

Saber Harness

For Complete Electrical and Mechanical Design from Concept to Manufacturing

Overview

Wire harness design is one of the most expensive parts in many automotive and aerospace electrical systems. The harness forms the backbone of the entire electrical system interconnect allowing efficient and cost-effective operation. With its myriad complexities and interdependencies on all connected sub-systems, the harness design process poses significant technical and logistical challenges to make it function reliably.

SaberHarness™ enables design teams to deal with these challenges by providing an integrated process for electrical system design from concept to manufacturing. SaberHarness minimizes data entry, manages complex, system-wide design variants, enables concurrent engineering, maintains data integrity, and allows efficient exchange with 3D CAD systems.

SaberHarness allows designers to create schematic drawings and connectivity diagrams, export component and wire data, import geometry information from MCAD tools, simulate electrical functions, create bundles with connector positions and generate data for manufacturing - all within one easy-to-use tool.

Benefits

- Enables complete analysis of electrical systems before layout and manufacturing to avoid system failure later in production
- Provides an integrated data flow for electrical system design from concept to manufacturing
- Minimizes data entry and manual checking tasks, automates data processing steps while maintaining data integrity, and integrates with popular 3D CAD tools (Catia V5, UGS, ProE)
- Supports team and concurrent engineering working methods, saving valuable design time and maintaining data integrity
- Provides an easy-to-use design editor

Harness Design Challenges

Managing harness designs is a major challenge. Electrical designs are becoming more complex and can have a multitude of

possible variations. For example, today's automotive braking system standards are ABS and ESP (electronic stability program - a more sophisticated variant of ABS); but soon brake-by-wire systems, already in use in aircraft, will add a layer of complexity and have even more complex wiring requirements.

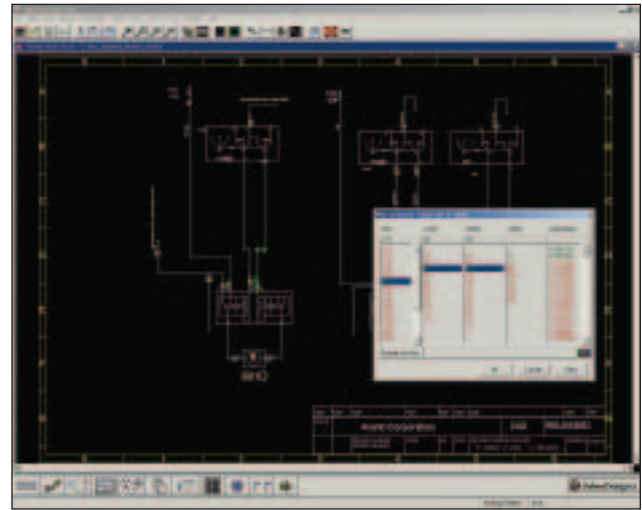
Therefore, design changes must be managed throughout the process and users must exchange data between varying design and analysis tools. The size of these tasks requires the use of concurrent engineering methods, as the design must be continually revised and documented. Finally, designers have the added pressure of needing to reduce the cost, weight and connector size of the design while enhancing its safety and robustness.

Saber Harness Solution

Saber Harness provides an integrated data flow for electrical system design from concept to manufacturing. Saber Harness is a single, intuitive tool for developing both wire and bundle diagrams, allowing electrical engineers and harness designers to become familiar with the data while working with a consistent data source and database. With the use of a single database, data translation errors further downstream in the design are eliminated. Data integrity is maintained even when exchanging data between Saber Harness and 3D CAD tools such as Catia V5, ProE, and UGS. After the wires and bundles have been routed in the 3D design, wire length and splices position are transferred back to Saber Harness to retain the information in the database.

**Multiple tools help to manage,
Check, generate and visualize the design data:**

- Connector Manager
- Automatic Part Selector
- MCAD projection
- Design Rule Check
- Generated Drawing Tools like Saber Bundle™, Power and Ground Distribution



A Harness drawing:with the wire property editor

Schematics and Connectivity Diagrams

SaberHarness can use schematics that come in from the electrical engineering departments and contain subsystems and architectural concepts of the complete electrical design. The user can either elaborate those drafts or create the connectivity diagram from scratch and use the parts gallery to find the needed components. Or, the user may create custom components with the symbol editor.

After placing the components, wire connections are made. SaberHarness provides extensive wire information including diameter, color, and part number to facilitate selecting the needed wire for manufacturing. Wire information can also be imported from the designer's corporate database into SaberHarness.

Inline connectors are inserted into the design to separate the different harnesses. The connectors are managed by the Connector Manager so that the user can quickly find the inlines and to ensure that no cavity is incorrectly occupied. Based on user-defined rules, the Automatic Parts Selector determines the required passive components for each connector shell and all the cavities. Design Rule Check finds problems such as disconnected wires and mismatching diameters of wires and termi-

nals. SaberHarness lets the designer quickly and efficiently enter the correct data and find conflicts in the design.

Concurrent Engineering

Larger designs are usually split into multiple "sheets," each worked on by a different engineer. Most of the sheets share common data such as power supply and ground; some sheets share components like control units and fuse boxes. If individual engineers work on the different sheets, data integrity is jeopardized. But Saber Harness takes care of this problem. A check-in/check-out mechanism and conflict resolution capability prohibits multiple users from concurrent manipulation of shared wires and shared/split objects, eliminating integrity issues.

Interfaces

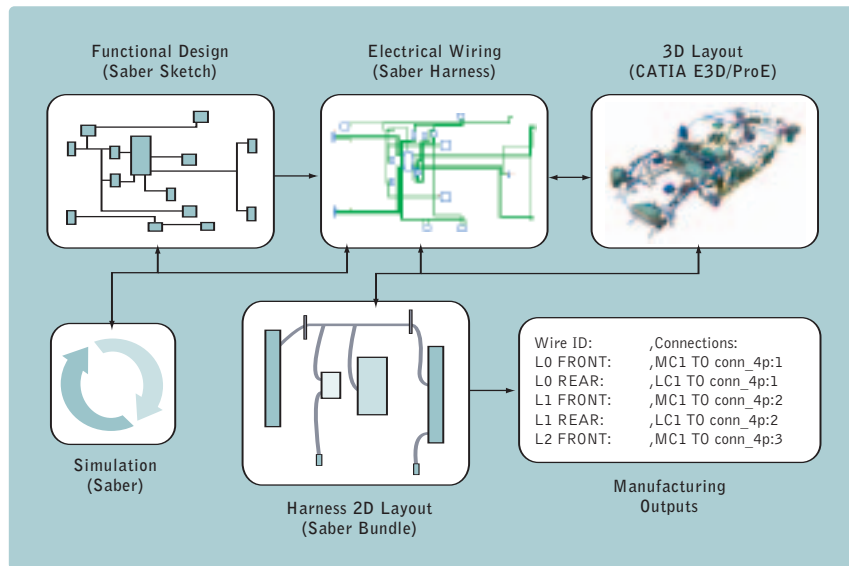
Once all data on the components, wires and connectivity is stored in the database, it's a simple "export to file" function that makes this data available to the 3D CAD tool. The CAD designer now positions the components and routes the wires in the 3D model. This added geometrical data can be imported into Saber Harness, so that all wires and bundle segments now have the correct length information. Many other tools require unique formats to exchange data. Saber Harness' Table Manager lets the

user quickly generate tables in any ASCII format to meet these unique requirements. For example, the designer can generate a list of components, together with their coordinates, and put them onto the schematic or generate a bill of material and export it to various spread-sheet programs.

Generated Drawings

Only Saber Harness offers a variety of tightly integrated generated drawing tools. One such tool is Saber Bundle. With the connectivity, harness and variant information available in the database, Saber Bundle quickly creates bundles that make up the wire harness. The designer need only position the connector symbols and may define desired bundle segment routings. If the geometrical information from the CAD tool has been imported into the database, the bundle segment information will have the correct length information.

Saber Bundle MCAD projection feature uses 3D information about the positions of the bundle junction and connectors and makes a 2D projection. The designer can select the perspective, rotation, and scale of the projection. For example, if the designer wants the engine bay connectors on one side of the sheet and the truck connectors on the opposite side, the 2D projection will approximate those locations.



Saber Harness design process.

This eliminates the need to move dozens or hundreds of symbols manually.

Saber Harness has other drawing tools for visualizing how different harnesses are connected and how power and ground are distributed.

Those drawing tools include:

- Bundle drawings
- Power distribution
- Ground distribution
- Harness connectivity

These unique drawing tools help the designer to speed up the documentation process and therefore save time for their design tasks.

Simulation

Another big challenge in the wire harness design is electrical integrity. Together with Synopsys industry-standard, mixed-signal/mixed-technology simulator, Saber, Saber Harness can verify the harness meets the required specifications. For example, dc-analysis shows the voltage

levels at the terminals, while transient simulation helps to determine the correct fuses, optimal dimensions of the fuses, cross-sectional areas of all wires, existence of sneak paths, etc. Saber Harness performs the measurements and calculations on the simulation results to determine the electrical functionality and quality of the design. Once analyses are complete, Saber Harness provides features such as back-annotation and probes that visualize the simulated information in the design.

A Next-generation Tool

Saber Harness was developed with input from wire-harness designers and electrical engineers to ensure that it addresses wire harness issues for real-world designs. Its unique integration and adaptability enable it to fit into very complex design flows without compromising the ease of use. It gives users the ability to design and verify complex designs with minimal user input to save time, labor and money while improving the overall design.

Platform Support

- Popular Unix
- Linux
- Windows Platforms Supported

For more information about Synopsys products, support services or training, visit us on the web or at www.synopsys.com/saber, contact your local sales representative.

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