Analysis of Fax over IP, TDM, and PSTN - FaxScan™

FaxScan™ (VBA038, PKV104)
Fax Decode and Analysis
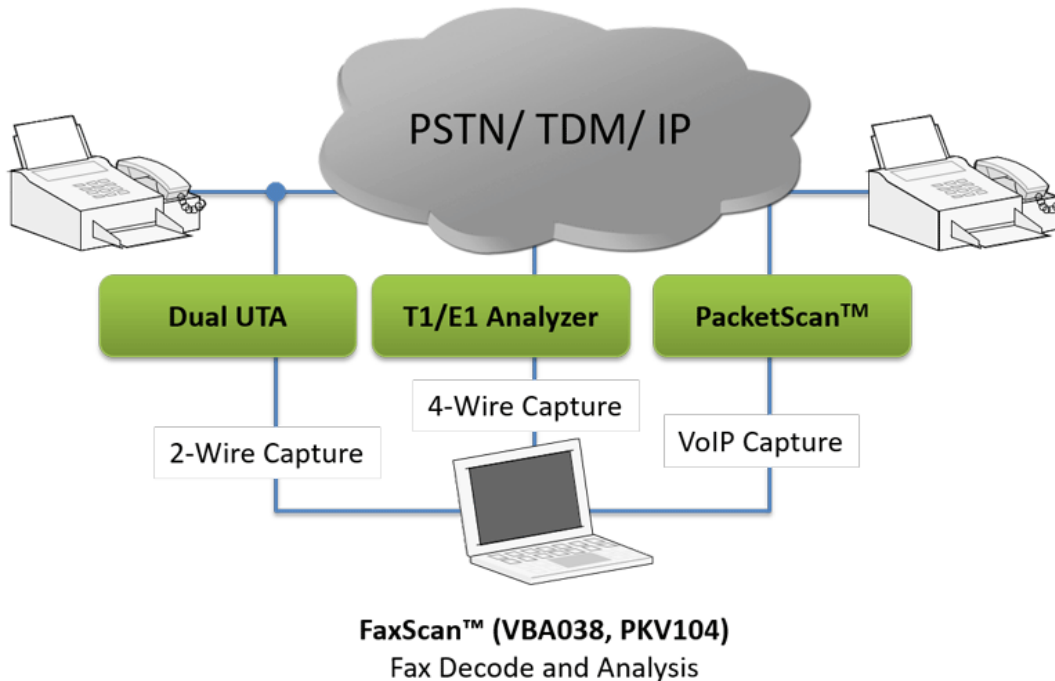
Overview

Call-center quality engineers, brokerages, government agencies, and other entities have a need to monitor fax transactions. Monitoring is done by recording the analog or IP traffic using suitable call capture applications. These files need to be decoded to investigate issues with protocol messages and Fax image quality.

FaxScan™ application is used to process 2-Wire and 4-Wire voice band capture files as well as Win PCAP captures to provide analysis of the T.38 packets, T.30 frames, a Fax TIF image decode, and general call-flow indicators for detail analysis. It is a valuable T.30 and T.38 debug and test tool, aiding significantly in system development. Fax sessions can contain standard G3 or V.34-based sessions.

FaxScan™ can work with popular packet capture applications such as GL's PacketScan™ or Wireshark®, as well as TDM / 2-Wire capture applications such as GL's tProbe™ T1 E1 FXO FXS Analyzer, and VQuad™ Dual UTA. FaxScan™ is also available as an integrated analysis module within **Voiceband Analyzer**.

FaxScan™ can

- Process up to V.34 T.30 recordings in 2-Wire, 4-Wire, μ-Law, A-Law, 16 bit, 14 bit, and 13 bit PCM captures (requires VBA038 License)
- Process V.34 T.38 IP captures and SIP/RTP PCAP captures (requires PKV104 License). Win PCAP captures can be processed from T.38 packets alone or as part of a capture file with multiple SIP calls

For more details, please visit FaxScan™ webpage.

GL Communications Inc.

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Main Features

- 3 modes of operation depending on the type of input file: PCM, SIP, and T.38
- Supports 2-Wire or 4-Wire PCM captures that are sampled at 8-Khz only
  - G.711 A-Law, μ-Law encoded 8-bit PCM data formats
  - 13-bit linear PCM, and16-bit linear PCM data formats
- Supports Modems: V.8, V.17, V.21, V.27, V.29, V.33, and V.34
- Output contains page-by-page packet statistics and Fax image summary
- Fax image output in TIFF-F format (as specified in RFC 2301)
- Creates detailed SIP Ladder diagram files for SIP calls
- Reports Modem Rate, Resolution, Encoding, and Page Size
  - 2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 31200, or 33600 bits per second
  - HIGH (204x196dpi), LOW (204x98dpi), or SUPER_HIGH (204x391dpi).
  - Modified Huffman (MH), Modified READ (MR), or Modified-Modified READ (MMR).
  - A4, B4, or A3
- Single and multi-page ECM and non-ECM fax sessions are supported
- Integrated with GL's Voice Band Analysis product for Automated Operation

Supported Data Rate and Protocol

The FaxScan™ supported transmission Group 3 protocols include:

Data Rates (Kbps)	ITU Standard		
	V.27 V.29	V.17	V.34 V.34bis
2.4	X		X
4.8	X		X
7.2	X	X	X
9.6	X	X	X
12		X	X
14.4		X	X
16.8			X
19.2			X
21.6			X
24			X
26.4			X
28.8			X
31.2†			X
33.6†			X

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Supported File Formats

- Analog Inputs
  - G.711 A-law encoded 8-bit samples
  - G.711 μlaw encoded 8-bit samples
  - 16-bit linear samples that utilize only the low 13 bits. The upper 3 bits are sign extended
  - 16-bit linear samples utilizing all 16-bits
- IP Inputs
  - PCAP files with SIP, RTP, T.38 packets captured on Windows® OS and the Ethernet interface
- Fax Image Output
  - Class-F TIFF format as specified in RFC 2301

FaxScan™ for 2-Wire and 4-Wire Captures (PCM)

FaxScan™ processes two synchronized audio recordings captured using tools such as GL's Fax Simulator and MAPS™ FXO FXS applications. A fax machine can be connected to tProbe™ in the monitoring mode using RJ-11 splitter. In place of a fax machine a fax call can also be achieved using MAPS™ FXO FXS application or Fax Simulator.
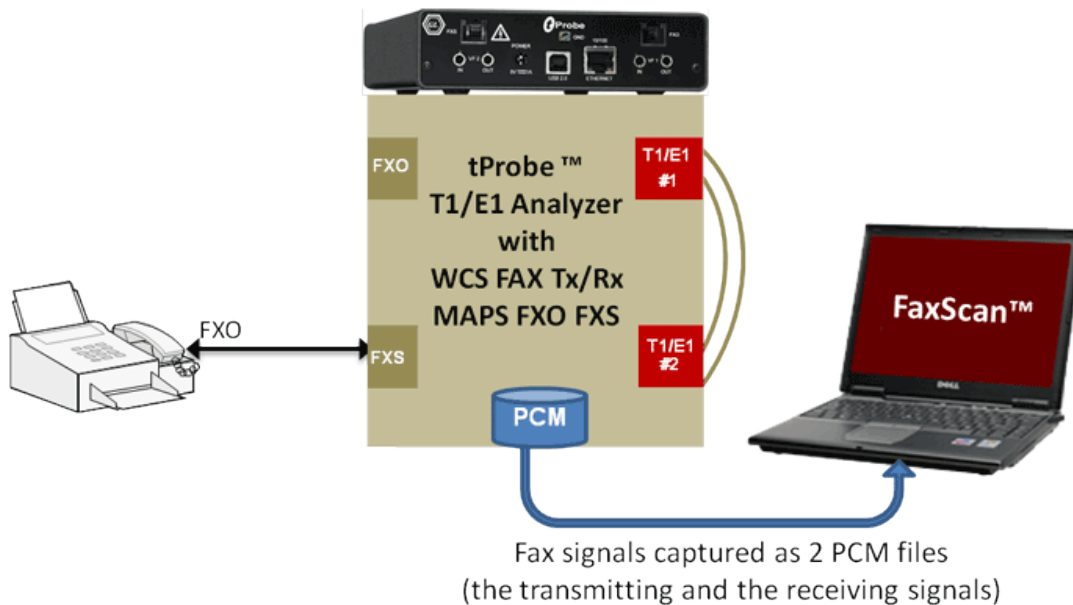
Figure: FaxScan Dual PCM Recording

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FaxScan™ for 2-Wire and 4-Wire Captures (PCM) (*Contd*.)

The FaxScan™ reports for PCM files takes the form of a ladder diagram. The ladder listing is used to print the events in the list in three time-ordered columns, calling terminal, neither, and called terminal respectively.

Some of the parameters summarized are:

- Bad Lines — The number of bad lines received.
- Total Lines — The total number of lines.
- Pages — The number of pages processed.
- Bytes — The number of bytes processed by the high-speed (non V.21) modem.
- Trains — The number of training signals processed.
- Sender ID — The sending fax machine identification number
- Receiver ID — The receiving fax machine identification number

Figure: FAX PCM Ladder File

Figure: Decoded FAX TIFF Image

FaxScan™ for Fax over IP (SIP/RTP, SIP/T.38)

FaxScan™ supports T.38 and pass-through modes for capture and analysis of Fax over IP. Calls are captured using GL's **PacketScan™** - All IP analyzer via port mirroring on a Ethernet switch. The **PacketScan™** monitors, decodes, and records the captured sessions as a single PCAP file and then these captures are fed to FaxScan™ software for Fax decode and analysis.
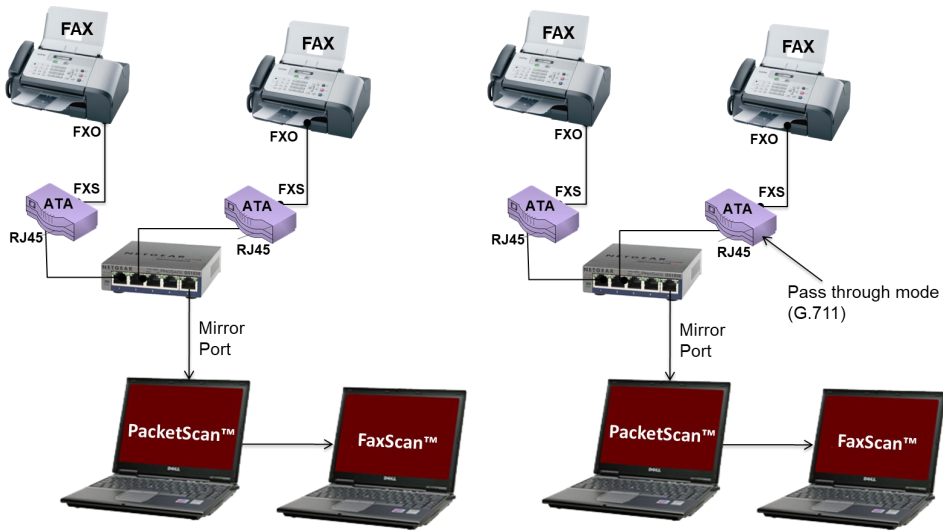
Figure: FAX Over IP T.38 and Pass-through Mode

The following features are supported:

- Analysis of files captured by popular IP capture tools in Transparent (pass-through mode) and T.38 mode.
- Single- and multi-page ECM and non-ECM fax sessions are supported.
- Decoding of transmitter-only captures is supported for non-ECM faxes.
- ECM faxes must have both transmitter and receiver packets present in the capture.
- Output contains page-by-page packet statistics and fax image summary.
- Fax image output in TIFF-F format.
- Generates a SIP ladder file with a summary of the fax call flow.

Figure: FAX SIP Ladder Files

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Batch File Processing

Files can be processed on a per line basis in a DOS window or more conveniently by using Batch files. Generally, running FaxScan™ through a batch script avoids the tedious process of bringing up the Command Window manually, and keying in a command for each analysis to be conducted.

Command Line Syntax

The FaxScan™ command line syntax for **SIP** is as follows:

```
Bin\Faxscan.exe SIP –p ladder-diagram -f pcap-file
```

Where

-p = folder to output TIFF-F files

-f *pcap-file* = pcap file containing SIP traffic

The FaxScan™ command line syntax for **PCM** is as follows:

```
Faxscan.exe PCM –f first-pcm-file –s second-pcm-file –e pcm-encoding
```

Where

-f = One side or dual side recording

-s = Second file for dual recordings

-e = alaw, µlaw, lin16, lin13 PCM encoding

The above commands will generate ladder diagram and a tiff file in the FaxScan™ installation directory after decoding and analyzing PCAP or PCM fax captures.

Figure: Command Line Syntax for SIP

Figure: Command Line Syntax for PCM

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Integrated into Voice Band Analyzer (VBA)

The FaxScan™ is integrated as an option in the GL **Voice Band Analyzer**. It can be used to analyze both 2-Wire and 4-Wire voice band captures for all types of traffic including fax traffic. The Voice Band Analyzer can be set up for Manual, Batch, and Automatic operations. Users can decide if they want fax images or to include the log file with additional information on messages used during the fax transaction.
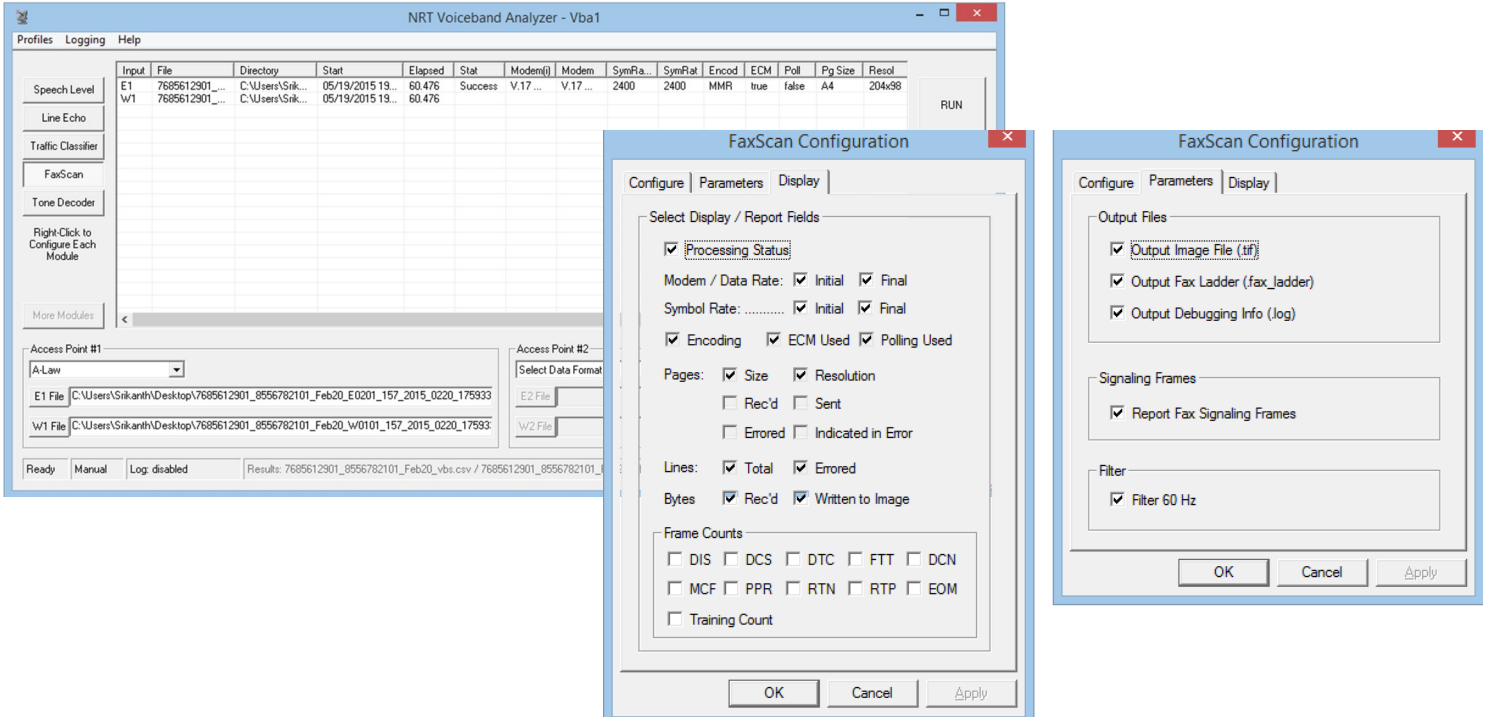

Figure: FaxScan in Voiceband Analyzer

FaxScan™ — Verbose Log File

Verbose output is useful in examining the T.38 protocol. When verbose output is enabled, each packet is decoded and its type is printed. T.30 events are also decoded and shown. A small section of verbose output is shown in the figure below. You should use caution when requesting verbose output, as log files are much larger than those generated without verbose output.

Figure: Verbose Output

Buyer's Guide

Item No	Product Description
VBA038	FaxScan™ for PSTN, TDM
PKV104	FaxScan™ for T.38

Item No	Related Software
VBA032	Near Real-time Voice-band Analyzer
FXT001	GL Insight™ - Single Fax Analysis - TDM
FXT002	GL Insight™ - Single Fax Analysis - IP
PKV100	PacketScan™
VQT022	VQuad™ 2 Ports Fax Emulation (2-Wire and 4-Wire)
VQT022a	VQuad™ 8 Ports Fax Emulation (2-Wire and 4-Wire)
VQT035	2-Wire Voice/Data Capture

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more details, please visit FaxScan™ webpage.