7} (sync only)

ALARMS

Line

Errors

Pattern

No transmit clock

PROPAGATION DELAY (sync only)

Measured using a PRBS test pattern

Range	*Up to 2 seconds*
Resolution	*1 bit period*
Update rate	*Typically 2 seconds. Can be longer at low data rates.*

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*
Range	*0 to 10s*
Resolution	*1 ms*

BIT RATE MEASUREMENT

(Transmitter and Receiver)

Measurement of transmitter bit rate confirms DCE clock rate when DTE, or external clock rate.

Sync

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

Async

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

Accuracy

±1 ppm.

MEASUREMENTS, RX1

ERROR TYPES

Line Code (Bipolar Violations)

Frame Bit

Frame Word

Pattern

CRC

(Pattern errors only for data test interfaces)

Main parameters:

Made if the framing system and Test Mode allow.

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

Octet Slips are detected for single channel pattern measurements:

Number of positive and negative slips.

Time of last slip.

Time between last two slips.

BIT SLIPS

Single bit slips are detected within a 64 or n x 64 kbit/s test pattern within a 2 Mbit/s signal, an unframed 2 Mbit/s test pattern, or an unframed test pattern via one of the data test interfaces.

Positive and negative bit slips are counted.

(Bit Slips and Octet Slips are mutually exclusive).

TWO RECEIVER PCM CLOCK SLIPS, Rx1 and Rx2

The clock is extracted from a primary rate digital signal (Rx1) and

compared for synchronisation with the clock extracted from a second primary rate digital signal or an external clock input (Rx2). A sync slip is registered for each bit of relative phase shift.

Measurement

Frequency of extracted clocks of receiver (Rx1) and reference input (Rx2)

Resolution 1 Hz

Accuracy ±1 ppm

Difference in ppm (+/-)

Total aggregate slips since start of test

Positive peak slips

Negative peak slips

Positive peak slips/sec

Negative peak slips/sec

ADDITIONAL PARAMETERS

Current Error Ratio

Gating

1, 2, 5 or 10 seconds.

Residual Bit Error Ratio

(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.

The inverse % parameters are also available.

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.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 Seconds 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 Seconds 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

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	S >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

PROPAGATION DELAY

Measured using a PRBS test pattern.

Mode

2048 kbit/s unframed.

64 kbit/s channel within 2048 kbit/s signal.

n x 64 kbit/s channel within 2048 kbit/s signal.

Range

Up to 2 seconds

Resolution

1 µs or 1 bit whichever is the greater

Update rate

Typically 2 seconds.

STORED RESULTS

Storage Capacity

Up to 4,000 events per results store including errors and alarms stored with a time and date stamp to a resolution of 1 second.

Multiple Tests

8 full sets of results stored.

Results Retrieval

Print to external printer (print from RAM).

Selected results histograms.

Mark portion of histogram and print selection of errors, alarms and periodic results between marks.

Error and Alarm Distribution Histograms

Any one of the following parameters can be selected as the histogram display:

Parameters

Major Errors

Errored Seconds

Severely Errored Seconds

Degraded Minutes

Unavailability

Breaks

Loss of Signal

AIS

Loss of Frame Alignment

Loss of Pattern Synchronisation

Resolution

1 second, 1 Minute, 1 Hour, 1 Day

Accumulation time

Typically 7 days or better

Histogram page width

7 or more days with a resolution of 1 day.

30 hours with a resolution of 1 hour.

30 minutes with a resolution of 1 minute.

30 seconds with a resolution of 1 second.

The display is selectable from anywhere within the N days.

Display

The stored results are displayed as a histogram. A cursor is moved to point at any day, hour, minute or second. The number of events for the parameter selected for that interval are displayed together with the date and time.

Histogram Baseline Alarms

Alarms history is shown by histogram baselines. Totals for each alarm can be determined by displaying as the main histogram with cursor scrolling and reading of alarm totals for each interval.

Alarms

Loss of signal

AIS

Loss of Frame Alignment

Loss of Pattern Synchronization

Loss of Power (not available on the main histogram)

TEST TIMING

Start time

YYYY, MM, DD, HH, MM (year, month, day, hour, minute).

By keypress

Stop time

YYYY, MM, DD, HH, MM (year, month, day, hour, minute).

By keypress.

Duration

DD, HH, MM (days, hours, minutes)

Indefinite.

SIGNALLING ANALYSIS

Channel associated signalling analysis for selected channel.

Display

Decimal and binary equivalent of current and previous 16 signalling codes.

Signalling code for all 30 channels simultaneously, with programmable IDLE and BUSY display.

C-BIT FRAMING

(Option 02, French)

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

Display of C-Bit Frame message bits.

BIT RATE MEASUREMENT, Rx1 and Rx2

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

Accuracy

±1 ppm.

DIGITAL SIGNAL VOLTAGE MEASUREMENT

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

Range

+3 to -10 dB

±1 dB

-10 to -20 dB

±2 dB

-20 to -36 dB

±3 dB

GENERAL CHARACTERISTICS

OPERATOR INTERFACE

The instrument is controlled via a keyboard containing a data entry keypad. The 1/4 VGA transflective LCD (30 line by 50 character), with CFL backlight, and keyboard are fully interactive providing menu and soft-key operation.

SET UP

Copy facility from Transmitter to Receiver and Receiver to Transmitter.

DISPLAYS

Standard

Transmit parameters

Receive parameters

Measurement results

RS-232C port parameters

Printer type selection

Measurement definition

Autoprint definition

Setup conditions (Stored Parameters)

Current status

Zoom

Selected results can be displayed in zoom mode with large character size.

QUICK

2 Mbit/s PCM parameters

Synchronous data parameters

Asynchronous data parameters

Two receiver PCM clock slips

Configuration selection (built-ins)

Two receiver PCM A/B audio

AUDIBLE ALARM

When ON alarm sounds on detection of:

A signal alarm.

An 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).

Setup Conditions

3 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 10 character label. In addition 8 non-alterable standard setups are available:

2 Mbit/s Unframed 75/120 Ohm

2 Mbit/s Framed 75/120 Ohm

2 Mbit/s - Monitor Mode

N x 64k Voice - 2 Mbit/s G.703

N x 64k Data - X.21

V.24 Asynchronous

V.24 Synchronous

V.35 Synchronous

REAL TIME CLOCK

Displays date and time.

Resolution

One second

Accuracy

±1 minute per week.

KEYBOARD LOCKOUT

The keyboard can be disabled whilst a test is running.

PRINTER OPERATION

The RS-232 port is used for printer operations and remote control

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 to print automatically on the occurrence of any of the following (where applicable), each event printed with its date and time and two digit identity number.

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 alarms.

Detection of octet slips.

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

Detection of change of signalling code.

Cumulative printout at user selectable intervals, with a resolution of 15 minutes.

All stored results may be included in the interval print. User selectable.

Loss and restoration of power.

REMOTE CONTROL

The RS-232 port is used for remote configuration and collection of results.

RS-232 PORT

The RS-232 port is used for printer operations and remote control.

Type

Asynchronous

DTE

Full Duplex

Bit Rates

300, 600, 1200, 2400, 4800 and 9600 bit/s.

Code

ASCII

Code bits/Parity/Stop bits

7/Odd/1, 7 /Even/1, 7/Odd/2, 7/Even/2, 8/None/1, 8/None/2

Terminator

None, CR, LF, CR \ LF.

Handshake

Hardware

DTR, RTS, CTS and DSR.

Software

XON and XOFF.

Lines used

Tx DATA	*Pin 3*
RTS	*Pin 7*
DTR	*Pin 4*
Rx DATA	*Pin 2*
CTS	*Pin 8*
DSR	*Pin 6*
Signal Ground	*Pin 5*

Connector

9 way female D-type

Electrical

To RS-232C / V.28

LIMIT RANGE OF OPERATION

Temperature

0 to 55°C (Display specified to 50°C)

Safety

Conforms with the requirements of EEC Council Directive 73/23/EEC and Standard IEC/EN 61010-1 : 1993
Complies with IEC 1010-1, BS EN61010-1 for class 3 hand-held equipment and is for use in a pollution degree 2 environment. The instrument is designed to operate from an installation category 1 supply.

CONDITIONS OF STORAGE AND TRANSPORT

Temperature

-10 to +60°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

The instrument is powered by internal batteries which give a nominal 5 hours operation. This is extended in receive only mode.

UNIVERSAL AC POWER ADAPTOR

The AC power adapter is capable of powering the instrument and at the same time recharging the batteries in 3 hours (to 95% battery capacity).

AC Voltage

90 to 264 V

Frequency

45 to 440 Hz

Consumption

20 VA maximum.

DIMENSIONS

	Height	***Width***	***Depth***
2842/2843	57 mm	206 mm	170 mm

WEIGHT

2842/2843	*1.3 kg*
2842/2843/Charger/Handbook in pouch	*2.6 kg*

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers

Versions

2842	2 Mbit/s Transmission Analyzer
2843	Digital Communications Analyzer

Options

Option 02	French key panel, C-bit frame, language

Supplied Accessories

46882/414	Operating Manual 2843.
46882/450	Operating Manual 2842.
46662/606	Universal AC Power Adapter (90 - 264 V).
46662/561	Carrying Pouch.
82500	RJ45 Stub Cable (male to female).
	One adapter lead from the list below selected at time of order (2843).

Adapter Leads (2843)

One specified lead supplied at no charge. Additional leads can be ordered from the list below:

54311/190	X.21 (V.11) Adaptor Lead, 0.2m, female.
54311/191	RS-449 (V.11) Adaptor Lead, 0.2m, female.
54311/227	V.35 Adaptor Lead, 0.2m, female.
54311/193	RS-232 Adaptor Lead, 0.2m, female.
54311/194	Co/Contradirectional Adapter Lead - 15 way D-Type, 0.2 m, female.
54311/209	Codirectional Adapter Lead - CF connectors, 0.2 m, female.
54311/211	X.21 Adapter Lead, 2 m male.
54311/212	RS-449 (V.11) Adapter Lead, 2 m, male.
54311/228	V.35 Adapter Lead, 2 m, male.
54311/214	RS-232 Adapter Lead, 2 m, male.
54311/215	Co/Contradirectional Adapter Lead - 15 way D-Type, 2 m, male.
82515	X.21 (V.11) Monitor Adapter Lead, 2 m, male to female
82526	RS-530 adapter lead, 0.2 m female
82527	RS-530 adapter lead, 0.2 m male

Optional Accessories

46880/098	Service Manual 2843.
46880/097	Service Manual 2842.
54311/190	X.21 (V.11) Adaptor Lead, 0.2m, female.
54311/191	RS-449 (V.11) Adaptor Lead, 0.2m, female.
54311/227	V.35 Adaptor Lead, 0.2m, female.
54311/193	RS-232 Adaptor Lead, 0.2m, female.
54311/194	Co/Contradirectional Adapter Lead - 15 way D-Type, 0.2 m, female.
54311/209	Codirectional Adapter Lead - CF connectors, 0.2 m, female.
54311/211	X.21 Adapter Lead, 2 m male.
54311/212	RS-449 (V.11) Adapter Lead, 2 m, male.
54311/228	V.35 Adapter Lead, 2 m, male.
54311/214	RS-232 Adapter Lead, 2 m, male.
54311/215	Co/Contradirectional Adapter Lead - 15 way D-Type, 2 m, male.
54311/121	RS-232 Lead - male to male - 25 Way D-Type - 1.5m (2843).
54311/122	X.21 Lead - male to male - 15 way D-Type - 1.5 m (2843).
54311/147	RS-449 Lead - male to male - 37 way D-Type - 1.5 m (2843).
54311/148	V.35 Lead - male to male - 34 Way MRAC - 1.5 m (2843).
54311/130	Co/Contradirectional Test Lead - 15 way D-Type to free end (2843).
46662/619	Cable accessory bag.
46662/562	Hard carrying case.
54717/039	Scriptos printer (includes special lead 54311/217).
54311/217	RS-232 special lead Scriptos to 2842/2843.
54311/218	Printer cable 9 way to 25 way null modem.
46662/620	Scriptos paper 10 pieces.
46883/805	Signal lead balanced (CF-CF).
54311/210	Signal lead unbalanced (BNC-BNC)
46662/387	Null Modem (female to male).

46662/388	BNC to 1.6/5.6 adaptor.
46662/564	RS-232 adaptor - 9 way male to 25 way female D-Type.
82500	RJ45 stub cable (male to female).
82501	Signal lead balanced (RJ45 - RJ45).
82502	Converter lead (RJ45 - CF).
82516	RJ45 ISDN 30 monitor Rx crossover lead, female to male.
85000	Car Charger

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IFR is a world leader in developing leading edge test and measurement equipment. The priority at IFR is to understand your communications test needs and respond to them. IFR has the flexibility and expertise to create just the right test solution for you. We understand that just as you are the expert in designing wireless products, we are expert in wireless test.

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