



CADEX CATIA CADAM DRAFTING

o Electrical Schematic Capture

- Quickly create and modify diagrams
- Graphics plus built-in intelligence
- Convert images to intelligent CADEX

o Create and Manage Libraries

- Hierarchical libraries
- Graphical and/or Text Interface

o Intelligent Components

o Customize Reports

- Bill of Materials
- From-To
- Netlist
- Comma Separated Values

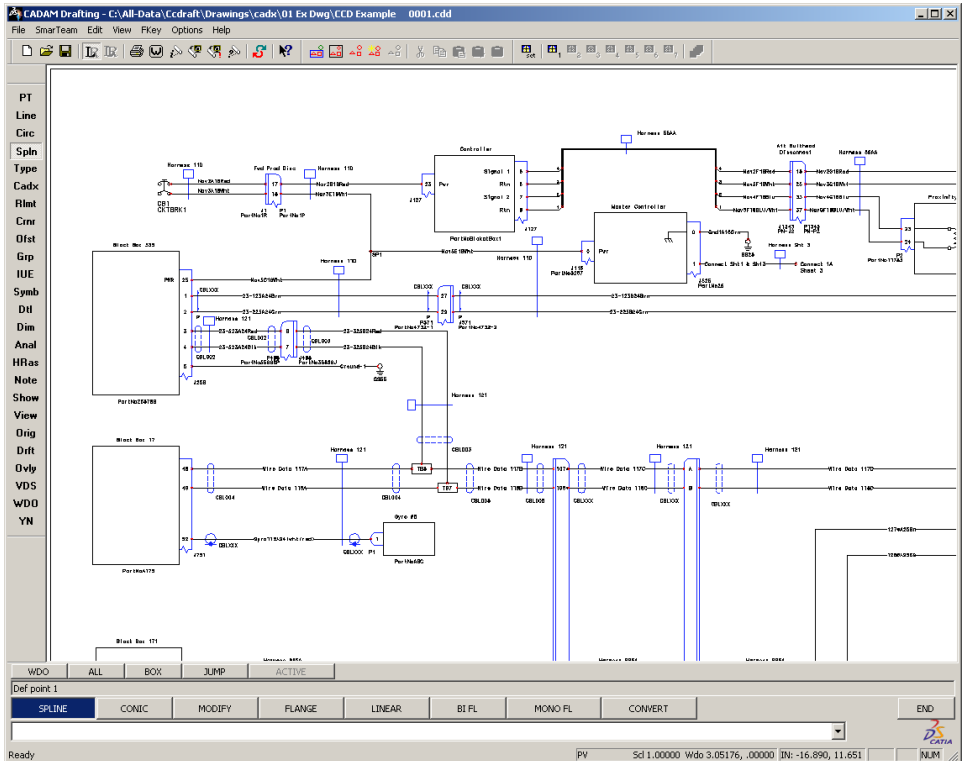
o Customize Design-Rule Checking

o RDBMS - CADEX Table

- All Electrical Data
- All Metadata

o XML-iXF Interface to CATIA

- Migrate CADEX data to CATIA



CADEX

- The complete wiring diagram, schematic, and metadata capture tool. RDBMS-based CADEX Table stores and provides open access to your electrical data.

CADEX is the complementary front end to CATIA's 3D harness design program. CADEX and CATIA provide an end-to-end solution to your electrical requirements from the most trusted vendor

**DASSAULT
SYSTEMES.**

AN OVERVIEW

CADEX provides a powerful schematic and wiring diagram creation tool using CADAM's proven, fast CADAM drafting techniques. CADEX enables you to quickly organize, save, and retrieve information in a CADEX drawing. This information can be extracted and output as customizable reports or in a format matched to downstream automated processes such as wire cutting. Also important is the ability to follow a connection from beginning to end automatically. CADEX can follow a wire run through connectors, splices, busses, and even from sheet to sheet.

CADEX also provides powerful utilities to retrofit existing "unintelligent" drawings that could result from the importation of a foreign file format for example. Drawings can be imported from mainframe CADAM, PROFESSIONAL CADAM, Helix, MICROCADAM, and LDX and retain electrical intelligence. Through neutral formats such as IGES, DXF/DWG, NURESTOR, and others CADEX can import drawings from many different systems and quickly convert them to intelligent drawings.

Libraries of intelligent CADEX electrical components can be created with effective text-based or graphics-based search methods for identifying and retrieving the desired component. Databases of parts can be associated with CADEX components by using unique part numbers as well.

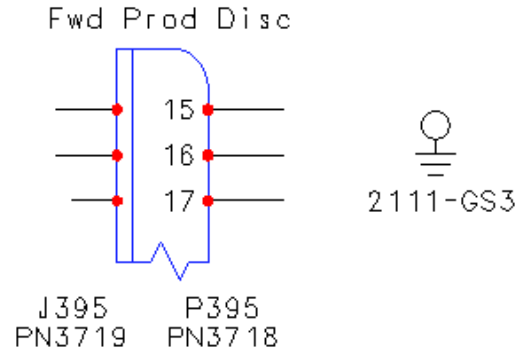
With CADEX you can choose design rules. These rules are evaluated interactively to warn the designer of specific problems such as duplicate pin IDs or components without reference designators, and many others.

A way to gain a better understanding of CADEX may be to follow a sample scenario. This scenario does not describe all CADEX function, but it may help you understand why CADEX is the right solution for you.

A SAMPLE SCENARIO

First create CADEX components by using normal CCD drafting methods. Lines and arcs can be used to create different shapes representing different

electrical components. For example, the following symbols often are used to represent a connector and a ground.



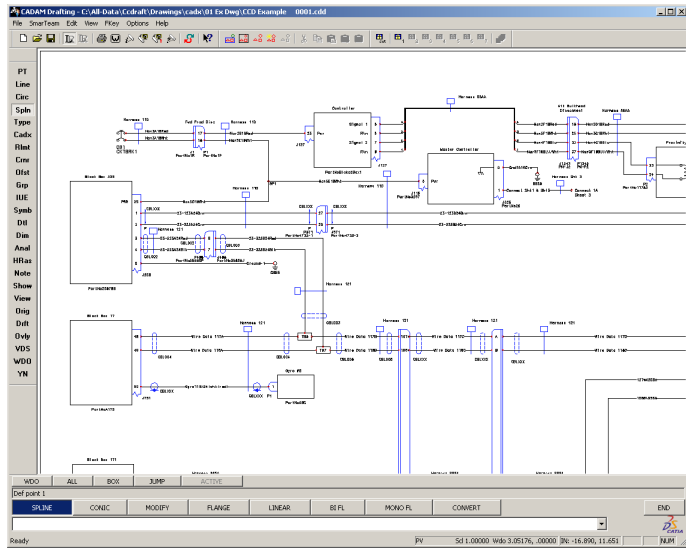
What makes these symbols powerful is that CADEX recognizes them as electrical components. The text and geometry are easily grouped in a CADEX set that is also defined as being either a ground or connector component. The numbers "15", "16", and "17" inside of the connector symbol are recognized as being pin identifications. The notes underneath the symbols (they can be placed anywhere) are the reference designator and the part number. The symbol (geometry and notes) acts as a single entity that can be moved, copied, or deleted. CADEX components are different from CCD dittos that are carbon copies of master geometry. With CADEX Components you can modify the individual notes and elements that are parts of the component.

At this point if these were the only items on your drawing, you could run a CADEX report and ask for an equipment list. You can list the reference designator and part number associated with the component. You can also add any attribute that you define. The attribute can describe

anything from power rating, weight, price, to the manufacturer for example. Such a report (fully customizable), might look similar to the following.

Cadx	Ref Des	Part Number	Manufacturer	Pin insert tool
Rlmt	P395	PN3718	Cannon	xyz157
Cnrr	J395	PN3719	Cannon	
Ofst	ref1	part1		
Grp	ref2	part2	Box	none
IUE	ref5	part5	Acme	none
Symb	ref6	part6		
Dtl				

The ground and connector symbols can be stored in a library, a detail page (the master geometry for dittos), or selected and copied as symbols anywhere on the drawing. The standard note editor can be used to modify copies to easily create several connectors as seen in the following diagram. Different symbols can be created with different meanings by using embedded intelligence.



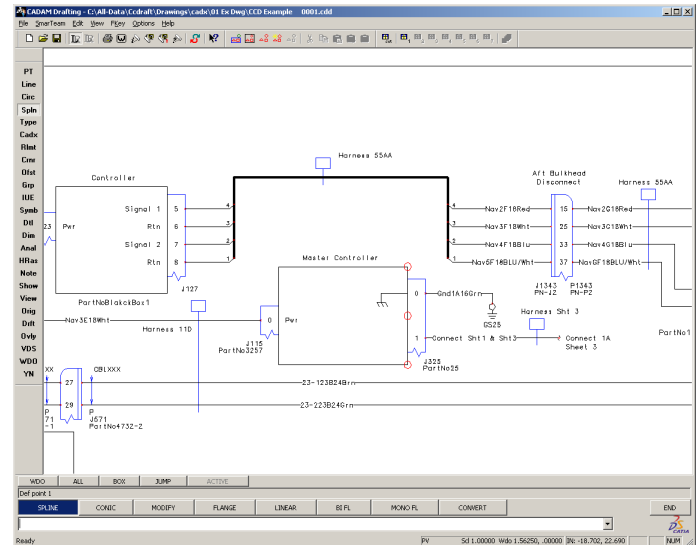
As the drawing is developed, lines representing wires or circuits can be added. Extractable notes added to lines can represent wire number, gage, color code, etc. These notes can be positioned on-top-of, above, or below the line consistent with company standards.

CADEX will trace all wires or circuits through components collecting all the information such as what components are traversed, what pin numbers the wire is connected to, etc. The tracing of the circuit is automatic. The designer needs only to draw the lines representing wires.

All of this circuit information including automated grouping into nets and describing types of components included in the net, is collected automatically. Other associations and characteristics such as twists, shields, cables, etc., are also collected. This information can be output in hardcopy reports, or it can be output in CSV (Comma Separated Variables) format and passed to other automated downstream processes.

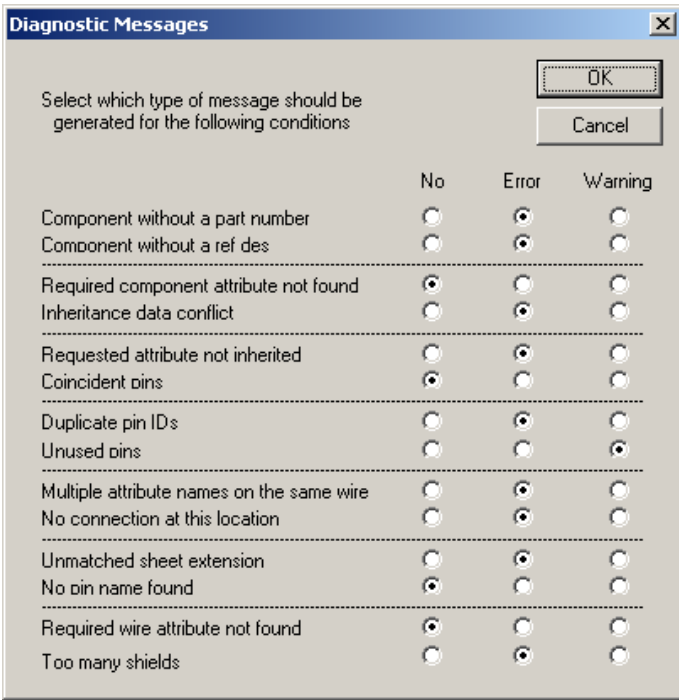
CADEX also handles conditions such as splices where a net may branch. As a space saving and readability feature, wires/lines may be bundled

together into busses. These busses can bundle many wires from different components, even those on different sheets, and distribute those wires with the same flexibility. CADEX maintains the continuity of each individual wire and keeps track of it through the bus and to its final connection.

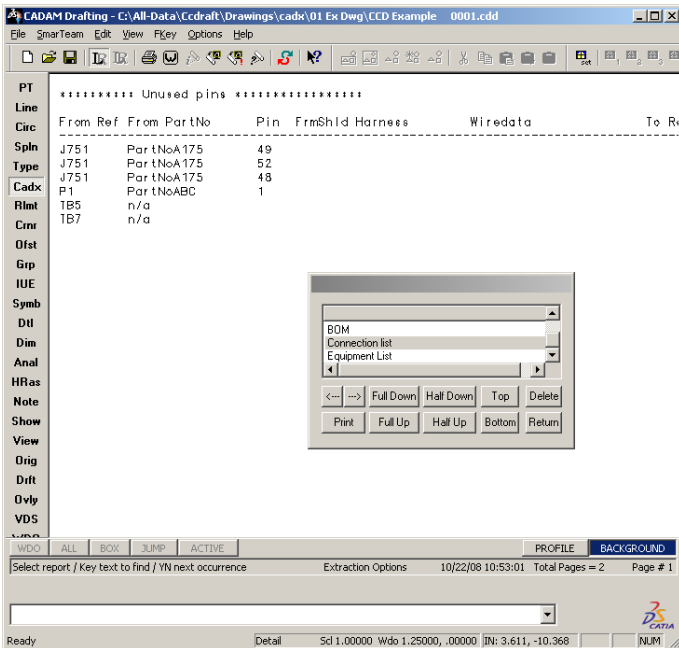


CADEX also checks for error conditions. Conditions such as components without a part number or reference designator, unused pins, missing attribute numbers, and many others - all can be identified as either errors, warnings, or be ignored. Additionally, each instance can be circled. You can step through each condition, automatically centering on each one, and fix it or move on.

The following panel shows the list of conditions that can be labeled as either warnings, errors, or not a problem.

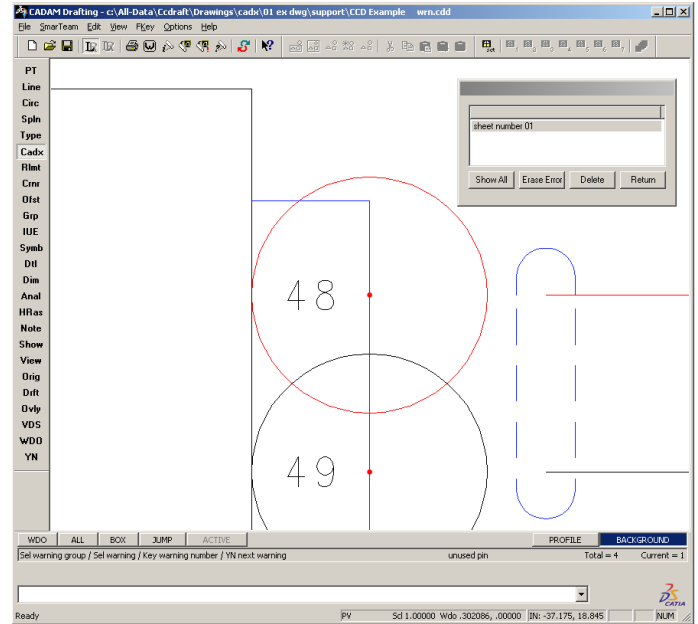


In the report below you can see that a number of unused pins have been found.

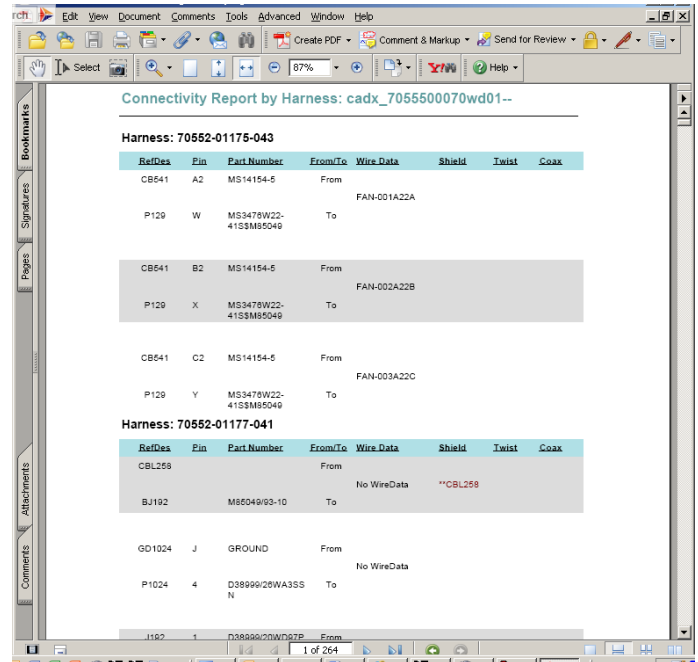


In this case we have chosen to identify unused pins as a warning condition and not an error condition. CADEX has determined these are pins on components to which wire lines have not been attached. The pins are identified by ID, reference designator and part number of the component, sheet number, and x-y location on the sheet. These locations can be located interactively, or located later on a plot. The following screen capture shows

a warning condition that has been circled, highlighted, and moved to the center of the display.



The following From-To report demonstrates that CADEX is capable of putting all the pieces together to provide extremely useful information. This report is only one example of the wealth of information that can be extracted and used for different downstream processes.



In addition to the predefined characteristics and categories that add information/intelligence to the drawing, you can define your own attributes or characteristics. For example, you can have categories of components or wires that have been

approved for extreme environmental conditions. You can specify that certain parts are only available through a certain vendor. You have the capability of defining any category you want to create, assign, and track. You can assign these attributes and make these predefined characteristics available to all of your users. You can even add help information, default data definitions, and use your customized data in predefined reports.

The above scenario gives a view of some of the core CADEX function. Following we will step through some of the functions in greater depth.

LIBRARIES

USER LIBRARIES ARE FLEXIBLE AND CAN BE CREATED AND USED WITHOUT ADMINISTRATOR HELP

CADEX provides two kinds of libraries, User and System. The User library consists of CCD drawings that contain CADEX components. These drawings, up to five, are identified in the CADEX Profile. The components on these drawings are available to any CADEX session. The drawings are accessible through either a graphical interface called "PANEL" or by using text-based "LISTS". Either method can use hierarchical links to create a very efficient path to find the correct component.

The key identifier for all CADEX components is the part number. All part numbers must be unique. You cannot have duplicate part numbers attached to different components. In the case of System libraries you can have multiple unique part numbers attached to the *same* component.

SYSTEM LIBRARIES USUALLY ARE CREATED BY THE ADMINISTRATOR AND CANNOT BE MODIFIED BY USERS.

The System library format is different from the User library format in several ways. The System library is meant to be maintained by the system administrator and requires a few more steps to create. By controlling access to the System library, you can ensure that all changes are managed. The System library format also provides more information about each component than the User library. It also allows you to associate several part numbers with one component.

For example, you may require only one symbol for a variable resistor, but a particular variable resistor

may be available from different vendors. Also, different ratings of variable resistors from the same vendor will have different part numbers. The System library allows you to have one symbol for a variable resistor, yet have multiple part numbers associated with that symbol.

RDBMS - CADEX TABLE

CADEX stores electrical data in a Relational Database Management System (RDBMS) named CADEX Table. The format of this database is available to all users. Users can create reports and data extraction queries in addition to those provided with the product. Also, many spot reports and design rule checks can be made before exporting data to CADEX Table.

When a designer completes changes to a CADEX drawing, the Extraction Process can be initiated. One of the several sub processes initiated by the Extraction process causes CADEX to trace wire runs automatically through components, busses, and from sheet to sheet. CADEX recognizes intersections of wire lines as either crossovers or splice points. At splice points, the net expands to include all wires that intersect at the splice point. It can be restricted to trace only certain line types and through specific views. CADEX also keeps track of all useful information about a particular wire run. The list of information it collects and can report about include the following:

- *Component data*
 - Part number
 - Reference designator
 - Pin Identification
 - X-Y location
 - Signal
 - Type
 - Connector
 - Power
 - Shield
 - Ground
 - etc.

- Wire data
- Net number
- Any attribute (user or system)

When a user is satisfied that the changes are correct, he or she can “Update the DB.” Until the update button is pushed, the CADEX Table is not updated. This update function can optionally be password protected.

REPORTS

CADEX creates several types of reports automatically. Customized reports can be created with both contents and format defined to meet the particular purpose. Reports can be generated interactively, as a background process, or output to files including the CSV format for exportation to other processes. Reports can be generated using the data in CADEX Table as well.

Attributes that are user defined can also be included in reports and exportable files. The CADEX system provides you with ultimate flexibility in defining data in your CADEX drawing and reporting or exporting it in an intelligent way.

DESIGN RULE CHECKING

As shown in the preceding, CADEX provides both interactive and background processing techniques for design rule checking.

This powerful function helps to catch errors early in the process thereby saving manufacturing and production costs later.

Queries are and can be written for CADEX Table as well. User queries can be designed to look for design rules that may be unique to a user, e.g., requiring every wire to have a color code that is defined in a specific table. As queries are developed that have general benefit, the library of design rules increases.

OTHER PRODUCTIVITY ENHANCERS

USER ASSIGNED ATTRIBUTES

You can assign attributes capable of adding any user data to components, wires lines, or any

element in a CADEX drawing. User attributes may include special help information, default values, be required such an EWIS definition on all wires, and be protected. They may be restricted to different data types (alpha or numeric) and be categorized. This is more than just adding additional data to a drawing. It is a complete implementation with user help and syntax checking.

These attributes can be added to reports and become part of the data input to downstream processes.

HIERARCHY

Special hierarchy attributes can be added to your drawing that reference other drawings. When selected, those elements with the hierarchy attributes assigned will automatically take you to another drawing. This capability can be used to provide additional detail to a drawing, where such detail is not needed on the main drawing.

In mechanical drawings, this capability can be used to create a family of drawings where the highest level might be an assembly drawing. Each of the parts in the assembly drawing may be drawn as separate detail drawings. Further detail can be added to the detail drawings by adding another level of drawings. In fact, you can have as many as 99 levels of hierarchy.

The entire hierarchy tree can be displayed, and you can move up and down or skip levels by using this tree.

COMPONENT MANAGEMENT

CADEX components, although a collection of lines, arcs, notes, etc., can be managed as a single entity. Components can be moved, copied, turned, flipped, deleted, and scaled. One very useful function is that they can be moved with the “STRETCH” option, and any wire lines that are connected will be moved with the component and the connectivity integrity will be maintained.

AUTOMATIC NUMBERING AND BACK ANNOTATION

CADEX can automatically assign pin numbers on a drawing. Wire data also can be automatically assigned, either for background reports only or can be back annotated to the drawing. That is, you have the choice of using the automatic numbers for

output reports, only, or to modify the drawing (back annotate). The wire data feature is useful when the entire wire data or a portion of the wire data requires sequential and unique numbers that can be computer assigned.

PART NUMBER REPLACEMENT TABLES

Rather than place the same part number multiple times on a drawing such as the multiple instances (reference designators) of a single connector, you can use a part number replacement table. Such a table allows you to define a part number for each reference designator. All reports generated will show the part number even though it is not actually drawn or displayed on the CADEX drawing.

RELAY AUTOMATION

CADEX provides several tools for automating the creation of relays, automatically assembling them checking for errors, automatically assigning pin numbers, and automatically back annotating this information into an electrical diagram.

LADDER DIAGRAMS

CADEX provides automated techniques for quickly creating horizontal or vertical ladder diagrams. Components such as relays can be easily added to the diagram. Relays without reference designators or part numbers can be inserted that are later defined through a CADEX background process.

THE BEGINNING

CADEX provides a full set of function that can be used to produce intelligent electrical drawings. Many companies already rely on CADEX to create all of their electrical drawings. Indeed entire aircraft electrical systems have been designed using CADAM/CCD and CADEX. CADEX also provides the flexibility to be customized to meet needs that are unique to your project.

Much more function is available in CADEX than has been introduced by this article. By using CCD and the other products in the CCD suite: Hybrid Raster, Interactive User Exit (IUE), Variational Design, and the various translators, many more solutions become available to meet your needs. For example, as part of V5 CCD, at no additional cost, you are able to create separate programs using IUE

capable of interacting directly with the CCD/CADEX database.

If you are interested in using CADEX, please give us a call or contact us through our website at www.cadam.com. If you are a current user of CADEX and were not aware of all the function available in CADEX, please contact us as well. Help yourself by implementing a new and much more productive solution by taking advantage of CCD and CADEX today.