## LOGIC ANALYZERS PM 3580 / PM 3585 Getting started guide

## Dual logic analysis

PF8690/00 System Software Software Version 1.0, English I&E, Test & Measurement © Copyright 1990, Philips Export B.V.

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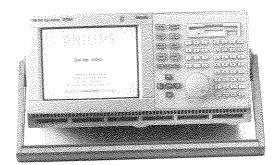
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## Introduction



Page 5

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Introduction	C	Getting Started with the PM 3580 or PM 3585	
	W elcome analyze	to the new PM 3580 / PM 3585 family of logic rs from PHILIPS.	
	The PM 3580 give you easy mance, and e	D/PM 3585 logic analyzers were designed to y and simple access to state of the art perfor- even more.	
	The family co	nsists of four different models.	
	PM 3580/30:	32 dual-analysis channels with 100 MHz timing, 50 MHz state, and 1k deep acquisition memory.	1
	PM 3580/60:	64 dual-analysis channels with 100 MHz timing, 50 MHz state, and 1k deep acquisition memory.	,
	PM 3585/60:	64 dual-analysis channels with 200 MHz timing, 50 MHz state, and 2k deep acquisition memory.	(
	PM 3585/90:	96 dual-analysis channels with 200 MHz timing, 50 MHz state, and 2k deep acquisition memory.	(
	The key feature	es of all these models are as follows:	- / · · · ·
	<ul> <li>"Dual Analys</li> </ul>	is Per Pin (DAPP)" architecture (simulta- ated state and timing acquisition on all	
	<ul> <li>Transitional ti</li> </ul>	ming on all channels	
	<ul> <li>Powerful trigg trigger functio</li> </ul>	ering functionality integrating state & timing ns in the same trigger sequence	. (
	<ul> <li>Eight-level sed (IfThenEls</li> </ul>	quencer with full conditional structure	Ç.
	• Eight state trig	•	.*
	One range rec		<u>(                                    </u>
	<ul> <li>Three timing tr</li> </ul>		· · · · · · · · · · · · · · · · · · ·
	One edge dete		Marie Control
	One glitch determine		C
	<ul> <li>Absolute or re (5 ns resolution</li> </ul>	elative time stamp, always at full speed	(*)
	<ul> <li>Powerful select</li> </ul>	tive data acquisition functions.	
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Not all these features are covered in this manual. For additional information, please refer to the *PM 3580/PM 3585 User Manual* and *PM 3580/PM 3585 Reference Guide*.

This *Getting Started Guide* is intended for someone who is using a PM 3580/PM 3585 analyzer for the first time. It is written for both novice and experienced users of logic analyzers.

This manual will give you the basic knowledge on these instruments, based on real life examples. After reading this manual, you will be able to make measurements with the PM 3580/PM 3585 instruments.

The logical follow-up of the *Getting Started Guide* is the *User Manual*. This gives you complete information on what you can do with PM 3580/PM 3585, and it tells you how to do it.

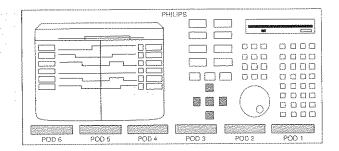
A Reference Guide is also supplied with the instrument. In this manual you can find an explanation of any option of any field in any menu of the analyzer.

If you are new to logic analyzers or if you just need a refresher, we think you will find that *The ABC's of logic analysis* is a good way to get a clear view of the applications of logic analyzers and how to get the most out of them.

The ABC's of logic analysis can be ordered from your local Fluke/Philips sales representative. (It has code number 9498 718 02611.)

Introduction	Getting Started with the PM 3580 or PM 3585
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## **Exploring the Instrument**



Page 9

#### Exploring the Instrument Getting Started with the PM 3580 or PM 3585 his chapter explains the layout of the instrument and shows you the basic principles of the User Interface. Front Panel The Front Panel of the Logic Analyzer (as shown at the bottom of this page) consists of four areas: · The display screen on the left displays the menus, operating information, and acquisition results. · The keyboard in the center and right is used to enter commands. · The floppy disk drive in the upper right is used for the system floppy disk and for saving and restoring data. The pod connectors at the bottom are used to connect the signals to be measured to the analyzer. Each pod connector carries 16 signals. Depending on the channel width of your instrument, you can see two, four or six pod connectors at the bottom of the front panel. Floppy disk drive Keyboard Display Pod connectors POD 6 POD 4

#### Rear Panel

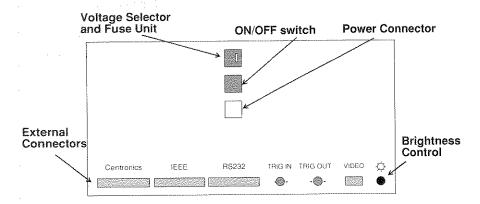
On the rear panel shown below you will find:

· The voltage selector and fuse unit.

#### CAUTION

The selected voltage MUST match your line (mains) voltage: otherwise, you can damage the instrument. See the *Installation* procedures for instructions on selecting the correct voltage.

- The instrument ON/OFF switch.
- The connection for the power cable.
- External connectors for connecting a Centronics printer, for remote communication, for exchange of a trigger pulse with other instruments, and for connecting an external 32 kHz monochrome monitor (MVGA). For a complete description of these connectors, see the *User Manual*.
- Brightness control to increase or decrease the brightness level of the display.



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play). Three of these, CONFIG, FORMAT and TRACE, are setup menus. The DISPLAY key selects the screen on which the measurement results are shown. The other two,

Exploring the Instrument

Getting Started with the PM 3580 or PM 3585

PRINT and I/O, are auxiliary screens. For more information, see the PM 3580/PM 3585 User Manual.

Now, you should connect the instrument and take a short tour around the menus.

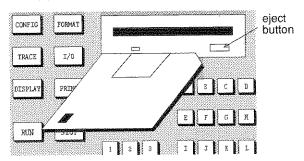
#### Power On

First, ensure that the instrument is set up for the correct voltage (see page 11 and the *Installation* procedures delivered with the instrument).

Ensure the power cable is not connected to the power supply. Plug the female end into the instrument, and ensure that the power switch is *OFF*.

Plug the power cable into an appropriate *grounded* power source.

Remove the transport protector (if any) from the floppy disk drive by pressing the eject button.



Set the power switch to *ON*. The light on the disk drive lights up, and a start-up message appears on the screen.

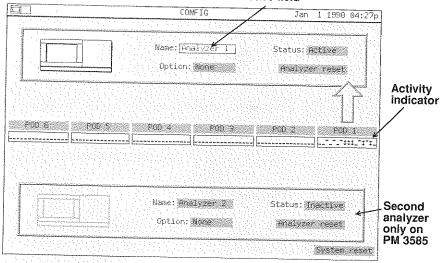
Now insert the system floppy disk (see the *Installation* procedures for details) fully into the floppy disk drive until it clicks.

The analyzer now loads the system software. Wait until the Configuration menu (similar to that shown on the next page) appears.

# Experimenting with Fields

On each menu, there are a number of *fields*. These are the small white or gray boxes containing text. The currently active field is the one with a white (highlighted) background. That is the Analyzer name field in the Configuration menu shown below. Key press actions only affect highlighted fields. You use the arrow keys or the dial to move the highlight from field to field.

#### Active field



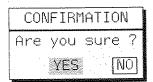
Status: Active

Press the right arrow key once. The Status field should be highlighted as shown at the left.

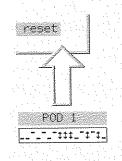
To do something with the instrument, you will select the appropriate menu, highlight the appropriate field, and then press the appropriate key to do the action you want done. During the learning phase, this will most often be the *SELECT* key. You can also think of the *SELECT* key as a kind of help function.

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#### **Confirmation Fields**



#### Pod Field



Press the *SELECT* key. The word *Active* is toggled to *Inactive*. Press the *SELECT* key again, and the Status is again *Active*. The status field is a simple toggle field.

Press the down arrow key. The *Analyzer reset* field should be highlighted. Press the *SELECT* key. A Confirmation menu, as shown at the left pops up in the middle of the screen. You can highlight the answer with the left or right arrow key, as appropriate, and select the highlighted answer by pressing the *SELECT* key.

The popup is then closed and the action is taken or not according to your answer. (Either answer is O.K. at this moment.) The *Yes* and *No* fields are function fields, i.e., the action is performed when they are selected.

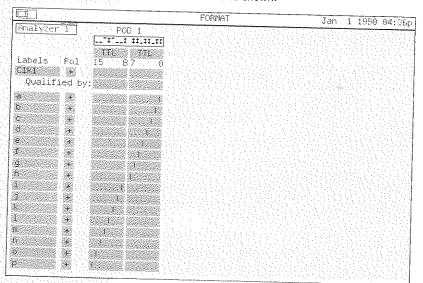
Now press the down arrow key again. The Pod field for Pod 1 should be highlighted. Press the left arrow key once to move to Pod 2.

Now press *SELECT*. You should see an arrow, as for Pod 1 in the figure at left, pointing from the Pod box to the analyzer (1) box.

On PM 3580 instruments, if you press the *SELECT* key again, the arrow is toggled off. On PM 3585 instruments the arrow is toggled to the second analyzer box, and a third press of the *SELECT* key toggles the arrow off.

## Other Field Types

To look at some other field types, press the FORMAT key. The Format Menu is shown.

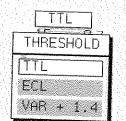


As you will notice, the first time you come to a menu, the highlighted field is always that at the top left. However, once you have moved that highlight, as long as you do not remove power, the instrument remembers where you were. You can see that now by pressing the *CONFIG* key. Then come back to the Format menu.

Use the arrow keys or dial to move to the first threshold

field (reading "TTL"). These fields show the threshold

#### A List Field



 Press the SELECT key. A list appears showing you the different options available (TTL, ECL, or variable) as shown at left.

values selected.

• Use the arrow keys or the dial to move to the option you want and press SELECT.

You may choose any option here.

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Exploring the Instrument

## Getting Started with the PM 3580 or PM 3585

There are other field types. These are for advanced use. See the *User Manual* chapter "Menu Overview" and the *Reference Guide* for more information.

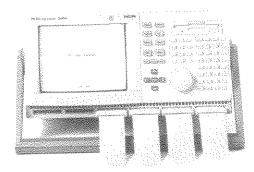
### Connecting Signals to be Measured

You will use the pod system (pod cable plus front end) to connect the signals you want to measure to your analyzer. This section describes the pod system only briefly. For a detailed description of the pod system and probing, refer to the "Probing" chapter of the *User Manual*.

#### CAUTION

Do not use any other probe leads or cables than those delivered with your instrument, as damage may occur to your instrument if you do so.

The specially-designed pod cable connects at one end to a pod connector on the Logic Analyzer.



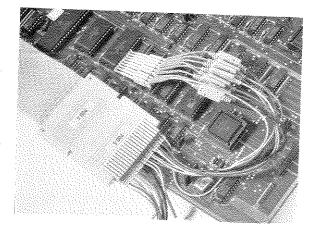
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## Exploring the Instrument

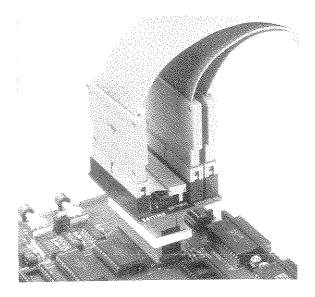
## Getting Started with the PM 3580 or PM 3585

The other end of the pod cable is connected to a target in one of three ways:

- Connect the standard front end (plug with detachable leads) to the pod cable. You can then use the grabbers delivered with the logic analyzer to attach the probe leads to those pins of the ICs you want to observe (see photo below). Alternatively, use only the small probe tips at the end of each lead and push them onto the wire wrap pins on your printed circuit board or onto the pins of a measuring clip.
- Connect the pod cable directly to an RC connector on a microprocessor adapter to measure microprocessor signals (see photo on next page).
- Connect the pod cable directly to an RC connector that has been designed-in as part of an application.



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#### Summary

This has completed a preliminary look around the instrument. Now it is time to do some measurements.

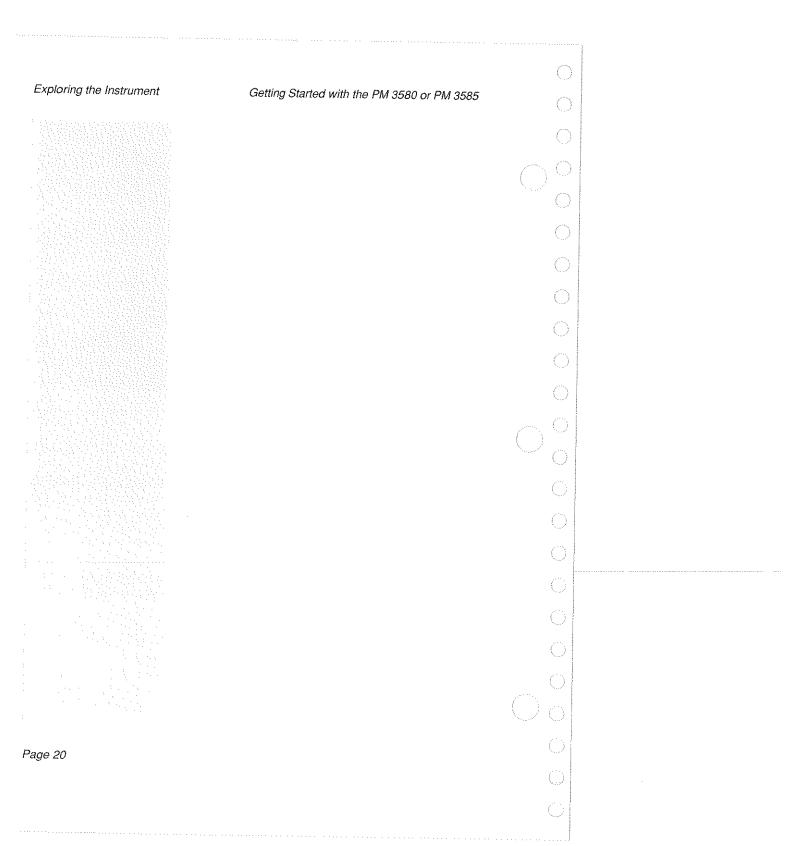
Before moving on, you may want to look at other aspects of the instrument. If you do, we recommend that you avoid using the *PRINT* or *I/O* keys until you are familiar with their operation (see "Making a Printout" beginning on page 68 and "Getting Examples from the Disk" beginning on page 70).

When you have finished, press the eject button to remove the floppy disk from the instrument, and power off the instrument.

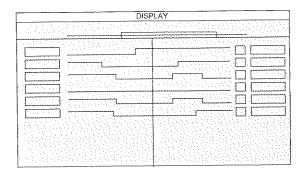
It is good practice to remove the floppy disk whenever the instrument is not running, and to remove the power from the instrument when it is not required.

Note:

By powering down the instrument before performing the operations in the next chapter, you will clear any of the settings made during your experiments in this chapter.



## **Timing Acquisition**



Timing Acquisition

Getting Started with the PM 3580 or PM 3585

### The Purpose of Timing Acquisition

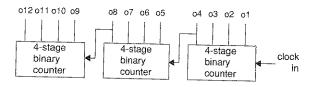
n timing acquisition, logic analyzers sample the input channels at a fast fixed rate.

In this mode, the analyzer behaves like a digital storage oscilloscope with a very limited vertical resolution (1 bit). Because of that, you lose the analog shape of the signals you capture, but you keep all the timing relationships between them.

If you want to know more about timing analysis, please refer to *The ABC's of logic analysis*.

#### A Practical Problem

You are going to check if a 12-stage binary ripple counter works properly.



First you will use the logic analyzer to determine if the counter counts properly (frequency divided by 2 at each output). You will also measure the delay between the toggling of different outputs.

## Logic Target PF 8669/20

The measurements described in this and the following chapters are all based on the logic target PF8669/20, which contains a 12-stage binary ripple counter.

The complete documentation for this logic target is supplied with it, and may be inserted at the back of the *User Manual*.

If you do not have this logic target, you can use the files containing the results of the measurements. These files are available on the system disk supplied with your instrument. The chapter "Getting Examples from the Disk" beginning on page 70, explains how you access these files.

The "Probing" chapter of the *User Manual* provides detailed information on the pod system and probing.

# Connecting the Logic Target

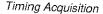
The logic target has an RC connector designed-in. To connect the logic target to your analyzer, proceed as follows:

- Connect a pod cable directly to the RC connector on the logic target. If the standard front end is connected to the pod cable, first remove it.
- Connect the other end of the pod cable to pod connector 1 on your analyzer (bottom right on the Front Panel).
- Set the Mode switch of the logic target to position "I".
- Set the switch for the clock frequency into position "15 MHz".

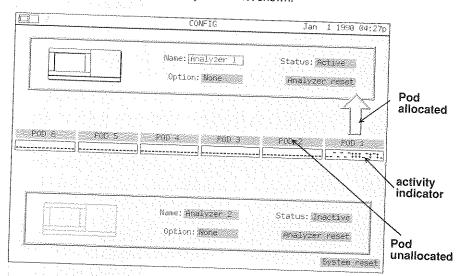
Your logic target has now been properly set up and connected for the measurements you are going to do.

### Setup and Acquisition

Once the analyzer is powered up, the first menu, called the Configuration menu, appears. This menu is used to set up the main configuration of a measurement session, i.e., the assignment of pods to an analyzer. Activity indicators are also displayed here, showing the activity of the input channels. Signal level is high (-), low (-), or changing  $(\ddagger)$ .



Note that if you have a PM 3580, you have only Analyzer 1 and the box below the activity indicators relating to Analyzer 2 is not shown.



By default, only POD 1 is allocated to acquisition. This is sufficient for this test, because you need only 13 signals (12 output signals o1 .. o12, plus the clock signal) to characterize this target. So you can make an acquisition immediately and see signals displayed on the screen.

#### The Timing Display

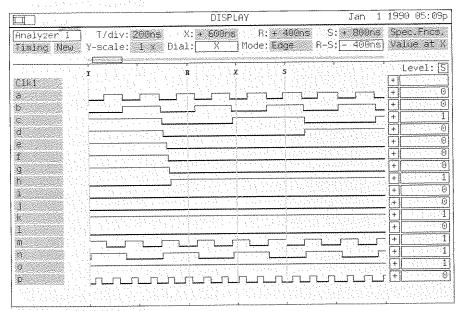
To start the acquisition, just press the RUN key; almost immediately you will get a timing diagram of your signals on the screen similar to that shown below.

If you want to experiment with the same data but you do not have the logic target available, you can get the data from the floppy disk under the file name TIMING.NEW. Please refer to "Getting Examples from the Disk" beginning on page 70 for how to load this file.

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Timing Acquisition

A first visual check shows you that the target behaves like a binary counter: each line toggles at a frequency that is half that of the previous line. So it seems that the target is made of cascaded dividers by two, i.e. a binary counter.



#### Specifying Signal Names

Before measuring the parameters of the signals, you can customize the display to your needs.

If you do not specify signal names, the analyzer automatically assigns default names to each channel.

#### Timing Acquisition

### Getting Started with the PM 3580 or PM 3585

### The Format Menu

Using the Format menu, you can define your own labels for channels or groups of channels.

Now display the Format menu by pressing the *FORMAT* key. Note that the activity indicators you previously saw on the Configuration menu are also present on the Format menu.

Frialyzer 1		FORMAT				
Labels Pol 15 87 0  Clki  Qualified by:  3	Description of the second		Jan	1	1990	04:36p
Labels Pol 15 87 0  Clki  Qualified by:	<u></u>	I II_III				
Qualified by:    a	Labels Pol 15	87 : 4:0 : 1:4:1:4:1:4:1:4:1:4:1:4:1:4:1:4:1:4:1				
	Qualified by:					
	k 1					
	π + 1 Δ + 1					
	9 + I					

To re-label the channels, proceed as follows:

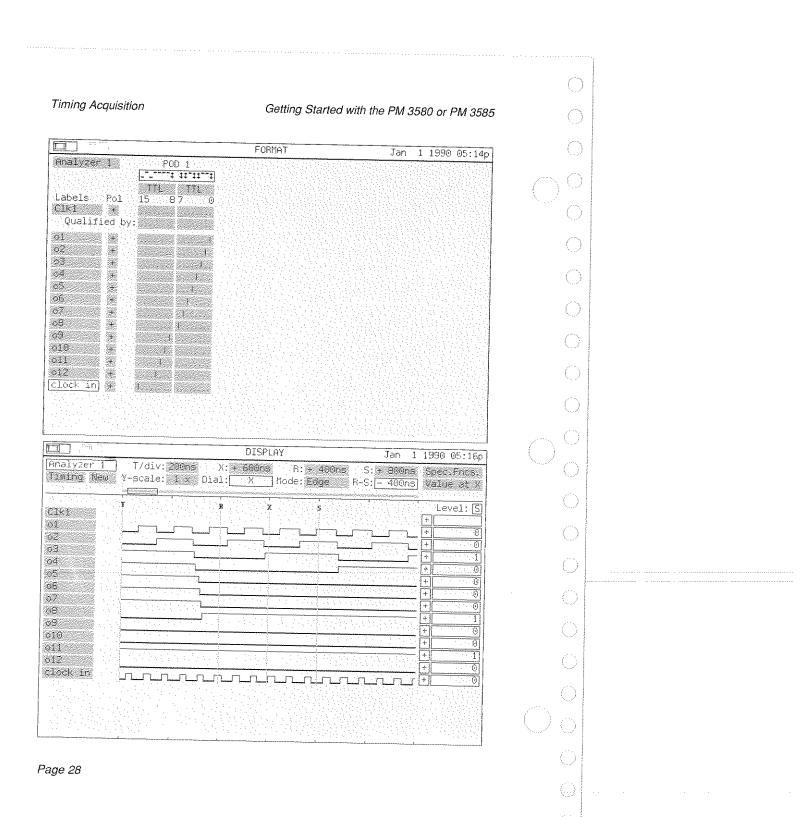
- Use the arrow keys or the dial to go to the first data label, called *a* by default.
- Type in the new name, *o1*, using the alphabetic and numeric keys.
- Do the same for the following labels, between b and I, and replace them by o2 to o12.
- The labels m through o are allocated to currently irrelevant input channels. Delete these unused labels:
- Use the arrow keys or the dial to go to the label you want to delete.
- Press the DELETE key; the label is removed.

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Timing Acquisition

• Label p is allocated to channel 15 by default. This channel carries the counter's clock signal. Rename this label to *clock in*.

Now that the Format menu fits your needs (see top of next page), you can go back to the Display menu (bottom of next page) to make some measurements.



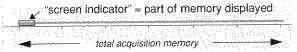
www.valuetronics.com

#### Measurements

First you measure the ripple time through the flip-flops of the counter.

To do this, you use four functions of the Timing Display menu: T/div, the X cursor, the R cursor, and the S cursor.

On top of the data area of the Timing Display menu, you can see a line with a screen indicator that shows which part of the memory is displayed on the screen.



X: +11.1us

The X field allows you to display different parts of the data captured (change the position of the *screen indicator* in memory), i.e., to move along the time axis in the measurement.

T/Div: 10 us

 ${\sf T/div}$  allows you to change the horizontal scale on the screen, and thus the size of the  ${\it screen indicator}.$ 

Now look at the interesting "event" at the left of the screen: a lot of output toggling.

- Use the dial to move the screen indicator and get this event at the center of the screen. The dial is linked by default to changes of X.
- Then, use the arrow keys to highlight the scale field (T/div).

This enables the dial to change the scale of the screen divisions. Turning it clockwise expands the data on screen and the screen indicator gets smaller. You can also type in the value of the scale you want to get, for example 20n (n for nanosecond).

Measuring a Time Difference Once the interesting part of the data is on the screen at the proper scale, you can easily measure timing parameters with the two cursors (R and S).

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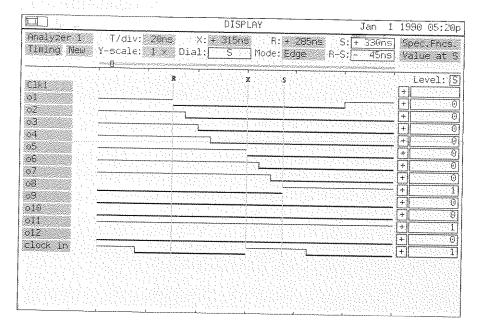
R: +11.1us S: +11.1us R-S: + 0us On the top line of the screen, right of center, there are two fields showing from left to right the exact position of the R and S cursors. (You will modify them later.) Below the S field, is a field (R-S) that shows the time interval between the R and S cursors.

To move the R or S cursor, first use the arrow keys to highlight the corresponding field. Then you can move the cursors:

- By using the dial.
- By making a direct numeric entry (as for T/div).
- By pressing SELECT to get a list on which you can select a predefined position (begin, center, end, etc.).
- By pressing the first character of one of the predefined positions on the list (e.g., X for the X position).

Back to the practical measurement:

- · Use the arrow keys to highlight the R field.
- Type X to position the R cursor to the X cursor in the middle of the screen.



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- Use the dial to move the R cursor to the falling edge of the first output (o1).
- Use the same procedure to position the S cursor to the rising edge of the last changing signal (o8).

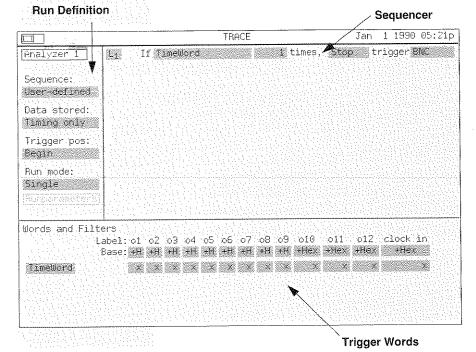
The time elapsed between these two events is displayed in the R-S field (45 ns):

The target needs at least 45 ns to toggle its first eight outputs.

## Specifying a Trigger Condition

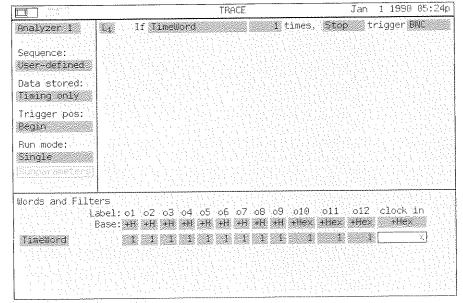
The acquisition you made before used the default trigger condition to trigger the analyzer. If you want the analyzer to trigger on a special condition, you must specify that condition. This is the purpose of the Trace menu.

• Press the TRACE key to access the Trace menu.



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Timing Acquisition	Getting Started with the PM 3580 or PM 3585		
The Trace Menu	The Trace menu is divided into three menu areas:		
	Run definition	S. C.	
	Sequencer	$- \bigcirc \downarrow$	
	Trigger words		
Menu Areas of the Trace Menu	In the run definition area, you can choose various acquisition parameters, such as the position of the trigger point in the memory.		
	In the sequencer area, you can define the "triggering scenario".		
	In the trigger words area, you can define each of the events of the scenario; they are called trigger words.		
An Example	For example: to see the end of one count cycle and the be- ginning of the next set the trigger condition such that the analyzer will trigger when all signals are high (i.e. at the		
	end of a cycle).		
	The first thing to do is to choose the "scenario": the trigger sequence. The default trigger sequence (TimeWord) fits perfectly:		
	L <sub>1</sub> If TimeWord 1 times, Stop		
	This means that the analyzer will sample and store data until the trigger condition is met. The trigger condition is met when the pattern is the same as the TimeWord.		
Defining the Events	After you have chosen the sequence, you must define		
	each of its events. In this case, it is simple, since only one trigger word is used, and the value of this trigger word is: "all output lines high".		
	To define the events:		
	Use the arrow keys to go to the trigger words area.		
	Go to the definition line of TimeWord.  Time of the Mark of t	,	
	<ul> <li>Type 1 in all the fields allocated to the outputs of the flip- flops (o1 - o12).</li> </ul>		
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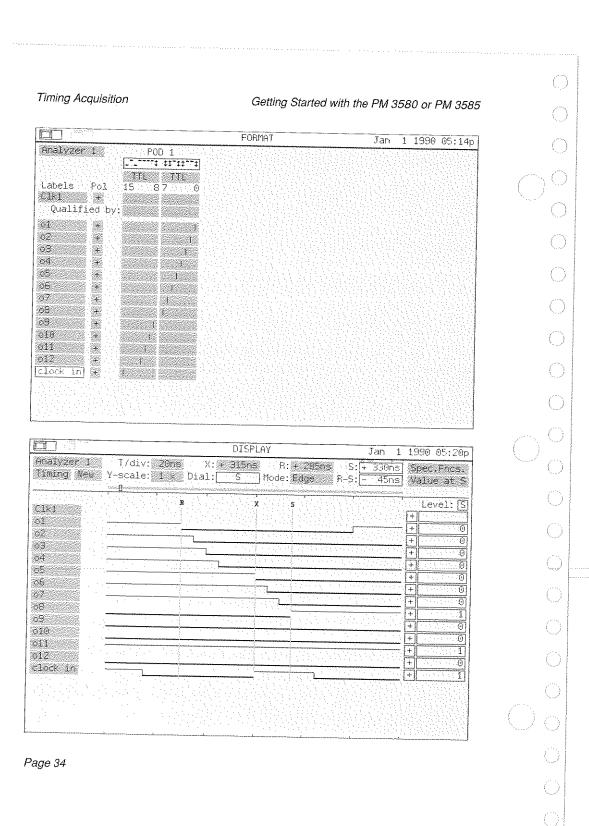
Now that the Trace menu is filled in with the right parameters, press the RUN key to make the acquisition.

An acquisition done with this trigger sequence is available on disk with the file name TIMETRIG.NEW. Please refer to "Getting Examples from the Disk" beginning on page 70 for instructions on how to recall this file.

## Summary

With timing acquisition, you can display and measure the timing relationships between digital signals. On the next page, you can see how the Format and Display menus were set up.

The next chapter explains another method of looking at the target: state acquisition.

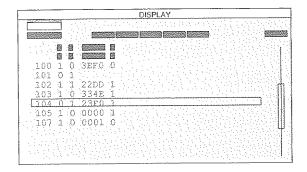


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State Acquisition

Getting Started with the PM 3580 or PM 3585

## **State Acquisition**



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State Acquisition

Getting Started with the PM 3580 or PM 3585

# The Purpose of State Acquisition

W ith state acquisition, logic analyzers store information strobed using an external signal coming from the application itself.

This clock signal is chosen such that, at the time it changes, all the important signals of the system have a stable and defined state.

Therefore, with state acquisition, you store only meaningful states of the system you are observing but you lose the continuous view you have with timing acquisition.

If you want to know more about state analysis, please refer to *The ABC's of logic analysis*.

### The Problem

After you have verified that the output lines of the counter toggle properly, you must check to see if it counts properly.

As mentioned before, to make a state acquisition, you use an external signal as a clock. In this case, it will be the clock input of the counter.

On each falling edge of this signal, the outputs change, incrementing the binary number they represent. The outputs must have stabilized before the next falling edge. Therefore you use the falling edge of the clock signal as the external clock for the analyzer.

If the target counts properly, the screen will show a list of sequential numbers (0,1,2,....,FFF and back to 0).

Your logic target should still be connected to pod connector 1 as described in the previous chapter.

## Specifying External Clocks

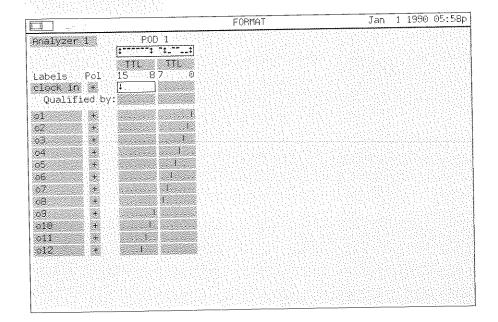
Connecting the Target

Once you have connected the signal used as an external clock, you must tell the analyzer which of its inputs is used as the external clock. Therefore we have to remove the

normal label we called *clock in*, and define the channel as an external clock instead. This allocation is done in the Format menu.

#### To make the allocation:

- Press the FORMAT key to go to the Format menu.
- Use the arrow keys or dial to move the cursor to the label clock in and press the DELETE key to remove it.
- Use the arrow keys or dial to move the cursor to the field called *Clk1*.
- Use the alphabetic keyboard to change the name to clock in.
- Use the arrow keys or dial to move the cursor to the right until you reach the allocation field containing channel 15.
- Press SELECT to enter edit mode.
- Use the arrow keys to move the cursor to channel 15.
- Press SELECT until the down arrow symbol (for falling edge) is displayed.



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State Acquisition

Getting Started with the PM 3580 or PM 3585

## Specifying a Trigger Condition

Since you want to see a counting sequence from the beginning, you need to trigger the analyzer for example, on the last value of a sequence (i.e., all outputs set to 1). You can do that on the Trace menu. You can also see that the trigger scenario is almost the same as for the last timing example.

The only change is, instead of using TimeWord as the trigger word, you will use a trigger word synchronized with the input clock, like  $sw_1$ .

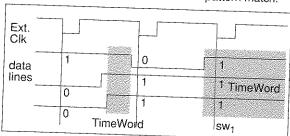
Synchronous and Asynchronous Trigger Words What is the difference? Suppose that, if all the lines do not toggle between two stable states at the same time, you can have one or several transient states (thus of short duration).

If you specify a trigger condition with TimeWord, which is totally asynchronous from the external world (i.e., the target system), the analyzer would be able to trigger on one of these transients. A state trigger word, such as sw<sub>1</sub>, is examined at the same time as the external clock you use on the target. This is a way to be sure to trigger on well-defined events.

The diagram below shows a typical situation where you are matching on a 111 signal.

The shaded areas show where the TimeWord would match. The vertical dotted lines are where data are sam-

pled on the falling edge of the clock. Only at the third falling edge of the external clock does the 111 pattern match.



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### Setting Up a Trigger Sequence

To set up the desired trigger sequence, do the following:

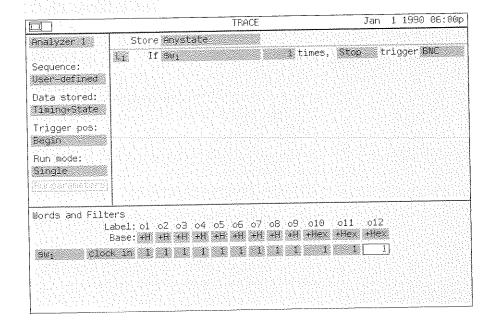
- Press the TRACE key to go to the Trace menu.
- Use the arrow keys to go to the trigger sequencer menu field with TimeWord in it:



Press the S key to indicate you want a *state word*. A list of state words is shown; press 1 or SELECT to select  $sw_1$ . You must also tell the instrument which value the trigger word  $sw_1$  should recognize.

This is done as follows:

- Use the arrow keys to move to the trigger words area at the bottom of the Trace menu.
- Use the arrow keys to go to the definition line of sw<sub>1</sub>.
- Type in the value needed in all the fields: 11111...11. The trigger words menu is updated as shown below:



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### State Acquisition

## Getting Started with the PM 3580 or PM 3585

## The State Display

Now, press the RUN key. Immediately you see a state listing on the screen, showing the state of each individual output of the counter on each falling edge of the input clock.

Englishment of the second	DISPLAY	Jan	1	1990	06:08p
Analyzer 1 State New	Hamila V . No. a medicontrol .	0004			Fries.
Label: Time Base: Abs		meet mindered		[2]	
-0006 - 43 -0005 - 36 -0004 - 29 -0003 - 21 -0002 - 145 -0001 - 76	50ns	1 1 1 1 1	1 1 1 1 1 1 1		🗓 ingendengkan kamanan nagan segangan pe
	ns	1	1 0		A CONTRACTOR OF THE CONTRACTOR
S 0004 + 290 0005 + 365 0006 + 435	ns	0 0	0		
0007 + 510 0008 + 580 0009 + 655	ns v 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0		2000
0010 + 725 0011 + 800		0 0 8	0 0		

This acquisition is also available on disk with the file name STATE.NEW. Refer to "Getting Examples from the Disk" beginning on page 70 for instructions on how to load this file.

The left column (Time) on the State Display menu is always available to the user. It gives very valuable information: The time elapsed between a certain cycle and the trigger point. For example, the value 290ns at the S cursor (line 004) means that, between the trigger event (value 0ns) and cycle 4, there was a delay of 290ns.

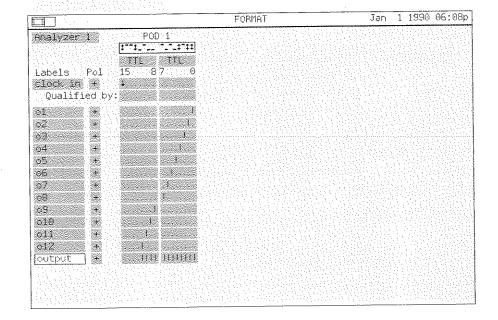
A tick  $(\checkmark)$  in the *clock in* column indicates that the data on that line was captured with that clock signal. This is more significant when you have more than one clock.

# Grouping Signals Under a Label

You can scroll through this list by turning the dial (by default allocated to that task – Y for vertical scroll).

It would, however, be more useful to have all the outputs re-grouped under a single label name and their combined value shown in hexadecimal format. To do that, you must define a new label in the Format menu:

- Press the FORMAT key, and the Format menu appears.
- Use the arrow keys or dial to go to the last label (012).
- Press the *INSERT* key, and a new label appears under the last one. This will have the default name *a*.
- Type in the new name of this label, for example output.
- In the allocation field, use the *SELECT* key to assign your 12 outputs to the label.



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### State Acquisition

## Getting Started with the PM 3580 or PM 3585

						DISP	LAY					Ja	n 1	1990	1 06	1 Qr
	malyze State	r 1 New	Disa: None	] Y: Dial:	Ŋΰ	1 <b>02</b> Y	l'ic	R: >de:	00 Lin		5 8-S	: 00			G, Fn	~
	Label: Base:	output #Hex	Time Abs	lock <u>i</u> n	61 44	22 +1	23	94	95	06	67,	78 0 H H	9 01	0 o1 +H	COL CHES	
RYS	0008 0009 0010	ff9 ffa ffb ffc fffc fff fff 601 002 003 004 005 006 007 008 009	- 435ns - 360ns - 290ns - 215ns - 145ns - 70ns + 0ns + 75ns + 145ns + 125ns + 220ns + 365ns + 365ns + 530ns + 580ns + 580ns + 725ns + 800ns	V V V V	Í.	1 1 0 0 1 1 0 0 0	() 1 1 1 1 () ()	0 0 0 0 1	0 0 0 0	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			Son Desir telepantile kelalah k

output
[+Dec]

BASE

Binary
Octal

Decimal

Hexadecimal

Return to the Display menu. You now see the hexadecimal values of the combined signals in the column under *output*.

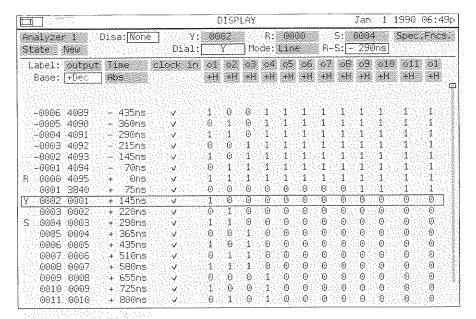
To change the radix (the *Base*) in which the *output* column is displayed, do the following:

- Use the arrow keys to move to the field under the *output* label on the line called *Base*.
- Press the SELECT key to get a list with the different bases available.
- Use the arrow keys or dial to choose one of them. In the example at the left, Decimal was chosen.
- Then press the SELECT key to close the list and change the base. The result is shown in the figure on the next page.

Now switch back to the hexadecimal base and inspect the state list in detail. You can see that one of the numbers is not correct in the list: F00 appears instead of 000 on line 0001.

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Ascii

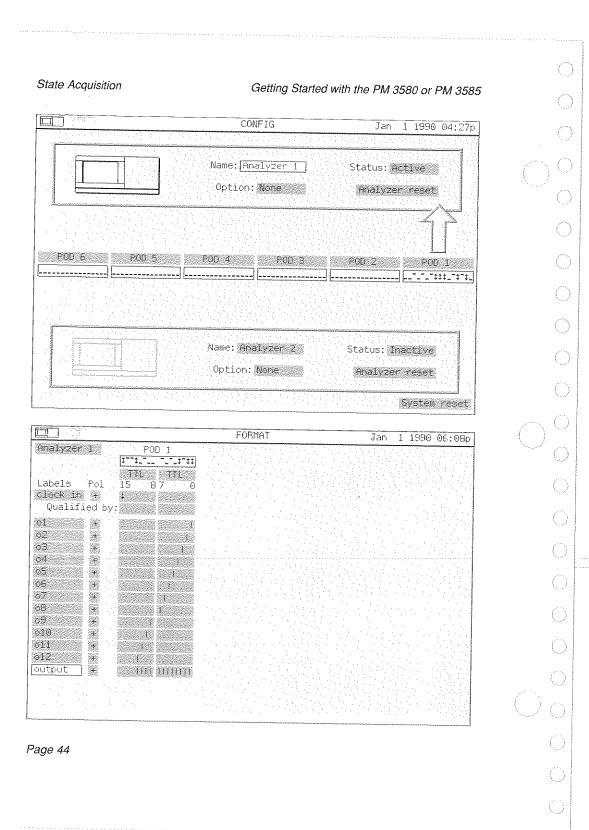


So, it seems that the target system has some problems. You know when it occurs, but you do not know why. In the next chapter, you will use another mode of these logic analyzers to find out why.

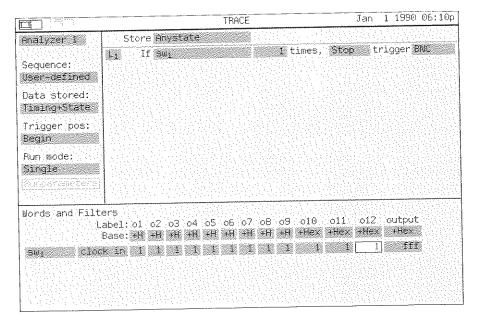
## Summary

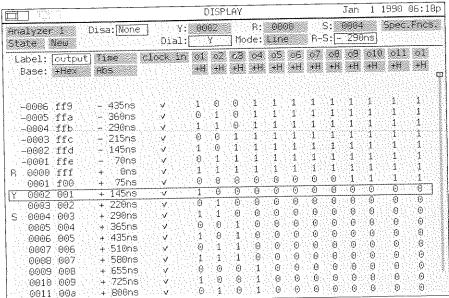
With state acquisition, you tested, fast and efficiently, the functionality of the clock-driven target. On the next two pages, you can see the four menus that you used to do this. On the other hand, you did not see most of the time-related information you got with timing acquisition which could be useful in understanding the "why" of a problem.

In the next chapter, you will combine these two modes to see both views of the target together.



#### State Acquisition

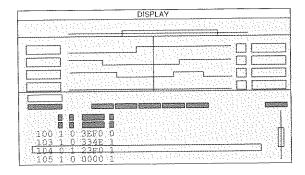




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State Acquisition	Getting Started with the PM 358	20 or DM 0505
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		and the second s
		A management of the second
		Vermouth.
발발 경험 등로 관리를 위한다. 기본 경우 전기를 보고 있는데		
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46		

# Dual Analysis Per Pin (DAPP) Mode

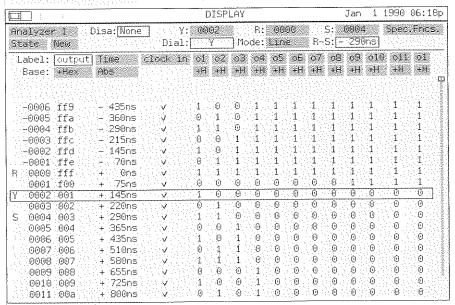


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Dual Analysis Per Pin (DAI	PP) Mode Getting Started with the PM 3580 or PM 3585	(
Why DAPP?	n the previous two chapters, you have seen that timing and state acquisition are complementary to exploring and testing a digital system.	(
	The Dual Analysis Per Pin (DAPP) mode, an exclusive feature of the PHILIPS PM 3580 logic analyzer family, allows you to get timing and state acquisition on all channels at the same time with a common triggering sequence.	
	If you want to know more about timing and/or state analysis, please refer to <i>The ABC's of logic analysis</i> .	
Back to the Practical Problem		C
	With state acquisition, you checked the binary counter. You saw that in some cases, the counter did not count properly.	C
	If there had been a timing measurement at the same time as the state acquisition, you would have been able to see immediately what really happened on each channel for each unexpected state in the state list.	
Connection		(**
	Since all the signals were previously connected for timing and state acquisition, you do not need to do anything special, because the <i>DAPP</i> architecture allows you to make a state and a timing acquisition simultaneously on all pins.	C
Setup of the Logic Analyzer		$\bigcirc$
	The default acquisition mode for PM 3580/PM 3585 logic analyzers is <i>DAPP</i> mode, as soon as an external clock is defined. So, the last acquisition you did was already made	0
	in <i>DAPP</i> mode even though you perhaps did not realize it. So, how do you display all this information? Since the information you need is already in acquisition memory, you	0
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do not need to do a new acquisition or read in a file, you simply do the following:

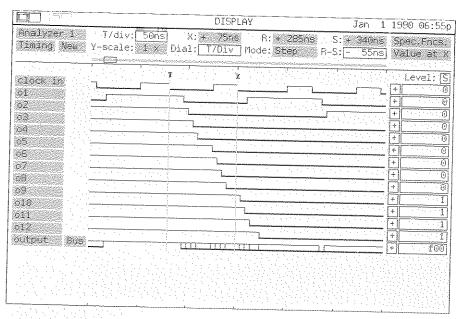
• Press the *DISPLAY* key to return to the state list of the last acquisition (STATE.NEW).



- Scroll the data with the dial until the first bad state (F00 instead of 000) is in the center of the screen in the small rectangle.
- · Go to the field called "State" (beginning of the 2nd line).
- Press the SELECT key to switch from the state to the timing acquisition display.
- Go to the X field and press Y to set the X cursor position to be the same as the Y cursor position of the state list.

Dual Analysis Per Pin (DAPP) Mode

Getting Started with the PM 3580 or PM 3585



The center of the display window (X) is now aligned with the time when the state in the rectangle was sampled. It is now clear that, because of too long a propagation delay in the flip-flops of the counter, the value "000" is never stable on the falling edge of the clock.

Determining the Maximum Clock Speed

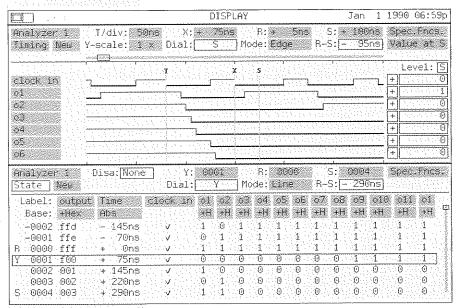
You can go further and try to determine the maximum clock speed that you can use on the target to avoid a false count.

To do this, just do the same kind of measurement you did in "Timing Acquisition", "Measuring a Time Difference" on page 29, to measure the time delay between the falling edge of the clock and the toggling of the last signal (o12).

The toggling time is 95 ns. To always have proper counting, the count information should be stable before the next falling edge of the clock; therefore, the clock period should be greater than the time you measured. Thus the clock frequency should be less than 10 MHz.

Dual Analysis Per Pin (DAPP) Mode

You can also see both the timing and state displays on the same screen, as shown below. All you do is press the *HOME* key to ensure you are on the Analyzer field, then press *INSERT*. This displays the two windows as shown below.



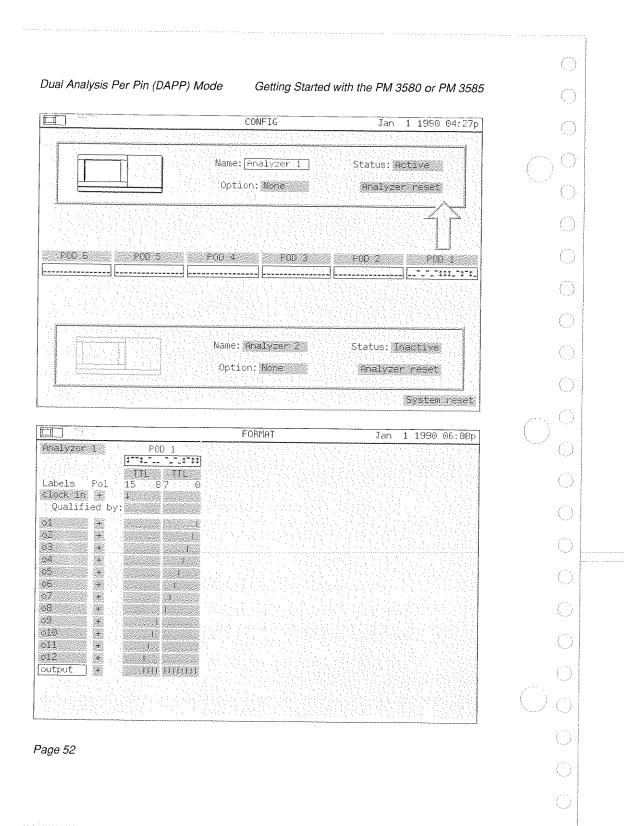
To switch between the two windows, use the *DISPLAY* key. To remove one of the windows, press the *DELETE* key on the Analyzer field of the window you wish to delete.

## Summary

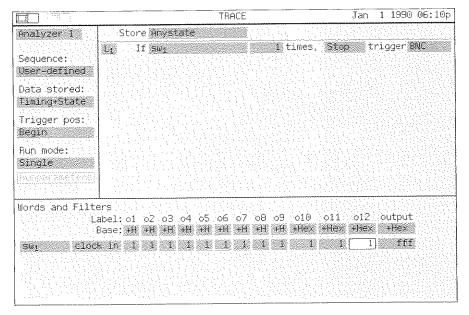
The last three chapters illustrated the respective advantages of state and timing acquisition, and the benefits of the exclusive Dual Analysis Per Pin (DAPP) mode.

On the next two pages, the four contributing menus are shown.

The next chapter introduces another feature of this range of logic analyzers: microprocessor disassembly support.



### Getting Started with the PM 3580 or PM 3585 Dual Analysis Per Pin (DAPP) Mode

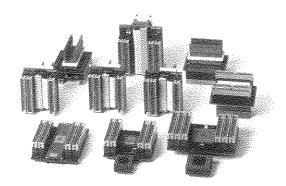


	DISPLAY Jan	1	1990 06:	59p
Analyzer 1 Timing New	T/div: 50ns X: + 75ns R: + 5ns S: + 100 -scale: 1 x Dial: S Mode: Edge R-S: - 95	56999ac	Spec.Fr Value a	2596/47284
clock in oi oi oz	I X S	1_1	Level + + + + + + + + + + + + + + + + + + +	: [5] 0 1 0
o4 o5 o6 Analyzer 1	Disa:[None] Y: 00001 R: 00000 S: 0000	SERVICE SERVICE	+ + + Spec.Ft	0 0 0
State New Label: outpu Base: #Hex	Abs +H +H +H +H +H +H +H +H		011 0 #H #	ı,
-0002 ffd -0001 ffe R 0000 fff Y 0001 f00	- 70ns v 0 1 1 1 1 1 1 1 1 + 0ns v 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1	i i i i i i	
0002 001 0003 002 S 0004 003	+ 145ns v 1 0 0 0 0 0 0 0 0 0 0 + 220ns v 0 1 0 0 0 0 0 0 0 0 0 0 + 290ns v 1 1 0 0 0 0 0 0 0 0	0	0 0 0 0	08/08

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Dual Analysis Per Pin (DAPP) Mode	Getting Started with the PM 3580 or PM 3585	
		<u> </u>
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## Use of Microprocessor Disassembly



Use of Microprocessor Disassembly

Getting Started with the PM 3580 or PM 3585

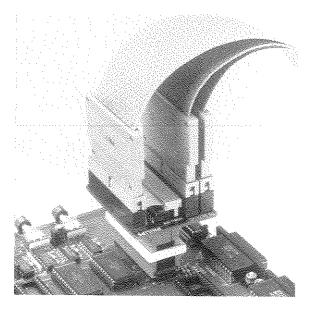
## What is a Disassembler?

When you work on simple clock-driven digital circuitry, timing and state information usually are enough to let you understand what is going on.

However, if you are testing a microprocessor-controlled board, the task is more difficult.

In addition to observing the signals, you must also understand and trace the program executed by the microprocessor. This means you must translate the state data into a more understandable form, especially for the software engineer. Disassembly software is a tool that can be used to translate the numbers of the state display back into a list of assembly instructions.

A microprocessor adapter is supplied with each disassembler. This simplifies the connection between the logic analyzer and the microprocessor under test.



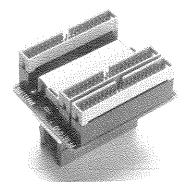
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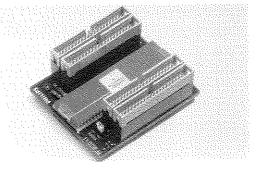
## The Problem

The problem is to check which part of a program is executed after a board with a 16-bit microprocessor is reset. To do this, you will use the logic analyzer with the disassembly support dedicated to that microprocessor (in the example, a MC 68000 from MOTOROLA).

## Connection

The microprocessor adapter makes it easy to connect to a microprocessor. Simply clip the clip version of the microprocessor adapter onto the chip or insert the socket version between the chip and its socket.

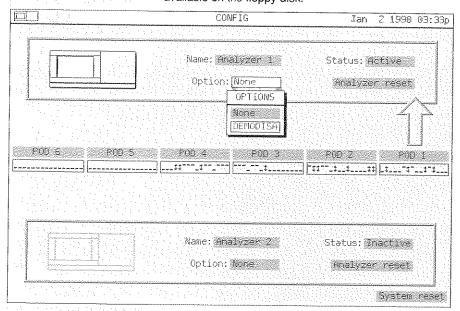




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## Setup of the Logic Analyzer

The setup of the analyzer with a disassembler is even easier than for normal logic observation. The Configuration menu has a field called "Option". Its default value is "None". By pressing *SELECT*, you get a list of all the disassemblers available on the floppy disk.

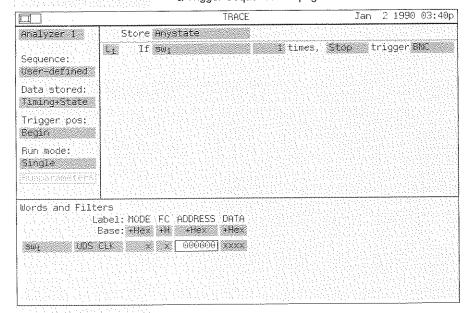


To choose the right disassembler (here called *Demodisa*): highlight the selection with the arrow keys or dial. Press *SELECT*. The disassembler translation software and the associated setup are then loaded.

Note: a confirmation popup may appear asking you if you want to remove settings (i.e., previous settings) if you have not just switched on. Answer yes.

Now all you must define are the events that will stop the acquisition. To do this:

- Press the TRACE key to go to the Trace menu.
- In the sequencer area, change the trigger sequence from TimeWord to sw<sub>1</sub>, as in "State Acquisition", "Setting Up a Trigger Sequence" on page 40.



The first thing that the 68000 microprocessor does after reset is read addresses 0H, 2H, 4H, and 6H to initialize some registers.

To capture data starting after Reset, you just specify address 0H as the trigger event. As the default trigger sequence is appropriate (if  $sw_11$  times, stop), you just have to fill in  $sw_1$  with the correct pattern, i.e., 000000 Hex for the address.

Once the trace is specified, press *RUN* and wait for an occurrence of RESET.

While the analyzer is waiting for the trigger condition, a special window displays the present status of the sequencer, and the box at the top left of the screen flashes.

Use of Microprocessor Disassembly

Getting Started with the PM 3580 or PM 3585

ACQUISITION PROGRESS
Analyzer 1: 1
Analyzer 2: Inactive

As soon as the trigger sequence is met, the window disappears and the state display menu is shown.

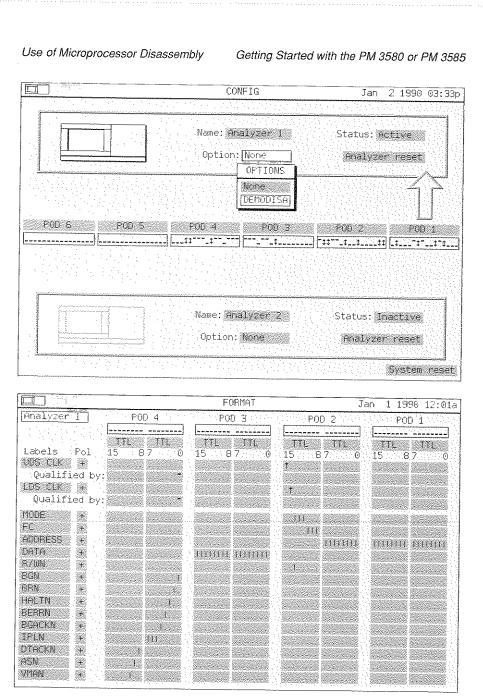
		DISPLAY	Jan 2 1990 05:53p
(Analyzer i	Disa:On	Y: 9005 P: 9008	S: Volg Specifica.
State New	Parameters D	ial: Y Mode: Line F	R-S:[-10.3us]
Label: MODE	FC ADDRESS DAT	A 68000 Instructions	Time L
Dase: #Hex	th the the		Aps.
-0001 4	6 000460 534	e SUBQ.W ≠+1,A6	- 272ms - 7
0000 4	6 000000 000		A that A that A wons A A
8001 4	6 000002 boo	アー・ルー・ストン さんしんしょく かんしん しょうしゅう こうしょう ごんさんしゃ	+1560ns
9002 4	6 000004 000		+3125ns
9003 4 9004 4	6 000006 070		+4696ns
0004 4	-6 000700 4eb -6 000702 043		+6255ns
0007 0	-5 000702 043 -5 00affc 000		+8445ns
R 0008 0	5 00affe 070		+12.5us +14.4us
0006 4	6 000430 327		+10.5us
Y 0009 4	6 - 000432 400		+16.0us
0010 4	6 000434 123	o NOVE.B .≉98,D1	77.5us 1.417.5us 1.4
9911 4	6 000436 009	# 연극 등 하는 연극 하는 등 등 등 하는 다시 하는	+19.1us
0012 4	6 000438 128		+20.6us
S 0014 Z	5 004006 9		+24.1us ∦
0013 4		5 BTS	+22.2us
0016 4 0017 4	5 00affc 000 5 00affe 070		+27.2us
9917 4 9018 4 · ·		The second secon	+28.8us
0019 4	. 6 000706 400	c MOVEA.W ≭4001,A2	430.3us
9949 7	0 000708 400	L	+31.9us

This acquisition is also available on disk with the file name DEMODISA.NEW. Refer to "Getting Examples from the Disk" beginning on page 70 for instructions on how to load this file.

This list is formatted according to the setup loaded with the disassembly software.

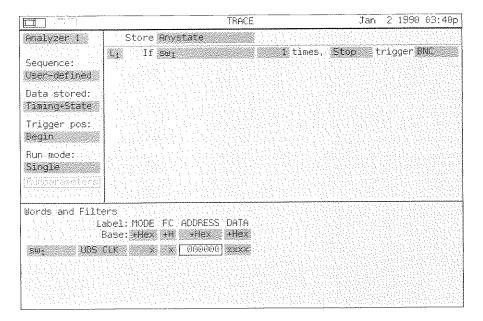
With this disassembled list, you can do exactly the same you did before: scrolling, setting cursors, etc..

Use of Microprocessor Disassembly



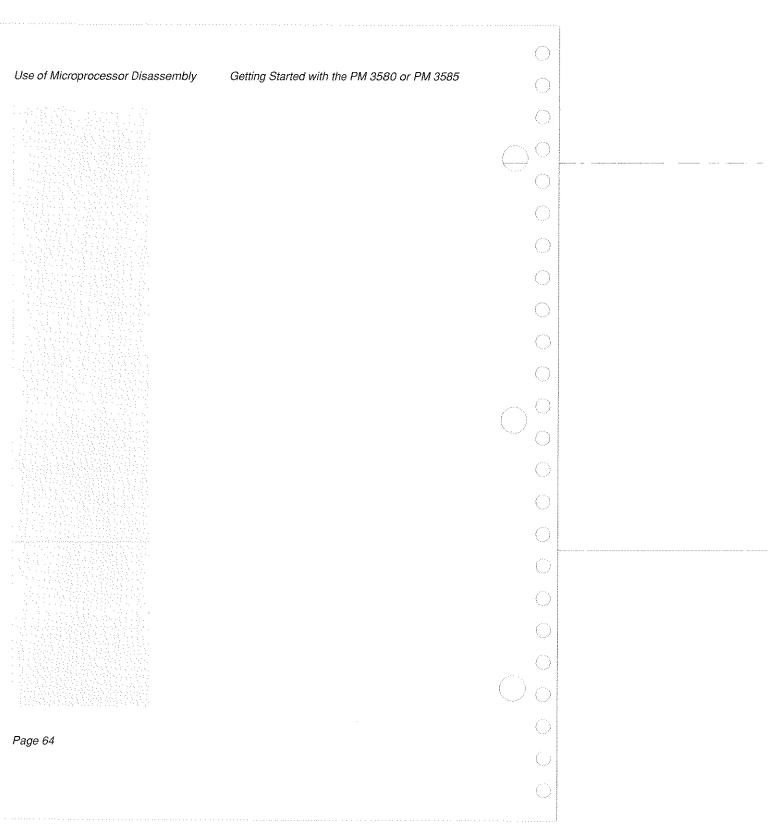
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## Getting Started with the PM 3580 or PM 3585 Use of Microprocessor Disassembly



				***************************************	DISP	_AY	Jan	2 1990 05	5:53p
Analyzer	- 1	Dí	sa:On	N 10 1 1 1 1 1 1	Y: 0009	R: 0008	S: 001	SPORTAGE - GROSSMANDSCHARGES	rics.
State	lleu	P	mameters	Dia	1:[Y	] Mode: Line	R-S: -10.	3us)	
Label:	MODE	F	ADDRESS	DATA	68000 Ins	tructions		Time	T.
Base:	Hex	AH.	+Hex	÷Heλ				Abs	
-0001	4	6	000460	534e	SUBQ.W	≠+1,A6		- 272ms	<b>!</b> !
0000	4	6	000000	0000		RESE		→ Ons	
0001	4	6	000002	b000				+1560ns	
9002	4	6	000004	0000				+3125ns	
0003	4	6	000006	0700				+4690ns	
0004	4	6	000700	4eb8	JSR	0430.W		+6255ns	
0005	4	6	000702	0430				+8445ns	
0007	0	5	00affc	0000		mw		+12.5us	
R 0008	0	5.	00affe	0704	医乳头 医肾上腺 医二角性结合	mw		+14.4us	200
0006	4	Б.	000430		MOVEA.W	#4007,A1		+10.6us	
Y 0009	4	-6	000432		granda eta g			+16.0us	
0010	4	ъб.	000434		MOVE.B	≠98,Di		+17.5us	
0011	4	6	000436	0098				+19.1us	
0012		6	and the contract of the contra		MOVE.B	D1,(A1)		+20.6us	
5 0014	2	5	004006	98		Mid		+24.1us	
0013		-6	00043a	4e75	RTS			+22.2us	
0016		5	00affc	0000		mr		+27.2us	医二氯化物 经基
0017	1. 1. 1. 1. 1. 1. 1.	5	00affe	0704		mr		+28.8us	
0018	4 :: :	fo :		and the first of	MOVEA.W	#4001,A2		+30.3us	4.30年十二年前
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Getting Started with the PM 3580 or PM 3585 **Making a Printout** Page 65

## Making a Printout Getting Started with the PM 3580 or PM 3585 sing the printout facility of your logic analyzer allows you to make hardcopies of settings and acquisition results. To use it, you need an "Epson-compatible" printer (most printers used with PCs are of this type) with a Centronics interface, and the cable used to link a PC to this printer (male 25-pin 'D' to Amphenol 36-pin male). Then link your printer to the logic analyzer via the cable using the 25-pin 'D' Centronics connector on the rear panel of your logic analyzer. The installation is now complete. To start a printout at any point, just press the PRINT key. PRINT The print pop-up menu appears as at left. Just press SE-Print Screen LECT to start the print-out. To stop the print at any time, Handoopy to disk press any key. A confirmation pop-up appears so that you can continue or abort the print-out. To cancel the print from the print popup menu, select the box with the 'x' (the cancel field). The other option on the print menu ("Hardcopy to disk") allows you to 'print' to a floppy disk in a special format. See the User Manual for more information.

Getting Started with the PM 3580 or PM 3585 Getting Examples from the Disk Page 67

A II the acquisitions on which the examples in this manual are based are stored on the system floppy disk delivered with the instrument.

If you want to practice "real life" examples you simply recall them from disk.

TIMING.NEW is the timing example from "Timing Acquisition" beginning on page 21,

TIMETRIG.NEWis the second timing example from "Timing Acquisition" beginning on page 21.

STATE.NEW is the state example from "State Acquisition" beginning on page 36 and "Dual Analysis Per Pin (DAPP) Mode" beginning on page 50.

**DEMODISA.NEW** 

is the disassembly state example from "Use of Microprocessor Disassembly" beginning on page 58. It is associated with the disassembly software file DEMODISA.DIS.

To recall one of these examples, do the following:

 press the I/O key to see the screen at the top of the next page.

The I/O screen is divided in two parts:

- The top of the menu where you can invoke all disk utilities (load, store, rename, copy, delete, format).
- The large lower area showing the list of all the files available on disk.
- Use the arrow keys to move to the field "Load".
- Press the SELECT key, and a file selection window appears.
- In the file entry field, use the arrow keys to go to the name of the file you want to load (for example TIMING.NEW),
- When you are sure that the name you highlighted is correct, press the SELECT key to accept it; then select the return (
  ) button to start loading.

