Nexans	**Evaluation of 3COM® NJ100 Network Jack**
Data Communications Competence Center	**DCCC02101601R2** **July 11, 2007**

Test Summary

Outlined in this report are the results of a performance assessment of the 3Com NJ100 network jack. Testing was performed to determine the strengths and weaknesses of the device.

Background

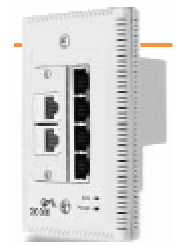

Figure 1: 3Com Network Jack

The 3Com NJ100 network jack is a 4-port, unmanaged Ethernet switch that fits into any standard data port opening. It is connected to the LAN by one UTP network connection. The concept of the product is to bring switching capability into a single port, while allowing the connection of up to four networking devices such as several computers or peripherals. Figure 1 depicts the 3Com NJ100.

The network jack features 10/100 Mbps auto-negotiation that configures the jack for 10 Mbps or 100 Mbps operation. The NJ100 operates in either full or half-duplex operating modes. It contains a switch that toggles between the ports to deliver the network traffic to the appropriate connection.

The network jack requires a source of power to operate and is supplied by either a single or multi-port Ethernet power supply that provides IEEE 802.3af compatible power over Ethernet. Power over Ethernet supplies voltage over the UTP network cable allowing the device to receive both power and data from the same network cable. The components may also be powered locally by an independent supply located at the unit.

Test Setup

Active network testing was performed using the Spirent SmartBits® 200 and 2000 mainframe units that contained Fast Ethernet modules. SmartBits is a multi-port traffic generation and performance analysis system. It provides scrutiny of the Ethernet frame traffic that occurs between active network elements.

In addition to SmartBits testing, Chariot®, a Net IQ software product, was used to evaluate the performance of the switch that is imbedded in the NJ100. Chariot allows the analysis of switch while using different types of network traffic such as streaming video or Internet traffic to demonstrate data transfer while under congestion control.

- Test Equipment
  - Spirent SmartBits® Models 200 and 2000 Multi-Performance Analysis System with SX-7410B Fast Ethernet modules.
- Other Equipment
  - 3Com 3C16468 10/100/1000 Ethernet Switch
  - 3Com Ethernet Power Supply
- Software
  - NetIQ Chariot®

- Cabling
  - Cable
    - Berk-Tek LANmark-350
  - Connectivity
    - Patch Panel: Ortronics GigaMo CAT5e
    - Jacks: Ortronics GigaMo CAT5e
    - Patch Cables: Ortronics GigaMo CAT5e

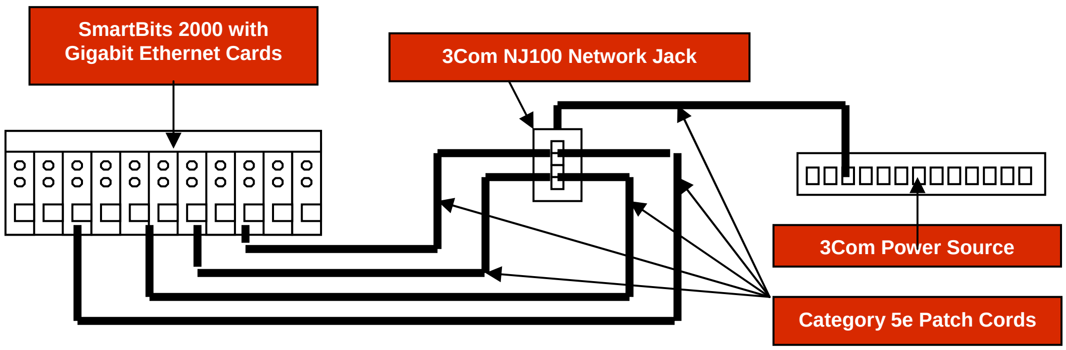

Figure 2: Utilizing the NJ100 for a local connection

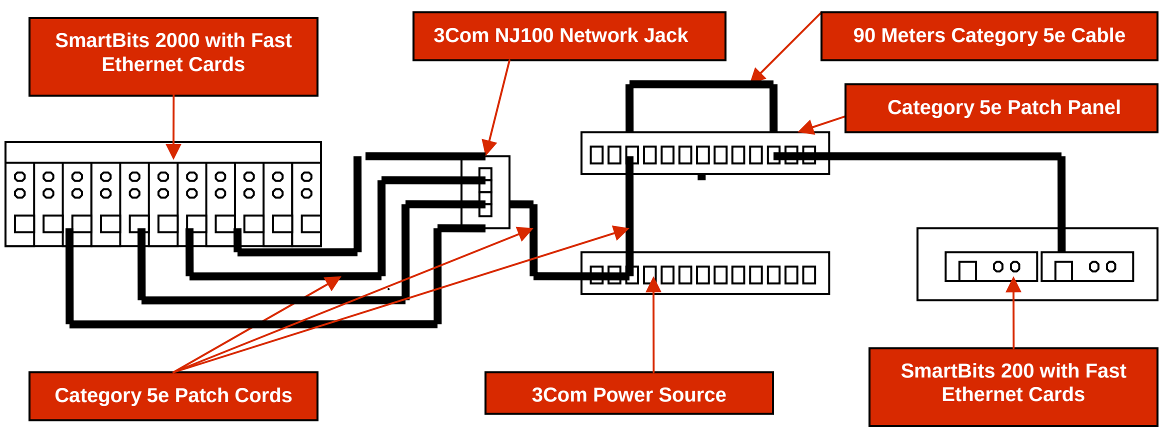

Figure 3: Utilization of the NJ100 in a network configuration with SmartBits

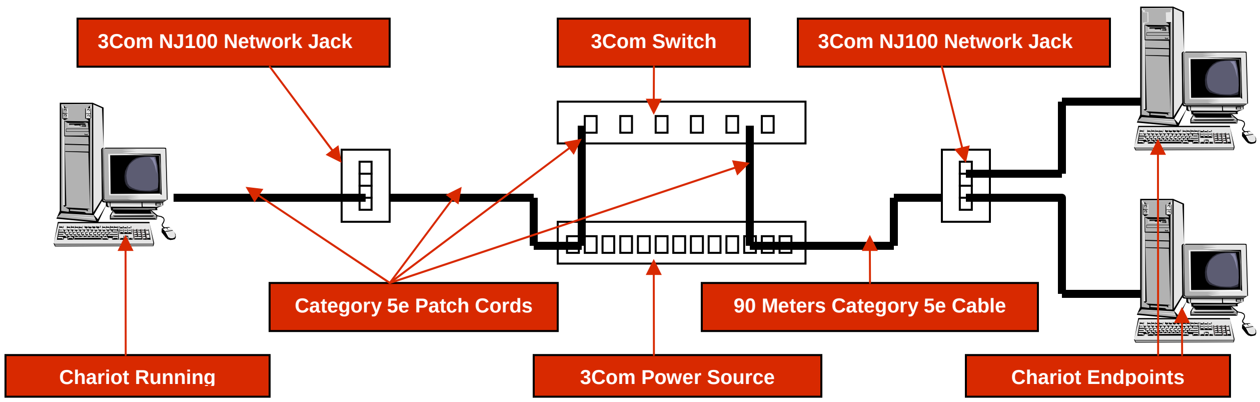

Figure 4: NJ100 in a real-world network configuration measured by Chariot

Test Results

SmartBits Testing

The local setup shown in Figure 2 tests the performance of the network jack as an independent switch. This would simulate multiple computers being connected to the ports of the NJ100 and transmitting locally across the internal network jack switch. Performance between each local port was analyzed.

In this mode of operation, three of the four network jacks performed their function as expected with no frames lost. One of the four NJ100 switches dropped frames. The overall throughput of this NJ100 switch was reduced due to the need to resend data. This port had a frame loss of 4.1×10^{-6} as compared to the specified Ethernet frame loss of 10^{-7}. Other ports performed better, but still lost some frames. The typical frame error rates for these ports were 8.1×10^{-9} – well within the required maximum.

Figure 3 shows a setup that emulates a complete network configuration. Ninety meters of horizontal cable connected the NJ100 to the patch panel. The total length of the cabling channel was 100 meters.

Four channels of the SmartBits unit were set to transmit 64-byte frames with 0.96-microsecond gaps between the frames. Signals were sent from the network jack to the single connection. The purpose of this test was to evaluate if there was any preference between the ports of the NJ100 when it was transmitting to the network. Ports on three of the four switches showed little preference from port-to-port. The NJ100 that showed poor performance in other tests also exhibited it in this test. Of the frames transmitted to the network, 41 percent were from port 1, 35 percent were from port 2, 15 percent were from port 3 and 9 percent were from port 4.

A second full network test was configured so that the SmartBits 2000 was sending Fast Ethernet signals into each port of the NJ100 simultaneously (uplink). At the other end of the cabling channel, the SmartBits 200 unit was transmitting to the NJ100 (uplink) at the same time. Three of the NJ100s performed without any lost frames. The fourth jack, the same unit that showed performance problems in the other tests, had a downlink frame loss of 1.8×10^{-1} and an uplink loss of 6.7×10^{-6}.

Chariot Testing

For all of the Chariot testing, data was sent at 100 Mbps and the resulting receiver speed was measured for different configurations and file types. Table 1 shows the results.

Table 1: Chariot Test Results

Connection Type	Transaction Type	Transmit Data Rate (Mbps)	NJ100 Received Data Rate (Mbps)	Standard Wall Jack Data Rate (Mbps)
Local[1]	Ethernet frames	100	86.5	91
Local	Ethernet frames and MPEG video file incoming from local PC	100	85.5	90
Entire Network (Figure 4)	Ethernet frames	100	81.8	91
Entire Network	Ethernet frames and MPEG video across the network	100	74.7	90
Entire Network	FTP transfer simulation	100	40.0	47.9
Network	Ethernet frames from 2 PCs sharing the NJ100	100	46.5	91

[1]Local is defined as between devices connected to the NJ100

Connecting through the NJ100 showed a substantial degradation in received data rate no matter what type of data was being sent.

Conclusions

3Com claims that the NJ100 will save companies from "pricey" new cable installations, but the equipment manufacturer neglects to mention that there is a subsequent cost that manifests itself in performance degradation and network security issues.

Advantages and disadvantages of the NJ100 are summarized in Table 2.

Table 2: NJ100 Advantages and Disadvantages

Advantages	Disadvantages
Enables local connections of peripherals for a work group	Poses potential security issues because devices can be connected to the network that are not approved by network management.
Potential to reduce cabling connections for work groups	Throughput decreased to each port by as much as 75 percent if all four ports are being used.
	Unmanaged – may not auto-negotiate to the best solution-set.
	Not upgradeable to Gigabit speeds

Other results also showed that there may be another problem with the NJ100 as far as manufacturing consistency goes. Three of the four NJ100s investigated performed as expected in Smartbits testing, but the fourth executed very poorly in comparison. This part had difficulty transferring frames between the ports of the unit both downstream and upstream to the LAN. This particular network jack also showed preference to certain ports. The other three NJ100s did not exhibit this anomaly.

Nexans maintains that using a NJ100 may be an easy interim solution for companies that are growing and would like to add personnel onto existing network connections, but to use them for long-term system links will prove to be detrimental to both productivity and security.

Data Communications Competence Center

Nexans' Data Communications Competence Center, located at the Berk-Tek Headquarters in New Holland, Pennsylvania, focuses on advanced product design, applications and materials development for networking and data communication cabling solutions. The Advanced Design and Applications team uses state-of-the-art, proprietary testing and modeling tools to translate emerging network requirements into new cabling solutions. The Advanced Materials Development and Advanced Manufacturing Processes teams utilize sophisticated analytical capabilities that facilitate the design of superior materials and processes. The Standardization and Technology group analyzes leading edge and emerging technologies and coordinates data communication standardization efforts to continuously refine Nexans' Technology Roadmap. An international team of experts in the fields of cable, connectors, materials, networking, standards, communications and testing supports the competence center. The competence center laboratories are a part of an extensive global R&D network that includes eight competence centers, four application centers and two research centers dedicated to advanced technologies and materials research.