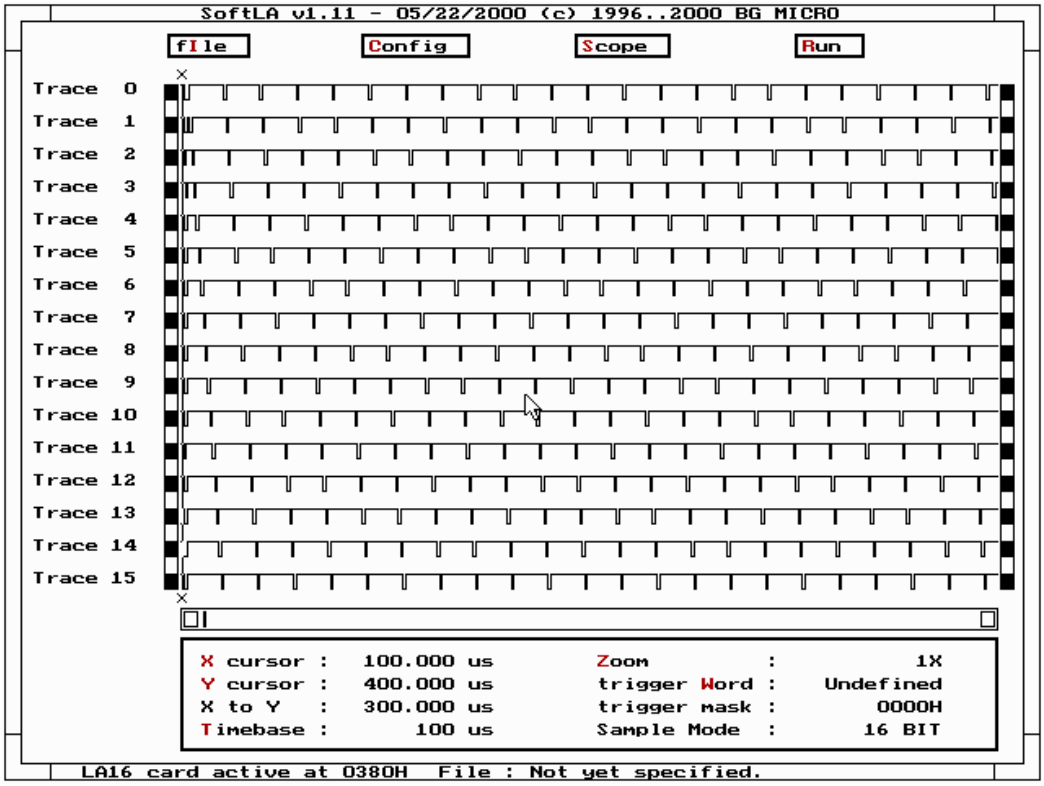
SOFTLA
Users Manual



Turn your PC into
a LOGIC ANALYZER

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COMPATIBILITY SOFTLA runs on a variety of PC based platforms. Any PC with a '286 or better processor will support SOFTLA. A minimum of 640K memory is required in the PC. SOFTLA should run well with as little as 512K of memory available after DOS has loaded. DOS 5, or up is recommended.

SOFTLA requires VGA graphics..

A standard mouse is supported, but not required. It should emulate the Mouse Systems mouse.

CAUTION Modern PC's are made using CMOS chips. These chips can be damaged by several things. One potential problem is ESD, or Electro Static Discharge. Have you ever walked over a carpeted floor and then been shocked when you touch something metal? This is ESD, and it can permanently damage CMOS chips.

Another possible source of damage for CMOS chips is allowing an input pin to be driven to a voltage higher than it's power supply voltage. This can create a situation where the CMOS chip will literaly melt itself.

While neither of these potential problems is usualy severe, you should be aware that, when you connect the test probes to your computer, the other end of these wires is likely connected to a CMOS device, so some care is needed in order to prevent damage to your computer. To help protect your computer, you should do the following.

1. Before you reach to pick up a test lead, touch something metal on the computer, or the ground lead of the test probe cable. This will harmlessly discharge any static built up in your body.

2. Make sure that the 1K ohm resistors are in place in the test leads. This will limit the current that can flow through the wire without interfering with the operation of SOFTLA.

If you know that you are using a non-CMOS printer port, then these things will not apply to you. You can identify this by looking at the chips in the printer port. If they say something like 74LSxxxx, then the interface is TTL, not CMOS, and not subject to the above problems.

ANOTHER NOTE Regardless of which type of printer port you have, SOFTLA will only safely monitor TTL voltage levels. These voltages swing between ground, and +5 volts. Attempting to monitor voltages greater than +5 volts will definitely cause permanent damage to your computer.

PRINTERS Any fully EPSON compatible dot matrix printer may be used with SOFTLA. An IBM Proprinter may also be used.

A WORD ABOUT PRINTER CARDS

SOFTLA works best with the bi-directional printer cards shipped with AT class computers. When SOFTLA is used with one of these cards, the full 16 channels may be achieved on the display. SOFTLA will also work with the older XT class printer cards, which do not support bi-directional data flow. With these cards, a maximum of 8 display traces may be achieved.

NOTE *SOFTLA is compatible with the new EPP/ECP bi-directional printer cards as long as you can set them to disable the ECP/EPP mode. You usualy do this in the PC's BIOS. Look for a selection like SPP, or COMPATIBLITY mode.*

Before You Install Be sure to make a backup copy of your diskette. You are permitted to make two backup copies of the original diskette to protect your investment. These copies must remain in your possession.

Use DOS DISKCOPY to make the copies of your diskette. The following command will copy the diskette in your A: drive.

DISKCOPY A: A:

After copying the original diskette, place it in a safe place, and work from the copies.

INSTALLATION Installation to a hard disk is recommended, but not required. To use SOFTLA from a floppy, simply copy the distribution diskette, and use it. To install on a hard disk run the batch file included on the distribution diskette, To do this type :

INSTALL <cr>

This will install SOFTLA to your C: drive.

Technical Support 972-205-9427

INTRODUCTION For many years engineers, technicians, and other electronics professionals, have used logic analyzers to design and troubleshoot digital circuitry. These logic analyzers all have one thing in common; THEY ARE VERY EXPENSIVE. Also, they are dedicated pieces of equipment. In other words, logic analysis is the only thing that they can do. This puts a logic

analyzer out of the reach of most individuals, especially the electronics hobbyist or experimenter.

What is needed is something that will allow the use of something that most of these people already have, and at a price they can afford.

SOFTLA is such a product. Most hobbyists and experimenters today have an IBM compatible computer with good graphics capabilities and fast CPUs. This is all that is needed to provide logic analysis capabilities for many applications.

SOFTLA is a SOFTware Logic Analyzer. It runs as any other program on a PC, or compatible. The printer port of the PC is used to provide up to 16 CHANNELS of digital input. ALL other logic analyzer functions are provided in software. A special cable can be attached to the printer port of the PC allowing connection to the circuit to be monitored.

NAVIGATING SOFTLA The display screen is configured to present as much information at once as possible. SOFTLA was written using state-of-the-art Object Oriented Programming techniques to give you lots of features, and reliability. The PC's display is used in full graphics mode.

While active, SOFTLA is controlled with the system MOUSE. SOFTLA may be used without a mouse, but the primary intended method is to use the mouse. For operation without a mouse, see the next section entitled "USING THE KEYBOARD".

When the mouse is used, there will be an arrowhead pointer on the screen, which will follow the mouse around. When a function is to be selected, place the tip of the arrow on the item to be selected, and press, then release, the LEFT mouse button. This is known as "CLICKING" on the item. When this manual instructs you to "CLICK" on an item, it means to place the arrow on the item, then press, and release, the LEFT button.

USING THE KEYBOARD

While the recommended method of operating SOFTLA is to use the system mouse, SOFTLA may be operated from the keyboard. In general, the hot-key will be the letter that is capitalized in the menu item name. On VGA systems, this letter will also be colored RED. Typing the hot-key will select the function. CAPS LOCK, SHIFT, and ALT are ignored. You can therefore use ALT keys, or not, as you see fit. See page 21 for a list of hot keys.

GETTING STARTED

To start using SOFTLA simply type the following at the DOS command line.

C:\CD SOFTLA
SOFTLA <filename>

In the above example the <filename> is optional. If specified, SOFTLA will load a fileset previously saved. You will be presented with exactly the same screen as when the dataset was saved.

NOTE *SOFTLA is a DOS application. It does not run on WINDOWS. If you are running Windows 95, or 98, you can still use SOFTLA by rebooting the computer to an MS-DOS prompt before starting SOFTLA.*

When SOFTLA starts execution you will be presented with a screen that looks like the following illustration.

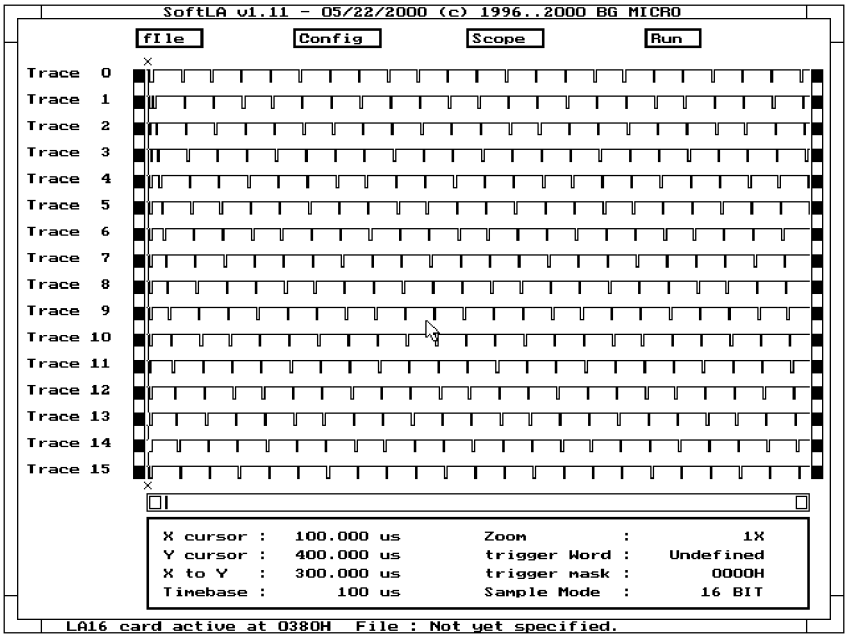


Figure 1. Typical SOFTLA screen.

As can be seen in the illustration, the screen looks just like those expensive logic analyzers, only better; SOFTLA is not expensive. The screen will display up to 16 traces at a time.

THE MAIN MENU Across the top of the screen is the main menu. It consists of four functions; FILE, CONFIG, SCOPE and RUN. Any of these functions may be selected by either "CLICKING" the desired item, or using the hot key. The first two menu items, FILE, and CONFIG, will each have sub-menus.

THE FILE MENU When the FILE menu is activated, a sub-menu will appear. It contains the options : NEW, LOAD, SAVE, SAVE AS, PRINT, DOS, ABOUT, EXIT, and QUIT. These commands operate as follows.

NEW This command causes SOFTLA to discard any currently specified file name. The sample buffer is not cleared.

LOAD This command causes SOFTLA to load a previously saved data set. The display is set to the same place it had been when the data was saved.

SAVE This command will save the data in the sample buffer, and current setup information. If a name has not previously been specified, you will be prompted for one. If a name has been specified, the data will be saved to that name, and any data that was previously saved to that name is overwritten.

The data saved will form a file set. There are two files written. The first is <file>.DAT. This file is the binary data from the sample buffer. The second file is <file>.CFG. This file contains the current configuration at the time of the save. With these two files, SOFTLA can bring the data back to the screen exactly the same as it was when the data was saved.

SAVE AS This command is the same as SAVE above, except that it will always prompt for a new name.

PRINT This command will allow you to get hardcopy printouts of your analyzer data. You will be prompted for the start, and end, times that you want to print. You will have to enter the sample times, in either milliseconds, or microseconds.

NOTE When you are prompted for the times, SOFTLA will have already filled in the beginning of the buffer for the start time, and the end of the buffer for the end time. To print the entire sample buffer, simply press <ENTER> when prompted for the times.

ENTERING TIMES *When entering times, specify milliseconds by following the number with MS or ms. Specify microseconds with US orums. If neither is specified, the time defaults to microseconds. For example :*

2.400ms 2.4MS 2.4 ms 2400us 2400 US

The examples above, all specify the same time. Don't worry about hitting the time right on a sample interval, SOFTLA will round the time specified off to the next even sample time.

PAGE BREAKS After you have entered the starting, and ending sample times, you will be asked if you want to insert page breaks. If you want the data to be printed as one continuos strip, enter NO. If you enter YES, the default, the printout will be broken up at page boundaries.

REMEMBER*The PRINT function will only work with an EPSON compatible, or IBM Proprinter, dot matrix printer.*

DOS This function will allow you to "shell" out to DOS. This can be especially useful if you are running from a floppy, and need to delete some files to make room to save a dataset. To return to SOFTLA, type EXIT.

CAUTION *Be careful what you do while "shelled" out to DOS. You will not have enough memory to run any large program.*

ABOUT This command will display a window telling about SOFTLA.

EXIT This command will terminate SOFTLA. If a file name has been specified, as shown at the bottom of the screen, then the current data will be saved to that name. If no file name is specified, then the current data will not be saved.

QUIT SOFTLA is terminated. The current data is discarded. It is not saved, even if a file name has been specified.

CONFIG The CONFIG function brings up another menu consisting of two functions; WIDTH, and PORT.

WIDTH SOFTLA uses the printer port of the PC to display up to 16 traces of logic. These 16 traces are not available at one single port, they are constructed from available bits in the printer interface. These bits are presented in three groups.

In 8 bit or 16 bit modes these groups of bits are assembled to form the display. Since SOFTLA is a software product, it takes time to assemble these groups of bits. To allow you the option of trading sample width for sample speed, you may tell SOFTLA how many of these bits you want to use. The menu that appears when you select WIDTH will allow you to select 4 bit, 8 bit Bi-DI, or 16 bit mode.

4 BIT The 4 bit mode is the fastest if you don't have a printer card capable of bi-directional data flow on the data port. The sample data is taken from only one group. Use the GROUP 1 bits, bits 0 to 3.

8 BIT The 8 bit mode is obtained by sampling the GROUP 1 and GROUP 2 bits. Since it takes two operations to read the data, this mode will be slightly slower than the 4 bit mode. It is included for those who do not have printer cards capable of bi-directional data flow.

BI-DI For those whose printer cards are capable of bi-directional data flow, this mode is the fastest. It will give you 8 traces with the speed of the 4 bit mode. Use the GROUP 3 bits for sampling.

NOTE *When Bi-Di is selected SOFTLA attempts to test your printer card to determine if it is capable of bi-directional data flow. If the test fails, an informative message will be displayed. If you know that you are using a printer card that is capable of bi-directional data, then ignore this*

message. If a circuit to be monitored, or a printer, is connected to the printer card it may cause this test to fail.

16 BIT For users with printer cards capable of bi-directional data flow, all three groups may be combined to achieve 16 traces.

NOTE *When 16 bit is selected SOFTLA attempts to test your printer card to determine if it is capable of bi-directional data flow. If the test fails, an informative message will be displayed. If you know that you are using a printer card that is capable of bi-directional data, then ignore this message. If a circuit to be monitored, or a printer, is connected to the printer card it may cause this test to fail.*

PORT SOFTLA can use a printer card at any of the three standard addresses; 3BC, 378, or 278. When an address is selected from the menu, SOFTLA tests for a printer card at that address. If this test fails, a message will be displayed, and the selection will not be allowed.

SCOPE This command tells SOFTLA to run in oscilloscope mode. In this mode, enough data is sampled to fill the screen, it is displayed, then the process is repeated. This continues until the user presses any key on the keyboard.

If a trigger word has been set up prior to starting the scope mode, then SOFTLA will wait for that trigger event before beginning the sampling. Depending on the frequency of the trigger event occurring, this may make the screen update at random intervals, or not at all if the trigger event does not occur.

Pressing a key on the keyboard will cause SOFTLA to abort even if the trigger event has not occurred.

NOTE *After a SCOPE mode sample has been taken only the first screen contains valid data. If you use any of SOFTLA's features to move around in the buffer, you will be viewing invalid data. This is just like an oscilloscope. You only see one screen worth of data.*

RUN This command tells SOFTLA to enter full logic analyzer mode, and gather sample data. If a trigger word has been set up, then SOFTLA will scan for it, while storing data. When the trigger event occurs, the location in the buffer is saved, and a predetermined number of additional samples will be taken.

While waiting for the trigger event to occur SOFTLA will continuosly store data at the specified sample rate. If the storage of data reaches the

end of the storage buffer SOFTLA will start over at the beginning of the buffer. When the trigger event is found, the location of this event will be saved, and the RED cursor will be set to this point.

After the trigger event occurs SOFTLA will continue storing data until the buffer is full.

NOTE *There is no circumstances where SOFTLA will store more than one buffer full of data. If the storage wraps around the end of the buffer while SOFTLA is waiting for the trigger event it simply starts over at the beginning of the buffer.*

If a trigger condition has been set up that never occurs SOFTLA will patiently wait forever for it. After a time, when you realise that it is not triggering, you may pres any kep on the keyboard to abort the sampling.

When the sample buffer is full, SOFTLA will display the starting data on the screen. If no trigger word is specified, this will be the beginning of the buffer. If a trigger word has been specified, the screen will be centered on the trigger event. A red cursor will also be placed at the trigger event.

ABORTING A SAMPLE RUN

If no trigger word has been specified, then SOFTLA will immediately begin storing data. In RUN mode, the daat buffer will contain whatever data was being sampled while waiting for the trigger event. In SCOPE mode, the buffer will contain all zeros, the buffer is cleared prior to beginning the sampling.

REMEMBER*In SCOPE mode, no data is stored before the trigger event occurs. In RUN mode, data is constantly stored while waiting for the trigger event.*

THE STATUS DISPLAY

The lower portion of the screen is the status display area. In this part of the screen, SOFTLA displays information about its' configuration and the data in the buffer. Some of the status displays can also input data. If a letter is shown in red, typing that letter, or "CLICKING" on that item, will allow you to change the settings. The settings that may be changed in this way are X and Y cursor locations, the storage TIMEBASE, the display ZOOM, and the TRIGGER WORD.

X and Y CURSOR LOCATIONS

The locations of the X and Y cursors may be changed in several ways. You can "CLICK" on the item, or enter the appropriate "X" or "Y". This will

bring up a window that allows you to directly type in the time. While this window is open, you may type in the time, or use the mouse to "CLICK" on some event on the screen. If the mouse is used, the cursor will snap to the location of the mouse pointer, and the window will close. If the time was typed in, the cursor will be moved to that location and the window will close. If you type in a time that is not on the screen, then the cursor will no longer be visible.

REMEMBER*When entering times, specify milliseconds by following the number with MS or ms. Specify microseconds with US or us. If neither is specified, the time defaults to microseconds. For example :*

2.400ms 2.4MS 2.4 ms 2400us 2400 US

The examples above, all specify the same time. Don't worry about hitting the time right on a sample interval, SOFTLA will round the time specified off to the next even sample time.

TIMEBASE The TIMEBASE specifies how long SOFTLA should wait between samples. The following illustration shows setting the timebase.

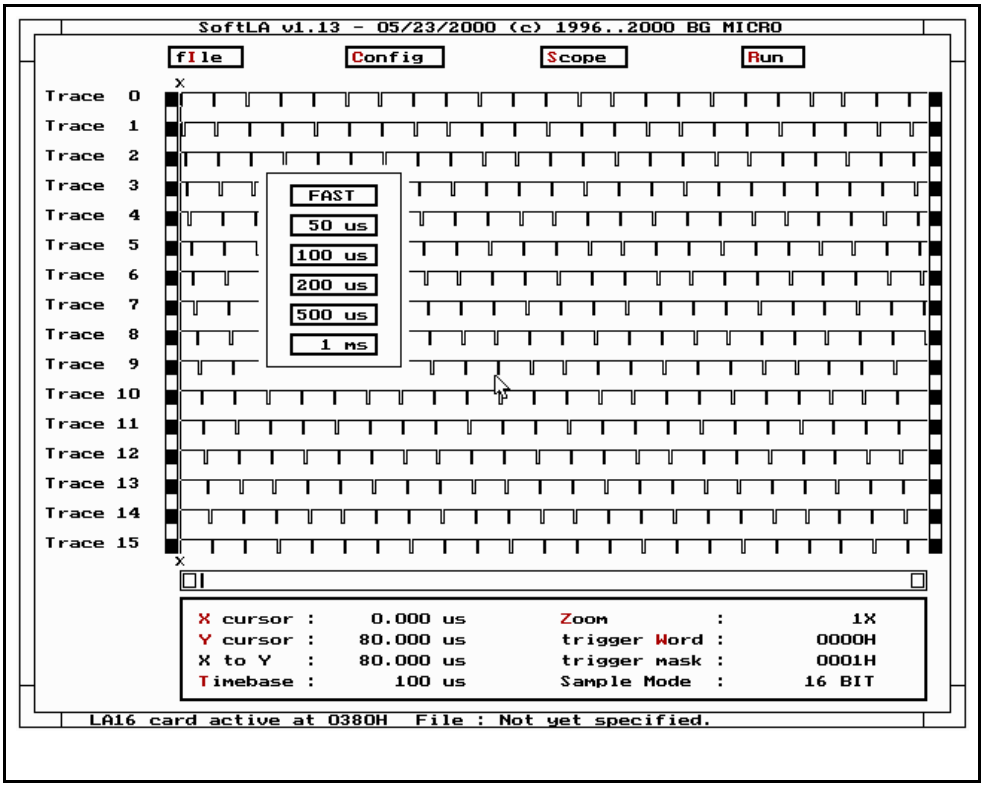


Figure 2 Setting the TIMEBASE.

As can be seen from the above illustration there are several options to choose from.

The FAST interval is "as fast as the computer can go". The storage routines are all written in assembly language for speed, but these routines will run at different speeds on different PC's. Before the sample begins, SOFTLA performs an automatic calibration. After the sample run is complete, the value determined during calibration is displayed as the timebase. This value will depend on the PC's CPU speed, memory speed, etc. It will be much slower, for example, on a 12 MHZ 286, than it would be on a 600MHZ Pentium III. Sample width settings also efect this number as the different modes require different amounts of code to support.

The intervals from 10us up are controlled by the PC's system timer chip, and should be very accurate independent of CPU speed. These times may not be precise as they are made up from the PC's timer which does not have a nice, even frequency, clock source. They are, however, very close.

When using the slower sample rates, it may be more difficult for SOFTLA to recognize a complex trigger event. The trigger value is tested as each sample is taken. If the event occurs between samples, then it may be missed by SOFTLA.

NOTE *SOFTLA uses the timer channel which runs the system real time clock. During a sample the real time clock is disabled and the timer reprogrammed. The timer is restored immediately after the sample is completed. It is possible for this to slow down your real time clock some, but it should be insignificant. This does not affect the battery backed up clock at all, and the system real time clock will be reset the next time you reboot the computer.*

SAMPLING FAST SIGNALS

Sampling fast signals, or signals that change at about the same rate as you are sampling, can lead to displays which are inaccurate. Figure 3 illustrates this.

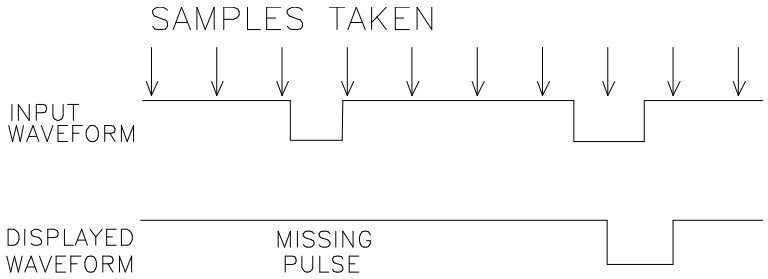


Figure 3. Sampling fast signals.

In the illustration, notice first that a pulse was missed. This was because the width of the pulse was less than the sample interval, it happened to fall between two samples, and SOFTLA did not see it. The second pulse is delayed because of where the samples were taken. This problem becomes much less severe with slower moving signals.

This problem exists with all logic analyzers, regardless of how expensive they are. The only solution is to sample at a rate much faster than what the circuit being monitored is running. You can do the same.

The speeds at which most hobbyist circuits operate will not present much of a problem, with a running frequency of a few hundred hertz. SOFTLA should be able to see anything you want to see. If you are working with a microprocessor that naturally runs much faster than this, try slowing it down just while you are trying to debug it. This can often be accomplished simply by replacing a crystal, or an oscillator module. If the circuit contains a logic error, or a wiring error, this technique will work for you. Once you have the problem fixed, you can speed it back up.

ZOOM

The ZOOM function allows you to spread the display data out for better viewing. The standard view is one pixel per sample event. This will allow you to see typicly over 500 samples on a VGA screen. To see more detail, select one of the other viewing modes. You can select the ZOOM function either by clicking on the word ZOOM at the lower right of the screen, or by pressing the E key on the keyboard. Make your selection, as with any other menu in SOFTLA, either with the mouse, or by using the arrow keys to highlight the desired selection, then press ENTER.

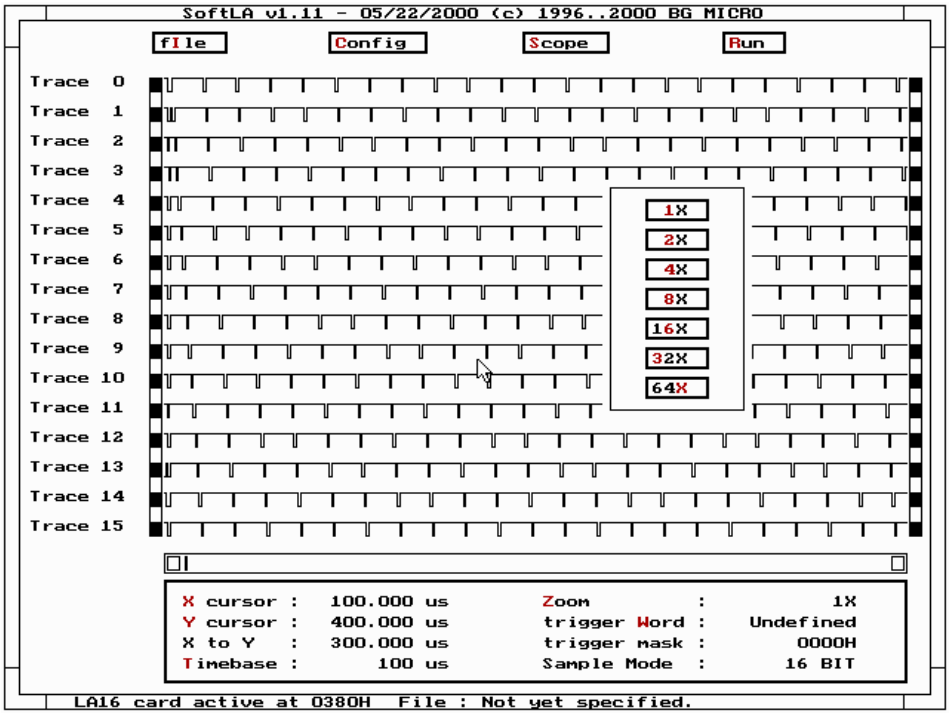


Figure 4. The ZOOM menu.

TRIGGER WORD

Setting the trigger word is how you tell SOFTLA what to watch for in determining the trigger point. The following illustration shows the input screen for setting the trigger word. Note that when it is started for the first time, it will show all X's. That is, an "X" for each trace. The "X" means don't care, or ignore. In this state, there is no trigger word defined, and the status display shows : "trigger Word : Undefined".

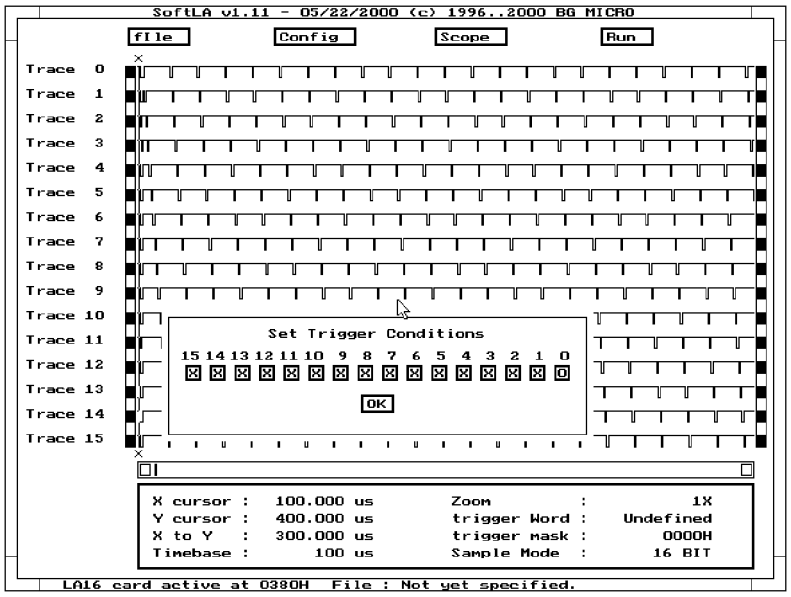


Figure 5. Setting the Trigger Condition

To enable triggering on a given trace, "CLICK" on the trace you want. The first time you "CLICK" on the trace it will go to "0". If you want a "1", then click again. If you "CLICK" a third time, it will return back to "X". Do this for each trace until the desired trigger word is established.

Let's work through an example. Suppose that we have our test probes connected to our circuit, and we want to trigger when Trace 0 is low, and Trace 1 is high. To begin, open the "Set Trigger Conditions" window by "CLICK"ing on "trigger Word" in the status display area, or by typing a "W" at the keyboard. We then "CLICK" on the "0" button once, and the "1" button twice. Figure 6 shows the screen after this has been done.

NOTE *To set the trigger word from the keyboard, type the hexadecimal number corresponding to the trace to be set; 0 to 9, and A to F. In the above example, you would press the "0" key once, and the "1" key twice.*

When you are through setting the trigger word, you may close the window by "CLICK"ing on the "OK" box, by pressing the RIGHT mouse button, or by pressing the ESC key on the keyboard. The screen should now look like figure 6.

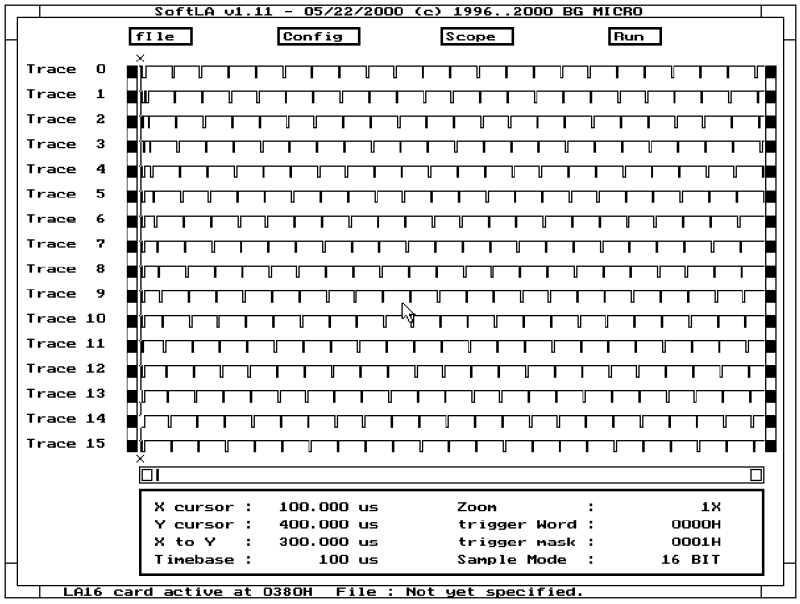


Figure 6. After setting the trigger word.

The trigger word consists of two components, a MASK, and a VALUE. The TRIGGER MASK tells SOFTLA which input traces to watch, and the trigger word tells SOFTLA what value to watch for.

NAMING TRACES Along the left side of the screen is a column of names, one for each trace. When first started, SOFTLA furnishes default names for each trace. You can change the name of any trace. To do this, "CLICK" on the trace name shown, and a window will appear allowing you to enter a new name. Figure 6 illustrates this

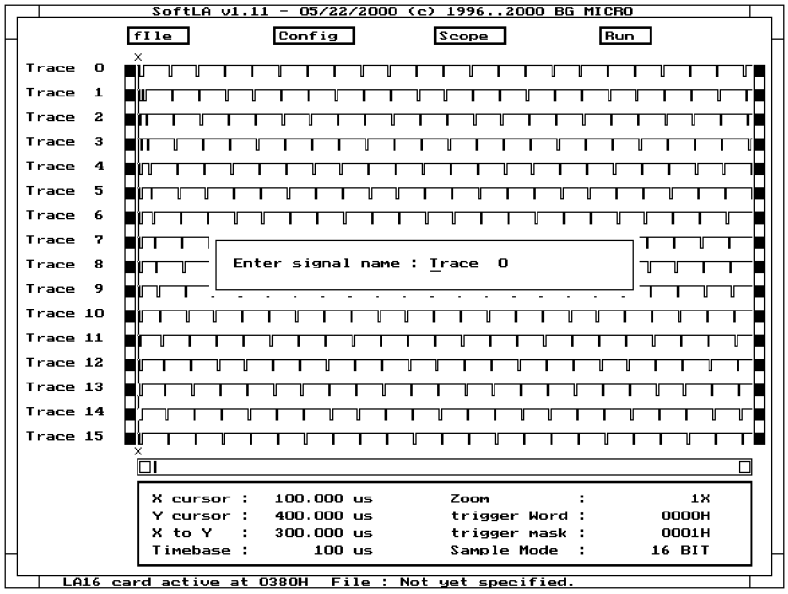


Figure 7. Changing a trace name.

You may enter a new name, up to 8 characters. When done, press the ENTER key. The trace name will be changed on the screen. If the file set is saved, the new trace names will be saved with it, and will be restored when the file set is loaded.

THE PANNING BAR

Located between the bottom of the data display area, and the top of the status display area, is the panning bar. This is your primary mechanism for moving around in the sample buffer.

MOVING the DISPLAY

At either end of the panning bar is a small square button. "CLICK"ing on the LEFT button will pan the screen to the left. "CLICK"ing on the RIGHT button will pan the screen to the RIGHT. There will be a 10% overlap of the data when panning so that you will be able to see some of the data on the previous screen.

You may move in large jumps by placing the mouse pointer in the area of the panning bar between the two panning buttons and "CLICK"ing. The display will move to that position in the buffer.

NOTE *This is a relative position. If you "CLICK" approximately in the middle, the display will go to that position. It may be difficult to do precise positioning in this manner. Use the panning bar to get you close to where you want to be, then use the keyboard arrow keys, or the panning buttons to fine tune your location.*

The area between the two panning buttons has another purpose. There are four colored vertical lines in this area.

These lines represent the relative position within the buffer of the X cursor, the Y cursor, the trigger point, and the screen display. The X cursor will be represented by a narrow white line. The Y cursor will be represented by a narrow yellow line. The trigger point is represented by a narrow red line. The location of the display screen within the sample buffer will be represented by a wide white line.

As you move around in the sample buffer, the wide white line will move with the screen. As you move the X or Y cursors, the wide white line will move with them; the white line will move with the X cursor, and the yellow line will move with the Y cursor.

The red line will not move except when a new sample is taken. It shows the location in the buffer where the trigger event is stored.

MEASURING TIMES

It is often necessary to measure the time between two events. This is what the X and Y cursors are for. They may be placed at the points defining the time to be measured, and the time between the events may then be directly read from the screen.

MOVING the X and Y CURSORS

The X and Y cursors may be moved in several ways. If either event to be measured is on the screen, you may pick up either of the cursors by placing the mouse pointer on the cursor, then PRESSING AND HOLDING the LEFT mouse button. When you do this, the cursor will snap to the mouse pointer and follow it. You may then DRAG the cursor to where you want it. When you release the LEFT mouse button, the cursor will be left behind. If the other event to be measured is also on the screen you may repeat the process with the other cursor. The difference between these two times may be read from the status display after the last cursor is placed in the "X to Y" section.

If one of the events to be measured is not on the screen, but is close, say in the next screen over, you may DRAG the cursor to it. First place one of the measurement cursors on the event that is on the screen, then pick up the other one. To shift the screen in the direction needed to find the other event, simply "BUMP" the cursor into the edge of the screen. When you do this, SOFTLA will automatically pan in that direction. As long as you keep holding the LEFT mouse button down, the cursor will follow. When you find the place where you want to place the cursor, place it there and release the LEFT mouse button. Read the time in the status display area labeled "X to Y".

If the events are a long way apart, it is not practical to drag the cursor. In this case, place the one you can see, if it is in the current display, and then use the techniques described earlier to find the second event.

Once the event to be measured is displayed on the screen, you can easily bring the desired cursor to it. Bring up the set cursor window by either "CLICK"ing on the cursor name in the status display area, or by typing the hot key for that cursor. With the window open, place the mouse pointer on the desired event, and "CLICK" it. The cursor will be placed at that location, and the time difference may be read from the status display area.

THE CABLE

You will need to have a cable to connect your printer port to the circuit to be monitored. Appendix B shows the drawing for this cable, and the pinout of the DB25 connector on the printer card, as used by SOFTLA. You can either build this cable yourself or purchase it, in kit form,from B.G. Micro..

BUILDING THE PROBE CABLE FROM SCRATCH

If you want to build the cable, it may be up to 6 ft. long. You may use flat ribbon cable, and a press on IDC (Insulation Displacement Cable) connector. This makes connection to the printer card quite easy. Use the following instructions to help you build the cable.

1. If you choose to use a Centronics printer cable, go to the instructions for the B.G. Micro probe cable kit.

2. If you are using a lat ribbon cable, start by crimping a DB25 MALE connector onto one end of a 6 ft piece of ribbon cable. The multi-color cable is especialy helpful for this, but is not necessary.

3. Carefuly split the cable at the end opposite from where you crimped the DB25 connector so that you have approximatelty 12 inches of loose wire.

4. Strip apporximately ½ inch of insulation from the end of each wire.

5. Using an ohm meter, and referencing the drawing at the back of this manual, identify each wire, and solder a 1K ohm, ¼ watt, resistor to the end of each wire. Then, carefuly solder the other end of the resistor to the test clip.

6. As you go, label each test clip. We suggest making labels out of Avery stick-on labels to stick to the sides of the test clips. These labels will not stay on by themselves, so you will need to cover them with something to make them stay put. Either a piece of clear Scotch tape, or clear fingernail polish, should help here.

7. For the ground lead, you can probably get away with just using pin 25 of the DB25 connector. Solder a test clip to the pin 25 wire. Be sure that you do not add a resistor to the ground lead.

8. Double check the label you put on the probe clip with which trace moves on the screen to be sure you have the labels on correctly. This could lead to much frustration later if they are not labeled correctly. Now go to the following section TESTING THE CABLE to check out your cable.

ASSEMBLING THE B.G. MICRO PROBE KIT.

The B.G. Micro probe kit is usualy made from a Centronics printer cable for the IBM PC/AT. If you are building your own cable from a Centorincs printer cable, you may use the following instructions. This cable is converted to your probe cable by following this procedure.

1. Cut the Centronics connector from the end of the cable. Be sure you have the correct end before you make the cut. You want to leave the DB25 connector on the cable.

2. VERY CAREFULLY remove 12" to 18" of the jacket from the end of the cable you removed the Centronics connector from. Be vary careful not to nick, or cut, any of the wires.

3. Strip about 1/2" of insulation from each wire.

4. Carefully ohm each wire to the DB25 connector. Attach resistors and test clips to each wire as it is identified. Most printer cables for the IBM PC will include a wire for pin 15 of the DB25 cable. This wire is not used by SOFTLA and may be clipped close to the jacket. Also, most of these cables will include a bare wire that is connected to the shield of the

connector. Clip this wire too. Do not attempt to use this wire as the ground wire for the system.

TESTING THE CABLE

NOTE **DO NOT PERFORM THE FOLLOWING TEST IF YOU HAVE NOT INSTALLED THE 1K RESISTORS IN THE TEST LEADS.**

1. Start SOFTLA. From the main menu, select CONFIG/WIDTH, and select 4. You will only use the first four test leads for this test. These are the test clips attached to pins 1, 14, 16, and 17 of the printer connector.

2. From the main menu, select SCOPE. Next, touch the first four test leads, one at a time, to either +5v, or gnd. The appropriate trace on the screen should follow. Press ENTER to stop the SCOPE display.

3. Next, select CONFIG/WIDTH/8. Repeat the above test with the first 8 traces. This will use the same test clips used in the above test, plus the ones connected to pins 13, 12, 10 and 11 of the printer connector.

The two above tests do not require the bi-directional mode of the printer port.

Now, select CONFIG/WIDTH/Bi-Di. Repeat the test. This test requires the bi-directional mode of the data port. This test will use the test clips connected to pins 2,3,4,5,6,7,8, and 9 of the printer connector.

For the final test, select CONFIG/WIDTH/16. Repeat the test with all 16 test leads. This test will use the test clips used with the bi-di mode above. They will be displayed as traces 8 through 15. In addition, it will also use the test clips connected to pins 1, 14, 16, 17, 13, 12, 10, and 11. These will be displayed as traces 0 through 7.

This completes the assembly and test of the probe kit for SOFTLA.

CONNECTING UP

You are now ready to make your connections to the circuit to be monitored, and take some samples.

When working with digital I.C.'s using a DIP CLIP will make your work much easier. The DIP CLIP snaps onto the body of the IC and gives you metal posts to which you can attach your test clips.

REMEMBER *Try not to short out two adjacent pins on an IC with your probe clip. Most digital circuits can not tolerate this, and will require a reset before proper operation can be restored.*

Connect the ground clip from your cable to the circuit to be monitored. Unpredictable results may be obtained if this is not done. Both the printer card, which is your input device, and the circuit to be monitored must be at the same ground potential.

Connect your other probe clips to points of interest in the circuit. Set the trace names on the screen as you go. This will make it much easier to keep track of what you are doing as you go.

When all probes are connected, you need to setup SOFTLA. Set the trigger word if desired, and the trigger mode. Next, select either SCOPE or RUN, to capture and display data.

Congratulations! You are now ready to enter the wonderful world of DIGITAL CIRCUIT ANALYSIS.

I - FILE menu
    R - RUN
    X - Set X cursor location.
    Y - Set Y cursor location.
    T - Set Timebase.
    Z - Set Zoom factor.
    W - Set trigger word.
    C - Configure.
    S or O - Oscilloscope mode.
    M - Set storage mode.
    0..9, A..F - Rename trace. NOTE : ONLY WHEN
    at main menu level. You MUST enter a
    hexadecimal number.
    LEFT ARROW - Pan Left.
    RIGHT ARROW - Pan Right.
HOME KEY - Go back to the beginning of the
    sample buffer (first screen of data).
F1 - Print screen. You MUST have an EPSON
    compatible printer.
F2 - Zoom in.
F4 - Zoom out.
ESC - Exit from sub menus

N - New file set.
L - Load a saved file set.
S - Save current data to file set.
A - Save current data to a new name.
P - Print data to EPSON compatible printer.
D - Shell out to DOS. Type EXIT to return to SOFTLA.
B - Tell about SOFTLA.
X - Exit SOFTLA. Current data will be saved as a file set if
    a design name has been specified.
Q - Exit SOFTLA without saving the current data.

DOWN ARROW - Move the highlighted menu item down one.
UP ARROW - Move the highlighted menu item up one.
ENTER - Select the highlighted menu item.
ESC - Exit menu without selecting anything.

EVENT A single data sample, all signals taken together. This combination of logic levels is referred to as an event.

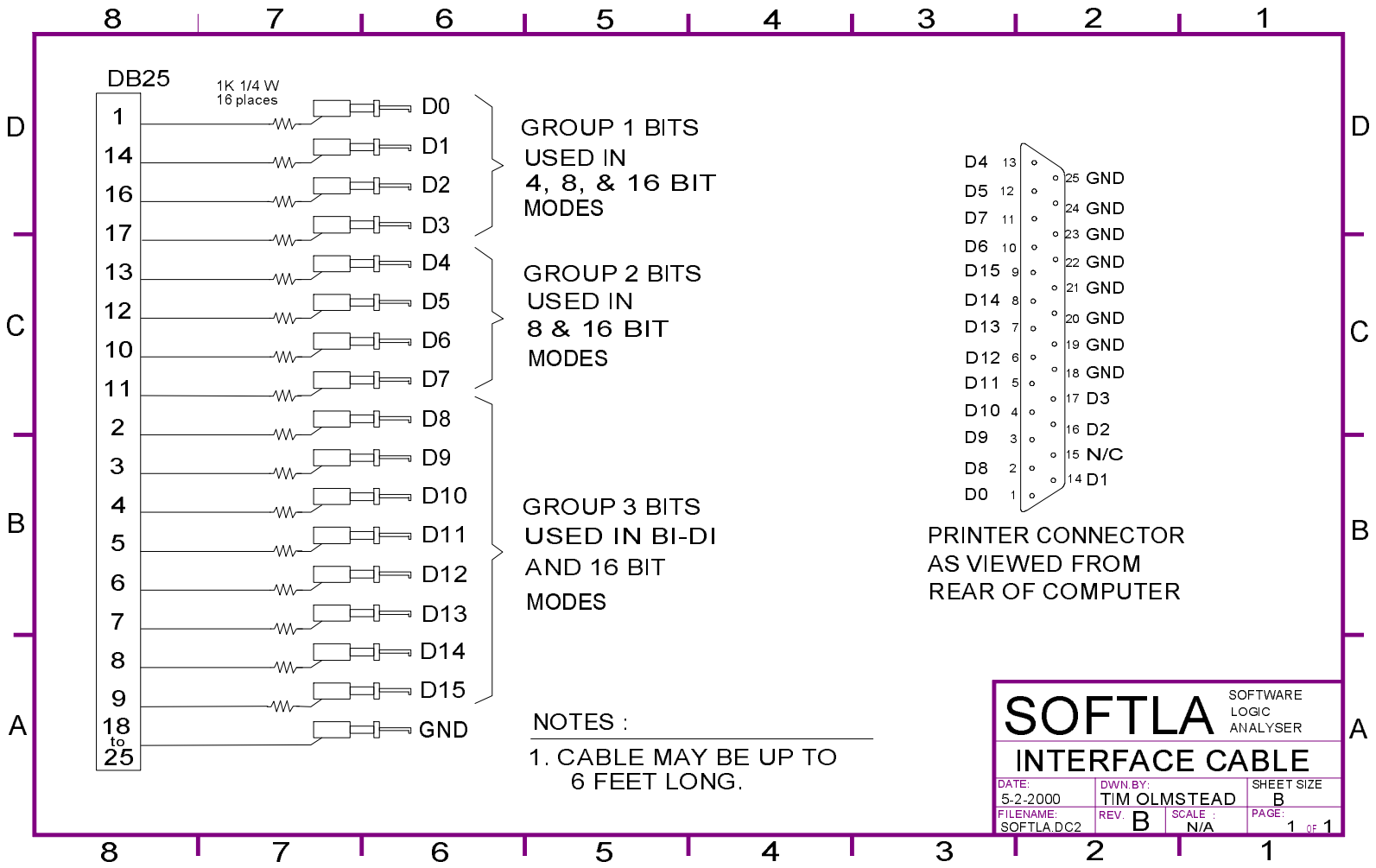
FILE SET or DATA SET The two files that SOFTLA uses to save data; I.E. - <FILE>.DAT, and <FILE>.CFG.

SAMPLE BUFFER The memory that data sampled from the printer port is stored for later retrieval. SOFTLA stores 16384 samples in the buffer.

TRIGGER EVENT That event which triggers the logic analyzer. This is similar to triggering an oscilloscope. For SOFTLA it determines when to begin storing samples in SCOPE mode, or how many more samples to store in RUN mode.

TRIGGER MASK The trigger mask tells SOFTLA which input traces to consider. If a bit is set to a one in the trigger mask, then that trace is compared to the same bit in the trigger word.

TRIGGER WORD That combination of ones and zeros that SOFTLA should look for to indicate that a trigger event has occurred.


DB25
1K 1/4 W
16 places
1
14
16
17
13
12
10
11
2
3
4
5
6
7
8
9
18 to 25
D0
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
GND
GROUP 1 BITS
USED IN
4, 8, & 16 BIT
MODES
GROUP 2 BITS
USED IN
8 & 16 BIT
MODES
GROUP 3 BITS
USED IN BI-DI
AND 16 BIT
MODES
D4 13
D5 12
D7 11
D6 10
D15 9
D14 8
D13 7
D12 6
D11 5
D10 4
D9 3
D8 2
D0 1
25 GND
24 GND
23 GND
22 GND
21 GND
20 GND
19 GND
18 GND
17 D3
16 D2
15 N/C
14 D1
PRINTER CONNECTOR
AS VIEWED FROM
REAR OF COMPUTER
NOTES :
1. CABLE MAY BE UP TO
6 FEET LONG.
SOFTLA
SOFTWARE
LOGIC
ANALYSER
INTERFACE CABLE
DATE:
5-2-2000
DWN.BY:
TIM OLMSTEAD
SHEET SIZE
B
FILENAME:
SOFTLA.DC2
REV.
B
SCALE :
N/A
PAGE:
1 OF 1