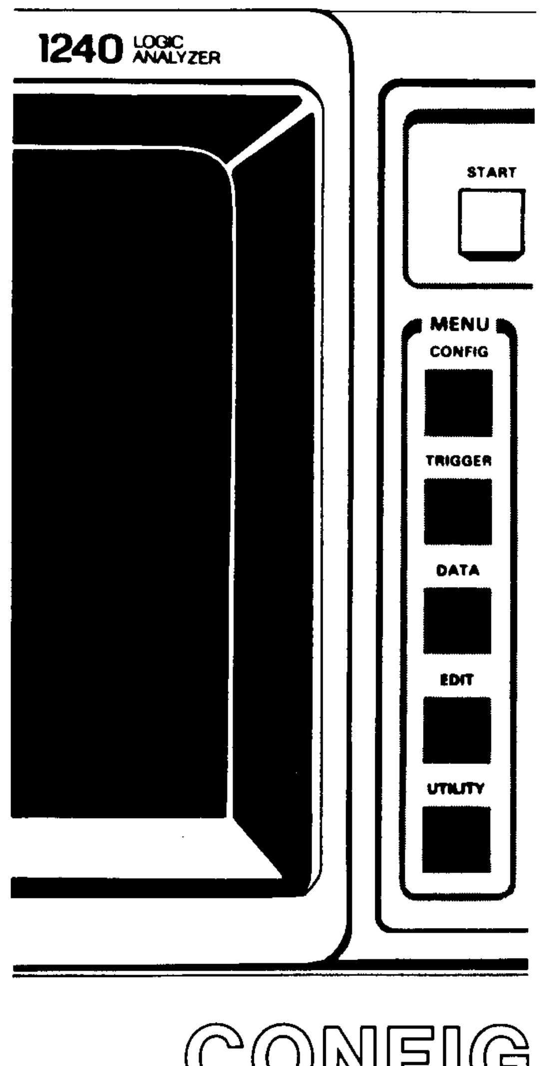
3


1240 LOGIC ANALYZER
START
MENU
CONFIG
TRIGGER
DATA
EDIT
UTILITY

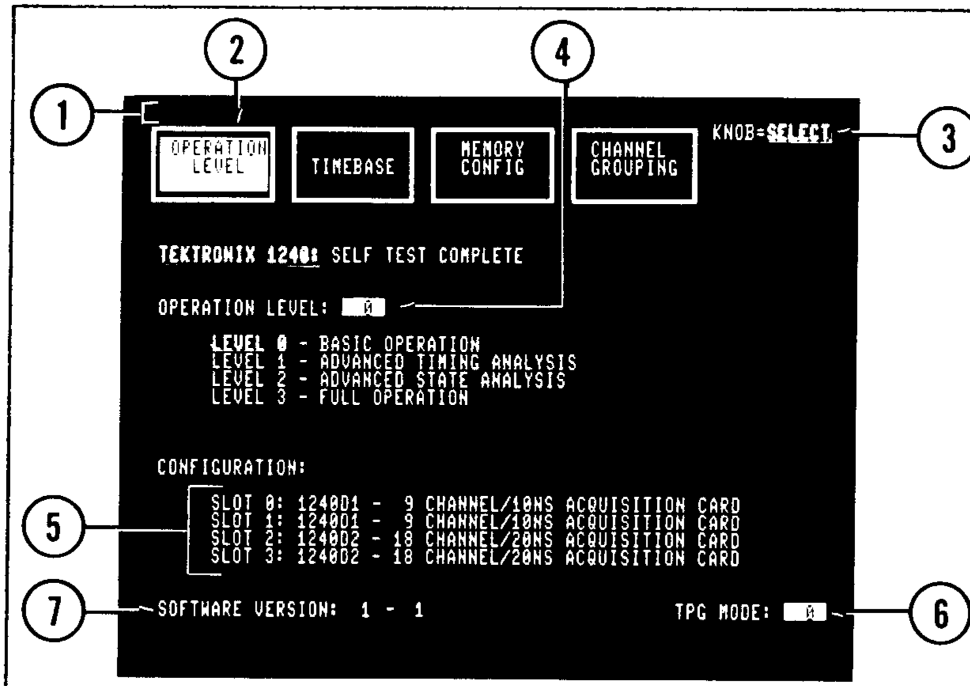
CONFIG

The CONFIG key on the front panel allows you to access the Operation Level, Memory Config, Timebase, and Channel Grouping menus. These menus work together to determine how the 1240 acquires and stores data.

OPERATION LEVEL

The 1240 displays the Operation Level menu at power-up. See Figure 3-1 for a menu display.

The four levels are: 0 (Basic Operation), 1 (Advanced Timing Analysis), 2 (Advanced State Analysis), and 3 (Full Operation). Level 0 supports most state and timing analysis applications. Levels 1 and 2 have extra features that provide more flexibility and problem-solving power than is available under Level 0. All features are available in Level 3. An overview of the differences between the levels is provided in Table 8-10 in the *Reference Information* section.



1 Reserved for prompts and error messages.
2 Soft key in reverse video indicates which menu is currently displayed.
3 Function of the knob in this menu.
4 Selects the Operation Level, **0 - 3**. The Operation Level determines what features are available in other menus. The label for the selected level is highlighted.
5 List of the acquisition cards installed.
6 Selects the Test Pattern Generator (TPG) mode. Refer to *Test Pattern Generator Information* in Section 8 for details.
7 Software version installed in your instrument.

4340–22

Figure 3-1. Operation Level menu power-up default display. The 1240 displays this menu at power-up. The blinking cursor must reside in a field before changes can be made to that field. Move the cursor from one field to another with the CURSOR keys. Highlighted areas are for information only and cannot be accessed by the cursor.

The field at the bottom of the menu allows you to select the mode of operation for the Test Pattern Generator (TPG). The TPG is a useful learning aid for the beginning user as well as a valuable tool for instrument verification. It allows the beginning user to familiarize himself with the 1240 without having to connect to an actual system under test. The TPG simulates a data source by sending data patterns to two sets of pins located directly above the probe connections on the right side panel of the 1240. Probes connected to these pins acquire data just as they would from a system under test.

Refer to *Test Pattern Generator Information* in Section 8 for a description of the TPG modes, a listing of the patterns, and TPG timing information.

NOTE

When you acquire data from the TPG, you must set the THRESHOLD *fields for the cards connected to the TPG outputs to* **TPG**. *Refer to Figure 3-6 in the description of the Memory Config menu for information about the* THRESHOLD *field.*

TIMEBASE

The Timebase menu specifies the number and type of timebases that can be used to control data acquisition. The power-up default condition is one asynchronous timebase with a 20 ns period and no clock qualification.

NOTE

Timebase specifications are set up in this menu, but ***pod-timebase assignments made in the Memory Config menu determine what timebases are actually used.*** *Refer to Pod-Timebase Assignments later in this section under the description of the Memory Config menu.*

ACTIVE TIMEBASES

The 1240 can acquire data using one or two timebases. In Operation Levels 2 and 3, the selection in the ACTIVE TIMEBASES field determines the number of timebases (see callout 1 in Figure 3-2). The selections are **T1 ONLY**, **T2 ONLY**, and **T1 AND T2**. Selecting **T1 AND T2** lets you acquire data simultaneously from two sources with different clock rates.

In Operation Levels 0 and 1, T1 is the only available timebase; the ACTIVE TIMEBASES field is not displayed.

You can specify T1 to be an **ASYNC** (asynchronous) or **SYNC** (synchronous) timebase; T2 may be **SYNC** or **DEMUX**. The **DEMUX** selection customizes T2 for demultiplexing; see *Demultiplexing* later in this section for more information. Detailed clock qualification is available for all three timebase types.

GLOBAL EVENT RECOGNIZER CLOCKED/UNCLOCKED

Generally, logic analyzers test the trigger condition only against data present at the probe tips at the sample point. The 1240 can recognize events regardless of when they occur. In other words, an event does not have to coincide with a sample point in order for the 1240 to trigger on it. The only requirement is that the data be present for the amount of time defined by the global event filter period. (The global event filter specifies the amount of time data must be present at the probe tips to be considered an event. Refer to *Global Event Recognizer* in Section 4 for more information about the filter.) This feature applies to the global event recognizer [1] and is controlled by the GLOBAL EVENT = **CLOCKED/UNCLOCKED** field in the Timebase menu (see callout 2 in Figure 3-2).

The GLOBAL EVENT = **CLOCKED/UNCLOCKED** field is displayed when the Operation Level is 1 or 3. The **CLOCKED** selection means that only events coinciding with a sample point are compared to the global event recognizer. When you choose **UNCLOCKED**, data from the system under test is continuously compared to the global event recognizer; the global event can be satisfied by any event that meets or exceeds the global event filter period.

Figure 3-3 demonstrates the **UNCLOCKED** selection. Use **UNCLOCKED** when you want to be able to trigger an an event that occurs between occurrences of the sample clock.

---

[1] The global event recognizer is specified in the Trigger Spec menu. It is called "global" because you can specify an event using values for all connected channels (regardless of the timebase they are associated with), and because it is in effect during the entire acquisition. Refer to *Global Event Recognizer* in Section 4 for more information.

Data is not stored in acquisition memory unless it occurs at a sample point. Therefore when using **UNCLOCKED**, it is possible to trigger on an event that does not get stored. This is demonstrated in Figure 3-3. To see the event, reacquire with a faster clock.

ASYNCHRONOUS TIMEBASE

Only timebase T1 can be **ASYNC**. Refer to the top portion of Figure 3-2 for descriptions of the fields that define an asynchronous timebase.

The default asynchronous clock period is **20 NS**; other selections are available from **10 NS** to **1 S**. The 10 ns period is not always available; see *10 ns Acquisition*, next.

10 ns Acquisition. The **10 NS** selection for the ASYNC clock period is only available if:

- At least one 9-channel card (1240D1) is installed.
- All 18-channel cards (1240D2) are assigned to timebase T2 in the Memory Config menu (requires Operation Level 2 or 3).
- Glitch storage is disabled (**GLITCHES OFF** selected in the Memory Config menu).

If 9- and 18-channel cards are installed, use the following procedure to change to a setup that supports 10 ns acquisition:

1. In the Operation Level menu, select Level 2 or 3.
2. In the Timebase menu, select ACTIVE TIMEBASES: **T1 AND T2.** Select TIMEBASE 1: **ASYNC.**
3. In the Memory Config menu, select **GLITCHES OFF**. Select **T2** in the TIMEBASE field for each 18-channel card.
4. In the Timebase menu, select **10 NS** for the asynchronous clock period.

If no 18-channel cards are installed, the **10 NS** selection is available if **GLITCHES OFF** is selected in the Memory Config menu.

Glitches. Glitches can be acquired only on 9-channel cards. In addition, glitch acquisition requires a timebase selection of T1 ASYNC and a clock period of at least 20 ns (glitches cannot be acquired on T2 or with a synchronous timebase); GLOBAL EVENT = CLOCKED must be selected. Finally, GLITCHES ON must be selected in the Memory Config menu (see callout 4 in Figure 3-6.)

Qualification. Each pod has one clock/qualifier line. The 1240 determines clock qualification by ANDing together the C/Q line from each pod. For each C/Q line, you can select 1 or 0 (for signals above or below the acquisition card threshold set in the Memory Config menu), or a blank (no qualification). The 1240 samples data only when the qualifier conditions are true.

The 1240 does not support clock qualification for T1 when both T1 and T2 are active and T1 is ASYNC 10 NS. When these selections are made, the T1 qualifier fields are not displayed.

SYNCHRONOUS TIMEBASE

Both T1 and T2 [2] can be **SYNC**. The second portion of Figure 3-2 shows the fields used to define and qualify a synchronous timebase.

A synchronous timebase is specified as the logical OR of the transitions on the clock/qualifier line from each pod. For each C/Q line, you can select (rising edge), (falling edge), (rising or falling edges), or a blank (signal ignored). The default synchronous timebase is the rising edge of the signal on the pod P0 C/Q line (see callout 6 in Figure 3-2).

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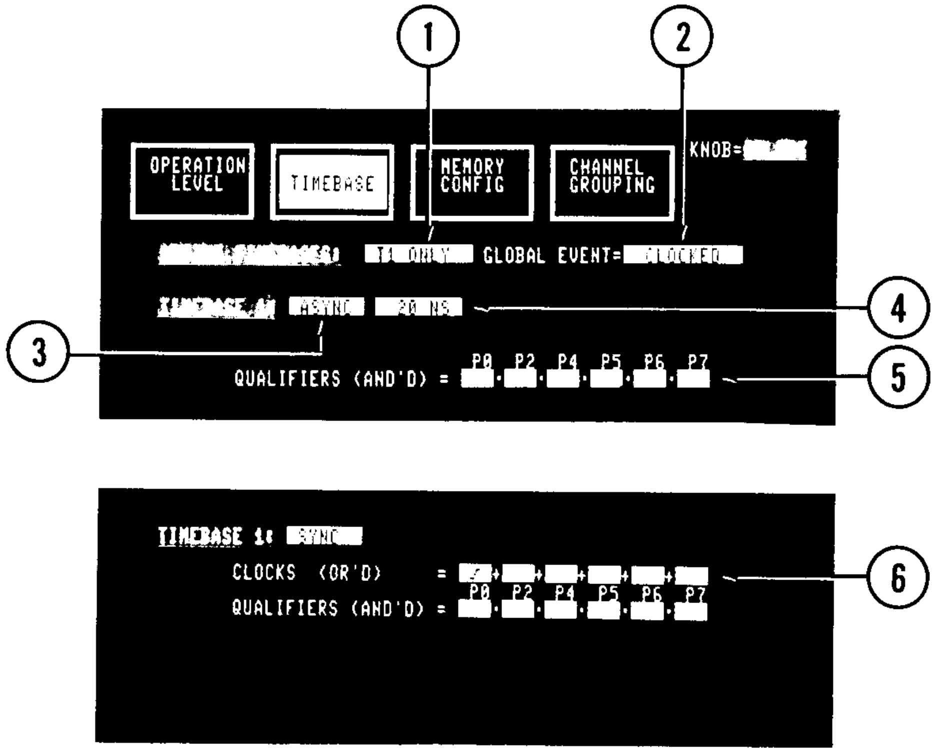
[2] T2 is available only in Operation Levels 2 and 3.



1 Selects which timebases can be used to control data acquisition. Selections are **T1 ONLY**, **T2 ONLY**, **T1 AND T2**. Displayed only in Operation Levels 2, 3. In Levels 0 and 1, only timebase T1 is available.

2 Displayed when Operation Level is 1 or 3. **CLOCKED**: events that coincide with a sample point are compared to global event recognizer. **UNCLOCKED**: data continuously compared to global event recognizer; an event can be recognized only if present for at least the time defined by the global event filter period (see Section 4).

3 Type of timebase for T1; Selections are **ASYNC**, **SYNC**.

4 Asynchronous clock period. Displayed only if **ASYNC** selected. Range is **10 NS** to **1 S** in a 1-2-5 sequence. Default is **20 NS**. **10 NS** selection not available if glitch storage enabled or 18-channel cards assigned T1 in the Memory Config menu. See *10 ns Acquisition* in this section for details.

5 ASYNC and SYNC timebases are qualified in the same manner: AND of the C/Q line from each pod. Pod IDs are displayed over each field. Default is all blanks (no qualification). Other selections are **1** and **0**, for signals above or below the card threshold.

6 Synchronous clock is the OR of the C/Q line from each pod. Pod ID numbers shown below the fields. Selections are ⎍(rising edge), ⎍(falling edge), X(rising or falling edges), or a blank (signal ignored). Default specification of a synchronous clock is the rising edge of the signal on the C/Q line for pod P0.

4340–23

Figure 3-2. Timebase menu: specifying an ASYNC or a SYNC timebase.

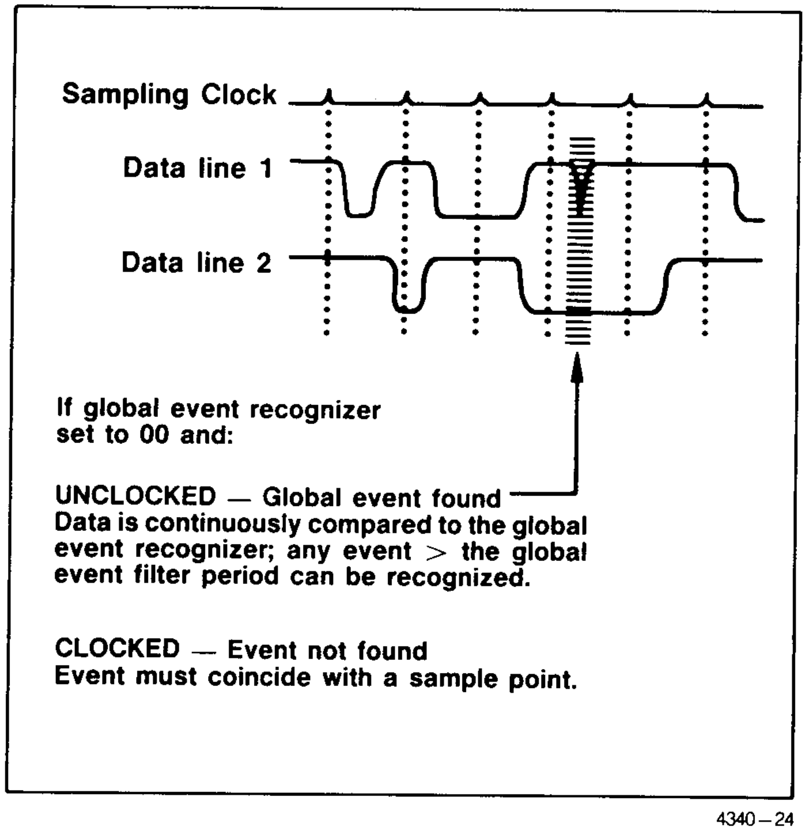


Figure 3-3. Demonstration of Global Event Recognizer UNCLOCKED. In this example, the global event recognizer is set to 00. This event will be recognized (shaded area) only if the global event recognizer is UNCLOCKED. If the global event recognizer is CLOCKED, the 00 event will not be found because it does not occur at a sample point.

Synchronous and asynchronous timebases are qualified in the same manner: as the logical AND of the C/Q line from each pod (see callout 5 in Figure 3-2).

NOTE

Pod clock/qualifier lines are used to specify synchronous clocks and to determine clock qualification. C/Q lines are independent of data lines; any C/Q line can be used to specify or qualify any timebase. A given C/Q line can be used simultaneously in several specifications. The C/Q line operates normally even if a pod's data lines are not stored due to memory chaining (see Memory Config for details).

DEMULTIPLEXING

Many systems transmit two types of data on the same lines at different times (such as address and data information on a bus). The 1240 can demultiplex this information so that each type of data can be studied separately.

Demultiplexing occurs when: 1) a set of data channels is sampled by two different timebases, and 2) the data acquired at different times is stored in different areas of memory. Use the Timebase menu to set up the timebases for the first step of the process. The rest of the conditions are specified in the Memory Config menu and are discussed later in this section.

The **DEMUX** selection customizes T2 for demultiplexing. **DEMUX** defines T2 as the combination of separate, synchronous clocks named T2 First (T2 F) and T2 Last (T2 L). The 1240 forms the storage clock for T2 by alternately recognizing T2 F then T2 L.[3] T2 F defines the synchronous clock that drives the first data from a multiplexed bus. T2 L defines the synchronous clock that drives the second data on the bus. Figure 3-4 describes the menu fields that are displayed when you select **DEMUX**.

T2 F and T2 L must alternate. Symmetrical, phase-shifted clocks (as shown in Case 1 of Figure 3-5) naturally alternate. If the clocks do not alternate (as in Case 2 of Figure 3-5), the 1240 discards clock occurrences until they do. ***Data is not stored until both T2 F and T2 L have occurred.***

T2 DEMUX is not the only demultiplexing method. Instead of T2 F and T2 L, you can use T1 (ASYNC or SYNC) and T2 SYNC. This method is demonstrated in Case 3 of Figure 3-5.

NOTE

The only menus that distinguish between T2 F and T2 L are the Timebase and Memory Config menus. All other menus refer to these clocks collectively as T2.

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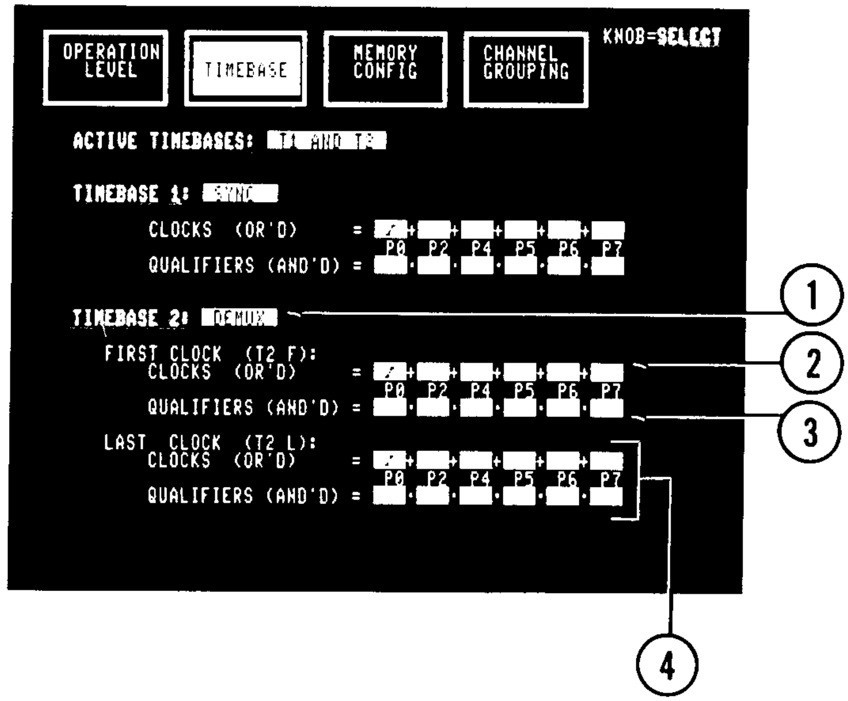
[3] The 1240 requires at least 10 ns between T2 F and T2 L and at least 20 ns between T2 L and T2 F; see Table 8-5, 1240 Electrical Specifications.



1 Type of timebase for T2; selections are **SYNC** and **DEMUX**. **DEMUX** defines T2 as the combination of two separate synchronous clocks, T2 F and T2 L.

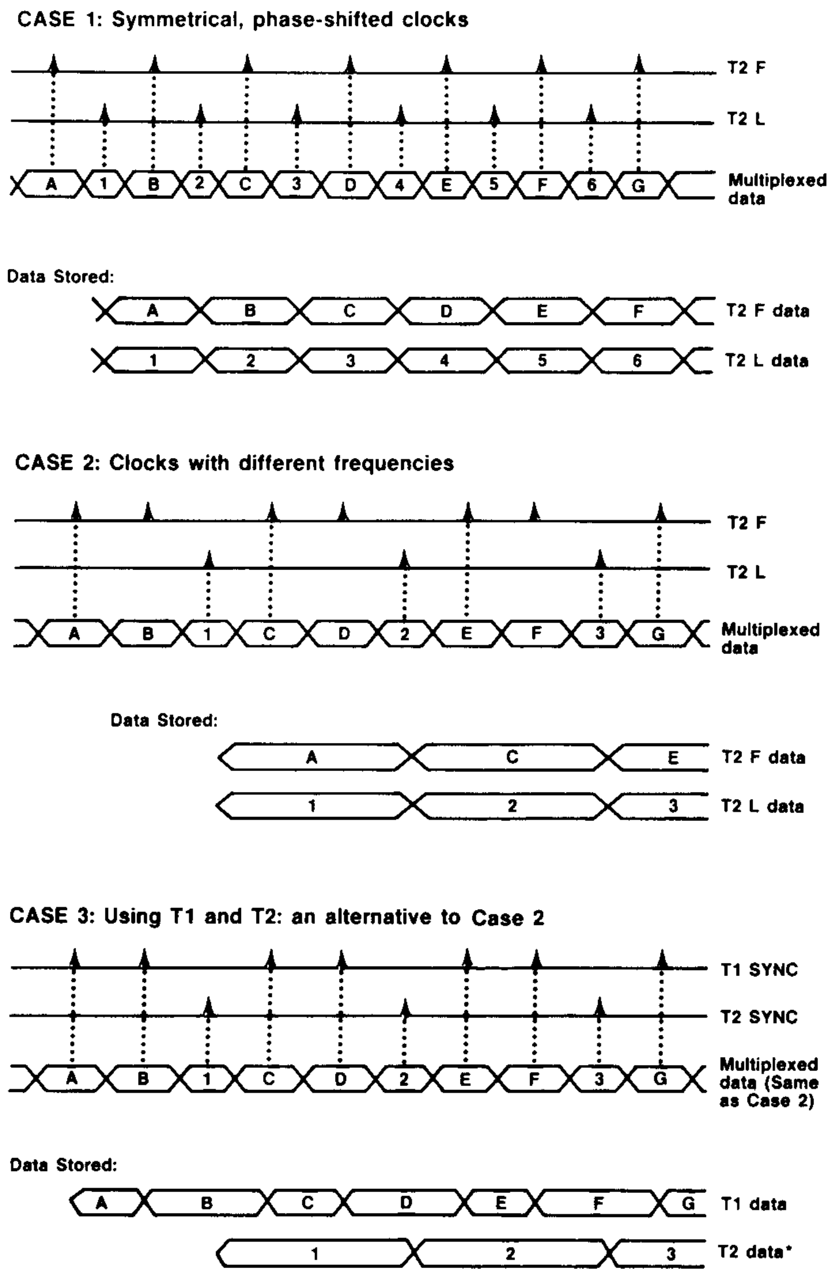
2 Defines T2 F, first synchronous clock of T2 DEMUX. All synchronous clocks are defined in the same manner: the OR of the C/Q line from each pod. Selections are _/‾(rising edge), ‾_(falling edge), X(rising or falling edges), or a blank (signal ignored). Default specification is the rising edge of the signal on the C/Q line for pod P0.

3 ANDed clock qualification for T2 F; one select field per installed pod. Default is all blanks (no qualification); other selections are **1** and **0**.

4 Defines T2 L, second synchronous clock of T2 DEMUX.

4340—25

Figure 3-4. Timebase menu: description of T2 DEMUX fields. The DEMUX selection is available only for timebase T2.



* The 1240 data correlation feature preserves the time relationships between events occurring on different timebases. Refer to Data Correlation in Section 5 for more information.

4340-26

Figure 3-5. Setting up timebases for demultiplexing, three examples. When timebase T2 is set to DEMUX, it is a combination of two separate, synchronous clocks, T2 F and T2 L. The 1240 alternately recognizes T2 F then T2 L. Case 3 uses dual timebases (T1 and T2) to demultiplex data that was missed in Case 2.

MEMORY CONFIG

PODS ACQUIRING DATA

The arrangement of rectangles in the tabular portion of the menu (see Figure 3-6) corresponds to the pattern of pod attachments on the right side-panel of the 1240. Each rectangle represents one pod. Since a 9-channel acquisition card uses one pod, each 9-channel card has only one rectangle in the display; 18-channel cards have two adjacent rectangles. The fields displayed inside a rectangle identify the pod and define how it acquires data.

The 1240 acquires data only with pods whose IDs are displayed under the INPUT POD columns (callout 7 in Figure 3-6). If a specific Pod ID is not displayed, then the 1240 is not set to acquire data with that pod, even if it is physically attached to an acquisition card.

To determine the ID of a specific pod, just press the button on the back edge of the pod's plastic case. The Pod ID will be displayed on the top line of the screen.

MEMORY WIDTH VS. DEPTH

The 1240 stores the data supplied by each pod in a separate area of acquisition memory; call it a "memory segment." Since a 9-channel card uses only one pod, all data acquired by a 9-channel card is stored in one memory segment. Data acquired by an 18-channel card is stored in two memory segments, one for each pod.

How much information is stored in each memory segment is controlled by the 9-channel and 18-channel width vs. depth fields[4] (see callouts 2 and 3 in Figure 3-6). The first value in each field is the number of channels acquiring data (width); [5] the second value is the number of samples stored per channel (depth). The depth of one memory segment is 513 samples.[6] To state this another way: the basic number of samples stored per pod is 513.

In Operation Level 0, the width vs. depth fields are fixed at basic values; each pod supplies data to fill one memory segment. In Levels 1 - 3, the available selections vary with the number and type of acquisition cards installed (refer to Tables 3-1 and 3-2). Selections with larger depth values "chain" memory segments together to store more data per channel.

As you can see in Tables 3-1 and 3-2, at least two 9-channel or two 18-channel cards are required for memory chaining. Memory in 9-channel cards cannot be chained to memory in 18-channel cards. Since the amount of memory in each acquisition card is fixed, width values must decrease as depth values increase. Smaller width values indicate that fewer pods are supplying data.

The 1240 rearranges the tabular portion of the menu as you change the memory width vs. depth fields. The depth of the rectangles for each pod indicates how much memory is reserved for data from that pod. In Figure 3-6, the width vs. depth selections are set so that each pod will supply data to fill one memory segment. Figure 3-7 illustrates

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[4] If your 1240 has just one type of acquisition card, only the width vs. depth field for that card type is displayed.

[5] Width ÷ 9 = number of pods supplying data.

[6] If GLITCHES ON is selected, 9-channel card memory depth is halved, but each data sample includes glitch information. See *Glitch Storage* later in this section for more information.

chained memory for two 9-channel cards. Notice that the rectangle for pod P0 is twice as deep as it was in Figure 3-6. Also notice that pod P2 is not displayed. This arrangement shows that the 9-channel width vs. depth selection chained the memory for pods P0 and P2 together to double the number of samples stored per channel for pod P0. The data lines from P2 are not used.[7]

GLITCH STORAGE

Glitches can be acquired only on 9-channel cards. In addition, the 1240 can acquire glitches only if you select T1 ASYNC, a clock rate of at least 20 ns, and GLOBAL EVENT = CLOCKED in the Timebase menu. Glitch storage is enabled by the **GLITCHES ON/OFF** field to the right of the 9-channel width vs. depth field in the Memory Config menu (see callout 4 in Figure 3-6). When you select **GLITCHES ON**, glitch information is stored for each data sample acquired.

GLITCHES ON also enables glitch triggering; you must select **GLITCHES ON** to be able to enter the glitch symbol (♦) in the event recognizers in the Trigger Spec menu (see Section 4).

When glitch storage is on, the depth of each 9-channel card memory segment is halved, and the minimum asynchronous clock period is 20 ns.

POD-TIMEBASE ASSIGNMENTS

A timebase name is listed in the TIMEBASE column of each rectangle (see callout 8 in Figure 3-6). The 1240 uses this timebase with the listed pod to clock data into acquisition memory. *Timebases are specified in the Timebase menu, but the fields in the TIMEBASE column of the Memory Config menu determine how timebases are actually used.*

In Operation Levels 0 and 1, all pods are clocked by T1; no other timebase selections are available. In Levels 2 and 3, the available selections depend on the number and type of timebases specified in the Timebase menu. If both T1 and T2 are active or if T2 is DEMUX, the entries in the TIMEBASE column become select fields and are displayed in reverse video. Table 3-3 lists the available timebase selections; any timebase can be assigned to any pod.

A reminder of what timebases are currently specified in the Timebase menu is displayed in highlighted video in the upper-right corner of the Memory Config menu (see callout 1 in Figure 3-6).

DEMULTIPLEXING

To demultiplex different types of data off one set of channels, you need to be able to clock the channels with two different timebases and store the data acquired at different times in different areas of memory. For every nine channels to be demultiplexed, you will need one 18-channel card or two 9-channel cards. T2 DEMUX or two timebases are required, so the Operation Level must be 2 or 3. Refer to *Demultiplexing* in the description of the Timebase menu earlier in this section for information on setting up the timebase(s). The rest of the conditions can be set up very quickly in the Memory Config menu with the INPUT POD and TIMEBASE fields. Figure 3-8 shows a sample Memory Config setup for demultiplexing using one 18-channel card.

Demultiplexing is most efficient with 18-channel cards because only one pod needs to be connected to the data source. Only one pod is necessary because of the special feature of the INPUT POD field. To demultiplex with 9-channel cards, you must connect two pods to the data source.

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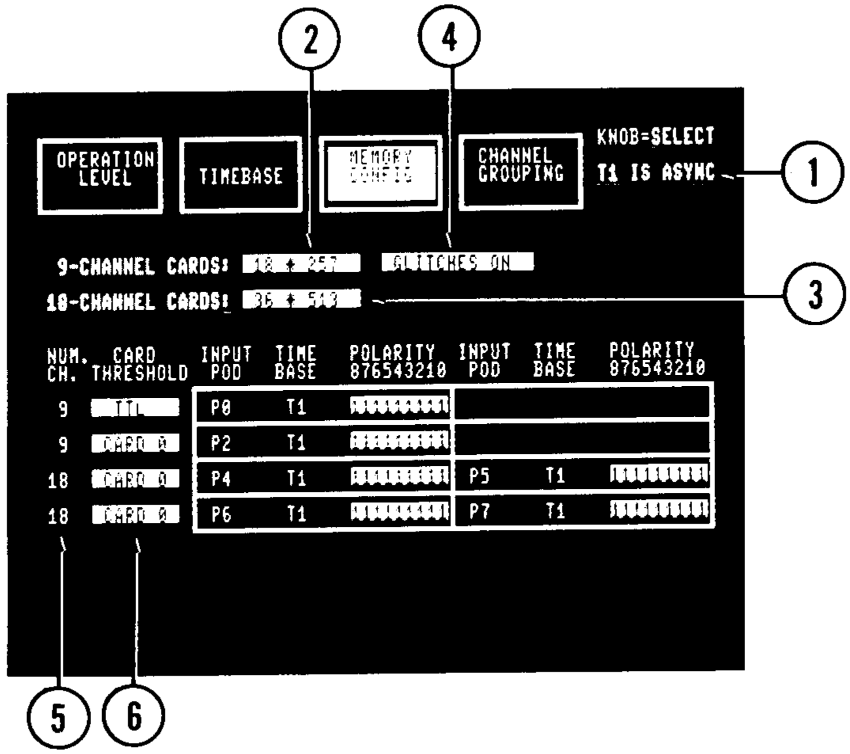
[7] Data lines from chained pods are not active, but the C/Q lines operate normally. The threshold selection displayed to the left of a chained pod only applies to the C/Q line.



1 Reminder of how timebases are set up in the Timebase menu.

2 Acquisition memory width vs. depth for 9-channel cards. Appears if at least one 9-channel card is installed. First value is the number of channels to be stored (width); second value is the number of samples stored per channel (depth). Values are fixed in Level 0. In Levels 1-3, values vary with the number of cards installed; see Table 3-1. If **GLITCHES ON** is selected (callout 4), 9-channel memory depth is halved.

3 Acquisition memory width vs. depth for 18-channel cards. Appears if at least one 18-channel card is installed. Values are fixed in Level 0. In Levels 1-3, values vary with the number of cards installed; see Table 3-2.

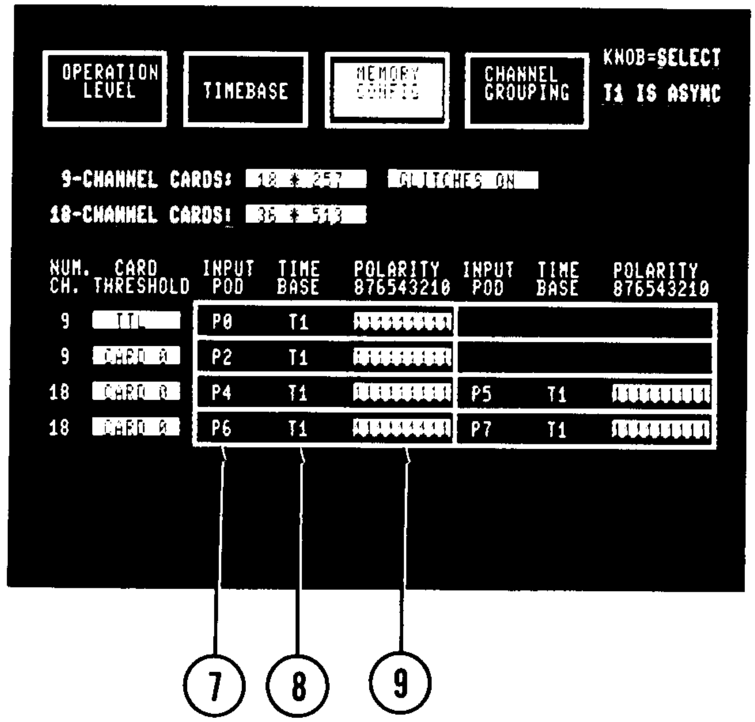
4 Glitch storage (9-channel cards only). Selections are **GLITCHES ON** and **GLITCHES OFF**. If glitch storage is on, 9-channel memory depth is halved but each data sample includes glitch information.

5 Number of channels on each installed card (card type).

6 Card threshold voltage, one field for each installed card. Used with POLARITY fields to determine logic levels for incoming data. Selections include **TTL**, **-ECL**, **TPG** (used with the Test Pattern Generator), and a range of voltages between **+6.35 V** and **-6.35 V** in 50 mV increments. Cards in slots 1-3 also have a **CARD 0** selection which matches the threshold already set for card 0 and lets you quickly change several cards to the same threshold. (When a fixed-threshold probe is attached to a card, the threshold of the probe is used. The THRESHOLD field can still be changed, but the selection has no effect.) (cont.)

Figure 3-6. Memory Config default display. This default setup occurs when the 1240 is equipped with two 9-channel and two 18-channel acquisition cards.

(cont.)



7 INPUT POD. Data from the pod is clocked into memory according to the timebase shown. Becomes a select field for odd-numbered pods of 18-channel cards when T1 and T2 are active or when T2 is DEMUX.

8 Timebase used to clock data from the pod into memory. Timebases are specified in the Timebase menu, but this field determines how timebases are actually used. Entries in this column become select fields when T1 and T2 are active or when T2 is DEMUX; see Table 3-3 for selections.

9 Channel Polarity. Applied to the card threshold to determine the logic level of incoming signals. Nine digits correspond to pod leads 8-0. A **1** indicates positive-true logic; negative-true logic is indicated by **0**. If a signal is above the threshold voltage and the polarity of that lead is 1, the signal is "true," and the value of the signal is 1. Under the same conditions but a polarity of 0, the signal is "false," with a value of 0. Polarity is applied at the probe tip; therefore, changes to this field do not affect display of previously acquired data.

4340-27

Figure 3-6. Memory Config default display (cont.).

INPUT POD Field. When T1 and T2 are active or when T2 is DEMUX, the INPUT POD field for the odd-numbered pod of each 18-channel card is a reverse video select field. Selections are the IDs for both pods connected to that 18-channel card. For demultiplexing, select the even-numbered Pod ID. This selection causes data from a single pod to be stored in different areas of memory.

TIMEBASE Field. When T1 and T2 are active or when T2 is DEMUX, all TIMEBASE entries are select fields; Table 3-3 lists the available selections. For demultiplexing, assign one timebase selection (such as T2 F) to one area of memory and another timebase selection (such as T2 L) to the other area of memory. Callout 3 in Figure 3-8 shows an example demultiplexing setup using T2 DEMUX and an 18-channel card.

Table 3-1
MEMORY WIDTH VS. DEPTH SELECTIONS FOR 9-CHANNEL CARDS
(Operation Levels 1 - 3) [a]

Number of 9-ch cards	Width vs. Depth [b]	Pods Acquiring Data
1	9 * 513	0
2	18 * 513 9 * 1025	0, 2 0
3	27 * 513 9 * 1537	0, 2, 4 0
4	36 * 513 18 * 1025 9 * 2049	0, 2, 4, 6 0, 4 0

[a] In Operation Level 0, 9-channel width vs. depth is not a select field. With glitch storage off, standard memory depth is 513 samples.

[b] If glitch storage is on, acquisition memory depth is halved but each data sample includes glitch information.

Table 3-2
MEMORY WIDTH VS. DEPTH SELECTIONS FOR 18-CHANNEL CARDS
(Operation Levels 1 - 3) [a]

# 18-Ch Cards	Width vs. Depth	Pods Acquiring Data With:			
		0 9-Ch Cards	1 9-Ch Card	2 9-Ch Cards	3 9-Ch Cards
1	18 * 513	0/1	2/3	4/5	6/7
2	36 * 513	0/1, 2/3	2/3, 4/5	4/5, 6/7	—
	18 * 1025	0/1	2/3	4/5	—
3	54 * 513	0/1, 2/3, 4/5	2/3, 4/5, 6/7	—	—
	18 * 1537	0/1	2/3	—	—
4	72 * 513	0/1, 2/3, 4/5, 6/7	—	—	—
	36 * 1025	0/1, 4/5	—	—	—
	18 * 2049	0/1	—	—	—

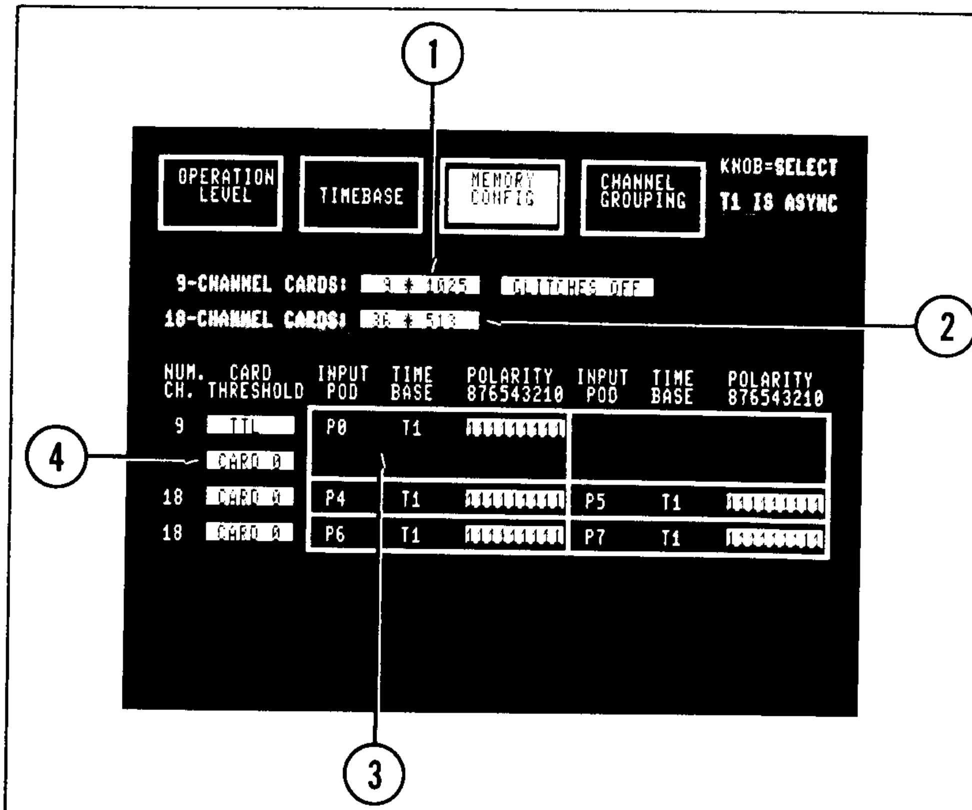
[a] In Operation Level 0, 18-channel width vs. depth is not a select field. Standard memory depth is 513 samples.

Table 3-3
TIMEBASE SELECTIONS FOR
POD-TIMEBASE ASSIGNMENTS IN THE MEMORY CONFIG MENU
(Operation Levels 2 and 3) [a]

Active Timebases [b]	T2 is [b]	Timebase Selections
T1 ONLY	—	T1
T2 ONLY	SYNC	T2
	DEMUX	T2 F , T2 L
T1 AND T2	SYNC	T1 , T2
	DEMUX	T1 , T2 F , T2 L

[a] In Operation Levels 0 and 1, all pods are assigned T1; no other selections are available.

[b] Determined in Timebase menu.



1 Sets up acquisition memory in 9-channel cards to store 1025 samples for 9 channels; the memory for two pods is chained. If glitch storage was on, the depth would be halved.

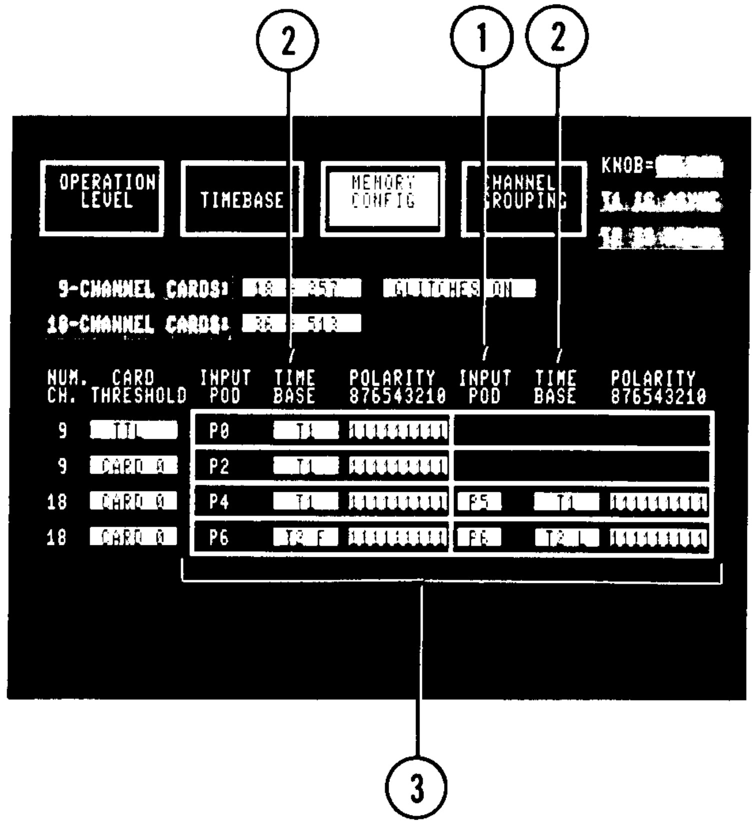
2 Sets up 18-channel acquisition memory to store 513 samples each for 36 channels; basic memory depth, no chaining.

3 Rectangle twice the normal depth indicates that data from pod P0 will fill twice the normal amount of memory; two areas of memory are chained together to double the number of samples stored per channel.

4 The threshold of a chained card applies only to the C/Q line of the pod(s) attached to the card.

4340–28

Figure 3-7. Memory Config display illustrating memory chaining. This display shows memory from two 9-channel cards chained together to increase the number of samples stored per channel for pod P0. The depth of the rectangles in the display changes as you change the width vs. depth; the size of each rectangle is a visual indicator of how many samples will be stored for each pod.



1 INPUT POD. When T1 and T2 are both active or when T2 is DEMUX, INPUT POD is a select field for odd-numbered pods of 18-channel cards. The ID of either pod connected to the card may be selected. For demultiplexing, select the even-numbered Pod ID.

2 TIMEBASE. A select field when T1 and T2 are active or T2 is DEMUX; refer to Table 3-3 for a list of the selections. This field allows you to select a different timebase for each area of memory.

3 This 18-channel card is set to demultiplex data acquired from pod P6. Pod P6 will supply data to one area of memory on T2 F cycles and to another area of memory on T2 L cycles.

4340—29

Figure 3-8. Memory Config example demultiplexing setup. This example uses T2 DEMUX and one 18-channel card. Each rectangle in the display represents an area of acquisition memory. The INPUT POD field identifies which pod supplies data to that area of memory. The TIMEBASE field determines when the pod will sample data.

CHANNEL GROUPING

Use this menu to organize channels from 9- and 18-channel cards into groups for data entry and display purposes. A "group" is a collection of channels from one card type.

If your 1240 is equipped with at least one 9-channel and one 18-channel card, a select field labeled CARD TYPE is displayed in the upper right portion of the screen. This field allows you to select 9- or 18-channel grouping. Grouping principles are the same for both card types.

The default grouping arrangement displayed when you first enter this menu is based on the current setup of the Memory Config menu. Figure 3-9 describes the default settings for 9-channel grouping when two 9-channel cards are installed (Memory Config setup shown in Figure 3-6). Variations in the default settings due to different 1240 configurations are discussed later in this section under *Channel Grouping Defaults.* Figure 3-10 shows default 18-channel grouping based on the Memory Config demultiplexing setup shown in Figure 3-8.

You can specify a total of 10 groups, five groups using channels from 9-channel cards and five groups using channels from 18-channel cards. The maximum group size is 36 channels.

NOTE

The default grouping arrangements are in effect the first time you access Channel Grouping. These defaults are based on the current Memory Config setup. You can rearrange the grouping to suit your needs using the procedures described in the following paragraphs. Be aware that changes to the Memory Config menu may affect the grouping arrangement. See Table 8-3 for details.

GROUPING BASICS

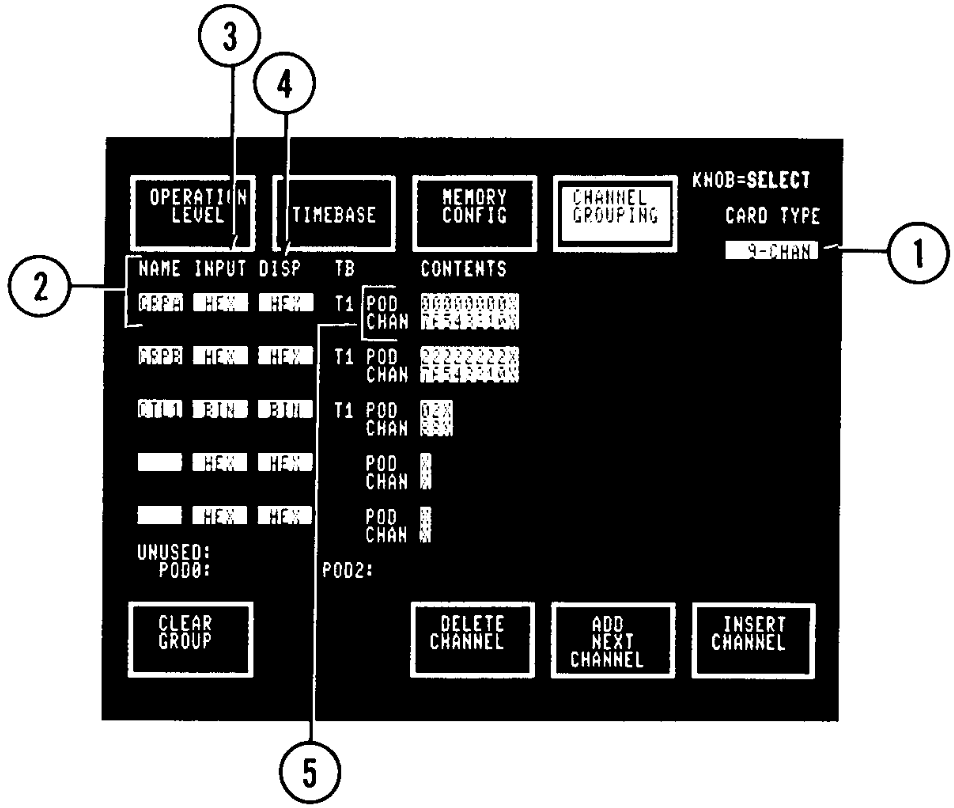
Group Name, Input Radix, Display Radix. A group is identified in other menus by the characters entered in the NAME field. The available characters are letters A - Z, numbers 0 - 9, special characters . , / : ∧ $ and a blank space. A group name is four characters long; use the knob or the SELECT keys to enter each character individually.

Data values in the Trigger Spec, Auto-Run Spec, Search Pattern Entry, and Reference Memory Editor menus are entered according to the input radix. Choices for input radix are **HEX**adecimal, **BIN**ary, and **OCT**al.

Data acquired by a group of channels is displayed according to the group's display radix. The selections available are **HEX**adecimal, **OCT**al, **BIN**ary, **ASCII**, **EBC**DIC, and **OFF** (group not displayed). To display data acquired by a group of channels, the 1240 applies the selected display radix starting with the least significant (rightmost) channel and working toward the most significant channel. If the number of channels in a group is not a multiple of the number of channels used to form one digit of the display radix, the missing channels are assumed to be 0. Refer to Table 3-4.

POD/CHAN Pairs. Groups are built with Pod/Channel pairs. Each pair assigns a specific channel from a pod to the group. As seen in Figure 3-9, a POD/CHAN pair is one digit in the POD field and the digit directly beneath it in the CHAN field.

Near the bottom of the display is a list, labeled UNUSED, that shows the pod numbers that can be used for grouping and the channels in each pod that are not currently assigned to a group. If you delete channels from a group, clear an entire group, or change a pod-timebase assignment in the Memory Config menu, the unused channels appear in this list.



1 CARD TYPE; selects the type of grouping. Selections are **9-CHAN** and **18-CHAN**. Only displayed if both types of acquisition cards are installed.

2 Group Name. This column lists the name assigned to each group of channels. Select each character individually using the SELECT keys or the knob. Selections are letters A - Z, numbers 0 - 9, special characters . , / : ∧ $ and a blank space. Default group names are assigned according to the 1240 physical configuration.

3 Input Radix. Determines the radix used to enter data values in the Trigger Spec, Auto-Run Spec, Search Pattern Entry, and Reference Memory Editor menus. Selections are **HEX**adecimal, **BIN**ary, **OCT**al.

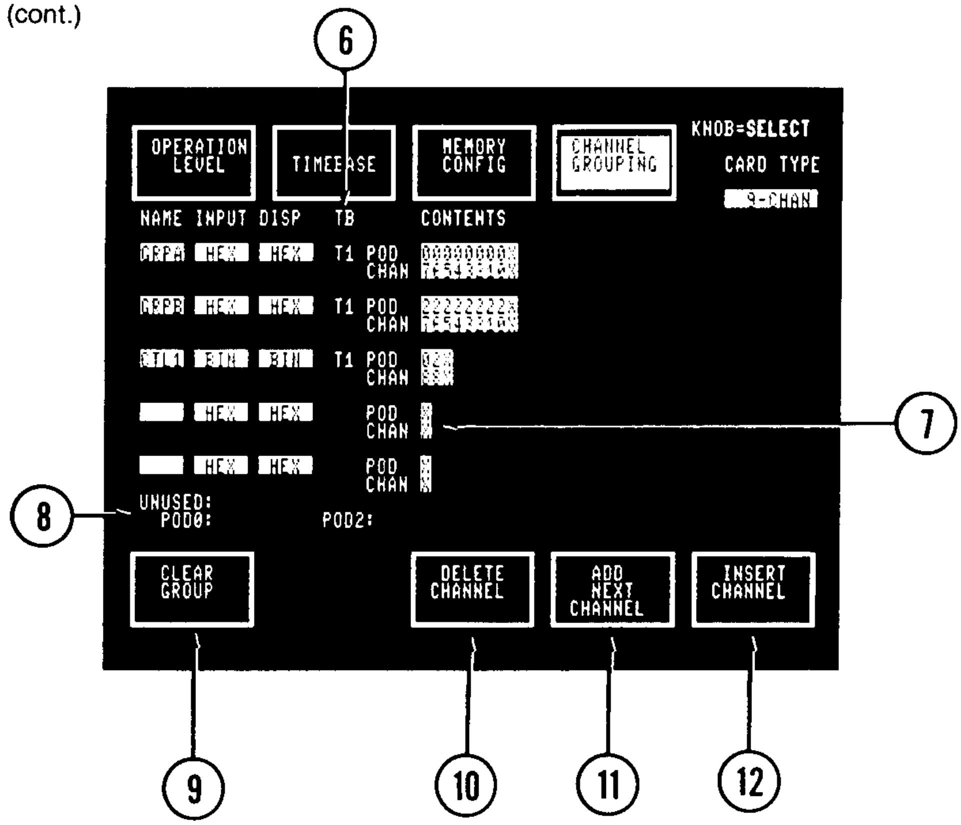
4 Display Radix. Data acquired by a group is displayed according to the radix selected in this field. The choices are **HEX**adecimal, **BIN**ary, **OCT**al, **ASC**II, **EBC**DIC, and **OFF** (group not displayed).

5 POD/CHAN pairs. Each pair assigns a specific channel from a pod to the group. A specific pair can appear in only one group at a time. The first POD entry in a group determines the group's timebase; subsequent POD entries must use the same timebase. A blank POD/CHAN pair, $^{X}_{X}$, occupies the rightmost position in a group unless the group has 36 channels (maximum allowed).

(cont.)

Figure 3-9. Default 9-channel grouping when two 9-channel cards are installed. Channel grouping is closely related to the Memory Config setup. This display is based on the 9-channel portion of the Memory Config setup shown in Figure 3-6.

(cont.)



6 Group Timebase; timebase associated with each group. When the first pod number is entered in the POD field, the timebase associated with that pod in the Memory Config menu is displayed in the TB column. When T2 is displayed in this column, it is shown in highlighted video. (These are informational fields only; they cannot be accessed by the field cursor.)

7 Unused group.

8 UNUSED List. Pod numbers and the channels in each pod that are not currently assigned to a group. In this display, all channels are assigned.

9 Deletes the group containing the blinking field cursor. All channels assigned to the deleted group appear in the UNUSED list. No action is taken until you confirm the operation by pressing the X key.

10 Deletes the POD/CHAN pair at the location of the field cursor; the channel is added to the UNUSED list.

11 Adds a new POD/CHAN pair to the right of the pair where the field cursor is located. The new pair has the same POD value as the preceding pair, but the next lower CHAN value.

12 Inserts $\genfrac{}{}{0pt}{}{X}{X}$ to the left of the field cursor. The POD and CHAN characters can then be changed to other values.

4340–30

Figure 3-9. Default 9-channel grouping when two 9-channel cards are installed (cont.).

Valid POD entries are pod numbers shown in the UNUSED list, and X (no pod specified). The UNUSED list is based on pod numbers for that card type in the Memory Config menu.

The first non-X POD entry for a group determines the timebase for the group. Subsequent POD selections for the group must use the same timebase. This is a concern only in Operation Levels 2 and 3, where more than one timebase can be specified. In Levels 0 and 1, all groups use timebase T1. When T2 is displayed in the TB column, it is shown in highlighted video (see callout 2 in Figure 3-10). POD labels for groups associated with T2 are also highlighted. *In all other menus where group names are displayed, group names associated with timebase T2 are highlighted.*

Valid CHAN entries are 0 - 8 and X (no channel assigned). Look in the UNUSED list at the bottom of the display for the channels in each pod that are not yet assigned to a group.

Guidelines for Entering POD/CHAN Pairs. A specific POD/CHAN pair can appear in only one group. If you enter a pair already assigned to another group, the 1240 deletes that channel from the original group.

The digits for a POD/CHAN pair are linked. When a POD or CHAN entry is changed, its companion digit changes to X. If you do not replace the X with a valid digit, the pair is equivalent to $^{X}_{X}$. When you enter a POD digit, the blinking field cursor moves to the CHAN digit below. Entering a CHAN digit moves the field cursor to the next POD field to the right (the cursor does not move if there are no more POD/CHAN pairs to the right).

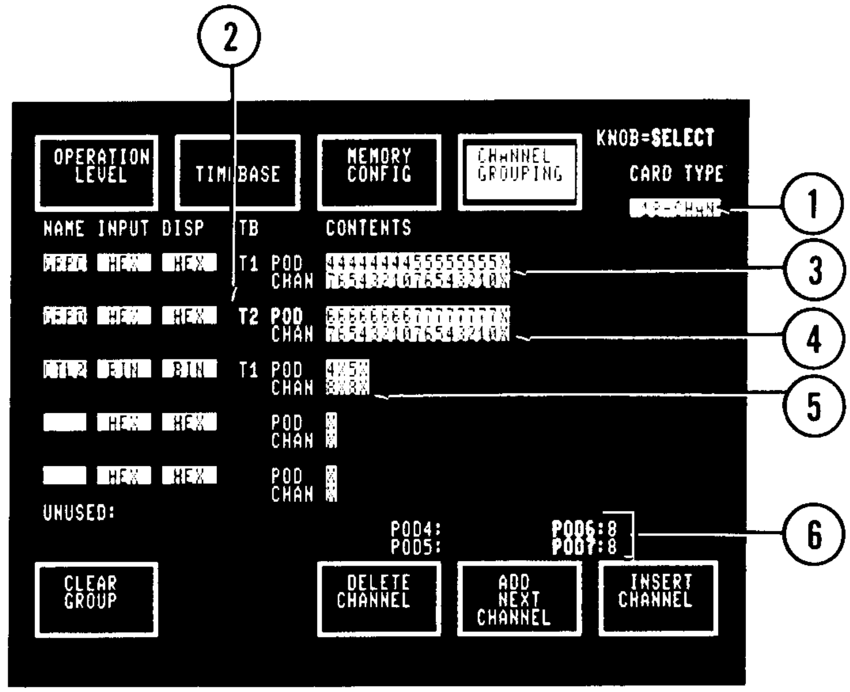
Each group has at least one POD/CHAN pair. If no specific digits are entered, the pair is blank, $^{X}_{X}$. A blank POD/CHAN pair always occupies the rightmost position in a group unless the group has 36 channels (maximum). If you enter values in the rightmost pair, the 1240 adds another $^{X}_{X}$ pair to the right.

X's have no effect on grouping. For example: $^{00X0XXX00X}_{87X65X420X}$ is equivalent to $^{00000}_{87620}$.

Table 3-4
APPLYING THE DISPLAY RADIX TO ACQUIRED DATA

Display Radix	# channels to form 1 displayed digit	Examples: different radices applied to a group of 13 channels
HEXadecimal	4	000[a]+1 1001 0100 1011 = 194B
OCTal	3	00+1 100 101 001 011 = 14513
BINary	1	1100101001011 = 1100101001011
ASCII	8 (msb ignored)	000+11001 01001011 = EM K
EBCDIC	8	000+11001 01001011 = EM .

[a] Implied leading zeros.



1 Selects 18-channel grouping when both 9-channel and 18-channel cards are installed.

2 When T2 is the group timebase, it is shown in highlighted video. POD labels for groups associated with T2 are also highlighted.

3 This group is formed from channels 0-7 of both pods for the first 18-channel card in Figure 3-8. The pods are P4 and P5.

4 This group is formed from channels of the 18-channel card set up for demultiplexing in Figure 3-8. Notice that some of the channels in this group are from pod P7. Even though P7 is not used in the Memory Config setup, it is used here to help differentiate the channels that supply the card's two areas of memory. P7 identifies the channels that supply the area of memory specified on the right side of the Memory Config display for this 18-channel card.

5 X's have no effect on grouping. This group is equivalent to $\begin{smallmatrix}45\\88\end{smallmatrix}$.

6 UNUSED List; channels not currently assigned to a group. The numbers of pods associated with timebase T2 are shown in highlighted video; those associated with timebase T1 are shown in regular video.

4340–31

Figure 3-10. Sample 18-channel grouping arrangement. These default groups are based on the 18-channel portion of the Memory Config setup shown in Figure 3-8. In Figure 3-8, the second 18-channel card is set up for demultiplexing.

BUILDING GROUPS

CLEAR GROUP. Touch this soft key to delete the group containing the blinking field cursor. All channels assigned to the deleted group appear in the UNUSED list at the bottom of the display. The remaining POD/CHAN pair is $\substack{X\\X}$. The TB (Timebase) field is cleared, but the NAME, INPUT, and DISP fields are unchanged. After you touch this soft key, the message PRESS "X" TO CONFIRM OPERATION (ANY OTHER HARD KEY CANCELS IT) is displayed at the top of the screen. The group is not deleted unless you press the X key on the front panel.

DELETE ÇHANNEL. Touch this soft key to delete the POD/CHAN pair at the location of the field cursor. If the pair specifies a channel, the deleted channel is added to the UNUSED list.

ADD NEXT CHANNEL. This soft key lets you quickly create groups with sequential CHAN values. ADD NEXT CHANNEL creates a new POD/CHAN pair to the right of the position of the field cursor. The new pair has the same POD value as the previous pair, but with the next lower CHAN value. For example: the field cursor is on 8 in the group $\substack{4X\\8X}$. Touch ADD NEXT CHANNEL twice to create $\substack{444X\\876X}$.

The cursor can also be positioned on an $\substack{X\\X}$ pair immediately to the right of a valid POD/CHAN pair. You get the same results as described above if you position the field cursor on one of the X's in $\substack{4X\\8X}$ and press the soft key twice.

Channels added with this method are deleted from other groups if necessary. No channels can be added with this soft key after a CHAN entry of 0.

INSERT CHANNEL. This soft key inserts a new POD/CHAN pair, initialized to $\substack{X\\X}$, immediately to the left of the field cursor. For example: the cursor is positioned on 2 in the group $\substack{02X\\88X}$. After you touch INSERT CHANNEL, the group appears as $\substack{0X2X\\8X8X}$.

CHANNEL GROUPING DEFAULTS

The 1240 creates default 9- and 18-channel grouping arrangements from the current setup in the Memory Config menu. For 9-CHAN grouping, channels 0-7 from each pod assigned to a 9-channel card are placed in a separate group. Channel 8 from each of these pods is placed in a group named CTL1. Figure 3-9 shows this arrangement.

For 18-CHAN grouping, channels 0-7 from both pods assigned to an 18-channel card are placed in a separate group (a group like this has 16 channels). Channel 8 from each of these pods is placed in a group named CTL2.

For both 9-CHAN and 18-CHAN grouping, channels from the lowest-numbered pod make up the first group.

There is a maximum of six default groups, named GRPA, GRPB, GRPC, GRPD, CLT1, and CTL2. The methods used to create CTL1 and CTL2 are described above. How groups GRPA-GRPD are assigned can be best explained with examples. Example 1: For a 1240 equipped with one 9-channel and one 18-channel card, GPRA will be the name assigned to the first group in 9-CHAN grouping. The only other group in 9-CHAN is CTL1. In 18-CHAN grouping, the first group will be named GRPB, and the remaining group will be CTL2. Example 2: In a 1240 with four 18-channel cards, the first 18-CHAN group is named GRPA, and the next three groups are GRPB, GRPC, then GRPD. GRPA is made up of channels 0-7 from pods P0 and P1. Similarly, groups GRPB - GRPD have channels 0-7 from pods P2 and P3, P4 and P5, and P6 and P7. The last group is CTL2. In this case there is no 9-channel grouping because no 9-channel cards are installed.

Input and display radices for all groups *except* CTL1 and CTL2 are HEX. Input and display radices for CTL1 and CTL2 are BIN.

DEMULTIPLEXING

As you read these paragraphs, refer to Figure 3-8, callout 3, and Figure 3-10, callout 4.

When you use an 18-channel card for demultiplexing, you need to connect only one probe (pod) to the data source. This probe always has an even-numbered pod ID (see Figure 3-8). The 1240 stores data acquired with this probe in the 18-channel card's two areas of memory.

In the 18-channel grouping setup, the 1240 must be able to refer to the same probe channels in two different ways: one method identifies data in the first area of memory, and the other method identifies data in the second area of memory. Since the even-numbered pod ID can be used for only one method, the 1240 must use another pod ID to identify data in the other area of memory. The 1240 solves this problem by using the even-numbered pod ID to identify data in the first area of memory (left side of the Memory Config display); the card's odd-numbered pod ID identifies data in the area of memory on the right side of the Memory Config display. Refer to Figure 3-10, callout 4, for an example. (The odd-numbered pod ID is for labeling purposes only; that pod is not involved in demultiplexing and does not have to be connected to the 1240.)

Pod IDs 6 and 7 are shown in the same group in Figure 3-10 because this demultiplexing setup uses timebases T2 F and T2 L. The Channel Grouping menu does not differentiate between T2 F and T2 L; both are labeled T2. If you demultiplex with T1 and T2, the pod IDs must be in different groups because they are associated with different timebases. (Remember that each channel in a given group must use the same timebase.)