2000 Test Pad™

2230 E1/Data Communications Analyzer

Product Highlights

- Analyzes E1, Data, ISDN, CAS, DASS2, and Frame Relay to deliver a complete solution for business services performance testing
- Easy-to-use, touch-screen graphical user interface (GUI) simplifies and expedites testing
- Modular 2000 Test Pad architecture enables up-to-date support for established and emerging technologies in a single platform
- Engineered for the field with rugged construction, lightweight design, and battery-powered operation
- Dual PCMCIA slots support easy installation of future upgrades and bring added testing functionality and versatility
- Automated testing minimize training costs and testing complexity

Application Highlights

- Install, commission and maintain key business services
- Qualify E1 and data circuits with an array of BERT patterns to ITU-T standards
- Isolate and troubleshoot physical layer problems associated with data or other services
- Confirm access network equipment configuration and function
- Monitor network voice quality and signaling
- Verify or troubleshoot ISDN, CAS and DASS2 services by placing and receiving calls and analyzing decodes
- Assess Frame Relay service availability and achievable CIR
- Analyze problems by monitoring signaling and control messages

The 2230 E1/Data Communications Analyzer provides all necessary test functions and interfaces to install, commission, and maintain Digital Leased Line, ISDN PRA, CAS, DASS2, and Frame Relay services. This solution lowers the cost of providing and maintaining business services. Physical and service layer problems are solved quickly; service performance is proven rapidly and consistently. Reducing the amount of equipment field engineers need to carry results in lower purchasing and whole-life costs.

ACTERNA™
The Keepers of Communications

Function Highlights

- E1 and data physical layer testing
- Comprehensive service testing and monitoring
- Clear results presentation, including 'Views'
- Quick tests provide rapid test initiation
- Trigger and event logging
- Configuration and Results storage

Features

- Quick Tests—select pre-configured tests from a drop-down menu for rapid test initiation.
- Views—gain an immediate overview of everything happening on the link with a glance at a single screen.
- Event Log—set triggers to the Event Log when certain error or alarm conditions arise. Rapidly diagnose problems by reviewing the contents of the log either while the test continues, or after the test is complete.
- Configurations—load customized configurations to eliminate operator error in setting up the equipment prior to a test. Results can be saved internally to a print file for later reference, or printed out to an optional external printer.
- Reduce dependance on portable PCs by using the optional VT100 Terminal Emulator to configure compatible network equipment and display performance statistics using a soft-keyboard on the 2230's display.

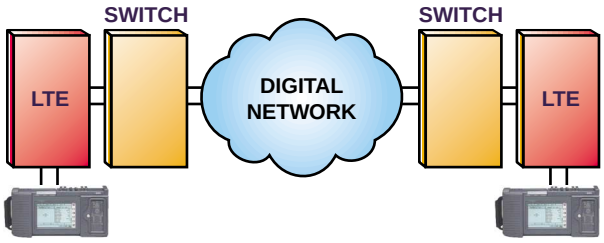
Applications

E1 and Data Physical Layer Testing

When installing and commissioning E1 and data based digital leased lines, all aspects of the line's performance must be tested, from bit error ratio to network equipment function and stability. Higher layer services (e.g. ISDN, Frame Relay) that may be run over these lines could also fail to turn up due to problems at the physical layer, further demanding similar tests to ensure satisfactory performance.

When maintaining digital leased lines, problems can occur due to poor connections, transmission errors, and faulty or incorrectly configured network components. Successful resolution requires a flexible test instrument to rapidly guide the engineer to the cause of the problem.

To ensure that service is provisioned properly, testing and troubleshooting on the basic E1 or V.xx data circuit is essential.

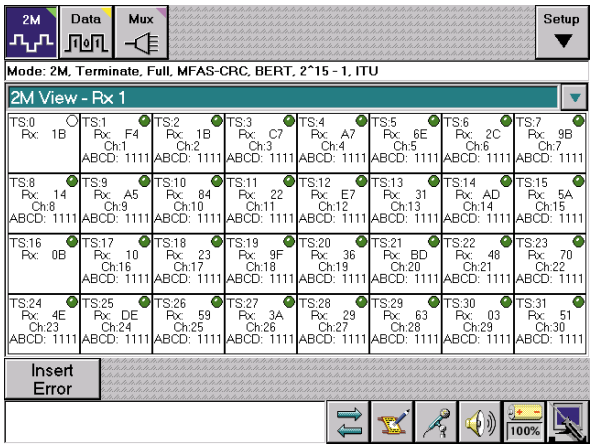


Test BER performance throughout the network using the 2230

The 2230 covers all essential tests for E1 and data circuits:

- Bit Error Ratio (BER) testing to G.821, G.826, and M.2100, with error and alarm indication. Channelized (n x 64kbit/s) tests can be made on a G.704 interface. The 2230 can be set to autodetect the BER pattern present, eliminating guesswork.
- Two Receiver Monitoring allows in-service monitoring of both directions of a link simultaneously, speeding problem diagnosis. The receiver inputs can be compared to assess if clock instability is the source of synchronization problems. Comprehensive analysis is performed, including Maximum Relative Time Interval Error (MRTIE).

- Mux Wrapping—Multiplexers and de-multiplexers can be tested using the combination of E1 and Data interfaces. Using two BER tests simultaneously (one from the 2M side, one from the Data side) avoids the need to perform two independent, sequential tests.
- Round trip delay can be measured on all interfaces assessing the likely impact of transmission delays on (for example) data transmission performance.
- Signal level measurement can be used to indicate whether digital pulse level problems are the root cause of reported alarms and errors.
- VF Mode assesses the circuit's digitized analogue performance. A tone can be generated and inserted into any selected timeslot, and monitored on the return path for any distortion. In-service voice can be dropped to the loudspeaker to assess live voice quality. This function can be performed rapidly by using the VF View (similar to 2M View shown) to select each applicable channel in turn.

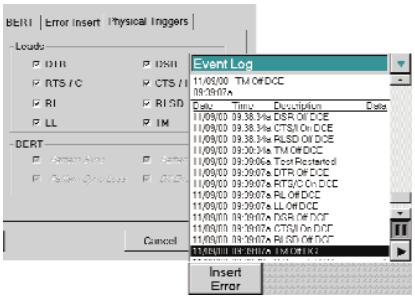


The 2M View provides a complete overview of the current state of the G.704 access, for example confirming activity (or the absence of), prior to taking the link out of service for essential services.

DCE and DTE Testing

The 2230 offers DCE and DTE emulation for performance testing, supporting both synchronous and asynchronous circuits. "Y" monitor cables allow the 2230 to be inserted between DCE and DTE to passively monitor for problems.

The lead status of signaling/control leads can be viewed, and control leads can be forced in emulation mode.



Lead transitions can be captured and timestamped to the Event Log for follow-up analysis, aiding the diagnosis of hand-shaking problems, for example.

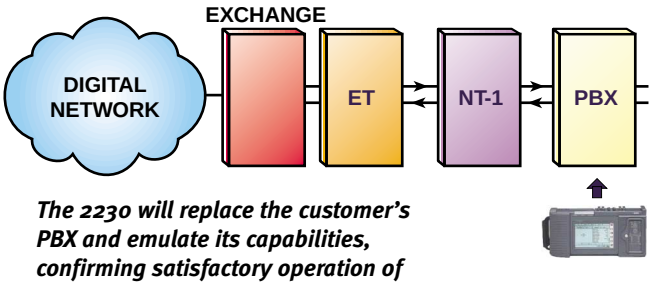
Service Layer Testing

Many test instruments offer only limited physical layer testing analysis when provisioning higher layer services, e.g. Frame Relay or ISDN. However, the 2230 provides all of the physical layer capability identified above at the same time as performing service layer testing.

This function eliminates the need to change the mode back to physical layer testing to confirm that encountered problems did originate there. Problems are therefore captured the first time.

Signaling Based Services Access Testing

The 2230 provides all necessary test functions to install, commission, and maintaining the E1-based accesses including CAS, DASS2, and ISDN. For each of these services, the following tests can be performed.



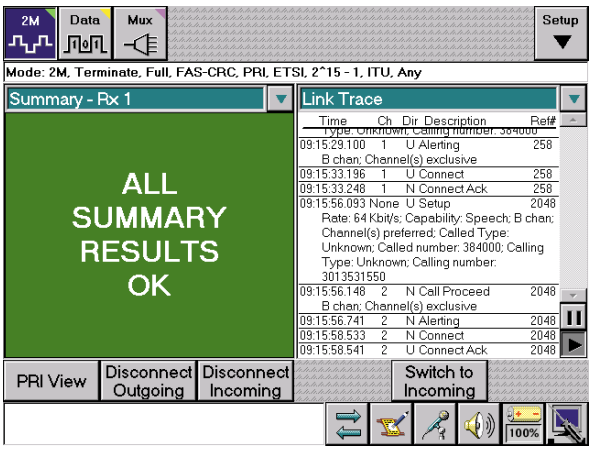
The 2230 will replace the customer's PBX and emulate its capabilities, confirming satisfactory operation of the provided service.

Installation and Commissioning

Because calls can be placed and received by the 2230, call quality can be assessed using the handset or built-in microphone and loudspeaker for voice, and BER testing to relevant standards for data.

Calls can be initiated in three ways:

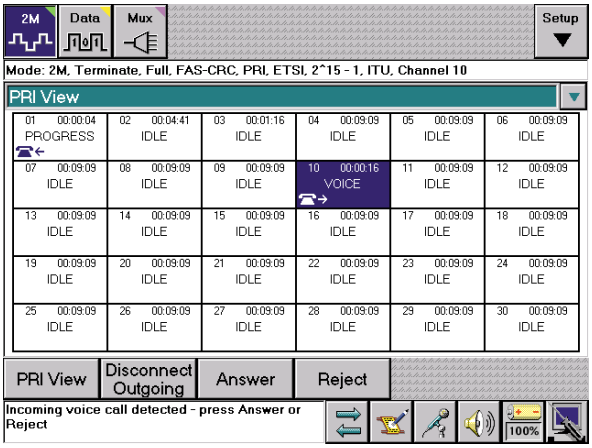
- Manually using displayed keypad
- Program mode, when a single-dialed number can be selected from an internally stored list of numbers
- Phone List mode, when stored numbers are dialed automatically in sequence. This is particularly useful when a variety of numbers have to be checked e.g. local, long distance, international.



The Trace function captures relevant signaling information during emulation and monitor, to aid fault diagnosis by providing clear detail of the messages that led to a call failed.

In-service Monitoring and Trouble Shooting

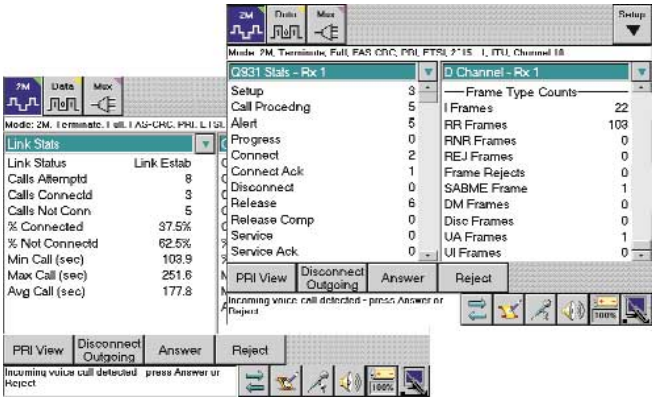
Monitor mode provides protocol analysis for the signaling channel. It records the exchange of information between terminals and network, making it easy to isolate the major causes of impairments such as missing information elements and service incompatibility.



In View mode, the current status for all 30 channels can be seen at a glance. Activity is shown in real time.

Historical information for the link and/or individual channel is also presented, including signaling channel statistics (e.g. Q.931 for ISDN). Triggers can be used to seek particular anomalies or calls related to particular numbers, and record them to the Event Log.

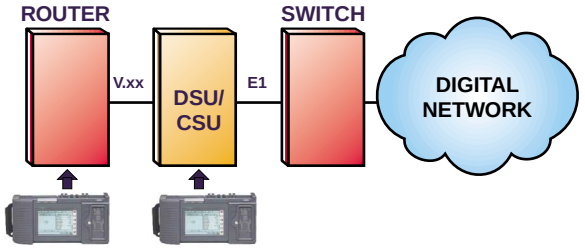
The 2230 also operates in Seek mode, when all selected channels are monitored for the beginning of a call. When the first call begins, the 2230 locks onto the call and records all events associated with the call. It will capture either the complete call (Complete mode) or a pre-set period from the start of a call before hopping to the next (Scan mode).



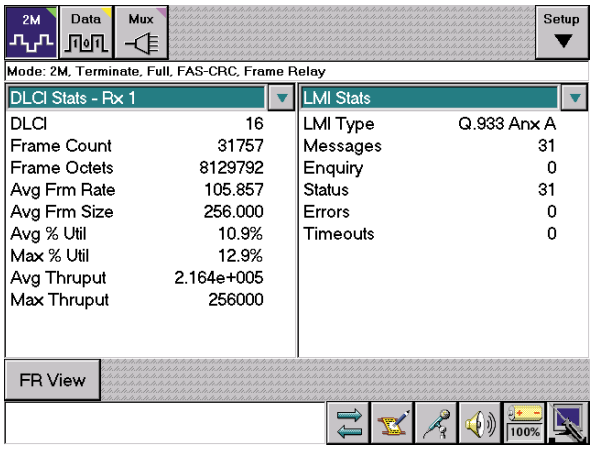
In both Emulate and Monitor modes, statistics are presented relating to channel utilization, number/percentage of calls connected, and other key parameters for satisfactory performance analysis.

Frame Relay Installation and Commissioning

The 2230 provides all the necessary test functions to rapidly install and commission a Frame Relay connection. It assesses all key parameters relevant to satisfactory performance. It indicates active links and displays the status of configured DLCIs. Any problems are reported on screen and frame/link statistics are displayed and recorded.



The 2230 replaces and emulates the customer's router or DSU/CSU to confirm satisfactory operation of the provided service.



Frame link statistics are displayed and recorded.

The 2230 performs the following tests to install and commission frame relay.

- The Load (Fox) test is designed to prove the capacity of a virtual circuit by confirming a customer's committed information rate (CIR). It can also be used to stress the network to assess how it will respond to different levels of traffic, e.g. by bursting. Each available DLCI can be tested, with user-definable frame size, percent loading, and setting of FECN, BECN and DE bits.
- The PING test measures end-to-end connectivity through a network by sending simple IP PING to a specified device using its IP address. The round trip delay time (maximum, average, and minimum) is measured during this test. This information is valuable because large differences in these times can provide an early indication to the user of congestion within the network.
- In-Service Monitoring. The 2230 provides dual receivers for in-service monitoring of E1 and V.xx Frame Relay circuits making it possible to diagnose problems that appear only when the CPE is installed and connected—often after a seemingly satisfactory turn-up test. Such problems are normally associated with differences in configuration between the CPE and the network, e.g. poll timing.

Technical Specifications

PHYSICAL CHARACTERISTICS

Overall Dimensions.....(190 x 346 x 57 mm)
7.5 x 13.6 x 2.3 inches
Overall Weight.....1.5 kg with battery (3.4 lb)
Module Dimensions.....(184 x 190 x 56 mm)
7.25 x 7.5 x 2.2 inches
Module Weight .....0.91kg (2 lb)
With User Interface Module .....2.3 kg approx. (5.2 lb)

Environment

Temperature Range
Operating .....(0° C to 50° C) 32° F to 122° F
Storage.....(-40° C to 75° C) -40° F to 167° F
Humidity.....10% to 95% relative humidity, non-condensing

Power Requirements

AC Adapter .....200 to 220 at 60 Hz or 200 to 240 VAC at 50 Hz to 19 VDC, 2.37 AMPS
Charging Time .....Maximum of 2 hours from full discharge

Battery Type .....10.8 V NiMH
Operating Time.....Typically 2 hours on full charge

Display

.....6-inch diagonal graphic LCD color display

PHYSICAL INTERFACES

G.703 Transmitters

Outputs.....2 x Balanced CF Connectors, Imp. 120Ω
2 x Unbalanced BNC Connectors, Imp. 75Ω
Bit Rate .....2048kbit/s, ± 5 ppm
Line Coding .....AMI or HDB3
Jitter.....To ITU-T G.823
Clock Source.....Internal, Recovered

G.703 Receivers

Inputs.....2 x Balanced CF Connectors
Impedance 120Ω , Bridge or Monitor
2 x Unbalanced BNC Connectors
Impedance 75Ω , Bridge or Monitor
PMP Compensation .....20, 23, 26 and 31dB gain
Bit Rate.....2048 kbit/s
Level Measurement .....0 to –32 dB
Line Coding .....AMI or HDB3
Jitter.....To ITU-T G.823

Datacom Port

Interfaces supported (via adapter cables):
.....X.21, V.24 (RS232), V.35, V.36, EIA-530E
Data rates (Emulate and Monitor):
X.21 .....50 bit/s to 2048 kbit/s
V.24 Async.....50 bit/s to 115.2 kbit/s
V.24 Sync/EIA-530E .....50 bit/s to 2048 kbit/s
V.35.....50 bit/s to 2048 kbit/s
V.36.....50 bit/s to 2048 kbit/s

G.703 LEDs

Current and History .....Signal, FAS Sync, MFAS Sync, Pattern Sync, AIS, TS-16 AIS, FAS Distant, MFAS Distant
Current Only CRC-4

Data LEDs

DTE.....Mark, Space, DTR, RTS/C, RL, LL
DCE.....Mark, Space, DSR, CTS/I, RLSD, TM
Languages .....English, German, French, Italian, and Spanish

General (Rx/Tx Mode and 2 Rx Mode)

Framing .....PCM30 (MFAS), PCM31 (FAS)
PCM30C (MFAS+CRC), PCM31C (FAS+CRC)
or Unframed

Test Patterns

PRBS .....2^6-1, 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1,
QRSS, TTC1

Non-random .....All 1s/All 0s, 1:1, 1:3,
1:4, 1:7, 3:1, 7:1, QBF

Program .....one 3 to 32 bits, two up to 2048 bytes
Auto Detect Mode

Error Injection

CRC, Pattern Slip.....Single

Consecutive FAS 1, 2, 3, 4

Bit, Logic, Code, Line .....Single, $9.5x10^{-4}$, $1x10^{-3}$,
$1.05x10^{-3}$, $1.05x10^{-6}$, $1x10^{-6}$, $9.5x10^{-7}$

Alarms Exerciser

Generation of .....AIS, TS-16 AIS, REBE,
FAS Distant, MFAS Distant

Performance Analysis

To.....G.821, G.826, M.2100

Interface Results

Error Count/Rate for .....Bit, Code, FAS, MFAS,
CRC, REBE

Indication of .....FAS, NFAS, MFAS words,
Sa6 and C-bit Datalink messages,
C-bit Delay (ms)

Signal Results

Count/Display of .....Signal Loss Seconds, Bit Slips,
Rx Level (dBnom), Tx & Rx Freq, Rx Delta ppm

Wander .....Max Positive, Negative, Peak-to-Peak,
Max Peak-to-Peak 15 min. and 24 hours
Max Relative Time Interval Error (MRTIE)

BER Results

Indication of .....Bit Errors and Bit Error Rate,
Block Count, Errored Secs, Error Free Secs,
percentage Error Free Secs, Pattern Slip,
Round Trip Delay, Pattern Loss Seconds,
Pattern Invert

Received Frame Information (2M View)

Display of . . . . . Timeslot and Channel Number,
Rx Byte, Channel Activity, Signaling Bits

Voice Frequency (inc VF View)

Display of.....Rx Freq (Hz), Rx Level (dBm),
Rx Max. and Min. PCM, Rx DC Offset
Drop contents of timeslot (Rx 1 and/or 2) to speaker

CAS Option

CAS View.....Channel No, Time, State, Rx Byte

Link/Channel Statistics.....Calls Attempted,
Connected/Not Connected and percentage,
percentage Utilization (Per Channel)
Min./Ave./Max. Call (secs)

Link/Channel Trace .....Time, Channel,
Forward/Backward ABCD, State, Error

Dial Modes.....Manual, Program, Phone List

Telephone Handset (included)

Connector.....RJ-11

Handset Modes.....Internal (hands-free), or external
Connects to UIM

ISDN PRI Option

Test modes.....TE
Protocols supported EDSS1
Test of services.....Speech, Data
Dial Modes.....Manual, Program, Phone List
Results:
PRI View .....Channel No, Time, Call Direction, Call Type, Channel Continuation Indicator
Link/Channel Statistics.....Calls Attempted, Connected/Not Connected and percentage, Min./Ave./Max. Call (sec)
Link/Channel Trace .....Time, Channel, Direction, Description, Reference Number
D Channel:
Link Statistics .....Count of Total and Valid Frames, Direction, Description, Reference Number
Error Counts .....CRC, Aborted, Short /Long Error, Invalid SAPI, Rx Overruns, Non Octet Aligned, Single Octet Address
Frame Type Counts .....I, RR, RNR, REJ, Frame Rejects, SABME, DM, Disc, UA, UI
Q.931.....Count of Q.931 messages

DASS Option

Test modes.....TE
Test of services .....Voice (Cat1), Voice (Cat2), Voice (Tel), 3.1 kHz, 64 kbit/s Data
Dial Modes.....Manual, Program, Phone List
Results:
DASS View.....Channel No, Time, Call Direction, Call Type
Link/Channel Statistics.....Calls Attempted, Connected/Not Connected and %, Min./Ave./Max. Call (secs) LAP Status (Channel)
Link/Channel Trace .....Time, Channel, Direction, Description LAP Statistics Count of Total and Valid Frames
Error Counts .....CRC, Aborted, Short/Long Error, Invalid SAPI, Rx Overruns, Non Octet Aligned, Single Octet Address
Frame Type Counts .....SABMR, UA, UI(C), UI(R)
DASS Layer 3 .....Count of Layer 3 messages

Frame Relay Option

Link Management Types .....ANSI TI.617 Annex D, ITU Q.933 Annex A, LMI Rev 1, Auto
Test of CIR.....Fixed and Burst
Setting of Control Bits.....FECN, BECN, DE, C/R
Results:
FR View.....DLCI List, DLCI Status
LMI Statistics .....LMI Type, Messages, Enquiry, Status, Errors, Timeouts
Link/DLCI Statistics.....Frame Count, Frame Octets,

Link Frame Counts.....FECN, BECN, DE, Lost, Ave. Frame Rate, Ave. Frame Size, Ave. and Max. percentage Utilization, Ave. and Max. percentage Throughput CRC, Abort, Short, Long
PING Statistics.....Tx Echo, Lost Echo, Min./Ave./Max. Delay (ms)

Ordering Information

User Interface Module

TTC2000-C	2000 Test Pad with color display (Includes kickstand, AC adapter/charger, hanging strap, and printer cable)

Application Module

TTC2230	2230 E1/Data Communications Analyzer

Select one main power lead from the following:

AD-2000-AU	Australian
AD-2000-EU	European
AD-2000-UK	British
AD-2000-US	North Amercia

Additional Application Modules Available

2207 T1/T3 Wireless Field Services Module
2209 T1/T3 Field Services Module
2109 Copper Analyzer Module
2357 DSL Broadband Services Module
2310 SONET Field Services Module
2416 SDH Field Services Module

Analyzer Options

TTC2230-FREQ	Frequency Offset (2M and Synth)
TTC2230-CAS	CAS Emulation/Monitor
TTC2230-PRI	ISDN PRI Emulation/Monitor
TTC2230-DASS2	DASS Emulation/Monitor
TTC2230-FR	Frame Relay Emulation/Monitor
TTC2230-VT100	VT100 Terminal Emulator

Optional Accessories

CB-44390	X.21 DTE/DCE Emulate Cable
CB-44385	V.24/EIA-530 DTE/DCE Emul. Cable
CB-44389	V.35 DTE/DCE Emulate Cable
CB-44388	V.36 DTE/DCE Emulate Cable
CB-44346	X.21 Y-Monitor Cable
CB-44348	V.24 /EIA-530 Y-Monitor Cable
CB-44341	V.35 Y-Monitor Cable
CB-44347	V.36 Y-Monitor Cable
CB-30662	BNC to BNC Cable
CB-30687	Siemens 3 pin to Siemens 3 pin Cable
CB-30761	Siemens 3 pin to Bantam Plug Cable
CB-30914	Siemens 3 pin to Weco Plug Cable
CB-30969	1.6/5.6mm to 1.6/5.6mm Cable BNC (75Ω) to Siemens
CB-31066	3 pin (120Ω) Cable
CB-31201	BNC (75Ω) to Bantam Plug Cable BNC Male to 1.6/5.6mm Female

AD-20430	Adapter Plug (Set of 4) BNC Female to 1.6/5.6mm Male
AD-20432	Adapter Plug (Set of 4)
TTC2000-PC	PCMCIA Card 4Mb (Extra Storage)
AC-31705	External Battery Charger
AC-31905	Cigarette Lighter Adapter/Charger
BA-014081	Replacement Battery
CC-44581	Carrying Case/Tilt Stand (includes adjustable strap)
CC-44605	Carrying Case Large Soft
CC-45158	Carrying Case, Multi-Mode (soft)
PR-40B	Thermal Graphics Printer+Carrying Case
10966	Thermal Printer Paper (10 rolls)

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

LL/PL/0042/0201/AE

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