

Elma Services

Elma Company Profile

Elma Electronic is a global company that designs and manufactures solutions in electronics packaging. The company provides standard to fully customized components such as modular enclosures, cabinets and backplanes up to complete system integration. Elma also manufactures precision rotary switches. The company offers a fast, flexible response to customer needs and extensive practical knowledge in tailoring solutions to specific applications.

Why choose Elma?

Flexibility: Elma tailors solutions to individual applications to ensure fast and cost-effective results.

Experience: extensive practical experience in packaging electronic systems is used to minimise the time taken to develop new customised solutions without compromising system performance or reliability.

Compatibility: because the two key electromechanical components - enclosures and backplanes - are made in-house, Elma guarantees compatibility, consistency and reliability.

Global resources: with manufacturing in Europe and the USA customers benefit from local service backed by global resources.

Founded in 1960, the Elma Group today is a leading supplier for 19" electronic packaging and rotary components worldwide.

Elma's modular approach allows fast, cost-effective, and proven performance for customized design modifications to standard platforms. The base products are centered around 19" and 23" Eurocard specification, with creative design innovations for VME/ VME64x, CompactPCI/2.16, VXS/VPX, VXI/PXI, AdvancedTCA/MicroTCA and other architectures. The company's design expertise allows fast implementation of full custom designs for backplanes, sub-racks, enclosures and cabinets, as well as full system integration.

The Rotary Components division is a technology leader in rotary and coded switches, mechanical and optical encoders and is the preferred supplier in many electronic industries. Knobs , LED arrays, and pushbutton and dip switches complete the product offering. Customization is offered "in any quantity".

The Elma Group has its headquarters in Wetzikon, Switzerland. The Elma Group



incorporates production facilities in Switzerland, USA, Germany, Romania and Great Britain as well as company owned sales organizations in Switzerland, Germany, USA, France, Great Britain, Israel, Romania and China.

Since 1996, the group has been listed on the Swiss stock market.

Elma USA

Founded in 1986, Elma Electronic Inc. is an industry innovator in the design and manufacture of electronic enclosures and passive electronic components.

Elma USA has achieved a leading position in the VME/ VME64x, CompactPCI/2.16, VXS/VPX, VXI/PXI, AdvancedTCA/MicroTCA and Rugged COTS packaging markets.

Elma has a broad base of customers throughout the United States and the Americas in diverse industries such as telecommunications, industrial control, medical electronics, defense and aerospace. The company maintains multiple sales, engineering and manufacturing operations in California and Sales/Engineering offices in Atlanta/GA, Washington/DC and Boston/MA. The companies headquarter is located in Fremont, California

Elma Electronic Inc. strives to provide products superior in quality, reliability, performance, and consistently presents new, innovative designs to the market. Elma's product line encompasses well over 20,000 parts, including enclosures, cabinets, high quality switches, LED arrays, knobs and much more. Elma also offers design/integration services backed by responsive and knowledgeable technical support.

Elma's leading quality level is reached through training of all employees and following of systematic procedures per ISO standards to which Elma has been certified.

Elma Bustronic

As a leader in backplanes, Elma Bustronic Corp., delivers high-performance products that are unsurpassed in design and quality. Since 1989, the company has designed thousands of standard, modified and custom in a wide range of industries. The Elma Bustronic team of designers and engineers have delivered innovative and intelligent solutions for applications ranging from the most advanced supercomputers in the world, high profile combat systems, precision automation equipment, to ultra high-reliability medical imaging systems. Advanced simulation and rigorous testing is used to perfect each design, ensuring the signal integrity and performance of every backplane Elma Bustronic is headquartered in Fremont, California.



Optima

Optima EPS Corp, an Elma company, is a designer and manufacturer of electronic cabinets, server racks, security consoles and complete enclosure systems. The company operates from a 110,000 sq. feet sales, engineering and manufacturing facility in Atlanta, Georgia.

Optima was formed 1962 by Scientific Atlanta and joined the Elma Group in 2004. The company tailors solutions to individual applications ensuring fast and cost-effective results. Extensive practical experience in packaging electronic systems is used to minimize the time taken to develop new customized solutions without compromising system performance or reliability. Furthermore, the in-house manufacturing ensures compatibility and consistency.

Elma Switzerland AG

Elma Electronic AG was founded in 1960 in Hombrechtikon and has more than 40 years of experience in the design and manufacturing of modular mechanical components for 19" enclosures and of rotary switches.

Elma Electronic AG is under the current strategy responsible to design, develop and manufacture all 19" components for the Elma group companies as well as for a wide network of long-term distribution partners. Elma Electronic AG also offers integrated system platforms and backplanes within its home market Switzerland.

It is also the center of competence for rotary components such as switches and knobs as well as LED-arrays. Its leading position for demanding applications such as two way radio channel selector switches and others is a result of continuous investments in product development and automation.

The comprehensive standard product line is backed up by extensive customization options. The production facility in Wetzion includes an aluminum surface treatment plant which is also open and well received to third party companies. A production site in Timisoara, Romania is running under Elma Switzerland's full responsibility and utilized for low cost production where volume and delivery time allows.

Elma Germany

Founded in 1987, today's Elma Trenew Electronic GmbH is one of the leading solution providers and manufacturer in the field of Packaging Systems and Backplanes

Our standard product portfolio includes CompactPCI, VME, VME64x and switched fabric solutions. Our application engineers develop custom backplanes and System Platforms to meet your specifications, from initial concept to finished product. These designs serve a wide array of industries including, but not limited to aerospace, military, industrial automation, telecommunications, medical, and

high-performance computers.

By using the latest CAD tools and manufacturing technology we insure the highest level of performance and quality in the industry. The solid background in simulations and measurements, allows us to cover all elements of High-End designing to offer all qualified support from the concept phase to the product solution.

Elma France

Founded in 2000, Elma Electronic France SA is the solution partner of choice for all French companies working in the high-end electronics, telecom, defense, transportation and system solutions industry. Our sales and engineering team can provide you with state of the art design for mechanical packaging solutions, design of standard and fully customized backplane and, if required, we can fully integrate them in our French facility into complete, turn key, functional system's. We take care of the design, logistics, assembly and test freeing the customer to concentrate on the area of their key expertise. Our sales team can fully support your project from 'cradle to grave'. Supported by our manufacturing facilities in the USA, Switzerland, Germany, UK and Romania we believe we have the capability to provide any solution for any scenario.

Elma's leading quality level is reached through training of all employees and following of systematic procedures per ISO 9001 standards to which Elma France has been certified.

Elma UK

Elma Electronic UK Ltd is the solution partner of choice for all British companies working in the high-end electronics, telecom, and system solutions industry. Our sales and engineering team can provide you with state of the art design for mechanical packaging solutions, design of standard and fully customized backplanes and, if required, we can fully integrate them into complete, turn key, functional system's. We take care of the design, logistics, assembly and test freeing the customer to concentrate on the area of their key expertise.

History

Founded in January 2000 in the new millennium Elma UK was another expansion by its parent company Elma AG. With eleven staff in disciplines such as mechanical engineering, electronics and assembly we can fully support your project from 'cradle to grave'. Supported by two 3D design system's, Pro-Engineer and Solid Designer, as well as our design facilities in the USA, Switzerland, Germany and Romania we believe we have the capability to provide any solution for any scenario. Five thousand square feet of assembly facility in Fareham enables us to give excellent delivery times and shortens the time to

market. With a £2 million turnover in the first year Elma UK are set to become a major force in electronic packaging in the UK.

Mektron UK

Since its foundation in 1995 Mektron Systems has swiftly established itself as a highly successful and distinguished specialist in the systems packaging and integration market. The company's outstanding success can be attributed to its highly focused and extensively experienced team of engineers coupled with the ability to supply exactly what the discerning customer needs.

Mektron Systems Limited is an approved supplier to many major international blue chip commercial and defense companies and has extensive involvement in numerous major defense programmes. The company has full BS EN ISO 9001/2000 accreditation and is a recognized authority on rugged COTS system enclosures, integration technology, thermal management and EMC expertise, where Mektron boasts its own EMC pre-compliance test facility.

The ability to provide innovative engineering solutions enabling our customers' to safely deploy COTS hardware in hostile and onerous operating conditions, such as those frequently seen in defense/military applications, is a vital part of our successful business model.

Ensuring maximum partnership benefits to our customers the company's multifaceted defense engineering design capabilities covers mechanical, electrical, electronic, transmission line/backplane, flexi-rigid circuit, thermal management, EMC, TEMPEST, power, 'systems engineering' and I/O interconnection schemes. Mektron Systems also undertake hardware and operating system software integration and qualification/type approval testing.

Elma Israel

Elma Electronic Israel Ltd is the solution partner of choice for all Israeli companies working in the high-end electronics, telecom, internet access, web applications and system solutions industry. Our strong sales and engineering team can provide you with state of the art design for mechanical packaging solutions, design of standard and fully customized backplanes and, if required, we can fully integrate them into complete, turn key, functional system. We take care of the design, logistics, assembly and test freeing the customer to concentrate on the area of their key expertise.

History

Founded in 1997 as Printech Electronics Ltd by Moshe Eisenkraft and Dov Matalon to provide the Israelian telecom and electronics market with high-end printed circuit boards, backplanes, mechanical accessories and electro-

mechanical components. In July 2000 the company was integrated into the international company Elma Electronic AG.

Elma Romania

Elma Electronic Romania SRL is the main design centre for the Elma Group. Our engineering team, made up of 13 high-qualified engineers in electronics and mechanics, based on a large experience in their fields, is able to provide the ultimate solutions to any customer request. Whether is about standard or fully customized backplanes, active peripheral or processor cards we provide state of the art PCB designs giving to the customers the best solutions for their products. In addition we can handle any level of complexity in mechanical design for system platforms.

History

Founded in 1997 as the design centre for Trenuew Electronic GmbH, today's Elma Trenuew Electronic GmbH, the Romanian company has been acquired by Elma Group in January 2001. We already have almost 6 years of experience in the backplanes, active cards and systems design. This high level of expertise is a guaranty for the success of the Elma products. The latest developments in the Romanian economy give us the perspective of playing an important role on the local market as supplier of integrated systems and components in the next years. For that reason, we build, in addition to the engineering team, a local sales force in order to use any opportunity on the market.

Elma Asia

Elma Electronic China Ltd, Shanghai was founded in 2004 and serves the customers from both, mainland and other Asian regions. Elma China provides designs and solutions in housing advanced electronics such as system platforms, backplanes, enclosures and components as well as rotary switches. The products and solutions are widely applied in the high-end electronics, telecom, and system solutions industry. Elma China works very closely with the corporate R&D, Engineering and Production centers in Switzerland, USA, Germany and Romania. Thanks to an offshore company in Hong-Kong and a sales office in Singapore, Elma China is able to provide customized solutions in terms of logistic requirements.

Services Overview

Elma Electronic offers a wide range of services to assist our customer with new product introduction (NPI). From custom design and verification testing through agency certification, Elma has the experience to function as an extension of your company's design and compliance engineering team. Combined with Elma's level 4/5 integration capability for both embedded systems and switches Elma provides a single solution to your outsourcing needs.

Allow Elma to take your latest product from prototype to production quickly, cost effectively and with reduced risk.



Custom Overview



Customization is the standard at Elma Electronic. With an extensive offering of modular products as a foundation, Elma is able to leverage existing solutions and proven design concepts to meet any custom application. This approach insures that Elma will provide a quality, compliant solution with significantly reduced lead-time, cost and risk.

Over 70 engineers, in strategically located design centers in eight countries, are available to assist with the specific needs of our customers. For over 45 years, Elma Engineers have been innovating customer specific solutions in the areas of component design, backplane design, system platform design, and switch design.

Each product discipline is equipped with the latest 3D solid model and simulation tools needed to verify product design prior to manufacturing. With expertise in a

wide range of markets to include defense, telecom, medical and industrial automation, our engineers have a proven history of meeting the applicable specifications and standards from MIL Spec. to NEBS and agency compliance. Whether your need is as simple as silk-screening the company logo on a standard panel or as complex as a fully custom system platform to meet NEBS level III, Elma has the team and the tools to insure the success of your program.

Custom Enclosures & Components

Elma offers the following panel customization services:

- High speed milling suitable for volumes from 1-2000 panels
- Punching suitable for volumes of 2000+ panels
- Silk-screening
- Painting
- Overlays
- Assembly of handles and springs



Design your customized panel:

1. Select Handle Size
2. Select Panel Size
3. Select Front Panel Components (optional)
4. Download Drawings
5. Modify the drawings to reflect your cutouts and mail to techsupport@elma.com



Elma's Express Fast Prototype Service

Elma's standard delivery for 1 to 50 panels is 15 working days and includes silk-screen. Elma can ship most standard size panels in 10 working days for a \$250 expedite charge.

Custom Backplanes

The Elma backplane team has one of the most impressive combined measurement and testing capabilities in the world. Elma Bustronic and Elma Trenuew have integrated engineering resources, including use of modeling systems, testing equipment, mechanical drawing software, measurement devices, and more.

Our top-of-the-line quality and testing equipment includes:

- Adaptronic backplane tester
- TDR backplane tester
- Weetech backplane tester

- Wavetek pulse generator -Vmetro cPCI bus analyzer
- Several oscilloscopes -Fibre-Lite illuminator and microscope
- Several multimeters
- Calibrated measurement tools

Backplane Measurement:

- Signal integrity
- Propagation delay
- Crosstalk
- Decoupling and bypassing
- Power distribution and power-dependent heat dissipation

System Measurement:

- Characterization and optimization of static and dynamic power distribution within a system
- Safety tests of high voltage, leakage current, isolation, and earth bond
- Function test with static load (min and max)

EMC Measurement

- Radiated emissions
- Conducted emissions

A separate brochure is available on this subject

Custom System Platforms

Elma Electronic has been designing custom chassis solutions for the embedded systems market for over 20 years. Our highly experienced team of engineers has expertise in mechanical and electrical enclosure design with emphases on thermal management, EMC, shock/vibration, system monitoring, reliability and maintainability.

Our engineers start with a solid foundation of quality Elma components and proven design concepts to reduce develop time/cost and insure compliant solutions regardless of the application. Using the latest in 3D solid modeling, thermal analysis, structural analysis and backplane simulation software, Elma designers are able to verify the performance of their designs without the time and expense of repeated prototyping, combined with a dynamic product lifecycle management (PLM) system.

Custom enclosures are what we do! Whether it is a modified, standard VME, CPCI or ATCA chassis or full custom solution Elma has the team and the tools to insure the success of your project.



Design Tools:

- 3D Solid Modeling – Solid Designer (CoCreate)
- 2D – Autocad (Autodesk)
- PLM – (Iqner)
- Thermal Simulation – Flotherm (Flomerics)
- Structure Analysis – FEM (Cocreate)
- Reliability - Relex
- EMC – Scanning equipment and software (Lapla)

Custom Cabinets

Optima, an Elma company, has access to over 70 engineers, in strategically located design centers, in eight countries that can assist with the specific needs of our customers. For over 45 years the company's engineers have been innovating customer specific solutions in the areas of enclosure design, component design, backplane design and system platform design.

With expertise in a wide range of markets to include Defense, Telecom, Medical and Industrial Automation, our engineers have a proven history of meeting the applicable specifications and standards from MIL-Spec to NEBS and agency compliance.



Whether your need is as simple as silk-screening the company logo on a standard panel or as complex as a fully custom enclosure to meet seismic, zone 4 requirements Optima has the team and the tools to ensure the success of your program.

Custom Product Capabilities

With over 110,000 sq. ft. of manufacturing and 40+ years of design expertise located in our main facility in Tucker, Georgia, Optima EPS has the capability to design and build packaging systems to suit your needs.

- Prototyping

- CAD Design and 3D modeling
- Tool Making
- CNC Punching
- Welding TIG/MIG/SPOT
- Paint - Water or Powder coat
- Silk-screening
- Assembly
- Testing (MIL-STD, NEBS, Thermal, EMC, Seismic)



Custom Switches, Knobs & LEDs

Switch Modification

Elma can assist our customers in creating a semi-custom solution to their line of precision rotary switch, coded switch or encoders. We welcome inquiries to modify shafts, switching schemes, bushings and output codes to meet specialized requirements. Most importantly, Elma has the ability to meet these challenges in large or small quantities.

Common requests range from simple modifications of shaft lengths, shapes and diameters, to custom bushings and switch housings. Additionally, we can provide altered and/or proprietary switching schemes and output codes upon request.

Complete switch assemblies are possible by combining standard parts together, or by fabricating brackets for customers to incorporate another component with one of our rotary switches.

Please contact our sales staff with your specific ideas and we will do our best to make them a reality at an affordable price.

Verification Testing

Elma offers a wide range of services to assist our customers with new product introduction (NPI). From custom design and verification testing through agency certification, Elma has the experience to function as an extension of your company's design and compliance engineering team. Combined with Elma's

level 4/5 integration capability for both embedded systems and switches. Elma provides a single solution to your outsourcing needs.

Allow Elma to take your latest product from prototype to production quickly, cost effectively and with reduced risk. Customization is the standard at Elma. With an extensive offering of modular products as a foundation, Elma is able to leverage existing solutions and proven design concepts to meet any custom application. This approach ensures that Elma will provide quality, compliant solutions with significantly reduced lead time, cost and risk. Elma uses the most advanced software and testing equipment to ensure our products comply with military and commercial standards. Elma has the capability to perform environmental testing, thermal testing and EMC testing to meet the desired specifications.

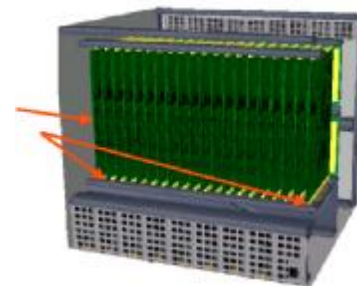
Elma has the capability to undertake and oversee design verification testing to ensure that your/our products comply with the following military or commercial standards depending on the specification requirements.

Environmental Chamber

The Environmental Chamber is used to test products within various levels of temperature and humidity. The chamber used by Elma has a temperature range of -73 degrees C to +177 degrees C and a humidity range of 10% to 90%. The unit has a chart recorder to record temperature and humidity. The chamber can have LN2 attached to increase the ramp rate for lower temperatures.

Airflow & Thermal Analysis

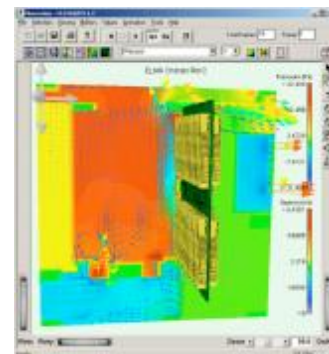
Elma has invested in modern simulation tools to insure that all Elma designs, both custom and standard, are able to provide optimum cooling protection for your electronics. Elma uses Flotherm, Flomerics Thermal Analysis Software.



Although Elma utilizes the latest in thermal simulation software, it is often critical to verify simulation predictions through “actual testing” Elma has a comprehensive set of thermal verification tools that allow measurement of all thermal parameters for a given design.

Tools include:

- Variable system load cards
- Error velocity sensors
- Thermal couples
- Air volume measurement
- Cambridge AccuSense



Airflow Chamber

The Airflow test chamber can determine the aerodynamic performance of a fan or blower, the CFM (cubic feet per minute) in a chassis, or the thermal resistance. The airmover is mounted on the front of the chamber and the static pressure versus volume flow is measured. The performance of different fans may be compared to select the optimum airmover for a given application. By energizing the system, a given volume of air may be drawn through the system and the temperature rise measured. By determining several points, the plot of temperature rise versus mass flow shows thermal resistance.

The 2000 CFM chamber is 30 inches in diameter and approximately 8 feet in length. The standard flow range is from 3 to 2000 CFM. The nozzle array is on a separate plate and is sealed between the front and aft section with inflatable seals. The front plate is also sealed with an inflatable seal. The motorized blast gate is powered with 115VAC, 1 ph, 60Hz and is controlled with a hand operated toggle switch. Limit switches control the extreme ends of the travel to prevent overrun of the gate. The counter blower is connected to the blast gate with a flexible duct. The 2000CFM chamber has a 5 horsepower motor and solid state speed controller. The power input is 208VAC, 3 ph, 50/60Hz.

Shock & Vibration

Elma has the capability to undertake and oversee design verification testing to ensure that your/our products comply with the following military or commercial standards depending on the specification requirements.

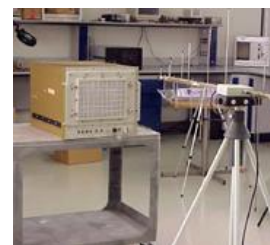
- Shock and Vibration Testing to meet MIL STD-810E, MIL-STD-167 and MIL-STD-901D
- EMC testing to meet MIL-STD-461D, FCC class A, FCC class B and CE emissions.
- NEBS testing to meet levels 1, 2 and 3
- In house cooling analysis and testing to meet thermal requirements
- Environmental testing: Temperature, Humidity, Fungus, etc
- Preliminary Reliability analysis per MIL-HDBK-217F



EMI

Pre-scanning for Radiated Emission:

- Computer controlled Spectrum Analyzer
- --10KHz to 1GHz coverage
- --CISPER 16 compliant
- --Auto compensation to test site errors
- Broadband Receiving antenna
- --30MHz to 1GHz Frequency Range.
- --Calibrated at National Physics Lab in U.K.
- --Preamplifier
- --Vertical and Horizontal



- Emission Reference Source
- --Used to calibrate the system to site conditions.
- --Calibrated at National Physics Lab in U.K.
- EMC software designed for use with the Spectrum Analyzer
- Near Field EM probes to help pinpoint trouble spots

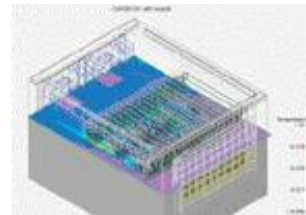
EMI Chamber

The Elma EMI Chamber is an 8081 series chamber 10'X10'X 8'. The RFI Modular Shielding System consists of modular panels and a unique clamping system. Designed for EMC and FCC Compliance testing, the Series 8081 enclosure panel system consists of a three quarter inch, high density particle board core, with 26 gauge galvanized steel laminated on both sides. The panels are clamped together with uniquely formed zinc plated, steel clamps, to form in-line and right angle connections. RFI High Performance RF Doors employ a recessed contact mechanism (RCM) with multiple rows of beryllium copper fingers to insure RF performance above 100dB @ 10 GHz.

Thermal Simulation

Airflow and Thermal Analysis

- Model flow behavior for entire system
- Identify performance-limiting components
- Quick evaluation of different physical layouts
- Explore many different design options
- Perform "what-if" studies
- Avoid costly design changes

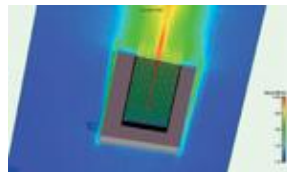
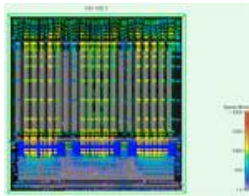


Elma's Thermal Simulation can be extremely helpful in coming up with an optimal chassis cooling solution. Elma can simulate specifically how your boards interact with the chassis in regards to the cooling. After modeling your card, Elma's designers can verify the cooling and make sure the hotter components of the card are placed in cooler parts of the chassis. If the per slot loading is provided, thermal simulation could be performed where baffles or extra fans could be added to ensure proper cooling for all boards.

Using CFD-based (Computation Fluid Dynamics) thermal modeling software like FloTherm, Elma can change the intake and exhaust areas, change fans and fan configuration, add and optimize baffling and monitor the temperature at critical locations before fabricating and testing a chassis. Simulation can help determine the proper fans to use in order to ensure proper chassis cooling as well as keeping the audible noise level at a minimum. Other ways to optimize the chassis thermal management are the spacing for air intake and exhaust, types of fans

and blowers, the plenum space above or below the fans, the placement of air filters and use of baffles. Locating hot spots in the chassis, the designer can simulate options to rectify the situation. For example, a baffle can be placed in a particular area to direct airflow, or changing a fan's position to increase or decrease the air plenum. A different type of fan or blower can also be used to improve the results.

Simulation can also help maximize the usefulness of the shelf managers. Thermal analysis can show how a shelf manager can tie or group fans together to optimize airflow when it senses a problem. It can also help determine the ideal sequence in timing solution for shutting down cards, which signals to send, and when it is absolutely necessary to shut down the entire system. For example, if there is a problem, perhaps only a few cards need to be shut down instead of all of them.

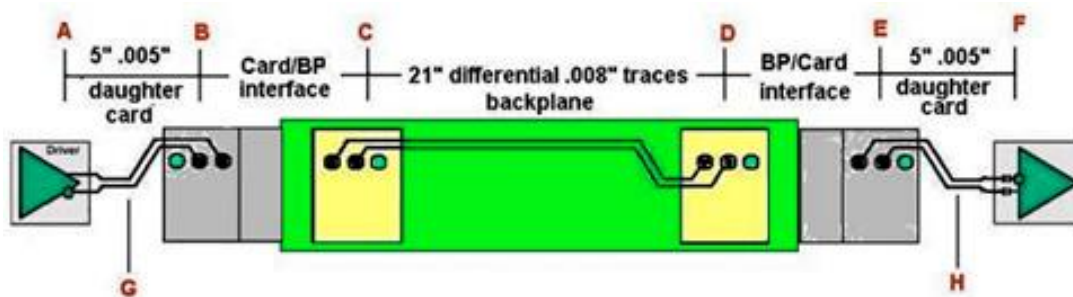


Backplane Characterization & Test

Investing substantially in state-of-the-art testing technology allows Elma Bustronic to deliver the quality our customers have come to expect. Testing systems include driver hardware and test-point electronics in extremely high-density packaging, which enable full, simultaneous testing of dense, high pin-count connectors on backplane slots. The network connection allows engineers to download and upload test programs without disrupting backplane testing, making the process virtually seamless.

Characterization and Modeling

A useful interconnect model for backplane based architectures would include the entire backplane path as well as the two connector interfaces and their required supporting via structure on both boards.



PICMG 3.0 Simulations

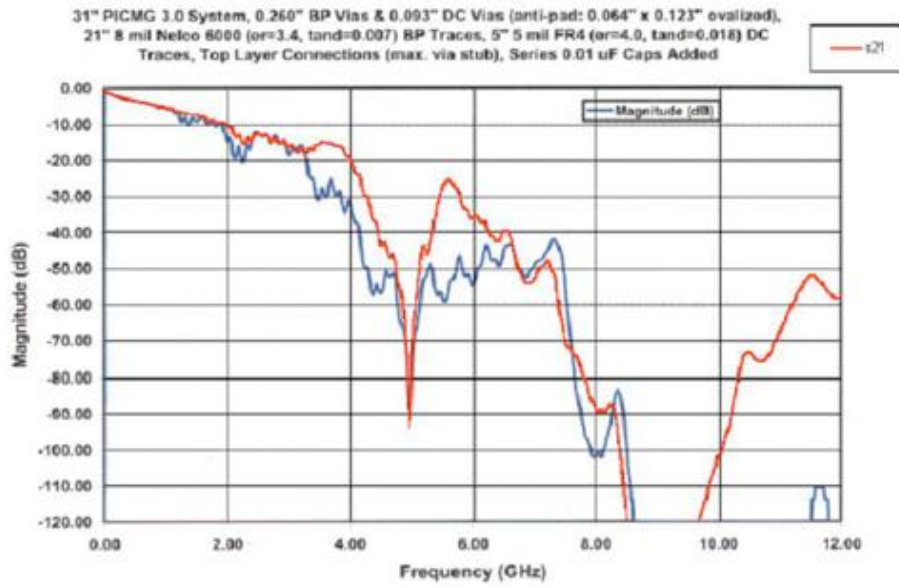


Figure 3-4. Interconnect Jitter Allocation

Table 3.5. Interconnect Jitter Budget

JITTER PARAMETER	PEAK-TO-PEAK JITTER BUDGET VALUE UI (PS)		COMMENTS
Peripheral Adapter	$J_{AR} < 0.0250$ (10ps)	$J_{AT} < 0.0325$ (13ps)	Notes 1, 2
Backplane and Mated Connectors	$J_B < 0.1675$ (67ps)	$J_B < 0.1675$ (67ps)	Notes 1, 3
System Controller	$J_{AT} < 0.0325$ (13ps)	$J_{AR} < 0.0250$ (10ps)	Notes 1, 2
Total Jitter	$J_{Total} < 0.225$ (90ps)		Note 1

Table 3.6. Peripheral TX Compliance Eye Requirements

Parameter	Value at BER 10^{-12}	Notes
V_{TXA}	$\geq 673\text{mV}$	1, 2, 4
V_{TXA_d}	$\geq 453\text{mV}$	1, 2, 4
$T_{TXA} @ \text{BER } 10^{-12}$	$\geq 287\text{ps}$	1, 3, 4
$T_{TXA} @ \text{BER } 10^{-6}$	$\geq 300\text{ps}$	1, 3, 4

Eye Diagram

When designing a backplane, the SI Engineer needs to make sure the measured eye opening results exceed the mask from the Tx/Rx spec.

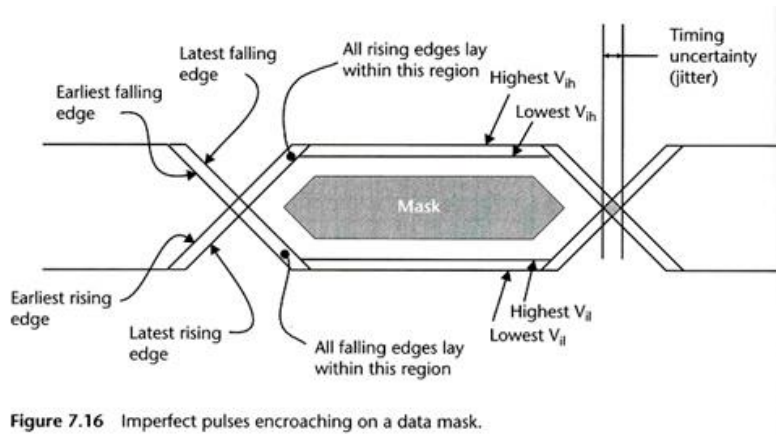
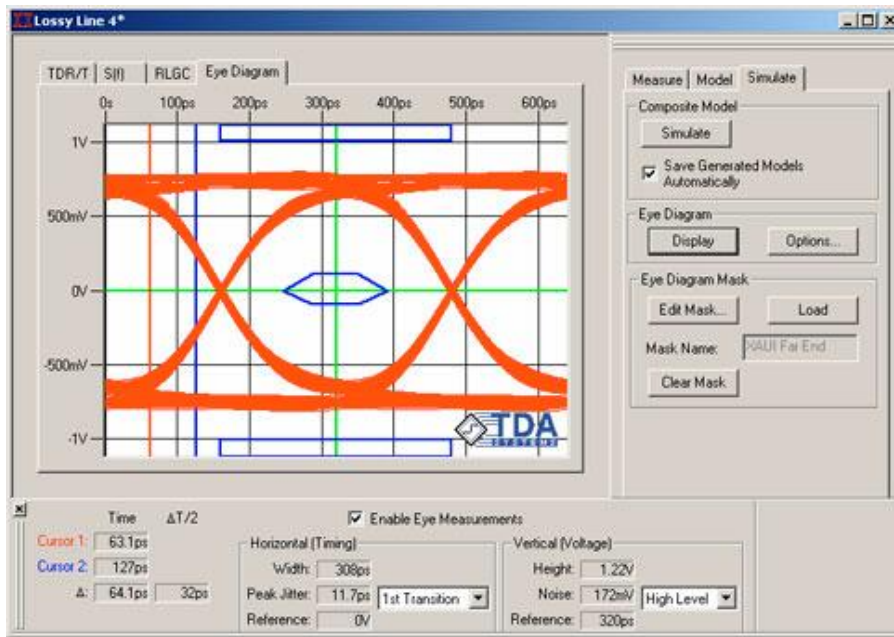


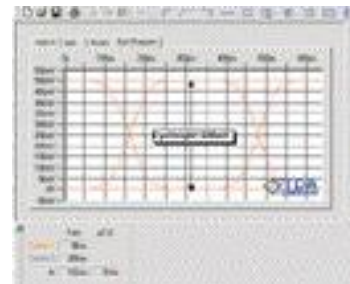
Figure 7.16 Imperfect pulses encroaching on a data mask.



Signal Integrity

Backplane Signal Integrity Studies

- Simulation provides the expected performance of the backplane based on specific design criteria.
- Backplane characterization measures the real signal integrity of the backplane



- Ensures backplane will perform as expected before shipment
- Backplane characterization measures the real signal integrity of the backplane
- Simulation characteristics include impedance, cross-talk, propagation delay, attenuation, insertion & return loss and eye diagram

Elma Bustronic Backplane Signal Integrity Initiative (SII)

With gigabit per second signal rates across the backplane, signal integrity analysis is increasingly important. In short, simulation and characterization of the backplane helps us insure the performance results of a design. For simulation, it gives us a chance to foresee the expected results of a particular backplane design with the option of viewing the results in relation with the system's boards. This helps us perfect the design before going to fabrication. When performing backplane characterization, we can measure the real signal integrity of the backplane. This ensures the backplane perform as expected before being shipped to the customer.

Elma Bustronic uses the following tools:

- HSPICE
- P-CAD signal integrity
- Iconnect
- HP 54750 TDR
- Specially designed probe cards

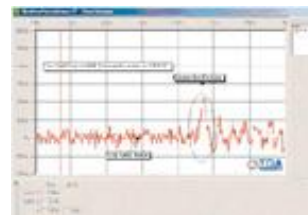


Examples of possible measurement characteristics:

- Impedance for single ended and differential lines
- Cross-Talk
- Propagation Delay
- S-parameter
- Eye Diagram

Examples of possible simulation characteristics:

- Impedance
- Cross-Talk
- Propagation Delay
- Attenuation
- Insertion & Return Loss
- Eye Diagram



HSPICE modeling and simulation is the industry's preferred methodology for full system simulation. TDA's I-Connect allows the modeling engineer to combine differential s-parameter models with SPICE-based semiconductor and trace routing models in an overall SPICE-driven system simulation. The S-parameter models come from extracted empirical models captured by VNA and software



driven TDT measurement techniques as well as the synthesized output of specialized 3D field solvers. The result is more accurately characterized via structures, much more capable connector models and a more precise representation of layout transition features and unavoidable stubs.

Measurement, model extraction, and simulation services Elma Bustronic offers services to characterize the interconnect path and provide models of representative circuit paths. These models can be used to generate reports that confirm the performance of these backplanes and also allow full system simulations to be performed that will help in the design process. Elma Bustronic can also provide the integration of measurement-derived models into the application engineering process. This includes the ability to easily generate eye-patterns based on the customer's specific requirements including such questions as signal degradation through backplane I/O connectors and specific lengths of I/O cabling.

Furthermore, Elma Bustronic can provide measurement based models, purely synthesized models and simulation tools to provide design rules, suggest trace launch geometries and evaluate layer and laminate choices to the design engineers who are designing a new backplane.

Certification & Compliance

Agency Certification

Over the past 20 years, Elma has worked directly with local testing labs to obtain safety, EMC and Environmental certification for our customer's products. All of our products are designed to meet safety certifications (with many agency "ready") for UL, CSA and TUV. Elma facilitates continued compliance of our approved products by setting up on site split inspections by safety agency personnel before the products ship. Relevant documentation is maintained for all approved products for inspectors to verify compliance at any time.

Elma maintains a pre-scan lab and follows the most rigid design practices to insure that our enclosures will meet the EMC needs of today's high performance electronics equipment.

When it comes to certifying that our chassis will meet the requirements of a NEBS or MIL environment our Engineers have assisted numerous customers with on site support to insure our chassis perform to expectation.

For your next project let Elma streamline the certification process.

Safety:
UL 1950

EMC:
EN55022, Class A/B

Environment:
NEBS

Contract Assembly Services

Customization of parts Sub-assemblies
Complete assembly
Verification testing, Compliance testing, etc.
Documentation, engineering, manufacturing, QC
Software integration services, etc.
End user packaging and shipping directly to our customers
A separate brochure is available on this subject



System Integration

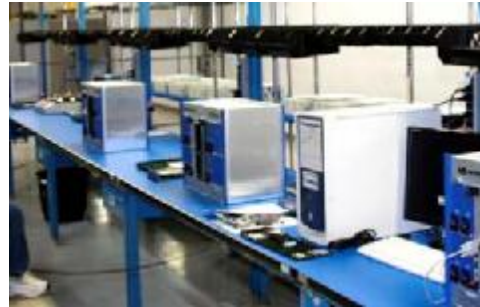
- Adding Peripherals
- Installing SBC's
- Loading Software
- Fully wired and tested
- Shock and vibration testing
- EMC and NEBS testing
- Thermal analysis
- FCC Class A and B certification
- UL, CSA, CE certification
- NEBS Level III certification



By allowing Elma to combine your system platforms with third party active components such as single board computers (SBC), peripherals, I/O cards and cabling you can greatly reduce your logistics and over cost of your project. Elma has strategic relationships with most major SBC and blade manufacturers. Our Systems Integration engineers routinely attend training seminars to ensure that they are up-to-date on the latest technology advancements. Elma's experience

with shelf management ensures that all system level monitoring of field replaceable units (FRU) is handled seamlessly. Combined with any of the major operating systems (OS) and application specific software, Elma can integrate, test and ship your completed product, turnkey and ready to run.

A separate brochure is available on this subject



Elma's Florida Representative is Altis Technology
www.AltisTechnology.com
Contact: David Parkerson 954-522-9300 david@altistechnology.com