CableEye®
SOFTWARE INTRODUCTION

**A Step-by-Step Guide to the CableEye Software**

This booklet (formerly Applications Guide) provides a self-guided introduction to CableEye®. Use it to learn how the software works. In general, we devote one page to each major function. For greater depth, please refer to the *CableEye User’s Manual*. This booklet also serves as an excellent training tool for new employees, or as a preview of capabilities that you may not have used previously. To gain the greatest benefit, have the CableEye tester, a set of connector boards, and a test cable available to you while you are reading so you can immediately try the operations we discuss. For convenience, we recommend the CB-T1 training board.

Note: If this is your first time setting up CableEye, be sure to read the Getting Started Guide first (included with your tester) and then return to this guide. The Getting Started Guide will show you how to connect the tester to the PC, installation of the CableEye software and your specific model’s hardware information.

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring a Cable</td>
<td>2</td>
</tr>
<tr>
<td>Learning a Good Cable</td>
<td>3</td>
</tr>
<tr>
<td>Comparing Two Cables</td>
<td>4</td>
</tr>
<tr>
<td>Checking for Intermittent Connections</td>
<td>5</td>
</tr>
<tr>
<td>Checking Quality of Connections (Resistance Measurement)</td>
<td>6</td>
</tr>
<tr>
<td>Saving Cable Data in the Database</td>
<td>7</td>
</tr>
<tr>
<td>Loading Cable Data from the Database</td>
<td>8</td>
</tr>
<tr>
<td>Searching the Database for a Match</td>
<td>9</td>
</tr>
<tr>
<td>Printing Schematics</td>
<td>10</td>
</tr>
<tr>
<td>Printing Labels</td>
<td>11</td>
</tr>
<tr>
<td>Production Testing of Cables</td>
<td>12</td>
</tr>
<tr>
<td>Simplified Production Screen</td>
<td>13</td>
</tr>
<tr>
<td>Data Logging</td>
<td>14</td>
</tr>
<tr>
<td>Editing a Wire List</td>
<td>15</td>
</tr>
<tr>
<td>Designing New Cables</td>
<td>16</td>
</tr>
<tr>
<td>Adapting to Custom Test Fixtures</td>
<td>17</td>
</tr>
<tr>
<td>Create Your Own Connectors</td>
<td>18</td>
</tr>
<tr>
<td>Testing Single-Ended Cables</td>
<td>19</td>
</tr>
<tr>
<td>Testing Wiring Harnesses</td>
<td>20</td>
</tr>
<tr>
<td>Testing Unterminated Cables</td>
<td>23</td>
</tr>
</tbody>
</table>

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Measuring a Cable

1 – Attach a cable of choice between the left CB board (test interface fixture) and the right CB board. Use only one connector on each board. You may mix and match CB boards in any manner to obtain the right combination of connectors for your cable.

2 – Click Test Cable in the Test Data summary box, or press the TEST pushbutton on the tester, to make a measurement. Most cables are measured in less than 0.5 s.

3 – When the measurement finishes, a simplified diagram appears in the summary box giving characteristics of the cable. In this case, we have a DB25 male connector on the left, a miniDIN8 male connector on the right, a shield is present, four wires connect the left side of the cable to the right, and internal jumpers connect two or more pins together on the same side of the cable.

4 – To examine the wiring of the cable in detail, click the “View Wiring” button (looks like a bow tie). You will see the complete schematic of the cable along with connector and pin information. Use the ↑ and ↓ keys, mouse or touchscreen to highlight a specific wire in the cable as shown below. This is helpful when reviewing the wiring of complex cables.
Learning a Good Cable

You may learn a cable that you know is good and use it as a model. The program stores wiring data from a learned cable in the Match Data Buffer. Wiring data from a cable under test is stored in the Test Data Buffer. By comparing Match and Test data, the program finds differences between cables.

1 – Click Learn Cable in the Match Data summary box located in the lower half of the screen.

2 – When the measurement is complete, cable data moves into the Match Data Buffer, and a simplified diagram appears in the Match Data summary box. *Try to identify this example cable using just the information in the summary box shown here. (answer below)

3 – As before, you may view the actual cable wiring by clicking the View Wiring button (see below). Use the ↑ and ↓ keys, mouse or touchscreen to highlight a specific wire in the cable.

* Straight through, 1 to 1, 9 conductors cable with shield. DB9 Female on the left and DB9 male on the right.
Comparing Two Cables

After you have learned a good cable and measured a test cable, summaries of both will appear.

1 – If there are no differences, you will see a green checkmark just below the Save button in the Test Data summary box. In the example shown here, however, the cables don’t match and a red "X" appears instead.

*What can you tell about the differences between these two cables using just the information in the summary boxes? (answer below)

2 – Change the Test Data wiring display to a netlist display by clicking on the Display Netlist button.

3 – Once the netlist is visible, click on the triangle button “∆” (Greek letter Delta) to see a detailed list of all wiring differences (shown below). In the +/- column, a “+” indicates an extra connection (a short), while a “–” indicates a missing connection (an open). In this case, we see also a short between pins 2 and 3 on the right, and an open between 1 and 1.

Also note that the type of faults are color coded. A missing/open connection is displayed in yellow and an extra/short connection is displayed in red. This allows you to quickly identify what type of fault your cable has.

4 – For batch testing of cables, you may automate this entire process by using a Macro (described later on page 14). In that case, you would press the TEST pushbutton on the CableEye tester and read the PASS/FAIL result on the LED indicators.

*Two or more pins are shorted together on the same side of the cable, and connections are missing (open).
Checking for Intermittent Connections

Bad crimps and broken wires, among other things, may cause intermittent connections. CableEye tests for this with the Continuous Test function. Test signals are passed through the cable continuously while you flex the cable and connectors. Changes in resistance cause a warning tone to sound and a wiring diagram to appear with all accumulated intermittent connections highlighted.

1 – Check the Continuous Test checkbox just below the Test Cable button. The name of this button changes to Start and the system is now set for Continuous Test mode.

Checking the Use Match checkbox ensures that we compare data acquired during the continuous testing to Match Data. If this box were unchecked, Match Data would not be necessary, and the program would use the first scan of the test cable as a baseline, comparing successive scans to it.

2 – With the test cable attached, click Learn Cable to acquire Match Data. Once Match Data has been loaded, click Start to begin testing.

3 – As the test runs, you see the test results in the Test Data Summary box. A large green checkmark indicates that no intermittent connections have been found.

4 – Flex the cable and connectors to locate intermittent connections. If any are found, a tone will sound, the error count will increment, and you will see a display with the intermittent connections highlighted (see below). In this case, we see an intermittent short between pins 2 and 3 and a missing connection between 1 and 1.
Checking Quality of Connections
Resistance Measurement

A connection’s quality is checked by measuring its resistance. Limits, also called Resistance Thresholds are setup to define a good quality connection or good isolation resistance.

<table>
<thead>
<tr>
<th>Good Connection</th>
<th>Faulty Connection or Embedded Resistor</th>
<th>Good Isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0.5 Ω</strong> Lower Limit of Measurement</td>
<td>Maximum Conductor Resistance Permitted</td>
<td>10 MΩ Upper Limit of Measurement</td>
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<tr>
<td>Minimum Isolation Resistance Permitted</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CableEye measures embedded resistors automatically when the resistor's value falls between the high and low thresholds. When you save a cable in the database, the resistance values associated with any embedded resistors are saved along with the wire list and other cable information. Thus, embedded resistors become one of the characteristics of the stored cable and must be present in a test cable to successfully match against the saved data.

In this example, the cable measured contains a resistor between pins 5 and 5. The 2.70 kΩ resistor falls between the 2 limits show on the drawing above (0.5 Ω and 10 MΩ) and it is displayed as an embedded resistor.

Conductors between SH, 1, 2, 3, 4, 6, 8 and 9 are all under 0.5 Ω, and are displayed as good quality connections.

The connection between pins 7 and 7 is above 0.80 Ω, which is above the Maximum Conductor Resistance permitted. This line is highlighted as a fault, and the cable is failed.

You can easily experiment, if you have a CB29 Board and different value resistors. Connect the resistors to the CB29 Board and adjust the resistance thresholds to see how the tester displays the results.

Please check our User’s Manual, Section 4, for more details on how to setup your CableEye system for resistance measurement, tolerances, trace resistance, 4-Wire resistance and many more options.
Saving Cable Data in the Database

After measuring a good cable, you may wish to annotate it with descriptive notes and save it in the database using a name or part number of your choice. Later, you may reload the cable, or search the database for a match to the cable's wiring.

1 – Click Learn Cable to acquire new cable data, and then click on the Notes tab to open the Notes editor. Type in descriptive notes, part numbers, names, dates, color codes, or any other information you deem important. You may also copy notes from another cable to the clipboard and paste them here using standard Windows methods, and then edit the notes as necessary. The first line of these notes appears in the title block of printed reports, so you should choose this first line thoughtfully.

If desired, click the Label tab and enter any notes that you wish to appear on a printed label.

2 – Click the Save button when you are ready to save the cable and notes in the database, and the Save Cable dialog box will appear (below).

3 – Use as many characters as you need to name the cable. You may use spaces, dashes, and other special symbols in the name. As you type the name, the file list below it shows all other cable files that begin with the characters you have typed thus far. Continue typing until no other files appear, indicating that you have selected a unique name. You may also check a Type, or define a new type, to assign this cable to a special group which may help find the cable when you load it later. Click OK to save the cable.
Loading Cable Data from the Database

You may wish to recall previously saved cable data to test against it, read the descriptive notes, view its wiring, print a label or use is as a template you can edit for your next project.

1 – Click Load Cable.

2 – Select the cable by its Name or its Description by typing into the appropriate entry box. As you type, the file list below the entry box gives all files that begin with the characters you have typed. At any time, you may scroll into this list with the ↓ key to choose a file, or click directly on a cable of interest. Click OK to load the cable, or Cancel to dismiss this window.

3 – The Match Data summary box describes the cable just loaded. Note that the cable's database name appears at the top. Click the View Wiring button to see the cable’s schematic (below), or the netlist button to see a wire list.
Searching the Database for a Match

Unlabeled or unknown cables with complex internal wiring may cause damage if connected to inappropriate equipment, or may go unused or be discarded. To avoid problems like these, you may measure an unknown cable and search the database for a match to its wiring. If CableEye locates a match, it loads it and displays the descriptive notes to give you the cable’s name and some information about it.

1 – Measure a cable using Test Cable. Then click Search Database (top).

2 – If a matching cable is found, it loads immediately for your review (right).

3 – If an exact match is not found, a pop-up window alerts you. Click the down arrow tab to activate a pull-down menu with additional search criteria (bottom), and try again.

If you would like to automatically search the database after clicking Test Cable, turn on the Auto Search after TEST option in Preferences/Control. With this option enabled, the database will be searched silently after each test.

Note that found match data will only be loaded if the match data window is empty.
Print complete documentation on any cable you test, or any cable in the database. Each page includes the wiring schematic with connectors and pins labeled, the wire list, and your descriptive notes and label text.

1 – Before printing, choose the printer you wish to use under the \File\Report Printer Setup... menu item. Any printer for which you have a Windows driver will appear in this list and should work. You may define different printers for Reports, Labels, and Logs.

2 – Obtain the data you wish to print by either measuring a cable (use Test Cable) or loading a cable from the database (use Load Cable). Then click the Print button.

3 – Two or more pages may be printed for long wire lists or extensive notes.

Before printing, you may change the connector orientation by clicking the Connector View Button next to the connector (see below). The graphic will print as shown on the screen. In this way you may depict the cable as a technician would see it while wiring with the hoods off.
Connect any windows compatible label printer to your computer, or use a laser printer with the proper label paper. Label and report printers have different setup choices and may remain active simultaneously, and employed as needed.

1 – From the *File* menu, choose *Printer, Report, and Label Setup...* and select the printer you wish to use for labels.

2 – From the *Preferences* menu, choose *Labels*. Then select font and label size, spacing, and number across. One-wide or multi-column labels may be printed. All units are in “spaces” except for the number of labels across. You will not need to set the Preferences and Label Printer settings again unless you are making a change on your label layout.

CableEye comes with an out-of-the-box built-in label layout for text only.

It is possible to print custom labels, which can include full color text and graphics. Our Add-On optional Custom Labeling Software is required for this. More details about it in Section 5 of the User’s Manual.

3 – Load *Match Data* from the database in which label text has been stored, or *Learn* a cable and type in label text.

4 – Click the *Label* button located at the left side of the screen to print one label. If you are printing on a laser printer, the page will not print until a full page of labels has been transmitted. Sheet-fed printers usually have an Eject button that will print a partially full page.
**Production Testing of Cables (Macros)**

Production testing requires only that a PASS/FAIL result be obtained. You may set up CableEye so that the operator needs only to press the TEST pushbutton on the tester and read results on nearby LED lights. Using the mouse or keyboard, becomes unnecessary. The test engineer would initially create a Macro (also called a Script) to specify a desired test procedure. Then the operator loads the Macro and may immediately begin testing without any knowledge of the set-up procedure.

1 - Click the *Auto* button to open the Automatic Test window. Then choose a Macro to load from the menu. You may create any number of Macros for different jobs. You will find the example shown here available in your software.

2 - The Macro specifies the test operations you need for a particular job. Easily create Macros by just choosing commands from a menu (not shown here). You may modify the Macro at any time with the "Edit" function, and save the final Macro for future use.

3 - Press the TEST pushbutton on the tester, or click the “Execute” button on the screen, to begin testing. Results are shown on LED lights. The PASS light is green, and the FAIL light is red.

4 - If CableEye detects a fault, the instruction on Line 10 (above right) displays the Differences List. The problem found here is a missing connection between pin 1 on the left and pin 1 on the right.

There are plenty of options to customize and automate the tester to control tower lights, LEDs, audible tones, foot pedal, remote control, lock and release latches, diverter gates, reports, labels and more.

Program automatic test procedures with Macros or Javascript, and use external relay boards to automatically switch different circuits in your UUT during test.

You can even scan ID badges for operator log-in and work orders for automatic tester setup.
Simplified Production Screen (Macros)

CableEye is a powerful program with a main screen full of menus, fields and buttons. Sometimes you might want access to a simplified screen for production testing, to show only basic buttons and functions to the operator. This is possible using the SHOW PANEL macro instruction, which on execution, brings to the front the simplified screen shown below, and hides the main screen completely.

To call the Simplified Production Screen, you enter the SHOW PANEL instruction at the beginning of your macro, as illustrated in Macro Example 4 shown below and included with your software, then click Execute. You can add the SHOW PANEL instruction to any macro, just make sure to make it the first instruction.

Macros is a powerful tool that allows you not only to automate a pass/fail process, but it can also handle many background tasks, as printing reports, exporting reports to PDF, displaying graphic instructions on the screen for the operator, scan process data like serial numbers, work order numbers, and all this can run without operator intervention behind the Production Screen.

For complete details on how Macros will simplify your production test process, read Sections 6 and 7 of the User’s Manual.
Data Logging (Macros)

You may wish to record the result of every test when testing a batch of identical cables. Then, at the end of the batch, print a summary report showing exactly the test results you’ve obtained. CableEye will do this automatically when you employ Data Logging. Several new commands need to be added to a standard Macro to engage Data Logging.

Initialize the Count value seen in the drawing below at a number other than “1” if desired, print labels as you test each cable, and use the count value as a serial number for either labels or reports. You may end the log after a fixed number of cables, or at an arbitrary time. You may also interrupt the batch test to check a cable for someone else, and resume the batch test later without disrupting the data log.

1 – Convert a standard Macro to a data-logging Macro by adding several new instructions. At the beginning, add the command OPEN LOG FILE to create a new data log (you will be asked to supply a log file name when this executes). To insert the title block, use the command LOG HEADER. Then add the instruction LOG TEST RESULT in the main test loop to record the result of every test. Finally, at the end, add LOG SUMMARY to print a summary at the end of the test. If you wish to print the result from within the Macro, add PRINT LOG FILE before the Macro ends. As an example, have a look at the Macro “LOGTEST1” included with your software.

2 – Execute the data-logging Macro like any other (as described on the previous page).

3 – When you finish a batch test, the results are printed as shown on the right. You can print any log file at any time by clicking the LOG button. CableEye stores log files as comma-delimited ASCII, so you may import them into other programs if desired.
**Editing a Wire List**

Modify the wire list of a cable at any time. You may add or delete wires, or change the connector types using CableEye’s netlist editor. You can use this technique when modifying one golden cable to create another one.

1 – Measure a cable, or load a cable from the database, and click the *Display Netlist* button to see a wire list.

2 – Click on the yellow Pencil button to begin editing.

3 – When the Edit mode starts, the first cell highlights. Note that the yellow pencil becomes gray to show you have entered the Edit mode.

4 – Click on the cell you want to edit and type in the new connection.

5 – When finished editing, click on the green checkmark to accept your changes.

6 – If you are happy with the changes, click the Save button to store the cable in the database. You can overwrite the existing file or save the cable with a new name.
Designing New Cables

You may design a completely new cable while at the same time creating test data against which the first prototype can be measured.

1 - Start by clearing the Match and Test buffers by Clicking in the CLEAR button.

2 - Click on the Edit button (pencil) in the Match Data Window.

3 - A new window titled Connectors will appear, in which you will choose the first connector for your cable. Note that if you check the View Connector checkbox in the Connectors Window, you will get another window with a preview of the connector as show in the right. This preview is very useful to help you find the proper graphic for you cable.

4 - After selecting the first connector, you can click the Add New Connector button if you have to add another connector. The same Connectors window will appear allowing you to choose another one. You can add as many connectors as you need repeating this step.

5 - You can now start adding connections between the connectors as shown in the right. This is very similar to how you edit a cable, as explained in the previous section. The only difference is that the netlist is empty.

6 - Once you are done adding connections to your cable, you can proceed to add description, colors and any other required information for your cable.

7 - Finally, you will click the Save button and name your cable accordingly. Note that we recommend you to save your cable several times during the creation, so you don't loose any changes in case a mistake is made. The final result might look something like the image in the right. This is a very simple example of a DB15M to DB15F cable with only 6 connections.
Adapting to Custom Test Fixtures (PinMap™)

CableEye can easily adapt to custom test fixtures. You may mount unusual mating connectors on our CB8 (up to 64 pins) or CB30 (up to 128 pins) boards, build adapter cables that attach to our CB29 or CB29A Screw Terminal boards, or use 64-conductor IDC flat cable or AMPMODU™ cable connected directly from CableEye to your custom harness. With the optional PinMap™ software (Item 708), you may choose a suitable connector graphic from our large library for each mating connector, and assign custom pin labels that match your schematic.

1 – To create a new map, start PinMap by clicking on the Map button, and specify the name of the map file you wish to create.

2 – Choose the connector graphic you wish to use for the mating connector and click OK. You may employ as many different connectors as needed for the cable or wire harness interface you have constructed. The software can handle as few as one connector to hundreds of connectors.

3 – Attach the PinMap probe to the tester, click the Scan button, and begin touching the probe to the pins on the connector, starting with the Shield and moving up (see the grid). Custom labels like J2:1 overwrite the default number if desired.

4 – Turn off PinMap by clicking again on the Map button. Then choose Custom Fixture Maps and the name of your map, as shown here. Ready to test!
Create Your Own Connectors
(Connector Designer™)

The Optional Connector Designer™ software (item 707) is required for this function. Connector Designer allows you to create your own custom connectors. You can choose from built-in shapes or import an image of a connector for full graphic detail.

1 - Click on EDIT on the left side buttons, and the click on the New Connector button.

2 - Create a new connector From Picture.

3 - Navigate to your connector image and double click on it or click open to load it.

4 - Enter the data in the dialog box. You can type in any Connector Type and Name that you which, but make sure to enter the right number of pins and shell if present.

Then Choose between male or female.

The unique identifier, Full Name and Short Name will be filled in automatically.

5 - Click Create when done.

6 - Drag the yellow pins with the mouse to the desired position. You can use the keyboard arrows to move the pin one pixel at a time for fine adjustment.

7 - Once you are done positioning the pins, click the Save button and the Create Connector button.

Your connector should now be available in the connectors library.

Read Section 10 of the User’s Manual for full details on Connector Designer.
Testing Single- and ‘Remote’-Ended Cables

Case 1: Single-ended cable

You may need to measure a cable that has only a single connector, with the other side hard-wired to a board or other component. To do so, insert an appropriate CB board into the left or right bank, or activate a custom pin map for your own interface, then attach the cable to an available mating connector. After you click Test Cable, the program may ask what kind of connector its attached. View the wire list or graphic display for the result.

Case 2: Double-ended cable with one ‘remote’

You may also have a cable with two connectors where only one end can be connected to the tester. Maybe the other end terminates a long distance away (for example, if the cable runs through a conduit). Or perhaps the cable cannot be uninstalled from machinery. For this case, you may employ a loopback connector. Testing then becomes a two-step process:

Step 1 – Test for Open Circuits
Attach a loopback connector to the ‘far’ end so that pairs of pins are connected together. This completes an electrical circuit to allow current to flow down the cable on one wire and return to the tester on the other wire. After testing, you should then see pairs of connected wires on the graphic display.

Step 2 – Test for Shorts
Remove the loopback connector and test in this configuration. If no shorts exist in the cable, you should see a connector with no wiring shown at all. If shorts are present, you will see connections showing which wires contain the short.

If you see continuity between pairs of wires in step 1, and no connections in step 2, the cable is functioning correctly. If you perform a test like this, be sure any installed cables are completely disconnected from any signal sources before testing with CableEye! Also, keep in mind that the resistance will double since the test signal must traverse the cable in both directions.

Of course, you can always route a return cable from the far end back to CableEye. If possible, this is the best solution since no loopback is necessary. We have tested cables as long as 2 miles with no problems, and the upper limit is likely to be even longer.
Testing Wiring Harnesses

Cables and wire harnesses differ primarily in the number of connectors they employ. You may easily test wiring harnesses with CableEye and take advantage of all of the benefits available when testing two-ended cables. Specifically, you may connect a model harness to CableEye and learn the correct wiring, add descriptive notes and label text, and store the wiring information for future reference. Most importantly, you may directly compare the unit under test to a model harness and instantly view any differences in wiring graphically or in list form. Finally, of course, you may print test reports, and error reports (if problems are revealed). Adapting CableEye to test wire harnesses requires that you first build a mating harness, and then tell CableEye which graphics and pin labels to employ for the connectors.

Note: Expansion units can be added to your system to increase the number of test points available. Check our Catalog for details.

1 – Build a Mating Harness: The mating harness consists of a series of opposite-gender connectors that exactly mate to the harness under test. The other side consists of transition connectors that link to CableEye. These transition connectors may take several forms:

a – connect individual wires from the mating harness to screw terminal boards (for example, CB29 in the CableEye catalog or CB29H for a High Voltage suitable interface.

b – wire the mating harness directly to prototyping boards (for example, CB8 in the CableEye catalog). This is the basis of the example on the following page.

c – wire the mating harness to a common connector that then joins to one of the standard CB boards (for example, terminate the mating harness in two DB50 male connectors, and connect them to two CB3 boards).

d – if the mating harness can be constructed strictly from IDC flat cable, then you can use two 64-pin wiremount sockets (Item 854) that connect directly to CableEye’s 64-pin latch headers. Use an equivalent AMPMODU™ Cable (Item 864) for High Voltage applications.

2 – Create a Custom Pin Map for the Harness: Once you determine how the mating harness is wired to CableEye, you will create a look-up table for the CableEye software showing which test point is assigned to which connector pin on the harness. Use our optional PinMap software (Item 708) for this purpose. See Page 16.

The drawing on the next page provides a simple harness interface example using the CB8 board set. We provide the map information for CB8 (telling you which test point corresponds to which pad), and you add the labels you like.
NOTE: Screen image and wire list are normally viewed only when locating errors. Generally, it is not necessary to examine them, but just to look for a PASS or FAIL condition.
Display of Wiring Harness Graphic

Wire Harness Netlist (individual connector columns view)

Wire Harness Netlist (FROM/TO view)
**Testing Unterminated Cables**

When a cable or harness terminates in bare wires (no connector), you need a means of making a temporary electrical connection to these wires during testing. CAMI Research offers several possibilities:

1 – Use a handheld probe, suitable for a momentary electrical contact with one wire (Item 718), and the special *Probe* function in the software. The probe works well for point-by-point testing of individual wires. In the screen shot below, the highlighted wire shows the last wire probed, and the white wires show memory of previous wires probed.

To use the Probe function, check “Probe” box in the Test Data Window. The *Test Cable* button changes to *Start*. Set the system for 152 test points, attach your cable, and click Start to begin scanning.

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2 – Use our special Minihook probes (Item 710) consisting of ten color-coded spring-loaded hooks capable of holding up to ten wires simultaneously. To use the minihooks, attach the DB9 connector to the *Minihooks* socket on the right side of the tester. Set the system for 152 test points, attach the minihooks to the cable’s bare wire ends, and click *Test Cable* in the usual manner to measure the cable. A diagram similar to that shown on the right will appear.
3 - Use CB27 which has 64 individual push-pins (the type of connector on the back of audio speakers). Push-pins are very quick to attach and detach wires and provide an excellent electrical contact. Attach the CB27 extender cable to the tester as shown here, and use as you would any other CB board.

4 - Use CB29 or CB29A screw terminal boards. 64 screw terminals provide a more secure and permanent connection than push-pins and are best suited for heavier gauge wire (20 gauge or large) or complex connections.