

9 Adapting to Custom Fixtures and Wire Harnesses

About this Section

This section also serves as a User's Guide to PinMap and includes a variety of examples showing how to design and interface custom fixturing.

There may be times when you need to test cables with unusual connector types, or wiring harnesses having many and varied connectors. This section explains how to do this. In most cases, you will need our PinMap™ software (catalog Item 708), an option purchased by those CableEye Users whose test requirements extend beyond the realm of standard cables.

Note that PinMap is sold as an optional software and activated with a special license. PinMap is embedded in the main CableEye software for easy access and flexibility. If you have not already purchased a license, contact CAMI Research to do so.

You will learn how to import custom graphics for your connectors and learn great tips on how to pre-process your pictures to import better quality connector graphics.

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9.1 Connector Interfaces and Pin Maps

The electronics industry uses an almost uncountable number of different connector types. While CableEye's CB boards provide a standard interface for the most common connectors, they represent only a small percentage of the universe of available connectors. Interfacing connectors not supported by standard CB boards involves two steps:

1. Build a *physical interface* for the connector to provide an electrical link to the test instrument.
2. Create a custom *pin map* to assign a graphic image and meaningful pin labels to the connector.

The physical interface may take one of these forms: an *adapter cable* (also called a *pigtail*); a *fixed-mounted connector* attached to a generic prototyping board we provide; a *custom CB board* which is designed to fit the CableEye test fixture; an external *connector panel* housing all of your custom connectors; or a *mating harness* that mounts under a harness board for wire harness applications. We describe each of these options in detail later in this section.

Once your physical interface is ready, you create a *pin map*. The map serves the purpose of assigning graphic images to represent the connectors, and replacing test point numbers with sensible pin numbers or labels that correspond with the schematic of your cable. You develop pin maps using our optional *PinMap software*.

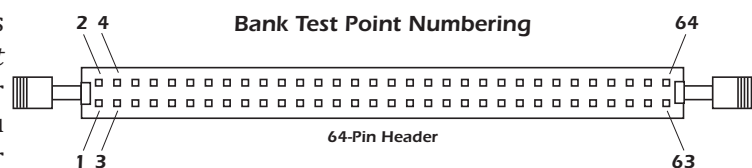
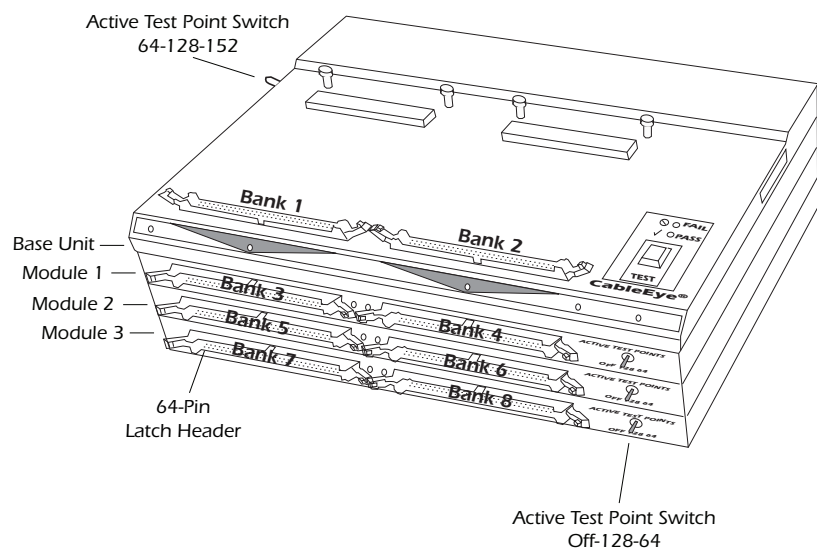
9.2 Test Point Organization and Numbering

CableEye organizes test points in *banks of 64*. The smallest CableEye system contains two banks to provide a total of 128 test points for cable or wire harness testing. You may expand most CableEye models in increments of two banks (128 test points) by adding *expansion modules* until a maximum capacity of 2560 points is reached.

Headers for the first two banks are oriented vertically to allow plug-in connector boards to be mounted. Headers for banks 3 and above, located on expansion modules, face the operator and would normally link directly to flat cable connectors. These banks cannot mount plug-in boards directly; should you need to do so, use the *QuickMount Housing*, Catalog Item 712.

The drawing above shows a 512 test point CableEye system with eight banks. Each bank uses one standard 64-pin dual-row latch header with 0.1" (2.54 mm) pin spacing to which a corresponding wire-mount socket may be connected.

We assign pin numbers to each header as shown on the right. *Bank-Relative Test Point Numbers* denote the *bank number* and *pin*. For example, "B1:1" for Bank 1 Pin 1. When you set the software's *Connectors* preference for



Generic Headers, pin numbers appear in CableEye’s wire list using bank-relative numbering.

Absolute Test Point Numbers start at 1 and increase to the maximum capacity of the system. So, Bank 1 covers Test Points 1 to 64; Bank 2 covers Test Points 65-128, etc. For the 512-point system above, the relative and absolute pin numbering progresses as follows:

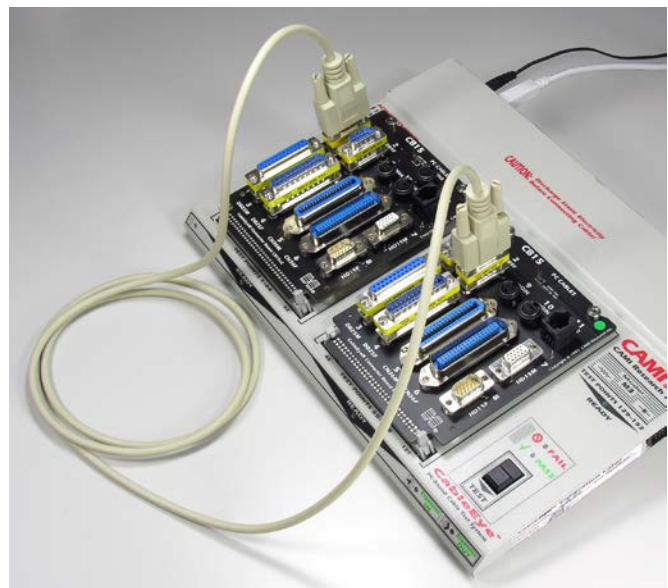
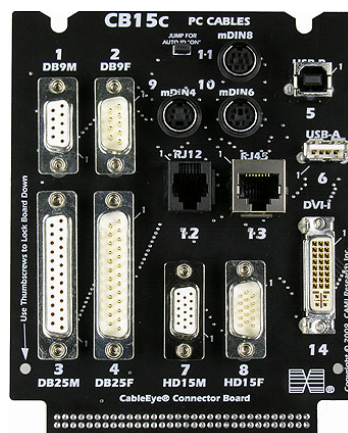
<i>Module</i>	<i>Bank</i>	<i>Bank Relative</i>	<i>Absolute</i>
Base Left	1	B1:1 to B1:64	1 to 64
Base Right	2	B2:1 to B2:64	65 to 128
Expansion 1 Left	3	B3:1 to B3:64	129 to 192
Expansion 1 Right	4	B4:1 to B4:64	193 to 256
Expansion 2 Left	5	B5:1 to B5:64	257 to 320
Expansion 2 Right	6	B6:1 to B6:64	321 to 384
Expansion 3 Left	7	B7:1 to B7:64	385 to 448
Expansion 3 Right	8	B8:1 to B8:64	449 to 512

Note: Polarizing slots on the 64-pin headers differ between the base unit (Banks 1 and 2) and the expansion modules! This results from an inconsistent design decision by 3M Corp. who first developed these connectors. Unfortunately, right-angle headers connectors available in only one format (with the slot on top). If you plug flat cables directly into these headers, we suggest using unpolarized connectors and instead paying attention to the red line on the cable denoting Pin 1.

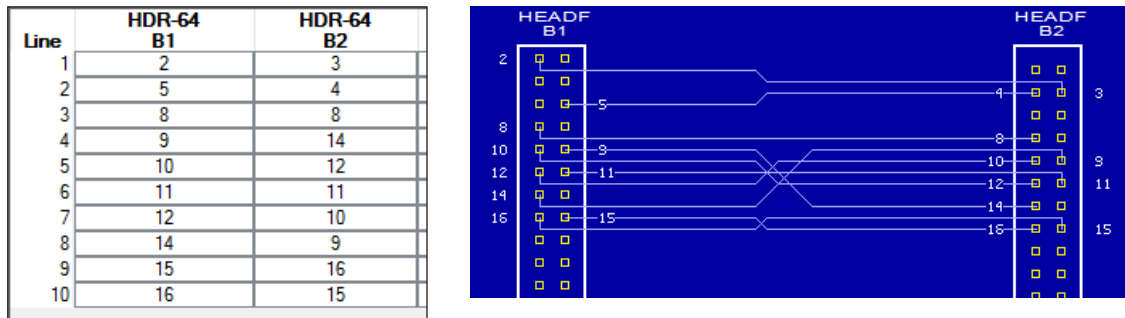
9.3 How CableEye Uses Pin Maps

When you click the TEST button on CableEye, you trigger a scanning process in which every test point is measured with respect to every other test point. A *continuity matrix* (“c-matrix”) results from this process and shows where connections have been found. From the c-matrix, we produce a raw connection list. Because test point numbers are unrelated to the connectors or pin numbers you see in the cable, the raw connection list cannot be readily understood nor can it be related to the cable’s schematic drawing without a translation table showing which connector pin is wired to which test point. Although you could create a “manual” translation table (a sheet of paper listing the test points and the pins they are connected to), CableEye can do this automatically using a pin map.

As an example, consider the CB15C board shown below, and the connection of a DB9 male to DB9 female cable attached to two CB15 boards on a CableEye tester as you see on the right. Note that the picture with the cable displays old style CB15 boards and where only used for display purposes. We wish to check the wiring in this cable.

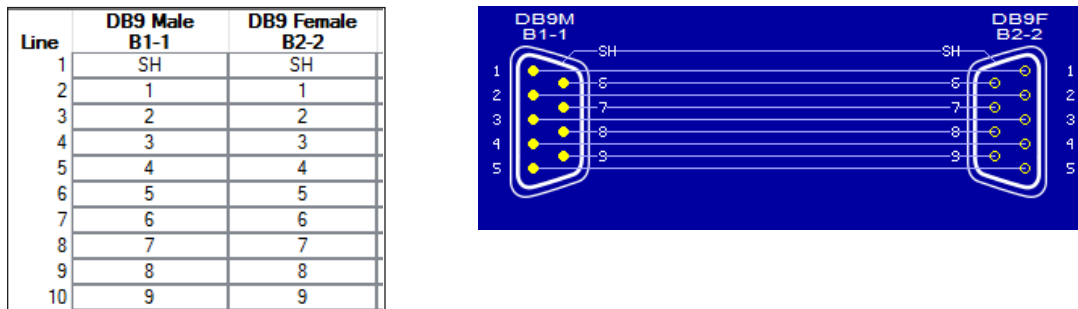


Because many connectors share the same 64-pin Bank on the CB15C, it is not possible to lay out each connector on this board so that its Pin 1 goes to Test point 1. In fact, in this example, Pin 1 of the DB9 male goes to Test Point 8 on the left board, and Pin 1 of the DB9 female goes to Test Point 8 on the right board. Also, the c-matrix contains no information about the connectors in use – it tells us only which test points are connected to each other. If we display the wiring and netlist using *only* information available in the c-matrix, we obtain the wiring diagram and netlist shown below. Unfortunately, this does not present the wiring we’ve measured in a very useful form.



Comment: To try this for yourself, connect your CB15C boards to the tester and attach a DB9 male to female cable as shown in the last photo. Then, set the *Connectors* menu to *Generic Headers* and click the *Test Cable* button. You will see the wiring diagram above. Also in the wiring diagram you will see jumpers between test points 17 and 64 on each side that represent the *Auto ID* jumpers along the top of the board; these jumpers uniquely identify the CB15C board telling the CableEye software which boards you have plugged in.

The desired graphic representation appears below. To produce this, the software needs to know (a) which connector shape should be employed when it draws the graphic on the screen, and (b) how the pins on the CB15C’s DB9 connector are wired to the test points. This information resides in the CB15C board’s *pin map*.



Comment: Referring to the screen images above and to the right, note that the connector type (DB9M or DB9F) now appears above the connector graphic and also in the column heading of the netlist, and that the Bank and Socket Number, such as “B1-1” for Bank 1, Socket 1, appear after the connector type to denote the location of the CB15C board and the socket in use.

The complete pin map for the CB15C board is given in the next page. This table consists of *fourteen* maps, one for each connector on the board. You can see from this table that the connectors share test points; the board was designed so that only one connector would be used at a time. For any connector, pin “0” represents the *shield* (or *shell*) and in most cases does not share a test point with any other connector. Thus, when the *shield* has a connection, we then know which connector is in use. Try using the first test point netlist in this page and the CB15C map on the next page to convince yourself that the DB9M-F cable is wired as shown in the second netlist in this page.

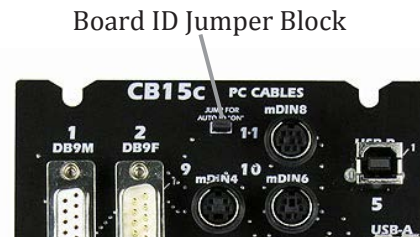
CB15C PinMap

CB15C The gender given below is that to be displayed; the connector on the board has the opposite gender.

TP	DB25M	DB25F	DB9M	DB9F	DVI-IM	HD15M	HD15F	mDINA	mDINB	mDIN	RJ12	RJ45	USB-A	USB-B	ID
1								0							
2			5												
3				5											
4				0											
5			0												
6	7														
7	0														
8	1	13	1	1		6		6	8	5					
9	14	25	2	4		11		5	3	6		7	0		
10	2	12	7	8	104	7	10	2	1	4		8	2	3	
11	15	24	3	3		12		1	2	8	6	1			
12	3	11	8	7	103	8	9	4	4	2					
13															1
14	16	23	4	2		13		8	6	3					
15	4	10	9	6	16	9	8	7	7	1					
16	17	22	6	9		14		3	5	7		6			
17	5	9			15	10	7								
18	18	21				15									
19	6	8			22										
20	19	20			13										
21	20	19													
22		0													
23		7													
24											1				
25	8	6			21										
26	21	18			12										
27	9	5			20										
28	22	17			11										
29	10	4			19										
30	23	16			10										
31	11	3			18						5				
32	24	15			9						4	5			
33	12	2			17						3	4			
34	25	14									2	3			
35	13	1										2			
36						0									
37						5	11								
38						4	12								
39						3	13								
40						2	14								
41						1	15								
42												0			
43					102			5							
44								4							
45								0							
46									0						
47										0					
48														0	
49													4		
50					14		6								
51					23		1								
52					24		2								
53					101		3								
54					105										
55					0										
56					8										
57					7										
58					6										
59					5								3		
60					4								1		
61					3										2
62					2										4
63					1										1
64															2

As you've seen with the CB15C board, multiple connectors may share test points on the same board. Each connector has its own map, first because it will have a different graphic image than other connectors, and second because it need not use the same test points as the other connectors. In fact, it is desirable that each connector have at least one uniquely assigned test point on that CB board to distinguish it from all other connectors on the board, as the shield pins do on the CB15C. When this is true, CableEye can determine *automatically* which connector on the board you are using without asking.

Most CB boards have a board ID jumper block that creates a connection between the highest-numbered test point on the board (pin 64) and one other test point not assigned to any other board. In this way, CB boards show a unique signature identifying themselves to the software and thereby revealing which connectors are available on that board, and thus which maps to employ.



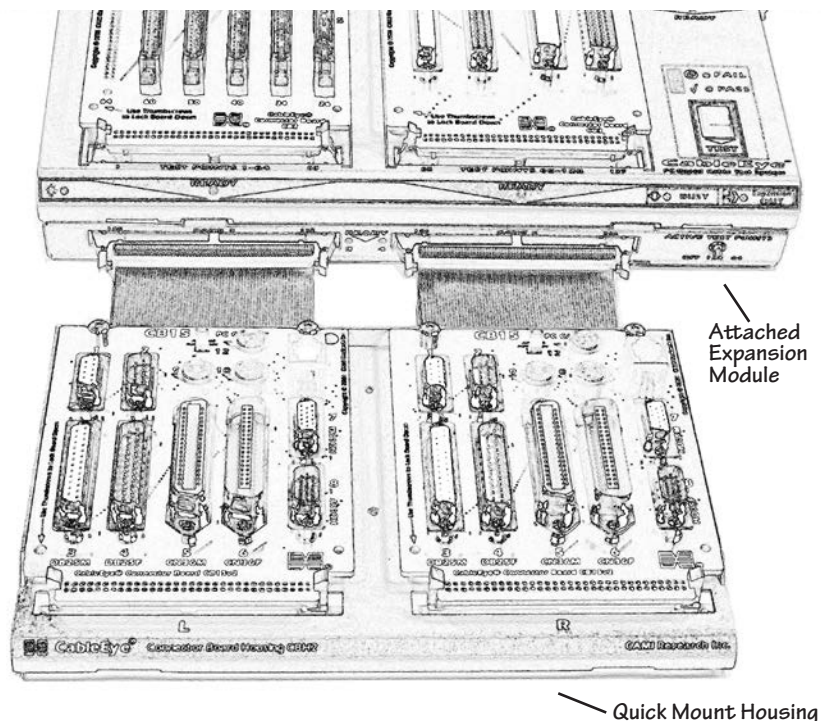
9.4 Plug-and-Play Operation Using CB Boards

We designed CableEye's software so that any combination of CB boards could be connected to the tester, and any cable attached between the chosen boards when testing cables. When you measure a cable, CableEye first gets a raw connection list using test point numbers only. It then looks for the board ID jumper to identify the boards. At that point it knows that the permissible connectors are limited to only those found on the installed boards. Using the built-in maps for these boards, it then finds the actual connector in use on each board by locating a wired test point not shared by other connectors on that board. With that information, it can draw the proper graphics and wiring.

This process of identifying the boards and connectors in use normally executes without operator intervention and produces a correct wiring diagram within a fraction of a second. In the event that more than one connector fits the raw connection list (as might be the case when the shield or some of the pins on a connector are unwired), an ambiguous situation results. In this case, CableEye posts a pop-up window showing the possible choices and asks you to select the connector in use.

When you test cables with three or more connectors, the same rules apply, but in this case you must use a tester with expansion modules to provide an extra bank for every new CB board you need. Expansion modules provide two extra banks and stack underneath the base unit to save space. In this case, CB boards cannot mount to the tester directly and require the *QuickMount Housing* (catalog item 712) as shown on the right.

CB boards offer a standard physical interface, and our distribution software includes the pin maps and connector images needed for these boards. However, using CB boards to provide quick, automatic fixturing for your cables comes with a tradeoff. Specifically, *test points cannot be used efficiently*. For example, if you install four CB15C boards to test a cable with four DB9 male connectors, you really need only 40 test points to make the measurement. Yet, the two boards require a tester with 256 test point capacity so over 200 points will be unused. While a 256-point system does not represent a particularly large system or impose a great hardware expense, testing cables or wire harnesses with many more connectors makes the CB board approach impractical. It is this situation which requires a custom connector interface and to which we devote the next section.



9.5 Creating a Custom Hardware Interface

When you need to test cables with unusual connectors not found on CB boards, or test wire harnesses with a quantity of connectors or a physical size that makes the use of CB boards impractical, you must create a *custom hardware interface* to CableEye. This section presents examples of custom interfaces we've built for our customers to review some of your options. A custom hardware interface must meet several important objectives:

1. Mating connectors should be available for all connectors on the unit under test.
2. The mating connectors should be positioned and oriented to facilitate easy attachment and removal of the unit under test.
3. Construction of the interface should be built to *test equipment standards*, and thus capable of withstanding many attach/remove cycles before the mating connectors or the supporting structure require maintenance. Specifically, this means using the best quality mating connectors available, protecting exposed copper from corrosion or contamination, securing all loose wires, and adding strain relief to avoid premature failure of adapter cables or connector supports.
4. The mating connectors and supporting structure should be clearly labeled permitting operators to easily locate named connectors and pins while attaching the unit under test or when isolating faults identified by the tester.
5. The interface design should consider the inevitable maintenance that will result from normal wear, and thus leave solder junctions, fasteners, service loops, and lacing straps sufficiently exposed to make access possible.

Keep these objectives in mind while you design and build your custom interface. It cannot be stressed too strongly that taking the time and expense to build a high quality interface will always repay itself in usability, long life, and maintainability.

Depending on the number of connectors in your cable or harness as well as their size and weight, you may choose from a variety of options for building the interface:

- Build *Adapter Cables* (also called *Pigtail Cables*)
- Mount the Mating Connector on a *Standard Blank CB Board* (Example: CB8, Item 738)
- Design a *Custom CB Board*
- Build an *External Connector Panel*
- Build a *Mating Harness* (a wire harness with mating connectors that attaches to the harness being tested)

We summarize each of these options below stressing their benefits and limitations, and show photos or drawings illustrating each.

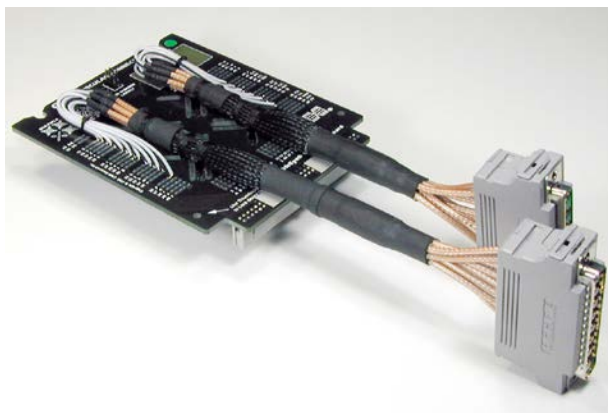
9.5.1 Adapter Cables

An adapter cable has a mating connector attached to one end, and a standard connector to the other. The side with the standard connector may then attach to an available CB board. As an alternative to using a standard connector on one side, the second end of the adapter cable may be hard-wired to a blank CB board that then plugs into the tester.

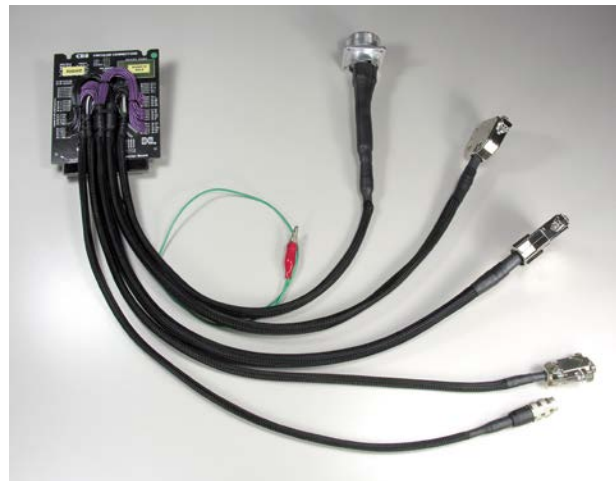
Advantages: easy and inexpensive to build; provides strain relief for test cables that are heavy, bulky, or do not lend themselves to being attached to a fixed mating connector.

Disadvantages: requires sufficient space on the test bench to lay out adapter cable; increases the resistance in the cable being measured by the resistance of the adapter cable (about 0.1 ohms per foot); not practical for more than about 10 connectors.

Example: Dual adapter cables wired to a CB8 blank board. These 8W8 connectors each have eight coaxial pins, one connector with male pins and the other with female pins. These mating connectors do not share test points on the CB8 and thus can both be used at the same time, if desired.



Example: Five adapter cables and a ground clip wired to a CB8 board. Only one of these five connectors will be used at a time, and thus the adapter cables may share test points on the CB8.



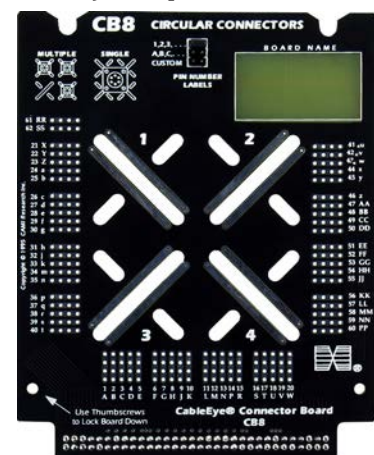
9.5.2 Fixed-Mounted Connectors

CAMI Research provides two standard-form CB boards with no connectors, and a construction area in the middle to which you may mount your own connectors. CB8 (Catalog Item 738) has a capacity of 64 test points and requires one bank. CB8 may be used with any model CableEye tester. CB30 (Catalog Item 760) has a capacity of 128 test points and requires two banks on a system with 256 test points or more.

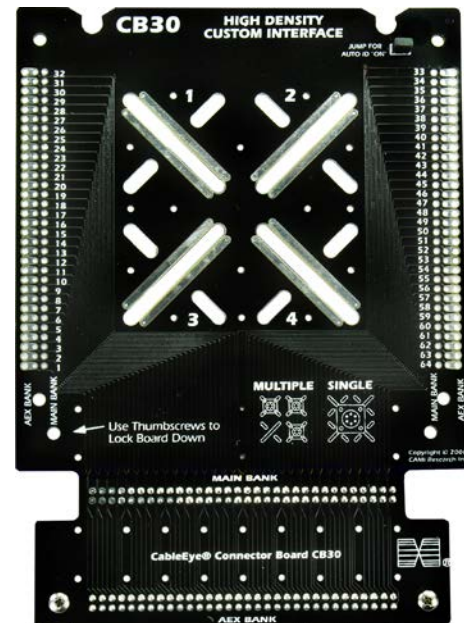
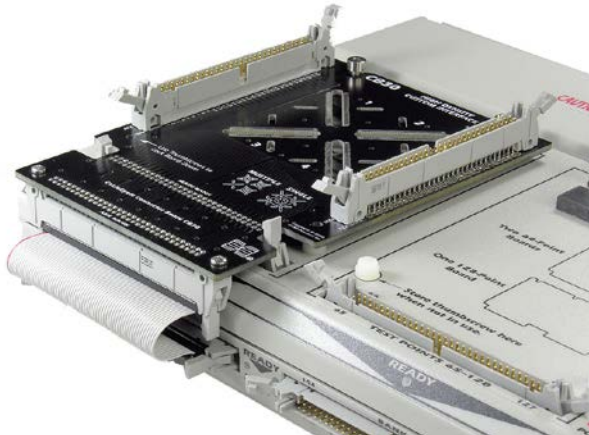
Advantages: mount several connectors on each board, depending on size; plug-in boards are available from CAMI Research and include a kit of screws and standoffs; easily attaches to and removes from the tester as needed; presence of jumper ID on CB8 board permits mixed use with standard CB boards; may be easily disassembled and reused for another application.

Disadvantages: connector size limited to about 2.5" x 2.5" (64 mm x 64 mm); test point count limited to 64 for CB8 and 128 for CB30; only two boards may be mounted on a CableEye tester directly with more possible when QuickMount housings are attached to expansion modules.

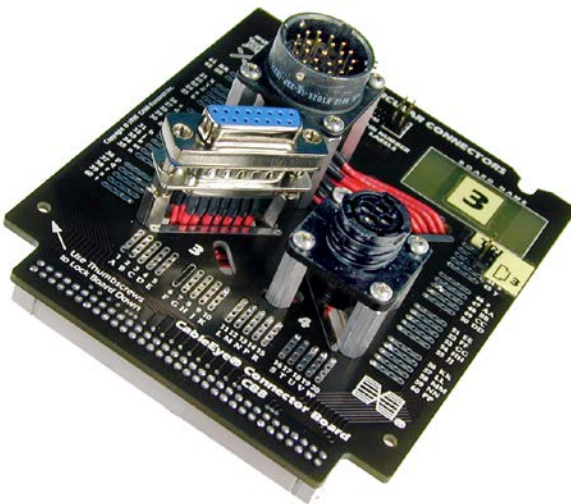
The CB8 Board: This generic board accepts a wide range of circular or other connectors with up to 64 pins. For circular connectors, any panel-mount connector with four mounting holes fits the "X"-pattern slots on this board. Connector pins are wired to labeled pads surrounding the board. You may mount up to four small circular connectors, or one large connector. Any noncircular connector may also be mounted if it includes a bracket of some kind. Use the bare area in the upper right for custom labeling. Set of two boards with kit of standoffs and screws.



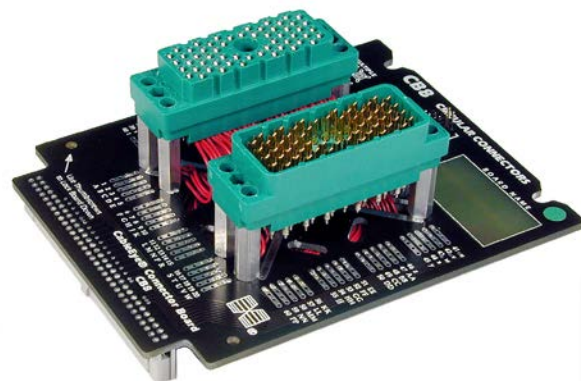
The CB30 Board: This board is similar to the CB8 but accepts connectors up to 128 pins using an overhang connector that pulls test points from an expansion module below. Mount headers on the CB30 to accept custom designed plugboards like the CB30B (next page).



Example: Three connectors mounted on a CB8 board. A hardware kit included with each board provides 4-40 screws, washers, lockwashers, and standoffs. This board is labeled “3” as part of a set of four custom boards.



Example: 56-pin Elco male and female connectors mounted on a CB8. Because only 64 test points are available on this board, most pins are shared between the two connectors and only one can be used at a time. The 24-gauge solid wire was wire-wrapped to the posts along the bottom of the connector and then soldered to the CB8 board.



9.5.3 Custom CB Boards

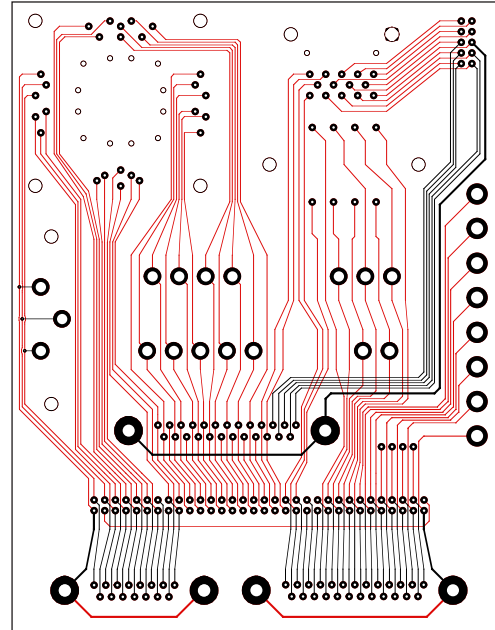
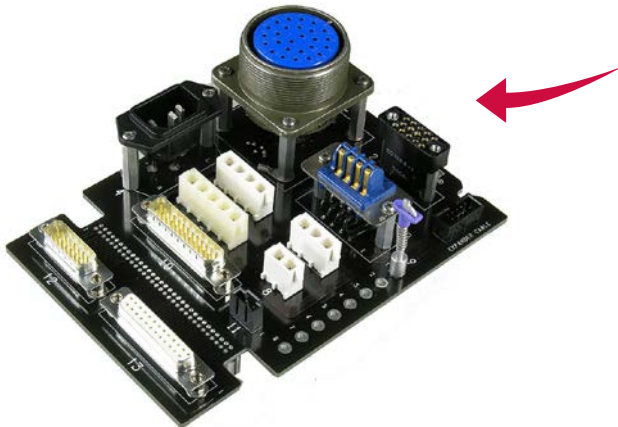
When you need to interface high density through-hole or surface-mount connectors, or when the four or more connectors need to be mounted in close proximity, you may need to design a custom CB board that fits the CableEye fixture. CAMI Research will gladly provide the mechanical routing pattern needed to ensure that a custom board mounts perfectly into the fixture; contact us for details.

Advantages: unlimited flexibility about the type of connectors used and their placement on the board; multiple copies can easily be manufactured when several test stations will use the

same custom interface, or when connector or board wearout becomes an issue; high degree of control over connector placement to minimize trace resistance.

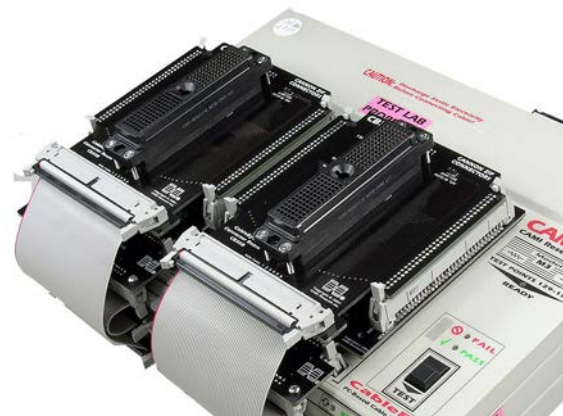
Disadvantages: time consuming to design; expensive to fabricate the PC board.

Example (right and below): We designed this board for a customer who required a particular arrangement of connectors in close proximity on a single board. With this arrangement, you have on one board all the connectors needed for a series of tests.



Example (right): The pin density of this Cannon DL-156 connector left no choice but to design a custom printed circuit board. The result is a neat, robust interface. Any method requiring hand wiring would have been impractical. We designed this board to plug into the CB30, and added an additional connector to pull points from a third bank.

This board became our standard CB30B board.



9.5.4 External Connector Panels

When the needed mating connectors become too numerous or too large to mount on a CB board, or to connect with adapter cables, an external panel may be appropriate. In this case, all mating connectors reside in a custom-designed rack or bench panel laid out to provide easy access for the test technician, and thus permit rapid attachment and removal of the device under test.

Advantages: the physical layout may be custom-tailored to the application for maximum efficiency; wiring to the mating connectors resides behind the panel and out of harm's way; connectors may be spaced far enough apart for easy access and maintenance; open connections and wiring may be fully enclosed to enhance operator safety during high voltage testing.

Disadvantages: high cost in building a custom-machined panel; large, bulky interface may require significant storage space when not in use; large panels or enclosed housings may be difficult to move or transport.

Example: We built this connector panel to support custom PLC connectors in a Delrin block on the left side of the panel. The other end of the test cable terminates in either bare wires for which pushpin terminals are used, or standard dual-row headers as shown on the right side of the panel. A custom PC board brings the connector pins to two 64-pin headers at the top which connect to CableEye using 64-conductor flat cable (not installed). The entire assembly is supported by a Delrin panel.



Example: One of our customers built this panel for various combinations of circular and BNC connectors. He mounted the connectors in an easily-drilled Plexiglas panel, and mounted it in a commercially-available steel housing. The four posts at the top serve as mechanical hold-downs for the two CB8 interface boards (off the frame at the top) when the housing is not being used.

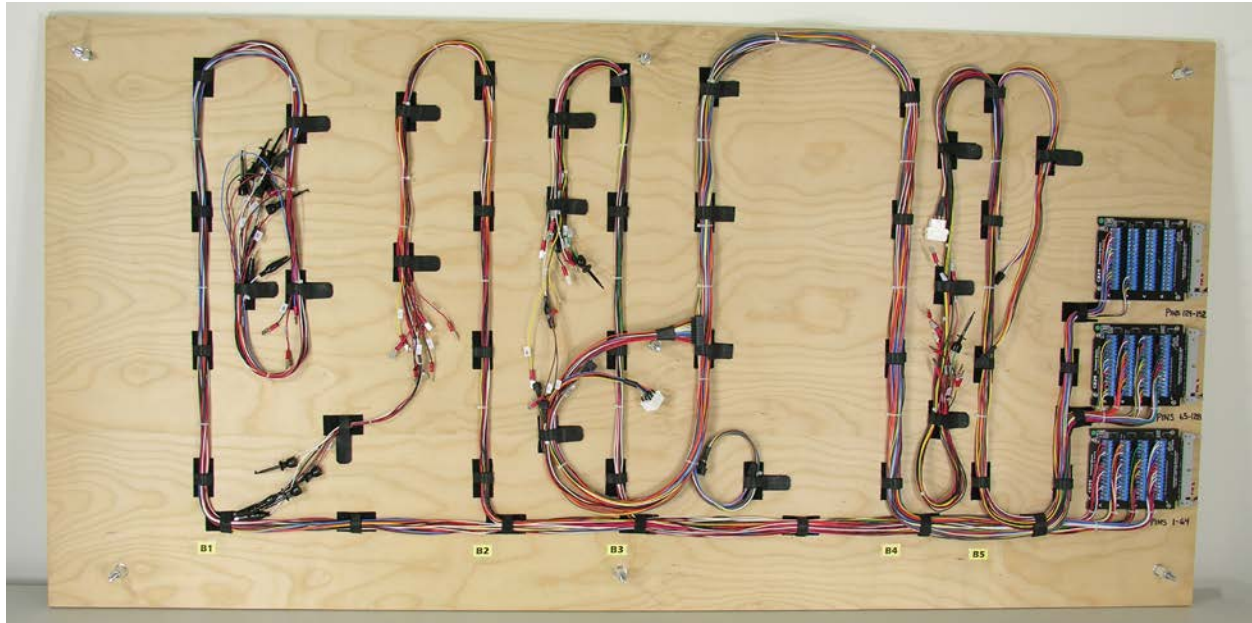


9.5.5 Custom Mating Harness for Harness Boards

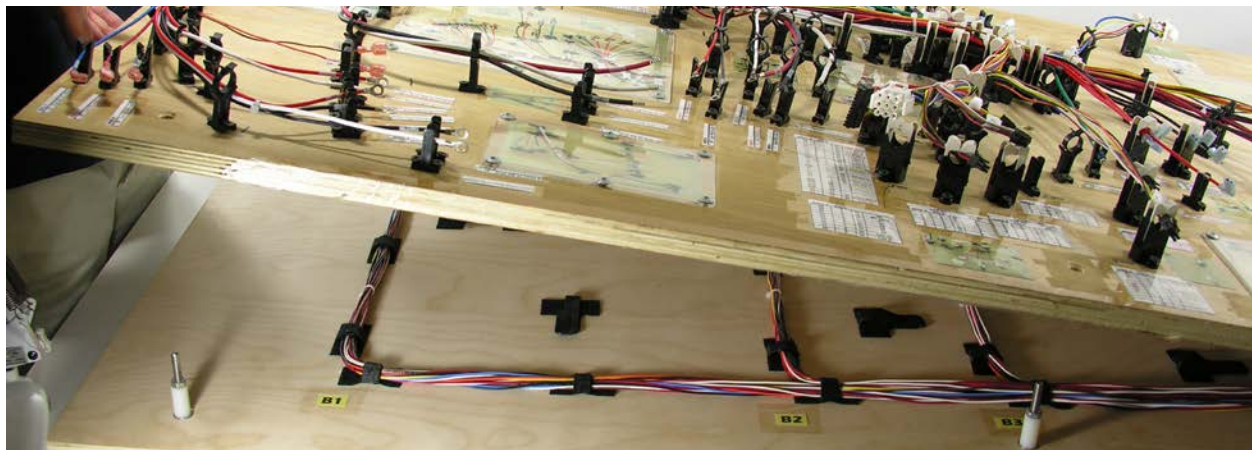
Wiring assemblies that contain numerous connectors or involve large, spreading nets of wiring require special layout boards to assemble and test. We generally refer to wiring of this type as a *wire harness*, and the assembly panel on which it is built as a *harness board*. A *mating harness* consists of complementary mating connectors that attach to the connectors of a wiring harness and then route the wiring to a common location connected to the test system. A typical harness board appears below.



The mating harness built for this board appears next. This mating board is the same size as the assembly board and mounts directly below it. The tester connects to the right side. Velcro strips hold wiring in place for easy release should future changes be needed.

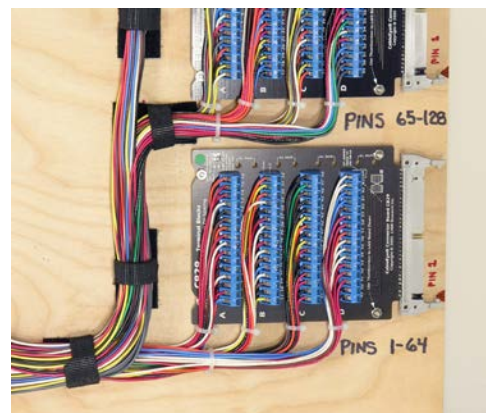


Here you see the assembly board being placed over the mating board. Bolts and standoffs hold the assembly board a fixed distance above the mating board and secure the two together.



CableEye CB29A boards consolidate wires from the mating harness and provide a compact interface to the test equipment using standard 64-pin IDC cables (shown unconnected). Wiring from the mating harness hangs from the top of the mating board during assembly. When the harness being built is finished, bundles of wire from the mating harness are pulled down over the device under test and connected.

Each connector position on the main harness board (top layer) has identifiers that correspond with the schematic diagram. CableEye reports wiring errors using similar identifiers, making the job of locating wiring errors easy.

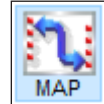


9.6 Creating a Fixture Map - Quick Guide

Once you've designed and built the hardware interface for the device under test, the CableEye software must be informed how the mating connectors on your interface are wired to the test point pins on the front of the tester, and how they should be displayed on your computer. This information is contained in a **pin map** which consists of:

- your choice of a connector image to be used on the screen for each physical connector, and
- a table showing the test point to which each pin on your mating connectors is wired.

You create the pin map using the optional *PinMap software* (Catalog Item 708). Look for a button along the left side of the screen labeled "Map" as shown here. If you don't see this button and believe you've purchased PinMap, please contact CAMI Research for an updated license file.



Example: To demonstrate how to create a pin map, we present a simple example in which we mount two small 7-pin circular connectors, one male and one female, each one on a separate CB8 board and develop a custom pin map for it.

Note that this example serves only to illustrate the process you will use and is not intended as a detailed explanation of the steps

A detailed explanation will come later in Section 9.13 in several examples.

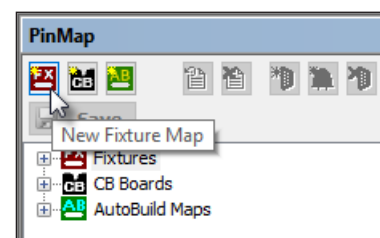


1 – Mount the 2 custom boards, each on one bank. Refer to the photo above showing only the left side board connected. You may mount more than one connector on these boards if there is room. A total of 62 pads are available, divided among as many connectors as you can fit on the board.

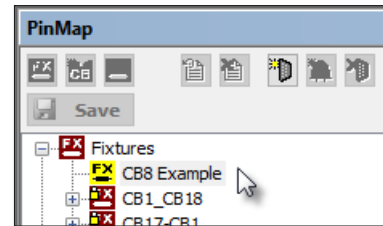
2 – Attach the probe to CableEye and set the Active Test Points switch to 152.



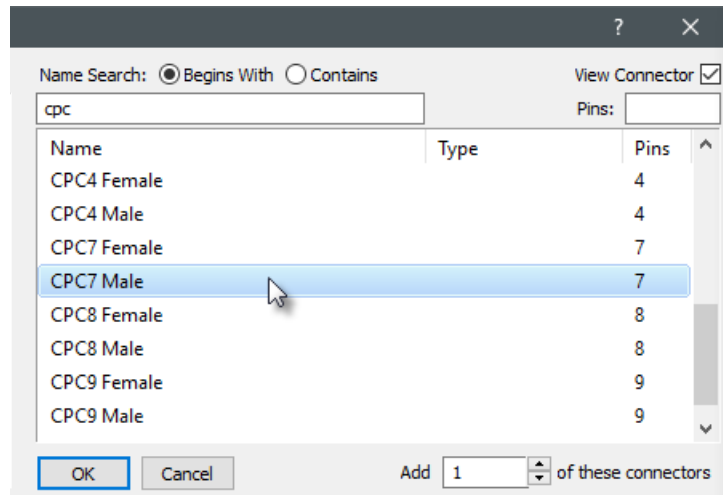
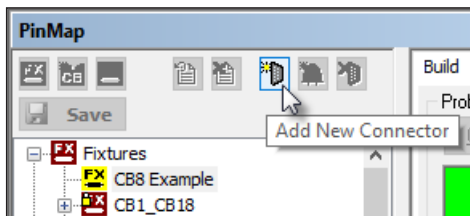
3 – **Start** the **CableEye** application and **click** the **MAP button** (above, right) to start PinMap. A new window will appear named *PinMap*. The upper left corner of this screen consists of some small control buttons and a file tree. Three types of maps may be created, *Fixture* maps, *CB Board* maps and *AutoBuild* maps. We will discuss the differences later. For this application, we need a *Fixture* map and will **click** the **FX button** at the top to create a new map.



4 – Once you click the FX button, you must supply a name for the new map. We will call it “CB8 Example” and **type in the name**. After the name is entered, the file tree then expands to show our new map followed by the names of all other FX maps included with the system. You will note the FX icon for our new map appears *yellow* indicating that the map contains new data not yet saved.

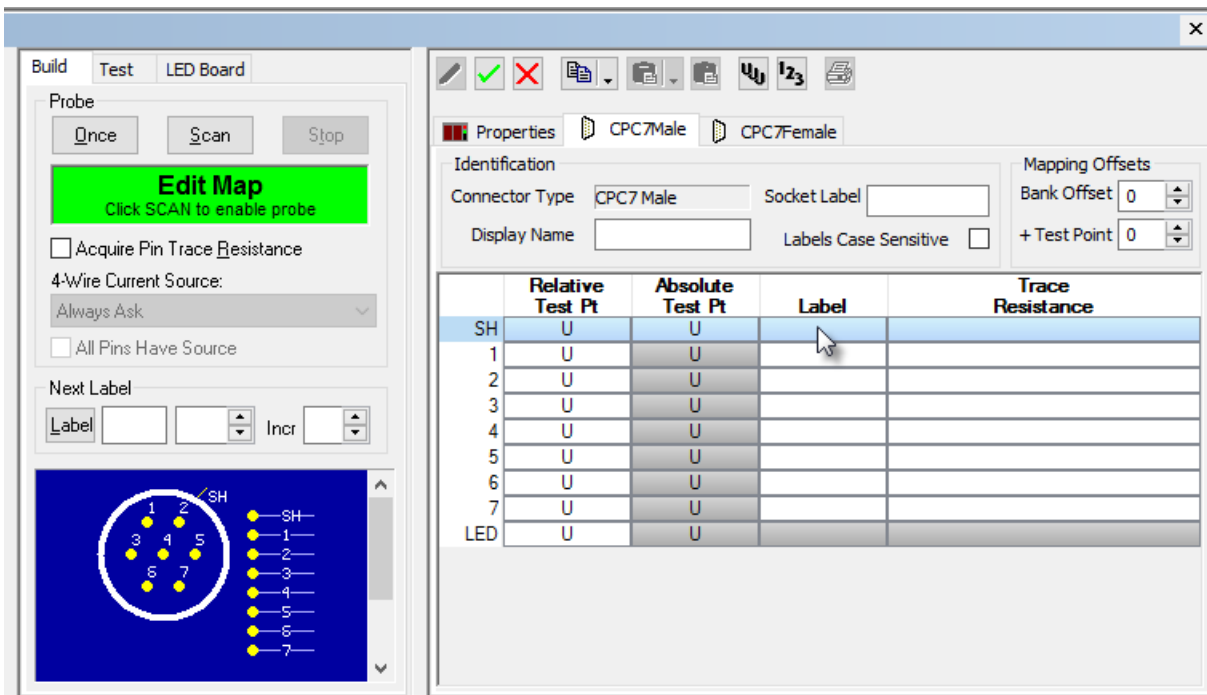


5 – Go back to the Control buttons at the top and **click on Add New Connector** to bring up the *Connectors* pop-up. We now choose the graphic we’ll use to represent each connector on our CB8 boards. Note that if you have two or more connectors on the board, you would choose a separate graphic for each one.



In this example we selected the standard CPC7 Male and CPC7 Female Connectors.

6 – Once you have chosen the two connectors, their images will appear along with a grid in which we will add the test point numbers. The connectors are separated in tabs, as shown below. **Click on the tab of the connector** that you want to map first and then **click the first line of the grid** to select the Shield connector, then **click the Scan button** on the left side to activate the probe. At this time, the *Busy* light on the CableEye tester begins flashing.



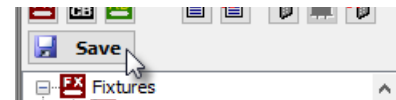
7 – **Touch the probe to the Shield** conductor on your circular connector. You will hear a Beep if your computer has speakers connected to confirm that the probe has detected a pin. Then, the *Relative Test Point* column in the grid will show the test point to which the Shield is actually connected, and the blue highlight will advance to Pin 1 (next row).

	Relative Test Pt	Absolute Test Pt
SH	4	4
1	3	3
2	8	8
3	12	12
4	U	U
5	U	U
6	U	U
7	U	U
LED	U	U



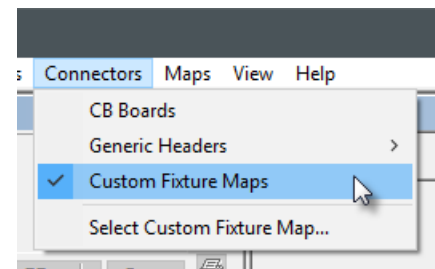
Continue this process until all pin numbers have been defined.

8 – Finally, to finish your edit **click the green check** , and then in the file tree controls, **click the Save button**.



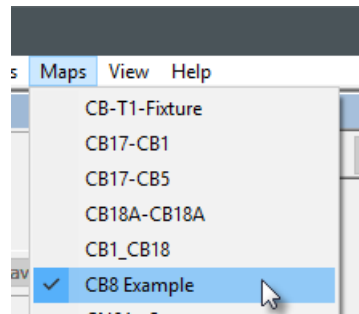
9 – With the map complete, **click the MAP button** on the left side of the screen to turn off PinMap and resume the main application.

Because we created a Fixture Map map and not a CB Board Map (described later in this section), we have to select the fixture map that we just created from the list of available maps.

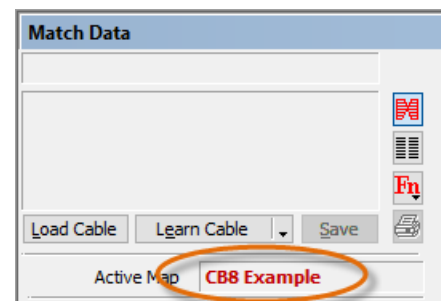


10 – **Click on the Connectors menu** and then **select Custom Fixtures Maps** from the menu.

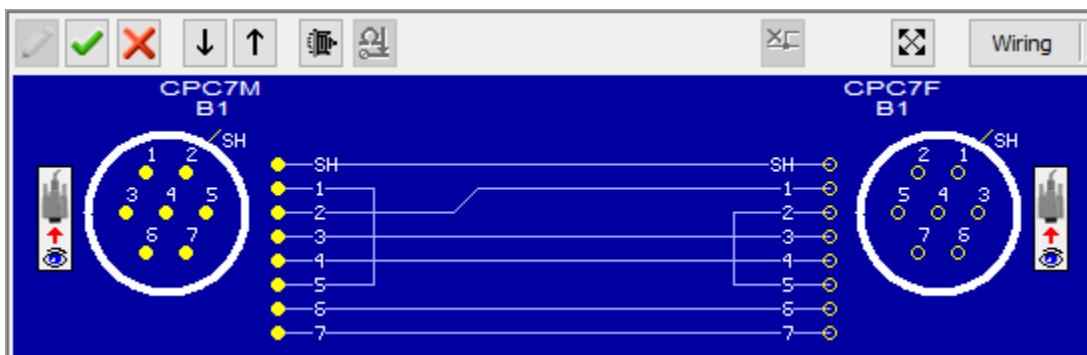
11 - **Click on the Maps menu** and **select the CB8 Example** map that we just created.



Note that the currently selected map is now displayed on the Active Map box, in the Match Data Window.



10 – Finally, test a cable using the new map we’ve created. **Attach a cable**, and **click Test Cable**. If we’ve made no errors making the new map, we will see the desired test results.



9.7 The PinMap Software

In this section, we begin a detailed review of PinMap’s controls and operation. You may wish to follow this section while at your computer to see first-hand how the software responds!

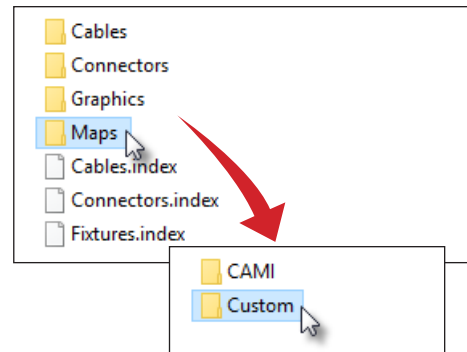
9.7.1 PinMap Terminology and Organization

CableEye employs *map files* to relate hard-wired connector interfaces to the graphics and pin labels that appear on the screen. Individual map files reside in CableEye’s *Maps* folder:

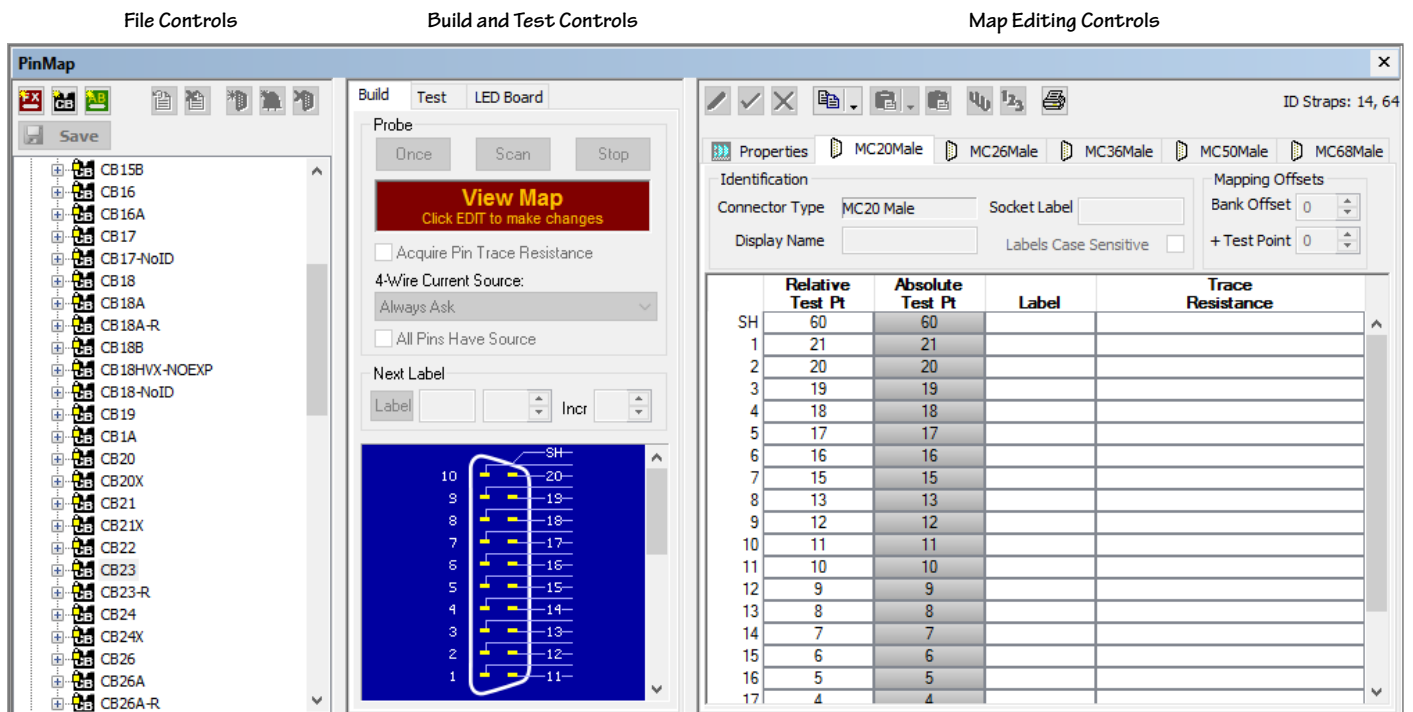
Program Files (x86)\CableEyeV5\Software\Databases\Maps

We subdivide the Maps folder itself into CAMI maps and Custom maps to make it simpler and faster for you to back up special data files you create. All of the map files you develop reside in the Custom maps folder.

The *PinMap* software permits you to create and edit map files. Click the Map button to turn on the PinMap and show the *Fixture Editor* window. During map editing, the Fixture Editor window will appear as shown below.



The PinMap window consists of 3 panels as displayed below. Each one of these panels will be explained in detail.



9.7.2 File Controls

The PinMap's left panel has file and connector control buttons and a *File Tree* as shown on the right. Click the "+" button to expand the file tree. All map files present in your Maps folder appear in the tree. Each map file generally consists of two or more connector maps.





Buttons above the file tree let you control the creation and deletion of map files and the individual connector maps they contain. Note that three types of map files are possible, *Fixture Maps*, *CB Board Maps* and *Autobuild Maps*. Each has different properties and would be used in different situations; these differences will be described shortly.

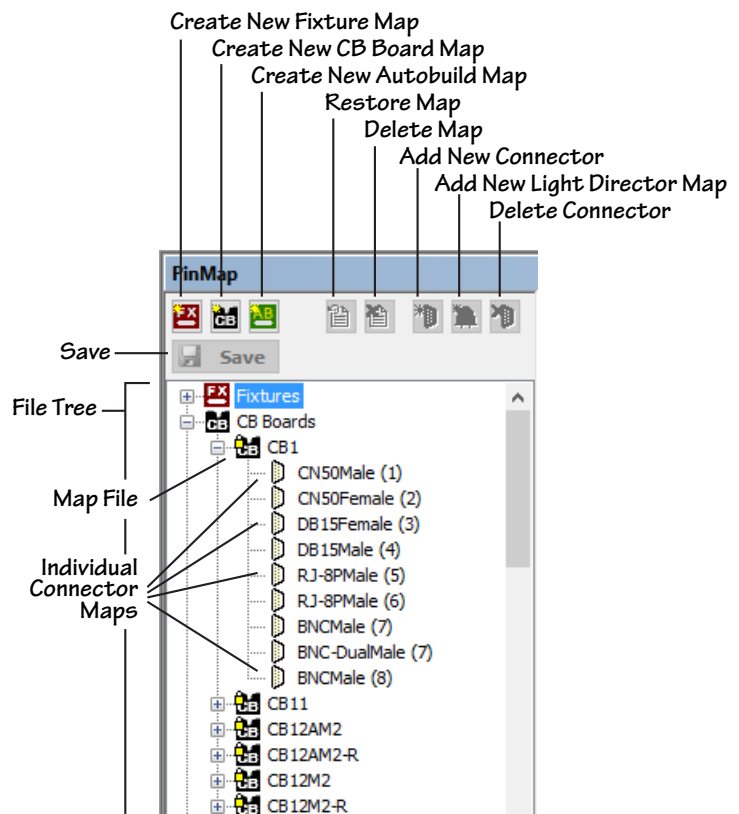
After you've built a new test fixture or mating harness, you would then typically create a new map file for it and add connector images for each mating connector on the fixture.

Use **Create New Fixture** , **CB Board**  or **AutoBuild Map**  to start a new map file.

Then use **Add New Connector**  button to populate that map with the connector graphics needed.

In the file tree above, you see the CB1 map expanded to show all the connectors it contains. The numbers in parentheses next to each graphic name show the *socket number* we have assigned to that connector; this socket number is also printed on the board itself.

The Save button  Save saves any editing changes, whereas Restore Map  discards the changes, restoring the map to the last time that it was saved. Use Delete Map  to discard a map file no longer needed, and Delete Connector  to remove an individual connector from a map.



9.7.3 Fixture Maps vs. CB Board Maps

Fixture Maps and *CB Board Maps* have different properties. When creating a new pin map, decide which to use based on the following description:

CB Board Maps apply to relocatable fixtures that may be operated in different banks of the tester. All standard CAMI CB boards fall in this category. You may attach a CB plug-in board to *any* bank (recall that Bank 1 covers Test Points 1-64, Bank 2 covers Test Points 65-128, etc.) and expect it to work properly. CableEye's software will recognize the board based on its ID jumper, determine in which bank it resides, and develop an automatic offset from test point 1 to where it's actually installed. This permits you to mix and match boards and place them in any available bank in the test point address space. The software will *automatically* recognize CB boards and draw the proper graphics and pin numbers on the screen according to the connectors in use.

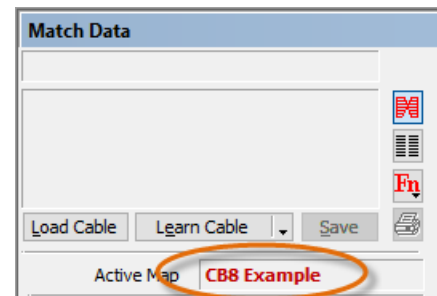
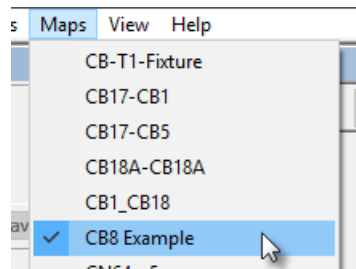
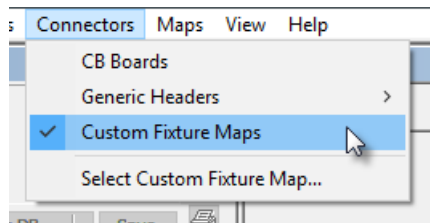
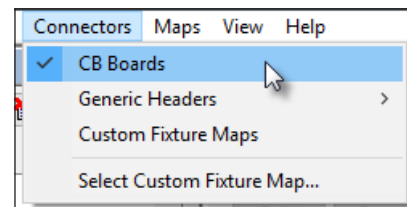
Maps for all standard CB Boards appear in the CB Boards file tree, even boards you have not purchased. Should you design your own plug-in boards and add a jumper ID between Pin 64 and another pin unassigned to any other board, you may use your custom board in combination with any other CAMI board we have available. In summary, CB Board Maps:

- should be created for relocatable fixtures like CAMI CB boards, or for plug-in boards of your own design;
- require a jumper ID connected between Pin 64 on that board to another unique pin not used by any other board (see page 9-24 for ID strap assignments);
- are limited to 64 test points or less, or greater than 64 test points when an expander cable is employed;
- permit the sharing of test points among connectors on the board as long as only one connector among those sharing the points will be used at one time;
- may be mixed and matched with existing CAMI CB boards.

Fixture Maps apply to mating harnesses or connector panels that reside at permanent, unchangeable locations in the test point address space. Use Fixture Maps when your test fixture connects to CableEye with flat cable or other external cabling and does not consist of interchangeable boards. In summary, Fixture Maps:

- operate at a fixed, predefined position in the test point address space and may not be relocated without changing the map;
- do not require a jumper ID;
- may encompass as many test points as needed, from test point 1 up;
- do not allow test points to be shared among connectors;
- may not be used with CAMI CB boards unless the CB board map is specifically embedded within the fixture map at a fixed bank address.

Important: When preparing to test cables or harnesses, use the Connectors menu to set the system for CB Board Maps (right) or Fixture Maps (below). Once you learn a cable and save it to the database with a custom fixture map selected, that map will be saved with the cable and restored automatically when the cable is loaded in the future.



9.7.4 Build and Test Controls

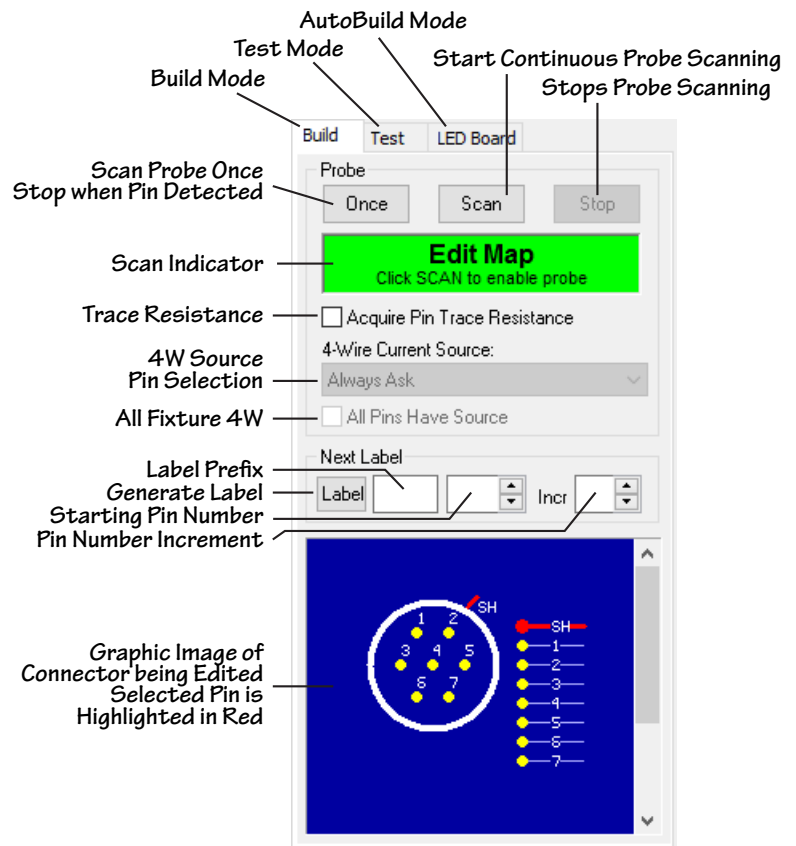
Developing a pin map largely involves entering test point numbers in a grid and, if desired, assigning alternate text labels to the pins. CableEye automates this process to a high degree by use of a *probe*, and a *label generator* if you wish to add alternate labels. The Build panel provides controls for this purpose.

We use the Build panel to view the connector being mapped, set up the label generator, and activate the probe. These functions will be demonstrated later.

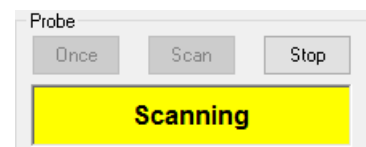
Note: before using the probe, be sure to set the *Active Test Points* switch on CableEye to 152 and attach the probe to the DB9 connector on the right side of the tester!

This panel is used *when creating a map*, at which time we touch the probe to pins one-by-one in numerical order while the software detects the test point number to which each pin is connected and enters this number in the grid. As we go through this process, the graphic pin that is next to be probed glows red on the connector drawing.

We use the Test mode *to check a completed map* and ensure that the physical pin number on the connector corresponds with the pin number shown in the grid. When in Test mode, we can touch the probe to pins in *any order* to cause the corresponding pin on the graphic to glow red and the grid row to highlight.



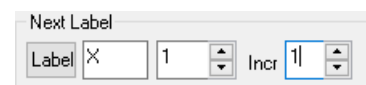
Scan initiates a continuous scanning process on all test points. When you press the button, the indicator changes to yellow with the word Scanning displayed. When you touch the probe to a pin on your fixture, the probe signal passes into a test point and software then identifies the test point number to which it is connected. This number writes to the grid automatically, and the grid advances to the next successive pin number waiting for the next probe contact.



Stop is enabled when scanning continuously and will terminate the process of pressed.

Once functions like Scan but stops after a pin is detected and waits for you to click the button again to continue.

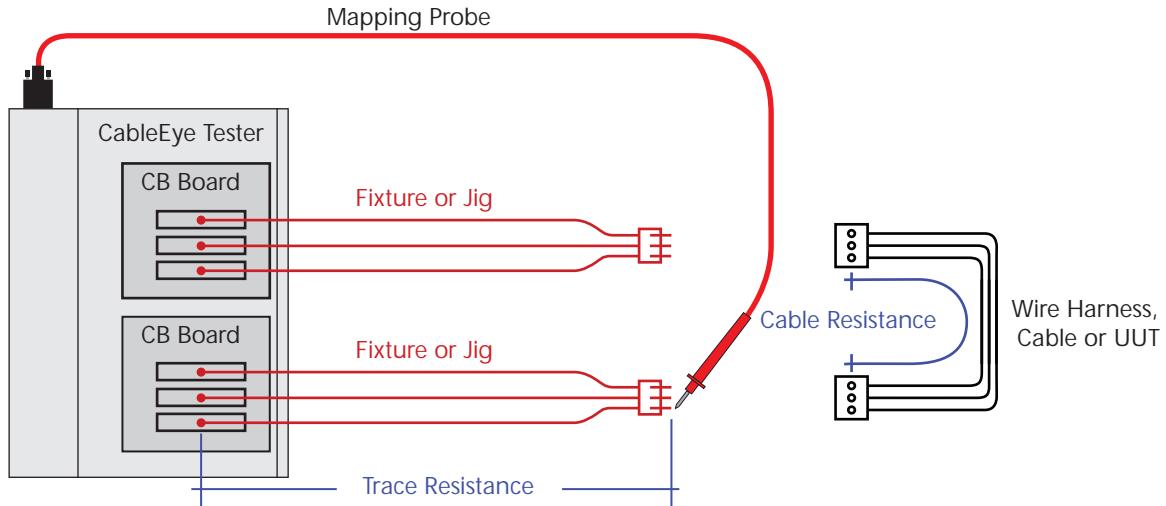
Label generates one pin label based on the prefix, current label number, and increment specified in the Label Setup Boxes. Note that if you set up the label generator *before* you start to probe pins, the labels will insert automatically with each new pin the probe touches.



This example generated pin numbers automatically as follows: X1, X2, X3, etc.

Acquire Pin Trace Resistance - You may optionally include trace resistance for each one of the pins in your fixture map. Trace resistance is explained in detail on section 4, page 4-16.

The following drawing displays the trace resistance in the fixture or jig and the probe during mapping.



When *Acquire Pin Trace Resistance* box is checked, PinMap will measure the resistance for each one of the mapped test points, from the tip of the mapping probe, all the way to the internal circuitry in the CableEye tester.

Note in the drawing above that the displayed trace resistance will be measured and stored with the map as shown below. The trace resistance measured will then be used when the cable is tested and subtracted from the measured resistance.

With this method, any resistance in the electrical fixture leading to your wiring will not affect your readings, giving you better and more accurate resistance results.

The screenshot shows the PinMap software interface. The 'Acquire Pin Trace Resistance' checkbox is checked. The '4-Wire Current Source' is set to 'Always Ask'. The 'Next Label' is 'G'. The table below shows the test results for various pins, with the 'Trace Resistance' column circled in red.

	Relative Test Pt	Absolute Test Pt	Label	Trace Resistance
SH	43	43		0.2
A	44	44		0.2
B	41	41		0.3
C	42	42		0.2
D	39	39		0.2
E	46	46		0.3
F	45	45		0.4
G	U	U		
H	U	U		
J	U	U		
K	U	U		
LED	U	U		

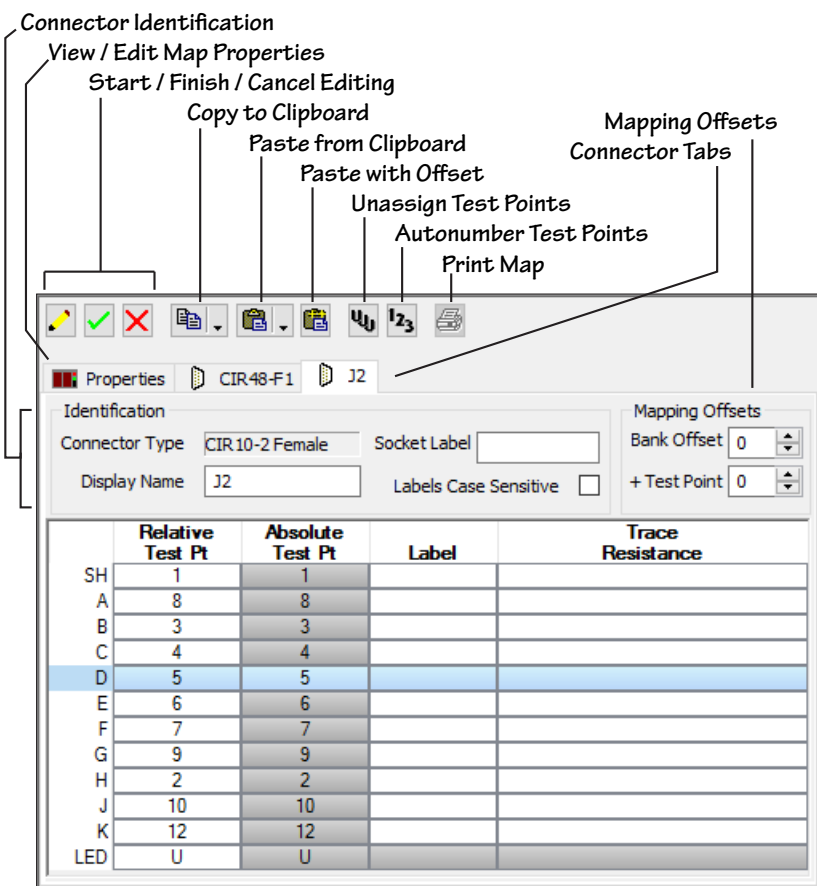
Note that acquiring trace resistances slows down the scan process since PinMap must wait for the probed resistance value to stabilize. Be sure you make clean, constant contact to the pins as you are probing them.

4-Wire Current Source - This option allows you to automatically define which probed pin will become the current source for a pair of test points. 4-Wire mapping will be explained in more detail in section 9.11.

9.7.5 Map Editing Controls

The grid panel on the right side of the screen shows the pin map data and provides a means for it to be entered, changed, copied, pasted, and cleared. All connectors contained in a map file are named in tabs above the grid along with a *Properties* tab that shows options you may apply to the map.

The grid shows all test points involved in a test connector. If you've created a *CB Map*, the connectors may have overlapping test points, but those that do *may never be used at the same time during testing*. Because CB maps are relocatable, all test points are shown relative to pin 1 on the CB board. During mapping, the absolute test points always appear equal to the relative test points. During testing, however, the software automatically adds an offset according to the bank in which the board is actually connected: Bank 1, offset = 0; Bank 2, offset = 64; Bank 3, offset = 128; etc.

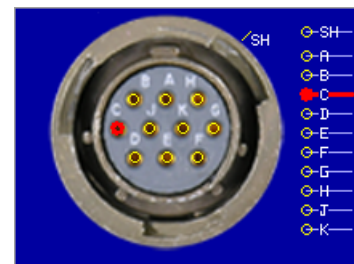


If you've created a *Fixture Map*, the connectors *should not* have overlapping test points. Connectors in a Fixture Map are assigned to fixed test points which may range from 1 to the highest test point supported by the hardware. The test points a connector uses need not be sequential or even adjacent, as long as no other connector uses them. During mapping, the numbers shown in the Relative Test Point column show the actual test points detected when probed.

As long as you use the probe to assign test points, the Relative and Absolute Test Point columns will be identical. Only when you enter a manual *bank offset* in the *Properties* panel will the Absolute Test Points become larger by some multiple of 64, something that is done only in very unusual situations.

The **line number** of the grid represents the *pin number* of the connector graphic. When you click on a row in the grid to select it, the corresponding pin number in the graphic appears highlighted (right). If you wish to use the natural pin number of the connector, leave the *Label* column blank. Enter label values here *only* if you wish to override the natural pin numbers with your own labeling scheme.

	Relative Test Pt	Absolute Test Pt
SH	1	1
A	8	8
B	3	3
C	4	4
D	5	5
E	6	6
F	7	7
G	9	9
H	2	2
J	10	10
K	12	12
LED	U	U



LED Pin – Use the “LED” pin shown in the last row if you wish to flash an LED lamp to identify the connector during Guided Assembly. In most cases it remains “U” for unassigned. If it were used, that test point would be wired to the cathode (“-” terminal) of an LED lamp located in close proximity to the connector. The anode (“+” terminal) would be wired to a pull-up resistor appropriate for the power supply used (typically 220Ω for a +5v supply).

Label Length – A label may contain any number of characters. However, in wiring graphics, the software has room to display *only three characters* of the label to avoid interfering with connector shells, pins, and wiring. If a label has more than three characters, only the right two appear, with a *tilde “~”* in the third position to indicate the presence of missing characters. Thus, a label “C523” would show in a wiring diagram as “~23”. The full label with all characters present always appears in the net list.

Upper and Lower Case Labels – CableEye normally shows upper-case labels in graphics and net lists regardless of the case used when you enter the label in the grid. We do this because upper case letters are generally easier to read on a crowded display or report. In some situations, you may need to show lower-case labels, such as to show the pin “Aa” or “Ab” as might appear on some connectors. Check the “Labels Case Sensitive” box just above the Label column to permit upper- and lower-case labels.

Connector Identification – The *Connector Type* identifies the connector graphic you’ve chosen from the CableEye graphics library; this is unchangeable. If you leave the *Display Name* box below it blank, then CableEye uses the standard Connector Name on the video display and wiring reports by default. If you wish to override the default name with your own choice, such as with a connector number, then enter the name you wish in the Display Name box. Note that this name will appear in the netlist automatically as the prefix of the pins.

Identification	
Connector Type	CIR 10-2 Female
Socket Label	
Display Name	J2
Labels Case Sensitive	<input type="checkbox"/>

Assign a *Socket Label* to designate a *connector position* on the board. You may, for example, have three or four *identical* connectors on a CB board as on the CAMI CB18 board set which has eight RJ45 receptacles. In this case, we will need to identify the socket positions so that when a test cable is attached to the fixture, it may be reliably connected in the same manner each time it is tested: Connector J1 to Socket 1, Connector J2 to Socket 2, etc.

Mapping Offsets – In most situations, the *Relative Test Point* and *Absolute Test Point* columns show the same value. However, when we paste data from one map into another map, it may be desirable to shift the original position of the imported map up or down by a fixed amount. We use the *Mapping Offsets* controls to do this.

In the first example shown here, we set the bank offset to “1” which adds 64 to every value shown in the relative test point column. In the second example, we set the bank offset to “2” which adds 128 to every value, and the test point offset to 10, which adds an additional 10 to every value. The offset can be positive or negative, and apply in increments of one bank (64 points) plus individual test points offset if necessary.

Mapping Offsets	
Bank Offset	0
+ Test Point	0

	Relative Test Pt	Absolute Test Pt
SH	1	1
A	8	8
B	3	3
C	4	4
D	5	5
E	6	6

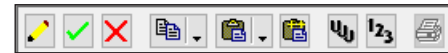
Mapping Offsets	
Bank Offset	1
+ Test Point	0


	Relative Test Pt	Absolute Test Pt
SH	1	65
A	8	72
B	3	67
C	4	68
D	5	69
E	6	70






Mapping Offsets	
Bank Offset	2
+ Test Point	10


	Relative Test Pt	Absolute Test Pt
SH	1	139
A	8	146
B	3	141
C	4	142
D	5	143
E	6	144


A series of buttons along the top of the grid panel provide controls for grid editing. Use these when you wish to enter or edit test point data.

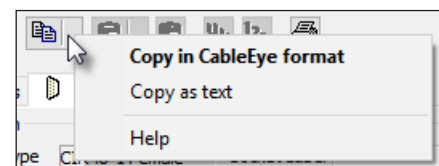



Edit Map  enables the grid for editing. When this happens, grayed-out fields in the Identification and Mapping Offsets boxes become active, and an edit box appears at the top of the Relative Test Point column. Note that only the Relative Test Point and Label fields are editable. The Absolute Test Point field is *computed* from the Relative Test Point and Mapping Offset values, and the Pin ID field (line number in the grid) is fixed by the connector type.

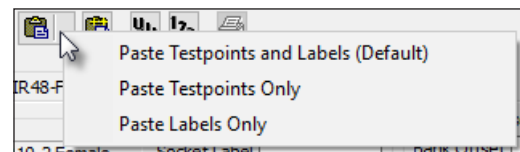
Edit Done  copies your changes into the map file. After you press this button, the changes reside in a temporary buffer and are not saved until you press the Save button  **Save** above the file tree. If you wish to cancel your edits before you press this button, use the Restore Map button  above the File Tree. Note that the icon for your map in the file tree turns yellow  when editing changes have been made but not yet saved, and returns to its normal color  once the changes have been successfully saved.


Cancel Changes  discards any changes you made to the map file and restores the original data. You may not undo this.

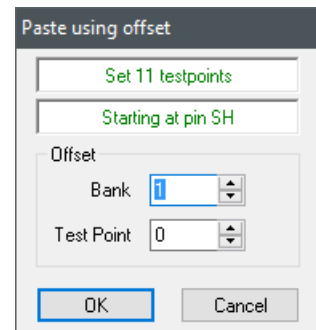
Copy Map to Clipboard  copies the selected map into the clipboard using the format you choose from the pull down menu (right). Use *Copy in CableEye format* if you intend to paste it into another CableEye map. Use *Copy as text* if you plan to paste it into another application like Excel or Word.




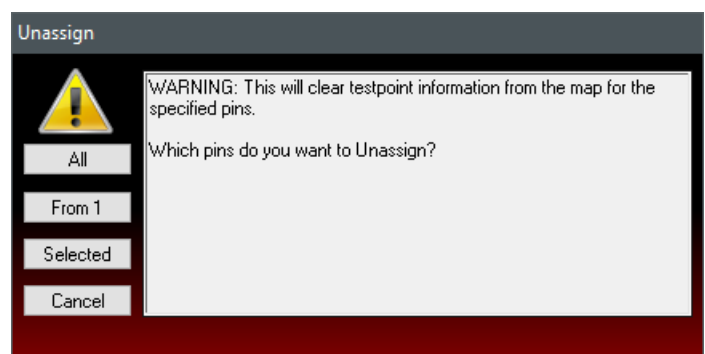
Paste Map from Clipboard  pastes a map into the currently selected map file, overwriting any map data already there. If you click the small arrow, you will get a pull down menu (right) with three options. The default pastes test points and labels, but you can choose to paste only Test Points or Only Labels if needed.




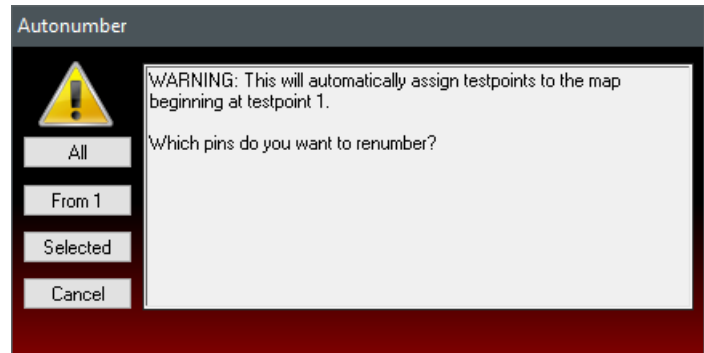
Paste Map with Offset  operates just like Paste Map from Clipboard but with two differences: (a) You may paste at a starting point other than Pin 1. To do so, click on the row in the grid on which you wish to begin inserting the clipboard data before clicking the button. Lines before the selected row remain unchanged. (b) You may add a bank and test point offset to the values pasted in, if desired. A pop-up window appears after you click *Paste with Offset* for entry of the offset values as shown on the right.



Unassign Testpoints  replaces any existing data in the map with "U" to indicate that a pin in a connector does not have a test point assignment. A pop-up window appears when Unassign is clicked giving you three choices: (a) *Unassign All* clears the entire map. (b) *From 1* will clear from the currently selected row forward. (c) *Selected* will clear a range of rows that you have highlighted. This provides a quick way of deleting a block of entries that are no longer required. You may manually type in a "U" for individual test points.



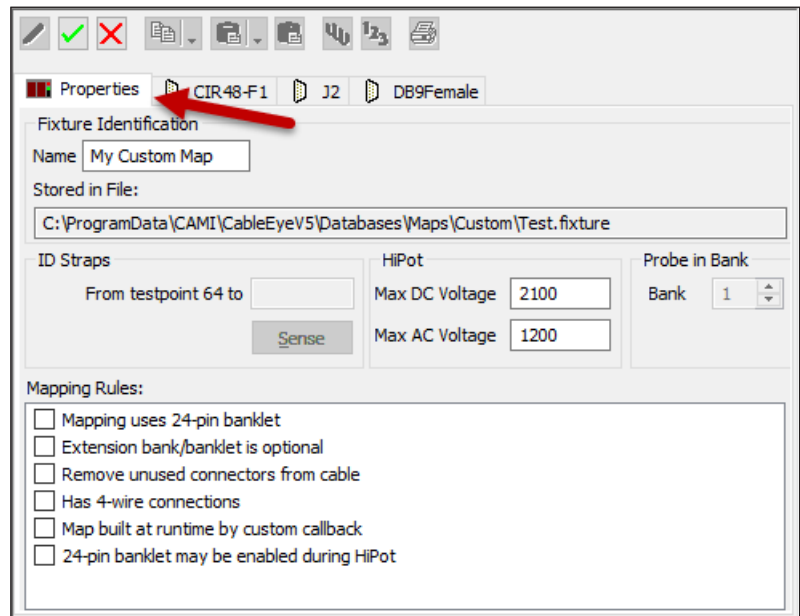
Auto Number Testpoints  replaces any existing data with a numerically increasing sequence of test points beginning at “1”. As with *Unassign Testpoints*, a pop-up window appears giving you three choices: (a) *Auto Number All* starts the numbering sequence from the first row in the grid. (b) *From <X>* starts the sequence from the currently selected row forward. (c) *Selected* auto numbers over a range of rows that you have highlighted. This function offers a quick way to assign test points that advance in a natural sequence in your test fixture. This would be the case when the physical connector you are interfacing has been wired to the test point bus in pin order.



Print  prints the currently selected map. The Identification, Mapping Offsets, and Test Point Table are printed to fit the format of a standard page.

9.7.6 Map Properties

The Properties tab in the Editing Controls panel reveals various attributes and options that apply to the map.



Fixture Identification – This shows the name of the map file. You may change it here, if desired. Note that you are free to change CB Board Map names at any time.

*Note: If you change a **Fixture Map** name, you will also need to change its name in any stored cable files that use that fixture!*

Failing to do this will mean that stored cables will be unable to locate the map they need when you test a cable or harness using that fixture.

Stored in File – This uneditable line shows where this map is located on your hard drive. You might need to know this for backup purposes, or if you want to copy a map to another computer.

ID Strap – This choice applies to CB boards only and assigns this board a unique ID that the software uses to distinguish boards. The 1st jumper position of the ID strap must always be pin 64, and the second may be any other number. The table at the right summarizes these assignments.

Test Point Range	Assignment
1 – 10	Customer Use
11 – 63	Reserved for CAMI Boards
65 +	CAMI and Customer Use

Some CAMI boards have multiple ID options, each selecting a different map or labeling option. The CB8 board, for example, reserves three ID numbers: one for numeric pin IDs (TP 51), one for alphabetic pin IDs (TP 52), and one for customer use (TP 53). So, if you use a CB8 board and



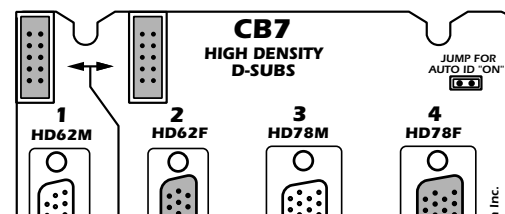
change the jumper to *Custom*, you may assign the map to ID Strap 53 in the Properties tab and that board will not interfere with any other board.

If the CableEye software finds a conflicting ID assignment, a dialog box will appear asking you to select which CB board map you wish to use. While this is inconvenient, no damage will be done. Note that if you run short of ID Straps (you've used all ten positions assigned for customer use), you may remove any CAMI board maps that you don't need from the *Maps* folder (located in \Program Files\CableEyeV5\Software\Databases\Maps\CAMI\) to make that board's ID available for your own custom CB boards. However, if you remove CAMI maps to make use of their IDs for your own boards, the next time you upgrade your software, the CAMI maps will be replaced and you will again have two maps with the same ID. No harm is done, however, you will need to manually remove the offending CAMI maps to again allow exclusive use of those IDs for your own maps.

Important! HiPot - If your unit under test requires high voltage testing, your custom fixture should be designed to withstand the maximum voltage necessary for your testing. In the map, you can limit the maximum voltage that the tester can apply to your fixture in the event the test voltage is inadvertently set above this limit. This avoids a risk of insulation breakdown, arcing, or component damage. Enter these limits in the Max DC and AC voltage boxes.

Mapping Rules for CB Boards– These checkboxes apply only to CB Boards that require *more than 62* test points, like the CB7 board (below right). The CB7 supports DB78HD connectors with 78 pins, more than the 62 available test points on this board (remember that we reserve two additional points for the ID Strap, so this then totals 64). We supply an *Expander Cable* with the CB7 which connects to the two 10-pin headers on the board and brings additional test points in from another bank on an expansion module. The Mapping Rules checkboxes specify which bank the Expander Cable comes from:

Mapping Rules:	
<input type="checkbox"/>	Shared expansion bank (LEFT side mapping)
<input type="checkbox"/>	Shared expansion bank (RIGHT side mapping)
<input type="checkbox"/>	Mapping uses 24-pin banklet
<input type="checkbox"/>	Extension bank/banklet is optional
<input type="checkbox"/>	Single connector selection only
<input type="checkbox"/>	Has 4-wire connections



- two banks ahead of the board's current position ("... LEFT side mapping"),
- one bank ahead of the board's current position ("... RIGHT side mapping"), or
- the 24-pin expansion bank on the right side of the tester (we call this the *banklet*).

If the expander cable is not required to use some of the connectors on the board, then we check the fourth box, "Extension bank/banklet is optional".

It is possible to use 2 or more connectors at the same time in a CB Board map, as long as none of their pins share any test points. If "Single connector selection only" is enabled, you can only use one connector at a time.

If your CB Board fixture is intended for 4-wire testing, you should check "Has 4-wire connections".

Mapping Rules for Fixture Maps - As in CB Boards, you can define if the Banklet is used in the map or if it is optional, as well as define the map as a 4-wire fixture.

"Remove unused connectors from cable", simply suppresses the display of connectors that have no wiring leading to them when

Mapping Rules:	
<input type="checkbox"/>	Mapping uses 24-pin banklet
<input type="checkbox"/>	Extension bank/banklet is optional
<input type="checkbox"/>	Remove unused connectors from cable
<input type="checkbox"/>	Has 4-wire connections
<input type="checkbox"/>	Map built at runtime by custom callback
<input type="checkbox"/>	24-pin banklet may be enabled during HiPot

a harness is tested; this makes available more valuable screen area for the connectors that do contain wiring.

You can build the map at runtime with the proper callback events. A callback is a routine that is executed if a condition is met. Check custom callback events on page 8-9.

The 24-pin banklet is not HiPot capable, however, you can enable it to test for low voltage first, and then switch it off when high voltage is applied. You do this by checking the last option, "24-pin banklet may be enabled during hipot".

9.7.7 Mapping Test Points

After you've created a map file and loaded it with the connector graphics you need, there remains the task of entering the test point assignments that link the graphic to physical pins on your mating connectors. You may do this either using the probe (preferred) or manually. Use the probe whenever possible because of increased speed and accuracy compared to manual entry. When you enter test points in the grid, keep in mind the following guidelines:

1. You may assign a specific test point to *only one pin in the same connector*. If you inadvertently touch the probe to a previously sampled pin, a warning message will appear asking you to choose which pin you intend to assign to this test point.
2. When a connector graphic includes a shield (sometimes called a shell), it appears in the Pin Name column abbreviated "SH" (right). Some connectors, such as standard dual-row headers, do not have a shield and thus the letters SH would not appear in the Pin Name column for that graphic (below right). If you plan to test the shield of the connector, make sure that the graphic includes one.
3. If the connector graphic has more pins available than your physical connector actually has, you may leave unused pins in the graphic unassigned ("U").
4. If you know the cable connected to your fixture will not be fully populated with pins, you need not assign test points to those unused connector pins if you are running short of available test points. However, we don't recommend this for the simple reason that should a wiring error exist in the cable in which a pin assumed to be unused becomes wired (due to a short circuit or miswiring), CableEye will be unable to display or identify the error.
5. Custom Pin Labels override the natural pin numbering scheme shown in the Pin Name column. Use them when you use a connector graphic that differs from the physical connector on your fixture or to develop a special labeling scheme for the connector.
6. A pin label may be any length desired, although it is generally not practical to have labels more than 10 characters long. Also, on graphic wiring diagrams, we have room for only three characters per pin label. If a label contains more characters than this, only the right two characters appear, with a tilde ("~") in the left position to denote that some characters are missing. The netlist always shows the complete pin label.

9.8 Creating a CB Board Map


Recall that *CB Board Maps* apply to relocatable fixtures that may be operated in different banks of the tester. All standard CAMI CB boards fall in this category. You may attach a CB board to *any* bank (Bank 1 covers Test Points 1-64, Bank 2 covers Test Points 65-128, etc.) and expect it to work properly. CableEye's software will recognize the board based on its ID jumper, determine in which bank it resides, and develop an automatic offset from test point 1 to where it's actually installed. This permits you to mix and match boards and place them in any available bank in the test point address space. The software will *automatically* recognize CB boards and draw the proper graphics and pin numbers on the screen according to the connectors in use.

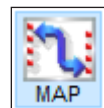
Custom CB Boards may be created in these different ways:

- a. You may design a fully custom plug-in board for your special needs.
- b. You may mount your own special connectors on a standard CB8 board (64 points) or CB30 board (128 points).
- c. You may employ a standard CableEye CB board with different connectors than intended in its original design. This is possible by either building a custom adapter cable having a standard connector on one end and your custom connector on the other, or by purchasing a blank standard CableEye board to make use of its connector footprints for your own purposes.


For any of these situations, developing a CB Board map as described in this section will allow your custom CB boards to be used interchangeably with all standard CableEye boards.

Important: Before starting this procedure, your custom CB Board hardware should be completely finished and attached to Bank 1 (the software expects all CB boards to be mapped from Bank 1; this eliminates any offsets). Banks 2 and above should remain unoccupied. The cable you intend to test *should be disconnected* from the board and all mating connectors on the board exposed and available for probing. Remember that the map we will make establishes connections between your hardware fixture and the test point connectors on CableEye, and is *completely unrelated to the cable or harness you need to test!*

1. Start the CableEye application and **click** the **Map** button along the left side of the screen start PinMap.
2. **Click** on the **New CB Board Map** button  to start a new map.
3. **Enter a name** for your new map when the pop-up window appears.

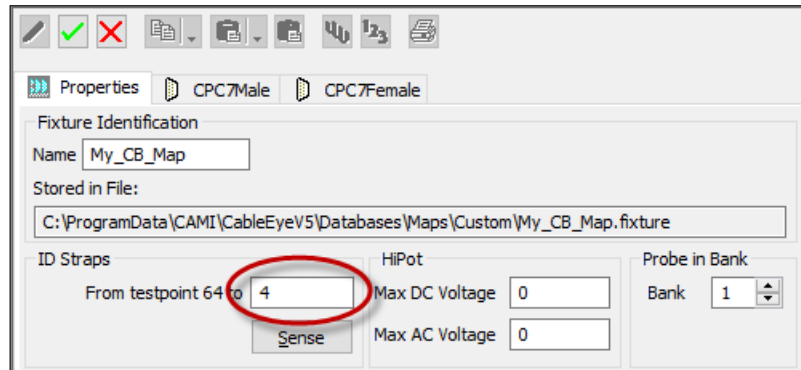


Naming Suggestion: Don't use the part number of the device you will be testing! You may use the CB Board to test *any device that mates to it*, even if it has vastly different wiring than the cable you intend to test now. Also, apply a label to the CB Board itself to match the map name you give it here.

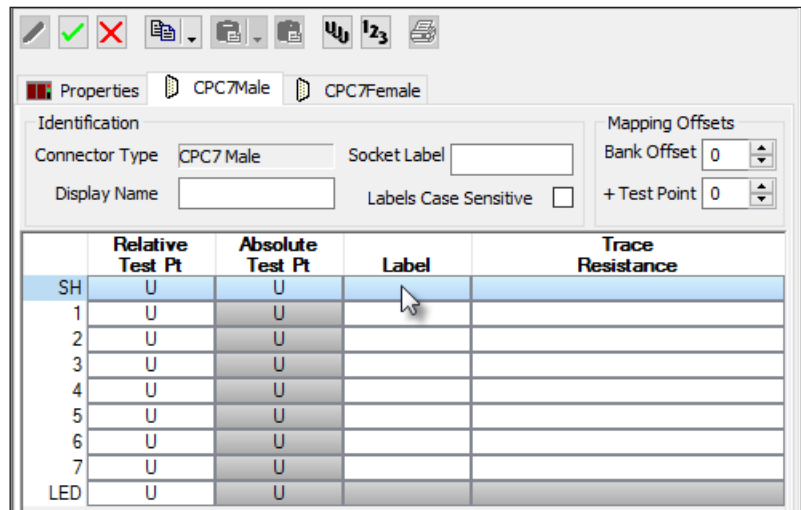
4. **Click** on **Add New Connector**  and choose the first connector graphic for your board. Continue adding connectors until you have one graphic for each connector present on your CB board.

Important: When you add connectors, choose the gender of the connector *on your cable or harness*, NOT the gender of the mating connector! The connector you select here is what you will see on the screen when CableEye displays wiring.

5. Click the **Properties** tab and **Enter** the **Jumper ID** for your board in the ID Strap box. The ID you enter applies to *all* connectors in this map. Recall that we have reserved IDs 1 to 10 for customer use, and 11 to 63 for standard CableEye CB Boards. You may use IDs above 11 if you don't use the CableEye board assigned to it and delete that board's map.





6. Click the **tab of the first connector** you would like to map, and then **enter** an optional **Display Name** and **Socket Label**. If you leave the Display Name blank, then the Bank and Socket Number, such as "B1:3", will appear above the connector in the graphic display and netlist when the cable is tested. "B1:3" would show that the CB board is plugged into Bank 1, and the cable you are testing is connected to Socket 3 on that board. If you don't leave the Display Name box blank but instead enter a connector name such as "J1", then that name appears above the connector on the graphic display and netlist.



7. Click **Scan** to activate the probe. Note that the first row of the grid, in this case "SH" (for "Shield"), is highlighted in blue.
8. **Touch the probe to the shield first.** The grid will advance automatically to the next row, so Pin 1 should be probed next. Pin numbers advance automatically in numerical order as you probe each successive pin on the mating connector. **Continue touching pins 2, 3, 4, etc.,** until complete.

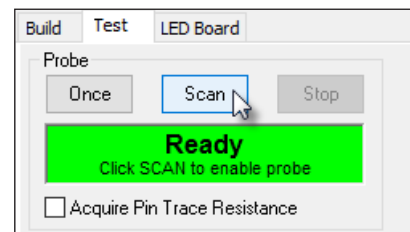
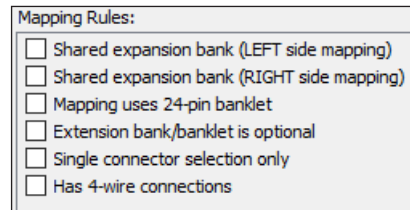
If you have speakers attached to your computer, you will hear a tone following each successful probe entry. If you inadvertently touch two pins at the same time, an error message will appear and you will be asked which pin you intended to touch.

9. The completed map should show a test point value for every pin on the connector. **Click the green check** button to copy to accept these values.

Note: The map file is not saved until you click the Save button  Save. Unsaved Fixture or CB Map files are highlighted yellow  in the file tree and change back to their normal color once saved.

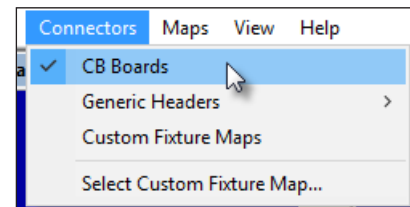
10. Repeat the process of assigning test points for each connector in your map. If you enter a Display Name for a connector, it will be added as a prefix to every pin number in the netlist to make the pin location clear. If you named the miniDIN8 connector above "J1", the first few pins of connector J1 above will appear as J1:SH, J1:1, J1:2, etc., in the wire list.

- Review the *Mapping Rules* you find in the *Properties* tab (right) and choose any that apply to your map. These options were explained in [Mapping Rules for CB Boards](#) in page 9-25.
- When each connector in your map has been probed and all grid entries show test point assignments, the map is finished. Before using the map, however, we highly recommend that you test it to ensure that all pins have been properly assigned. To use PinMap's special test tool, click the *Test* tab on the *Build and Test* panel and then click the *Scan* button to activate the probe. At this time, you may now touch the probe to any pin on the connector to highlight the corresponding pin on the graphic and row in the grid. So, if you touch Pin 5 with the probe, for example, Pin 5 on the graphic will glow red, and Row 5 in the list will highlight in blue. You may probe the pins in any order desired. When you see that each physical pin number on the connector highlights properly in the grid, you can be certain that the map is correct.



Comment: The probed pin numbers will be read to you through the speaker system of your computer and you need not continually look between the connector and the screen to confirm that the numbers match.

- Finally **Exit PinMap** by clicking the Map button on the left side of the screen. Because this map is a CB Board map, the final step is to ensure that you have **CB Boards selected** from the **Connectors drop down menu** on the top of the screen.



9.9 Embedding a CB Board Map in a Fixture Map


Generally, you choose to use either CB Boards when your cable mates with standard CAMI boards, or Fixture Maps when you've designed specialized hardware having the mating connectors you need. In some situations, such as those described below, you may wish to *embed an existing CB Board map in a custom Fixture Map*:

- Your test fixture combines one or more standard CB boards in fixed positions along with specialized custom-mounted mating connectors. Doing so saves you the time of designing and building mating connectors that already exist on stock CAMI boards.
- Your test fixture has connectors that share test points. These connectors can't be used at the same time but could be used at different times for different cables that share the same test fixture. Connectors can't share test points in Fixture Maps, but they can in CB Board maps. So, in this case, you would design the shared connector part of your map as a *CB Board*, then embed it into a Fixture Map where the rest of the connectors are defined.
- You need to use standard CB Boards, but the jumper IDs have been removed to access all 64 test points on the board. Consider using a CB18 board, having eight RJ45 connectors, and one CB1 board, having a 50-pin Telco connector. When all eight RJ45 sockets on the CB18 are used, no pins remain available for the ID strap, which must be removed. In this case, we would then define a Fixture Map consisting of embedded CB18 and CB1 boards.

Because embedded CB Boards occupy fixed positions in the test point range, the ID Jumper is not needed and must be removed. However, we must now specify a *bank offset* for any embedded CB board to fix the

board's position in the correct bank. Clicking the connector tab of an embedded board (above the grid) reveals a bank offset option for this purpose (demonstrated below).

Procedure:

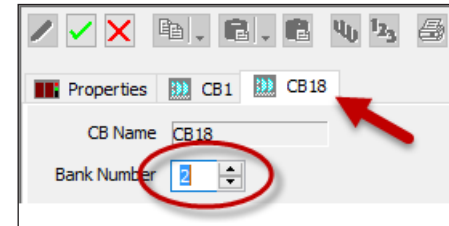
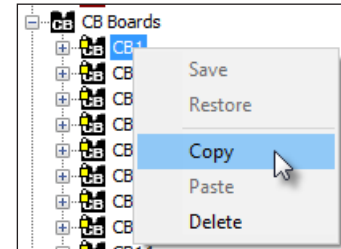
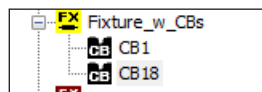
1. **Create a new Fixture Map**  in which to embed the desired CB Boards. For this example, we call the new Fixture Map *Fixture_w_CBs*. You may add any fixed connectors you need either before or after the CB boards are embedded, or use only the CBs.



2. **Right-click** on the **CB1**, **copy** it to the clipboard, and **right-click** again on *Fixture_w_CBs* to **paste** it into the fixture map.

Alternate method: If your screen size allows it, you can also drag and drop the CB Board into the Fixture Map.

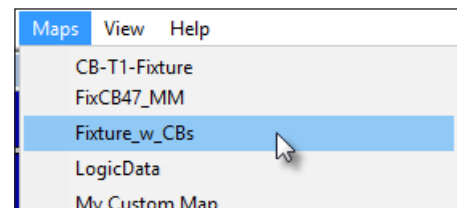
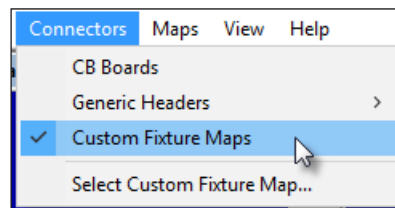
3. Repeat this process for the CB18 board.

4. **Click** on the **CB18** tab and **set the Bank Position to "2"** to fix the position of the CB18 in Bank 2. The CB1 board defaults to Bank one, so no change to its Bank Position is needed.



5 – Finally, **click the Edit Done**  button to commit your changes to memory, and **Click Save**  to save your changes.

6 – To use your newly-saved map for testing a cable, select *Custom Fixture Maps* from the Connectors menu and then *Fixture_w_CBs* from the Maps Menu.



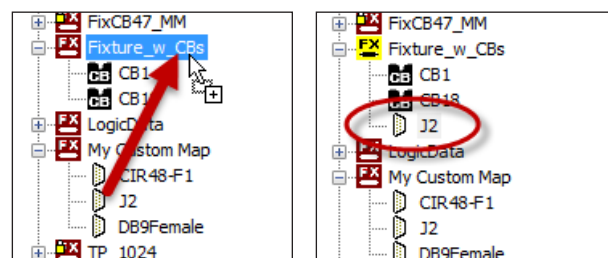
Ready to test!

9.10 Copying and Pasting Maps

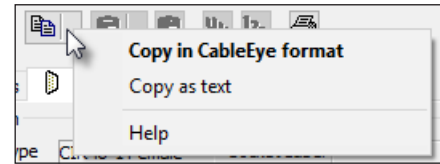
On occasion, we find it necessary to copy a connector map from one map file to another, or to export the map data to a text file. PinMap permits this either by using *drag-and-drop* methods for moving whole connectors between maps, or, when you wish to move the test point data alone without connector information, by using the clipboard in a manner consistent with other Windows applications.

To move a whole connector from one map to another, simply drag it from the first map into the second one as shown on the right.

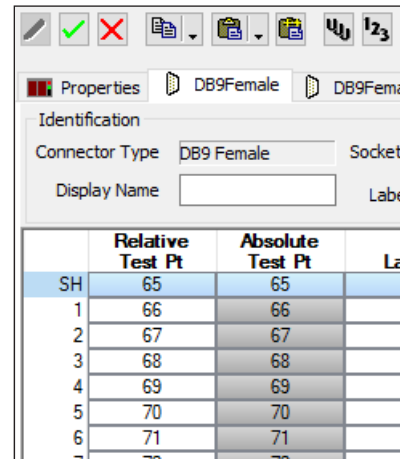
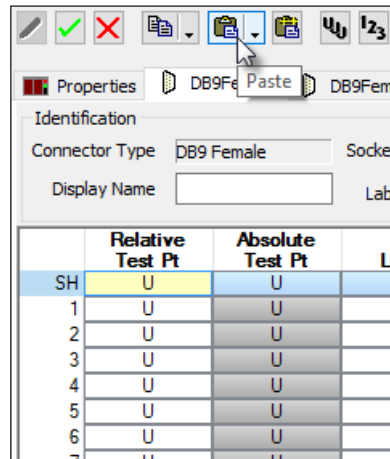
Alternatively, you may right-click on the connector of interest and choose *Copy*, then right-click on the target map and click *Paste*.



To copy *just the map data* without any connector graphic, offsets, or other options, select the connector of interest by clicking on its tab, use the *Copy* Pull-Down Menu to then choose *Copy in CableEye Format* (right). The map data is now saved to the clipboard.



Before pasting the data, add a connector to the map and choose its name and properties as appropriate. To paste without any offsets (offsets described next), click the *Paste* button. The *Before* and *After* images of the grid appear to the right. Note the “U” symbols (*Unassigned*) in the map before pasting, and the test point numbers inserted after pasting.

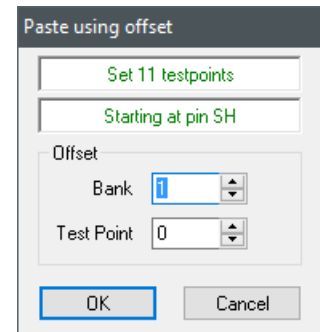


Pasting clipboard data with an offset allows you to insert the data at a point other than the beginning of the map, and to add a fixed test point constant to each entry in the map at the time data is transferred. This could be useful, for example, if you had multiple, identically-mapped connectors repeated in your hardware fixture and did not wish to probe each one again and again. So, you would just probe one, and then repeatedly paste with ever-increasing offsets.

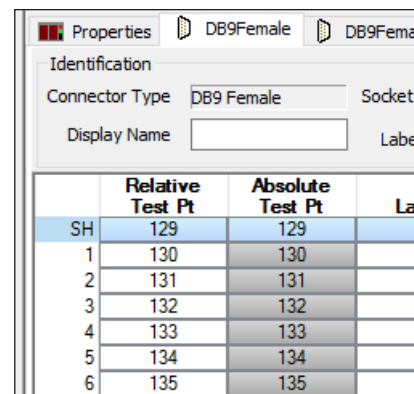
If you wish to start pasting at other than the first row in the grid, click on the desired start row. Then, click *Paste with Offset* .

A pop-up window will show the starting pin (in this case, Pin SH), and ask for Bank and Test Point offsets. The offset value is computed like this:

$$\begin{aligned} &\text{Original TP Value} \\ &+ (\text{BankOffset} \times 64) \\ &+ (\text{TestPointOffset}) \\ &= \text{Final TP Value} \end{aligned}$$



Press OK to compute the offset, add it to all values on the clipboard, and insert data in the map. The result appears to the right. Compare the numbers shown in this image to those shown above where no offset was in effect.



9.11 Maps for 4-Wire Testing

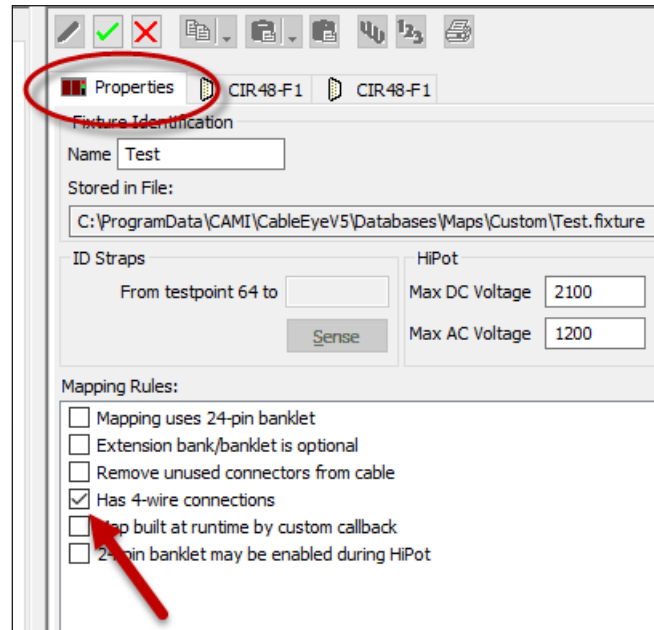
A 4-Wire Kelvin resistance test requires a special kind of fixture, one that uses 2 test points for each pin present in your cable or harness. A dedicated map is required to define each pair of test points for each contact. PinMap allows you to create this map as easily as a standard 2-Wire map.

For a detailed explanation about creating 4-Wire fixtures, and testing 4-Wire with the CableEye system, please refer to section 4.13 – 4-Wire Kelvin Measurement Option. The explanation below is only intended to teach you how to create a Map for your 4-Wire custom fixture.

1. Specifying a Fixture Map as 4-Wire -

Fixture maps for general use do not contain 4-Wire information since the fixtures that they describe do not contain the test point pairs for each pin but only the measurement points.

Assuming that your 4-Wire fixture has been built, the first step is to **check** the **Has 4-Wire connections** check box in the Mapping Rules section of the **Properties** tab. You may need to click the yellow “editing pencil” to enable editing of the Mapping Rules.



2. Adding 4-Wire Test Points to the Map -

As covered in section 4.13, in 4-wire measurements, one of the pins is intended for taking the measurement and the other one as the current source/sink.

For 4-Wire maps, the connector map contains two sets of Relative and Absolute test points as shown on the right. The first two columns specify the measurement points for the pins and the second two columns specify the current source/sink test points.

You can manually enter pairs of test points here, carefully considering which one of the 2 will serve as the current/sink test point, or you could simply use the probe as described next.

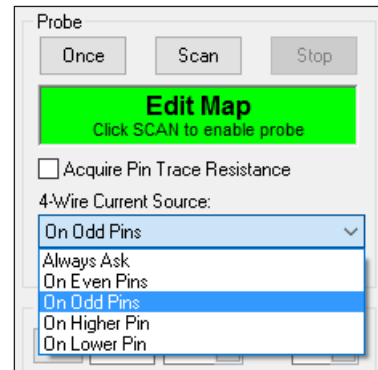
	Relative Test Pt	Absolute Test Pt	Relative Test Pt	Absolute Test Pt
SH	U	U	U	U
A	U	U	U	U
B	U	U	U	U
C	U	U	U	U
D	U	U	U	U
E	U	U	U	U
F	U	U	U	U
G	U	U	U	U
H	U	U	U	U

3. Probing 4-Wire Test Points -

You can use the probe to automatically assign the pairs of test point numbers if your 4-Wire fixture is ready.

Note that your Test Cable (Product Cable, UUT, etc) *must not be connected to the tester when a map is being created!*

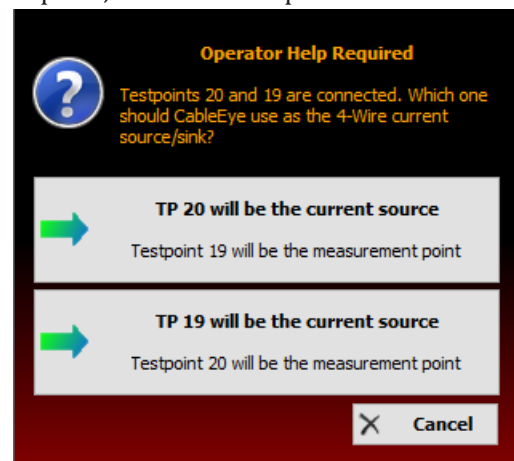
When you probe a pin on a 4-Wire fixture, the tester detects TWO test points: one is the current source and one is the measurement point. Since a test point can function as either the current source or the measurement point, the probe function needs to know how to interpret the two test points it sees. To distinguish the test point functions, use the **4-Wire Current Source** drop-down menu to indicate which of the probed test point pair to assign as the current source; PinMap assigns the other test point as the measurement point of the pair.



You can set the source pin to the Even, Odd, Higher or Lower Number Pin automatically using the 4-Wire Current Source menu.

For instance, when you select “On Odd Pins”, then PinMap assumes that if the probe returns an odd test point and an even test point, then odd test point is the current source and the even test point is the measurement point.

If the choice is still ambiguous (e.g., both test points are odd or both are even, or if you selected the “Always Ask” item), then PinMap displays a popup dialog as shown on the right so that you can indicate which assignments to make.



Click the desired option and the test points will be assigned immediately after.

- Once all your pins have been probed, you should get something similar to the grid on the right. Note that for this example, we choose “On Even Pins” from the drop down menu, automatically assigning the source pin to the even numbered test point.

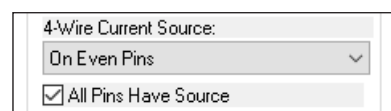
	Relative Test Pt	Absolute Test Pt	Relative Test Pt	Absolute Test Pt
SH	25	25	26	26
A	27	27	28	28
B	33	33	34	34
C	35	35	36	36
D	37	37	38	38
E	39	39	40	40

- At this point everything should be the same as in a regular non 4-Wire fixture. You can edit the name of connectors, change the Max HiPot parameters, etc. Finally Save the map and try it out!

Mixing 4-Wire and 2-Wire Testing - Note that a map can be a mix of 4-Wire connections and standard 2-Wire connections. This is actually very common and you don’t have to do anything different to create the map. If the probe detects 2 test points, it will assume that it’s a 4-Wire pin, but if it only detects 1, it will assume that you don’t need a 4-Wire measurement on that pin and report back only one test point. The resulting map would look as on the right, displaying “U”s on the right side columns for non 4-Wire pins.

	Relative Test Pt	Absolute Test Pt	Relative Test Pt	Absolute Test Pt
SH	25	25	U	U
A	27	27	28	28
B	33	33	U	U
C	35	35	36	36
D	37	37	38	38

You can force a map to be only 4-Wire by checking the *All Pins Have Source* check box. If then, you probe a pin that has only one test point connected to it, PinMap will alert you with a message in the screen.



9.12 Map Entry Errors and Their Consequences

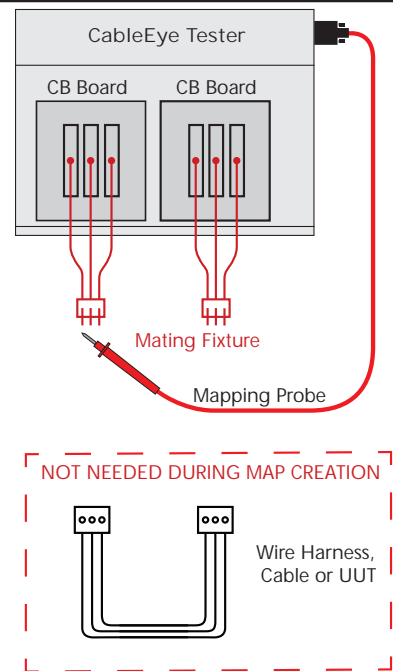
Mistakes happen. That very fact leads you to use the CableEye tester and other test equipment to confirm that cables you build conform to specifications. We would be faced with a wholly unacceptable situation if our test equipment lied to us. Yet, that is exactly what might happen if you incorrectly assign test points to pin numbers on your test fixture. CableEye includes various features to safeguard against map errors. These features, along with your own reasonable care, will be ample protection against such problems.

We outline some common problems here, along with an explanation of unintended consequences that may produce error messages, or worse, produce correct-looking results that are wrong.

Error 1: Failing to disconnect the Cable Under Test when the map is created.

Result: The Map characterizes the custom fixture, not the cable under test. Therefore, keep the test cable detached during this steps. Creating a map by probing the pins with the cable connected will cause all sorts of problems, such as “shorts found”, that will not allow you to finish the map. If you cable is straight through, you might be able to finish the map, but you could get reversed connector genders, or graphics shown on the wrong side of the screen.

Fix: Disconnect the cable under test and set it aside during map creation. You might need it for visual reference to identify pin positions if your mating connector doesn’t have pin labels, but there should be no electrical connection to the fixture you’re mapping. If you’ve already begun creating the map when you discover the cable connected, disconnect it and unassign all the test points that were previously mapped. Then, begin probing them again directly to the mating connector.



Error 1: Failing to enter a pin assignment (leaving its assignment “U”) for a pin that will have wiring attached when a cable is connected.

Result: When CableEye finds wiring attached to a test point, it refers to the pin map to locate the connector and pin number to which that wiring should be connected, and this information will be missing.

For a *Fixture Map*, if the test point number cannot be found in the map, CableEye displays the message on the right. Clicking OK creates a new header connector named *Unmapped* and draws the missing wiring using the Bank Number and raw test point number to label it. In the example below, Pin 6 of J1 is inadvertently unmapped, so the HDR-64 connector is created, identified as residing in Bank 1 (B1), and showing test point 15 unassigned.

Line	DB9 Female J2	DB9 Female J1	HDR-64 Unmapped-B1
1	SH	SH	
2	1	1	
3	4	4	
4	6		15
5	7	7	
6	8	8	

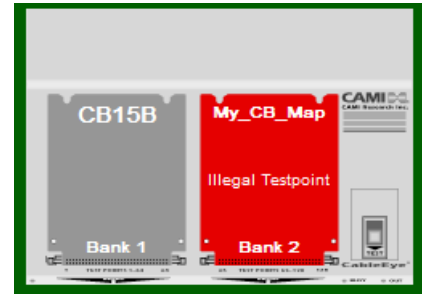
Unmapped Testpoints Present
One or more of your pins is attached to a testpoint that is not in your Pin Map

OK
Proceed with test anyway

Info
Proceed with test, but show me more information on Pin Map errors

Run Diagnostics
Perform some automated diagnostics now to determine the cause of this problem

For a **CB Board Map**, CableEye posts an image of the boards with the unresolved board displayed in red as shown on the right, and an explanation of the problem.



Fix: In both cases, Fixture map or CB Board map, reopen the map file and look for an unassigned pin to locate the problem, and assign the pin correctly. If you have a complex fixture with several connectors, start by looking where Test Point 15 in Bank 1 is connected to. It will give you a clue of where the unassigned pin can be found.

Error 2: Assigning a connector pin to a test point that will never have wiring attached.

Result: The result is very similar to Error 1 because the test point number that *should have* been assigned to that pin remains unassigned and thus the same symptom will exist. In this case, finding the problem will be harder because there will be no telltale “U” in the faulty map. If you use the probe to assign test points, this error is unlikely to happen unless you inadvertently touch the probe to a shield or pin on another connector.

Fix: The unmapped test point will be displayed again as an unmapped header with a Bank and test point number, giving you a quick clue to where that test point should be connected to. You should be able to find the wrongly assigned test point easily after.

Just delete the previous number and enter the new one. At the same time, check if the deleted number is indeed unused in the fixture or if it belongs somewhere else, which brings us to error 3 below.

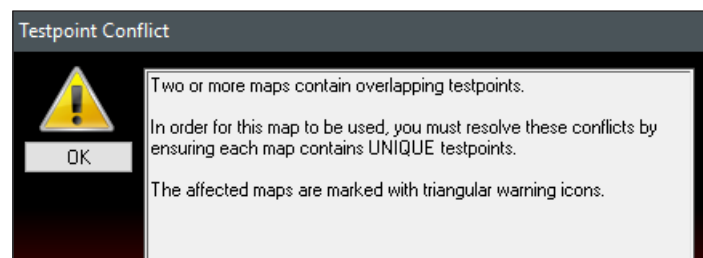
Error 3: Reversing the assignment of two or more test points.

Result: If you inadvertently reverse the assignment of two pins, the wiring display and netlist may show an erroneous connection even though the actual wiring is correct. *No error message will be produced* because the software cannot anticipate your intentions. As in Error 2, if you use the probe to assign test points, this error is unlikely to happen unless you inadvertently touch the probe to a shield or pin on another connector, or misread the pin number on the physical connector. In any case, plan to test your map (Section 9.8, Step 12).

Fix: You should first identify the reversed test points in your cable. Then use the **Test** tool on PinMap as explained in Section 9.8, Step 12 to verify if the pins are indeed reversed in the map. If they are, simply reverse them and save the map.

Error 4: Sharing test points between two or more connectors in a fixture map.

Result 4: **CB Board Maps** permit overlapping connectors as long as you don’t try to use both connectors at the same time when testing a cable. **Fixture Maps**, however, do not allow this. PinMap detects this kind of problem when creating a fixture map and warns you by highlighting offending test points in red and displaying the message on the right when you click the green checkmark..



Fix: Check the connectors in the map that have a warning yield warning symbol as shown on the right. The icon indicates which connectors are illegally sharing test points. Then rewire your fixture or otherwise reassign the points so they do not conflict.



Error 5: Trying to map a CB Board in other than Bank 1.

Result 5: A warning message alerts you to this problem. **CB Board Maps** must be created while the board is plugged into Bank 1 because the map data must be referenced to Test Point 1.

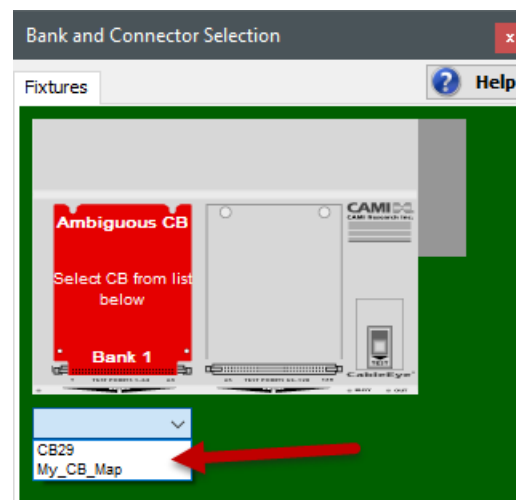
During actual use when the software scans the test points, the presence of a CB board's jumper block reveals the bank to which the board has been connected, and an automatic offset is added to the relative test points in the map you create. If you experience this problem when creating a CB Board Map, just move the CB Board you are trying to map to Bank 1 and continue.

Error 6: Using an already-assigned ID pin for a new CB Board map.

Result 6: This problem will not occur during mapping, but when you test a cable with the board. It's not a serious problem because the software will just ask you to select which CB Board map you wish to use. However, you should generally avoid using the same jumper ID for two or more boards because of the annoyance factor involved in selecting the right map every time you test.

In the example shown on the right, our CB Board Map created previously, "My_CB_Map" uses the same ID jumper (assigned when the map was created) as the CB29 board, and this is the message that results.

In this case, just select the correct board from the drop down menu and click OK.



Fix: If you don't want to get this message every time that you learn a new cable in either of the two conflicting boards, you would need to change where the Jumper ID connects to in your Custom Fixture Map. You can also remove the CB29 Map from the maps directory and any other Standard CB Board maps that you are not planning to use (remember that CAMI maps will be replaced when you do a software update!).

9.13 More Examples

To illustrate how PinMap applies to real-world problems, a couple of examples follow. The first example offers an adapter cable scenario with the adapters connected directly to the CableEye headers. The second example offers an scenario where a custom connectors are mounted on a CB8 board and a CB3 board is embedded in the map.

For more examples, visit our page camiresearch.com/pinmap. While these examples may not apply to your situation, you should find at least one relevant example. Review as many of the examples as you have time for.

Example 1: Interfacing Adapter Cables

An *Adapter Cable* (sometimes called a *pigtail* cable) is a short cable designed to adapt two different connector styles. On one side, we attach a connector that mates to the test instrument, and on the other side, we use the proper mating connector for the cable under test. This approach offers a quick and easy interface when you do not have the right connector on any of the standard CB boards. However, because pigtailed cables would be moved and flexed constantly in a production environment, they may not survive the rigors of continuous use and thus are best suited for short-run and prototype testing.

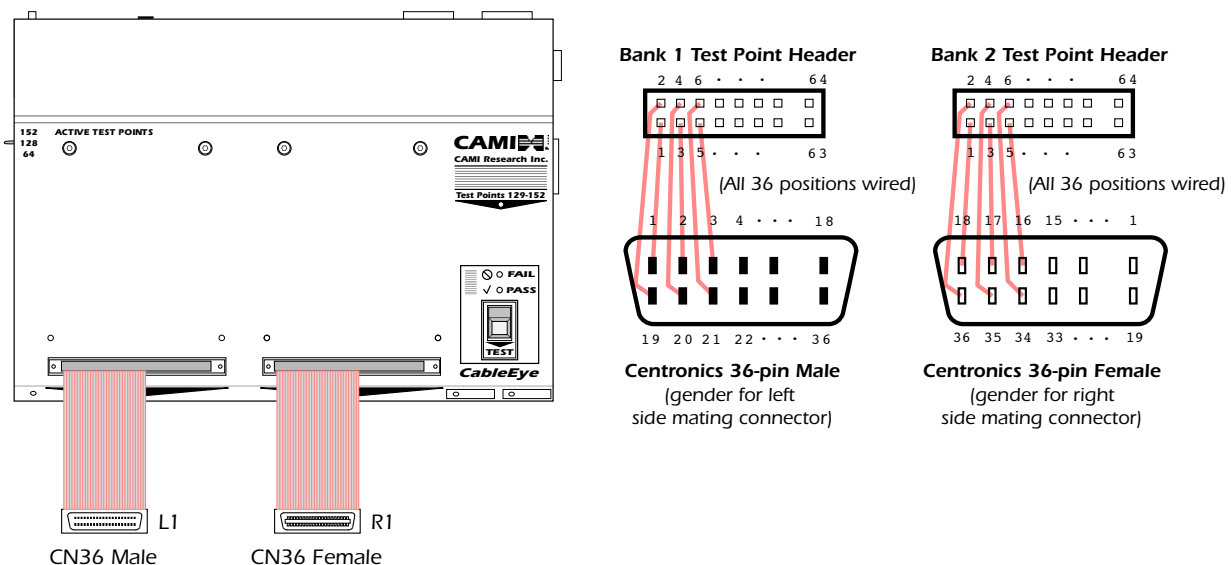
In the following example, we will develop maps for two 36-pin Centronics adapter cables. We construct these cables from IDC flat cable, using a 64-pin IDC socket on one side and a Centronics connector on the other. In this case, the cables will connect directly to Banks 1 and 2 on CableEye.

The Figure below illustrates how we have constructed the CN36 IDC connectors, and their method of attachment to Banks 1 and 2. Note the pin order on the enlarged drawings of the connectors; this shows exactly how the Centronics pins relate to the test point headers.


Observe the following:


1. The gender we choose for the screen display is the gender of the connector on your cable; this is *opposite* of the gender on the adapter cable.
2. Because we will be using the probe to enter test point data and we will be probing the adapter from the bank in which it will be used, the *Bank Offset* will be zero. Note also that for female connectors with buried pins (pins surrounded by plastic insulator), you may need to temporarily wrap a small wire around the probe tip to access the buried pin.
3. The grid shows the *screen connector pins* in numerical order; for each screen connector pin, we show the test point to which it is connected.

The procedure for creating the left-side map appears in the next page. Repeat this procedure to create the right-side map.





Procedure

1 - **Create** a new **Fixture Map**  named Example1.map and type in the map name when the pop-up appears. After you click OK, the new Fixture Map will appear in the file tree.

2 - **Click** the **Add New Connector**  button and choose a CN36 Female. We use the *female* connector to match the gender on the cable we're testing, not the *male* gender on our adapter cable.

3 - The grid now opens in the Edit mode. For the *Socket Label*, enter "L1", an abbreviation for "Left Socket #1, and leave the *Display Name* blank. Although the socket label you choose is arbitrary, it's important to label them so you are sure to attach the adapter cables to the proper Banks the next time you use them. Write "L1" on the adapter cable too!

4 - With the Build tab selected, **click Scan to activate the probe**. You should now see the *BUSY* LED flashing on CableEye. Because there is no shield conductor on the adapter cable, click on Pin 1 in the grid to begin there, and **touch the probe to Pin 1** on the adapter cable. You will here a "beep" to confirm contact, the test point number will appear in the grid, and Pin 2 will now highlight. **Continue touching successive pins** on the adapter cable until the map is complete.

5 - Finally, when all pins have been entered, click the green Check  button. Note that this saves the map in a temporary buffer; you must save the file Example1.map by clicking the Save  **Save** button above the file tree. Repeat this process for the connector in Bank 2.

Map for adapter cable in Bank 1

Pin Number	Rel Test Point	Abs Test Point
Shield	U	U
1	1	1
2	3	3
3	5	5
4	7	7
5	9	9
6	11	11
7	13	13
8	15	15
9	17	17
10	19	19
11	21	21
12	23	23
13	25	25
14	27	27
15	29	29
16	31	31
17	33	33
18	35	35
19	2	2
20	4	4
21	6	6
22	8	8
23	10	10
24	12	12
25	14	14
26	16	16
27	18	18
28	20	20
29	22	22
30	24	24
31	26	26
32	28	28
33	30	30
34	32	32
35	34	34
36	36	36

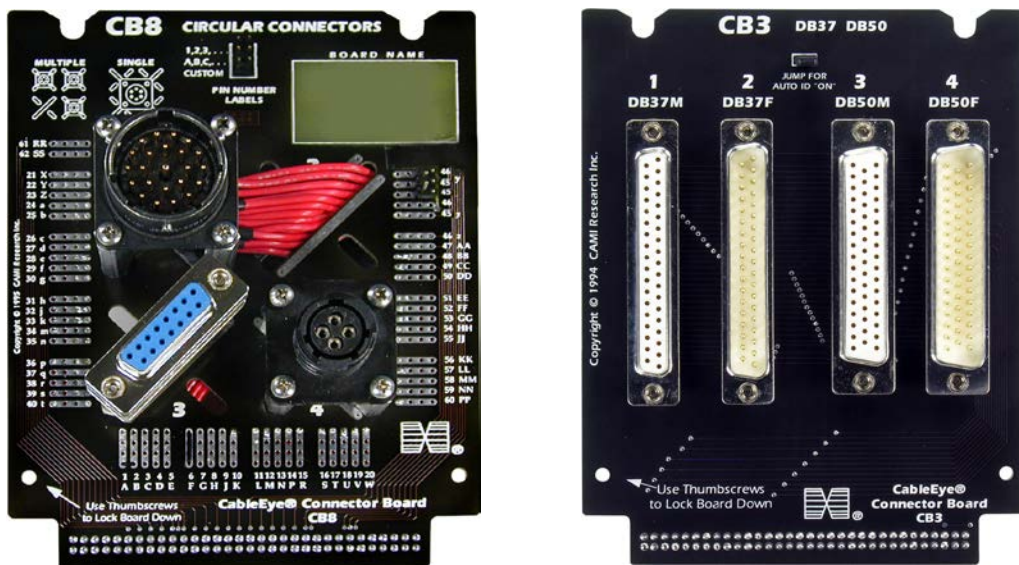
Map for adapter cable in Bank 2

Pin Number	Rel Test Point	Abs Test Point
Shield	U	U
1	99	99
2	97	97
3	95	95
4	93	93
5	91	91
6	89	89
7	87	87
8	85	85
9	83	83
10	81	81
11	79	79
12	77	77
13	75	75
14	73	73
15	71	71
16	69	69
17	67	67
18	65	65
19	100	100
20	98	98
21	96	96
22	94	94
23	92	92
24	90	90
25	88	88
26	86	86
27	84	84
28	82	82
29	80	80
30	78	78
31	76	76
32	74	74
33	72	72
34	70	70
35	68	68
36	66	66


Example 2: Custom CB8 and Standard CB3


In this example, we need to test a cable that has 3 connectors in the left side, 2 of them are custom circular connectors and the other one is a standard DB15 male connector. The right side has a DB37 female connector. A fixture map will be created, using a CB8 to mount the 3 connectors on the left side, and the CB3 board will work for the DB37. The map for the CB3 already exist, so we need only to embed it into the fixture map.

The 3 mating connectors are mounted on a CB8 board, as shown below left. Each one of these connectors will be added and mapped in a new fixture map. As mentioned before, the DB37 can be found in our CB3 board, shown below right, and the map for the board will be embedded in the fixture map.

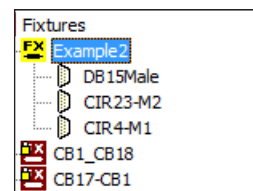



Procedure

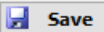
1 - **Create** a new **Fixture Map**  and type in the map name “Example2” when the pop-up appears. After you click OK, the new Fixture Map will appear in the file tree.

2 - **Click** the **Add New Connector**  button and choose a DB15 Male. We use the *male* connector to match the gender on the cable we’re testing, not the *female* gender on our CB8 board.

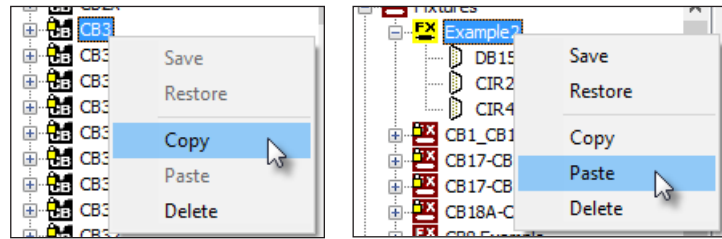
3 - **Repeat the previous step to add the 2 circular connectors.** When done, the map tree should look something like the screenshot on the right.



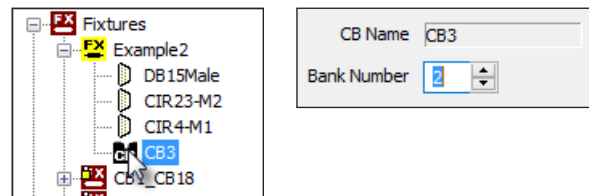
4 - We will map the DB15 connector first. You will need to temporarily wrap a small wire around the probe tip to access the buried pins on the DB15 female connector. When ready, **select the DB15 connector** from the tree or by clicking the connectors tab on the right side. **Click the Scan**  button and **start probing the pins** on the DB15. Note that the first row in the grid, named SH for Shield or Shell is highlighted. This means that you should touch the Shell of the Connector. When done, it will automatically assign the test point and move to the next line, which is Pin 1. Probe Pin 1 and continue until all the pins are probed.

5 - When all the pins on the DB15 had been mapped, **select another connector** and repeat the previous step until all 3 connectors are mapped. At this point it might be a good idea to save  your progress. You can do this at any time.

6 - The next step would be to map the DB37 connector, but this map already exists on the CB3 board. Because of this, we only need to embed the CB3 board in our fixture map. **Right-click on CB3** and select **Copy**. Then, **right-click on Example2** and select **Paste**.



7 - The CB3 board will always be used on bank 2, so we have to specifically define it for bank 2. To do this, **select the CB3 board** in the fixture map and **assign it to Bank 2** as shown on the far right. The CB8 board is fixed and was mapped to bank 1, so it should always be used on bank 1.



8 - When done, we can **add socket labels** to the connectors and change their names if needed. **Click the green check mark** when ready and the **Save** **Save** button to finish the map creation.

9 - Before using your map, be sure to **remove the Jumper IDs on both boards**. Remember that the jumper IDs are not required when a fixture map is created. The map already knows that we are going to use a CB8 board on bank 1 and a CB3 board on bank 2.



10 - To use your new map, first **close PinMap**, then from the **Connectors menu**, choose **Fixture Maps**. From the **Maps** menu, choose **Example2**. Ready to test!

7 - **Attach a cable** and **click Test Cable**. The result should look something like the image below.

