



# V.34 Fax: Superior Performance and Cost Savings

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# Abstract

As fax technology continues to evolve enterprises are faced with the important decision of whether to upgrade their fax solution to V.34, the latest in fax standards.

Nicknamed “V.Fast”, the V.34 fax standard is an important development in fax technology. Not only can it send fax data over twice the speed of V.17 (14.4 Kbps), but it also supports fast handshaking which can cut call setup and session-management time by one-third. Fax devices supporting the V.34 protocol also deliver more reliable fax transmissions, with less requirement for resends, under a wider range of line conditions than those supporting older fax standards such as V.17 and 9.6 Kbps.

This white paper discusses the unique features of the V.34 fax standard that help deliver improved performance and reliability and how the rapid adoption of 33.6 Kbps fax devices result in increased cost savings to enterprises that choose to make the leap to the latest in fax technology, V.34.

## Overview: The New V.34 Fax Standard Delivers Significant Cost Savings

Fax continues to be an important and cost-effective means for business-to-business and business-to-customer communications. It is estimated that more than 90% of U.S. businesses have fax machines in the office and sales of fax machines in recent years have maintained a slow, but steady growth rate. Even with the popularity of email, more than 7.5 million fax machines were sold in 2002 alone.

Recent advancements in fax technology have resulted in a renewed interest in fax in the business environment. One such advancement is the introduction of the V.34 fax standard, which can help businesses increase productivity and reduce costs.

## What is the V.34 Fax Standard?

The V.34 fax standard was established by the International Telecommunications Union (ITU) as the standard for full-duplex modems sending and receiving data across phone lines at up to 33.6 Kbps. Compared to the V.17 (14.4 Kbps) standard and 9.6 Kbps fax, V.34 allows faster transmission time per fax page, greater adaptability to varying line conditions, and a reduction in the number of resends per fax. These improvements result in cost savings from reduced fax phone bills.

In order to understand the benefits of the V.34 standard, it is first necessary to understand how a fax call takes place. The first step is the “handshake” that determines key factors in how the fax call will be set up. The handshaking stage enables the sending and receiving fax device (such as a fax machine or fax server) to find a common speed at which the fax can be transmitted. With a 9.6 Kbps or a V.17 modem, the handshaking is done at 300 bps. With V.34 fax, the handshaking is done at a much faster rate of 1,200 bps. The result is that handshaking time is reduced from approximately 16 seconds with 9.6 Kbps and V.17 to seven seconds with V.34.

The next stage of a fax call is the data transmission. V.34 provides the widest range of supported data transmission rates, allowing it to optimize speed and reliability over a wider range of line conditions. With V.34, fax pages are transmitted at 33.6 Kbps, which is twice the speed of V.17, which transmits at 14.4 Kbps, and three times the speed of 9.6 Kbps fax. After each page is transmitted, a retraining or re-synchronizing process is done between each additional page until the fax call is completed.

V.34 improves the entire handshake and connection process through a feature called “line probing”. Line probing allows a V.34 device to intelligently choose optimum operating parameters for any given connection. Immediately following the handshaking stage, complex signals are transmitted that allow the distant receiver to analyze the characteristics of the connection before beginning the data transmission stage. The connected devices use this line analysis to choose several key operating parameters. Line probing is performed on every new connection, and can also be performed at any time during the connection as part of the retraining process. As a result, V.34 allows devices not only to adapt to a broad range of different line types and distortions from call to call, but also to accommodate varying line conditions over long periods of time on any given connection.

## V.34 Fax Machine Penetration and Growth

Growth of V.34 fax machine shipments has been significant over the past several years. Table 1 shows that sales of V.34 machines in 2001 totaled 1,080,600 units and will grow to just over 4 million units by 2005, with a compounded annual growth rate (CAGR) of 40%. The primary driving factors for this high growth are sales of low-end laser and inkjet fax machines that are V.34 enabled. Currently, 60% of all laser fax machines and 25% of inkjet models sold are V.34 enabled. By 2005, 75% of all laser fax machines and 50% of all inkjet fax machines sold will be V.34 enabled. This means that of the 6.3 million laser and inkjet fax machines sold in 2005, 4.2 million, or 66%, will be V.34 enabled. Consequently, by 2005 the general installed base of V.34 fax machines will grow to 12%. In the corporate world, V.34 fax machine penetration will grow to 36%.

The net result of this is that the installed base of V.34 fax machines is increasing and adoption is becoming widespread. As a result of the growth, users of V.34 intelligent fax will experience greater cost savings when both the sending and receiving fax machines are based on the V.34 standard.

**Table 1: V.34 Unit Shipments Worldwide**

	2001	2002	2003	2004	2005	CAGR (%)
V.34 Units Shipped	1,080,600	3,001,200	4,075,000	4,100,000	4,200,200	40%
V.34 Installed Base	1,800,000	4,800,000	8,800,000	12,000,000	16,000,000	73%
Worldwide Installed Base	112,000,000	118,000,000	125,000,000	131,000,000	138,000,000	5%

*Source: Davidson Consulting, 2003*

## Show Me the Money—ROI of a V.34 Fax Server

The total savings accrued by using V.34 fax versus V.17 and 9.6 Kbps fax is relative to the total amount of time it takes to send a fax using each fax transmission. Table 2 shows the anatomy of an enterprise fax phone call and compares the time each step in the process takes for each fax transmission rate.

For the fax being sent using V.34, once the handshaking is completed, the first page is transmitted at 33.6 Kbps. This means that the first page of a typical four-page fax will transmit in seven seconds, versus 16 seconds with the older technology. For the example of the four-page fax transmission, the transmission time can vary from 166 seconds with a 9.6 Kbps modem, to only 41 seconds using V.34 fax technology, saving more than two minutes per call on average.

**Table 2: Average Fax Transmission Times**

	<b>9.6 Kbps 4-Page Fax (in seconds)</b>	<b>V.17 4-Page Fax (in seconds)</b>	<b>V.34 4-Page Fax (in seconds)</b>
Handshake	16	16	7
Page 1 (3%)	18	12	5
Retraining	6	6	0.25
Page 2 (6%)	27	18	7
Retraining	6	6	0.25
Page 3 (6%)	27	18	7
Retraining	6	6	0.25
Page 4 (12%)	54	36	14
Retraining	6	6	0.25
<b>TOTAL</b>	<b>166 seconds</b>	<b>124 seconds</b>	<b>41 seconds</b>

Source: Davidson Consulting, 2003

V.34 fax can save users thousands of dollars when compared to V.17 and 9.6 Kbps fax. Table 2 shows the time savings accrued per fax using V.34 fax, compared with the slower 9.6 Kbps and V.17 fax transmissions. The long term cost savings over a 5-year period is calculated in Table 3 by multiplying the average fax transmission times by V.34 traffic rates and average per minute phone costs.

For Table 3, the following assumptions are used:

- The time required to fax a four-page V.34, V.17 and 9.6 Kbps fax are 41 seconds, 124 seconds and 166 seconds respectively (see Table 2).
- Daily fax usage by a typical enterprise customer is assumed to be 1,250 four-page faxes, which equates to 5,000 pages per day.
- A weighted average of \$.07 per minute phone charge is used, based upon the assumption that 25% of faxes are local (free), 62.5% are long distance (\$.07 per minute) and 12.5% are overseas (\$.20 per minute).
- 20% of faxing in enterprises is intra-company, meaning to and from people or systems in the same company. This type of faxing is under the control of the corporation and can be made to conform to V.34 at both ends of the sending and receiving fax devices. For this model it is assumed that both the sending and receiving fax machines or servers within the same corporation for intra-company faxing are V.34.
- Assumptions of the percentage of fax traffic transmitted at V.34 speeds are conservative estimates.

Taking the time-savings per day from Table 2 for 9.6 Kbps and V.17 fax transmissions and multiplying those by V.34 traffic rates one can calculate the ROI of V.34 in an enterprise fax implementation using two scenarios.

The first scenario in Table 3 shows V.34 fax savings in the case of a corporation that has 80% of daily fax traffic sent to other corporations or corporate lists and the remaining 20% of daily fax traffic sent as intra-company faxes. The total savings accrued in just one year represent \$14,958 when compared to 9.6 Kbps fax and \$9,932 when compared to V.17 fax.

The second scenario in Table 3 is the case of a corporation that has 80% of daily fax traffic sent to the general installed base of fax machines and the remaining 20% of fax traffic sent as intra-company faxes. The total savings accrued in one year represent \$12,657 when compared to 9.6 Kbps fax and \$8,404 when compared to V.17 fax.

**Table 3: Sample ROI of V.34 Fax**

	2001	2002	2003	2004	2005
Percent of Overall Installed Base 33.6 Kbps Traffic	8%	13%	15%	16%	19%
Percent of Corporate 33.6 Traffic	14%	24%	33%	42%	51%
Percent of Intra-Company Faxing	20%	20%	20%	20%	20%

**Scenario 1: Corporate + Intra-Company V.34 Fax Savings**

V.34 Savings compared to 9.6 Kbps fax	\$14,958	\$18,794	\$22,245	\$25,697	\$29,149
V.34 Savings compared to V.17 fax	\$9,932	\$12,479	\$14,771	\$17,063	\$19,355

**Scenario 2: General Installed Base + Intra-Company V.34 Fax Savings**

V.34 Savings compared to 9.6 Kbps fax	\$12,657	\$14,575	\$15,342	\$15,725	\$16,876
V.34 Savings compared to V.17 fax	\$8,404	\$9,678	\$10,187	\$10,442	\$11,206

*Source: Davidson Consulting, 2003*

The result is that a typical enterprise company saves thousands of dollars in the first year alone from V.34 fax. As 33.6 Kbps fax traffic increases the cost savings also increase year over year. Most importantly, as savings accumulate, the money saved from V.34 fax usage adds up to tens of thousands of dollars over the course of just a few years.

## Conclusion

V.34 is an important development in fax technology, not only because it can send fax data more than twice the speed of the older fax standards, but also because it supports fast handshaking which can cut call setup and session-management time by one-third. Fax devices supporting the V.34 protocol also deliver more reliable fax transmissions, with less requirement for resends, under a wider range of line conditions. The V.34 protocol is highly adaptive, automatically and intelligently applying the optimum combination of modulation methods and impairment-compensation techniques for each fax call. The result is faster fax transmissions and significant cost savings over time.





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