

Agilent N2X  
**2-Port OC-3c/OC-12c/  
OC-48C ATM/POS/FR  
XR/XS Test Cards**

E7909A, E7909B, E7907A, E7907B  
Technical Data Sheet



**The leading test solution for IP & MPLS packet  
and protocol testing over ATM, POS and Frame  
Relay interfaces.**



**Agilent Technologies**

## Key Features

- **Dual-port, multi-mode, multi-rate interface card**
- **Test layers 2 and 3 on the same port at the same time**
- **Full IPv4 and IPv6 Routing, Multicast, MPLS, and Access protocol support with the industry's highest scalability**
- **Supports both LLC and VC-mux (bridged and routed) ATM encapsulations per RFC 2684/1483**
- **Full Frame Relay support including IETF, Cisco, and Q.933 encapsulations with up to 1,024 PVCs per port**
- **Up to 32,768 ATM PVCs and traffic streams per port with flexible traffic encapsulations**

## Product Overview

Agilent N2X is the industry's most comprehensive test solution for testing the development and deployment of network services for converging network infrastructures. Service providers, network equipment manufacturers (NEMs), and component manufacturers can verify service attributes of entire networks end-to-end, while also isolating problems down to individual networking devices and subsystems. Agilent N2X delivers unparalleled test realism to verify the ultimate performance, scalability and resilience of carrier grade services and infrastructure.

The Agilent N2X OC-3c/OC-12c and OC 48-c ATM/POS/FR XR and XS test cards in conjunction with the N2X Packets and Protocols application provide multiport traffic generation, scalable protocol emulation, and unprecedented performance analysis of today's IP & MPLS networking devices. From wire-speed traffic generation and analysis, to full emulation of Internet-scale routing topologies using the latest protocols and technologies, Agilent provides the most comprehensive and easy-to-use system available today.

Agilent N2X's innovative "flexible PDU builder" technology delivers the most advanced solution for traffic generation and analysis available. Any kind of data-plane frames and packets can be generated, including custom formats.

For more complex testing, N2X provides emulation of the most popular routing protocols, including BGP, OSPF, ISIS and RIP and the latest MPLS protocols, including RSVP-TE, LDP/CR-LDP, L2oMPLS (Martini), and VPLS. Multicast protocols can be verified easily with our IGMP, MLD and PIM-SM protocol emulations. For Access networks, PPPoA, PPPoEoA, and L2TP are available.

The powerful Packets and Protocols application enables off-line data and capture analysis, graphing, decodes, and easy diagnosis of erratic or transient network behavior.

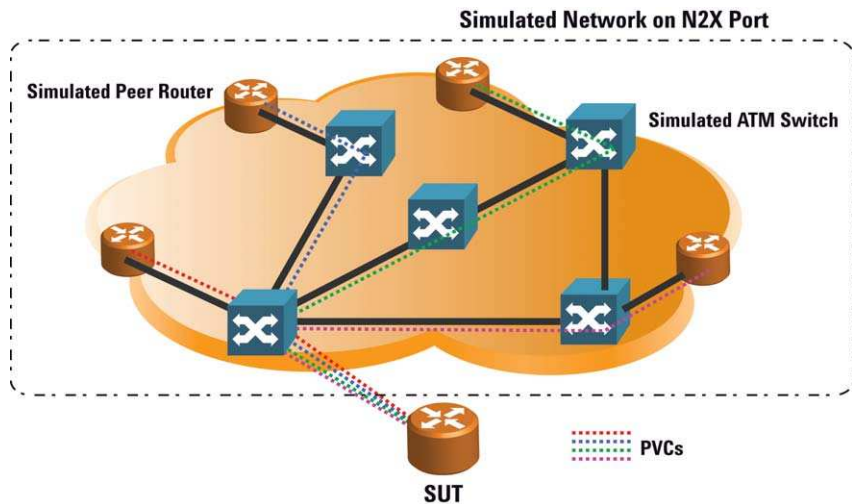


Figure 1: N2X supports simulation of multiple peer routes connected via PVCs to each ATM interface of your SUT. The test port will simulate an ATM "cloud" with many routers connected to the edge of the cloud.

## Product Features

### Dual-port, multi-mode, multi-rate interface cards

Each interface card provides two-test ports for connection to the SUT. Single-mode or multi-mode optics are supported with duplex-SC fibre connectors. Dual-mode OC-3c/OC-12c and OC-48c interface cards are available. The OC-3c/OC-12c cards support ATM, POS or FR capability, providing optimal flexibility in your test system. Each OC-48c port supports POS and FR capability.

### Test layers 2 and 3 on the same port at the same time

Generate and analyze ATM cell traffic on one PVC and IP over ATM traffic on another PVC. Switch between layer 2 and layer 3 testing without moving to a different test system.

### ATM and SONET-layer test features

The OC-3c/OC-12c ATM/POS Test Card supports capture of ATM cells and reassembled AAL-5 PDUs for protocol analysis, with 64 MB of capture RAM per port. For debugging and system configuration, the module supports ATM-layer real-time statistics, alarm monitoring and error generation, and SONET-layer alarm monitoring and generation.

Each test port will support up to 32,768 ATM PVCs. For IP networks, users can use the PVCs to transmit and receive both IP data traffic and routing protocols simultaneously. For MPLS networks, the PVCs can be used for routing and signaling protocols while IP traffic is carried over MPLS LSPs. For access network testing, each PVC can carry a single PPPoA session or multiple PPPoEoA sessions.

### PPP- and SONET-layer test features

The POS Test Cards support capture of PPP headers and IP packets for protocol analysis, with up to 64 MB of capture RAM per port. The cards also feature SONET/SDH-layer alarm monitoring and generation for debugging and system configuration.

### Full IPv4 and IPv6 Routing, Multicast, MPLS, and Access protocol support with the industry's highest scalability

N2X emulates the entire suite of routing and multicast protocols that are used in networks, including BGP-4, OSPF, IS-IS, RIP, IGMP, PIM, and MSDP, (and their IPv6 variants) enabling the creation of a realistic network cloud around the router under test. With N2X's Packets and Protocols software application (E7881A), packet-forwarding performance is measured while routes are simultaneously

added and withdrawn. MPLS signaling protocols such as RSVP-TE and LDP/CR-LDP are also supported. PWE3 testing is made easy with the L2 VPN application on N2X. And broadband access devices can be qualified using the PPPoA, PPPoEoA, and L2TP protocols.

### Supports both LLC and VC-mux (bridged and routed) ATM encapsulations per RFC 2684/1483

The test card encapsulates IP datagrams into AAL-5 frames using either the LLC or VC-mux method for routed or bridged protocols, as specified in RFC 2684 (formerly RFC 1483). Both LLC/SNAP and "null" encapsulation is supported for MPLS packets, as specified in RFC 3035. Users can specify the encapsulation type on a per-PVC basis for IP packets and a per-port basis for MPLS packets.

### High Protocol Performance & Scalability XS Test Cards

N2X XS POS/ATM/FR test cards offer industry leading protocol performance and scalability. When multiple XS test cards are combined in a complete N2X test system, you easily reach and exceed performance and scalability limits of devices being tested, ensuring that the most demanding real-world network conditions can be met.

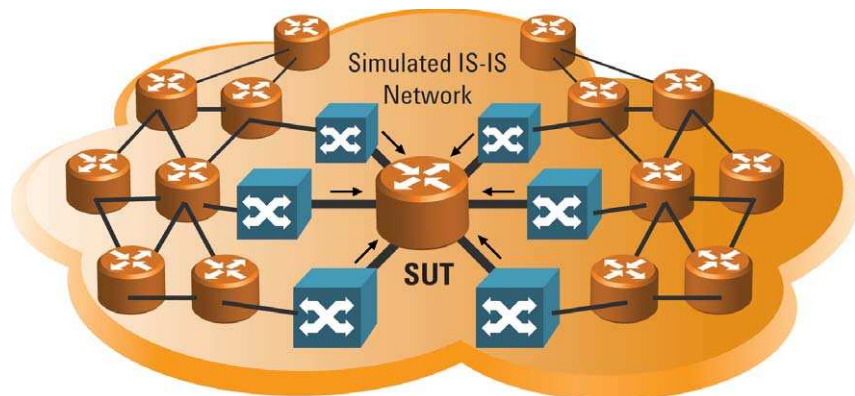


Figure 2: Routing XS Test Cards can emulate large routing topologies with thousands of sessions

## Product Numbers

- E7907A - 2-Port OC-3c/12c ATM/POS/FR XR Test Card
- E7907B - 2-Port OC-3c/12c ATM/POS/FR XS Test Card
- E7909A - 2-Port OC-48c POS/FR XR Test Card
- E7909B - 2-Port OC-48c POS/FR XS Test Card
- Optics options:
  - Option 001 Single Mode Intermediate Reach Optics
  - Option 002 Multimode Optics

## Software Compatibility

The E7880B Packets License enables the traffic generation and analysis features on the XR & XS test cards. XR and XS cards can take advantage the multi-protocol emulation environment plus integrated traffic & routing features available in the E7881B Packets & Protocols license.

## Technical Specifications

	<b>OC-3c/12c (STM-1/4c)</b>	<b>OC-48c (STM-16c)</b>
<b>Optical Interface</b>		
Connector	Two duplex SC connectors	Two duplex LC connectors
	Single Mode	Single mode
	<ul style="list-style-type: none"> <li>• 1310 nm receiver</li> <li>• 1310 nm Class 1 laser transmitter</li> <li>• Compliant with Telcordia GR-253-CORE intermediate reach and ITU-T G.957 S-4.1 short-haul specifications (for OC-12c/STM-4c)</li> </ul>	<ul style="list-style-type: none"> <li>• 1310 nm receiver</li> <li>• 1310 nm Class 1 laser transmitter</li> <li>• Compliant with Telcordia GR-253-CORE short reach (for OC-48c) and ITU-T G.957 intra-office (for STM-16c) specifications</li> </ul>
	Multimode	
	<ul style="list-style-type: none"> <li>• 1310 nm receiver</li> <li>• 1310 nm LED transmitter</li> <li>• Compliant with ATM Forum 622.08 Mb/s Physical Layer Specification (AF-PHY-0046.000)</li> </ul>	
Input Power	Single Mode	<ul style="list-style-type: none"> <li>• Minimum: -28 dBm</li> <li>• Maximum: -3 dBm</li> </ul>
	<ul style="list-style-type: none"> <li>• Minimum: -28 dBm</li> <li>• Maximum: -7 dBm</li> </ul>	
	Multimode	
	<ul style="list-style-type: none"> <li>• Minimum: -28 dBm</li> <li>• Maximum: -11 dBm</li> </ul>	

Output Power	Single Mode	Single Mode
	<ul style="list-style-type: none"> <li>• Minimum: -15 dBm</li> <li>• Nominal:-11 dBm</li> <li>• Maximum:-8 dBm</li> </ul>	<ul style="list-style-type: none"> <li>• Minimum: -15 dBm</li> <li>• Nominal:-11 dBm</li> <li>• Maximum:-8 dBm</li> </ul>
	Multimode	Multimode
	<ul style="list-style-type: none"> <li>• Minimum: -19.5 dBm</li> <li>• Nominal:-17 dBm</li> <li>• Maximum:-14 dBm</li> </ul>	<ul style="list-style-type: none"> <li>• Minimum: -19.5 dBm</li> <li>• Nominal:-17 dBm</li> <li>• Maximum:-14 dBm</li> </ul>
Safety	<ul style="list-style-type: none"> <li>• Complies with IEC 825/CDRH Class 1</li> </ul>	

## Measurement System

Result Types	<ul style="list-style-type: none"> <li>• Cumulative: measurements are reported from the start of the measurement interval</li> <li>• Sampled: measurements are reported from the most recently completed sampling interval</li> </ul>
Measurement Interval	<ul style="list-style-type: none"> <li>• Range: 1 second to 7 days</li> </ul>
Sampling Interval	<ul style="list-style-type: none"> <li>• Range: 1 second to 1 day</li> </ul>
Measurement Clock	<ul style="list-style-type: none"> <li>• 10 ns resolution</li> <li>• +/- 0.5 ppm/year clock drift</li> <li>• 3ppm max. difference between cards</li> </ul>
Interface Synchronization	<ul style="list-style-type: none"> <li>• All measurements are synchronized across all cards and modules within the RouterTester system</li> </ul>

## External Reference Clock

Connector	<ul style="list-style-type: none"> <li>• SMB</li> </ul>
Input	<ul style="list-style-type: none"> <li>• 0 dBm (nominal)</li> </ul>
Impedance	<ul style="list-style-type: none"> <li>• 50 to ground</li> </ul>
Frequency	<ul style="list-style-type: none"> <li>• 19.44 MHz (nominal)</li> </ul>
Duty Cycle	<ul style="list-style-type: none"> <li>• 50% +/- 5%</li> </ul>

## Framing

Encapsulation	IP datagrams are encapsulated using: <ul style="list-style-type: none"> <li>• PPP in HDLC-like framing, as per IETF RFC 1662, or</li> <li>• Cisco HDLC (Ethernet protocol field)</li> </ul>	
FCS	16 or 32 bit length	32-bit length (only)
	Negotiated between test port and device under test	Negotiated between test port and device under test
Frame spacing	<ul style="list-style-type: none"> <li>• Frames can be transmitted continuously with a minimum one flag octet between frames</li> </ul>	
PPP configurable parameters	<ul style="list-style-type: none"> <li>• Restart Timer (default 3 sec)</li> <li>• Max-terminate (default 2 sec)</li> <li>• Max-configure (default 10 sec)</li> <li>• Max-failure (default 5 sec)</li> </ul>	

- LCP negotiation parameters
- Max-Receive-Unit (default 1500)
  - Magic-Number (default is randomly chosen)
  - FCS (default 32 bit)
- IPCP negotiation parameters
- IP address
- Scrambling/Descrambling
- 1 + X<sup>43</sup>, after HDLC framing.
  - Scrambling can be enabled or disabled
- Minimum frame size
- 13 octets for HDLC, so as to encapsulate a minimum PPP frame size of 6 octets
  - 29 octets for IP, so as to encapsulate a minimum IP frame size of 20 octets

### HDLC Real-Time Transmit Statistics

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- Frames transmitted
- Octets transmitted (before octet stuffing)
- Octets transmitted (after octet stuffing)
- HDLC transparency efficiency (percentage)

### HDLC Real-Time Receive Statistics

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- Frames received
- Octets received (before octet destuffing)
- Octets received (after octet destuffing)
- FCS errors
- Aborted frames
- Invalid frames

- Minimum frame size
- 12 octets for HDLC, so as to encapsulate a minimum FR frame size of 5 octets
- Error
- HDLC aborted frames
- Generation
- HDLC FCS errors
- Capture
- Full capture of complete frames including FCS

### HDLC Real-Time Transmit Statistics

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- Frames transmitted
- Octets transmitted (before octet stuffing)
- Octets transmitted (after octet stuffing)
- HDLC transmit efficiency (percentage)

### HDLC Real-Time Receive Statistics

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- Frames received
- Octets received (before octet destuffing)
- Octets received (after octet destuffing)
- FCS errors
- Aborted frames
- Invalid frames

### Per-PVC Statistics

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- Test packets (PDUs) received
- Test octets received
- Received test packet throughput
- Received test packet average latency

## Frame Relay Specifications

### Traffic Generation & Analysis

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- Encapsulation
- HDLC
  - Cisco HDLC (Ethernet protocol field)
- FCS
- 32- or 16-bit length
  - Negotiated between test port and device under test
- Scrambling/Descrambling
- 1 + X<sup>43</sup>, after HDLC framing.
  - Scrambling can be enabled or disabled
- Frame spacing
- Configurable minimum interframe gap (1 to 256)
- Max PVCs
- Tx: 1024 per port
  - Rx: 1024 per port
- PVC encapsulations
- IETF IPv4, IPv6, MPLS
  - Null MPLS
  - Q.933
  - Bridged Ethernet
  - Cisco Frame Relay
- LCP negotiation parameters
- Max-Receive-Unit (default 4700)
  - Magic-Number (default 0)
  - FCS (default 32 bit)

## Physical Layer (SONET/SDH) Specifications

OC-3c/12c (STM-1/4c)	OC-48c (STM-16c)
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### Configuration Options

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- Framing
- SONET or SDH
- Scrambling
- On/Off
- Descrambling
- On/Off
- Clock source
- Internal, Recovered, or External
- Adjustable SONET Clock
- Not Applicable
  - -30 to +30 ppm
- Port mode
- Full duplex, Receive monitor, or Transmit loopback
- User-definable overhead fields
- C2 (Path Signal)
  - K1/K2 (Automatic Protection Switching)
  - S1 (Synchronization Status)
  - J0 or Z0 (Section Trace or Growth)

## Alarm Indications

- Loss of Signal (LOS)
- Loss of Frame (LOF)
- Loss of Pointer (LOP)
- AIS-L/MS-AIS
- RDI-L/MS-RDI
- AIS-P/AU-AIS
- RDI-P/Path RDI

## Alarm Generation

- Loss of Frame (LOF)
- Loss of Pointer (LOP)
- AIS-L/MS-AIS
- RDI-L/MS-RDI
- AIS-P/AU-AIS
- RDI-P/Path RDI

## Real-time Statistics

- Section BIP-8 (B1) Errors
- Line BIP-8 (B2) Errors
- Path BIP-8 (B3) Errors

## Mechanical Specifications

	OC-3c/12c (STM-1/4c)	OC-48c (STM-16c)
<b>Physical</b>		
Width	• 206mm	• 206mm
Depth	• 313mm	• 313mm
Height	• 30mm	• 30mm
Weight	• 875g	• 910g

## Electrical

Power consumption	• 40W max	• 60W max
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## Environmental

Operating temperature	• 0 °C to 40 °C
Storage temperature	• -40 °C to 70 °C
Humidity	• Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C – non condensing

## Regulatory Compliance

### Electromagnetic Compatibility

- IEC 61326-1:1997+A1:1998 / EN 61326:1997+A1:1998+A2:2000+A3:2003
- CISPR CISPR 11:1997+A1:1999 +A2:2002 / EN 55011:1998+A1 :1999 +A2:2002
- Canada: ICES-001:1998a
- This equipment is designed to operate in a controlled electromagnetic environment, ie where RF transmitters such as mobile telephones may not be used in close proximity
- EMC Directive 89/336/EEC, amended by 93/68/EEC

### Electrical Safety

- CAN/CSA C22.2 No. 1010.1:1992
- UL3101-1:1993 / UL3111-1:1994
- IEC 61010-1(1990) +A1(1992) +A2(1995) in accordance with IECCEB CB Report no.177559-1233411 (including Edition 4, Project 1408903)
- Low Voltage Directive 72/23/EEC, amended by 93/68/EEC

### Optical Safety (when fitted with optical interfaces cards)

IEC 60825-1:1993 + A1:1997 + A2:2001  
 EN60825-1:1994 + A :2002 + A2:2001  
 IEC 60825-2:2000  
 CFR title 21 part 1040.10 and 1040.11

## Front Panel

	OC-3c/12c (STM-1/4c)	OC-48c (STM-16c)
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## Connectors

Ext Clk	• External 19.44 MHz clock input (SMB)	
Test Ports	• Duplex SC	• Duplex LC
	• Single mode or	• Single mode
	• multimode	

## LED Indicators

Status	• 4-digit display to indicate card status and numerical identification	
LASR	• Red when output laser is on	
SGNL	• Green when a valid optical receive signal is detected	
TX	• Green when an HDLC frame is transmitted	• Not applicable
RX	• Green when an HDLC frame is received	• Not applicable
155	• Green when the port is operating at OC-3c/STM-1 speed	• Not applicable
622	• Green when the port is operating at OC-12c/STM-4c	• Not applicable

LOF/LOP	<ul style="list-style-type: none"> <li>Yellow when a Loss of Frame or Loss of Pointer condition exists at the receiver</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>
AIS/RDI	<ul style="list-style-type: none"> <li>Yellow when a Line/MS AIS, Line/MS RDI, Path AIS or Path RDI condition exists at the receiver</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>

## Applicable Standards

<b>OC-3c/12c (STM-1/4c)</b>	<b>OC-48c (STM-16c)</b>
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### Optical Transmitter and Receiver

SONET	<ul style="list-style-type: none"> <li>OC-12c Single Mode: Telcordia GR-253 CORE Intermediate Reach Specifications (Issue 2, Rev 2, Jan 1999) - IR intermediate reach OC-12 interface specification)</li> <li>OC-12c Multimode: ATM Forum 622.08 Mbps Physical Layer Specification (af-phy-0046.000, Jan 1996)</li> </ul>	<ul style="list-style-type: none"> <li>Telcordia GR-253-CORE (Issue 2, Rev. 2, Jan. 99 1999 - SR short reach OC-48 interface specification)</li> </ul>
SDH	<ul style="list-style-type: none"> <li>ITU-T G.957 (06/99) S-4.1 Short Haul Specifications</li> </ul>	<ul style="list-style-type: none"> <li>ITU-T G.957 (06/99) I-16 intra-office STM-16 interface specification</li> </ul>

### SONET/SDH

SONET	<ul style="list-style-type: none"> <li>STS-3c/STS-12c as per ANSI T1.105 and Telcordia GR-253-CORE (Issue 2, Rev 2, Jan 1999)</li> </ul>	<ul style="list-style-type: none"> <li>STS-48c as per ANSIT1.105 and Telcordia GR-253-CORE (Issue 2, Rev 2, Jan 1999)</li> </ul>
SDH	<ul style="list-style-type: none"> <li>STM-1/STM-4c as per ITU-T Rec. G.707/G.708 (03/1996)</li> </ul>	<ul style="list-style-type: none"> <li>STM-16c as per ITU-T Rec. G.707/G.708 (03/1996)</li> </ul>

### Protocols

Packet over SONET/SDH	<ul style="list-style-type: none"> <li>IETF RFC 2615, PPP over SONET/SDH</li> </ul>
PPP/HDLC	<ul style="list-style-type: none"> <li>IETF RFC 1662, PPP in HDLC-like Framing</li> </ul>
Link Control Protocol	<ul style="list-style-type: none"> <li>IETF RFC 1661, The Point-to-Point Protocol (PPP)</li> </ul>
IP Control Protocol	<ul style="list-style-type: none"> <li>IETF RFC 1332, The PPP Internet Protocol Control Protocol (IPCP)</li> </ul>

## Agilent N2X

Agilent's N2X multi-service tester combines leading-edge services with carrier grade infrastructure testing and emulation. The N2X solution set allows network equipment manufacturers and service providers to more comprehensively test new services end-to-end, resulting in higher quality of service and lower network operating costs.

## Warranty and Support

### Hardware Warranty

All N2X hardware is warranted against defects in materials and workmanship for a period of 1 year from the date of shipment.

### Software Warranty

All N2X software is warranted for a period of 90 days. The applications are warranted to execute and install properly from the media provided.

This warranty only covers physical defects in the media, whereby the media is replaced at no charge during the warranty period.

## Software Updates

With the purchase of any new system controller Agilent will provide 1 year of complimentary software updates. At the end of the first year you can enroll into the Software and Support Agreement (SSA) contract for continuing software product enhancements.

## Support

Technical support is available throughout the support life of the product. Support is available to verify that the equipment works properly, to help with product operation, and to provide basic measurement assistance for the use of the specified capabilities, at no extra cost, upon request.

## Ordering Information

To order and configure the test system consult your local Agilent field engineer.

## Sales, Service and Support

### United States:

Agilent Technologies  
Test and Measurement Call Center  
P.O. Box 4026  
Englewood, CO 80155-4026  
1-800-452-4844

### Canada:

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Printed in USA November 22, 2007  
5988-5019EN

