



UNDERSTANDING FAX COMPATIBILITY

A Review of the Fundamentals Helps Answer The Question: What About Performance?

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Some years ago, a top salesperson attending a fax training course was asked, "How many groups are there?" Very seriously, he said, "Oh, there are lots. You've got the Beatles, the Rolling Stones..."

Of course, the topic was "Group Compatibility." Back then, knowing that there were four CCITT Groups was considered high-tech. Today, the issue of compatibility goes far beyond G3 to include a host of features that impact your customer's business. Those features, many of which are outlined in this article, influence transmit speeds, output quality, productivity, data security, reliability and operating costs.

To *increase* transmit speed, improve output quality and lower operating costs, both the sender and receiver must be "equally equipped" or compatible. The question then becomes, "What can a customer expect in terms of performance? By reviewing the following "fax fundamentals" you'll realize that the answer is, "It depends."

Group Compatibility

The ITU, or International Telecommunications Union (formerly called the CCITT, or Consultative Committee on International Telephony and Telegraphy), establishes design and operation standards for telecommunications equipment, including facsimile. Conformity to ITU standards prevents incompatibility. At one time, only fax machines manufactured by the same vendor could communicate with one each other, e.g., Ricoh-to-Ricoh. While manufacturers still design units with "proprietary" features, fax communication is essentially unrestricted.

There are four international fax standards (Group 1, 2, 3, and 4). The current group is Group 3. Today, fax traffic is primarily G3-to-G3 communication. Group 4, the newest ITU standard, speeds data over digital lines and is ideal for high-volume, long-distance fax applications. All G4 systems are compatible with G3 units. (Note: G3 and G4 backward compatibility to obsolete G1 and G2 devices varies by vendor.)

Compatibility Principle #1: *Communication is only possible if both systems support the same ITU Group Protocol, e.g., G3-to-G3.*

Error Correction Mode

ECM ensures that data reaches its destination intact in the event that line noise is encountered. By checking the quality of the connection, garbled data can be resent (from memory) while the call is in progress. ECM improves the system's reliability (legible copy is received), saving operator time and improving productivity (no refaxing is required).

Compatibility Principle #2: *ECM is an ITU standard so compatibility is universal...provided both units conform.*

Coding Scheme

Coding, or compression methods, are used to "compress" repetitive data and increase the transmission speed, thus lowering phone costs. The least efficient compression scheme is Modified Huffman (MH), a one-dimensional coding process. The faster method that produces higher quality images is Modified Read (MR), a two-dimensional coding scheme that increases the speed by 20 percent over MH alone. Virtually all fax units utilize MH, MR. Modified, Modified Read (MMR) is prevalent at the mid- to high-end and, when added to other proprietary methods, supports the fastest and lowest operating costs.

Compatibility Principle #3: *The send and receive units must both support the same ITU compression standard, e.g., MMR-to-MMR.*

Modem Speed

Currently the maximum speed of a G3 fax over analog phone lines (the PSTN - Public Switched Telephone Network) is 14,400 bps (bits per second). A fax equipped with the faster 14,400 bps (pronounced 14 dot 4) modem will detect if it's communicating with another 14.4 fax machines during the handshake. If communication is with a 9,600 bps modem, the sender will automatically fallback (or step-down) to 9,600 bps.

Two factors determine whether a modem will communicate at the fastest speed: The modem capabilities of the receiving unit, and the quality of the phone line.

The handshake, which precedes every fax transmission, is when data on Group compatibility, ECM, coding scheme, resolution and modem speed is exchanged.

Compatibility Principle #4: *The slower of the two fax units dictates the speed at which transmission takes place. The sender is a slave to the receiver.*

Transmit Speed

The CCITT Test Chart #1 (Slerexe Letter), at 4 percent image density, is used to determine transmit speeds. This letter is communicated between the same manufacturers' models (in standard resolution). Under these "laboratory" conditions (with identical units connected back-to-back) you cannot factor in real-time operating conditions. During a normal transmission, over the PSTN, there are many variables that influence the duration of the call.

- The 300 bps "handshake" (which occurs at the beginning, end and between pages) slows down the transmission. (Note: This "greeting" is not included in documented transmit speeds.)
- Communication is often between fax brands. So factors that execute the call more quickly (fast handshake) are ineffective unless communication is between like models.
- The "Slerexe Letter," at 4 percent image density, does not reflect common workplace applications. Cover sheets and correspondence often contains logos, graphics, bolded text, etc. which will slow transmission.

Compatibility Principle #5: *Transmission speed varies based upon the capability of the receiver, the length of the document, the complexity of the images and the resolution setting.*

Resolution

When transmitting detailed drawings, text with fine print, etc., the resolution can be enhanced from standard (200-by-100 dpi) to fine (200-by-200 dpi) or to superfine (200-by-400 dpi). Cross-vendor compatibility does exist as long as the receiving machine has the same resolution capabilities, e.g., fine. (Note: Superfine is not backward compatible to units manufactured prior to the 1993 ITU approval.)

Compatibility Principle #6: *When the density of the text is increased, you improve output quality. However, you sacrifice speed and increase phone line costs.*

Halftone: 64-level Gray Scale

Halftone or photo mode (also called gray scale) is used when sending photographs or images containing shades of gray. The sending fax scans and deciphers the image to provide gradations or levels of gray. Two questions often arise regarding halftones.

1. "Must the receiving unit have the same gray scale capability? Gray scale is a function of the sending unit, so the answer is no. A receiver without gray scale can still receive the image with the expected clarity.
2. "Does it take twice as long to send a photo in 64-level as it does in 32-level gray scale?" Technically, yes. A higher level of gray enhances output quality but also slows transmission and increases phone costs.

Compatibility Principle #7: *Gray scale is a function of the sending unit and therefore compatibility is not an issue.*

Confidential Reception

Confidential mailbox reception is a proprietary feature that requires communication between like models. Each manufacturer's "software architecture" differs, making the passcode programming unique to their product line. However, new fax products are emerging with ITU-approved mailboxes that do offer cross-vendor compatibility. Still, there must be a sizable installed base before confidential reception becomes a reliable security method.

Compatibility Principle #8: *Currently, confidential mailboxes are proprietary, but stay tuned for new developments.*

Conclusion

Today, more than ever, having a competitive edge in business means controlling costs and increasing productivity. Both goals, when applied to fax, are achievable if principles of compatibility are properly applied. Whether you're marketing standalone or connected fax products, examine compatibility and its impact on your customer's fax communications. Besides offering a valuable service, you'll uncover needs that might justify the installation of more profitable network solutions.

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