Cable Designer
Version 2.1
User's Manual

Note: The original manual has been converted from Microsoft Word to .pdf; page numbers no longer conform to those mentioned in the text. HMB – April 2012

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Introduction

Cable Designer is a flexible, user-friendly program that assists with the development and testing of cable television systems, both the design and production of new systems as well as the re-design and modification of existing ones. Written by a team combining years of experience in cable system design with years of experience in software development, Cable Designer offers you the technical soundness and capability you desire as you create systems, as well as the ease of use, adaptability, and error protection you demand from a good piece of software.

How Does Cable Designer Work? What Are Its Capabilities?

In Cable Designer, as in the actual creation or modification of a cable design, there are three main activities that take place. One, you prepare to work with a design by gathering all the information you need (cable types you will use and their losses, devices you will use and their losses, etc). Two, you work with the design (laying out cable footages, inserting and removing devices, experimenting with different layouts, different types of cable, hot taps, etc.) until the design is shown to meet your criteria in terms of energy and equipment use. Three, you compile an inventory of the parts in a completed design so that the parts may be ordered, the system built or maintained. Within Cable Designer, these three activities are organized into three menus: The Preparations Menu, The Design Menu, and The Bill Of Materials Menu. Each menu contains many sensible, useful options.

Cable Designer takes as much work out of the design process as possible, freeing you up to use your knowledge and creativity to do what you do best--design and maintain cable systems. Here are just some of the things Cable Designer does to help make the design process easier:

· Cable Designer creates room for your design as you make it, there's no limit on the number of branches/legs you may have or the number of entries in each one. It will match any configuration you have, no matter how unusual or large. For example, Cable Designer could handle a design of 100 branches with 1 entry each or a design with one branch of 1000 entries. You can be sure your designs will work with Cable Designer.

· Specifying data to use with your design is as simple as can be:
· Enter data on straightforward, fill-in-the-blank forms, hopping from one field to the next in the order you desire.
· Enter data from scratch or use existing data files as templates to make new ones, further saving time and effort. Note that data files for several equipment manufacturers (Scientific Atlanta, Jerrold, C-COR, Magnavox, etc.) are included with Cable Designer and may be used directly or as templates to make your own data files.
· Optionally, annotate your data files with comments, allowing them to serve not only as program input, but as meaningful report files you can print out along with your design reports. A smart editor within Cable Designer allows you to view, annotate, and create the format of your data files as you desire.

Cable Designer protects you as you create or annotate data files, making it impossible for you to make a mistake or create a data file that is unusable.

· Entering your design is flexible, easy, enjoyable:
· Test as you build. Enter part of your design. Test what you've done. Quit for the day. Tomorrow, load back in what you've done. Make changes. Test again. Add to the design. Add more. Test again. Modify. It's that easy with Cable Designer.
· A window always shows you the branch you're working on and reflects any changes you make. Keys on the keypad allow you to easily move around within your design, from branch to branch to branch. An option called FIND allows you to search for and "jump" to any branch within the system.
· A name field lets you "tag" each branch if you so desire. You can use this to help you remember where the branch began or bits of information you'd like to remember about a particular branch.
· Enter the design from the keyboard if you're a typist, or from the keypad if you're not. Using one hand on the keypad leaves the other one free to keep your place on a map. Device codes allow you to enter any device in the system with a 1-to-3 character code. The codes are easy to learn. Of course, you can actually key in devices by name also.
· Delete and insert entries in the design with ease. Replace devices, cable footages, or cable types with new ones by simply typing the new over the old. For more difficult or critical replacements, like replacing a 2-way splitter with a 3-way splitter, Cable Designer will prompt and guide you through the process to make sure you have no problem in achieving the desired outcome. You can easily modify any design to meet any design change that happens in the real world.

· Testing the design is only a few keystrokes away. Status lines inform you of any errors in the system, and tag the entry within the branch that contains the error so you may easily find it. Furthermore, you will be told of any data that was needed that you did not supply, so that you may go get it and complete the test. Cable Designer never leaves you wondering what went wrong. After a test, each branch in the design shows you the power levels input to the device in each entry. Optionally, you may have the test procedure compute running reverse losses throughout the system and view those too. The test procedure computes optimal tap values for all taps in the system. Pad and equalizer values are computed for all of the design's amplifiers. A message appearing on the design window tells you whether or not the design has been tested since you last changed it.

There are many, many more conveniences to assist you in the design process, like handy messages to warn you if a footage value is unusually high, or the option of setting a default cable type, which tells the computer to automatically fill in the "cable type" field whenever you make a new entry. We think you'll like Cable Designer's capabilities. Here are some others:

· Besides totaling the devices you've used in the system, Cable Designer sums up the amount of each type of cable you used, and tells how may connectors you need for each. Furthermore it tells you the needed number of AC terminators, of housing-to-housing connectors....

· Cable Designer makes it easy to lay out the trunk system separately from each part of the distribution system. The starting point you select for each design can be easily changed, so that linking up the entire system is simply and realistically represented.

· Materials for each design may be saved and later summed with materials from other designs allowing you to total up all materials in a system, to total up all materials in two systems, to total up the materials in two legs of a given distribution system, and so forth....

· Any report that you can send to the printer you can also write to a disk file. This allows you to further annotate a report before mailing it to someone, or .... The flexibility is there.

· A pop-up window lets you see the current values of all data in use (losses low, high, and reverse for all cable types you're using, etc.) anytime you want it. All that's required is that you press one key.

And Cable Designer provides for your other needs while you use the program to design, knowing that any job can be done easier when there are other useful tools available. And using each of these tools requires only this--the press of one key:

· On-line help gives you help text on what you're currently doing, no matter what. And if you don't think the help information is adequate, you can add your own pages of help to the help that is there or replace the supplied help with your own.

· Directory shows you the files contained in any disk or directory you request. The directory is displayed in a nicely formatted window, making it much easier to view than the output of the DOS DIR command.

· A listing option lets you view and page through any file you request to see.

· DOS2 creates a second copy of DOS for you and places you at the DOS prompt. This lets you do anything you can do from DOS, even run other programs, without ever really leaving Cable Designer. Typing EXIT at the DOS prompt returns you to Cable Designer at the exact spot you were when you left.

· The LUNCH security feature puts a "padlock" on the system when you need to leave for a while, but don't want to quit what you're doing. With LUNCH you enter a password and in 10 seconds the screen is replaced with the Cable Designer credits screen. From there you enter your password and Cable Designer returns you to whatever point you were at when you selected LUNCH.

· Plus, you can always CANCEL the option you've just selected from a menu, END any mode you're in (viewing a file, for example), or QUIT the entire program.

Hardware Requirements

Cable Designer requires 512K of RAM when it executes and requires DOS 2.0 or higher. 640K of RAM or more is recommended, allowing you to make full use of program features, such as DOS2. Note that with 512K of memory Cable Designer will not have space to automatically convert files made with earlier versions into 2.1 format. However, the conversion program (CONVERT.EXE) can be run at the DOS level before running Cable Designer to get around this memory problem. See Appendix C. Cable Designer will run on any IBM PC or IBM PC compatible and should support any video adapter you throw at it. From the original IBM PC to the PS/2 Model 80, from the Monochrome Printer Adapter to the Hercules card and on through the CGA, the EGA, and the VGA, Cable Designer will use it and will run beautifully. If the adapter you have has color capabilities Cable Designer will run in color. However, even if you have color capability, but prefer to work in black and white, Cable Designer has a start up option that will accommodate you.

Cable Designer will run from a floppy disk(s). A hard disk will noticeably improve performance, since disk access speeds will be increased.

Microsoft Windows users: Although Cable Designer is not a Windows Application, its program code is "well-behaved" and it therefore has no problem running under the Windows environment. A ".pif" file, (cdesign.pif) is included with the extras diskette. This program can be installed with the rest of your ".pif" files in your Windows subdirectory, and will optimize Cable Designer running under a Windows environment. The Windows "program manager" should be instructed, under properties, to load cdesign.pif at the command line.

Copy Protection

The Cable Designer Program Diskette and Extras Diskette are not copy protected. You are free to make backup copies for your own use as you desire. However, you will notice when you start Cable Designer that your name and registration number appear in the upper right-hand corner of the credits screen. This is our way of encouraging you to take care of your Cable Designer diskette. Don't let someone illegally copy your diskette--it will have your name on it. Having your name within the program also represents the personal type of business arrangement we'd like to have with you. We want Cable Designer to meet your needs and we'd like you to inform us of any problems you're having (bugs, etc.) and any things you'd like Cable Designer to be able to do that it can't. Feel free to write us at the CableSoft address anytime, and call when you have a question or problem that needs immediate attention.

1. Starting Up

This chapter will get you started with Cable Designer. You'll install it, you'll start it up, you'll create a simple beginning design. You'll learn the general kinds of things you'll need to know, like the device codes you can use when entering your design and the editing keys that are available. Finally, you'll become familiar with the extra features of the program, like FIND and DOS2.

1.1 Installing Cable Designer

Cable Designer comes to you with a Program Diskette and an Extras Diskette. The Program Diskette contains files essential to running Cable Designer. The Extras Diskette contains useful, but "extra" material, such as sample design files, and data files that are pre-configured for certain brands of equipment.

Installing Cable Designer For Floppy Disk Use

If you intend to run Cable Designer from a floppy disk, here's what you need to do:

1. Use DOS (be sure you're using 2.0 or higher) to format a blank diskette. Be sure to use the /S option if you will want to boot your computer with the new diskette or if you will want to use Cable Designer's DOS2 feature. Refer to your DOS manual for help.
2. Use the DOS COPY command to copy all files from the Program Diskette to your newly formatted diskette.
3. Label the disk "Cable Designer 2.1 Program Diskette" and keep the original as a backup.

Follow these same directions (without the /S option) to make a backup of the Extras Diskette if you so desire.

Just insert your newly created Cable Designer Program Disk and you're ready to run Cable Designer.

Installing Cable Designer On A Hard Disk

To prepare for running Cable Designer on a hard disk, simply copy the entire contents of the Program Diskette to your hard disk using the DOS COPY command. Refer to your DOS manual if you need help. Optionally you may also copy the Extras Diskette to your hard disk.

With a hard disk it's a good idea to create a subdirectory to hold all of your design work. Use the DOS command MKDIR to create a directory called CABLEDES.DIR as in:

```
mkdir cabledes.dir
```

If you make a new directory to hold Cable Designer, be sure to copy the files from the Program Diskette into the directory. With the Cable Designer Program Diskette copied to your hard disk you're ready to run Cable Designer.

1.2 Starting Cable Designer

At the DOS prompt (C>, for example) type:

cdesign

and press return to start Cable Designer. A message will appear asking you to wait a moment while the program's standard data files are loaded. Cable Designer's Program Disk contains four files named std.lvl, std.cbl, std.tap, and std.pas. When Cable Designer initializes, it looks for files with these names and loads their contents. You'll learn more about data files shortly.

Note that if your screen has color capabilities, Cable Designer will run in color automatically. If you want Cable Designer to run in black and white, enter:

cdesign /bw1

or

cdesign /bw2

when you start Cable Designer. Note that bw1 is the preferred black and white mode, since it does a better job of showing the various data entry forms and menus. However, on some screens (such as some monochrome portables or laptops), bw1 may appear too bright or dark. Try adjusting your screen first. If it is still too bright or shaded, quit Cable Designer and start over with bw2 which employs less contrast.

Once the standard data files are loaded, the Cable Designer credit screen appears. First a graphic showing part of a map with a cable system running through it appears. Then, a second or two later, a box with the CableSoft address appears followed by a box with the name and registration number belonging to the legal owner of this copy of Cable Designer.

The credit screen will be passed through every time the program starts up and every time the program ends. On startup, the credit screen serves as a reminder of CableSoft's rights and of our arrangement with you, the registered owner. On closing, the credit screen serves as a last chance to return to the program and finish something you may have forgotten, and as a sort of "good-bye" with hope that you found Cable Designer useful and were able to accomplish what you set out to do.

From the credit screen, press F10 if you wish to quit the program. Press any key besides F10 if you want to begin or continue design work.

1.3 Editing Keys and Techniques

Whenever Cable Designer prompts you for an answer it automatically "turns on" keys that you may use to enter and edit your answer. For example, when Cable Designer prompts you to enter a filename, it enables all keyboard keys that are valid for use in a DOS filename and it enables some editing keys to let you change your answer. If you try to enter a space key in a filename, Cable Designer will beep at you, letting you know that space characters are not valid in DOS filenames. This feature is just one way that Cable Designer protects you from making errors.

Editing keys differ slightly, depending on the current task. If you are annotating a data file, for example, there are many editing keys available to you. This section discusses editing keys that are ALWAYS available to you, anytime you are prompted for an answer. Additional editing keys will be discussed in the sections covering the program areas where they are enabled.

Editing Keys Always Available

Anytime you key in information for Cable Designer, these keys are available and perform the following functions:

Backspace: always erases the character to the left of the cursor.
Delete: always erases the character below the cursor.
Insert: inserts a blank character above the cursor (if blanks are allowed in the entry)
Ctrl-Backspace: erases the entire string of characters you've typed. Hold down the Ctrl key and press backspace. This shortcut lets you quickly replace what is there.
Left Arrow: moves the cursor left one character.
Right Arrow: moves the cursor right one character.
Home: places the cursor under the first character.
End: places the cursor under the last character.

With these simple editing capabilities, you can quickly modify any character string you've entered. Again, they're always available. If you're used to using a terminal and prefer Ctrl/H to backspace, note that Ctrl/H is supported and performs the same activity.

Editing Keys For Forms And Menus

In Addition to the editing keys just mentioned. The following keys are available on forms and menus.

Up Arrow or Shift-Tab: moves the cursor to the previous field or selection.
Down Arrow or Tab: moves the cursor to the next field or selection.

On a menu, using the up and down arrow keys provides a simple way to select items. As the keys are pressed, an indicator points to the current menu item that is entered for selection and the letter of the item is displayed. When the indicator points at the selection you want, press the return key to make the selection. You can also select menu items by entering the letter of the

menu item you desire--the indicator will "jump" to point at the item you've selected--then pressing return. If you use other editing keys to erase the menu selection, the indicator will temporarily disappear and the up and down arrows will be disabled until you specify a new selection, by typing it in.

On a form, the up and down arrow keys provide a simple way to move from field to field. Hold down the arrow keys and rapidly move through the form to a field you want to change. Note that on forms the arrow keys are sometimes disabled to force you to stay in the current field. Pressing the arrow keys under these circumstances may just cause Cable Designer to beep at you. This condition always means that there is an error in the current field or that it has not been entered, and that a valid string must be entered in the field before you may move on.

1.4 Example 1: Simple Beginning Design

The complicated process of designing a cable system layout is rendered easy with Cable Designer. Lets start out by trying a simple design layout. The diagram below shows a simple cable distribution layout from trunk (bridger) amplifier through eleven spans of cable, one splitter, and terminations (designs with greater complexity will be discussed in Section 6).

Figure 1. First Example Design

The following simple example assumes that you have started the program as described earlier and are using the standard tap, passive, level, and cable files provided with the program disk.

From the Preparations Menu select Option D to go to the Design Menu.

To select Option D, either type the letter D (upper or lower case) and press the return key or press the up and down arrow keys until the selection indicator is pointing at Option D, then press the return key.

Since the above example shows that there are two distribution lines exiting the bridger amplifier, you will now select Option 4, Bridger 3.5 dB, to indicate starting from a two-way feeder split at the bridger location. The program asks if you wish to load an existing design (one that was previously created and saved on diskette). Answer no (type the letter n for "no" and press return). The above design can be loaded if desired by entering yes (y for yes, followed by return) and entering Example1 (the file resides on the Extras Disk) at the prompt for the design name, but it is recommended that you try manual entry at this time to gain experience in the entry method. Cable Designer now asks if you wish to track homes "passed"? In this example, answer "N" for no and continue. Next, select a default cable type of 1 (enter the number "1"). This establishes the current cable type 1--T-3 .500" cable--as the default. F3 (DATA) can be used at any time to review the cable types currently available. You can use it now, if you like, to double check that cable type 1 is the desired type (you'll be returned to the point you were at). You may also want to use the HELP key, F1, as you enter cable footages, cable types, and devices into your design (during design entry, the first help screen you'll receive contains a list of the device codes you may enter).

Your screen should now be ready for design entry, showing you a design entry form in which you will enter the first leg of your design. The Leg I.D. field has been filled in for you by the computer and a message tells you that the leg contains no entries yet.

Lets begin entering the design by first replacing the computer-supplied I.D. for the leg (1) with something more meaningful. The Leg I.D. field is for your own use and may contain any string you enter of up to 15 characters.

Press backspace and then type Bridger Start in the leg I.D. field. Pressing return then places the cursor in position to accept the first cable footage. Type 100 to enter the footage as shown in Figure 1, return, return again to select the default cable type (pressing backspace or control/backspace and then typing any other valid number will override the default entry), and then type 4 to request a four way multitap as the device at the end of this entry. Press return to place the cursor at the next entry line. Continue entering the data (use Figure 1) until you arrive at the entry for the splitter. Then, type 20 for splitter (see device codes) and press return. The program will discontinue any further entry in this leg/branch and subbranch indicators will appear along the bottom edge of the entry form (page down <- (tap) and page down -> (tap)) indicating that two new legs have been created below this one for you to fill in. The codes also show you that both legs are tap legs and that the page down and arrow keys are used to move to them.

Press the page down key (PgDn on most keyboards) followed by the left arrow key to jump to leg #2. Erase the default I.D. and then type Upperleg for the Leg I.D. and press return. Now enter the data for branch Upperleg (i.e., 110, return, return (to accept the default cable), 4, return, etc). Continue until the final four way tap (terminate) is reached. When 4 is typed on the device code line, press page up followed by the up arrow key to terminate entry on that branch and to jump back to the main branch. Note: if you pressed return after typing the final device code you made an extra leg entry that you must delete--hold down the ALT key and press the letter D to delete the extra leg entry. Then press Page Up followed by Up Arrow as indicated above.

Now press page down followed by the right arrow key to jump to the third leg. Replace the leg I.D. of 3 with Lowerleg and press return. Enter all data until the final four way multitap is reached.

Type a 4 for the final multitap and then hold down the ALT key and press the letter T to test the design on screen. Answer Y for "yes" to the question about calculating reverse losses and press return. A window "pops" open to display the testing results. In this case, no errors are reported in any legs. Press any key to return to the design. Note: you can also test the design using Option 2 on the Design Menu, but ALT-T is usually more convenient.

The last leg you were working on--Lowerleg--is displayed along with the test results (running power levels, selected taps, etc.). Press page up and then the up arrow key to display the design's first leg--Bridger Start. Lets use F7, the FIND key to look at the other two legs and to view some additional information. Press F7--note that a new window opens and some additional information is now displayed.

·Total number of legs in the current design.
·Number of legs without proper design information (empty legs).
·The total footage in the current leg.
·Note that if we'd answered yes earlier to enable the tracking of homes passed, FIND would additionally show the number of houses in the current leg and in the current design.

F7 can be used anytime to display this additional information or to jump to a new leg. Type upperleg and press return. The design results are shown for leg Upperleg. Press F7 again to show the total footage for leg Upperleg--375 feet. Type lowerleg and press return. The design results for leg Lowerleg are shown. Press F7 one more time to show the total footage for the final leg. Now press the up arrow key and the starting leg is again displayed.

A few other notes about the design results information are in order. The power levels shown are in dBmv and are the input levels for the given device or point in the design. The reverse loss columns are always the reverse losses in dB from the preceding amplifier to the current point. Again, they do not take the loss of the current device into account as power levels or reverse losses indicated are at the forward input or reverse output of the given device or point.

Lets do a few more things regarding this design before continuing on. We'll save the design to disk, print the current design, and print the design's bill of materials.

Press F9 to end the design examination and return to Menu 2, the Design Menu. Now select item 7, Save the current design. Type Example followed by return. The design is now saved as EXAMPLE.DES. You are returned to the Design Menu. Select item 8, Print the design report. The program asks for the number of blank lines to leave at the top of your paper in case you are using letterhead paper or want to leave extra space at the top for some other reason. Type in the number of lines and press return or just press return if you desire that no lines be skipped. You are prompted for a title line for the report. Enter First Example Design and press return to print the current design. The program gives a final warning, requesting that you make sure that the printer is on. Press return again and the current design will print out on your printer. The message "Printing..." flashes at the bottom of the screen while the computer sends the report to the printer. When the message has disappeared, the Design Menu will return again. Now, select Option B to go to the Bill of Materials Menu. On the Bill of Materials Menu, select Option 1. Again, a message prompts you for a title line and reminds you to be sure your printer is turned on. Respond to the prompts and the Bill of Materials for the current design is sent to your printer. Sample printouts of the Design Report and Bill of Materials are included on the next two pages.

This completes our first small design. You should now start to sense the potential in Cable Designer although this first small design only touches on some of the many features available. Further design examples in Sections 5 and 6 give more detailed use of Cable Designer and some basic cable system design examples.

4/14/1991 at 11:45 AM

CABLE DESIGN REPORT, CABLE DESIGNER 2.1

First Example Design

STARTING POINT: bridger (3.5 dB leg).

Levels, cables, taps, and passives files in use are:
Std.lvl
Std.cbl
Std.tap
Std.pas

LEG I.D.> BRIDGER START| START>35.50|42.50|0.000|0.000|OK
NO. FEET CBL   DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
  1| 100| 1| 4-WAY-TAP|26.000|34.98|41.19|0.160|0.400|OK
  2| 85| 1| 4-WAY-TAP|26.000|34.04|39.48|0.696|1.240|OK
  3| 105| 1| 4-WAY-TAP|23.000|32.99|37.50|1.264|2.160|OK
  4| 120| 1| 2-WAY-SPLIT|0.0000|31.87|35.33|1.856|3.140|OK
410.000 FEET IN THIS LEG
PARENT LEG>   NONE
LEFT SUB LEG>   UPPERLEG(tap)
CENTER SUB LEG> NONE
RIGHT SUB LEG> LOWERLEG(tap)

LEG I.D.>   UPPERLEG| START>28.27|31.53|5.656|6.740|OK
NO. FEET CBL   DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
  1| 110| 1| 4-WAY-TAP|17.000|27.70|30.09|5.832|7.180|OK
  2| 105| 1| 4-WAY-TAP|14.000|26.25|27.61|6.900|8.500|OK
  3| 85| 1| 4-WAY-TAP|11.000|24.41|24.70|8.536|10.24|OK
  4| 75| 1| 4-WAY-TAP|8.0000|21.12|20.52|11.76|13.44|OK
375.000 FEET IN THIS LEG
PARENT LEG>   BRIDGER START
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.>   LOWERLEG| START>28.27|31.53|5.656|6.740|OK
NO. FEET CBL   DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
  1| 120| 1| 4-WAY-TAP|17.000|27.64|29.96|5.848|7.220|OK
  2| 140| 1| 4-WAY-TAP|14.000|26.02|27.02|6.972|8.680|OK
  3| 185| 1| 4-WAY-TAP|8.0000|23.65|22.80|8.768|10.82|OK
445.000 FEET IN THIS LEG
PARENT LEG>   BRIDGER START
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

TOTAL FEET> 1230.000 = 0.2330 MILES
VALUE OF MIN. LEVEL OFF TAP LOW FREQ> 7.0000
VALUE OF MIN. LEVEL OFF TAP HIGH FREQ> 12.000

4/14/1991 at 11:45 AM

BILL OF MATERIALS, CABLE DESIGNER 2.1

First example BOM

DEVICE OR CONNECTOR TYPE	TOTAL	DEVICE TYPE	TOTAL	DEVICE TYPE	TOTAL
High Power Line Extender..	0	DC-7 Coupler...	0	DC-30 Coupler..	0
Derated Line Extender.....	0	DC-8 Coupler...	0	DC-A Coupler...	0
Trunk Amplifier.....	0	DC-9 Coupler...	0	DC-B Coupler...	0
Housing-To-Housing Conn...	0	DC-12 Coupler..	0	DC-C Coupler...	0
AC Terminator.....	0	DC-16 Coupler..	0	3-Way Splitter.	0
Distribution Equalizer....	0	DC-20 Coupler..	0	3-Way Uneven	
2-Way Splitter.....	1	DC-24 Coupler..	0	Splitter.....	0

CABLE TYPE	TOTAL FEET	IN MILES	CONNECTORS
1: T3-500	1230.00000	0.232955	22
2: T3-625	0.00000000	0.000000	0
3: T3-750	0.00000000	0.000000	0
4: T3-875	0.00000000	0.000000	0
5: T31000	0.00000000	0.000000	0
6: NONE	0.00000000	0.000000	0
7: NONE	0.00000000	0.000000	0
8: NONE	0.00000000	0.000000	0
9: NONE	0.00000000	0.000000	0
10: NONE	0.00000000	0.000000	0

2-WAY TAPS		4-WAY TAPS		8-WAY TAPS		T TAPS	
FACEPLATE	TOTAL	FACEPLATE	TOTAL	FACEPLATE	TOTAL	FACEPLATE	TOTAL
4.0000	0	8.0000	2	11.000	0	NONE	0
8.0000	0	11.000	1	14.000	0	NONE	0
11.000	0	14.000	2	17.000	0	NONE	0
14.000	0	17.000	2	20.000	0	NONE	0
17.000	0	20.000	0	23.000	0	NONE	0
20.000	0	23.000	1	26.000	0	NONE	0
23.000	0	26.000	2	29.000	0	NONE	0
26.000	0	29.000	0	32.000	0	NONE	0
29.000	0	32.000	0	35.000	0	NONE	0
32.000	0	35.000	0	NONE	0	NONE	0
35.000	0	38.000	0	NONE	0	NONE	0
38.000	0	41.000	0	NONE	0	NONE	0

41.000	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0

1.5 Example 2: Making and Using A Data File

Creating and using your own data files with a design is also easy--and flexible. Let's create a new operating parameters file to use with the first simple design you completed in the last example. We'll create the new data file, load it, and then test the example design again to see what effect the different values in the new operating parameters file have on the design's power levels.

If you have tried the DATA feature (try it now if you want to by pressing F3) you will see that Cable Designer loads and uses four kinds of data files:

- levels files (or operating parameters files) contain settings for the system's operating parameters
- cables files contain settings for the cable types you will use
- taps files contain settings for the taps you'll use
- passives files contain settings for the passive devices you'll use

You'll learn everything else you'll want to know about data files in Section 2.

The technique used in this example to create a new operating parameters file can be used to make any of the data files listed.

If the Preparations Menu is not displayed on your screen, go to it (select Option P from the Design Menu or the Bill Of Materials Menu, press F9 if you're in the DATA option, etc.). Then, select Option 6, Create/change operating parameters file (.lvl). As the option's name implies, it can be used to create a new data file or to modify an existing one (such as std.lvl, the operating parameters file that was in use during testing of the first example design).

An entry form appears and you are prompted for the name of a file to use as a template. Often the simplest way to make a new file is to use an existing one as a model or "template" for the new one. You can create a data file completely from scratch in Cable Designer, which is also easy, but let's use a template in our example.

Enter

std.lvl

at the prompt to use the standard levels file that comes with Cable Designer as a template.

When asked if you wish to re-use the file's comment lines, enter Y for yes. We'll talk more about comment lines in a moment.

The entry form is automatically filled in with the values from the data file that was used as a template. All you have to do is change the values that will differ in your new data file. For this example, suppose you need to make these changes for your new file:

Field	From	To
Maximum Bridger Output	46	49 dBmv
Maximum Line Extender Output	46	45 dBmv
Trunk Tilt	3	2 dB
Distribution Tilt	7	5 dB
Minimum High Frequency Input For Trunk Amplifier	11	9 dBmv

Use the up and down arrow keys to move to the position of each data item needing a change. Erase the existing entry and then key in your own.

When you have made all of the above changes, press F9 once.

At this point you could end (by pressing F9 again and saving or not saving the file), that's really all there is to it. But, let's look at one other thing first.

Enter V to view the new file you are creating. This option actually allows you to see what the data file you are creating will look like, before you save it out to disk. Furthermore, it lets you add comments to the file that document the data items you've entered within it. With the data file annotated with comments, it not only serves as a data file to Cable Designer, but as a meaningful report file you may print out on your printer or list on your computer screen.

Comments lines are those lines that begin with the comment character (#). If you used the standard operating parameters file supplied with Cable Designer (std.lvl) and followed the directions above, your new file automatically inherited the comments from std.lvl when you answered yes to the question about re-using the template's comment lines.

By pressing the page up, page down, and arrow keys, you can move around in the file and see what it looks like. You will see how the comments included from std.lvl automatically document each piece of data in the file. Try entering your own comment line if you like by moving to the end of a line, pressing return to insert a new line, typing the comment character (#), then following it with the text of your comment. You can remove a comment line in a similar fashion--just remove the comment, then remove the comment character. Cable Designer ignores these comment lines when it loads your data file.

Press page up as many times as you need to until you reach the top of the file. Then use the arrow keys, the delete or backspace keys, and the keyboard keys to move to, delete, and replace the word "standard" with "example2".
After making this change, press F9 to end this view mode, then press F9 a second time. Enter

test.lvl

when prompted for the name of the new file. Your new data file will be saved on diskette and you'll be returned to the Preparations Menu.

Select Option 2, Load operating parameters file (.lvl) and at the prompt for filename, enter:

test

Note that Cable Designer is smart enough to append the correct filename extension for you.

Your new operating parameters file is loaded. If you created the first example design and still have it loaded, you will receive a message saying that your design's starting power levels now reflect the new .lvl's file values.

Now, return to the design menu (Option D). Select Option 2 to re-test your design. When the test is completed, select Option 1, Add to/change/view the current design to view the new power levels resulting from the use of the new operating parameters file during the test.

There you have it! That's how easy it is to create your own data file, load it, and use it with a design.

1.6 Program Device Codes

The device codes allow a wide variance of devices to be entered but at the same time are fairly simple and straight forward. The listing below is part of the help file covering the program device codes and is shown for your further inspection.

These strings and codes may be entered in the DEVICE field.

DEVICE	CODE	DEVICE	CODE	ALT. CODES WITH THEIR SPLIT PATTERNS
NONE	0	DC-7	70....701(thru tap) 702(tap thru)	
TRUNK-AMP	11	DC-8	80....801(thru tap) 802(tap thru)	
LEXT-HI	1	DC-9	90....901(thru tap) 902(tap thru)	
LEXT-LO	10	DC-12	120...1201(thru tap) 1202(tap thru)	
2-WAY-TAP	2	DC-16	160...1601(thru tap) 1602(tap thru)	
4-WAY-TAP	4	DC-20	200...2001(thru tap) 2002(tap thru)	
8-WAY-TAP	8	DC-24	240...2401(thru tap) 2402(tap thru)	
T-WAY-TAP	T	DC-30	300...3001(thru tap) 3002(tap thru)	
DEQ	9	DC-A	A0....A01(thru tap) A02(tap thru)	

2-WAY-SPLIT 20 | DC-B B0....B01(thru tap) B02(tap thru)
3-WAY-BAL 30 | DC-C C0....C01(thru tap) C02(tap thru)
3-WAY-UNBAL 31 |.....311(3.5 7 7) 312(7 3.5 7) 313(7 7 3.5)

Hot taps = tap code, period, plus a hot value (e.g. 2.4)
Figure 2. Device Codes

Further explanation is as follows:

Device	Comments
NONE	No device selected.
TRUNK-AMP	Trunk amplifier placed at current location.
LEXT-HI	A full level output line extender at current location.
LEXT-LO	A de-rated level line extender at current location--Deration amount is typically 3 dB, to keep 3rd-order distortion products constant on distribution legs whether one LEXT or two LEXTs used.
2-WAY-TAP	A two output port multi-tap is desired.
4-WAY-TAP	A four output port multi-tap is desired.
8-WAY-TAP	An eight output port multi-tap is desired.
T-WAY-TAP	A general use tap is desired. T-way taps are for your use to support tap needs outside the 2, 4, or 8-way types.
DEQ	A distribution line equalizer or equalized tap is desired at current location.
DC-7	A 7dB directional coupler is to be inserted and current design leg ended.
DC-8	A 8dB directional coupler is to be inserted and current design leg ended.
DC-9	A 9dB directional coupler is to be inserted and current design leg ended.
DC-12	A 12dB directional coupler is to be inserted and current design leg ended.
DC-16	A 16dB directional coupler is to be inserted and current design leg ended.
DC-20	A 20dB directional coupler is to be inserted and current design leg ended.
DC-24	A 24dB directional coupler is to be inserted and current design leg ended.
DC-30	A 30dB directional coupler is to be inserted and current design leg ended.
DC-A	An 'A' dB directional coupler is to be inserted and current design leg ended.
DC-B	An 'B' dB directional coupler is to be inserted and current design leg ended.
DC-C	An 'C' dB directional coupler is to be inserted and current design leg ended.
3-WAY-BAL	A three-way balanced output line splitter is to be installed at the current location. The term balanced means that the power levels exiting each of the three output legs are equal in value compared to each other and an equal amount less than the power input levels. (Not all manufacturers make a balanced three way splitter). The current design leg will be ended.
2-WAY-SPLIT	A two-way line splitter is to be inserted at the current location and the current design leg ended.
3-WAY-UNBAL	A three-way unbalanced output line splitter is to be installed at the current location. The term unbalanced means that one of the three output legs is of higher power level (typically -3.5 dB down from the input) and the remaining two output legs are of a lower power level (typically -7.0 dB down from the input). The current design leg will be ended.
HOT TAPS	If a two-way, four-way, eight-way or T-way, tap is required to have more than the stated normal high frequency output level this can be requested by the hot tap convention. For example, 2.6 entered for a device code would tell Cable Designer to select a

two-way tap with an additional 6 dB of minimum output power level. 4.12 would request a four-way tap with an addition 12 dB output power level. This additional level is added to both the high frequency output level and the low frequency output level.

Some additional general comments on the device codes are listed below:

· When a code such as 70 is entered (see Figure 2 earlier) that does not indicate a pattern for how a splitting device splits, the program will aid you in the placement of the tap and through legs. A "pop up" menu will appear and menu selections will be given to assist you in the choice of tap and through leg location. The choice 701 which is listed as "thru tap" means that the thru leg will be the leg split to the left and the tap leg will be the leg split to the right. Three-way splitters can be confusing at times regarding the placement of the tap and through legs. Again, the "menu" choice of 31 for an unbalanced three-way splitter will aid in the placement and should be the device code of choice until you feel comfortable with the device code conventions.

· Some passive manufacturers make 8dB directional couplers, others make 7dB and 9dB values. Almost all make a 12dB value. 7dB, 8dB, 9dB, 12dB, 16dB, 20dB, 24dB, and 30dB are all valid types so that all manufacturers are accommodated. Higher directional coupler values are not made by most manufacturers but are included as valid device codes. They are not generally used in cable system design for the following reasons: 1) If the plant is designed for two-way layout, values higher than 12dB should be avoided as intolerable reverse frequency losses will result; and 2) the savings in insertion loss values on the thru leg are insignificant above the 12dB value. If you feel your design has valid application for values of 16dB and up, include appropriate entires in the passives file. General coupler values A-dB, B-db, and C-db are also included so that you can customize your own values which don't appear otherwise.

· Any device codes relating to amplifiers (trunk amplifiers, high output line extenders, and low output line extenders) will insert an amplifier with input and output levels dictated by the values entered in the current levels data file.

· As noted above, some designers prefer to design their distribution legs so that the 3rd order distortion products are constant whether one line extender or two are used. In that case, they will typically use a high output line extender (LEXT-HI) if there is one line extender in cascade from the bridger, and use low output level line extenders (LEXT-LO) if two or more are in cascade. This design approach is allowed with device codes 1 and 10. The actual value of de-ration is determined by you when you set up your levels file. The normal value is 3dB since a 3dB reduction in power level will decrease the 3rd order products by approximately 6dB. This is the same approximate increase caused by the addition of a second amplifier in cascade, so the reduction in power level cancels the increase due to two amplifiers in cascade.

· A distribution equalizer (DEQ) is a device inserted when excessive tilt is encountered on a design leg and an amplifier is not to be placed nearby. The DEQ has a response exactly opposite of a certain length of cable and will bring the power levels back into balance. Not all passive manufacturers make a distribution line equalizer or equalized tap. Consult the catalog of your passive manufacturer of choice for further information. DEQ insertion loss values are entered in the passives file--std.pas or any passives file.

· The program will check for inconsistent device code type usage. For example, if you place a trunk amplifier (11) as a first amplifier and then attempt to place a line extender (1) on the same line, a warning will appear during testing since this would not be normal design convention. All conceivable device code checking is done by Cable Designer. Alarm messages do not prevent you from proceeding with your design, they only flag levels or procedures considered unusual.

· As noted in the associated help file, the actual device code string can be entered rather than the device code. For example, you can type "lext-hi" rather than "1" to place a high level line extender. The numeric device codes would normally be the most desirable as an entire design portion can be entered via the numeric keypad on your keyboard. This greatly facilitates and speeds the design entry process. If desired, however, you can use the actual device name.

1.7 Special Features: The Function Keys

Cable Designer has several special functions that are available through the function keys. A line across the top of the screen shows the names of the functions and denotes which function key is used to select each. If a function is disabled, its name does not appear on this line.

F1: Help Files and Features

Function F1, HELP, is always available. Pressing F1 at any given point will present a pop-up window with helpful material for the point you're at. Pressing any key when the help window is up will cause the help window to be put away or, if there is more than one page of help content available, will display the next page of help. In the case that there is more than one page of help content, Function F9, END, will be enabled to allow you to "end" the HELP option without viewing the rest of the help pages, if you so desire.

There is help content available for any given point you are at in the program. However, if you feel the help is inadequate or you would like to provide additional help for yourself at a certain point in the program, you may add your own pages of help or modify the content of the existing help files. Appendix D contains instructions describing how to do this, or you may press F1 twice and you'll get help on help itself, including instructions for adding your own help pages.

F2: Directory Key

Function F2, DIRECTORY, will pop up a window that is specially formatted for displaying the names and properties (size, date created, etc.) of the files found on a disk or in a disk directory.

Though it performs the same function as the DOS DIR command, DIRECTORY differs slightly in that you must include a filename when specifying the file(s) to search for. The DOS wildcard characters (* and ?) are available so you may easily display any group of files. For example:

.	Shows all files on the default drive and directory.
*.tap	Shows all files ending in .tap on the default drive and directory.

The directory feature is one place that shows how organizing your files with thoughtfully named directories and filenames can be a great convenience. Consider the following DIRECTORY search string:

Iowa\Red\Ionia.*

Which might be used to show all files involved in the design work for the city of Ionia, Iowa in Red County.

After you have selected DIRECTORY, select HELP (F1) for more search string examples. Also, your DOS manual can instruct you in the use of wildcard characters.

F3: Data File Listing Key

Pressing F3 will select the DATA option, which will give you information about the data files currently in use by the program.

After selecting DATA, a pop-up window appears showing you the drive, path, and filename of the current operating parameters file, cable attenuations file, taps file, and passives file that the program is using (you will learn more about data files in the sections that follow).

Also, the pop-up window contains, near its bottom, a small menu that allows you to select options to view the data values provided by each one of the loaded data files. Select the option providing the data you would like to view. A form will appear displaying the setting of each piece of data as it was set when the associated data file was loaded.

F4: Listing ASCII File Contents

F4 selects the LIST option, allowing you to view the contents of any text file on any disk attached to the machine. LIST lets you view a page of the file at a time, waiting until you press a key to show you the next page.

Enter the name of the file you'd like to view, using the editing keys to change the name if you need to. The first page of the file will be displayed as soon as you press the return key.

If there is another page that follows the one displayed, a small indicator (resembling a downward-pointing arrow) appears on the lower right hand edge of the LIST window. Press any key (besides F9) to display the next page of text.

The help screen for the LIST option provides more information. Remember, to see the help on LIST, select the LIST option then press F1 (HELP).

F5: DOS Shell

F5 selects DOS2, which creates a second copy of DOS, clears the screen, and places the cursor at the DOS prompt. At this point you can issue DOS commands, run other programs, anything you can normally do from DOS. The difference is you haven't quit Cable Designer.

Type EXIT at the DOS prompt and you'll be returned to Cable Designer--at the exact spot you were at when you selected DOS2.

NOTE: If you try the DOS2 option and you get a message saying that the file COMMAND.COM cannot be found, you must make this file available to the program before DOS2 will function properly. COMMAND.COM is placed on a floppy diskette if it is formatted with the /S option. COMMAND.COM is also usually placed on a hard disk when it is formatted. If you know COMMAND.COM is around, but Cable Designer cannot find it, this means you probably need to set the path, using the DOS command PATH (see your manual for assistance).

Further note that any programs (DOS commands included) that stay resident upon exiting should be run once to install them BEFORE you startup Cable Designer, not from DOS2. Starting these kind of programs for the first time from DOS2 will have negative consequences in that not all memory will be freed when you exit to return to Cable Designer. The DOS PRINT command is one example: type PRINT to install the resident part of PRINT before you start Cable Designer for the first time. Then when you use DOS2 and use the PRINT command to print a file, no side effects will occur when you exit DOS2 to Cable Designer.

F6: LUNCH Security Key

Suppose you've been working on a design for hours and for some reason you need to leave for a while, lunch, for example. You'd prefer to leave the program running and just continue from where you're at when you get back, yet you'd like to make sure no one tampers with your work or loses your current position.

Press F6 and use the LUNCH option to secure the system while you're gone. A small window appears, requesting a 1-8 letter password. Enter your password--it can be anything--then press return. For 10 seconds the window containing your password remains on the screen, so that you have time to write it down on a piece of scrap paper or notice any typos you've made. Then the current screen is replaced with the credits screen and you are prompted to enter your password to continue design work.

When you return, key in your password exactly as you typed it (including any space characters you used) and press return. You will be returned to the point you were at when you selected LUNCH.

Note that it's a good idea to save any work you've done before using LUNCH, in case you forget your password or somehow power is cut to your computer.

F7: Find Key

The FIND feature becomes available when you are creating or changing a design and the entry screen is shown. FIND can be used to quickly locate and move to (display) a specific leg in the design. As your design grows larger, FIND can save you time, since moving from leg to leg by other means can become cumbersome.

Pressing F7 displays the FIND window. Values in the FIND window tell you:

- How many legs there are currently in the design
- How many of those legs are empty
- How many feet of cable are in the leg shown when you selected FIND

If house tracking is on, the FIND window also includes:
- The number of houses in the leg shown
- The number of houses in the design

With the FIND window displayed:

- Pressing up arrow will take you to the topmost leg (the first leg in the design)
- Pressing return with nothing entered in the FIND window's leg I.D. box will take you to the next empty branch in the design, if there is one in the design
- Pressing return after entering a character string in the FIND window's leg I.D. box will take you directly to the leg whose I.D. matches the string you've typed in. Keep in mind that blank characters count, but you need not worry about upper/lower case differences

FIND can be very handy after testing a design. During the test you may be given the leg I.D. of a leg that contains an error. Use FIND to go directly to that leg. The leg's error message column will show you which entry or entries caused the problem and what the exact problem is.

CANCEL, END, and QUIT

Function keys F8 through F10 provide the CANCEL, END, and QUIT features.

Many programs use one key to represent multiple options with slightly different meanings. Perhaps you've used a program where the same key that meant "Quit the program" in one spot meant "Quit the mode I'm in" in another. It can make you nervous to use the provided options, since you're not always sure what the outcome will be.

This ambiguity is never a problem in Cable Designer:

- F8, CANCEL, always means "cancel the last selection I made and return me to the menu"
- F9, END, always means "end the mode I'm in now and return me to where I was when I selected it"

· F10, QUIT, always means "quit Cable Designer and return me to DOS"

Which key to use will never be confusing, because only one will be available at any given time. The one available is the one shown on the features line at the top of the screen.

F8: CANCEL Key

The CANCEL key becomes available whenever you select an option from a menu, allowing you to cancel the selection and return to the menu without performing the selection.

For example, suppose you selected Option 2 from the Preparations Menu, "load operating parameters file", then, when prompted for the name of the levels data file to load, you realized you meant to select Option 3, Load cable attenuations file. Pressing F8, CANCEL would immediately return you to the menu, ignoring the selection you'd just made. From there you could then select Option 3, as you'd intended.

F9: END Key

The END key is enabled whenever you make a selection that puts you in a "mode". A mode in Cable Designer is any enabled program area that allows you to perform a particular task as long as you desire.

Suppose you select the LIST option by pressing F4. You'll notice that END is enabled. This is because the LIST option is a mode. You may stay in the LIST option as long as you like, looking through as many files as you want to. When you are finished, press F9, END, to return to where you were when you selected LIST.

F10: QUIT Key

QUIT is enabled when you are at any of Cable Designer's main menus. Pressing F10, QUIT, first returns you to the Cable Designer credit screen. From there, press F10 to really quit the program and return to DOS, any other key to re-enter the program. If you re-enter, you will be at the menu you were at when you selected QUIT.

2. Menu 1: Preparations Menu

When you start Cable Designer, the first menu you come to is the Preparations Menu. As its name implies, the Preparations Menu provides options allowing you to prepare to work with a design.

Figure 3 below shows the Preparations Menu and its options.

MENU 1: PREPARATIONS MENU

+-
¦_ 1. Load standard level, cable, tap, and passive files.
¦_ 2. Load operating parameters file (.lvl).
¦_ 3. Load cable attenuations file (.cbl).
¦_ 4. Load taps file (.tap).
¦_ 5. Load passives file (.pas).
¦_ 6. Create/change operating parameters file (.lvl).
¦_ 7. Create/change cable attenuations file (.cbl).
¦_ 8. Create/change taps file (.tap).
¦_ 9. Create/change passives file (.pas).
+-
¦_ D. Go to the Design Menu.
¦_ B. Go to the Bill Of Materials Menu.
+-

Figure 3. The Preparations Menu

2.1 Loading Data Files

Preparing to work with a design entails loading data files containing the values you wish to use when you work with and test that design. As stated earlier, there are four data file types. They are:

- levels files (lvl), which contain settings for the system's operating parameters
- cables files (cbl), containing settings for the cable types you will use
- taps files (tap), containing settings for the taps you'll use
- passives files (pas), containing settings for the passive devices you'll use

The 3-letter strings shown in parentheses indicate filename extensions that are used with each data file type. A filename extension is attached to the end of a filename with a period as in "mydata.lvl". If you need more information about filename extensions, see your DOS manual.

One of each data file type must be loaded before you may work with a design. Note, however, that when Cable Designer starts it automatically loads one of each type of data file, so that you will always have one of each file type loaded, though each might not contain the values you

wish to work with. Cable Designer does this auto-loading by searching for four files with the name "std" (short for "standard") and the filename extension associated with each type. That is, data files with these names are loaded automatically when Cable Designer starts:

- std.lvl, the standard levels file
- std.cbl, the standard cables file
- std.tap, the standard taps file
- std.pas, the standard passives file

For this reason, data files with these names must reside on the same disk or directory as the Cable Designer program or Cable Designer will interrupt you during start up to ask for the name of replacement data file(s) to load. Pre-defined standard files come with Cable Designer and are on the Program Diskette. You are free to replace the supplied standard files with your own or to change the values of items in the standard files to your own preferred settings. You will learn more about creating and modifying data files below.

If you have just started Cable Designer for the first time and you're at the Preparations Menu, press F3, the DATA key, and select each DATA menu option in succession to view the values that come supplied with the pre-defined Cable Designer standard data files. You may also view these standard files in Appendix A.

Options 1 - 5 on the Preparations Menu allow you to load data files for use. These may be any of the CableSoft-supplied data files or your own data files that you've created using options 6 - 9 (discussed below).

Menu option 1 loads the standard levels, cables, taps, and passives files from the current directory. This is the same thing that happens automatically when Cable Designer starts. Use Option 1 to re-load the standard files in anytime you need to. For example, suppose you temporarily load in another passives file, to experiment with another brand of equipment. When you are done, you can use Option 1 to re-load the standard files, which will reset the passives file in use to std.pas.

Options 2 - 5 allow you to load any levels, cables, taps, or passives files of your choosing. Each of these options works like the others, except that each expects a filename with its associated filename extension. For example, suppose you have created a taps file that you want to load and use with a design you're creating. You've named the file Anita.tap since you only intend to use the file when you work on the design for a town named Anita. To load the file, you enter the number 4, for Option 4, or you press the up and down arrow keys until the indicator points at Option 4, then you press the return key. You are then prompted to enter the name of the file to load and reminded that the filename, since it is a taps file, must include the 3-letter extension "tap".

Anytime in Cable Designer that you must enter a filename with a designated extension, as a convenience, you need not enter the extension. Cable Designer will append it automatically to the filename you type. Cable Designer's filename cleanup capabilities are quite intelligent--for example, to load our file Anita.tap, any of these names could be entered:

- Anita
- Anita.
- Anita.tap
- Anita.tappppp

Note that in the last example, Cable Designer actually removes any extra characters you've accidentally keyed in. You will find, as a general rule, that the most convenient way to enter the file name is to simply enter the name without the extension, as in the first example shown above.

Furthermore, if you misspell the filename, you will be given an error message by Cable Designer, and asked to re-enter the name. Also, remember that the Cancel option will be available if you change your mind and the HELP option is always there too, if you need it.

After locating on disk a file with the filename you entered, Cable Designer will try to load it. Cable Designer may automatically invoke the CONVERT program (see Appendix B for more information) to bring the file up to date if it was created with an earlier version of Cable Designer. If there is not enough memory to invoke CONVERT, you will have to run convert from DOS2. If any errors are detected in the data file, such as bad data or missing data, Cable Designer will give you an error message to inform you of the problem and ask you for the name of an alternate file to load. Remember that you can always enter the name of the standard file to load. Note that if you use the create options on the Preparations Menu to make your data files, errors in loading data files should never happen, since Cable Designer protects you from creating data files that have errors in them.

Once you have loaded your new data file, you can use F3, DATA, to assure that the file was indeed loaded and that the values supplied in it are in effect.

After you have loaded the data files you wish to use with your design, select Option D to go to the Design Menu. Anytime you wish to load new data files in or make changes to existing ones, return to the Preparations Menu to do it.

2.2 Creating or Modifying Data Files

Now you know how to load data files and why you need to load them. All you need to know now is how to make your own data files, so that you may create and load data values of your choosing. After reading this section you'll know everything you need to know to easily make your own data files. Section 1.5 walked you through the creation of a data file using one of the standard files as a template. Use that section in conjunction with this one to help you create any data files you need.

Options 6-9 on the Preparations Menu let you create your own levels, cables, taps, or passives files. They also provide a simple way to change the contents of any existing data file.

Select the option that corresponds to the type of file you'd like to create. A fill-in-the-blank form overlays the preparations menu and a prompt appears asking you to enter the name of a

template file to use. The prompt also tells you that you could press return to not use a template file.

You may use any existing file of the same type you're creating as a template to help you create the new one. All values in the file you're creating will be initialized to the corresponding values in the template file. This makes creating new files very easy--you need change only the items that are to differ from the ones provided by the template.

You may also optionally re-use any comment lines from the template file. Comment lines are lines of text in the data file used to describe the data itself, or to provide a reminder to you, or anything you want. Since comments in one file can be re-used in others, it's easy to set up a consistent format to use throughout all of your data files. Commented data files can, of course, be loaded for use with your design work, like any other data file. Cable Designer simply ignores the comments when loading the file. Commented data files have one big advantage over un-commented data files, however. That is, since the comments may describe and document the values used in the data files, the data files make good reports when printed out and can be easily reviewed, with the LIST option for example. A data file without comments is very difficult to decipher, since, when printed or listed, it is simply a large group of numbers with no comments explaining what each number means.

You never have to use comments in any of your files if you don't want to. It is simply an option that can make your work easier, and Cable Designer more flexible.

If you are new to Cable Designer and this comment issue seems confusing, don't panic. Adding your own comment lines is easy and discussed in detail below. Plus, if you use the standard files (std.lvl, std.cbl, std.tap, std.pas) supplied by CableSoft as templates you will rarely, if ever, need to add your own comments, since they are already thoroughly commented. Note further that the standard files provide a format for new data files that use them as templates--if you use the standard files as templates, your new data files will be organized into columns as the standard files are. See Appendix A for a look at the standard files.

So, enter the name of a file to use as a template (remember, the standard files may be used) or press return to not use one.

If you enter a valid template filename, you will next be asked if you wish to re-use the template's comment lines. Enter Y if you wish to, N if you do not. After this, the template file will be read, the values are initialized, and the cursor is placed at the first entry in the entry form. Note that if you've re-used comment lines, the comment lines do not show on the entry form. You will be able to view and modify them when you END the entry screen, however.

If you do not use a template file, all entries on the entry form will be initialized to the string 'NONE', which means that "no value is supplied" and the file you're making will initially have no comment lines in it. You will be able to add any comment lines you want, however.

The use of the word 'NONE' on data entry screens should be fully understood. Not all items in Cable Designer data files have to have values entered for them. Or, more clearly, not all of them need to have a numeric value provided by you--they are optional. For any of these

optional items that you know will play no part in your design (for example, DC-7 coupler values need not be entered if you will use no DC-7s) simply enter the string 'NONE' instead of a numeric value. The tables below show the values that may be entered for each of the data files, the units the value should be entered in, and whether a numeric value must be entered for the item or 'NONE' is allowed. Note that Cable Designer will not allow you to enter the string 'NONE' in a field where it is not allowed. Further note that Cable Designer will not allow you to leave a field until a valid entry is made, nor will it allow you to leave the entry screen until all data items have been supplied and are valid.

Use the up and down arrow keys to move from field to field and the editing keys to erase or modify a field for replacement.

Levels (.lvl) File Values

Name of Item	Units	'NONE'Allowed?
Maximum Trunk Output	dBmv	No
Maximum Bridger Output	dBmv	No
Maximum Line Extender Output	dBmv	No
Trunk Tilt	dB	No
Distribution Tilt	dB	No
Line Extender Cascade Deration	dB	No
Minimum Level Off Tap (low frequency)	dBmv	No
Minimum Level Off Tap (high frequency)	dBmv	No
Maximum Reverse Tilt Allowed On Line Before Warning	dB	No
Minimum High Frequency Input for High Power Line Extender	dBmv	No
Minimum High Frequency Input for Derated Line Extender	dBmv	No
Minimum High Frequency Input for Trunk Amplifier	dBmv	No
Maximum Reverse Loss Between Trunk Amps	dB	Yes
Maximum Reverse Loss Between Bridger and First Line Extender	dB	Yes
Maximum Reverse Loss from Line Extender to Subsequent Line Extenders	dB	Yes

Levels file notes: The values for maximum reverse losses (last 3 items) are optional since calculating reverse losses during the design test is optional.

Cables (.cbl) File Values

Name Of Item	Units	'NONE'Allowed?
Cable Type 1's ID String	Any character string	Yes
Type 1's Loss Low Channel	dB per 100 feet	Yes

Type 1's Loss High Channel	dB per 100 feet	Yes
Type 1's Rev.Loss Low Freq	dB per 100 feet	Yes
Type 1's Rev.Loss High Freq	dB per 100 feet	Yes
Cable Type 2's ID String	Any character string	Yes
Type 2's Loss Low Channel	dB per 100 feet	Yes
Type 2's Loss High Channel	dB per 100 feet	Yes
Type 2's Rev.Loss Low Freq	dB per 100 feet	Yes
Type 2's Rev.Loss High Freq	dB per 100 feet	Yes

|
|
|
Same for missing cable types...
|
|
|

Cable Type 9's ID String	Any character string	Yes
Type 9's Loss Low Channel	dB per 100 feet	Yes
Type 9's Loss High Channel	dB per 100 feet	Yes
Type 9's Rev.Loss Low Freq	dB per 100 feet	Yes
Type 9's Rev.Loss High Freq	dB per 100 feet	Yes
Cable Type 10's ID String	Any character string	Yes
Type 10's Loss Low Channel	dB per 100 feet	Yes
Type 10's Loss High Channel	dB per 100 feet	Yes
Type 10's Rev.Loss Low Freq	dB per 100 feet	Yes
Type 10's Rev.Loss High Freq	dB per 100 feet	Yes

Cables file notes: Cable type I.D. (identification) strings may be any string of characters you assign. Fill in this field to help you associate the type with it's actual brand or specs. 'NONE' may be entered in any field. Fill in the values for as many types of cable as you intend to use. Fill in reverse loss values for the cable types you specify if you intend to calculate reverse losses when testing, which is optional.

Taps (.tap) File Values

Name Of Item	Units	'NONE'Allowed?
Terminated 2-Way Tap Faceplate Value	dB	Yes
Next Highest 2-Way Tap Faceplate Value	dB	Yes
· Its Loss For Low Channel	dB	Yes
· Its Loss For High Channel	dB	Yes
· Reverse Loss at Low Freq	dB	Yes
· Reverse Loss at High Freq	dB	Yes
Next Highest 2-Way Tap Faceplate Value	dB	Yes
· Its Loss For Low Channel	dB	Yes
· Its Loss For High Channel	dB	Yes
· Reverse Loss at Low Freq	dB	Yes
· Reverse Loss at High Freq	dB	Yes

(26 -- 2-Way Entries Allowed Max)

**	**	**
Terminated 4-Way Tap Faceplate Value	dB	Yes
Next Highest 4-Way Tap Faceplate Value	dB	Yes
· Its Loss For Low Channel	dB	Yes
· Its Loss For High Channel	dB	Yes
· Reverse Loss at Low Freq	dB	Yes
· Reverse Loss at High Freq	dB	Yes
Next Highest 4-Way Tap Faceplate Value	dB	Yes
· Its Loss For Low Channel	dB	Yes
· Its Loss For High Channel	dB	Yes
· Reverse Loss at Low Freq	dB	Yes
· Reverse Loss at High Freq	dB	Yes
(26 -- 4-Way Entries Allowed Max)		
**	**	**
Terminated 8-Way Tap Faceplate Value	dB	Yes
Next Highest 8-Way Tap Faceplate Value	dB	Yes
· Its Loss For Low Channel	dB	Yes
· Its Loss For High Channel	dB	Yes
· Reverse Loss at Low Freq	dB	Yes
· Reverse Loss at High Freq	dB	Yes
Next Highest 8-Way Tap Faceplate Value	dB	Yes
· Its Loss For Low Channel	dB	Yes
· Its Loss For High Channel	dB	Yes
· Reverse Loss at Low Freq	dB	Yes
· Reverse Loss at High Freq	dB	Yes
(26 -- 8-Way Entries Allowed Max)		
**	**	**

Terminated T-Way Taps (User Defined)		
Tap Faceplate Value	dB	Yes
Next Highest T-Way Tap Faceplate Value	dB	Yes
· Its Loss For Low Channel	dB	Yes
· Its Loss For High Channel	dB	Yes
· Reverse Loss at Low Freq	dB	Yes
· Reverse Loss at High Freq	dB	Yes
Next Highest T-Way Tap Faceplate Value	dB	Yes
· Its Loss For Low Channel	dB	Yes
· Its Loss For High Channel	dB	Yes
· Reverse Loss at Low Freq	dB	Yes
· Reverse Loss at High Freq	dB	Yes
(26 -- T-Way Entries Allowed Max)		
**	**	**

Taps file notes: Enter terminated tap value, then, one after the other, enter all other available taps of that type starting with the next lowest tap faceplate value and incrementing to the

highest available tap faceplate value. Enter 'NONE' in any remaining entry fields for that type. NOTE: Do not leave row gaps between entries for adjacent taps. Also, be careful that faceplate values are entered in correct ascending order--Cable Designer does many helpful things for you, but it currently does not sort your faceplate value entries to ensure ascending order. This will effect your test results. Use the provided taps files (such as std.tap) as correctly formed examples. Enter reverse loss values low & high if you intend to calculate reverse losses during testing, which is optional. If you do not intend to use a type of tap at all (like 8-way), enter 'NONE' in all of its fields.

T-Way or general use taps may be used when you wish to design with some "not-standard" type tap such as 6-way taps, single port taps as in MDU designs, or with "equivalent value" interdiction taps. Fill in values for them just as you would with 2-way, 4-way or 8-way taps.

Passives (.pas) File Values

Name Of Item	Units	'NONE' Allowed?
Distribution Equalizer Insertion Loss Low Freq.	dB	Yes
Distribution Equalizer Insertion Loss High Freq.	dB	Yes
Distribution Equalizer Reverse Loss - Lo Freq	dB	Yes
Distribution Equalizer Reverse Loss - Hi Freq	dB	Yes
2-Way Splitter Loss Low Freq.	dB	Yes
2-Way Splitter Loss High Freq.	dB	Yes
2-Way Splitter Reverse Loss - Lo Freq	dB	Yes
2-Way Splitter Reverse Loss - Hi Freq	dB	Yes
7 dB Coupler Thru Leg Loss Low Freq.	dB	Yes
7 dB Coupler Thru Leg Loss High Freq.	dB	Yes
7 dB Coupler Thru Leg Reverse Loss - Lo Freq	dB	Yes
7 dB Coupler Thru Leg Reverse Loss - Hi Freq	dB	Yes
7 dB Coupler Tap Leg Loss Low Freq.	dB	Yes
7 dB Coupler Tap Leg Loss High Freq.	dB	Yes
7 dB Coupler Tap Leg Reverse Loss - Lo Freq	dB	Yes
7 dB Coupler Tap Leg Reverse Loss - Hi Freq	dB	Yes
8 dB Coupler Thru Leg Loss Low Freq.	dB	Yes
8 dB Coupler Thru Leg Loss High Freq.	dB	Yes
8 dB Coupler Thru Leg Reverse Loss - Lo Freq	dB	Yes
8 dB Coupler Thru Leg Reverse Loss - Hi Freq	dB	Yes
8 dB Coupler Tap Leg Loss Low Freq.	dB	Yes
8 dB Coupler Tap Leg Loss High Freq.	dB	Yes
8 dB Coupler Tap Leg Reverse Loss - Lo Freq	dB	Yes
8 dB Coupler Tap Leg Reverse Loss - Hi Freq	dB	Yes
9 dB Coupler Thru Leg Loss Low Freq.	dB	Yes
9 dB Coupler Thru Leg Loss High Freq.	dB	Yes
9 dB Coupler Thru Leg Reverse Loss - Lo Freq	dB	Yes
9 dB Coupler Thru Leg Reverse Loss - Hi Freq	dB	Yes
9 dB Coupler Tap Leg Loss Low Freq.	dB	Yes
9 dB Coupler Tap Leg Loss High Freq.	dB	Yes

9 dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
9 dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes
12 dB Coupler Thru Leg Loss Low Freq. dB Yes
12 dB Coupler Thru Leg Loss High Freq. dB Yes
12 dB Coupler Thru Leg Reverse Loss - Lo Freq dB Yes
12 dB Coupler Thru Leg Reverse Loss - Hi Freq dB Yes
12 dB Coupler Tap Leg Loss Low Freq. dB Yes
12 dB Coupler Tap Leg Loss High Freq. dB Yes
12 dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
12 dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes
16 dB Coupler Thru Leg Loss Low Freq. dB Yes
16 dB Coupler Thru Leg Loss High Freq. dB Yes
16 dB Coupler Thru Leg Reverse Loss - Lo Freq dB Yes
16 dB Coupler Thru Leg Reverse Loss - Hi Freq dB Yes
16 dB Coupler Tap Leg Loss Low Freq. dB Yes
16 dB Coupler Tap Leg Loss High Freq. dB Yes
16 dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
16 dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes

20 dB Coupler Thru Leg Loss Low Freq. dB Yes
20 dB Coupler Thru Leg Loss High Freq. dB Yes
20 dB Coupler Thru Leg Reverse Loss - Lo Freq dB Yes
20 dB Coupler Thru Leg Reverse Loss - Hi Freq dB Yes
20 dB Coupler Tap Leg Loss Low Freq. dB Yes
20 dB Coupler Tap Leg Loss High Freq. dB Yes
20 dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
20 dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes
24 dB Coupler Thru Leg Loss Low Freq. dB Yes
24 dB Coupler Thru Leg Loss High Freq. dB Yes
24 dB Coupler Thru Leg Reverse Loss - Lo Freq dB Yes
24 dB Coupler Thru Leg Reverse Loss - Hi Freq dB Yes
24 dB Coupler Tap Leg Loss Low Freq. dB Yes
24 dB Coupler Tap Leg Loss High Freq. dB Yes
24 dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
24 dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes
30 dB Coupler Thru Leg Loss Low Freq. dB Yes
30 dB Coupler Thru Leg Loss High Freq. dB Yes
30 dB Coupler Thru Leg Reverse Loss - Lo Freq dB Yes
30 dB Coupler Thru Leg Reverse Loss - Hi Freq dB Yes
30 dB Coupler Tap Leg Loss Low Freq. dB Yes
30 dB Coupler Tap Leg Loss High Freq. dB Yes
30 dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
30 dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes
A dB Coupler Thru Leg Loss Low Freq. dB Yes
A dB Coupler Thru Leg Loss High Freq. dB Yes
A dB Coupler Thru Leg Reverse Loss - Lo Freq dB Yes
A dB Coupler Thru Leg Reverse Loss - Hi Freq dB Yes

A dB Coupler Tap Leg Loss Low Freq. dB Yes
A dB Coupler Tap Leg Loss High Freq. dB Yes
A dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
A dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes
B dB Coupler Thru Leg Loss Low Freq. dB Yes
B dB Coupler Thru Leg Loss High Freq. dB Yes
B dB Coupler Thru Leg Reverse Loss - Lo Freq dB Yes
B dB Coupler Thru Leg Reverse Loss - Hi Freq dB Yes
B dB Coupler Tap Leg Loss Low Freq. dB Yes
B dB Coupler Tap Leg Loss High Freq. dB Yes
B dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
B dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes
C dB Coupler Thru Leg Loss Low Freq. dB Yes
C dB Coupler Thru Leg Loss High Freq. dB Yes
C dB Coupler Thru Leg Reverse Loss - Lo Freq dB Yes
C dB Coupler Thru Leg Reverse Loss - Hi Freq dB Yes
C dB Coupler Tap Leg Loss Low Freq. dB Yes
C dB Coupler Tap Leg Loss High Freq. dB Yes
C dB Coupler Tap Leg Reverse Loss - Lo Freq dB Yes
C dB Coupler Tap Leg Reverse Loss - Hi Freq dB Yes

3-Way Balanced Splitter Loss Low Freq. dB Yes
3-Way Balanced Splitter Loss High Freq. dB Yes
3-Way Balanced Splitter Reverse Loss - Lo Freq dB Yes
3-Way Balanced Splitter Reverse Loss - Hi Freq dB Yes
3-Way Unbal. Splitter Low Leg Loss Low Freq. dB Yes
3-Way Unbal. Splitter Low Leg Loss High Freq. dB Yes
3-Way Unbal. Splitter Low Leg Rev. Loss - Lo Freq dB Yes
3-Way Unbal. Splitter Low Leg Rev. Loss - Hi Freq dB Yes
3-Way Unbal. Splitter High Leg Loss Low Freq. dB Yes
3-Way Unbal. Splitter High Leg Loss High Freq. dB Yes
3-Way Unbal. Splitter High Leg Rev. Loss - Lo Freq dB Yes
3-Way Unbal. Splitter High Leg Rev. Loss - Hi Freq dB Yes

Passives file notes: Enter values for each kind of device you intend to use in your design. Enter reverse values if you will want to calculate reverse losses during design testing. When you are through entering values, press F9.

General use (A - C) couplers may be used in any instance where the other coupler values don't apply or seem to fit. Examples are values of external couplers which don't match our values chosen (such as 25dB coupler), or internal couplers used in amplifiers where you don't wish to dedicate its use to an assigned value. For example, you design with an equipment type which allows for internal direction coupler values within an amplifier (it has two output ports). You commonly use the internal DC-9 and DC-12 values available from the manufacturer, but don't want to assign this to the standard DC-9 and DC-12 values as you also use external units of these values. DC-A and DC-B can be assigned the internal values.

When you are through entering values, press F9.

You are asked to enter V to view the file, C to make more changes, or F9. The view option allows you to see what the file will actually look like, including any comments, and you may add comments or change the file format. View is discussed further in the next section. Entering C puts you back on the entry form so that you may make additional changes to the values. You may switch between the entry form and the view window as long as you like until the file has the values, comments, and format you desire.

Press F9 when you're ready to save the new data file. When prompted for the name of the new data file, enter the name you'd like the file to have. Again, you may enter just the first part of the filename--the extension will be appended to the name automatically. If a file with the name you supplied already exists on the diskette, you will be asked if you wish to replace that file. Enter Y for yes or N for no.

When your data file has been saved, you are automatically returned to the Preparations Menu. Use options 2-5 to load in the data file you've made, if you want to.

2.3 Adding User Comments

As just mentioned in the last section, after pressing F9 or END on the entry form for creating data files, you have three options.

- Enter C to go back to the entry form and further enter or change data values.

- Enter V to view what the file will actually look like and add comments or change the format of the file.

- Press F9 to END data file creation, optionally save the file, and return to the Preparations Menu.

This section describes option V and explains the capabilities provided within it.

After entering V (typing "V" and pressing return) the topmost 16 lines of the file are presented to you in a window. Indicators on the lower and upper edge of the window (downward and upward-pointing arrows) tell you if there is more of the file to display after or before the portion shown in the view window. If an indicator is not present, there is no more of the file than is shown.

Comment lines, if the file contains any, are those that begin with the sharp symbol (#) or the "comment character" as it will be called from here on.

Use these keys to move around within the file:

- Arrow keys: each arrow key moves the cursor one space in the arrow's direction
- Home, End: places cursor at the beginning/end of the current line.
- Pg Up, Pg Dn: scrolls the displayed text up or down a page

Use these keys and the accompanying notes and examples below to add or remove comment lines, spaces and blank lines, thereby creating the file's format.

- Del: deletes the character above the cursor
- Ins: inserts a space character at the cursor location (the space bar does this too)
- Backspace: deletes the character to the left of the cursor
- Ctrl/Backspace: deletes the entire line the cursor is on
- Return: creates a new line

Note that these editing keys work only on comments, blank lines, and space characters. The data items themselves must be changed on the data file entry form. You may get back to the entry form by pressing F9, then selecting option C. Furthermore, note that these editing keys are quite smart. They won't let you accidentally "un-comment" a comment line (to remove a comment line you must remove everything following the comment character first, then remove the comment character) or "squish" two data items together into one by deleting the only space character that separates them. Here are some examples that explain how to do some of the things you might want to do.

1.) Entering a new comment line. Use the movement keys to position the cursor at the beginning (under the first character) of the line before which you'd like to add the comments or end (just one past the last character) of the line after which you'd like to add the comment. The Home and End keys work nicely to position the cursor at the beginning and end of a line. Press return to create a new line for the comment. Use the arrow keys to position the cursor at the beginning of the new line. Type the comment character (#), followed by the comment itself (e.g., #This levels file is used for Aurora, Illinois). Typing the comment character first is essential, in that it "enables" the other keys that you need to enter the comment. If you try to enter a word on a line not beginning with a comment character, Cable Designer simply beeps at you.

2.) Deleting a comment line. Position the cursor on the comment line that you'd like to delete, then use the delete key, the backspace key, or hold down the Ctrl key and press backspace to remove the comment line. If you're using the backspace key or the delete key, remember that you must remove all of the characters following the comment character before you may remove the comment character itself. Cable Designer won't let you remove the comment character first, since that would leave the comment "un-commented" and Cable Designer would have difficulty loading the file if it were saved that way. To remove a line with no characters on it, position the cursor at the beginning of the line and press backspace or Ctrl/backspace.

3.) Merging two lines. A comment line may be moved to the end of the comment line above it and a data line may be moved to the end of the data line above it. For example, positioning the cursor at the beginning of the second line shown below and then pressing backspace

```
10    20    30
40    50
```

would append the second line to the first as shown.

10 20 30 40 50

Note that Cable Designer would insert a space between 30 and 40 if one did not exist, to keep the values separate. Further note that you may delete extra space characters on a line, but that Cable Designer will enforce one space remaining between data items.

4.) Splitting a comment line or data line. A comment or data line may be split into two or more lines. Move the cursor to the location where you would like the split to occur (under the first character you'd like to drag to the next line). Press return. The line is split into two lines. If you split a comment line at a point where there was no comment character, a comment character will automatically be inserted for you at the beginning of the new line. Note that to split a data line, you must be positioned beneath a space character or the first character in a data item. Cable Designer will just beep at you otherwise, since it thinks you're trying to split a data item in two.

If you are new to Cable Designer, try using a standard file as a template to create a new data file, then select option V and experiment with adding comment lines and removing them. You don't need to worry about messing the file up--Cable Designer won't let you.

When you're finished, press F9. Again you'll see you have the three options listed at the beginning of this section.

With meaningful comments entered in your data files, the data files themselves can provide information about the data contained therein (reminding you or others why you used certain values) or anything at all you'd like to mention there. Review the comments in your data files using the LIST option, or print them using your printer. When you're through with a new design, staple the data files together with your design report and bill of materials to have a complete package that automatically documents the system.

2.4 Other Data File Techniques

This section is intended to be a general technical commentary on the use of data files. Cable Designer's easy-to-use, flexible data file options allow great versatility in the designing process.

One way this versatility can be applied is in the use of different equipment brands for cable system design. For example, Brand A might be used for taps and Brand B might be used for passives. The cables data file, with its ten allowable cable types, lets you mix brands and use unusual cable sizes. For example, cable types 1 through 4 might be used for your main design types, while cable types 5 through 8 might be for types used in an older section of your system built under different design criteria. Finally, cable types 9 and 10 could be used for super trunking type cable. Cable Designer is intended to be used in both rebuild and upgrade applications, and the great variety of cables allowed further enhances that ability.

Different types or brands of equipment can also be "intermixed" within a given data file. For example, Brand A and Brand B could be combined in a given data file such as the std.tap.

While this technique should be used with care, it does allow great adaptability. Brand A might be used for all tap values in the two-way and four-way classification, while Brand B was used for all eight-way types. Brand C could then be used in the T-way values section. This approach might be taken because Brand A is the preferred brand but does not manufacture an eight-way type; or because the eight-way of Brand A does not meet all technical criteria. T-Way taps, as discussed earlier, are the most common technique for the introduction of a non-standard equipment

Versatility is also allowed (and indeed is necessary) in the creation of the passives data file. Most manufacturers do not make, for example, all directional couplers in the 7dB, 8dB, 9dB, 12dB, 16dB, 20dB, 24dB, and 30dB values. One manufacturer may make 7dB and 9dB values, while another may make 8dB, 12dB, 16dB and 20dB. The passives data file allows the entry of all values, and the intermixing of several manufacturers. The use of all possible directional coupler values allows a much more efficient design as you choose to mix values. General use couplers A-dB, B-dB, and C-dB further allow the creation of your own specialized coupler file for design purposes. Finally, both balanced and un-balanced three-way splitters are allowed even though many manufacturers do not make both.

In all of the above scenarios, great care should be taken to add copious notes (the method of adding notes or "comments" is discussed in previous sections) to the data files so that when future questions arise (and they will) on what brands and types were used in the design process, adequate documentation is available. This annotation of data files is particularly important when different brands are intermixed in the same data file.

Finally, some more technical comments on the information required in each data file are in order. This dialogue is not meant to be a technical dissertation on the design process, but rather a brief explanation of what technical information is requested in each area.

Technical Comments On Levels (.lvl) File Values

Name of Item	Comment
Maximum Trunk Output	Maximum Pwr output at highest freq.
Maximum Bridger Output	Maximum Pwr output at highest freq.
Maximum Line Extender Output	Maximum Pwr output at highest freq. without any cascade deration.
Trunk Tilt	Trunk tilt in dB - Lowest frequency to highest frequency-block or true
Distribution Tilt	Distribution tilt in dB - Lowest frequency to highest frequency.
Line Extender Cascade Deration	The cascade deration factor in dB- often 3dB - any value can be used
Minimum Level Off Tap	Min. acceptable pwr level-low freq (low frequency)
Minimum Level Off Tap (high frequency)	Min. acceptable pwr level - hi freq
Maximum reverse Tilt Allowed On Line before warning	Max amount that the low freq power level can exceed the hi freq pwr lvl in dB

Minimum High Frequency Input for High Power Line Extender	Min. acceptable pwr lvl input at hi freq. for non-derated line extender
Minimum High Frequency Input for Derated Line Extender	Min. acceptable pwr lvl input at hi freq. for derated line extender
Minimum High Frequency Input for Trunk Amplifier	Min. acceptable pwr lvl input at hi freq. for trunk amplifier
Maximum Reverse Loss Between Trunk Amps	Max allowable reverse loss between trunk amplifiers in dB
Maximum Reverse Loss Between Bridger and First Line Extender	Max allowable reverse loss between the bridger amp and the first lext in dB
Maximum Reverse Loss from Line Extender to Subsequent Line Extenders	Max allowable reverse loss between the first lext and the second lext in dB

Levels file notes: The values for maximum reverse losses (last 3 items) are optional since calculating reverse losses during the design test is optional.

Technical Comments On Cables (.cbl) File Values

Name Of Item	Comment
Cable Type 1's ID String	An identifier string for cable type number 1
Type 1's Loss Low Channel	Cable type 1 loss/100 ft at lowest fwd freq
Type 1's Loss High Channel	Cable type 1 loss/100 ft at highest fwd freq
Type 1's Reverse Loss Lo	Cable type 1 loss/100 ft at reverse lo design freq
Type 1's Reverse Loss Hi	Cable type 1 loss/100 ft at reverse hi design freq
Cable Type 2's ID String	An identifier string for cable type number 2
Type 2's Loss Low Channel	Cable type 2 loss/100 ft at lowest fwd freq
Type 2's Loss High Channel	Cable type 2 loss/100 ft at highest fwd freq
Type 2's Reverse Loss Lo	Cable type 2 loss/100 ft at reverse lo design freq
Type 2's Reverse Loss Hi	Cable type 2 loss/100 ft at reverse hi design freq
|	
|	
|	
Same for missing cable types...	
|	
|	
|	
Cable Type 9's ID String	An identifier string for cable type number 9
Type 9's Loss Low Channel	Cable type 9 loss/100 ft at lowest fwd freq
Type 9's Loss High Channel	Cable type 9 loss/100 ft at highest fwd freq

Type 9's Reverse Loss Lo Cable type 9 loss/100 ft at reverse lo design freq
Type 9's Reverse Loss Hi Cable type 9 loss/100 ft at reverse hi design freq
Cable Type 10's ID String An identifier string for cable type number 10
Type 10's Loss Low Channel Cable type 10 loss/100 ft at lowest fwd freq
Type 10's Loss High Channel Cable type 10 loss/100 ft at highest fwd freq
Type 10's Reverse Loss Lo Cable type 10 loss/100 ft at reverse lo design freq
Type 10's Reverse Loss Hi Cable type 10 loss/100 ft at reverse hi design freq

Cables file notes: Cable type ID (identification) strings may be any string of characters you assign (fill in this field to help you associate the type with it's actual brand or specs). 'NONE' may be entered in any field. Fill in the values for as many types of cable as you intend to use. Fill in reverse loss values for the cable types you specify if you intend to calculate reverse losses when testing, which is optional.

Technical Comments On Taps (.tap) File Values

Name Of Item	Comment
Terminated 2-Way Tap Faceplate	2-way value that terminates line-
Next Highest 2-Way Tap Faceplate	Enter the next highest value,
Its Loss For Low Channel	enter the loss for forward low design freq,
Its Loss For High Channel	then loss for high design freq,
Reverse Loss - Lo Freq	then the loss at the rev. lo design freq
Reverse Loss - Hi Freq	then the loss at the rev. hi design freq
Next Highest 2-Way Tap Faceplate Value	freq if desired...continue this
Its Loss For Low Channel	process until all 2-way values are
Its Loss For High Channel	entered
Its Reverse Loss - Lo Freq	Insertion loss at low return freq
Its Reverse Loss - Hi Freq	Insertion loss at hi return freq
(26, 2-Way Entries Allowed)	
Terminated 4-Way Tap Faceplate	4-way value that terminates line-
Next Highest 4-Way Tap Faceplate	Enter the next highest value,
Its Loss For Low Channel	enter the loss for forward low design freq,
Its Loss For High Channel	then loss for high design freq,
Reverse Loss - Lo Freq	then the loss at the rev. lo design freq
Reverse Loss - Hi Freq	then the loss at the rev. hi design freq
Next Highest 4-Way Tap Faceplate Value	freq if desired...continue this
Its Loss For Low Channel	process until all 4-way values are
Its Loss For High Channel	entered

Its Reverse Loss - Lo Freq Insertion loss at low return freq
Its Reverse Loss - Hi Freq Insertion loss at hi return freq
(26, 4-Way Entries Allowed)

Terminated 8-Way Tap Faceplate 8-way value that terminates line-
Next Highest 8-Way Tap Faceplate Enter the next highest value,
Its Loss For Low Channel enter the loss for forward low design freq,
Its Loss For High Channel then loss for high design freq,
Reverse Loss - Lo Freq then the loss at the rev. lo design freq
Reverse Loss - Hi Freq then the loss at the rev. hi design freq
Next Highest 8-Way Tap Faceplate Value freq if desired...continue this
Its Loss For Low Channel process until all 8-way values are
Its Loss For High Channel entered
Its Reverse Loss - Lo Freq Insertion loss at low return freq
Its Reverse Loss - Hi Freq Insertion loss at hi return freq
(26, 8-Way Entries Allowed)

Terminated T-Way Tap Faceplate T-way value that terminates line-
Next Highest T-Way Tap Faceplate Enter the next highest value,
Its Loss For Low Channel enter the loss for forward low design freq,
Its Loss For High Channel then loss for high design freq,
Reverse Loss - Lo Freq then the loss at the rev. lo design freq
Reverse Loss - Hi Freq then the loss at the rev. hi design freq
Next Highest T-Way Tap Faceplate Value freq if desired...continue this
Its Loss For Low Channel process until all T-way values are
Its Loss For High Channel entered
Its Reverse Loss - Lo Freq Insertion loss at low return freq
Its Reverse Loss - Hi Freq Insertion loss at hi return freq
(26, T-Way Entries Allowed)

Taps file notes: Enter terminated tap value, then, one after the other, enter all other available taps of that type starting with the next lowest tap faceplate value and incrementing to the highest available tap faceplate value. Enter 'NONE' in any remaining entry fields for that type. NOTE: Do not leave row gaps between entries for adjacent taps. Also, be careful that faceplate values are entered in correct ascending order--Cable Designer does many helpful things for you, unfortunately, it does not sort your faceplate value entries to ensure ascending order and this will effect your design results. Use the provided taps files (such as std.tap) as examples of correctly formed taps files.

Enter reverse loss values, low and high reverse frequencies, if you intend to calculate reverse losses during testing, which is optional.

If you do not intend to use a type of tap at all (like 8-way), enter 'NONE' in all of its fields.

Technical Comments On Passives (.pas) File Values

Name Of Item	Comment
Dist. Equalizer Insertion Loss Low Freq.	Distribution equalizers may
Dist. Equalizer Insertion Loss High Freq.	be used or not--enter the
Dist. Equalizer Reverse Loss - Lo Freq	insertion losses as indicated
Dist. Equalizer Reverse Loss - Hi Freq	
2-Way Splitter Loss Low Freq.	Enter appropriate losses for
2-Way Splitter Loss High Freq.	the two-way splitters used
2-Way Splitter Reverse Loss - Lo Freq	for the fwd and reverse freqs
2-Way Splitter Reverse Loss - Hi Freq	
7 dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
7 dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
7 dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
7 dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
7 dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
7 dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
7 dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
7 dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
8 dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
8 dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
8 dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
8 dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
8 dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
8 dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
8 dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
8 dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
9 dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
9 dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
9 dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
9 dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
9 dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
9 dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
9 dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
9 dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
12 dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
12 dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
12 dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
12 dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
12 dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
12 dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered

12 dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
12 dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
16 dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
16 dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
16 dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
16 dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
16 dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
16 dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
16 dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
16 dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
20 dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
20 dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
20 dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
20 dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
20 dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
20 dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
20 dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
20 dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
24 dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
24 dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
24 dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
24 dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
24 dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
24 dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
24 dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
24 dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
30 dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
30 dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
30 dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
30 dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
30 dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
30 dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
30 dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
30 dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
A dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
A dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
A dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
A dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
A dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
A dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
A dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
A dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
B dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
B dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
B dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
B dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs

B dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
B dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
B dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
B dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies
C dB Coupler Thru Leg Loss Low Freq.	Enter appropriate losses for
C dB Coupler Thru Leg Loss High Freq.	the directional coupler (for
C dB Coupler Thru Leg Rev. Loss - Lo Freq	both the thru leg and tap leg)
C dB Coupler Thru Leg Rev. Loss - Hi Freq	and forward and reverse freqs
C dB Coupler Tap Leg Loss Low Freq.	Losses at lowest and highest
C dB Coupler Tap Leg Loss High Freq.	fwd design freqs are entered
C dB Coupler Tap Leg Rev. Loss Low Freq	plus loss at both reverse design
C dB Coupler Tap Leg Rev. Loss Hi Freq	frequencies

3-Way Balanced Splitter Loss Low Freq.	Enter appropriate losses for
3-Way Balanced Splitter Loss High Freq.	the 3-way splitters used
3-Way Balanced Splitter Rev. Loss Lo Freq	for the fwd and reverse freqs
3-Way Balanced Splitter Rev. Loss Hi Freq	

3-Way Unbal. Split Low Leg Loss Low Freq.	Enter appropriate losses for
3-Way Unbal. Split Low Leg Loss High Freq.	the 3-way splitter (both
3-Way Unbal. Split Low Leg Rev. Loss Lo Freq	the high leg and low leg) and
3-Way Unbal. Split Low Leg Rev. Loss Hi Freq	forward & reverse frequencies
3-Way Unbal. Split High Leg Loss Low Freq.	Losses at lowest and highest
3-Way Unbal. Split High Leg Loss High Freq.	fwd design freqs are entered
3-Way Unbal. Split High Leg Rev. Loss Lo Freq	plus losses at both reverse freqs
3-Way Unbal. Split High Leg Rev. Loss Hi Freq	

3. Menu 2: Design Menu

Selecting Option D from either the Preparations Menu or the Bill Of Materials Menu takes you to the Design Menu, which is shown in Figure 4 below. However, if you have not yet told Cable Designer what design you're working on (creating a new one or using an existing one previously saved to disk) Cable Designer automatically selects Option C from the Design Menu for you (Create/use another design) and presents you with the menu shown in Figure 5.

If you're new to Cable Designer and the menu in Figure 5 is on your screen, go to Section 3.10, Create/Use Another Design, which tells you how to start a new design as well as how to load in and work with an existing one you've saved to diskette.

MENU 2: DESIGN MENU

```
------------------------------------------------------------------
  +-
  ¦_ 1.  Add to/change/view the current design.
  ¦_ 2.  Test the current design.
  |_ 3.  Select a different starting point for the current design.
  ¦_ 4.  Select a new default cable type for the current design.
  ¦_ 5.  Toggle house tracking on/off.
  ¦_ 6.  Modify minimum level off tap high and/or low.
  ¦_ 7.  Save the current design to a disk file for later use.
  ¦_ 8.  Print the design report.
  ¦_ 9   Write the design report to a disk file.
  ¦_ C.  Create/use another design.
  ¦
  ¦
  ¦
  ¦_ P.  Go to the Preparations Menu.
  ¦_ B.  Go to the Bill Of Materials Menu.
  +-
```

Figure 4. The Design Menu

```
                MENU 2:  DESIGN MENU, CREATE/USE A DESIGN

------------------------------------------------------------------

      AMPLIFIER STARTING LEVELS       LOW            HIGH
      Line Extender Outputs =        40.000         47.000 dBmv.
      Bridger Output 1 Port =        40.000         47.000 dBmv.
                  +-
                  ¦_ 1.  Line extender (high output).
                  ¦_ 2.  Line extender (low output).
                  ¦_ 3.  Bridger (full output).
                  ¦_ 4.  Bridger (3.5 dB leg).
                  ¦_ 5.  Bridger (7 dB leg).
                  ¦_ 6.  Trunk amplifier.
                  ¦_ 7.  Manual start levels.
                  +-
                  ¦_ P.  Go to the Preparations Menu.
                  ¦_ B.  Go to the Bill Of Materials Menu.
                  +-
```

Figure 5. The Create/Use A Design Menu (from Option C on Design Menu)

3.1 Add To/Change/View The Design

Anytime you select Option 1 from the Design Menu or you're creating a new design or using an existing one with Option C, the end result is that your design is shown to you in the design entry form. If you are just starting, your first leg will be shown. If you've been on the entry form before, the last leg you were working on will be shown and the cursor will be placed on the last entry it was positioned on. On the design entry form, you may easily move around to the other legs of your design, and make changes or additions to any part of it.

MENU 2: DESIGN MENU, ADD TO/CHANGE/VIEW THE CURRENT DESIGN

```
+--¦PgUp,^  upper branch+------------¦design untested, Alt-T to test|-----
¦ Leg I.D.> DC12 THRU LEG  ¦START>  37.56 43.52  1.070 1.350  OK
¦                      +-------------------------------------------
- NO. FEET CBL    DEVICE   ¦ TAP    L IN  H IN   L REV H REV      ERRORS
^  3  60   1   2-WAY-TAP   ¦26.000  35.46 39.14  2.107 3.150  OK
-  4  70   1   2-WAY-TAP   ¦23.000  34.80 37.73  2.582 3.373  OK
¦  5  70   1   2-WAY-TAP   ¦23.000  33.93 36.21  3.094 4.510  OK
-  6  100  1   4-WAY-TAP   ¦20.000  32.91 34.30  3.654 5.410  OK
N  7  40   1   8-WAY-TAP   ¦20.000  32.10 32.97  4.218 6.170  OK
U  8  80   1   2-WAY-TAP   ¦17.000  30.79 30.83  5.246 7.390  OK
M  9  80   1   4-WAY-TAP   ¦14.000  29.77 28.98  5.874 8.310  OK
- 10  40   1   2-WAY-TAP   ¦14.000  28.16 26.65  7.438 9.870  OK
¦ 11  50   1   2-WAY-TAP   ¦11.000  27.00 24.90  8.418 10.97  OK
¦ 12  0    1   LEXT-HI     ¦2.1600  25.60 23.10  9.918 12.37  OK
- 13  50   1   2-WAY-TAP   ¦29.000  38.74 45.35  0.080 0.200  OK
v 14  100  1   8-WAY-TAP   ¦29.000  37.92 43.53  0.540 0.900  OK
- 15  60   1   4-WAY-TAP   ¦29.000  37.31 42.25  0.936 1.440  OK
+-----¦PgDn,<  7.0 dB+--------¦PgDn,v  7.0 dB+-------¦PgDn,>  3.5 dB+-----
```

Figure 6. The Design Entry Form (with all possible indicators shown).

If you are creating a new design, the first leg is shown to you and, since no entries have been made in the leg yet, a line in the midst of the leg says "Branch empty so far." Note that the terms "leg" and "branch" are used as interchangeable throughout this discussion as are "reverse" and "return".

Lets assume momentarily that you are creating a new design and that the cursor is placed in the Leg I.D. field. This will allow us to discuss each field on the entry form, as well as the form's other points of interest.

The Leg I.D. Field

Whenever a new leg of the design is created, Cable Designer will automatically assign it a number to serve as the leg's unique identifier and it places this number in the Leg I.D. field.

Cable Designer has given it a unique name so that you may search for the leg with the FIND option and locate the leg on the design report, but the Leg I.D. field is really for your use. You should replace the Leg I.D. assigned by Cable Designer with a better one, one with more meaning. For example, suppose you're creating part of the distribution system. Cable Designer has placed the first, empty leg, which it has given a Leg I.D. of 1, on the design form. On the map you're using you can see that this leg originates from a bridger amp located on the west end of 7th Street. So, with the cursor positioned in the Leg I.D. field, you press backspace or ctrl/backspace to erase the Leg I.D. '1' and then type in the new Leg I.D. of 'Bridger, W. 7th'. Entering a meaningful I.D. like this for each branch in your design will make your entire design easier to use and understand.

Leg I.D.s, like any part of the design, can be changed whenever you want to change them.

After typing the Leg I.D., press F9 if you want to end design entry and return to the Design Menu. From the Design Menu you can select Option 1, Add to/change/view the current design to get back to the design entry form. Pressing return after typing the Leg I.D. will move you to the first leg entry, it will also create a blank first leg entry for you to fill in, if no first leg entry exists.

The Leg Entry

A "leg entry" in Cable Designer corresponds to one horizontal row on the design entry form, below the column headers "NO., FEET, CBL, DEVICE, TAP,
L IN, H IN, L REV, H REV, and ERRORS".

```
 NO. FEET CBL    DEVICE   ¦ TAP    L IN  H IN   L REV H REV      ERRORS
  3  60   1   2-WAY-TAP   ¦26.000  35.46 39.14  2.107 3.150  OK
```

Figure 7. A Leg Entry and Column Headers

For each leg entry, you enter the length of cable (in feet) to the next device, the cable's type (1-10, corresponding to the types loaded from the cables data file), and the device attached to the end of the cable (entered by typing a device code or a mnemonic string, discussed below). Cable Designer automatically numbers the entry for you (the NO. column) and, as the design is tested, fills in all the remaining information (TAP through ERRORS):

TAP) If the device selected was a 2-way, 4-way, 8-way, T-way tap, or hot tap, a tap faceplate value is selected for you using information provided in the taps data file. If the device is an amplifier, the TAP column holds the pad and equalizer values, with the pad to the left of the decimal point and the equalizer value in the first two positions to the right of the decimal point (for example, with the value 9.030 shown, the pad value is 9 and the equalizer value is 3).

L IN) L IN shows the low frequency power level at the point of input to the device.

H IN) H IN shows the high frequency power level at the point of input to the device.

L REV and H REV) Reverse losses are optional, but if selected when testing, these columns are filled with the accumulative amounts of reverse losses (high and low reverse frequencies) from the point of input to the device back to the last amplifier in the system.

ERRORS) The ERRORS column contains a message explaining any errors that were encountered in that leg entry. The errors and their explanations are as follows:

OK) NO errors encountered
LOW LEVEL ON LINE) A tap faceplate value could not be selected for the entry's tap because the power levels were too low.
LO AMP INPUT) Power levels input to the entry's amplifier are below the minimum requirements specified in the levels file.
REVERSE TILT) Reverse tilt has occurred, according to data supplied in the levels file.
REVERSE LOSS) The maximum REVERSE LOSS was exceeded, as specified by information in the levels data file.
LO LVL, REV TILT) Both LO LEVEL ON LINE and REVERSE TILT occurred.
LO INP, REV TILT) LO AMP INPUT occurred and REVERSE TILT.
LO INP, REV LOSS) LO AMP INPUT occurred and maximum REVERSE LOSS was exceeded.
R. TILT, R. LOSS) REVERSE TILT occurred and REVERSE LOSS was exceeded.
INP, TILT, LOSS) Three errors all occurred on this entry: LO AMP INPUT, REVERSE TILT, and REVERSE LOSS exceeded.

The START Row

Note that above the L IN, H IN, L REV, H REV, and ERRORS column headings there is another partial row labeled START>, with corresponding entries for each of these columns. That is, the START row shows the low frequency power level, high frequency power level, and amount of reverse losses at the starting point for this leg--and any errors that occur there.

Now that you have a good feel for the fields Cable Designer automatically fills in for you when you test the design, lets go back and take a closer look at the fields you must enter while creating the design, the FEET, CBL, and DEVICE fields.

The FEET Field

When you're creating a new leg, pressing return in the Leg I.D. field will create a new leg entry for you. The cursor is placed in the FEET field and it, along with the CBL and DEVICE fields, is initially empty. Each of the fields to the right, TAP through ERRORS is unknown, since they are filled in when the design is tested. The ERRORS column attests to this fact saying there are no known errors, because the design has not been tested yet--at least not with this new entry in it.

Enter the feet of cable to the next device. The measurement can be as accurate as you like (e.g., 100 or 97 or 96.8). If the next device is attached directly to the previous device, enter 0 for the footage (a housing-to-housing connector will be added to connect them when the bill of materials is calculated; discussed below).

If the amount you enter is not a valid number (e.g. 9..5) Cable Designer will beep at you or give you an error message, then allow you to re-enter. If the amount you enter is greater than or equal to 1000 feet, Cable Designer will prompt you to make sure that you want the footage to be that large. Enter Y or N for yes or no. After entering the footage, Cable Designer moves the cursor to the CBL field.

The CBL Field

If you've selected a default cable type, the CBL field is automatically initialized to that value. If the default value indicates the cable type you want, simply press return and move on to the DEVICE field.

If the default type is not the one you want for this entry or you did not specify a default cable type, enter a number between 1 and 10 corresponding to the type you choose. The DATA option can be used to view the available types.

If you specify a cable type not supplied in the cables data file an error message appears to tell you this. Pressing any key makes the error message go away and you can then enter a different type.

The DEVICE Field

Section 1.6 introduced you to the device codes you may enter in the DEVICE field. A quick-reference table of the device codes may be viewed in that section or by pressing F1 for the HELP option.

The entry of a device code or a device string to represent a device is discussed in more detail here.

Entering No Device

Entering device code 0 or the string 'NONE' may be used to represent the lack of a device at the end of a cable footage. This is useful to represent splicing two lengths of cable together or to leave a "hole" in a stretch of cable where you might later want to insert a device.

If you use NONE as the device and the next entry's cable type differs from this entry's, you are asked if you are sure you want to attach two different types of cable directly together. Enter Y or N for yes or no. This is just Cable Designer's attempt to help ensure that you make no mistakes as you enter your design.

Note that when you test your design, the amounts for lo and hi power levels input and the amounts for reverse loss, when positioned beside an entry with no device, still represent the amounts that would pertain if a device were there.

Entering Amplifiers

The device codes or strings shown here may be entered to specify the insertion of an amplifier.

Code	String	Meaning
11	TRUNK-AMP	Trunk amplifier
1	LEXT-HI	Line extender, high
1	LEXT-HIGH	(alternate string)
10	LEXT-LO	Line extender, low
10	LEXT-LOW	(alternate string)

Keep in mind if you enter codes that Cable Designer will automatically replace the code with the string shown to the right when the field is left. This feature makes entry easy while still ensuring that the design will be easy to understand when you or someone else views it.

Entering Taps

These codes or strings specify the insertion of a 2, 4, 8, or T-way tap (general use).

Code	String	Meaning
2	2-WAY-TAP	Two-way tap
4	4-WAY-TAP	Four-way tap
8	8-WAY-TAP	Eight-way tap
T	T-WAY-TAP	General-use tap

T-way taps may be used anytime you're using taps that don't fit into the 2, 4, or 8 port category as discussed earlier in this manual. Examples could be 6 port multitaps or equivalent values for interdiction addressable taps.

Hot taps may be entered by typing a tap code (2,4,8, or T), a period, and a hot value. For example, note that 2.4 specifies a two-way tap with a hot value of 4. Also, note that the hot value may be a real number (e.g., T.4.8).

If you make an error, Cable Designer will inform you, then let you re-enter the device code.

Note that if house tracking is on, the entry of a tap device will cause a pop-up window to appear requesting the number of houses fed from this tap. Section 3.5 following discusses house tracking in detail.

Entering Distribution Equalizers

Entering a code of 9 or a device string of 'DEQ' represents the insertion of a distribution equalizer.

Entering Splitting Devices

The entry of splitting devices deserves more attention, since it is key to understanding design entry with Cable Designer. Consider the following drawing in which a 7dB directional coupler is placed near the intersection of 1st Street and Cherry Street.

Suppose you've been entering the leg called leg X in the illustration and you're ready to add the DC-7. There is nothing hard about adding the device, it simply involves a device code or device string, like all the devices talked about so far. The tricky part, you realize, is that unlike splitting devices that split the power evenly (like a 2-way splitter), a DC-7's power is distributed unevenly. You'd like to be able to specify which way the tap leg runs and which way the thru leg runs. In Cable Designer, this specification is simple and is called the "split pattern". Selecting the split pattern for your DC-7 above will allow you to specify whether the tap leg runs to the left and the thru leg runs to the right or vice versa. Well, that's still kind of tricky, isn't it? It's tricky because whether the tap leg runs to the left or right depends on how you view the design as you enter it.

Suppose, using the illustration, that you're standing where the DC-7 is, looking along leg X toward Willow Street. In this case, the tap leg runs to your left and the thru leg to your right. On the other hand, suppose you're standing where leg X meets Willow Street, looking along leg X toward the DC-7. In that case, the tap leg runs to your right and the thru leg to your left.

The answer? Both are valid ways of viewing the design as you enter it. The key is to pick one way and stick with it as you enter your design. If you don't stick with one way it won't have any effect on the correctness of your test results, but if you do, you should find your design's layout easier to understand.

This table shows the device codes and strings you enter to insert a splitting device. Furthermore, it shows that some codes specify the split pattern directly while others give you a pop-up menu from which the split pattern is selected.

			Split Pattern		
CODE	String	Meaning	Left	Center	Right
20	2-WAY-SPLIT	two-way balanced splitter	tap	---	tap
30	3-WAY-BAL	three-way balanced splitter	tap	tap	tap
70	DC-7	directional coupler, 7dB	(pattern selected from menu)		
701	·		thru	---	tap
702	·		tap	---	thru
80	DC-8	directional coupler, 8dB	(pattern selected from menu)		
801	·		thru	---	tap
802	·		tap	---	thru
90	DC-9	directional coupler, 9dB	(pattern selected from menu)		
901	·		thru	---	tap
902	·		tap	---	thru

120 DC-12 directional coupler, 12dB (pattern selected from menu)
1201 · thru --- tap
1202 · tap --- thru
160 DC-16 directional coupler, 16dB (pattern selected from menu)
1601 · thru --- tap
1602 · tap --- thru
200 DC-20 directional coupler, 20dB (pattern selected from menu)
2001 · thru --- tap
2002 · tap --- thru
240 DC-24 directional coupler, 24dB (pattern selected from menu)
2401 · thru --- tap
2402 · tap --- thru
300 DC-30 directional coupler, 30dB (pattern selected from menu)
3001 · thru --- tap
3002 · tap --- thru
A DC-A General Use Coupler, Type A (pattern selected from menu)
A1 · thru --- tap
A2 · tap --- thru
B DC-B General Use Coupler, Type B (pattern selected from menu)
B1 · thru --- tap
B2 · tap --- thru
C DC-C General Use Coupler, Type C (pattern selected from menu)
C1 · thru --- tap
C2 · tap --- thru
31 3-WAY-UNBAL 3-way unbalanced splitter (pattern selected from menu)
311 · 3.5 7.0 7.0
312 · 7.0 3.5 7.0
313 · 7.0 7.0 3.5

Let's carry our earlier discussion a bit further and show how you would select the DC-7 in the illustration, with the split pattern showing the tap leg going to the left and the thru leg going to the right.

You could do this directly by entering a device code of 702. But, so we may discuss the split pattern menu, let's assume you enter 70. A small, pop-up menu will appear to the right of the device code, prompting you to select a split pattern for this device code.

```
 +-     Left Subbranch   Right Subbranch
 ¦_ 1.     thru leg         tap leg
 ¦_ 2.     tap leg          thru leg
 +-
  Select a split pattern for device at left:
```

Figure 8. The Split Pattern Menu

From this menu you'd select Option 2 to have the split pattern set as discussed.

The Subbranches

As is true in a design, the splitting device is the end of one branch and the beginning of two or more subbranches.

Although designated as going in directions as non-specific as "left", "right", and "center", any configuration of two or three-way splitting in the real world can be easily represented in this fashion:

Directly after you enter the splitting device, indicators appear on the bottom line of the entry form conveying both the split pattern you selected and the keystrokes you would use to directly "hop" to the subbranch of your choice.

+---------¦PgDn,< thru+---------------¦PgDn,> tap+-------------+
Figure 9. Subbranch Indicators

This concludes the discussion of entering the DEVICE field. Pressing return after typing in the contents of the DEVICE field will move you to the next leg entry and will create a new leg entry for you if one does not exist. Remember, though, that if the device you entered was a splitting device, Cable Designer will not let you insert a new entry beyond the splitting device in the same leg--you must go to the leg's subbranches to continue your design.

Pressing F9 after typing in your device will return you to the Design Menu.

Moving Around In Your Design

Use these keys to move around in your design.

· Up Arrow and Down Arrow or Shift-Tab and Tab: moves the cursor to the previous and next fields respectively. Pressing up arrow with the cursor in the FEET field moves the cursor to the previous entry's DEVICE field or to the Leg I.D. field. Pressing down arrow with the cursor in the DEVICE column moves the cursor to the next entry's FEET field.

· PgUp, Up arrow or Alt-P: pressing PgUp, then pressing up arrow displays the current leg's parent leg and places the cursor in the Leg I.D. field.

· PgDn, Left Arrow or Down Arrow or Right Arrow or Alt-L, Alt-C, Alt-R: pressing PgDn, then pressing left arrow or down arrow or right arrow displays the current leg's left, center, or right subbranch respectively.

Also remember that the FIND option can be used to directly jump to any leg in the entire design. See the description of the FIND option in Section 1.7 Special Features--Function Keys for more information.

Other Indicators On the Design Entry Form

Besides the subbranch indicators, the design entry form has other types of indicators to assist you: the design untested indicator, the num lock indicator, the more above/below indicators, and the houses indicator.

The Design Untested Indicator

Anytime you make a change to a design, the design untested indicator appears over the start row. Its sole purpose is to remind you that you have made changes and that you'll need to test the design to ensure the accuracy of the results shown in the TAP through ERRORS columns.

After making your desired additions and changes, test the design. When you return to the design entry form you'll not only see the new test results, but also that the design untested indicator has disappeared.

You'll notice that whenever you load a saved design file the design untested indicator is showing. This is because you may be using different data files than were used when the design was last tested or that the data files' values may have changed. To be safe, Cable Designer flags the design as untested.

Cable Designer has made the testing process very quick and simple. Always, after making any desired changes, test the design to bring everything up to date. In fact, testing is so easy we recommend you test as you make additions or changes. That is, add a little, do a quick test, add some more, do another test. This allows your design to build on "proven" ground and greatly simplifies needed changes, and use of Alt-T makes the process quick and easy!

The Num Lock Indicator

You may enter your design using one hand only. To do this, press the Num Lck key to toggle the key pad keys between arrow keys and number keys. The numbers are active when Num Lck is "on" and an indicator on the left side of the design entry form denotes this active state. Press Num Lck again to toggle the key pad's state again, making the arrow keys active.

Of course, those of you with key pads that are separate never need to worry about this anyway. But for those who need it, the Num Lock indicator is there.

The More Above/Below Indicators

The design entry form is large enough to show 13 leg entries. This does not at all mean, however, that you can only have 13 entries in a leg. You can have as many as you want. If you have more than 13 leg entries, an indicator will appear on the left-hand edge of the design entry form (a downward-pointing arrow, an upward-pointing arrow, or both) to tell you that more entries exist than could be shown on the screen.

Use the up and down arrow keys to move to the top or bottom end of the design entry form, whichever is indicated to have more available for viewing. Continue to press the arrow key and more of the display will scroll into view.

Replacing, Inserting, and Deleting

With Cable Designer you can replace any item, insert items, and delete items in the same fashion that you would replace, insert, or delete them in the real world.

This section tries to discuss this ability thoroughly and to provide many examples. However, all possibilities cannot be covered since there are too many of them. Keep in mind this general rule and you should always be successful: simulate what you would do in the real world. For difficult replacements or large deletions, Cable Designer will prompt and guide you through the changes to ensure the outcome you desire.

Replacing

Replacing entries is very easy, just use the arrow keys to go to the entry you want to replace, use the editing keys to remove the entry, type in the replacement entry.

In most cases, that's the end of it. The new device simply wipes out the old. In some cases however, such as replacing a DC-7 with a 3-WAY-BALanced splitter, Cable Designer has some further questions and will present them to you, one at a time, in as simple a manner as possible.

The examples below show you a few but not all of the instances where this occurs.

Alt-I and Alt-D

Before any examples are given, however, the Alt-I and Alt-D key sequences need discussion.

Alt-I and Alt-D allow you to insert and delete leg entries and legs, adding to or removing any part of your design.

To insert a leg entry, move to the leg entry ABOVE or BEFORE the point you'd like to insert the new one (to insert a new first leg entry, move to the Leg I.D. field). Hold down the Alt key and press the I key. A new leg entry is inserted for you and the cursor is placed in the FEET field.

To delete a leg entry, move to the leg entry you'd like to remove (the FEET, CBL, or DEVICE field, it doesn't matter). Hold down Alt and press D. The leg entry is removed and any other leg entries affected by this deletion are renumbered.

Example 1. Replacing A Device

Let's assume you want to replace the 2-WAY-TAP shown here with a 4-WAY-TAP and that you've positioned the cursor in the DEVICE field.

NO.	FEET	CBL	DEVICE
1	50	3	2-WAY-TAP

Press the Home key to position the cursor under the 2. Press delete once and then 4 to complete the replacement.

Example 2. Inserting A Leg Entry

Suppose you want to insert a length of cable type 2 and an 8-WAY-TAP between the two leg entries shown below.

NO.	FEET	CBL	DEVICE
1	50	2	2-WAY-TAP
2	33	2	2-WAY-TAP

With the cursor positioned in the leg entry before which you'd like to insert the new leg entry, hold down the Alt key and press the letter I. A new leg entry is inserted, the old leg entry number 2 is renumbered leg entry number 3, and the cursor is positioned in the FEET field.

Enter the footage, the cable type, and the device. The leg entries will now look like this.

NO.	FEET	CBL	DEVICE
1	50	2	2-WAY-TAP
2	20	2	8-WAY-TAP
3	33	2	2-WAY-TAP

Example 3. Deleting A Leg Entry

Suppose in the example just illustrated that you decided you didn't want the second leg entry after all. With the cursor positioned in any field of the leg entry to be removed, hold down the Alt key and press the letter D. The leg entries will again appear as shown below:

NO.	FEET	CBL	DEVICE
1	50	2	2-WAY-TAP
2	33	2	2-WAY-TAP

Example 4. Deleting An Entire Branch And/Or Subbranches

With the cursor positioned in the Leg I.D. field of any branch, holding down the Alt key and pressing the letter D will allow you to delete all of that branch's leg entries and all of its

subbranches. Cable Designer will prompt you to make sure you want to do this before actually executing this command to protect you from doing it by accident.

If you want to keep all of the branch's entries, but delete its subbranches, move to the last leg (which contains the splitting device) and use Alt-D. Again, Cable Designer will prompt you before making the deletion.

Example 5. Changing A Splitter's Split Pattern

Suppose you have a DC-8 whose split pattern you'd like to change from thru leg on the left, tap leg on the right to tap leg on the left, thru leg on the right.

If you try re-entering a device code of 80 or a device string of 'DC-8' nothing happens, no menu appears. This is because Cable Designer can't tell you've made any change. To specifically change the split pattern you need to enter the more specific device codes. In this case, the current split pattern tells you the device code is an 801 (thru on the left, tap on the right). Enter a device code of 802 and press return. Cable Designer prompts you to make sure you want to make this change. If you answer Y for yes you will see the split pattern change.

This same technique can be used to change the split pattern for any splitting device.

Example 6. Replacing a Two-Way Splitter With a Two-Way Splitter or a Three-Way Splitter With a Three-Way Splitter

This type of change is easy, just replace the old device code with the new. You'll be prompted to make sure you want to do this. The old device's legs become the new device's legs, with the split pattern you've selected.

The illustration below shows the result of replacing a DC-9 with a 2-WAY balanced splitter.

FROM THIS TO THIS

Example 7. Replacing A Two-Way Splitter With A Three-Way Splitter

Suppose, as shown in the following illustration, you're wanting to replace a two-way splitter with a three-way splitter, perhaps so a new third leg could be added to feed houses being built on a new street. Let's take an unusual example, replacing a DC-12 with a 3-WAY-UNBALanced splitter, with the desired outcome shown in the illustration.

FROM THIS TO THIS

With Cable Designer, this change is much easier than it looks. As always in a replacement, just erase the old device (the DC-12) and enter the new. Remember, when you enter the new 3-way unbalanced splitter you can specify the split pattern directly using the more specific device codes (311, 312, or 313) or you can enter the less specific device code of 31 or the device string '3-WAY-UNBAL' and make your split pattern selection from the Split Pattern Menu. Let's assume here you want to avoid the menu. Suppose from the perspective you've been using to enter the design, the left and center subbranches need to be 7dB legs, and the right subbranch needs to be a 3.5 dB leg so you enter device code 313.

Cable Designer asks you if you're sure you want to make this replacement. Enter Y for yes or N for no.

Here's where Cable Designer's user friendliness and flexibility really can be seen.

You're asked which of the old device's subbranches should be the new left subbranch. You are to enter L, C, or R for left, center, or right or press return for none of these. From your perspective, Leg A (the old device's left subbranch) is to become the left subbranch on the new device, so you enter L.

Next, you are asked which of the old device's subbranches should be the new center subbranch. You want the center subbranch to be a brand new leg that you will enter yourself, so you just press return to indicate 'none of them'.

That's it! Cable Designer is smart enough to realize that the new right subbranch has to be the old right subbranch, since it's the only subbranch left to choose from. The subbranch indicators are redrawn. Hopping to any subbranch will show you that Cable Designer has linked up the new device with the existing subbranches in the desired fashion.

Example 8. Replacing A Three-Way Splitter With A Two-Way Splitter

Suppose you want to replace a three-way splitter with a two-way splitter. Let's use the last example and imagine you want to switch the 3-WAY unbalanced splitter back to the DC-12, just as it was previously.

Replace the device field '3-WAY-UNBAL' with the device code or device string for a DC-12.

As in the last example, you'll be prompted to ensure that you want to do this. Next you'll be given the Split Pattern menu if you entered 120 or 'DC-12'. Then you'll be prompted to decide which of the old device's subbranches should be the new left and right subbranches, respectively. The third, unused subbranch from the 3-way unbalanced splitter will be thrown away.

Example 9. Replacing A Splitting Device With A Non-Splitting Device

When you replace a splitting device with a non-splitting device, you are given the option of re-attaching one of the splitter's subbranches. For example, assume the splitter and split pattern shown here on the left:

FROM THIS TO THIS

Leg A is to be removed for some reason. Therefore there is no need to retain the 2-way splitter.

After replacing the device field entry of '2-WAY-SPLIT' with a non-splitting device (in this example 'NONE' is used to indicate a splice), Cable Designer asks you if you're sure you want to make this replacement. Enter Y for yes or N for no. Answering no will restore the 2-WAY-SPLIT exactly as it was before you replaced it.

If you answer yes, Cable Designer asks you which of the device's subbranches you want to re-attach. Enter L for left, C for center, R for right or just press return with nothing typed to indicate that you do not wish to re-attach any of the subbranches.

In our example, R would be entered to indicate that the right subbranch should be reattached, as shown in the TO THIS illustration.

Example 10. Inserting A Splitter In The Midst Of A Leg

Consider the need to insert a splitter in the midst of an existing leg, to, say, allow for the feeding of houses along a new street being built. In this example, a 3-way balanced splitter is to be inserted between two 2-way taps in an existing leg that ends in a DC-7.

FROM THIS TO THIS

With the cursor positioned in the leg entry for the first 2-WAY-TAP, hold down the Alt key and press the I key to insert a new leg entry. Enter the footage from the first tap to the 3-way balanced splitter (keep in mind you'll likely have to change the footage to the 2nd tap, since this insertion shortens it), the cable type, and the device code (30) or the device string (3-WAY-BAL).

You'll be prompted to make sure you want to insert the splitting device here.

If you answer Y for yes, you're next asked which subbranch you'd like to contain everything below the device you entered. Remember the inserted splitting device will designate the new end of leg I. As can be seen in the illustration, everything below the inserted 3-way balanced splitter is to become part of that splitter's center subbranch, so you would enter C.

That's all, the branch and subbranch indicators are redrawn to reflect the change. Pressing PgDn, followed by down arrow to go to the center subbranch will show you that the second tap and DC-7 have indeed been correctly replaced.

When Can You End Design Entry?

You can use F9 to END design entry anytime all of the leg entries in the branch currently shown have been entered.

If you press F9 without all of the leg entries filled in, Cable Designer will ask you to finish filling the entries before you quit.

Keep in mind that a leg can be empty and you can still quit design entry. Empty legs will cause no problems with the testing procedure. Return to the design entry form later to fill the empty legs in.

Pressing F9 returns you to the Design Menu, from which you can select other options or choose to return again to the design entry form.

3.2 Testing The Design

Menu option 2 (and Alt-T when in the Design Entry form) causes your current design to be tested. Cable Designer puts the data files (lvl, cbl, tap, and pas) to work as it performs the test and determines the values to be placed in the TAP, L IN, H IN, L REV, H REV, and ERRORS columns (see Section 3.1, Add To/Change/View the Design for a description of each of these columns). When the test has run to completion, selecting menu Option 1, Add To/change/view the current design lets you view the test results in these columns on the design entry form.

After you load or create a design, the first time you request a test Cable Designer will ask you if you want to calculate reverse losses. Calculating reverse losses is optional. If you've specified the reverse loss values in the data files and you do want to calculate reverse losses enter Y for yes. If you're not interested in the reverse loss values, enter N for no and Cable Designer will ignore the reverse calculations. Cable Designer will remember your answer to this question and won't ask you again until you again load in or create a design and request testing.

A window will appear in which the status of the test will be given to you as the test proceeds. The testing routine is quite fast and, if you have no errors, you can expect the test to be over in no more than a few seconds. Here's what the Test Status Window will look like if you have no errors.

```
      Menu 2:  Design Menu, Test The Current Design
-------------------------------------------------------------------
Starting test...
Test Completed.  No errors.
```

¦Press any key.¦
Figure 10. The Test Status Window

If any problems are encountered during the test, messages are added to the test status window. When the window becomes full of messages, the test routine will pause to let you read the messages. When you press a key, testing continues and messages will be added again.

The errors that can occur are of two types, data errors and design errors.

Data Errors

Data errors always imply a problem (usually a missing item) with one of the data files in use. Cable Designer's messages are descriptive enough that you'll know which data item is missing or problematic.

Here's an example. Suppose you requested that Cable Designer calculate reverse losses during testing. Then, as Cable Designer is testing your design, it encounters a distribution equalizer (DEQ) and discovers that your passives file has no values specified for a distribution equalizer's reverse losses. Cable Designer adds a message to the status window:

DEQ rev. loss val. missing in .pas file. In Leg X.

Not only does the message tell you what the problem is, it also tells you the design leg the DEQ that prompted the error was encountered in.

In this example you would solve the problem this way. When the test was completed, you'd go to the Preparations Menu and select Option C, Create/change passives file, loading the problematic passives file in as a template. You'd key in the missing reverse loss value, then END and save the file, using the same file name so that the old file is overwritten. Then, you'd select Option 5 from the Preparations Menu and load the changed passives file in. Last, you'd go back to the Design Menu and run the test again. This time, the error message will not appear and values can be correctly computed.

Anytime data errors appear you can be sure that at least some of the results values were not able to be computed and will therefore not be correct. Usually, Cable Designer will handle this by setting results to obviously incorrect values, such as 0, to "flag" the spot where lack of data made computing results impossible. For this same reason, lack of data may also cause Cable

Designer to present you with a design error message (discussed below) as it always does when it detects low power levels, etc.

This list contains all of the data errors that can appear during a test, grouped according to which data file you would modify to correct the problem. Note that whenever Cable Designer encounters a missing needed value during a test it adds a message to the test status window, so if data is missing for a device used throughout your design you may receive many similar messages. Cable Designer's testing routine is still fast enough though, that with key presses, you can quickly finish the test. In this case, one change to a data file before the next test will correct many, if not all, of the error messages.

MISSING MAX REV LOSS VALUES IN CURRENT LEVELS (lvl) FILE

'Maximum rev loss value for lext to lext missing in lvls file.'
'Maximum rev loss value between trunks is missing in lvls file.'
'Maximum rev loss val from bridge to lext missing in lvls file.'

MISSING LOSSES OR REVERSE LOSSES IN CURRENT CABLES (cbl) FILE
(X is number from 1 to 10, LegX is Leg I.D.)

'Cbl type X's low and/or high unknown. Leg is LegX.'
'Cbl type X's rev. loss val. missing. Leg is LegX.'

MISSING FACEPLATE, LOSS, OR REVERSE
LOSS VALUES IN TAPS (tap) FILE
(LegX is Leg I.D.)

'No faceplate values for 2-way taps. Leg is LegX.'
'No faceplate values for 4-way taps. Leg is LegX.'
'No faceplate values for 8-way taps. Leg is LegX.'
'No faceplate values for T-way taps. Leg is LegX.'
'Loss low value for 2-way tap missing In LegX.'
'Loss low value for 4-way tap missing In LegX.'
'Loss low value for 8-way tap missing In LegX.'
'Loss low value for T-way tap missing In LegX.'
'Loss high value for 2-way tap missing In LegX.'
'Loss high value for 4-way tap missing In LegX.'
'Loss high value for 8-way tap missing In LegX.'
'Loss high value for T-way tap missing In LegX.'
'Rev. loss value for 2-way tap missing In LegX.'
'Rev. loss value for 4-way tap missing In LegX.'
'Rev. loss value for 8-way tap missing In LegX.'
'Rev. loss value for T-way tap missing In LegX.'

MISSING LOSS OR REVERSE LOSS VALUES IN PASSIVES (pas) FILE
(LegX is Leg I.D.)

'No DEQ loss value(s), see passives file. In LegX.'
'DEQ rev. loss val. missing in .pas file. In LegX.'
'Missing loss val(s) for DC-7. Leg is LegX.'
'Missing loss val(s) for DC-8. Leg is LegX.'
'Missing loss val(s) for DC-9. Leg is LegX.'
'Missing loss val(s) for DC-12. Leg is LegX.'
'Missing loss val(s) for DC-16. Leg is LegX.'
'Missing loss val(s) for DC-20. Leg is LegX.'
'Missing loss val(s) for DC-24. Leg is LegX.'
'Missing loss val(s) for DC-30. Leg is LegX.'
'Missing loss val(s) for DC-A. Leg is LegX.'
'Missing loss val(s) for DC-B. Leg is LegX.'
'Missing loss val(s) for DC-C. Leg is LegX.'
'Missing loss val(s) for 3-WAY-BAL. Leg is LegX.'
'Missing loss val(s) for 2-WAY-SPLIT. Leg is LegX.'
'Missing loss val(s) for 3-WAY-UNBAL. Leg is LegX.'
'Missing ret. val(s) for DC-7. Leg is LegX.'
'Missing ret. val(s) for DC-8. Leg is LegX.'
'Missing ret. val(s) for DC-9. Leg is LegX.'
'Missing ret. val(s) for DC-12. Leg is LegX.'
'Missing ret. val(s) for DC-16. Leg is LegX.'
'Missing ret. val(s) for DC-20. Leg is LegX.'
'Missing ret. val(s) for DC-24. Leg is LegX.'
'Missing ret. val(s) for DC-30. Leg is LegX.'
'Missing ret. val(s) for DC-A. Leg is LegX.'
'Missing ret. val(s) for DC-B. Leg is LegX.'
'Missing ret. val(s) for DC-C. Leg is LegX.'
'Missing ret. val(s) for 3-WAY-BAL. Leg is LegX.'
'Missing ret. val(s) for 2-WAY-SPLIT. Leg is LegX.'
'Missing ret. val(s) for 3-WAY-UNBAL. Leg is LegX.'

Design Errors

One standard message appears to indicate that an error in the design has been encountered:

    Power Level Errors in Leg X

Leg X is of course replaced with the actual Leg I.D. of the leg in which the error occurred.

You may want to jot down the Leg I.D.s that appear to have problems during the test. When the test has run to completion, select item 1, Add to/change/view the current design and then use the FIND option to go to each leg containing errors. All errors will be shown in the ERRORS column, explained fully in Section 3.1, Add To/Change/View the Design.

Note that it may be a good idea to correct the first few errors (from the top of the design downward) and then retest. Power level errors often have a "trickle-down" effect and correcting the higher ones may automatically correct some of the lower ones.

Further note that if any data errors appeared along with the design errors, fix the data error problems first and retest. With the correct data supplied the design errors may disappear.

Mixing Trunk and Distribution

Finally, one other message may appear during testing:

WARNING: Amp usage indicates trunk & distrib. systems mixed

Suppose the start point for your design was a line extender and throughout your design, as Cable Designer tests it, are more line extenders. This appears to be part of the distribution system. Then Cable Designer encounters a trunk amplifier placed in one of the legs. Cable Designer gives you the above warning to help you detect this possible error. The test results, however, will be calculated and no error message will be flagged in the design's ERRORS column.

Testing A Design Using Different Data Files

You may "try out" your design with different data files by simply loading in the desired files using options on the Preparations Menu, then performing the test again. It is easy to see how this capability can allow you to test a design using various brands of equipment, etc., and can dramatically reduce the effort involved in cable design.

Note that whenever you load a new data file for use with your current design, the design is automatically marked as "untested", since it has not been tested using the new data file. Furthermore, if you load a new levels file for your current design, Cable Designer will give you a message to remind you that your design's starting power levels have been changed (they automatically change since they are determined by the values in the levels file and the start point you selected for the design).

3.3 Select A Different Starting Point For The Current Design

Item 3 from the Design Menu lets you change the starting point for your design from the starting point you selected earlier on the Create/Use A Design Menu.

The options on the Create/Use A Design Menu are shown to you again. Select the new starting point you desire. After selecting the new starting point you are returned to the Design Menu.

Remember that you'll have to re-test the design, now that you've changed the starting point.

3.4 Select A New Default Cable Type For The Current Design

Anytime you desire a new default cable type, select Option 4, Select a new default cable type for the current design.

Cable Designer will prompt you to enter the new type. Enter a number between 1 and 10 corresponding to the cable type you want. You may also press enter without typing a number to indicate that you do not want to use a default cable type.

Remember, the DATA feature (F3) will let you view the cable types that are available.

3.5 Toggle house tracking on/off

Select Option 5, Toggle House Tracking On/Off to change the state of house tracking from off to on or from on to off.

When house tracking is on, a housecount can be kept with any leg entry. By default, the housecount for any leg entry is 0 unless a tap device is in the leg entry, in which case the housecount defaults to

2 for a 2-way tap
4 for a 4-way tap
8 for an 8-way tap
2 for a T-way tap

After a new tap device is entered with house tracking on, a small window pops up in which you can modify the default housecount.

```
+------------------+
< Housecount:  2   ¦
+------------------+
```

Any number from 0 to 999 may be entered. Pressing Alt-H with the cursor positioned in any leg entry will bring up this housecount window, showing the number of houses fed from the leg the cursor is in. Note that a housecount can be entered for any leg, not just those ending with a tap--this allows maximum flexibility in tracking the houses fed by the system.

With house tracking on, information about houses shows in the FIND window and the design report. It does NOT show if house tracking is off, nor does the housecount window appear, even though a default housecount is actually being kept for each tap device that is entered.

The state of house tracking is saved with a design and is automatically set appropriately when a design is loaded. If you load a design that was created with a version of Cable Designer earlier than 2.1, house tracking will be off by default. If it is turned on, all taps will show a housecount according to their defaults (see above). Use Alt-H to modify the default housecount for any leg entry to update an older design's housecount information.

3.6 Modify Minimum Level Off Tap High and/or Low

As you polish a design, making changes and performing tests, you may find it very handy to be able to temporarily modify or "tweak" the low and high frequency values of Minimum Level Off Tap, specified in the levels data file, without actually modifying the data file itself.

You may do so with Option 6, Modify Minimum level off tap high and/or low. As the name of the option suggests, you can modify one or both of these values. When you change these values, Cable Designer remembers what the original values were, so that you may later reset them, using the same option.

When Cable Designer prompts you for each value, either enter the modified value or just press return if you're wanting to set the modified value back to the original.

While these values are modified, asterisks will appear by them when you view the levels file using the DATA option and the message '(modified)' will appear beside the values when they are printed at the end of the design report.

Cable Designer will automatically reset them to their original values anytime you create or use another design (Option C). Of course, these values are also changed if you load in a different levels file.

3.7 Save the Current Design to a Disk File for Later Use

Use Option 7 from the Design Menu to save a design you've created or modified to a disk file.

Cable Designer requests a filename from you and tells you that the name must end with the extension ".des". As always in Cable Designer, you can just enter the first part of the filename (1-8 letters) and Cable Designer will automatically append the required extension to it for you.

If a file with the name you enter already exists on the diskette, Cable Designer will ask you if you wish to overwrite (replace) it. Enter Y for yes or N for no.

With your design saved to disk you can again load it in for use later by selecting Option C, Create/use another design and then selecting Y for yes when asked if you want to load in an existing design followed by entering the file's name as you named it when saving it.

3.8 Print the Design Report.

Option 8 on the Design Menu lets you print the design report on your printer. A sample design report can be seen at the end of Section 1.4 Simple Beginning Design.

The design report lists all the information about your current design, including the values you entered in all of the FEET, CBL, and DEVICE fields as well as the values Cable Designer filled

in for you during testing in the TAP, L IN, H IN, L REV, H REV, and ERRORS columns. Furthermore, the design report provides information about each printed leg's parent branch and subbranches, so that you can easily link up the legs in the report.

The starting point you selected for use with the design, the names of the data files that were used, and the values of minimum level off tap high and low frequency are also printed.

If you print the design report without first testing the design, a message will be printed near the top of the design report, warning you that the test results shown in the TAP through ERRORS columns may not be accurate.

A couple options are available when printing this report or the Bill Of Materials:

1) The first time you do any printing after starting Cable Designer you are asked to enter a number of lines to skip at the top of the page for printing on letterhead computer paper. Enter a number or just press return to not skip any lines.

2) You may key in any string of up to 74 characters that you would like to be printed near the top of the design report. The string, if you enter one, will be written after the centered report header "Cable Design Report".

3.9 Write the Design Report to a Disk File

Option 9 on the Design Menu causes the same design report discussed in Section 3.8, Print The Design Report to be created. The difference is that instead of printing the design report on the printer, Option 9 writes the design report to a text file on your diskette.

You might wonder why you'd ever want to write the design report to disk file. Here are just a few reasons it can be handy:

1) With the design report in a text file, you can edit it in a word processor. Add comments to the report, explaining it to others. Use your word processor's particular capabilities to highlight areas of interest. Then print out the report with, say, embedded instructions to those who must actually implement the design or design changes.

2) Print a copy of the design report anytime you want one, without having to load the design into Cable Designer. Cable Designer has inserted formfeed characters in the design report so that it will paginate nicely even when printed with the DOS PRINT command.

3) Having written the design report to a text file, you can review it on the screen using Cable Designer's LIST option. Or, use DOS2 to temporarily go to DOS (without leaving Cable Designer, see the section on DOS2 in Section 1.7 Special Features Function Keys) and review it with the DOS TYPE command or invoke your favorite editor and load it in. When you're all done type EXIT at the DOS prompt and you're back in Cable Designer.

When you select Option 9, you'll be asked for a filename and told that it must end with the extension 'rpt'. As always in Cable Designer, you can simply enter the first part of the filename (1-8 letters) and Cable Designer will append the extension for you.

3.10 Create/Use Another Design

Whenever you select Option C, Create/Use another design from the Design Menu, you are presented with the Create/Use A Design Menu shown in Figure 5 above. The Create/Use A Design Menu also appears automatically when you request the Design Menu and you are not yet working with a design--Cable Designer automatically selects it for you.

From the Create/Use A Design Menu, select a starting point for the design. The starting point represents the device and power levels at the spot where the design portion you're creating or re-using originates. For example, suppose you've already entered the trunk system and saved it to diskette. Now you're going to enter the first portion of the distribution system, which happens to originate from a 3.5 dB leg of a bridger amp. Selecting menu item 4 would both set that as your starting point and establish the initial power levels for the design work you'll be doing. Power levels are defined by the settings of the items in the levels (lvl) files you loaded. Power level outputs of line extenders and bridgers are displayed on the menu. The DATA option lets you view the values in the levels file.

Also, rather than picking a specific device and allowing Cable Designer to set the starting power levels, you may manually enter the start levels yourself by selecting menu item 7, then entering the low and high frequency outputs as you are prompted for them.

If you are going to reload a design previously saved to disk, but you don't remember the starting point you selected, no worry, Cable Designer remembers it for you. Just select any starting point (of course, select the correct one if you remember it). If you pick one differing from the starting point in the saved design, Cable Designer will tell you so and let you change it, after the file is loaded.

Furthermore, you will be able to change the starting point at any time, so don't worry about being "locked in".

Next, Cable Designer asks you if you want to load an existing design for use. If you want to re-use a design you created and saved previously with Cable Designer, enter Y for yes. If you intend to create a new design, enter N.

If you answered "yes", you'll next be asked for the name of the saved design file. Enter the filename, which must end with an extension of 'des' (remember, Cable Designer will automatically append the extension for you, so you can just enter the first part of the filename). Cable Designer will load the file for you. Cable Designer may automatically call the CONVERT program to convert the file to 2.1 format if it detects that the file was created with an earlier version of Cable Designer. See Appendix C for more information on the CONVERT program. You may see a brief message that the file is being converted! When Cable Designer loads the

file, it will check to see that the saved starting point and starting power levels match those set when you selected the starting point. If they do not match, Cable Designer will prompt you:

The saved starting point and/or starting levels differ from your new selections. Do you wish to use the saved values or new ones (enter S or N)?

Enter S to use the values from the saved design, N to use the new selections.
If this message appears and you're not sure why, one of the following situations will apply to you. Recommended actions are shown.

1.) The starting point you selected from the Create/Use A Design Menu was not the same as the starting point you were using when you saved the design file that has been loaded. If you know the two differ, select S or N whichever one you want. If you believe the two should be the same, the message may have come up for one of the following reasons or you may have made a mistake when selecting the starting point. Remember: you can change the starting point again later, so if you've made a mistake it will be easy to correct.

2.) Your starting point is number 7, manual start levels and the levels you entered don't match the starting power levels from the saved design file. Select S since there is a fair chance you entered the start power levels incorrectly. You can easily change the starting power levels again later, if the saved values aren't the ones you want.

3.) Your selected starting point was not number 7, manual start levels, but the starting power levels assigned for your starting point by Cable Designer differ from those in the saved design file because the levels data file you're using is different from the levels file you were using when you saved the file. Keep in mind you may even be using the same levels data file, but the values have changed in it. You have many options available to you in this situation:
· Use the DATA option to see if the levels file you are using is different from that shown on the design report at the time you saved the design.
· Cancel or proceed. Switch to the Preparations Menu at your convenience and load in the correct levels file.
· Cancel and change your starting point. Remember, in Cable Designer you can always change your starting point again and you may always load new data files.

4.) You loaded the wrong saved design file. Cancel, select the starting point again, load the file you desire.

If you are creating a new design, Cable Designer next asks "Do you want to track homes passed (Y or N)?" Respond accordingly (see Section 3.5 for more information). House tracking allows you to easily track where homes are located in your system and prints out the information, along with totals, in the design report.

Last, you are asked for a default cable type to use for each new entry. What is a default cable type? When you're entering your design you will have to specify the type of cable to use for each footage of cable you enter. The type is a number from 1 to 10 corresponding to a type clarified in the cables data file. Use the DATA option to view the cable types available to you. If you specify a default cable type, anytime you enter a new footage and proceed to the cable type

column Cable Designer will automatically fill the type in for you (you may still change it). As a general rule, specify the cable type you intend to use most often as the default cable type. It will be a great assistance. If, for some reason, you desire no default type, simply press return at the prompt without entering anything. Keep in mind that the default cable type only applies to any new footage you enter. It will never overwrite any other types of cable you've already entered.

After this, the first leg of your design is shown in the design entry screen as though you had selected Option 1 from the Design Menu, Add to/change/view the current design (see figure 4). Refer to the section explaining that option, Section 3.1 Add To/Change/View The Design.

4. Menu 3: Bill Of Materials Menu

Selecting Option B from either the Preparations Menu or the Design Menu will present you with the Bill Of Materials Menu, shown here.

MENU 3: BILL OF MATERIALS MENU

---

1. Print the current design's bill of materials.
2. Write the current design's bill of materials to a disk file.
3. Save the current design's materials to a file for later use.
4. Add saved materials together and print a summation bill of mat's.
5. Add saved materials together and write a summation bill of mat's.

P. Go to the Preparations Menu.
D. Go to the Design Menu.

Figure 11. The Bill Of Materials Menu

Use options on the Bill Of Materials Menu to print a bill of materials for the design you're currently working with or to sum several bill of materials together creating a bill of materials that shows you the total materials used by an entire system or many systems.

4.1 Printing the Bill Of Materials

Option 1 on the Bill Of Materials Menu lets you print on your printer the bill of materials for the design you're working with.

If you have not yet loaded or created a design, selecting Option 1 will cause Cable Designer to simply give you a message saying you must first create or load a design. Use the options on the Design Menu to load or create a design, then select Option 1 on the Bill Of Materials Menu again.

As described in section 3.7, a couple options are available when you print a bill of materials or the design report:

1) The first time you do any printing after starting Cable Designer you are asked to enter a number of lines to skip at the top of the page for printing on letterhead computer paper. Enter a number or just press return to not skip any lines.

2) You may key in any string of up to 74 characters that you would like to be printed near the top of the design report. The string, if you enter one, will be written after the centered report header Bill of Materials Cable Designer 2.1.

The bill of materials shows you the total number of all of your design's devices, housing-to-housing connectors, and AC terminators. For each cable type used in the system, it tells you the total feet of that type used and how many connectors for that type are needed. Finally, the total number needed for each faceplate value in 2-way, 4-way, 8-way, and T-Way taps is printed.

A sample bill of materials can be seen at the end of Section 1.4.

4.2 Write The Bill Of Materials to a Disk File

Option 2 on the Bill Of Materials Menu causes the current design's bill of materials to be written to a text file on your diskette.

As mentioned in Section 3.9, you may wonder why you'd ever want to write a bill of materials to diskette. The same reasons mentioned there apply here also:

1) With the bill of materials in a text file, you can edit it in a word processor. Add comments to it. Use your word processor's particular capabilities to highlight areas of interest. Then print it out with, say, embedded remarks to those who must actually order the parts.

2) Print a copy of the bill of materials anytime you want one, without having to load the design into Cable Designer. Cable Designer has inserted formfeed characters in the bill of materials so that it will paginate nicely even when printed with the DOS PRINT command.

3) Having written the bill of materials to a text file, you can review it on the screen using Cable Designer's LIST option. Or, use DOS2 to temporarily go to DOS (without leaving Cable Designer, see the section on DOS2 in Section 1.7 Special Features Function Keys) and review

it with the DOS TYPE command or invoke your favorite editor and load it in. When you're all done type EXIT at the DOS prompt and you're back in Cable Designer.

Option 2 will ask you for a filename and tell you that it must end in 'bom'. You can just enter the first part of the filename (1-8 letters) and Cable Designer will append the extension for you.

4.3 Save the Current Design's Materials to File

Option 3 on the Bill Of Materials Menu may seem quite a bit like Option 2, but it is quite different. Option 3 does not save the design's bill of materials to a text file, but rather, creates a small file that records, in a condensed format, the amounts of the various materials making up your design.

Option 3 is only used in preparing to use options 4 and 5, which both use the kind of file created by Option 3.

When you select Option 3 you're asked for a filename which must end in the 3-letter extension 'mat'. You can just enter the filename (1-8 letters) and Cable Designer will automatically append the extension for you.

Before being asked for a filename you may be given the message:

Design has changed without subsequent test. Materials may be inaccurate. Save anyway (Y or N)?

This means that you have not tested the design since you last made changes or loaded it. You can still save the materials by selecting Y for yes, but be aware that testing the design could change its materials, particularly the cable footage or tap faceplate values, and that it may be wise to run a quick test before saving the materials.

Here's a quick example that shows how you use Option 3 in conjunction with options 4 and 5. Suppose you're designing a system for a small town and you've broken it up into five components--the trunk line and four distribution sections.

With Cable Designer, you design and test each section separately, one at a time, in this order: trunk, dist a, dist c, dist b, and dist d.

Upon completing each section, you not only save that section itself (with Option 7 from the Design Menu), you also save a file of the section's materials, using Option 3 from the Bill Of Materials Menu. When all sections of the system have been completed, you use Option 4 or 5 from the Bill Of Materials Menu to add together all of the materials files created for the system (trunk.mat, dista.mat, distb.mat, distc.mat, and distd.mat), making a summation bill of materials that shows the total materials included in the entire system.

4.4 Combine Materials and Print

Option 4 from the Bill Of Materials Menu lets you combine as many materials files (.mat, created with Option 3) as you desire and then print out a summation bill of materials.

The summation bill of materials will be in the same format as a regular bill of materials, except that the word "Summation" will be printed under the heading "Bill Of Materials". See the example in Section 4.3, which discusses using materials files to print a summation bill of materials.

When you select Option 4, you'll be prompted for the names of the materials files you want to add together, one at a time. When you have added all the materials files you desire to add, just press return without a filename typed in. The added materials files will be printed out as a summation bill of materials, with the printed total amounts for each item for all of the materials files you've added together.

4.5 Combine Materials and Write To Disk

Option 5 works exactly like Option 4, allowing you to sum together saved materials files (created with Option 3) and create a summation bill of materials.

With Option 5, however, the summation bill of materials is written to a text file on disk. See Section 4.2 for a list of reasons you may find it useful to write a summation bill of materials to disk. See Section 4.3 for an example showing how materials files (mat) are created and then used to sum together the materials involved in an entire system.

After selecting Option 5, you'll be prompted to enter the names of the materials files (ending in .mat) you want to sum together to produce the summation bill of materials. Enter each of the names, one at a time. When all of the files you wish to add have been entered, just press return without keying in a name to end the summing.

Cable Designer will ask you for the name you would like to give the bill of materials summation file, and tell you that it must end in the three-letter extension 'bos'. In Cable Designer you can just enter the filename and the extension will be automatically appended for you.

Note that saved bill of materials summation files (Option 5) end with the extension 'bos'. Saved bill of materials files (Option 2) end with the extension 'bom'.

5. Cable System Design Considerations

Section 5.0 will discuss various elements of basic cable system design and how Cable Designer can be used to employ those elements. There are several excellent published books within the cable industry which would explore this subject in greater detail, and those should be consulted if a more in-depth approach is desired. Finally, the manufacturers' specifications and published

data should always be used when determining the levels and equipment operating parameters, and when building and structuring your data files to be used with Cable Designer.

5.1 Data File Techniques

Sections 2.2, 2.3, and 2.4 have explored the creation and special techniques available with the data files system utilized in Cable Designer. This discussion explores the conceptual ideas employed in the basic data itself. The old computer adage "garbage in equals garbage out" most certainly applies to the data files section, and the use of cable equipment specifications in Cable Designer.

Levels Data Information: Of all the data files, this is probably the most straight forward, and yet contains the most probability for confusion and error. The levels section is critical for proper design, and involves a great deal of decision making and "number crunching" by the designer--just to choose proper levels for the trunk and distribution system layout.

This section will not attempt to delve into the complicated area of proper RF power level selection for a given brand of equipment. Chapter 7 describes use of the distortions templates included with this program package. Proper use of those template(s), along with manufacturers data, will allow you to properly choose equipment operating levels and values.

Comments on specific entries are as follows:

Maximum Trunk Output - Maximum power exiting the trunk station (not the module) at the highest design frequency.

Maximum Bridger Output - Maximum power exiting the bridger amplifier module before any feeder maker or splitters.

Maximum Line Extender Output - Maximum power exiting the line extender station (not module) at the highest design frequency without deration due to cascading.

Trunk Tilt - The trunk tilt, either linear, logarithmic, or block -- in dB.

Distribution Tilt - The distribution system tilt (bridger and line extenders) in dB.

Line Extender Cascade Deration - The deration factor, in dB, applied if 2 (or more) line extenders are placed in cascade. The deration factor may be left at zero (0) if no deration is desired between low power and high power level line extenders.

Minimum Level Off Tap (low frequency) - The minimum power allowed during the tap selection process at the low end design frequency (normally 55.25 Mhz - Channel 2).

Minimum Level Off Tap (high frequency) - The minimum power allowed during the tap selection process at the high end design frequency (i.e., 400 Mhz, 440Mhz, etc.).

Maximum Reverse Tilt Allowed On Line - The maximum reverse tilt (reverse power), in dB, allowed before an error message is shown. This does not mean that a distribution equalizer or amplifier must be placed--it only denotes a setting for the error message to occur.

Minimum High Frequency Input for High Level Line Extender - The minimal amount of power needed to properly drive a high level line extender at its input. This again denotes the setting for a "low level" input alarm to occur. This value is also used in the pad and equalizer computation process.

Minimum High Frequency Input for Derated Line Extender - The minimal amount of power needed to properly drive a low level (derated) line extender at its input. This again denotes the setting for a "low level" input alarm to occur. This value is also used in the pad and equalizer computation process.

Minimum High Frequency Input for Trunk Amplifier - The minimal amount of power needed to properly drive a trunk amplifier at its input. This again denotes the setting for a "low level" input alarm to occur.

Maximum Reverse Loss Between Trunk Amps - The information requested here is the maximum amount of loss allowed between trunk stations at the chosen return design frequency. In sub-low split equipment, for example, the frequency normally chosen would be around 30 Mhz.

These final three entries are used in the reverse design process. The reverse design process in this Cable Designer release computes losses at the specified reverse frequency in dB. The specification here denotes the maximum amount of loss allowed between two devices--in this case between trunk amplifiers. The loss computed by Cable Designer is the cable, tap, and passive loss at the chosen return frequency in dB. Exceeding this value will cause an alarm condition to occur during the design process.

As a general dialogue on reverse layout, the maximum reverse loss allowed in this case (or in the remaining two) is computed by analyzing the return equipment used, the gain of the amplifiers, loss of the reverse pad and equalizers, loss of the diplex filters, etc. The reverse loss levels should be noted (normally on your design printouts) and included on your design maps. They would also be used in the computation of the reverse pad and equalizer values. The program only concerns itself with the cable and passive loss, and your entry in these three sections should be the maximum amount of cable and passive loss that can be tolerated in your layout. See your manufacturers' specifications and equipment manuals for further information regarding reverse design equipment layout.

Maximum Reverse Loss Between Bridger and First Line Extender - This is the same as the above (Maximum Reverse Loss Between Trunk Amps) except that it is the maximum reverse loss allowed between the bridger and the first line extender in any direction on that distribution

leg. It is used for alarm conditions only within the program, and again is intended to be used as a general indicator that your forward layout will function at your chosen return frequency.

Maximum Reverse Loss from Line Extender to Subsequent Line Extenders - This is basically the same as the above (Maximum Reverse Loss Between Trunk Amps) except that it is the maximum reverse loss allowed between the first line extender and a second line extender (or subsequent line extenders such as second to third if allowed). It is used for alarm conditions only within the program, and again is intended to be used as a general indictor that your forward layout will function at your chosen return frequency.

Cables Data Information: The cables data section is probably the most straight forward of the four data file sections, but a few comments and suggestions would still be in order.

First of all, we have allowed up to ten (10) different cables to be specified in this section. This allows great versatility during design including the following scenarios:

· Setting your cable data up in sections allowing for several types or "vintages" of cable. Cables 1 through 5 might be for distribution and trunk design types, while Cables 6 through 10 might be for supertrunking and other specialized applications.
· In a system "upgrade" application, a different approach might be used. For example, perhaps certain sections of the system are to keep the original cable which is deemed to be in adequate condition, while other areas are to be rebuilt or extended with newer type cables. Cables 1 through 5 might contain the data for the older original cables, while cables 6 through 10 would be used for newer design cables for extensions and replacement areas.
· Several different design frequencies could be allowed within a given cable file. For example, cables 1 through 5 could be for Cable Type A losses at 350 Mhz, and cables 6 through 10 could be for Cable Type A at 450 Mhz.
· Finally, the cable file section is versatile enough to allow for specialty type cables if desired. If RG-11 cable is occasionally allowed during the design process, perhaps in an apartment building or high rise, you may place the cable loss values for RG-11 in a certain cable type and utilize them when desired.

As stated in the taps and passives sections, be sure to add notes within the data file to adequately explain your decision process and choices in the future.

The cable file also adds a further element of versatility by allowing you to name each cable with the Cable Type ID. This allows you to assign a "name" to each of the ten cable types to allow you to easily identify it during the design process without having to check the contents of the file itself.

Taps (Multitaps) Data Information: Great care should be used in entering the data on multitaps from your chosen manufacturer. You may wish or be required to create several tap files for a given brand since a multitap will have different insertion loss values at different frequencies, particularly at the high frequency design limit. For example, if you design systems at 300 Mhz, 400 Mhz, and 500 Mhz and normally use Brand A in all three applications, you have several

methods by which you could assemble your data file(s). Since the Brand A multitaps will have slightly different insertion loss values for each of the 300 Mhz and up frequencies you could:

· Create a single data file utilizing the worst case insertion loss values, normally those at the highest design frequency.
· Or create three separate tap data files - one for each of the three design frequencies!

Cable Designer will allow you to choose either approach, and either will work accurately given the accuracy of the data. The first approach stated will obviously place more "padding" or extra signal in the design process under certain conditions. For example, if 500 Mhz tap insertion loss values are used in your Brand A tap file but your present design is at 330 Mhz then a slight amount of extra signal is added each time a multitap is placed in your design. This does not necessarily create a problem, and some designers may in fact consider this a desirable feature.

One further consideration regarding insertion loss and multitaps. Many, perhaps most, tap manufacturers rate their insertion loss at both nominal, and maximum or worst case. This is demonstrated as follows: a 23 dB 4-way multitap might have a maximum insertion loss value of .9 dB at 400 Mhz, but a nominal insertion loss value of .8 dB at 400 Mhz. This means that the tap has a nominal or average insertion loss value at the stated frequency of .8 dB, but occasionally may display a slightly higher value up to the stated limit. Stated differently, out of a sample of the 23 dB value, perhaps 100 units, most would display the .8 dB value but a small amount may have higher insertion loss values up to the stated maximum limit. You, as the designer, have to make a choice as to which values to use--and either method carries with it some slight risk. If the nominal values are used you may occasionally see slightly higher losses during actual tests and may see levels at the end of distribution lines with slightly lower power levels than anticipated, normally on the order of tenths of a dB. If you chose to use the worst case values, then you will see the opposite situation occur. One possible other course of action, and one that is often used, is to compare the difference between the nominal and worst case losses. If the differences are only slight, then either could be used, with the nominal values probably recommended as the best approach. If the differences are greater, particularly at certain values, then the worst case can be used--or you can split the difference between nominal and worst case to allow the averaging process to equal itself out during the design process.

Passives Data Information: The same process and concerns that manifest themselves in the multitap section are true of the passives. The passives may very often be specified at both nominal and worst case insertion loss values, and you the designer will have to make a judgement call as to which to use. Cable Designer will also allow multiple files for each brand, so that you can again create a file for each design frequency if so desired. The other method, as stated previously, is to create a passives file for the worst case insertion loss values, typically the highest frequency, and to use those values in all design applications for that particular brand.

As mentioned in Section 2.4, you as the designer can intermix certain brands of directional couplers in the passives file because one manufacturer typically does not attempt to make all directional coupler values. For example, Brand A might manufacture a 7 dB and 9 dB value,

while Brand B may make an 8 dB and 12 dB value. If you do choose to intermix brands in a given data file, be sure to add adequate notes within the data file so that you will be able to reconstruct your reasoning in the future. What may seem like an obvious choice now, can become a nagging problem in the future--particularly if you do a great deal of design in multiple systems. Since Cable Designer makes it very easy to add user defined notes in each data file, you should always take the time to document choices for future clarity and reasoning. Then, if you wish to keep a design and records long term, print out the data file (simply an ASCII text file) for future reference.

One final note on the passives section. Many manufacturers do not make a "distribution equalizer", which will force you to intermix brands if you choose to design with them. For example, Brand X may be your normal passives source, but they do not make a distribution equalizer that meets the correct specifications for your design criteria. You add Brand Y distribution line equalizer to your Brand X passives data file. Be sure to add adequate notes within your passives file indicating any deviations from the normal manufacturer indicated, particularly in areas such as this.

6. Sample Designs, Design Procedures and Shortcuts

This section will try to show some further capabilities of Cable Designer by actually loading and "playing with" some designs. Rather than rehash the actual entry process, which was described in detail in Section 1.4, we will simply load several designs that are included on the Extras Diskette that comes with Cable Designer. If you wish to gain further practice in the design entry technique, see Sections 1.4 and Sections 3.1 through 3.7. This section will assume that you have acquired some basic skills at design entry and editing.

This section assumes that a small cable system which includes five (5) trunk amplifiers, and just over one mile of distribution system (6035') has been already entered. In this section we will load four files from the Extras Diskette, one at a time, for examination. Each is a unique design, corresponding to the trunk system or one portion of the distribution system. All of them together make up the entire system just described. The four files are:

- TRNKEXP1.DES - The trunk system design layout.
- DISTEXP1.DES - The first distribution leg design layout.
- DISTEXP2.DES - The second distribution leg design layout.
- DISTEXP3.DES - The third distribution leg design layout.

Figures 12 - 15, will give you a better idea of the system's size and makeup. Compare the figures to the design pieces used in the examples.

The data files used to create this design are the standard level, cable, taps, and passives files (STD.LVL, STD.CBL, STD.TAP, AND STD.PAS) included in the Cable Designer diskette. If you are not able to obtain the same results in the following examples as we do, be sure to check the

contents of your standard data files as you may have inadvertently changed some values. The contents of the standard data files are shown in Appendix A in case you feel that a value may have been changed and you wish to recreate the original ones. The data file editing techniques shown in Section 2.2 may be used to change values back to the originals if needed.

Figure 12. The Trunk Layout (file TRNKEXP1.DES)

6.1 Trunk Design Examples and Hints: Begin this exercise by loading Cable Designer and ensuring that the standard data files are in use (use F3, if necessary). Then select Option D, Go to the Design Menu. The Create/Use A Design Menu is now shown. Select Option 6, Trunk Amplifier. The program now asks "Do you want to load an existing design from file (Y or N)?" Answer Y for "Yes" and press Return. You are now prompted to enter a filename (must end in .des). Enter the name of the first sample design file (TRNKEXP1.DES). If the file (on the Extras Diskette) is in some other drive, be sure to include the drive designator. For example, if the Extras Diskette is in drive B, then type B:TRNKEXP1.DES at the prompt for the filename. Also, note that the extension ".DES" does not have to be included--Cable Designer will provide it automatically if you do not include it.

Cable Designer asks for the default cable type for any new cables and entries that might be added. This has nothing to do with the cables already entered previously during the entry process. Enter "3", since this is the type of cable used previously when the trunk system was designed. The Design Entry Form is now displayed with Leg I.D. 1 shown. The information shown next comes from the design report for this design and should closely correspond to the information now shown on your screen.

Trunk Example Number One

STARTING POINT: Headend trunk amplifier.

```
 LEG I.D.>            1| START>30.00|33.00|0.000|0.000|OK
 NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
   1|1800| 3|   TRUNK-AMP|5.1600|23.70|16.98|1.980|4.860|REVERSE TILT
   2|2300| 3|   TRUNK-AMP|1.2000|21.95|12.53|2.530|6.210|REVERSE TILT
   3|1175| 3| 2-WAY-SPLIT|0.0000|25.89|22.54|1.292|3.172|OK

 LEG I.D.>            2| START>22.29|18.74|5.092|6.772|OK
 NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
   1| 750| 3|   TRUNK-AMP|0.1700|19.66|12.07|5.917|8.797|REVERSE TILT

 LEG I.D.>            3| START>22.29|18.74|5.092|6.772|OK
 NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
   1| 850| 3|   TRUNK-AMP|0.1800|19.31|11.18|6.027|9.067|REVERSE TILT
   2|2400| 3|   TRUNK-AMP|0.2100|21.60|11.64|2.640|6.480|REVERSE TILT
```

A message at the top of the Design Entry Form indicates that the design is untested, since it has been loaded from diskette and the program is simply indicating the values of the previous design test. To demonstrate its design capabilities, press F9 (END). The main Design Menu appears. Select Option 2, Test the current design. Answer Y for "Yes" to the question about calculating reverse losses when testing. Cable Designer now performs the calculations to test the trunk design. (Using ALT-T from within the design entry form will also re-calculate the design and is generally the easiest way to perform this function). Messages in the Test Status Window indicate power level errors in all three legs! Don't worry. Many of the power level error messages merely indicate that your initial design "parameters" have been exceeded. This does not necessarily indicate a faulty design. Press any key to return to the Design Menu. Now select Option 1, Add to/change/view the current design to view the actual design. Cable Designer shows Leg 1 information again. Information such as starting power levels, footages, cable types, devices entered or requested, and power levels at the input of each device (or output in the case of reverse loss) is displayed. The reverse losses indicated are the cumulative losses from the preceding active device to that point in the design. Now press the page down key followed by the left arrow key (<--), or ALT-L, to jump to Leg 2. The footages shown are always the feet of cable preceding each device either requested or placed. For example, Leg 2 shows the following information:

· 750' of TYPE 3 cable is placed from the end of the preceding leg (terminated by a two-way splitter) to the next Trunk Amplifier.
· The starting power levels for this leg (the output of the two-way split feeding this leg) are +22.29 dBmv at the low end design frequency, and +18.74 dBmv for the high end design frequency.
· There is 8.797 dB of reverse loss from the preceding trunk amplifier at the high frequency tracked to the input (output of return) of the trunk amplifier in this leg. To further demonstrate what is taking place with the reverse loss layout, jump back to the beginning leg by pressing F7 (FIND) followed by the up arrow key. The information in the REVERSE LOSS column shows that there is 4.86 dB of reverse cable loss between the Headend and Trunk Amp 1 at the high reverse frequency, 6.21 dB of reverse cable loss between Trunk Amp 1 and Trunk Amp 2, and 3.172 dB of reverse cable loss between Trunk Amp 2 and the splitter. Now press page down followed by the left arrow key to jump to Leg 2 again. Notice that the reverse value starts with 6.772 dB of reverse loss. This is the addition of the 3.172 dB of cable loss preceding the splitter plus the 3.60 dB of loss at the reverse frequency due to the 2-way splitter itself! The final resultant value of 8.797 dB of loss at the return frequency is the 6.772 dB discussed plus the loss due to the final 750' of Type 3 cable.
· The final power levels into the Trunk Amplifier are +19.66 dBmv at the low end design frequency, +12.07 dBmv at the high end design frequency
· The 0.170 in the TAP column indicates that an 17 dB equalizer (first two digits past the decimal point) and a zero dB pad (digits before the decimal point) are required. The 17 dB equalizer is the exact value computed and the person designing will need to match this to the closest value made by the manufacturer. When matching to equalizer and pad values made by the manufacturer, a good "rule of thumb" is to always go down to the next lower size from the computed value. The format shown in the TAP column for pad and equalizer values is pad.equalizer. Thus 0.170 means a 0 dB pad and an 17 dB equalizer. If the value shown were 5.16 as indicated on Trunk Amplifier 1, this would indicate a 5 dB pad and a 16 dB equalizer. These values will be shown only on the inputs to active devices.

Now press the page up key followed by the up arrow key (or ALT-P to select parent leg) to jump back to the beginning leg. You can also use F7 and UP ARROW at any point in the design to jump back to the absolute top of the design. Then, press page down followed by right arrow (or ALT-R) to jump to the final leg, Leg 3. The information shown is for the devices and losses in the final leg.

Now lets examine some of the error messages shown in the ERRORS column, and consider whether or not we should be concerned about them. Perhaps you've noticed that all of the error messages in Legs 1 & 2 have been REVERSE TILT. This indicates that the value specified for Maximum Reverse Tilt Allowed On Line in the Levels File (STD.LVL) has been exceeded. This value is normally of concern only when designing the distribution system, and can generally be ignored when designing trunk (with the exception of "tapped trunk" design). The message simply tells you that the value you specified to be used in sounding a reverse tilt alarm (when the power level at the low design frequency exceeds the power level at the high design frequency) has been exceeded. On the long lengths of cable that are typically used in a trunk system this is to be expected.

Finally, lets compute the Bill of Materials for this trunk design. If not already at Menu 2: Design Menu, proceed there by pressing F9 (END). Then select Option B, Go to the Bill of Materials Menu. The Bill of Materials Menu is now displayed. Select Option 1, Print the current design's bill of materials. Respond to the prompts. Once printed, the Bill of Materials will look like the printout on the following page:

BILL OF MATERIALS, CABLE DESIGNER 2.1

TRUNK BILL OF MATERIALS EXAMPLE

DEVICE OR CONNECTOR TYPE	TOTAL	DEVICE TYPE	TOTAL	DEVICE TYPE	TOTAL
High Power Line Extender..	0	DC-7 Coupler...	0	DC-30 Coupler..	0
Derated Line Extender.....	0	DC-8 Coupler...	0	DC-A Coupler...	0
Trunk Amplifier.....	5	DC-9 Coupler...	0	DC-B Coupler...	0
Housing-To-Housing Conn...	0	DC-12 Coupler..	0	DC-C Coupler...	0
AC Terminator.....	2	DC-16 Coupler..	0	3-Way Splitter.	0
Distribution Equalizer....	0	DC-20 Coupler..	0	3-Way Uneven	
2-Way Splitter.....	1	DC-24 Coupler..	0	Splitter.....	0

CABLE TYPE	TOTAL FEET	IN MILES	CONNECTORS
1: T3-500	0.00000000	0.000000	0
2: T3-625	0.00000000	0.000000	0
3: T3-750	9275.00000	1.756629	12
4: T3-875	0.00000000	0.000000	0
5: T31000	0.00000000	0.000000	0
6: NONE	0.00000000	0.000000	0
7: NONE	0.00000000	0.000000	0

8: NONE	0.00000000	0.000000	0
9: NONE	0.00000000	0.000000	0
10: NONE	0.00000000	0.000000	0

2-WAY TAPS		4-WAY TAPS		8-WAY TAPS		T TAPS	
FACEPLATE	TOTAL	FACEPLATE	TOTAL	FACEPLATE	TOTAL	FACEPLATE	TOTAL
4.0000	0	8.0000	0	11.000	0	NONE	0
8.0000	0	11.000	0	14.000	0	NONE	0
11.000	0	14.000	0	17.000	0	NONE	0
14.000	0	17.000	0	20.000	0	NONE	0
17.000	0	20.000	0	23.000	0	NONE	0
20.000	0	23.000	0	26.000	0	NONE	0
23.000	0	26.000	0	29.000	0	NONE	0
26.000	0	29.000	0	32.000	0	NONE	0
29.000	0	32.000	0	35.000	0	NONE	0
32.000	0	35.000	0	NONE	0	NONE	0
35.000	0	38.000	0	NONE	0	NONE	0
38.000	0	41.000	0	NONE	0	NONE	0
41.000	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0

The Bill of Materials includes such items as total footage of each type of cable, number of amplifiers, number of passives, number and value of taps, etc. For a trunk design, many of the items such as multitaps do not apply, but the items of concern are counted. The counting and tallying process is fast and accurate and several options are available for printing the bill of materials or saving it to disk. For additional information on the Bill of Materials and all features, see Sections 4.1 through 4.5.

6.2 Distribution Design Examples and Hints

Figure 13. #2 Trunk Distribution (file DISTEXP1.DES)

Now go to the Design Menu (select Option D from the Bill Of Materials Menu, etc.). If you're still on the Design Entry Form from the previous example, press F9 (END) if necessary to gain access to the main menu. Now, lets load the first distribution design section and look at it. Choose Option C, Create/use another design. Since we did not actually make any changes to the design of the trunk system, Cable Designer does not give us any message notifying us that we have not saved the current design. If you did make any changes to the design while experimenting with it, you would receive the message "Your design has not been saved. You may have made changes you'd like to keep..." upon selecting Option C. If you did make changes, and wish to keep them, answer Y when questioned about saving your changes.

If you are starting this example after just having loaded Cable Designer, ensure that the standard data files are in use (F3 if necessary). Then, go to the Design Menu.

The Create/Use A Design Menu is now shown.

Lets check and modify the design of a single distribution leg originating from Trunk Amplifier #2 in the preceding trunk design section. Select Option 3, Bridger (full output). The program now asks "Do you want to load an existing design from file (Y or N)?" Answer Y for "Yes". Cable Designer prompts you for a filename. Enter the name of file containing the first sample distribution design--DISTEXP1.DES. Remember, the file resides on the Extras Diskette. If the diskette is in a drive other than the default drive, be sure to include the drive designator in the filename.

The program now asks for the default cable type for any new cables and entries that might be added. As stated earlier, this has nothing to do with the cables already entered into the design. Enter 1, since this is the type of cable used previously when the design was laid out. The Design Entry Form is displayed with Leg I.D. 1 shown. Press F7 (FIND) to display some general information regarding the design data entered. Information in the FIND Window indicates that there are a total of fifteen (15) legs in this distribution design, and that there is 75 feet total in the leg shown (Leg 1). Press the up arrow key to simply return to the first leg. Press F9 (END) to return to the design menu. Select Option 2, Test the current design and test the design. You will find that no error messages appear in the Test Status Window. Press any key to return to the Design Menu. The total information entered in this distribution design section, for your reference, is as follows:

EXAMPLE DISTRIBUTION DESIGN

STARTING POINT: bridger (Full output).

Levels, cables, taps, and passives files in use are:
Std.lvl
Std.cbl
Std.tap
Std.pas

LEG I.D.> TRUNK #2 START| START>39.00|46.00|0.000|0.000|OK

NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 75| 1| 2-WAY-TAP|29.000|38.61|45.02|0.120|0.300|OK
2| 0| 1| DC-12|0.0000|38.31|44.52|0.420|0.600|OK
75.0000 FEET IN THIS LEG
PARENT LEG> NONE
LEFT SUB LEG> FIRST DWN LEG(tap)
CENTER SUB LEG> NONE
RIGHT SUB LEG> DC12 THRU LEG(thru)

LEG I.D.> FIRST DWN LEG| START>26.31|32.52|12.42|12.60|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 100| 1| 2-WAY-TAP|17.000|25.79|31.21|12.58|13.00|OK
2| 75| 1| 4-WAY-TAP|17.000|24.80|29.43|13.20|13.90|OK
3| 100| 1| 4-WAY-TAP|14.000|23.38|27.02|14.26|15.20|OK
275.000 FEET IN THIS LEG
PARENT LEG> TRUNK #2 START
LEFT SUB LEG> NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.> DC12 THRU LEG| START>37.56|43.52|1.070|1.350|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 60| 1| 4-WAY-TAP|29.000|37.25|42.73|1.166|1.590|OK
2| 0| 1| 3-WAY-UNBAL|0.0000|36.95|42.23|1.466|1.890|OK
60.0000 FEET IN THIS LEG
PARENT LEG> TRUNK #2 START
LEFT SUB LEG> DWN LEG OFF 3WY(7.0 dB)
CENTER SUB LEG> RGT LEG OF 3WAY(7.0 dB)
RIGHT SUB LEG> TOP LEG OF 3WAY(3.5 dB)

LEG I.D.>DWN LEG OFF 3WY| START>29.95|34.73|8.466|8.890|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 80| 1| 4-WAY-TAP|20.000|29.53|33.68|8.594|9.210|OK
2| 100| 1| 4-WAY-TAP|17.000|28.41|31.57|9.254|10.21|OK
3| 90| 1| 2-WAY-TAP|17.000|27.04|29.29|10.30|11.47|OK
4| 120| 1| 4-WAY-TAP|14.000|25.82|26.92|10.99|12.55|OK
390.000 FEET IN THIS LEG
PARENT LEG> DC12 THRU LEG
LEFT SUB LEG> NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.>RGT LEG OF 3WAY| START>29.95|34.73|8.466|8.890|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 90| 1| LEXT-HI|13.050|29.48|33.55|8.610|9.250|OK
2| 0| 1| 3-WAY-UNBAL|0.0000|39.00|46.00|0.000|0.000|OK
90.0000 FEET IN THIS LEG

PARENT LEG> DC12 THRU LEG
LEFT SUB LEG> DWN LEG OF 3WAY(7.0 dB)
CENTER SUB LEG> 3.5 LEG OF 3WAY(3.5 dB)
RIGHT SUB LEG> UP LEG OF 3WAY(7.0 dB)

LEG I.D.>DWN LEG OF 3WAY| START>32.00|38.50|7.000|7.000|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
 1| 140| 1| 4-WAY-TAP|23.000|31.27|36.67|7.224|7.560|OK
 2| 120| 1| 4-WAY-TAP|20.000|30.15|34.49|7.816|8.540|OK
 3| 140| 1| 4-WAY-TAP|17.000|28.82|31.86|8.540|9.700|OK
 4| 210| 1| 4-WAY-TAP|14.000|26.83|28.01|9.776|11.44|OK
610.000 FEET IN THIS LEG
PARENT LEG> RGT LEG OF 3WAY
LEFT SUB LEG> NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.>3.5 LEG OF 3WAY| START>35.20|41.90|3.800|3.800|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
 1| 75| 1| 2-WAY-TAP|26.000|34.81|40.92|3.920|4.100|OK
 2| 0| 1| 2-WAY-SPLIT|0.0000|34.51|40.42|4.220|4.400|OK
75.0000 FEET IN THIS LEG
PARENT LEG> RGT LEG OF 3WAY
LEFT SUB LEG> DWN LEG OF 2WAY(tap)
CENTER SUB LEG> NONE
RIGHT SUB LEG> UP LEG OF 2WAY(tap)

LEG I.D.>DWN LEG OF 2WAY| START>30.91|36.62|8.020|8.000|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
 1| 40| 1| 2-WAY-TAP|23.000|30.70|36.09|8.084|8.160|OK
 2| 125| 1| 4-WAY-TAP|20.000|29.55|33.86|8.684|9.160|OK
 3| 135| 1| 2-WAY-TAP|17.000|28.25|31.29|9.400|10.30|OK
300.000 FEET IN THIS LEG
PARENT LEG> 3.5 LEG OF 3WAY
LEFT SUB LEG> NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.> UP LEG OF 2WAY| START>30.91|36.62|8.020|8.000|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
 1| 110| 1| 4-WAY-TAP|23.000|30.34|35.18|8.196|8.440|OK
 2| 120| 1| 4-WAY-TAP|20.000|29.21|33.00|8.788|9.420|OK
230.000 FEET IN THIS LEG
PARENT LEG> 3.5 LEG OF 3WAY
LEFT SUB LEG> NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.> UP LEG OF 3WAY| START>32.00|38.50|7.000|7.000|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 135| 1| 4-WAY-TAP|23.000|31.30|36.73|7.216|7.540|OK
2| 140| 1| 4-WAY-TAP|20.000|30.07|34.30|7.840|8.600|OK
275.000 FEET IN THIS LEG
PARENT LEG> RGT LEG OF 3WAY
LEFT SUB LEG> NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.>TOP LEG OF 3WAY| START>33.15|38.13|5.266|5.690|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 110| 1| 4-WAY-TAP|23.000|32.58|36.69|5.442|6.130|OK
2| 0| 1| DC-8|0.0000|32.08|36.09|5.842|6.630|OK
110.000 FEET IN THIS LEG
PARENT LEG> DC12 THRU LEG
LEFT SUB LEG> FINAL SPLIT(thru)
CENTER SUB LEG> NONE
RIGHT SUB LEG> DC8 TAP LEG(tap)

LEG I.D.> FINAL SPLIT| START>30.78|34.49|7.042|7.930|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 40| 1| 4-WAY-TAP|20.000|30.57|33.97|7.106|8.090|OK
2| 0| 1| 2-WAY-SPLIT|0.0000|29.97|33.17|7.606|8.690|OK
40.0000 FEET IN THIS LEG
PARENT LEG> TOP LEG OF 3WAY
LEFT SUB LEG> LEFT LEG OF SPT(tap)
CENTER SUB LEG> NONE
RIGHT SUB LEG> TOP LEG OF SPLT(tap)

LEG I.D.>LEFT LEG OF SPT| START>26.37|29.37|11.41|12.29|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 60| 1| 2.3|11.000|26.06|28.58|11.50|12.53|OK
2| 150| 1| 4-WAY-TAP|11.000|23.88|24.82|13.24|14.53|OK
210.000 FEET IN THIS LEG
PARENT LEG> FINAL SPLIT
LEFT SUB LEG> NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.>TOP LEG OF SPLT| START>26.37|29.37|11.41|12.29|OK
NO. FEET CBL DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
1| 90| 1| 4-WAY-TAP|14.000|25.90|28.19|11.55|12.65|OK
2| 110| 1| 2-WAY-TAP|11.000|23.93|24.95|13.23|14.49|OK
200.000 FEET IN THIS LEG

```
PARENT LEG>     FINAL SPLIT
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG>  NONE

LEG I.D.>    DC8 TAP LEG| START>23.58|27.59|14.34|15.13|OK
NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
  1|  80| 1|   4-WAY-TAP|14.000|23.16|26.54|14.47|15.45|OK
  2| 120| 1|   4-WAY-TAP|11.000|21.14|23.17|16.16|17.33|OK
200.000 FEET IN THIS LEG
PARENT LEG>     TOP LEG OF 3WAY
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG>  NONE


TOTAL FEET> 3140.000 = 0.5947 MILES
VALUE OF MIN. LEVEL OFF TAP LOW FREQ>  7.0000
VALUE OF MIN. LEVEL OFF TAP HIGH FREQ> 12.000
```

Lets investigate a few areas, and perhaps make a few changes to see what happens. First of all, note that LEG I.D.s have been assigned that are descriptive of the devices chosen. This is one approach that can be taken with the LEG I.D.s. Others would be simply assigning numbers, using the numbers that Cable Designer assigns automatically, or assigning street addresses where the equipment might be located.

The second leg (FIRST DWN LEG) of the design has a problem. When entering the data, one of the pole footages was missed. The footages from the split should have been 100', to 110', to 75', to 100'. The 110 footage was inadvertently missed. What do we do now? With Cable Designer this is not a problem, even if the design was done during a previous session. Lets jump to the second leg and make the change. Select 1. Add to/change/view the current design. Press F7 (FIND) and type FIRST DWN LEG (upper or lower case does not matter). NOTE: You could also have used the page down key followed by the left arrow key or ALT-L. This is the leg we must make changes to. Our problem is to enter the missed footage, and then re-check our design for errors. Using the down arrow key, move to any place in the first leg entry (which shows 100' to a two-way tap). Press the ALT (alternate key) while hitting the I key for Insert at the same time. If you make a mistake and insert a new leg entry where you did not want one, you may eliminate that leg entry by first holding down the ALT and simultaneously hitting the D key for Delete.

You'll now see that a new leg entry has been inserted between what were the leg's first and second leg entries. Type 110 for the footage and press the return key, press return again to enter the default cable type (1), then enter a device code of 2 for a two-way multitap and press return. Its as simple as that! The missing footage is now entered.

Now lets see if the design still works. We already know that, in principle, it only affects the leg we are on since this leg terminates within several spans of cable. So if there is an error, it should only be on the leg we just changed.

Type ALT-T (hold down the ALTernate key and simultaneously hit T for test) to test the new design. If this is the first time you have re-tested the design you will be given the option of checking for reverse losses. Answer according to your preference. The design window pops open and indicates that there are no testing errors. This means that the addition of the 110' did not create an error on the second design leg. Lets jump back to the leg and see what value of tap was picked. We're also interested in seeing if the original values downstream of the new entry have changed. Press any key to return to the design menu. You now return to the last leg and leg entry you were at--the leg in question. You'll now see that the tap values are 17dB 2-way, to a 14dB 2-way, to a 14dB 4-way, to an 11dB 4-way. The values did change past the additional footage and tap--as you might expect them to. The overall performance of this particular leg is well within the desired parameters, and the design still appears good.

The second question we wish to consider is "What are the input power levels to the line extender, the pad and equalizer values, and why did we pick that location for the amplifier?" The line extender is located in a leg with the LEG I.D. RGT LEG OF 3WAY. Press F7 (FIND) and then enter RGT LEG OF 3WAY. You will now see the leg with the line extender located in it. Under tap value you'll see 13.05. As we've previously discussed, the format shown in the TAP COLUMN for pad and equalizer values is pad.equalizer. This means that Cable Designer is calling for a 13 dB pad, and a 5 dB equalizer.

Why did we place the line extender here, and why "waste" so much signal with the 13 dB pad? In order to adequately answer that question, you really need to draw the design on a piece of paper, or more closely examine the drawing in the Cable Designer manual. You'll see that this particular design has many splits, and no leg continues for a great distance. In this design, only one line extender will be required, and the design will not work without at least one. If you doubt this, use Cable Designer's editing techniques to eliminate the line extender (or just replace it with the DEVICE entry NONE, for no device), and try to make the design work without one (you'll need to re-test several times, of course). No matter how you adapt the design, or what you pick for splitting/coupling devices, it simply will not work! Given that you must have at least one, in this type of layout the line extenders correct location becomes one of geographical location, and of where the best spot lies given the line splits involved. Looking at the design drawing, you'll see that the line extender is in an optimum location (although there may be other locations that would work). In other words, correct amplifier location is not necessarily the place where you run out of signal! It takes time, and a lot of practice to gain insight as to where an amplifier should be placed. Cable Designer will help you by letting you fine tune placement with error messages, etc., and by telling you the pad and equalizer values for any given placement. By watching the pad and equalizer values, you can easily fine tune the amplifier placement.

Finally, one of the legs has a "hot tap" located in it. Lets examine that concept for a moment. Press F7 (FIND) and then enter LEFT LEG OF SPT. The first line of this leg has a requested device of 2.3. The format, as shown here, for a "hot tap" is [tap type.extra signal in dB]. The 2.3 then means that a two-way tap is requested with an additional 3 dB of signal over normal specified output levels at the tap port(s). If the default value for tap out is +12 dBmv at the

highest design frequency, then +15 dBmv is the minimum output for this tap when Cable Designer picks the value. You will notice that two (2) 11 dB tap values are picked in this leg. The first 11 dB value is an artificially low one to give the 3 dB extra signal at the output ports. Now lets ask for an extra 6 dB and see what happens! Use the down arrow key or the Return key to go to the 2.3 tap entry. Now backspace one position, enter 6 to replace the 3 (it now reads 2.6), and press F9 (END). You are now returned to the design menu. Select Option 2, Test the current design. The message No Errors tells us that the request for an extra 6 dB instead of 3 dB worked! Now press Return and select Option 1, Add to/change/view the current design. Then press Return again. You are taken back to the leg with the hot tap! (All of the preceding could have been done with ALT-T to test the design. This eliminates going through menus and is the technique of choice in most design applications) Now notice that the tap values are a 2-way 8 dB which then feeds a 4-way 11 dB which terminates the line! Again, the lower value tap chosen first is because the lower value is required to give the additional signal at those tap ports.

6.3 Second Distribution Example

Figure 14. #5 Trunk Distribution (file DISTEXP2.DES)

Now lets examine the first distribution leg fed from Trunk Amp #5. This is a relatively short leg with only four spans of cable total. Gain access to the Design Menu, then select Option C. Create/use another design. Answer any questions regarding the saving of files as you wish, then select Option 4, Bridger (3.5 dB leg) as the starting point. Answer Y regarding loading an existing file. Enter DISTEXP2 for the design filename (be sure to include any drive identifiers or subdirectory routing if necessary). Enter 1 for the default cable type (remember, this is only for subsequent entries or changes). You will now see a single leg titled TRK #5- TOP LEG. Lets add several more footages to this leg and let Cable Designer help us pick a correct location for a line extender. Use the down arrow key or the return key to move the cursor to the last leg entry in the distribution leg. Hold down the ALT key and press I (ALT-I) and a new entry will appear. You can also begin to enter new footages by using the return key to proceed to the last device entry, then press it again to get a new leg entry. Type 225 for the footage and press return, then return again to accept the default cable type. Then type 4 to request a 4-way tap. Press the Return key again to create another new leg entry. Using the procedures covered, also enter the following additional footages so that the final leg looks like this:

1	100	1	4-WAY-TAP	(IN ORIGINAL DESIGN)
2	110	1	4-WAY-TAP	(IN ORIGINAL DESIGN)
3	120	1	4-WAY-TAP	(IN ORIGINAL DESIGN)
4	135	1	8-WAY-TAP	(IN ORIGINAL DESIGN)
5	225	1	4-WAY-TAP	(JUST ENTERED ABOVE)
6	185	1	8-WAY-TAP	(NEW ENTRY)
7	275	1	8-WAY-TAP	(NEW ENTRY)
8	215	1	4-WAY-TAP	(NEW ENTRY)
9	175	1	4-WAY-TAP	(NEW ENTRY)

Use ALT-T to test the design. Power level errors are now indicated in the leg that footages were just added to. Press any key to close the Test Status Window. By viewing the messages produced by Cable Designer you can see that we basically ran out of signal following the 275' span. The RF power level at the highest frequency is +20.24 dBmv at the output of the 275' span of cable, and at the input to the requested 8-way tap. We know that we need a +20 dBmv to properly drive the input of a High Level Line Extender, so it would appear that the output of the 275' span of cable, or one or two spans preceding it, would be the proper location for it (use F3 DATA to check the contents of the standard levels file if necessary). To test our theory, lets place the line extender at the output of the 275' span and re-test our design. Use the cursor keys or return to position the cursor on leg entry 7--the 275' entry line. Press ALT-I as described earlier to add a new entry line following the span in question. Type 0 for the footage followed by return, return again to take the default cable type, and 8 for an 8-way tap. Then press the up arrow key three times to move to the preceding 8-way tap device. Hold down ctrl key and press backspace to erase the 8-way tap entry. Then type 1 and return to enter a High Level Line Extender. What we now have is 275' to a High Level Line Extender, then zero feet to an 8-way tap. In other words, we have the same design request as before but we have added a line extender to solve our low level problems, and we have done it at a point where we believe (because of the preceding design test) we have just enough RF signal to adequately power the line extender input. Now use the ALT-T key combination to re-test the design with the line extender. This time we are informed that no power level errors were encountered. It appears as though the design changes worked! Press any key to return to the design menu. The inputs to the High Level Line Extender are +23.32 dBmv at the low design frequency, and +20.24 dBmv at the high design frequency. The line extender will require a 17 dB equalizer and a zero (0) dB pad. This line extender location will work and work properly.

There may be good reason to space the line extender back one or two spans, so this method was shown only to demonstrate how the line levels may be used to pick amplifier location, and to further demonstrate editing techniques. If you were designing on a long distribution route, and maximum distance were your consideration, then the present chosen line extender location would probably be good for an initial placement until further conditions are known. If you know that you will ultimately need a second line extender anyway, or you desire to have some extra signal available on the input to the amplifier, then move the amplifier back one or two spans. With Cable Designer, the editing and changing is easy, and quite fast once you get used to it. Continue to experiment with this design until you feel satisfied that you understand the procedures.

6.4 Third Distribution Example

Figure 15. #5 Trunk Distribution (file DISTEXP3.DES)

Now lets examine the second distribution leg fed from Trunk Amp #5. This is a longer leg with approximately twenty spans of cable. Gain access to the Design Menu, then select Option C, Create/use another design. Answer any questions regarding the saving of files as you wish. Select Option 4, Bridger (3.5 dB leg). Enter Y regarding the loading of an existing file. Type in

DISTEXP3 for the filename and press return. Be sure to include any drive identifiers or subdirectory routing if necessary. Respond with the number 1 for the default cable type (remember, this is only for subsequent entries or changes).

You are shown the first leg of the final distribution design example. The entries in the first leg are 100' to a 4-way tap, and then zero feet to a directional coupler. The total information entered in this distribution design section, for your reference, is as follows:

```
 DISTRIBUTION DESIGN FOR MANUAL
 STARTING POINT:  bridger (3.5 dB leg).

 Levels, cables, taps, and passives files in use are:
 Std.lvl
 Std.cbl
 Std.tap
 Std.pas


 LEG I.D.>TRK #5- LWR LEG| START>35.50|42.50|0.000|0.000|OK
 NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
   1| 100| 1|   4-WAY-TAP|26.000|34.98|41.19|0.160|0.400|OK
   2|   0| 1|        DC-8|0.0000|34.48|40.59|0.560|0.900|OK
 100.000 FEET IN THIS LEG
 PARENT LEG>     NONE
 LEFT SUB LEG>   DC8- 1ST DWN LG(thru)
 CENTER SUB LEG> NONE
 RIGHT SUB LEG>  DC8- 1ST RGT LG(tap)

 LEG I.D.>DC8- 1ST DWN LG| START>33.18|38.99|1.760|2.200|OK
 NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
   1| 110| 1|   4-WAY-TAP|23.000|32.61|37.55|1.936|2.640|OK
   2|   0| 1|        DC-8|0.0000|32.11|36.95|2.336|3.140|OK
 110.000 FEET IN THIS LEG
 PARENT LEG>     TRK #5- LWR LEG
 LEFT SUB LEG>   2ND DC8- TAP(tap)
 CENTER SUB LEG> NONE
 RIGHT SUB LEG>  DC8 THRU - SPLT(thru)

 LEG I.D.>   2ND DC8- TAP| START>23.61|28.45|10.84|11.64|OK
 NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
   1| 115| 1|   4-WAY-TAP|14.000|23.01|26.94|11.02|12.10|OK
   2| 120| 1|   8-WAY-TAP|11.000|20.99|23.57|12.71|13.98|OK
 235.000 FEET IN THIS LEG
 PARENT LEG>     DC8- 1ST DWN LG
 LEFT SUB LEG>   NONE
 CENTER SUB LEG> NONE
```

RIGHT SUB LEG> NONE

LEG I.D.>DC8 THRU - SPLT| START>30.81|35.35|3.536|4.440|OK
NO. FEET CBL   DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
  1| 0| 1| LEXT-HI|14.040|30.81|35.35|3.536|4.440|OK
  2| 0| 1| 2-WAY-SPLIT|0.0000|39.00|46.00|0.000|0.000|OK
0.00000 FEET IN THIS LEG
PARENT LEG>   DC8- 1ST DWN LG
LEFT SUB LEG>   DWN LEG OF SPLT(tap)
CENTER SUB LEG> NONE
RIGHT SUB LEG> RGT LEG OF SPLT(tap)

LEG I.D.>DWN LEG OF SPLT| START>35.40|42.20|3.800|3.600|OK
NO. FEET CBL   DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
  1| 110| 1| 4-WAY-TAP|26.000|34.83|40.76|3.976|4.040|OK
  2| 100| 1| 2-WAY-TAP|26.000|33.81|38.85|4.536|4.940|OK
  3| 125| 1| 4-WAY-TAP|23.000|32.86|36.71|5.036|5.740|OK
  4| 0| 1| 2-WAY-SPLIT|0.0000|32.36|36.11|5.436|6.240|OK
335.000 FEET IN THIS LEG
PARENT LEG>   DC8 THRU - SPLT
LEFT SUB LEG>   LEFT LEG OF SPT(tap)
CENTER SUB LEG> NONE
RIGHT SUB LEG> RGHT LEG OF SPT(tap)

LEG I.D.>LEFT LEG OF SPT| START>28.76|32.31|9.236|9.840|OK
NO. FEET CBL   DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
  1| 60| 1| 2-WAY-TAP|17.000|28.45|31.53|9.332|10.08|OK
  2| 160| 1| 4-WAY-TAP|14.000|27.01|28.63|10.09|11.32|OK
220.000 FEET IN THIS LEG
PARENT LEG>   DWN LEG OF SPLT
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.>RGHT LEG OF SPT| START>28.76|32.31|9.236|9.840|OK
NO. FEET CBL   DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
  1| 75| 1| 4-WAY-TAP|17.000|28.37|31.33|9.356|10.14|OK
  2| 90| 1| 4-WAY-TAP|17.000|27.00|29.05|10.40|11.40|OK
165.000 FEET IN THIS LEG
PARENT LEG>   DWN LEG OF SPLT
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG> NONE

LEG I.D.>RGT LEG OF SPLT| START>35.40|42.20|3.800|3.600|OK
NO. FEET CBL   DEVICE | TAP |L IN |H IN |L REV|H REV| ERRORS
  1| 100| 1| 4-WAY-TAP|26.000|34.88|40.89|3.960|4.000|OK

```
  2|   0| 1| 2-WAY-SPLIT|0.0000|34.38|40.29|4.360|4.500|OK
100.000 FEET IN THIS LEG
PARENT LEG>     DC8 THRU - SPLT
LEFT SUB LEG>   FINAL DWN LEG(tap)
CENTER SUB LEG> NONE
RIGHT SUB LEG>  RGHT FINAL LEG(tap)

LEG I.D.>  FINAL DWN LEG| START>30.78|36.49|8.160|8.100|OK
NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
  1| 105| 1|   4-WAY-TAP|23.000|30.23|35.11|8.328|8.520|OK
  2| 100| 1|   2-WAY-TAP|20.000|29.21|33.20|8.888|9.420|OK
  3| 110| 1|   8-WAY-TAP|17.000|28.14|31.16|9.464|10.36|OK
  4| 120| 1|   4-WAY-TAP|14.000|26.12|27.79|11.16|12.24|OK
435.000 FEET IN THIS LEG
PARENT LEG>     RGT LEG OF SPLT
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG>  NONE

LEG I.D.> RGHT FINAL LEG| START>30.78|36.49|8.160|8.100|OK
NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
  1| 105| 1|   4-WAY-TAP|23.000|30.23|35.11|8.328|8.520|OK
  2|  75| 1|   4-WAY-TAP|20.000|29.34|33.53|8.848|9.320|OK
  3|  90| 1|   4-WAY-TAP|17.000|28.28|31.55|9.492|10.28|OK
  4|  85| 1|   2-WAY-TAP|17.000|26.93|29.34|10.53|11.52|OK
355.000 FEET IN THIS LEG
PARENT LEG>     RGT LEG OF SPLT
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG>  NONE

LEG I.D.>DC8- 1ST RGT LG| START>25.98|32.09|9.060|9.400|OK
NO. FEET CBL    DEVICE  |  TAP |L IN |H IN |L REV|H REV|     ERRORS
  1| 125| 1|   4-WAY-TAP|17.000|25.33|30.45|9.260|9.900|OK
  2|  90| 1|   4-WAY-TAP|14.000|23.96|28.17|10.30|11.16|OK
  3| 160| 1|   4-WAY-TAP|11.000|21.73|24.28|12.06|13.20|OK
375.000 FEET IN THIS LEG
PARENT LEG>     TRK #5- LWR LEG
LEFT SUB LEG>   NONE
CENTER SUB LEG> NONE
RIGHT SUB LEG>  NONE


TOTAL FEET> 2430.000 = 0.4602 MILES
VALUE OF MIN. LEVEL OFF TAP LOW FREQ>  7.0000
VALUE OF MIN. LEVEL OFF TAP HIGH FREQ> 12.000
```

Lets take a look at this design for a few moments. Press F7 (FIND). Note that there are 11 legs total in the design. Now press up arrow. Then press ALT-T to re-test the design. Answer Yes to the question about calculating reverse losses. No power level errors are indicated. Press any key to return to the Design Entry Screen. One line extender amplifier has been located in this distribution leg at a position to feed the entire area. The assumption was again to locate it in such a manner that only one would be required. If the designer waits and places the amplifier in a leg when running out of signal, several line extenders would be used rather than just one.

Lets see if the line extender could be eliminated altogether if we did some "playing" with the tap levels. Press F7 (FIND) and enter DC8 THRU - SPLT as the Leg I.D. to find. This leg shows zero feet to a high level line extender, then zero feet on the line extender output to a 2-way splitter. Lets take out the line extender, try lowering the required tap output levels, and see what happens. Use the down arrow key to move to the first entry line. Hit the ALT-D key combination and the line extender entry will be eliminated. Now use ALT-T to test the current design. Power level errors are indicated in four of the branches of our design. Lets see if lowering the tap levels several dB will solve our problem. Press any key to leave the Test Status Window, then use F9 to exit to the menu. Now select Option 6, Modify minimum level off tap high and/or low. Now lets lower both the low and high tap output requirements by several dB and see if we can eliminate the line extender, while maintaining some sort of realistic design. Enter 5 for the minimum low level off the tap, then enter 10 for the minimum high level off the tap. Now select Option 2, Test the current design. There are still power level errors in four branches! Lets try this once more. Press any key to return to the Design Menu. Then select Option 6, Modify minimum level off tap high and/or low. Now lets lower both the low and high tap output requirements by several more dB. Enter 1 for the minimum low level off the tap, then enter 6 for the minimum high level off the tap. Now re-test the design with Option 2. Cable Designer still indicates power level errors in one leg--FINAL DWN LEG. Beyond this, power levels of +1 dBmv low frequency and +6 dBmv high frequency are hardly realistic. We could do some further playing with the types of directional couplers and splitters, but it is obvious by now that at least one line extender is required no matter what we do. Lets reset our levels and re-insert the line extender.

Press any key to return to the Menu. Now select Option 6, Modify minimum level off tap high and/or low. By just pressing return at the prompts for low and high frequency, Cable Designer will put the tap levels back to where they started for you (+7 dBmv and +12 dBmv). You may also enter the values yourself if you wish. Then select Option 1, Add to/change/view the current design. Make sure that you are still located in the leg DC8 THRU - SPLT. If not, use F7 (FIND) to go there. Now use the arrow keys to position the cursor in the Leg I.D. line. Press the ALT-I key combination to add a new first leg entry. Type 0 feet and return, then return again to accept the default cable, then 1 for a line extender. Use the ALT-T key combination to re-test the design. No power level errors are indicated and we are back to where we started. Press any key to return to the Design Entry Screen again.

Lets examine several other items regarding the line extender while we're on the subject. We are still located at the branch containing the line extender. Note that the pad and equalizer values are noted in the tap column. The design is calling for a 14 dB pad, and a 4 dB equalizer. As discussed in the first distribution example, this may seem like an illogical waste of signal (i.e., dropping 14 dB of signal in the pad). As demonstrated in the exercise above, correct amplifier

placement is not always where you "run out of signal". In this example, as in the first one, the placement of the multitude of splits, and the requirement for at least one amplifier, tends to make the line extender choice more one of demographics. If there were extenuating circumstances, as is many times the case, then those should be taken into account as well. For example, if one of the lines were to have a requirement for extension in the future, that might change your choice of line extender placement. Now press F9 (END) to return to the design menu.

Lets try one further exercise before ending this sample design section. Lets try raising the minimum tap output levels, and see how much we can raise them before encountering design problems. Select Option 6, Modify minimum level off tap high and/or low. If you will remember from the previous example, our default levels are +7 dBmv low frequency, and +12 dBmv high frequency. Lets raise both levels 1 db and see what happens. Enter 8 and 13 respectively for the new levels. Now re-test the current design using Option 2 or the ALT-T combination. A power level error is indicated in leg 2ND DC8- TAP. Lets go to that leg and examine the error. Press any key to return to the Design Menu and Select Option 1, Add to/change/view the current design if necessary. Press F7 (FIND) and enter 2ND DC8- TAP. As you can see upon examination, the problem is that there is not enough signal to select the last device, which was a requested 8-way tap. It is possible that you could change the request for the final tap to a 4-way tap and the design would work. If you wish to try that, you will find that the design will in fact work. Now press F9 (END) to return to the menu. Select Option 6, Modify minimum level off tap high and/or low and reset the minimum tap output levels back to our default +7 dBmv low frequency, and +12 dBmv high frequency.

As a final exercise, lets print the Bill of Materials for just this distribution leg. First, we need to re-test our design at the correct tap output levels to correct the errors from above. Select Option 2, Test the current design or use ALT-T. As you can see, the design now works again. Press any key to return to the Design Menu. Select Option B, Go to the Bill of Materials Menu. Rather than printing the Bill of Materials this time, lets write the Bill of Materials to an ASCII text file, and then use the F4 List feature of Cable Designer to view our Bill of Materials. Select Option 2, Write the current design's bill of materials to a disk file. You will notice a momentary pause while Cable Designer totals the bill of materials for this design. Cable Designer prompts for the number of lines to skip for letterhead paper. Enter the same number of lines you would skip if you were sending the report to the printer, then, if you later decide to print out the ASCII file, it will have the correct spacing at the top. Next, Cable Designer asks you for a title line--enter Cable Designer Example #3. The program now asks for the filename to save under. Enter example3. Be sure to include a drive or subdirectory designator if needed. You do not have to include the .bom filename extension on the end, but you can if you wish. Cable Designer will include this for you if you do not.

The bill of materials has now been saved to the disk drive you chose under the file name EXAMPLE3.BOM. Lets use the F4 (LIST) feature to view this file. Press F4 and Cable Designer will prompt you for the file name. Type (drive and subdirectory if necessary) example3.bom. For example, if you saved the file on the B drive in the main root directory area, type b:example3.bom and then press return. You will now see the top portion of the bill of materials file you just saved. The F4 (LIST) feature will allow you to see a portion of the file at a time, and by pressing any key, it will scroll to the next area. By scrolling through the bill of

materials slowly, you will view the total bill of materials for that distribution area. The data you will see is as follows:

5/22/1991 at 5:31 PM

BILL OF MATERIALS, CABLE DESIGNER 2.1

Cable Designer Example #3

DEVICE OR CONNECTOR TYPE	TOTAL	DEVICE TYPE	TOTAL	DEVICE TYPE	TOTAL
High Power Line Extender..	1	DC-7 Coupler...	0	DC-30 Coupler..	0
Derated Line Extender.....	0	DC-8 Coupler...	2	DC-A Coupler...	0
Trunk Amplifier.....	0	DC-9 Coupler...	0	DC-B Coupler...	0
Housing-To-Housing Conn...	6	DC-12 Coupler..	0	DC-C Coupler...	0
AC Terminator.....	5	DC-16 Coupler..	0	3-Way Splitter.	0
Distribution Equalizer....	0	DC-20 Coupler..	0	3-Way Uneven	
2-Way Splitter.....	3	DC-24 Coupler..	0	Splitter.....	0

	CABLE TYPE	TOTAL FEET	IN MILES	CONNECTORS
1:	T3-500	2430.00000	0.460227	46
2:	T3-625	0.00000000	0.000000	0
3:	T3-750	0.00000000	0.000000	0
4:	T3-875	0.00000000	0.000000	0
5:	T31000	0.00000000	0.000000	0
6:	NONE	0.00000000	0.000000	0
7:	NONE	0.00000000	0.000000	0
8:	NONE	0.00000000	0.000000	0
9:	NONE	0.00000000	0.000000	0
10:	NONE	0.00000000	0.000000	0

2-WAY TAPS		4-WAY TAPS		8-WAY TAPS		T TAPS	
FACEPLATE	TOTAL	FACEPLATE	TOTAL	FACEPLATE	TOTAL	FACEPLATE	TOTAL
4.0000	0	8.0000	0	11.000	1	NONE	0
8.0000	0	11.000	1	14.000	0	NONE	0
11.000	0	14.000	4	17.000	1	NONE	0
14.000	0	17.000	4	20.000	0	NONE	0
17.000	2	20.000	1	23.000	0	NONE	0
20.000	1	23.000	4	26.000	0	NONE	0
23.000	0	26.000	3	29.000	0	NONE	0
26.000	1	29.000	0	32.000	0	NONE	0
29.000	0	32.000	0	35.000	0	NONE	0
32.000	0	35.000	0	NONE	0	NONE	0
35.000	0	38.000	0	NONE	0	NONE	0
38.000	0	41.000	0	NONE	0	NONE	0
41.000	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0

NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0
NONE	0	NONE	0	NONE	0	NONE	0

As you can see, Cable Designer does a fast and complete job of totaling the bill of materials necessary for constructing this distribution system.

6.5 General Design Techniques and Hints

As stated in other sections of the manual, the Cable Designer manual is not intended to be a treatise or primer on cable system design. There are some brief hints, however, that might be passed on in terms of a general approach to this program, and to cable system design in general. They are:

· When first learning how to run Cable Designer, begin by working with small areas to design. As you gain proficiency, you can work with larger and larger areas. Cable Designer can work with very large areas at once, but you will find that until your proficiency is great with the program, it will be quite cumbersome to work in very large areas. When you do feel proficient with the program, the best method is to work with one distribution leg exiting a trunk/bridger amplifier at a time. In the three distribution examples included in this section, we basically took that approach. We kept the size of those distribution legs rather small for example purposes, but Cable Designer can essentially handle any size or amount of distribution fed on an exiting distribution line, no matter how many miles of cable are fed from it. Amplifier cascade limits will be reached long before Cable Designer runs out of room in memory.

· When laying out your initial design, pick the directional coupler and splitter values you "think" will work. You will find that as you gain in proficiency with both designing in general and Cable Designer, you will pick the correct device more often than not. When you do need to change a device, the simple editing techniques Cable Designer provides allow ease of change and correction. In terms of picking line extender location, several methods can be used. As your design proficiency increases, you can initially locate a line extender "close" to where you think it should be. Also, in some cases, amplifiers are located by other determining factors such as access by bucket truck, etc. One other method that can be used is to simply not enter any line extenders in the initial layout. Then test the design and see where you "run out of signal level". Then analyze the situation and insert line extenders where necessary. Again, because the editing techniques of this program are so easy and yet advanced, this method works well because the insertion of the amplifier is a very simple task. Also, wherever possible, leave an extra dB or two on the input to an amplifier. This not only allows some margin for error in case your footage or other factors are in error, but also allows for future taps or splits preceding the amplifier. If no margin is left, any future changes before the amplifier may cause you to have to re-design or re-space the plant.

· When a design is very close to working, but you are perhaps one or two taps off, at line ends, from an acceptable design, try "playing with" or adjusting the minimum tap output levels. By that I mean that if your design is close, sometimes changing the minimum tap output level from +12 dBmv to +11.5 dBmv will give you a workable design. Your response to this suggestion may be that you won't have enough signal level to feed customers! But remember, this specification is used by Cable Designer as the criteria to pick the minimum tap value! This means, because multitap values generally go in three or four dB increments, that if +12 dBmv is the minimum value, the average value will be around +14 dBmv to +15 dBmv. Therefore, dropping the minimum specification by .5 dB will not normally cause problems. Again, you are the designer, and you must "call the shots". This technique, if used carefully, will not cause problems and may save you an amplifier or two in the process.

· Make printouts of your designs and keep them in files under the project, or however you choose. You will find that the printouts will come in handy for a variety of reasons over a period of time. They can serve as valuable trouble shooting tools when you have turn on problems in an area, and also serve to remind you what your design criteria was when questions arise in the future. If you save your designs to diskette, keep the designs for an area or community on a separate diskette, or in a separate subdirectory. Also, pick names for the designs that will make sense to you in the future. For example:

TRK_1|7.DES Trunk design layout for Trunk Amps 1-7
TRK1_DL1.DES Distribution Leg #1 from Trunk Amp #1
TRK1_DL2.DES Distribution Leg #2 from Trunk Amp #1
TRK3_DL1.DES Distribution Leg #1 from Trunk Amp #3
TRK3_DL2.DES Distribution Leg #2 from Trunk Amp #3
TRK3_DL3.DES Distribution Leg #3 from Trunk Amp #3

If you have some sort of a numbering scheme for your trunk and distribution amplifiers, and most designers and/or systems do, then you can adapt that numbering scheme to name your design files so that you can identify them later when you are searching for one.

· When naming Leg I.D.s during the initial layout, either name them according to geographical locations, or by the device that is being used. The process of going through a design area, with many legs and branches, can be confusing at times. By picking Leg I.D.s that mean something to you, you will greatly aid yourself in the process of having a design that makes sense to you now, and when you look at it a year or two from now.

· When designing, normally have Cable Designer compute reverse path losses, even if you do not anticipate ever activating the reverse system. Your printouts will then contain the reverse path losses for future reference. If you do ever activate the reverse system, even if only in a given area, the printouts will aid you in verifying that the reverse system will function. The reverse path losses computed will also aid you in initial choices for reverse pads and equalizers.

· Although not stated specifically otherwise, Cable Designer can be used in "hybrid" applications. For example, by modifying the tap, passive, level, and cable files, Cable Designer can be used in the design of SMATV systems, apartment buildings or high rises, and in a multitude of other applications. Data files can be maintained and loaded that would contain

information on "sub-passive" type devices for internal wiring, etc. Again, there is great versatility built into Cable Designer and your imagination is the only limit to its application.

7. Distortion Calculations - Lotus/Quattro & Excel Templates

There are two versions of the distortions worksheet included with the extras diskette; Distort5.xls, which is the Microsoft Excel version; and Distort5.wk1 which is compatible with Lotus 123 or Borland Quattro. Also included with the Distort5.wk1 is a Distort5.all file used in conjunction with Allways.

Basic instructions for use:

7.1 Review the instructions embedded in the template which begin at Cell K1.

7.2 The user enters equipment specifications in the TABLE LOOKUP area which is included in cells K11:W111. Some sample equipment specs are already loaded. Equipment specs include information on the manufacturer and module type used, module noise figure, module output reference level for distortion specifications, reference channel loading for distortions specs, level tilt as referenced by the manufacturer, XMOD rating at the reference level, CTB rating at the reference level, discrete 2nd Order rating (DSO) at the reference level, composite 2nd Order rating (CSO) at the reference level, low frequency interference/hum rating at the reference level, and the amplifier gain (+) or directional coupler loss (-) of the amplifier or module.

7.3 The row which shows AMPLIFIER INPUT is a calculated row, and does not require user input.

7.4 Specific rows which do require user input are:

SYSTEM INFORMATION ENTER APPROPRIATE INFORMATION ON THE SYSTEM UNDER EXAMINATION INCLUDING NAME, ADDRESS, AND COMMENTS.
EQUIPMENT TYPE LOOKUP# CHOOSE EQUIPMENT TYPE FROM LOOKUP TABLE AND ENTER.
BW(MHZ) ENTER THE REFERENCE BANDWIDTH FOR NOISE CALCULATIONS; THIS IS ALMOST ALWAYS 4 MHZ.
SYSTEM CHNL LOADING ENTER THE NUMBER OF CHANNELS TO BE LOADED IN THIS PORTION OF THE CASCADE. EACH COLUMN CAN BE A DIFFERENT CHANNEL LOADING.
SYSTEM TILTENTER THE LEVEL TILT THAT THE EQUIPMENT WILL BE OPERATED AT; THIS IS NOT NECESSARILY THE SAME NUMBER ENTERED FOR REFERENCE TILT. FOR

EXAMPLE, YOU COULD WISH TO OPERATE EQUIPMENT SPECIFIED BY THE MANUFACTURER AT 3DB OF TILT -- AT 5DB.
AMPLIFIER OUTPUT ENTER THE OUTPUT LEVEL THAT EACH AMPLIFIER CASCADE IS TO BE OPERATED AT. FOR TRUE DISTORTION CALCULATIONS, THIS SHOULD BE THE ACTUAL LEVEL THE AMPLIFIER OUTPUT STAGES RUN AT, WHICH IS NOT NECESSARILY THE SAME AS THE OUTPUT OF THE STATION (INTERNAL D/C'S USUALLY EXIST BETWEEN THE MODULE AMP AND OUTPUT OF STATION).
CASCADE LENGTH ENTER THE CASCADE LENGTH FOR THIS TYPE OF AMPLIFIER, .IE., THE NUMBER OF REPEATED IDENTICAL AMPS.

2ND ORDER CALC FACTOR ENTER THE CALCULATION FACTOR TO BE USED FOR 2ND ORDER DISTORTION CALCULATIONS. IN THEORY, 2ND ORDER DISTORTIONS WILL ALWAYS FOLLOW A 10LOG FUNCTION. IN ACTUAL SYSTEM MEASUREMENTS AND IN PARTICULAR IN LONGER CASCADES, THE DISTORTION BUILD UP MAY FOLLOW A 15LOG TO 20LOG FUNCTION MORE CLOSELY. THE USER MAY ENTER WHAT CALCULATION FUNCTION IS TO BE USED (10, 20 ,ETC.) FOR EACH CASCADE OF AMPS.

7.5 Fiber optics links must be specified in Rows 91 thru 101 only in the lookup table. Not all columns must be filled, see asterisks (*) for each column and examples entered for further detail. When fiber optics links are used, actual link specifications are pulled into the individual column totals with no calculations -- that is beyond the intended use of this worksheet. Be sure to enter the manufacturers specifications for actual link performance under system conditions into the LOOKUP TABLE AREA.

7.6 If not all calculation columns are to be used, blank columns must have EQUIPMENT LOOKUP# 90 entered in the appropriate entry as shown with the sample template entries. While a blank column may be entered in any column position, CableSoft recommends that either the first columns(s) or last columns(s) are used rather than the intermixing of blank and active columns. If intermixed, the accuracy of the spreadsheet will not be affected.

7.7 Answers for all calculations are shown beginning with the area marked INDIVIDUAL COLUMN TOTALS. Information shown is further delineated as follows;

INDIV. COLUMN TOTALS NUMBERS SHOWN IN THESE COLUMNS ARE CALCULATED DISTORTION LEVELS FOR EACH CASCADE OF AMPLIFIERS, BUT NOT COMBINED WITH THE OTHER CASCADES. ANSWERS SHOWN THEREFORE REPRESENT THE DISTORTIONS AT THE END OF THE LONGEST CASCADE FOR EACH TYPE OF EQUIPMENT, BUT DISTORTIONS SHOWN ARE FOR THAT TYPE OF EQUIPMENT ONLY AND NOT CUMULATIVE.
CUMM. COLUMN TOTALS NUMBERS SHOWN IN THESE COLUMNS ARE CUMULATIVE NUMBERS; THE FIRST COLUMN IS FOR COLUMN 1 ONLY, THE NEXT COLUMN IS CUMULATIVE NUMBERS FOR THE EQUIPMENT IN COLUMNS 1 AND 2, AND SO ON. THE FINAL COLUMN REPRESENTS THE CUMULATIVE ADDITION OF THE DISTORTIONS IN

COLUMNS 1 THRU 5, AND WILL BE THE SAME AS ENTRIES SHOWN IN THE TOTAL SYSTEM DISTORTIONS COLUMN TO ITS IMMEDIATE RIGHT.

7.8 Finally, entering desired results in the DESIRED SYSTEM DISTORTIONS COLUMN is optional. If numbers are not entered, variance from desired results shown in the DISTORTION VARIANCE (+) TO GOOD COLUMN will not be valid.

7.9 The COMMENTS SECTION at the bottom of the worksheet is just that, a section for you to include comments on the distortion analysis.

7.10 See examples in the worksheet itself, and cell formulas, to better understand all aspects of the distortions worksheet.

8. AC Powering and PowerDesigner 2.1

8.1 Changes From Previous Version Power Program to Version 2.1

8.1a There is a conversion program (AC_CNVRT.EXE) included which must be used to convert AC data files from the previous power program version to the current one. This is required since there is much additional information saved with the newer data file structure. Additional information now saved is: AC block locations, loop resistance values for each cable type, and the power supply design voltage. All information saved under the previous format is still included, such as node numbers and data, footages between nodes, and cable types.

The data file conversion program must be run separately to convert old data files, and is MENU driven. Simply type:

AC_CNVRT at the DOS prompt and follow the instructions.

8.1b Other additions to the program are:

· Full Function Key use as denoted by the new Command Menu.
· Print routines for the current design, and all design files for your records. These routines are invoked via the function keys F9 & F10, or by using the PD and PT commands.
· As mentioned above, power block locations are now saved with the design file along with other additional information such as loop resistance values entered by the designer.
· .875" cable size has been added, using the number 8 for cable type.
· Three misc. cable sizes have been added by using cable numbers 2, 3, and 9; which correspond to cable types MISC_1, MISC_2, and MISC_3 respectively. As with the previous

program, initial default loop resistances are loaded but the value can be changed at any time during the entry process.
· Span resistance has been added to the printouts, to both screen and printer. Span resistance is the "cable footage times the loop resistance value" used on data entry.
· Certain other routines have been improved or optimized in various sections of the program.

8.2 General Instructions

Menu

An explanation of MENU functions and commands is as follows:

```
POWERDESIGNER 2.1 AC DESIGN PROGRAM <MENU OF COMMANDS>
======================================================
LOAD DATA FROM DISK                  LD  [F1]
RECORD DATA ON DISK                  RD  [F2]
CHANGE    : CABLE OR NODE DATA        CC
          : AMPLIFIER DATA            CA
          : VOLTAGES                  CV
BLOCKS    : LOCATE                    LB  [F3]
          : DELETE                    DB  [F4]
          : MOVE                      MB  [F5]
PRINT     : BLOCK LOCATIONS           PB
TO        : CABLE DATA                PC
SCREEN    : AMPLIFIER DATA            PA
          : PREVIOUS RESULTS          PR  [F6]
BEGIN (WITH NEW DATA)                 BE
STOP                                  ST
INPUT EXTRA DATA                      AD  [F7]
COMPUTE VOLTAGES/CURRENTS             GO  [F8]
MENU (RETURN TO)                      ME
------------------------------------------------------
PRINT     : DESIGN RESULTS            PD  [F9]
TO PRNTR  : DESIGN DATA               PT  [F10]

DESIRED COMMAND.....?
```

Here is an explanation of the above commands:

LD [F1]: Load Data is used to load a data file from diskette. Designs performed with PowerDesigner 2.1 must be saved previously with the RD [F2] Record Data command to use the LD command. Designs saved and loaded must end with a .POW extension. The extras diskette includes sample files that may be loaded (test_1.pow and test_2.pow). To load a data file, execute LD with carriage return or depress the F1 key from the command prompt. Be sure to follow all instructions carefully!

RD [F2]: Record Data is the command used to save entered data to diskette, once data is entered and the design is complete. It is used in conjunction with the LD command as noted above. Actual data stored to diskette with this command is: nodal entry numbers, cable footages, cable types, default loop resistances used with the design, node power and current loads, powering block locations, and the power supply default voltage. Actual design results are not recorded. When a data file is re-loaded (with LD), all data is recovered -- which allows recalculation of previous answers, addition of new data, or any other desired changes. Be sure to follow all instructions carefully as with the LD command.
CC: Change Cable (data) allows changing of cable data initially entered with the BE or Begin command. This command allows the changing of cable types, footages, or loop resistances via the previously entered node numbers. It prompts for cable location (node number), cable footage, cable type, and allows changing of the current default loop resistance for that cable type if desired. The command is also used in conjunction with the PC or Print Cable command which allows you to review entered cable parameters while making changes.

CA: Change Amplifier (data) allows changing of amplifier power and/or current drains by node location. The command prompts for node number, node power, and node current. The command is also used in conjunction with the PA or Print Amplifier (data) command which allows you to review entered power/current load parameters while making changes.

CV: Change Voltage(s) allows the user to change the two primary design voltage parameters; power supply voltage and low voltage design limit. The former allows changing of the power supply output voltage -- for example changing the default voltage from 60VAC to 30VAC. The latter allows selecting the voltage at which a low voltage alarm is sounded during design calculations and all calculations cease -- for example entering 35VAC with a 60VAC supply voltage indicates that you are willing to allow the voltage at any node to drop to 35VAC (with 60VAC at the supply) before the calculations cease and an alarm is noted indicating the design will not work as specified. The default voltage parameters are 60VAC supply voltage with a 40VAC voltage calculation limit when PowerDesigner 2.1 loads.

LB [F3]: Locate Block command allows the placing of an AC power block during the design process. If the design data was imported with the LD command, all previously saved blocks are retained. When the LB command is executed either by typing LB with carriage return or hitting the F3 key at the command prompt, the program asks for the two node locations between which the power block will be located. Follow instructions carefully when the command is executed. The PB or print block locations command will print all current block locations to screen.

DB [F4]: Delete Block command is the inverse of the LB command; it allows you to delete any powering block previously entered. Follow all instructions carefully.

MB [F5]: Move Block command allows you to move or shift a power block -- from between two given node locations to another position between two node locations. In other words, it allows you to shift or slide the block to another point in the design. Follow instructions carefully, and use the PB or print block locations command to verify your results.

PB: As noted above, the PB or Print Block locations command prints, to screen, all current power block locations. The LB, DB, and MB commands may be used to add, change or eliminate any block location.

PC: PC or Print Cable (data) prints, to screen, all cable data currently entered including node data, cable footages, cable types, and span resistances. Span resistance is the cable footage times the cable loop resistance entered during the BE or CC process.

PA: PA or Print Amplifier (data) prints, to screen, all power and current draw characteristics for each node in the entered data structure. Data is displayed by node location, constant power drain in watts, and current draw in amperes.

PR [F6]: PR or Previous Results prints, to screen, results of the current design, .ie., power supply location with given power blocks. It re-pages the screen and eliminates all information except design results, and sends to the screen the same information printed to your printer in the PD or Print Design results command. Information shown is the power supply location, voltage, and total current drain, along with total current and individual voltages at each node location.

The PR command is also used to examine results of designs that fail. When a design location fails for some reason, the calculations portion of PowerDesigner indicates failure at some node location, then ends all calculations. Selecting the PR command will send calculation results to screen for examination. The results shown are not final ones, but rather the contents of applicable storage registers at the time that the iteration process was interrupted because PowerDesigner determined that acceptable design was not possible. These results can be used to help decide on your next course of action, .ie., different supply location, but should not be taken as final current/voltage values for that design.

BE: The Begin Entry command allows you to reset all storage registers and default values, then begin the process which allows entry of an entirely new set of power design data points. After the clearing and resetting process, you will be prompted to enter footages, cable types, loop resistances, and nodal data which ties each point together. After all data is entered on cables and distances, the user enters a zero for the footage value to end that portion of the process. After the tree (connection points) is constructed, you will be prompted to enter current and/or constant power drains for each node location. Nodes which do not have active devices are entered with zero (0) values for both current and power. After the complete process is done, you will be returned to the command prompt for further action, typically the entering of power blocks and beginning design calculations. The maximum number of nodal entries with PowerDesigner 2.1 is 255.

ST: STop ends all design processing, and returns you to the DOS prompt (or windows if that environment is in use). This command will prompt you to save your data one last time before allowing you to exit PowerDesigner.

AD [F7]: Add Data allows you to input extra data as entered under the BE command, and to expand the original nodal information including all nodal, footage, and current/power

information. The original nodal structure cannot be changed, but it can be added to while retaining the original structure.

If you have imported design data with the LD command, you must first re-calculate your design with the GO command before any additional data (using AD) can be added. The program must go through one calculation to re-establish the original tree structure before any additional data will be accepted by PowerDesigner.

GO [F8]: Go is the command used to begin the actual design and calculating process. Execute this command by typing GO and carriage return or striking the F8 key. You will be asked for the initial location of the power supply. Enter the node that the supply will be located at for calculation purposes, then hit the enter or carriage return key. PowerDesigner will calculate out from the power supply location to the ends of all lines or power blocks. If the design is successful, the design results are returned to screen with accompanying instructions. If unsuccessful, error messages are displayed on screen.

PowerDesigner goes through many successive calculations (iterations) to be sure that design results are correct. When successive calculation passes result in a change of less than .0001 volts at every node location, the design is considered accurate and results are displayed. When constant power is entered for an amplifier or device, actual current draw for the device is calculated at actual node voltage, assuming the device has a uniform power supply efficiency over the entire design voltage range. While some power supplies internal efficiency will vary over a voltage range, switch mode power supplies generally exhibit a fairly uniform efficiency and PowerDesigner will calculate accurate answers for power drains entered for that type device.

Generally and overall, if all variables entered have a reasonable degree of accuracy, the answers from PowerDesigner are very accurate!

ME: The MEnu command. Type this command to re-display the entire command menu on the computer screen.

PD [F9]: The PD or Print Design results command does just that, results of the current design are routed to your printing device for hard copy. PowerDesigner will prompt you for a title for the printout (65 characters max) which enables you to title your design printout for later reference. An example would be "DESIGN FOR POWER SUPPLY #4C1: 4TH AND MAPLE STREETS".

PT [F10]: The PT or Print DaTa command results in the printing of all design data for future reference. This command function will normally be used to create a reference (for future changes) on what type of cables, power/current drains per node, and other data was used in the design process for this system or area. Data printed is the same as that routed to the screen using the PB (Print Block), PC (Print Cable) and PA (Print Amplifier) commands. You are given the option of entering a title line which will be helpful in future analysis.

8.3 Sample Designs

Example #1

With all of the preceding in mind (changes from PowerDesigner 1.0 and a description of PowerDesigner commands), lets try some sample designs.

The first design will be entered manually with your keyboard; the second and third examples will load two files included on the extras diskette called TEST_1.POW and TEST_2.POW.

Diagram One below shows a sample trunk tree with 7 trunks total; the trunk at node #8 has additional line extender (3) placements. During this process, we'll load the below data including node values; then calculate power supply requirements and locations with subsequent voltage and current calculations at all locations.

Figure 16. First Powering Example

Node numbers have already been assigned in the diagram. There's nothing special about the node number assignment; it just reflects the assigning of numbers in a logical sequence allowing the program to build a "tree" or memory diagram linking all logical cables together. The numbering could begin at any "end" of the diagram and progress logically through the system layout.

Load PowerDesigner 2.1 by typing:

POWER at the DOS prompt,

or with Windows 3.0 by typing:

[DRIVE:PATH]POWER.EXE at Program Manager, File, Run and then hitting the enter key or clicking on OK.

PowerDesigner 2.1 loads and you are shown the Command Menu as below (and also earlier in this text).

```
POWERDESIGNER 2.1 AC DESIGN PROGRAM <MENU OF COMMANDS>
=====================================================
LOAD DATA FROM DISK                 LD  [F1]
RECORD DATA ON DISK                 RD  [F2]
CHANGE    : CABLE OR NODE DATA        CC
          : AMPLIFIER DATA            CA
          : VOLTAGES                CV
BLOCKS    : LOCATE                    LB  [F3]
          : DELETE                  DB  [F4]
          : MOVE                    MB  [F5]
PRINT     : BLOCK LOCATIONS           PB
```

```
TO       : CABLE DATA              PC
SCREEN   : AMPLIFIER DATA          PA
         : PREVIOUS RESULTS        PR  [F6]
BEGIN (WITH NEW DATA)              BE
STOP                          ST
INPUT EXTRA DATA                  AD  [F7]
COMPUTE VOLTAGES/CURRENTS              GO  [F8]
MENU (RETURN TO)                  ME
-----------------------------------------------------
PRINT    : DESIGN RESULTS          PD  [F9]
TO PRNTR : DESIGN DATA             PT  [F10]

DESIRED COMMAND.....?
```

Type BE and hit the return key to begin the data entry process. You should now see the following prompt:

```
                ENTER SYSTEM DATA.....(0 FT TO STOP)

ENTRY#   CABLE FOOTAGE    CABLE TYPE    LOOP RESISTANCE FROM  TO
          (FEET)   (2,3,4,5,6,7,8,9,1) (OHM/1000FT)  NODE NODE

1         ?
```

Data is entered sequentially by the prompting messages above. To enter the first sequence, type:

1750 then Enter
7 then Enter
.75 then Enter
1 then Enter
2 then Enter

This completes the sequence for the first span of cable connecting two node locations. .750" cable size was chosen for trunk. The default loop resistance of .77 Ohms/1000' was printed to screen by the program. This value was overridden during the first entry, changed by typing .75 and hitting return. To accept the default value one simply hits the return key without typing any values. Now lets enter the next trunk span in sequence. Type:

2000 then Enter
7 then Enter
Enter (to accept the current default value of .75)
2 then Enter
3 then Enter

This completes the next span sequence. Entering all cable and node data is just this simple. Your computer screen should now look like this:

ENTER SYSTEM DATA.....(0 FT TO STOP)

ENTRY# CABLE FOOTAGE CABLE TYPE LOOP RESISTANCE FROM TO
(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

1 ? 1750 ? 750 0.770? .75 ? 1 ? 2

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

2 ? 2000 ? 750 0.750? ? 2 ? 3

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

3 ?

Now lets enter three more trunk spans in sequence. Type:

350 then Enter
7 then Enter
Enter (to accept the current default value of .75)
3 then Enter
4 then Enter

1500 then Enter
7 then Enter
Enter (to accept the current default value of .75)
4 then Enter
5 then Enter

1400 then Enter
7 then Enter
Enter (to accept the current default value of .75)
4 then Enter
6 then Enter

See how the node data is entered in the same logical sequence as the numbers are assigned? Your computer screen should now look like the following printout:

ENTER SYSTEM DATA.....(0 FT TO STOP)

ENTRY# CABLE FOOTAGE CABLE TYPE LOOP RESISTANCE FROM TO
(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

1 ? 1750 ? 750 0.770? .75 ? 1 ? 2

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

2 ? 2000 ? 750 0.750? ? 2 ? 3

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

3 ? 350 ? 750 0.750? ? 3 ? 4

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

4 ? 1500 ? 750 0.750? ? 4 ? 5

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

5 ? 1400 ? 750 0.750? ? 4 ? 6

Now continue entering trunk data until finished with nodal data #7 to #8 which ends the trunk portion. When finished with trunk, your screen should look as shown next:

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

4 ? 1500 ? 750 0.750? ? 4 ? 5

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

5 ? 1400 ? 750 0.750? ? 4 ? 6

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

6 ? 2100 ? 750 0.750? ? 6 ? 7

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

7 ? 2200 ? 750 0.750? ? 7 ? 8

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

8 ?

Entering final nodal/cable data for the distribution is as follows:

1200 then Enter
5 then Enter
2 then Enter
8 then Enter

9 then Enter

1000 then Enter
5 then Enter
Enter (to accept the current default value of 2.0)
9 then Enter
10 then Enter

100 then Enter
5 then Enter
Enter (to accept the current default value of 2.0)
10 then Enter
11 then Enter

250 then Enter
5 then Enter
Enter (to accept the current default value of 2.0)
10 then Enter
12 then Enter

Your computer screen now should appear like the following:

```
          (FEET)   (2,3,4,5,6,7,8,9,1) (OHM/1000FT)  NODE NODE

8         ? 1200        ? 500         1.980? 2    ? 8  ? 9

          (FEET)   (2,3,4,5,6,7,8,9,1) (OHM/1000FT)  NODE NODE

9         ? 1000        ? 500         2.000?      ? 9  ? 10

          (FEET)   (2,3,4,5,6,7,8,9,1) (OHM/1000FT)  NODE NODE

10         ? 100        ? 500         2.000?      ? 10 ? 11

          (FEET)   (2,3,4,5,6,7,8,9,1) (OHM/1000FT)  NODE NODE

11         ? 250        ? 500         2.000?      ? 10 ? 12

          (FEET)   (2,3,4,5,6,7,8,9,1) (OHM/1000FT)  NODE NODE

12         ?
```

Now enter a zero (0) for the next footage to end the cable/nodal entry routine. The program will take a moment to form the amplifier tree or stack, then prompt you to enter the final information needed for proper design; power and/or current ratings for all active devices at each node. You will be taken back through each node entered and be prompted to enter the (constant) power and/or current drawn at each location. Information entered can be power, current, or both!

Generally, switch mode supplies are entered with power draws since they draw a constant power, and linear mode supplies are entered using their current rating.

For example, if the trunk tree only is entered for design and trunk power packs are of the switch mode type, power draw for the trunk stations may be used while current draw for the total number of line extenders fed by each trunk may be entered at the same prompt. More illustrations will follow on this in examples two and three.

Now lets walk back through the nodal information and enter all power ratings (information in Diagram One rates all nodal drains in wattage only for this example assuming switch mode trunk and line extender supplies). The entry sequence is as follows:

35 then Enter
0 then Enter
35 then Enter
0 then Enter
35 then Enter
0 then Enter
0 then Enter <---Node #4 is a split and no power/current
0 then Enter <---consuming devices are located there!!
35 then Enter
0 then Enter
35 then Enter
0 then Enter
35 then Enter
0 then Enter
35 then Enter
0 then Enter
15 then Enter
0 then Enter
0 then Enter <---Node #10 is a split and no power/current
0 then Enter <---consuming devices are located there!!
15 then Enter
0 then Enter
15 then Enter
0 then Enter

Your computer screen should now look like this:

NODE #: 3 CONSTANT POWER (WATTS) ? 35 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 4 CONSTANT POWER (WATTS) ? 0 0 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 5 CONSTANT POWER (WATTS) ? 35 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 6 CONSTANT POWER (WATTS) ? 35 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 7 CONSTANT POWER (WATTS) ? 35 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 8 CONSTANT POWER (WATTS) ? 35 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 9 CONSTANT POWER (WATTS) ? 15 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 10 CONSTANT POWER (WATTS) ? 0 0 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 11 CONSTANT POWER (WATTS) ? 15 CONSTANT CURRENT (AMPS) ? 0 0

NODE #: 12 CONSTANT POWER (WATTS) ? 15 CONSTANT CURRENT (AMPS) ? 0 0

DATA ENTRY COMPLETE

DESIRED COMMAND.....?

Now that all pertinent data is entered, lets try a few designs and see if a single 60VAC supply will power this entire area. But first, lets use the PA and PC commands to verify that all information has been entered correctly.

Type PA and then the enter key. Your screen should show the following:

```
  PRINTING AMPLIFIER NODE DATA...
         CONSTANT   CONSTANT
NODE #     POWER      CURRENT
  1.0       35.0       0.0
  2.0       35.0       0.0
  3.0       35.0       0.0
  4.0        0.0       0.0
  5.0       35.0       0.0
  6.0       35.0       0.0
  7.0       35.0       0.0
  8.0       35.0       0.0
  9.0       15.0       0.0
 10.0        0.0       0.0
 11.0       15.0       0.0
 12.0       15.0       0.0
```

DESIRED COMMAND.....?

Now type PC and hit return or enter. Your screen will show the following:

```
PRINTING CABLE DATA...
NUMBER   FOOTAGE  CABLE TYPE  OHMS/SPAN  FROM   TO
1        1750       750       1.3125    1     2
2        2000       750       1.5000    2     3
```

3	350	750	0.2625	3	4
4	1500	750	1.1250	4	5
5	1400	750	1.0500	4	6
6	2100	750	1.5750	6	7
7	2250	750	1.6500	7	8
8	1200	500	2.4000	8	9
9	1000	500	2.0000	9	10
10	100	500	0.2000	10	11
11	250	500	0.5000	10	12

Look over your screen and compare it with the above data and the data entered in the earlier process. They should agree. If not, re-enter the data by typing BE and starting the entry process over again, or try the CA and CC commands to change the data entered.

Now lets try several designs with this data. Type GO and hit the enter key. Your screen will show the following:

..PREPARING TO COMPUTE VOLTAGES AND CURRENTS..

POWER SUPPLY LOCATION...?

PowerDesigner now wants to know your first choice for the power supply location. Type the number three (3) and hit the enter key. You are selecting node number 3 as a tentative location for the power supply. PowerDesigner will now go through an iteration process calculating successive voltages at each location, then the current draw by each (constant power) device given the node voltage. Successive iterations are required since current draws vary, which vary the voltage drop and voltage at each node. When successive passes vary by only a very small amount (<=1/10,000th of a volt) the design is complete with results printed to the screen. Depending on your computer hardware, these calculations are performed quite fast unless the number of data points becomes quite large.

Once calculations are complete, select the PR (previous results) command to re-print the answer to screen, clearing any extraneous information. Results for this design should look like this:

PRINTING FINAL RESULTS...

POWER SUPPLY AT NODE # 3

NODE#	NODE VOLTAGE	NODE CURRENT	TOTAL CURRENT
1.00	57.38	0.61	0.61
2.00	58.18	0.60	1.21
3.00	60.00	0.58	5.37
4.00	59.06	0.00	3.58
5.00	58.39	0.60	0.60
6.00	55.93	0.63	2.98
7.00	52.23	0.67	2.35

8.00	49.45	0.71	1.68
9.00	47.11	0.32	0.98
10.00	45.80	0.00	0.66
11.00	45.73	0.33	0.33
12.00	45.63	0.33	0.33

TOTAL CURRENT 5.373 AMPS

DESIRED COMMAND.....?

As you can seen from the design results, one (1) 60VAC power supply obviously works quite well with the data entered, assuming the supply is rated at greater than the above amperage total. Each node voltage is simply that, the calculated voltage present at each node location given current loadings and span resistances. Nodal currents are given in two (2) different values; NODE CURRENT AND TOTAL CURRENT. NODE CURRENT is the current contributed by loading at that node only. TOTAL CURRENT is the current present at that node only due to the local power load (NODE CURRENT), plus any current draws due to other power loads downstream.

Looking at the voltage spreads, by node, shows that voltage drops to around the 45VAC range at node #9 and beyond. Lets move the supply location to node #6 to see what differences are made in our calculations.

Type GO and hit enter, then enter number six (6) and hit enter again to select that node number for the next possible power supply location.

After recalculations, and executing the PR command to clear and repaint your screen, your screen will show the following:

PRINTING FINAL RESULTS...

POWER SUPPLY AT NODE # 6

NODE#	NODE VOLTAGE	NODE CURRENT	TOTAL CURRENT
1.00	54.08	0.65	0.65
2.00	54.93	0.64	1.28
3.00	56.86	0.62	1.90
4.00	57.36	0.00	2.52
5.00	56.66	0.62	0.62
6.00	60.00	0.58	5.25
7.00	56.62	0.62	2.15
8.00	54.10	0.65	1.53
9.00	51.99	0.29	0.88
10.00	50.81	0.00	0.59
11.00	50.75	0.30	0.30

12.00 50.66 0.30 0.30

TOTAL CURRENT 5.246 AMPS

DESIRED COMMAND.....?

As can be seen from the second design results, two improvements were realized by moving the supply to node #6. Higher overall & average node voltages are realized by this location, and total overall power supply current drain is slightly less - 5.246 amperes versus 5.373 amperes in the first design location choice. Although in this instance the total current reduction is only slight, many designs will realize significant current reductions by the optimal placement of the power supply.

Finally, lets place a power block between nodes #8 and #9 to eliminate the distribution powering, then recalculate trunk only loading with the power supply at node location #6.

Type LB (locate block) and hit return. Your screen will show the following prompt:

TO LOCATE CABLE BLOCK...

LOCATE BLOCK BETWEEN NODE # : ?

Type eight (8) and hit return.

The screen now shows:

TO LOCATE CABLE BLOCK...

LOCATE BLOCK BETWEEN NODE # : ? 8
AND NODE # : ?

Type nine (9) and hit return.

The screen now shows:

TO LOCATE CABLE BLOCK...

LOCATE BLOCK BETWEEN NODE # : ? 8
AND NODE # : ? 9

...BLOCK LOCATED...

DESIRED COMMAND.....?

Now type PB to Print Block locations and verify our placement.

The screen will show the following:

PRINTING BLOCK LOCATIONS...

AC BLOCKS:
FROM TO
8 9

DESIRED COMMAND.....?

Re-design trunk only, by typing GO and typing the return key. Then enter the number six (6) and hit return. PowerDesigner will recalculate on trunk footages only (since we've blocked off the distribution footages). PowerDesigner 2.1 designs from your choice on power supply location -- to all ends-of-line or power blocks placed from the supply location chosen. After the design is finished, type PR to repaint the results. The screen will show the following:

PRINTING FINAL RESULTS...

POWER SUPPLY AT NODE # 6

NODE#	NODE VOLTAGE	NODE CURRENT	TOTAL CURRENT
1.00	54.08	0.65	0.65
2.00	54.93	0.64	1.28
3.00	56.86	0.62	1.90
4.00	57.36	0.00	2.52
5.00	56.66	0.62	0.62
6.00	60.00	0.58	4.32
7.00	58.09	0.60	1.22
8.00	57.07	0.61	0.61

TOTAL CURRENT 4.317 AMPS

DESIRED COMMAND.....?

Eliminating the distribution powering gives the above results. It can be seen from the nodal voltage spread, that for trunk powering only, node #6 is probably not the best location for overall distribution of voltages from the supply. You can also compare these design results with previous calculations to see the difference between trunk-only powering, and trunk & distribution powering.

Example #2

Examples #2 and #3 will load existing data files from the extras diskette. Figure #17 below shows a "map" type view of data that has been entered in anticipation of our design. All data was entered in a similar manner to that performed in example #1.

Figure 17. Second Powering Example

With PowerDesigner loaded and at the command prompt, type LD for Load Data from disk. Assuming the data disk is in your b: drive, the following conventions should be used. If the extras diskette or its contents is located in some other drive, be sure to change (drive) selections accordingly below:

DO YOU WISH TO PERFORM A DIRECTORY SEARCH? (Y/N)

Answer Y and hit the return or enter key.

Then type b:*.pow and hit return to do a directory search on the b: drive for all files which end in .pow which is the PowerDesigner data file extension.

Your screen will now look like this:

```
DO YOU WISH TO PERFORM A DIRECTORY SEARCH? (Y/N)
  Y
DISK TO SEARCH FILES FOR - EXAMPLE (B:*.POW), (*.POW) IS DEFAULT? B:*.POW


TEST_.POW     TEST_2.POW
XXXXXX Bytes free


NAME OF SYSTEM FILE TO LOAD...(B:file.POW) ?
```

Now enter the name of the file, in this example and again assuming the extra's diskette is in your b: drive, type:

b:test_1.pow and hit the return key.

Your screen will now show the following:

```
DO YOU WISH TO PERFORM A DIRECTORY SEARCH? (Y/N)
  Y
DISK TO SEARCH FILES FOR - EXAMPLE (B:*.POW), (*.POW) IS DEFAULT? B:*.POW


TEST_.POW     TEST_2.POW
XXXXXX Bytes free


NAME OF SYSTEM FILE TO LOAD...(B:file.POW) ?
LOADING DATA FROM DISK...
```

DATA NOW LOADED FROM FILE...

FORMING AMPLIFIER STACK....

DESIRED COMMAND.....?

Data for the example shown in Diagram #2 is now loaded with all footages, node data, power/current drains and loop resistances. You may utilize the PB, PC and PA commands to verify that information properly loaded agrees with the above diagram. Further, please note that data on the section from node #7 to node #8 is not in the data file loaded. The idea here is to examine the present design, then determine if we can add the section from node #7 to node #8 and re-examine powering capacity.

At the command prompt, type GO and hit return or enter. When prompted for supply location, enter three (3), then hit enter. Results will be printed to your screen. PR may be used to clear the screen and reprint design results.

Now lets use PD, or Print Design results to your printing device. Type PD and hit enter or return. The screen will clear, then print the following message:

THIS ROUTINE WILL PRINT CURRENT PS DESIGN RESULTS TO YOUR PRINTER ATTACHED TO LPT1. IT WILL PRINT 50 LINES PER PAGE.....

INPUT YOUR HEADER FOR THE PRINTOUT, 65 CHARACTERS MAXIMUM...

Now type the following:

PRINTOUT FOR TEST_1.POW; EXISTING DESIGN CONDITIONS, then hit the enter or return key.

PowerDesigner will send the following information to your printing device.

PRINTOUT FOR TEST_1.POW; EXISTING DESIGN CONDITIONS
DATE: XX-XX-XXXX TIME: XX:XX:XX

POWER SUPPLY IS LOCATED AT NODE # 3

NODE#	NODE VOLTAGE	NODE CURRENT	TOTAL CURRENT
1.00	52.02	1.47	1.47
2.00	54.51	1.84	3.31
3.00	60.00	0.98	9.04
4.00	56.35	0.00	4.74
5.00	54.97	2.24	2.24
6.00	54.90	1.04	2.51
7.00	52.24	1.47	1.47

TOTAL CURRENT 9.043

The design obviously works fine as is. The question before us now is, will the present supply and location work with a trunk extension as indicated on Diagram Two (the plant portion between nodes 7 and 8 being the proposed extension)? This involves the addition of 2200' of trunk cable, one trunk station at 35 watts, and three line extenders fed from that trunk at .4 amperes each.

To add this information to the present nodal structure, type AD, then hit the return or enter key.

Your screen will show the following:

INPUT EXTRA DATA...
DESIGN MUST BE RUN ONCE (GO) ON EXISTING DATA STRUCTURE FIRST

ENTER SYSTEM DATA.....(0 FT TO STOP)

ENTRY # CABLE FOOTAGE CABLE TYPE LOOP RESISTANCE FROM TO
(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

7 ?

PowerDesigner starts with the end of last data entry process; in this case with entry #7 which terminated with node #7. Since we've already calculated the design once, you may now enter the required extra data as follows:

2200 then Enter
7 then Enter
Enter (to select the default loop resistance value)
7 then Enter
8 then Enter
0 then Enter (to end the cable/nodal entry process)

Your screen will now look similar to the following:

INPUT EXTRA DATA...
DESIGN MUST BE RUN ONCE (GO) ON EXISTING DATA STRUCTURE FIRST

ENTER SYSTEM DATA.....(0 FT TO STOP)

ENTRY # CABLE FOOTAGE CABLE TYPE LOOP RESISTANCE FROM TO
(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

7 ? 2200 ? 750 0.770? ? 7 ? 8

(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

8 ? 0

FORMING AMPLIFIER STACK....

NODE #: 7 CONSTANT POWER (WATTS) ?

Now lets enter the power and current information for nodes #7 and #8. Type in the following information:

35 then Enter
.8 then Enter
35 then Enter
1.2 then Enter

Your computer screen will now look like the following:

ENTER SYSTEM DATA.....(0 FT TO STOP)

ENTRY # CABLE FOOTAGE CABLE TYPE LOOP RESISTANCE FROM TO
(FEET) (2,3,4,5,6,7,8,9,1) (OHM/1000FT) NODE NODE

NODE #: 7 CONSTANT POWER (WATTS) ? 35 CONSTANT CURRENT (AMPS) ? .8

NODE #: 7 CONSTANT POWER (WATTS) ? 35 CONSTANT CURRENT (AMPS) ? 1.2

DATA ENTRY COMPLETE

DESIRED COMMAND.....?

Again, the PC and PA commands may be used to verify that data is entered correctly.

Now lets check the design with the additions just entered.

Type GO and hit the enter key. Enter node #3 when prompted for the power supply node location. PowerDesigner will re-design with the additional data from nodes #7 to #8, then display the results. Typing PR, then enter, to repaint the results -- your screen will look like the following.

PRINTING FINAL RESULTS...

POWER SUPPLY AT NODE # 3

NODE#	NODE VOLTAGE	NODE CURRENT	TOTAL CURRENT
2.00	54.51	1.84	3.31
1.00	52.02	1.47	1.47
3.00	60.00	0.98	11.23
4.00	54.66	0.00	6.93
5.00	53.27	2.26	2.26
6.00	51.96	1.07	4.68
7.00	45.44	1.57	3.60
8.00	41.99	2.03	2.03

TOTAL CURRENT 11.233 AMPS

DESIRED COMMAND.....?

As can be seen above, the power supply will indeed work with the supply situated at node #3, assuming the supply will handle an 11.233 ampere loading and you feel comfortable loading your supplies to that current level. Total nodal current at node #4 is 6.93 amperes which may exceed the powering passing capability of some actives or passives. You will also note that nodal voltages are not particularly optimized, meaning that one end of the run see's 52.02 volts while the trunk span added is at 41.99 volts at the trunk location. Moving the supply would very well optimize this design, but the physical moving of main AC supplies causes outages and costs money! PowerDesigner gives you the ability to optimize the design on paper, then weigh your options carefully against problems that will be met when considering the move to optimize your AC power distribution grid.

Finally, lets try one last example to get a feel for additional capabilities of PowerDesigner 2.1.

Example Three

Diagram Three illustrates a different use for PowerDesigner 2.1 -- that of system troubleshooting or deciding on temporary powering arrangements. The above "map" shows the following situation. All cable shown is underground with pedestals at all node locations. The span of cable between nodes 3 and 4 has "gone-bad"; it no longer passes RF or AC.

Figure 18. Third Powering Example

The technician is faced with the decision of restoring service and how to do so. Because of terrain considerations, the logical and optimal choice seems to be laying temporary RG-6/U cable on the ground between pedestals. The question now becomes "will the design work, on a temporary basis, with RG-6/U between nodes 3 and 4?". Determination of correct RF operation may be accomplished with the Cable Designer program. Our concern here is whether it will work with the AC drop through the RG-6/U cables and line extenders powered downstream.

PowerDesigner 2.1 data file TEST_2.POW on the extras diskette contains initial data on the above information, .ie., the original cables/power loadings before the cables "go-bad". Now, assuming you're beginning to get a feel for the convention and commands of PowerDesigner, we'll abbreviate our explanations for this example. If you have questions regarding how to use various commands in detail, please see the preceding sections.

Load the data file using the LD command or Function Key F1. Once the data is loaded, use the PA and PC commands to review the data loaded and to compare with the information in Diagram Three. Using the PC command lists the following information to screen.

PRINTING CABLE DATA...

NUMBER	FOOTAGE	CABLE TYPE	OHMS/SPAN	FROM	TO
1	1300	500	2.5740	1	2
2	800	500	1.5840	2	3
3	120	500	0.2376	3	4
4	1000	500	1.9800	4	5
5	250	500	0.4950	4	6
6	1100	500	2.1780	4	7
7	2300	750	1.7710	8	1

DESIRED COMMAND.....?

Then use the PA command to review and compare power loading with information in Diagram Three.

PRINTING AMPLIFIER NODE DATA...

NODE #	CONSTANT POW0R	CONSTANT CURRENT
1.0	35.0	0.0
2.0	18.0	0.0
3.0	0.0	0.0
4.0	0.0	0.0
5.0	18.0	0.0
6.0	18.0	0.0
7.0	18.0	0.0
8.0	35.0	0.0

DESIRED COMMAND.....?

The present power supply location in the system is at node #8. Therefore let's check present design considerations by selecting the GO command and calculating present design parameters before checking again with RG-6/U cable between nodes 3 & 4. Type GO and hit return, then select node #8 for power supply location and check design results. Design parameters for present conditions appear as follows:

PRINTING FINAL RESULTS...

POWER SUPPLY AT NODE # 8

NODE#	NODE VOLTAGE	NODE CURRENT	TOTAL CURRENT
1.00	56.39	0.62	2.04
2.00	52.75	0.34	1.42
3.00	51.04	0.00	1.08
4.00	50.79	0.00	1.08
5.00	50.08	0.36	0.36
6.00	50.61	0.36	0.36
7.00	50.00	0.36	0.36
8.00	60.00	0.58	2.62

TOTAL CURRENT 2.620 AMPS

DESIRED COMMAND.....?

As can be seen from the design results, the present power supply location not only works, it is very lightly loaded which is not an optimal condition as AC supplies should always be loaded (whenever possible with appropriate design) to around 75% to 85% loading, to maintain proper supply ferro-resonant efficiency.

Now lets change design data to incorporate the temporary span of RG-6/U cable and recheck calculations.

Use the CC command to change the cable type between nodes 3 and 4 to MISC_1 type with 35 Ohms/1000' as indicted by the diagram. After selecting the CC command, enter 120 for cable footage and select cable type MISC_1. For your convenience, a loop resistance value of 35 Ohms is already loaded as default and you only need to "enter" through. After proper selection and use of the CC command, use PC to verify your results with the screen printout looking like this:

PRINTING CABLE DATA...

NUMBER	FOOTAGE	CABLE TYPE	OHMS/SPAN	FROM	TO
1	1300	500	2.5740	1	2
2	800	500	1.5840	2	3
3	120	MISC_1	4.2000	3	4
4	1000	500	1.9800	4	5
5	250	500	0.4950	4	6
6	1100	500	2.1780	4	7
7	2300	750	1.7710	8	1

DESIRED COMMAND.....?

Now select the GO command to recalculate design parameters with this change to the powering grid structure. Type GO and again select node #8 as the power supply location. Completion of calculations gives the following results:

PRINTING FINAL RESULTS...

POWER SUPPLY AT NODE # 8

NODE#	NODE VOLTAGE	NODE CURRENT	TOTAL CURRENT
1.00	56.13	0.62	2.18
2.00	52.12	0.35	1.56
3.00	50.19	0.00	1.21
4.00	45.09	0.00	1.21
5.00	44.29	0.41	0.41
6.00	44.89	0.40	0.40
7.00	44.21	0.41	0.41
8.00	60.00	0.58	2.77

TOTAL CURRENT 2.767 AMPS

DESIRED COMMAND.....?

As can be seen from the above results, the addition of RG-6/U changes these items in terms of design parameters:

· The design still design obviously works! Scanning the above results shows that there are no clear concerns for the results.
· Change to the total current loading on the supply is slight.
· There are some significant reductions in voltages available at the line extenders, and some temporary power supply tap changes or adjustments may be necessary. In spite of this, the length of RG-6/U placed in the system should allow continued operation.

8.4 Summary:

The preceding text, both listings of command functions and demonstrated examples, are intended to give a "feel" for proper operation and features of PowerDesigner 2.1. Reading of the text and performance of examples will give you, the user, a good assessment of what you can do with proper system AC designs and layouts. There are obviously many possibilities not discussed here.

If you have additional questions regarding the capabilities or use of PowerDesigner 2.1 after careful review of these instructions, please call our user assistance number.

Appendix A. Supplied Data Files

Standard Level File Contents....

```
# CD2.1 <-data file version I.D.--please leave as the first line of this file.
#-------------------------------------------------------------------------#
#                    Standard Level File (std.lvl)                        #
#                     Copyright CableSoft, 1991                           #
#                                                                         #
#      Note that any user-created files may use this file as a template.  #
#  This file, however, should not be destroyed (you may rename it and use #
#  another file as std.lvl).                                              #
#      Lines in which the first non-blank is a comment character (#) are  #
#  treated by the program as comments (they are ignored).  Blank lines are #
#  also skipped.  Note that if you are using a word processor to edit this #
#  file it is your responsibility to keep the values in this file in their #
#  original ordering.  The program expects them this way.                 #
#      WARNING:  The integrity of data files can only be ensured if the   #
#  files are created with the 'Create New Files' options in the program.  #
#-------------------------------------------------------------------------#
# Maximum trunk output in dBmv, highest freq.
33
# Maximum bridger output in dBmv, highest freq.
46
# Maximum line extender output in dBmv, highest freq.
46
# Trunk tilt in dB
3
# Distribution tilt in dB
7
# L.X. cascade deration in dB (2 or more in cascade)
3
# Minimum level off tap low freq in dBmv
7
# Minimum level off tap high freq in dBmv
12
#
# Max. reverse tilt allowed on line before warning, in dB, forward direction
5
#
# Minimum high frequency input for high power line extender in dBmv
20
# Minimum high frequency input for derated line extender in dBmv
17
# Minimum high frequency input for trunk amplifier in dBmv
11
```

```
# Maximum reverse losses in dB
# Between trunk amplifiers
20
# From bridger to first line extender
20
# From line extender to succeeding line extenders
20
Standard Cable File Contents....

# CD2.1 <-data file version I.D.--please leave as the first line of this file.
#--------------------------------------------------------------------------#
#                    Standard Cable File (std.cbl)                         #
#                     Copyright CableSoft, 1991                            #
#                                                                          #
#      Note that any user-created files may use this file as a template.   #
#  This file, however, should not be destroyed (you may rename it and use  #
#  another file as std.cbl).                                               #
#      Lines in which the first non-blank is a comment character (#) are   #
#  treated by the program as comments (they are ignored).  Blank lines are #
#  also skipped.  Note that if you are using a word processor to edit this #
#  file it is your responsibility to keep the values in this file in their #
#  original ordering.  The program expects them this way.                  #
#      WARNING:  The integrity of data files can only be ensured if the    #
#  files are created with the 'Create New Files' options in the program.   #
#--------------------------------------------------------------------------#
#--ALL OF THE BELOW VALUES ARE IN dB WITH FORWARD FREQUENCIES AT 54/300
MHZ--#
#-------------AND REVERSE FREQUENCIES OF 5/30MHZ!!!-------------------------#
# CABLE TYPE 1
  T3-500
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  .52             1.31             .16              .40
# CABLE TYPE 2
  T3-625
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  .42             1.08             .13              .32
# CABLE TYPE 3
  T3-750
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  .35             .89              .11              .27
# CABLE TYPE 4
  T3-875
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  .30             .78              .09              .23
# CABLE TYPE 5
  T31000
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
```

```
  .27            .72            .08            .21
# CABLE TYPE 6
  NONE
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  NONE           NONE           NONE           NONE
# CABLE TYPE 7
  NONE
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  NONE           NONE           NONE           NONE
# CABLE TYPE 8
  NONE
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  NONE           NONE           NONE           NONE
# CABLE TYPE 9
  NONE
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  NONE           NONE           NONE           NONE
# CABLE TYPE 10
  NONE
# loss lo channel | loss hi channel | loss lo reverse | loss hi reverse
  NONE           NONE           NONE           NONE
```

Standard Passives File Contents....

```
# CD2.1 <-data file version I.D.--please leave as the first line of this file.
#-------------------------------------------------------------------------#
#                  Standard Passives File  (std.pas)                      #
#                     Copyright CableSoft, 1991                           #
#                                                                         #
#      Note that any user-created files may use this file as a template.  #
#  This file, however, should not be destroyed (you may rename it and use #
#  another file as std.pas).                                              #
#      Lines in which the first non-blank is a comment character (#) are  #
#  treated by the program as comments (they are ignored).  Blank lines are #
#  also skipped.  Note that if you are using a word processor to edit this #
#  file it is your responsibility to keep the values in this file in their #
#  original ordering.  The program expects them this way.                 #
#      WARNING:  The integrity of data files can only be ensured if the   #
#  files are created with the 'Create New Files' options in the program.  #
#-------------------------------------------------------------------------#
#----ALL OF THE BELOW VALUES ARE IN dB, & ARE S. ATLANTA OR GENERAL VALUES---
#
#-----FREQUENCIES USED ARE 54/300 MHZ FORWARD, AND 5/30 MHZ REVERSE MHZ!!---
-#
# Distribution Equalizer insertion loss values
# low frequency | hi frequency | reverse low | reverse high
  8.2            1.0            .5            .5
```

2-way splitter loss values
low frequency | hi frequency | reverse low | reverse high
3.6 3.8 3.8 3.6
7 DB coupler thru leg loss values
low frequency | hi frequency | reverse low | reverse high
NONE NONE NONE NONE
7 DB coupler tap leg loss
low frequency | hi frequency | reverse low | reverse high
NONE NONE NONE NONE
8 DB coupler thru leg loss values
low frequency | hi frequency | reverse low | reverse high
1.3 1.6 1.2 1.3
8 DB coupler tap leg loss
low frequency | hi frequency | reverse low | reverse high
8.5 8.5 8.5 8.5
9 DB coupler thru leg loss values
low frequency | hi frequency | reverse low | reverse high
NONE NONE NONE NONE
9 DB coupler tap leg loss
low frequency | hi frequency | reverse low | reverse high
NONE NONE NONE NONE
12 DB coupler thru leg loss
low frequency | hi frequency | reverse low | reverse high
.75 1 .65 .75
12 DB coupler tap leg loss
low frequency | hi frequency | reverse low | reverse high
12 12 12 12
16 DB coupler thru leg loss
low frequency | hi frequency | reverse low | reverse high
.6 .8 .55 .6
16 DB coupler tap leg loss
low frequency | hi frequency | reverse low | reverse high
16 16 16 16
20 DB coupler thru leg loss
low frequency | hi frequency | reverse low | reverse high
NONE NONE NONE NONE
20 DB coupler tap leg loss
low frequency | hi frequency | reverse low | reverse high
NONE NONE NONE NONE
24 DB coupler thru leg loss
low frequency | hi frequency | reverse low | reverse high
NONE NONE NONE NONE
24 DB coupler tap leg loss
low frequency | hi frequency | reverse low | reverse high
NONE NONE NONE NONE

30 DB coupler thru leg loss

```
# low frequency | hi frequency | reverse low | reverse high
  NONE          NONE          NONE          NONE
# 30 DB coupler tap leg loss
# low frequency | hi frequency | reverse low | reverse high
  NONE          NONE          NONE          NONE
# A coupler thru leg loss
# low frequency | hi frequency | reverse low | reverse high
  NONE          NONE          NONE          NONE
# A coupler tap leg loss
# low frequency | hi frequency | reverse low | reverse high
  NONE          NONE          NONE          NONE
# B coupler thru leg loss
# low frequency | hi frequency | reverse low | reverse high
  NONE          NONE          NONE          NONE
# B coupler tap leg loss
# low frequency | hi frequency | reverse low | reverse high
  NONE          NONE          NONE          NONE
# C coupler thru leg loss
# low frequency | hi frequency | reverse low | reverse high
  NONE          NONE          NONE          NONE
# C coupler tap leg loss
# low frequency | hi frequency | reverse low | reverse high
  NONE          NONE          NONE          NONE
# 3-way balanced splitter leg loss
# low frequency | hi frequency | reverse low | reverse high
  5.7           5.9           6.3           5.7
# 3-way unbalanced splitter low loss leg
# low frequency | hi frequency | reverse low | reverse high
  3.8           4.1           3.8           3.8
# 3-way unbalanced splitter high loss leg
# low frequency | hi frequency | reverse low | reverse high
  7             7.5           7             7
```

Standard Taps File Contents....

```
# CD2.1 <-data file version I.D.--please leave as the first line of this file.
#-------------------------------------------------------------------------#
#                    Standard Tap File (std.tap)                          #
#                     Copyright CableSoft, 1991                           #
#                                                                         #
#      Note that any user-created files may use this file as a template.  #
#  This file, however, should not be destroyed (you may rename it and use #
#  another file as std.tap).                                              #
#      Lines in which the first non-blank is a comment character (#) are  #
#  treated by the program as comments (they are ignored).  Blank lines are #
#  also skipped.  Note that if you are using a word processor to edit this #
#  file it is your responsibility to keep the values in this file in their #
```

```
#  original ordering.  The program expects them this way.                #
#      WARNING:  The integrity of data files can only be ensured if the    #
#  files are created with the 'Create New Files' options in the program.    #
#-------------------------------------------------------------------------#
#-----ALL OF THE BELOW VALUES ARE IN dB, AND ARE S. ATLANTA TYPE----------#
#-----FORWARD LOSS FREQ'S ARE 54/300 MHZ, REVERSE ARE 5/30 MHZ!-----------#
#-----(2-way tap info)
# Value of terminated 2-way tap
4
# Col. 1 = Tap faceplate values (26 values max)
#        Col. 2 = Tap insertion loss, low frequency
#                Col. 3 = Tap insertion loss, high frequency
#                        Col. 4 = Reverse low values
#                                Col. 5 = Reverse high values
8       2.9      3.2      3.1      2.9
11       1.4      1.8      1.5      1.4
14       .9       1.1      .9       .9
17       .6       .8       .5       .6
20       .5       .6       .4       .5
23       .5       .6       .4       .5
26       .3       .5       .3       .3
29       .3       .5       .3       .3
32       .3       .5       .3       .3
35       .3       .5       .3       .3
38       .3       .5       .3       .3
41       .3       .5       .3       .3
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE
NONE     NONE     NONE     NONE     NONE


#-----(4-way tap info)
# Value of terminated 4-way tap
8
# Col. 1 = Tap faceplate values (26 values max)
#        Col. 2 = Tap insertion loss, low frequency
#                Col. 3 = Tap insertion loss, high frequency
```

```
#                    Col. 4 = Reverse low values
#                           Col. 5 = Reverse high values
11      2.9     3.2     3.1     2.9
14      1.4     1.8     1.5     1.4
17      .9      1.1     .9      .9
20      .6      .8      .5      .6
23      .5      .6      .4      .5
26      .5      .6      .4      .5
29      .3      .5      .3      .3
32      .3      .5      .3      .3
35      .3      .5      .3      .3
38      .3      .5      .3      .3
41      .3      .5      .3      .3
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE


#-----(8-way tap info)
# Value of terminated 8-way tap
11
# Col. 1 = Tap faceplate values (26 values max)
#       Col. 2 = Tap insertion loss, low frequency
#              Col. 3 = Tap insertion loss, high frequency
#                    Col. 4 = Reverse low values
#                           Col. 5 = Reverse high values
14      2.9     3.2     3.1     2.9
17      1.4     1.8     1.5     1.4
20      .9      1.1     .9      .9
23      .6      .8      .5      .6
26      .6      .8      .5      .6
29      .4      .6      .3      .4
32      .4      .6      .3      .4
35      .4      .6      .3      .4
NONE    NONE    NONE    NONE    NONE
```

```
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE

# Values for general-use taps follow.
# Value of terminated T tap
NONE
# Col. 1 = Tap faceplate values (26 values max)
#       Col. 2 = Tap insertion loss, low frequency
#               Col. 3 = Tap insertion loss, high frequency
#                       Col. 4 = Reverse low values
#                               Col. 5 = Reverse high values
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
NONE    NONE    NONE    NONE    NONE
```

NONE	NONE	NONE	NONE	NONE
NONE	NONE	NONE	NONE	NONE
NONE	NONE	NONE	NONE	NONE
NONE	NONE	NONE	NONE	NONE
NONE	NONE	NONE	NONE	NONE

Appendix B. File Types Created By And Used With Cable Designer

As you use Cable Designer, you'll discover that specific rules are enforced when naming files. Each file must end with a specific 3-letter extension, which differs according to the file's type. This rule is enforced to help ensure that you use the right type of file when you select an option in Cable Designer. As you become familiar with these naming conventions, you'll find that the naming convention also makes Cable Designer easier to use.

The list below includes information about each of the kinds of files Cable Designer can create and use.

Note that all of the file types listed below can be printed on your printer, except design files (des) and materials files (mat). Design files and materials files hold information about a design or a design's materials in condensed form for use by Cable Designer only and are therefore not readable when printed.

Type	Extension	Explanation
Levels File	lvl	Levels files contain settings for a system's operating parameters. Options on the Preparations Menu are used to load in (2) and create or change (6) a levels file.
Cables File	cbl	A cables file contains settings for the cable types you'll use. Use options 3 and 7 from the Preparations Menu to load them in and create or change them.
Taps File	tap	A taps file holds settings for the taps to be chosen from in a design. Preparations Menu options 4 and 8 can be used to load and create or change a taps file.
Passives File	pas	Passives files have settings for passive devices to be used. The Preparations Menu's options 5 and 9 are used to load and create or change a passives file.
Design File	des	Design files hold a saved design for you, so that you can later work with the design again. Design files are created (Option 7) and loaded (Option C) on the Design Menu.
Materials File	mat	Materials files hold the totals for all materials used in your design. Materials files are created with

		Option 3 on the Bill Of Materials Menu and then used with options 4 and 5 on that same menu to add together materials from many designs, creating a bill of materials summation.
Design Report	rpt	Design report files contain information about a design organized in an easily readable format that is ready for printing. They are created with Option 9 on the Design Menu.
Bill Of Materials	bom	Bill of materials files contain information about kinds and amounts of materials in a design, organized in an easily readable format for printing. They are created with Option 2 on the Bill Of Materials Menu.
Bill Of Materials Summation	bos	Bill of materials summation files are like bill of materials files, except that the information contained in them can be totalled from many designs. They're created with Bill Of Materials Menu Option 5.
Help File	hlp	Help files are used by Cable Designer to present you with help information when you request it.

Appendix C. Converting Earlier Cable Designer Files To 2.1 Format

The format of these Cable Designer files has changed in version 2.1:

- Levels files (.lvl)
- Cables files (.cbl)
- Taps files (.tap)
- Passives files (.pas)
- Design files (.des)
- Materials files (.mat)

(Further note that the format of PowerDesigner AC data files has changed--see Chapter 8 for details of the AC_CNVRT program.)

Given enough available memory, CableDesigner will automatically load and run it's conversion program for you to convert any of the above files created with an earlier version. However, if you do not have enough memory (the convert program will tell you) or if you simply want to convert all of your old files to 2.1 format at once, you must run the conversion program from DOS.

The conversion program comes on the Program Diskette, along with CableDesigner (on the diskette, it's the file named CONVERT.EXE). To run the conversion program to convert a file, type CONVERT followed by the name (full name--including extension) of the file you want to convert. For example,

CONVERT a:mydesign.des

would convert the file MYDESIGN.DES on drive A: to CableDesigner 2.1 format. During the conversion process a window will appear on the screen in which the conversion program informs you of the status of the conversion. Conversion happens very fast, so typically the status window will appear only briefly. If you're having trouble reading the text in the status window, note that CONVERT handles the same /bw1 and /bw2 parameters as CableDesigner, forcing the screen output to appear in black and white.

After files have been converted to 2.1 format, Cable Designer will detect this and load them directly without first invoking CONVERT.

Appendix D. Saving A Design Over Time

Here's a good way to save a design and its related materials when you need to put it away for an indefinite period of time. When and if you need to make changes to the design, everything you need to continue where you left off with the design will be readily available.

Save the following materials on a separate floppy disk or in a separate subdirectory:

1. The design file (ends with three-letter extension "des"). This file holds all information about the design for you in a condensed format. Reloading it will allow you to change or view the design as it was when you last worked with it.

2. The levels, cables, taps, and passives files you used with the design (four files, ending in "lvl", "cbl", "tap", and "pas"). Saving copies of these files along with the design file prevents you from making changes to them that would show up later when you loaded the design, then the data files, then tested.

Though the files just mentioned are all you need to be able to bring in the design as you last worked with it, you may also want to save with them some of the following files associated with that design, for the reasons stated:

1. The design report file (ends in "rpt"). The design report file contains the same information you receive when you print the design report. You can send it to your printer anytime, using the DOS PRINT command, or load it into a word processor, etc. Besides the fact that it lets you print out a copy of the design anytime you like, it also contains some information you might like

to know the next time you change the design (such as if you modified the minimum level off tap high and/or low).

2. Files related to the design's bill of materials (ending in "bom", "mat", or "bos"). Saving these files will let you print out information about the materials in the design anytime you like, or add the materials from that design to the materials for another design. Keep in mind, however, that if you go back and change the design, these bill of materials files need to be recreated (with options on the Bill Of Materials Menu).

Clearly label the floppy diskette, or put a small text file (called something like "read.me") on the diskette or subdirectory that contains information about the design. Update the contents of that file anytime you make changes to the design.

This kind of organization and record saving will pay off, making it easy to modify any design, no matter how long ago you put it away.

For safety's sake, keep plenty of backups.

Appendix E. Adding Your Own Help

Help files are those files on the Cable Designer diskette that end with the extension 'hlp'. The content in these files is used to present you with help at whatever point you are at in the program. This example shows how you can add your own help content to any of these files, if you so desire.

Suppose whenever you're on the Preparations Menu and you select the HELP option (F1) you feel that the material presented to you there is too sparse and you'd like to add your own page of help after the existing page to provide you with more information.

After listing some of the help files with the DOS TYPE command, you find the help content you want to add to is in the file PREPMENU.HLP. Currently, it looks like this:

```
    The Preparations Menu is used to load and create data files
 used in the design portion of the program.  To make a selection,
 simply type the number of your choice or use the up and down arrow
 keys.  When the number of your choice is shown, press RETURN (<-+).

 Loading Data Files (Options 1-5):
 1.   Loads the program's standard lvl, cbl, tap, and pas files.
      NOTE:  If you have just started the program, these files
      have already been loaded for your convenience.
 2-5. Allows you to load your own operating parameters file (lvl),
      cable attenuations file (cbl), taps file (tap), or passives
```

```
     (pas) file.  These may be any of the standard files (e.g.,
     std.tap) or files you have created using options 6-9.
Creating Data Files (Options 6-9):
6-9.  Lets you create your own lvl, cbl, tap, or pas file using a
     straightforward fill-in-the-blank form.  Allows you to use
     an existing file as a template and easily change entries.
 +------------------------------------------------------------+
 ¦Press any key to return to the point where you selected HELP.¦
```

The size and format of this file shows you the exact dimensions your own help pages should be to fit into the help area on the screen (70 characters wide by 20 rows deep). In fact, the easiest way to make a new page of help is these four steps:

1) Load the existing help file into any word processor that can save files as text only (standard ASCII format).
2) Make a copy of the existing help page and duplicate it below the original, using the word processor's copy capability.
3) Put a period in row one to separate the two help pages.
4) Replace the help content in the second page with your own.

Following these instructions, the file above would be changed to look like this:

```
    The Preparations Menu is used to load and create data files
used in the design portion of the program.  To make a selection,
simply type the number of your choice or use the up and down arrow
keys.  When the number of your choice is shown, press RETURN (<-+).

Loading Data Files (Options 1-5):
1.   Loads the program's standard lvl, cbl, tap, and pas files.
     NOTE:  If you have just started the program, these files
     have already been loaded for your convenience.
2-5.  Allows you to load your own operating parameters file (lvl),
     cable attenuations file (cbl), taps file (tap), or passives
     (pas) file.  These may be any of the standard files (e.g.,
     std.tap) or files you have created using options 6-9.
Creating Data Files (Options 6-9):
6-9.  Lets you create your own lvl, cbl, tap, or pas file using a
     straightforward fill-in-the-blank form.  Allows you to use
     an existing file as a template and easily change entries.
 +------------------------------------------------------------+
 ¦ Press F9 to quit HELP any other key for the next HELP page. ¦

In this space you enter your own help content...
```

```
+------------------------------------------------------------+
¦Press any key to return to the point where you selected HELP.¦
```

Note these things:

1) The period in column one separating the help pages is very important. It causes Cable Designer to recognize the end of the first page and that there is another page to follow.
2) The prompt in the first help page should be changed to indicate CableDesigner's behavior when more than one help page is present. That is, F9 may be pressed to quit HELP, any other key will cause the next page of help to be displayed. The first page in the changed file above shows how the new prompt might read.

That's all there is to it. After making this kind of change, your page of help will automatically be displayed when you select help.

Appendix F. Cable Designer and DOS Error Messages

As you work, Cable Designer may give you some error messages to inform you of problems that have occurred. Most of these error messages are self-explanatory. The error messages listed below, most of them relating DOS errors to you, may need further explanation.

Note: this same information is available by pressing F1 for HELP when an error message appears on the screen.

Bad Data In File: You are trying to load a data file containing values that do not make sense. Please try another data file. This error should never happen if you use the create options on the Preparations Menu to make your data files.

Directory Full: The specified directory is so full of files that another one cannot be added. Please insert another diskette if appropriate, or use DOS2 to exit momentarily and clean up.

Disk Is Full: There's not enough room on the specified disk. If appropriate, insert another diskette, or use DOS2 to exit momentarily and clean up.

File Not Found: A file with the name you specified could not be found. Please try again. If you're having trouble with filenames, please consult your DOS manual.

Out Of Memory: This could only happen if your design is getting huge. You'll need to break up the design into smaller pieces. The manual contains examples showing how a design can be broken up into sections.

Missing Data: The data file you're trying to load is incomplete. Please try another one. This problem should never occur if you are using the create options from the Preparations Menu to make your data files.

You may also find the option keys helpful in finding your way out of trouble. For example, LIST could be helpful in viewing a file that is 'missing data'. You may discover the problem.

DOS may occasionally give you an error message directly (e.g., "Abort, Retry, Ignore?") and in doing so "mess up" the format of one of CableDesigner's screens. If this ever happens to you, you may "clean up" the screen by pressing F10 to return to the credits screen, then pressing the space bar to return to where you were--the screen will be free of the mess caused by the DOS error.

Appendix G. Some Things Cable Designer Doesn't Do And Why Not

Cable Designer does not pick values for splitters and couplers, nor does it pick amplifier locations. The creators of Cable Designer 2.1 include years of cable systems design in their collective set of experiences, and have used programs that did pick passive and amplifier locations and values. While this initially seems like a desirable feature, problems inevitably ensue. Until computer programs can truly gain a higher level of "artificial" intelligence, they are no match for the intuition you already have in anticipating where an amplifier must go, or in determining a coupler value. The typical program that "picks amplifier locations" for example, will blindly place an amplifier wherever signal runs out on a line. In the three distribution sample designs discussed in Section 6, line extenders were placed in areas that would have made no sense to a computer algorithm (i.e., there was plenty of signal left and no other determining criteria existed to indicate an amplifier was necessary). An algorithm which was to predict amplifier placement would have placed several amplifiers in those designs, as it would have simply placed them on ends of lines where the signal ran out.

The composers of Cable Designer are keeping abreast of current developments in AI (artificial intelligence), and when the state of the art has progressed to the point that it makes sense to write computer code to make these choices, Cable Designer will be revised to do so. In the interim, you can have a much more efficient design by locating and choosing these devices yourself and you are saved the hassle of constantly having to re-place devices put in the wrong spot by an inadequate algorithm.

Appendix H. What's On The Extras Diskette

FILE	DESCRIPTION
EXAMPLE1.DES	FIRST SAMPLE DESIGN - MANUAL SECTION 1
TRNKEXP1.DES	SAMPLE TRUNK DESIGN - MANUAL SECTION 6
DISTEXP1.DES	SAMPLE DISTRIBUTION DESIGN - MANUAL SECTION 6
DISTEXP2.DES	SAMPLE DISTRIBUTION DESIGN - MANUAL SECTION 6
DISTEXP3.DES	SAMPLE DISTRIBUTION DESIGN - MANUAL SECTION 6
P3_300.CBL	COMMSCOPE P3 CABLE LOSSES - FOR 300 MHZ HIGH LIMIT
P3_450.CBL	COMMSCOPE P3 CABLE LOSSES - FOR 450 MHZ HIGH LIMIT
P3_550.CBL	COMMSCOPE P3 CABLE LOSSES - FOR 550 MHZ HIGH LIMIT
MC_300.CBL	TRILOGY MC2 CABLE LOSSES - FOR 300 MHZ HIGH LIMIT
MC_450.CBL	TRILOGY MC2 CABLE LOSSES - FOR 450 MHZ HIGH LIMIT
MC_550.CBL	TRILOGY MC2 CABLE LOSSES - FOR 550 MHZ HIGH LIMIT
T4_300.CBL	TIMES T4+ CABLE LOSSES - FOR 300 MHZ HIGH LIMIT
T4_450.CBL	TIMES T4+ CABLE LOSSES - FOR 450 MHZ HIGH LIMIT
T4_550.CBL	TIMES T4+ CABLE LOSSES - FOR 550 MHZ HIGH LIMIT
SA_300.TAP	SCIENTIFIC ATLANTA TAPS - FOR 300 MHZ HIGH LIMIT
SA_450.TAP	SCIENTIFIC ATLANTA TAPS - FOR 450 MHZ HIGH LIMIT
SA_300.PAS	SCIENTIFIC ATL. PASSIVES - FOR 300 MHZ HIGH LIMIT
SA_450.PAS	SCIENTIFIC ATL. PASSIVES - FOR 450 MHZ HIGH LIMIT
SA_OP_33.TAP	S.ATL. INTERDICTION TAPS - FOR 330 MHZ HIGH LIMIT
SA_OP-45.TAP	S.ATL. INTERDICTION TAPS - FOR 450 MHZ HIGH LIMIT
GI_300.TAP	GENERAL INSTRUMENT TAPS - FOR 300 MHZ HIGH LIMIT
GI_450.TAP	GENERAL INSTRUMENT TAPS - FOR 450 MHZ HIGH LIMIT
GI_300.PAS	GENERAL INSTRUMENT PASSIVES- FOR 300 MHZ HIGH LIMIT
GI_450.PAS	GENERAL INSTRUMENT PASSIVES- FOR 450 MHZ HIGH LIMIT
MAG_300.TAP	MAGNAVOX TAPS - FOR 300 MHZ HIGH LIMIT
MAG_450.TAP	MAGNAVOX TAPS - FOR 450 MHZ HIGH LIMIT
MAG_300.PAS	MAGNAVOX PASSIVES - FOR 300 MHZ HIGH LIMIT
MAG_450.PAS	MAGNAVOX PASSIVES - FOR 450 MHZ HIGH LIMIT
CCOR_300.PAS	C-COR PASSIVES - FOR 300 MHZ HIGH LIMIT
CCOR_450.PAS	C-COR PASSIVES - FOR 300 MHZ HIGH LIMIT

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DISTORT5.ALL ALLWAYS FILE FOR DISTORT5.WK1 (SEE CHAPTER 7)
DISTORT5.XLS EXCEL TEMPLATE (SEE CHAPTER 7)
POWER.EXE PROGRAM FOR AC POWERING LAYOUT OPTIMIZATION (SEE CHAPTER 8)
AC_CNVRT.EXE AC CONVERSION PROGRAM FROM PREVIOUS VERSION (SEE CHAPTER 8)
TEST_1.POW SAMPLE AC POWERING LAYOUT (SEE CHAPTER 8)
TEST_2.POW SAMPLE AC POWERING LAYOUT (SEE CHAPTER 8)
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