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DISPLAY CONTROL FIELDS **SETTINGS EXPLANATION**

Trigger Function - START...TRISToff

These are the functions available for simulation. To access a function, position the cursor in the appropriate field e.g. **START**, then press **EXEC**.

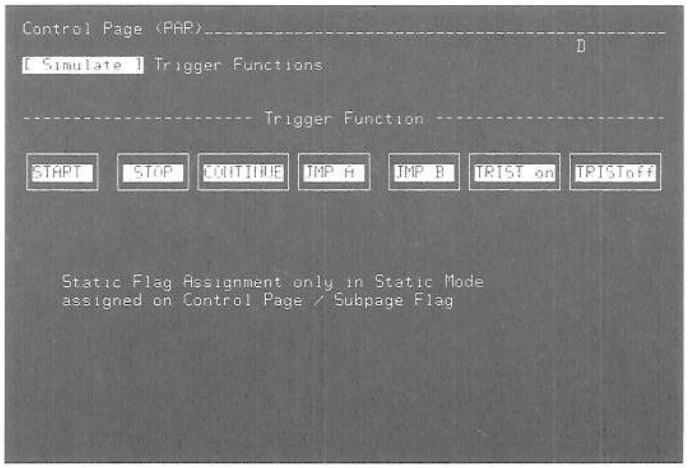


Figure 3D-9. **[Simulate]** Trigger Functions

Static Flag Assignment only in Static Mode
assigned on Control Page/Subpage Flag

This is a default heading. To display the Static Flag Assignment, you need to first access the **[Flag]** Assignment menu and set the mode to **[Static]**. Then, on the **[Simulate]** menu an additional row of setting fields will be displayed. they will appear as follows:

[BIN]

00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

The input/display code can be set to BIN. HEX, DEC or HEX. To set a Flag Output, position the cursor within the appropriate field and set the pattern as desired. Each Flag Output pattern will then be produced, at the Flag Output POD, whenever the corresponding Function is released.

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3D-3
TIMING (Timing Page) Menus

This section describes the **TIMING** (Timing Page) menus and how to use them. If the option is not installed in your 8175A then, on pressing the **TIMING** key, the message: "Fine Timing not available" will be displayed. If it is fitted, two menus are available: **[Fine Timing off]** and **[Fine Timing on]**. The first menu indicates that the Fine Timing capability is currently disabled. When **[Fine Timing on]** is selected, 4 channels (2 if Serial D.G.) can be delayed (compared to the same channels with "Fine Timing off") by between 20 ns and 40 ns (Parallel) and 0 ns to 20 ns (Serial)

The menu details differ depending on whether Parallel or Serial Data Generator configuration is set. The first explanation below is for Parallel configuration. Figures illustrating the concept of Fine Timing are given on the next page.

THE MENUS AND HOW TO USE THEM

[Fine Timing on] menu (Parallel D.G. Config. Refer to Figure 3D-10A)

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
Channel:	This indicates the 4 channels in the 8175A which can be delayed. They are all on POD 0. Remember that by selecting **[Fine Timing on]**, each of the 4 channels will now be delayed by a minimum of 20 ns. This is irrespective of the value set as below.
Delay:	For each channel, the delay value can be set to between 20 and 40 ns.

Serial Data Generator configuration (Refer to Figure 3D-10B)

The same basic details as for the Parallel Data Gen. apply, except that the delay range is 0 ns to 20 ns. Also, since there are only two channels available, the minimum 20 ns value does not apply. Channels 0 and 2 on POD 0 can be delayed. Note, Channel 1 is allocated to the Serial Clock. This clock output is available only in serial mode. Refer to the DATA Page menus description for more information concerning the Serial Clock.

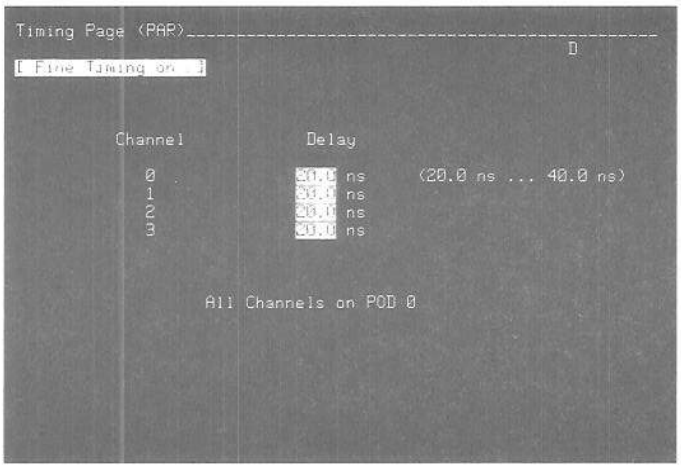


Figure 3D-10A. **[Fine Timing On]** (PAR)

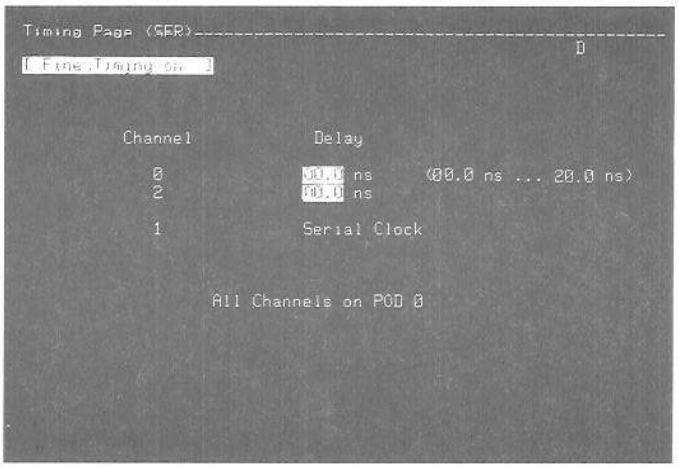


Figure 3D-10B. **[Fine Timing On]** (SER)

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The figure below illustrate the concept of Fine Timing. Note that delays greater than 40 ns can be achieved by combining the Pattern duration with the Fine Timing values. The middle waveform shows the effect of Fine Timing, the bottom one illustrates how a delay greater than 40 ns can be achieved. In this case, an 86.4 ns delay is achieved by programming the pattern duration 3 "0's" to 20 ns each and the Fine Timing delay to 26.4 ns.

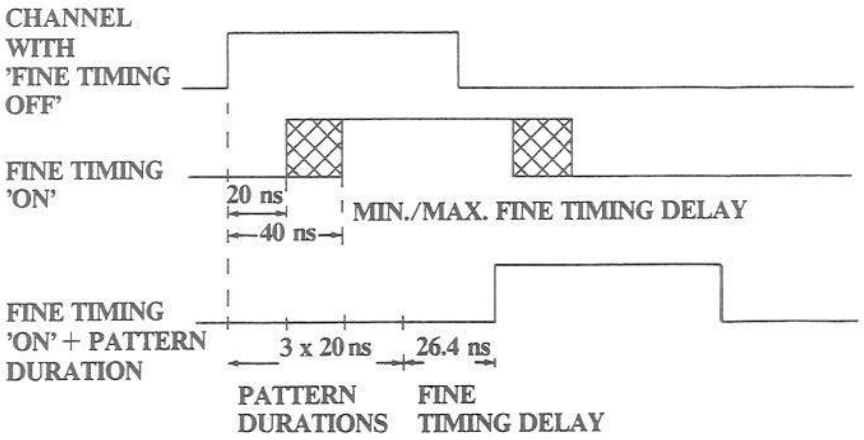


Figure 3D-10C. Illustration of Fine Timing

3D-4
OUTPUT (Output Page) Menu

This section describes the **OUTPUT** (Output Page) menu and how to use it. The main use of this menu is to enable/disable control of all output PODS including the Flag one. It also enables the output high levels of the TTL and CMOS PODS to be set. Note that, the high level of these pods can track an externally applied voltage. All output pods can be enabled or disabled from this menu.

As can be seen from the menu details, neither of the output levels of the ECL PODS are variable. This is also the case for the low level of the TTL/CMOS PODS. Refer to Figure 3D-11, details of the variable settings are as follows:

THE MENU AND HOW TO USE IT

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
All Output PODS are:	The two possible settings of "disabled", or "enabled" apply to all output pods including the Flag one. Note also that all output PODS can be disabled via the DISABLE key on the front panel. When disabled by either of these two methods, a "**D**" is displayed in the top right hand corner of the screen. Individual output PODS can also be enabled or disabled via an external signal applied to the "**TRIST**" input of the POD*. Details of the permissable voltage levels are shown on each pod.

NOTE:
* If disabled via either the Output Page menu or the **DISABLE** key, Output PODS can then only be enabled via the Output Page menu. Until so enabled, the Input Trigger Word and external control input (TRIST) status is irrelevent. However, when enabled, their tri-state status (or common low for ECL) can then be Input Trigger Word or external input controlled. Refer to the Control Page menus description ([Input] Trigger Word Assignment menu) for more information.

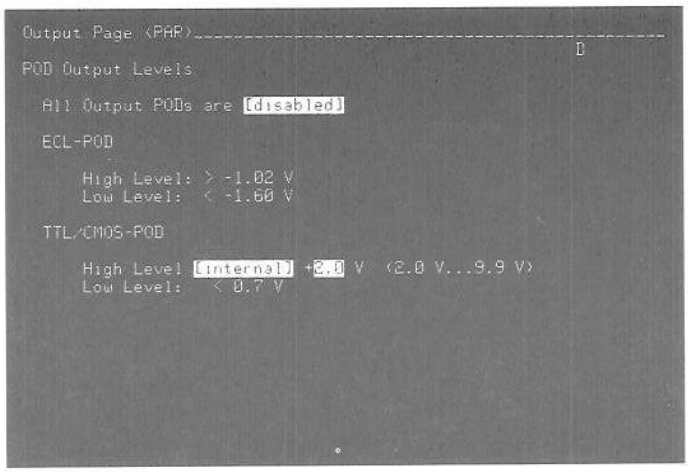


Figure 3D-11 Output Page menu

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TTL/CMOS-POD

High Level:

This can be set to either **[external]** or **[internal]**. Whichever setting is made applies to all TTL/CMOS Output PODS (Data and Flag). Note however, irrespective of the setting, if an external tracking voltage is applied to any POD, it will over-ride a lower internal level. Refer to the Specifications - Table 1-2, for permissable level and transition time data etc.

If set to **[internal]**, a value setting field is provided. A value between +2.0 V and +9.9 V can be set via the alphanumeric keys (specifications apply from +2.4 V- 9.9 V). The value can, if wished, be changed via the **VERNIER** capability of the **ROLL** keys. The Standard Settings **[internal]** value is + 2.0 V.
Note that, in **[internal]** mode, it is best to disconnect any external tracking voltage.

If set to **[external]**, the output voltage of any POD will track an external voltage applied (via its **HIL IN** input) to it. The tracking voltage should be within the range: +2.4 V to +9.9 V.

3D-5
DATA (Data Page) Menus

This section describes the DATA (Data Page) menus and how to use them. The three menus enable you to set up, edit and display data. The **[Pattern]** and **[Waveform]** menus are for setting up and displaying data. On the **[Format]** menu, up to eight combinations of channels to be displayed can be formatted and labelled. Configuration (Parallel or Serial) determines the content of all three menus. Therefore, menu display details are explained for both cases. Differences related to **[internal]** or **[external]** System Clock are also explained. For all three menus, differences applicable to Serial Configuration, are given in additional menu explanations after each corresponding Parallel one.

A powerful set of editing capabilities is provided for the Data Page menus. Use of INSERT/DELETE is explained here, section 3E covers use of these and all others.

THE MENUS AND HOW TO USE THEM

Data [Format] Allocation menu (Refer to Figure 3D-12)

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
Duration:	Duration is the time that any pattern will remain at the pod output. Either **[fixed]** or **[variable]** can be set. **[fixed]** means that all data patterns will be output at a fixed (programmable) rate. The pattern durations will be identical. The rate (and pattern duration) is as set in the "Period" field. **[variable]** means that each pattern can have a different duration value. When **[variable]** is set, the Period entry field is deleted from the display. Pattern duration values are then input on either the **[Pattern]** or **[Waveform]** menus.
Period:	The Period setting field is avilable only if Duration has been defined as **[fixed]**. The type of setting which can be made here depends upon the System Clock source. (System Clock is set on the Control Page **[Clock]** menu.) If the **internal** clock source is used, Period is input as a numeric value plus a units setting. An example of this is: **0.02 [us]**, which is the default value. When an **external** clock source is used, the Period (duration) is expressed as: m x the period of the clock, where m = the numeric value x 1 , k, or M. It is expressed in cycles **[Cyc]**. The default (fixed timing mode) is: **1[Cyc]**. This means that the pattern duration will equal the clock signal period. **Example** for System Clock **[external..]**: If external clock frequency is 10 Mhz (period = 0.1 us) and you want a duration of 2 us, the Period setting must be: **20 [Cyc]**. (20 x 0.1 us)

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Data Format Label — POD 2 etc. 7.....0

This is the "Formatting" area of the menu. Here you can edit, create, insert and delete Data Formats. Each Data Format defines one or more channels to be "active" (see next paragraph - **Active/ Inactive Channels**) for display purposes.

Up to 8 different Data Formats can be defined, each must have an identifying Label.

Labels:

A Label can be between 1 and 5 alphanumeric characters long. Note that the position of characters within the label field is significant. For example, Label: **B**.... is not the same as ..**B**.. or, ...**B**. This is of particular significance when only single characters are used as Label names.

The first character of a Label must be alphabetic. The default format is assigned the label "**A**". This has all channels of all pods active.

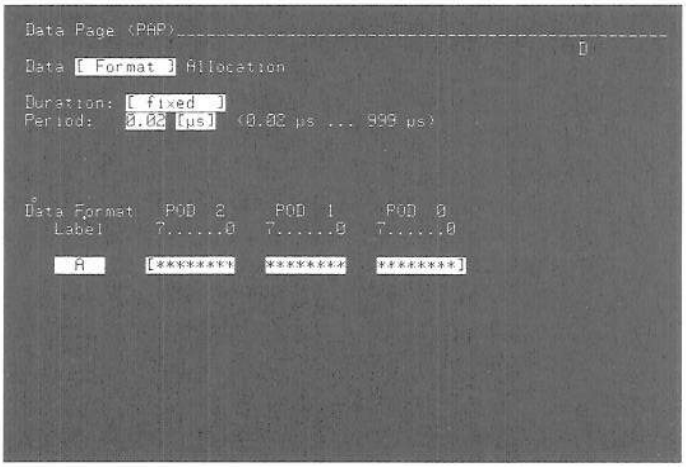


Figure 3D-12. Data **[Format]** Allocation menu

Active "*"/Inactive "."Channels:

An active channel is indicated by an asterix: *. The **NEXT[]/ PREV[]** keys are used to change channel status. To make a channel inactive (not displayable), position the cursor at the appropriate "*" status indicator and change it to ".".

NOTE: Active or inactive refers only to the display of PODS and channels. It has no influence on the actual output channels. For example, it is possible to have a Format with just one channel of one POD displayed, but a 24 bit output pattern.

The significance of the order in which Data Formats are displayed, is given under the **[Pattern]** menu explanation.

How to **INSERT** and/or **DELET** Formats:

INSERT

To insert a new Format, move the cursor into the preceeding Label field. Press the blue SHIFT key followed by the **SYSTEM** (**INSERT**) key. You have now created a new format field. It must have a name assigned. Names can be between 1 and 5 alphanumeric characters long, the first character must be a letter. Note the **WARNING** referring to "**One ***" required. This is the minimum requirement of any format. As soon as one channel is made active, the warning will disappear.

DELETE

Deletion of a format is done as follows:
Position the cursor anywhere within the format to be deleted (Label or POD/channel fields), then press SHIFT and **CNTRL** (**DELETE**) KEYS. The format will then be deleted.

How to "fast move " the **CURSOR**:

Within the central display area (data format displays), a "fast move" cursor positioning feature is available. This lets you move the cursor quickly, from field to field. It avoids having to step through every position within each field. Fast move is done via the SHIFT, and appropriate **CURSOR** ← or → key.

Interchanging display order of Formats:

You can interchange the order of the Format displays, via the SHIFT and **CURSOR** ↑ or ↓ keys. This enables you in effect to move Format displays up or down. The significance of the order of the Data Formats is given under the **[Pattern]** menu explanation.

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Serial Data Generator Configuration

Data [Format] Allocation menu - Differences (Refer to Figure 3D-13)

In the "Serial" configuration, the following details apply to the **[Format]** menu:

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
Duration:	For **[fixed]** or **[variable]** duration, the value at each address applies to 8 successive bits. It also applies to both channels.

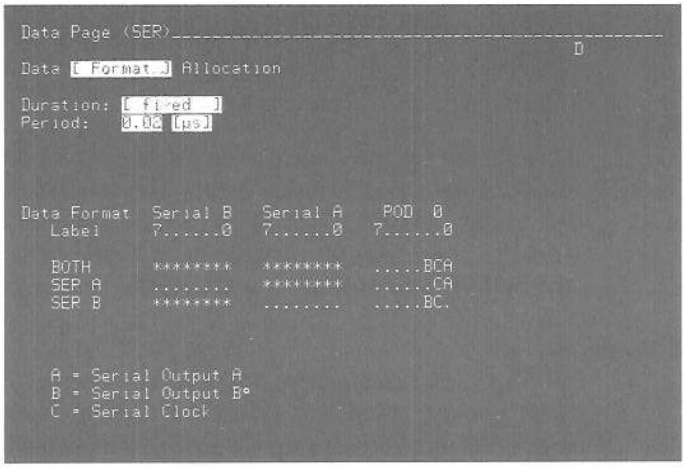


Figure 3D-13. Data **[Format]** Allocation menu (Serial D.G. Config.)

Data Format details:

In Serial configuration, 2 channels of data are available. For each channel, the data is output in a stream of 8 bit words. The words for each serial output are set up across all eight channels of a complete POD/channel group. The details can be seen by referring to the menu. Briefly, the setup and output details are as follows:

Ser. Output A, data set in POD 1, output from POD 0 chan. 0
Ser. Output B, data set in POD 2, output from POD 0 chan. 2.
The Data Formats and Labels are fixed, they require no user action.

C= Serial Clock

This clock signal (obtainable only in Serial configuration) provides an output pulse at every data bit. It is available from channel 1 of POD 0.

Data [Pattern] Setup menu (Refer to Figure 3D-14)

On this menu, data can be set up, edited and/or deleted. Also, in the variable duration mode, duration values can be input. Data Formats, as configured on the **[Format]** Allocation menu, can be assigned here. They determine which channels will be displayed. Data can be set up and displayed in binary, octal, hexadecimal or decimal.

DISPLAY CONTROL FIELDS — **SETTINGS EXPLANATION**

Used Format Allocation:

This field indicates the assigned Data Format Label. Any of the formats, configured on the [Format] menu can be called up. The formats can be stepped through, in the order shown on the [Format] menu, by pressing the **NEXT[]/PREV[]** keys. For each Format, data entry code(s) can be assigned (see next paragraph). These code(s) will be recalled as part of the format.

[BIN] [BIN] [BIN]

These fields are for assigning the data entry (and display) code for the three POD/channel groups. The code can be set (via the NEXT[]/PREV[] keys) to either: **BIN***, **OCT**,**DEC** or **HEX**. Whenever a Format is assigned, the codes as assigned previously will be recalled. Note that, the selected code determines which alphanumeric keys will be active for data entry.

* If the code is set to **BIN**, then the active channels will be identified by their corresponding numbers. These will be displayed directly beneath the **BIN** header. For all other codes, the POD number will be displayed.

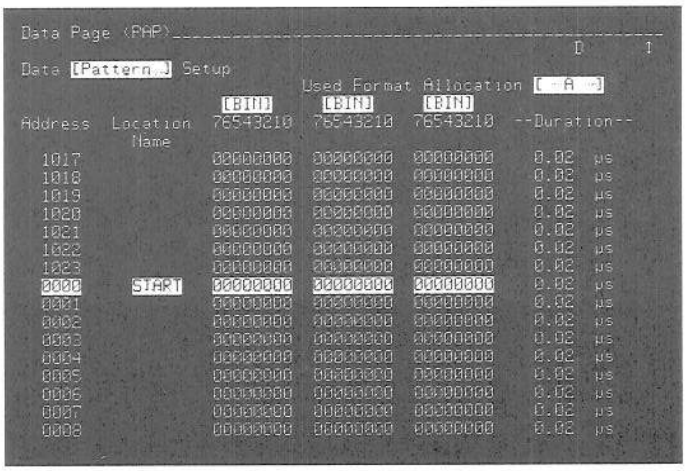


Figure 3D-14. Data **[Pattern]** Setup menu

Address:

Each data pattern has a specific address. There are two methods of accesssing an address, they are:

1) Either, **ROLL** the display up or down until the required address lies in the inverse video field.
or,
2) (usually the quickest method) move the cursor into the address field, then change the current value to the required one.

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Location Name:

The field under this heading is for assigning and/or displaying a location name or label. Each pattern, in addition to its address, can also have such an identifier. Names/Labels can be from 1 to 5 alphanumeric characters long, the first character must be alphabetic. Note (particularly for single character names) that the position of characters within the field is significant. The Name A.... is not the same as ....A. Up to 50 labels can be assigned. Labels are of particular help, in enabling existing data patterns to be easily accessed after INSERTion or DELETion of new ones. This is because a label remains assigned to its pattern even though the pattern has a new address. This is of special significance for the PRGM Page and data cycling.

Data setting fields:

For each of the three POD/channel groups, a data entry/display field is displayed. The default Data Format Label defines that all 8 channels of each POD will be displayed. For simple entry* of new data, position the cursor at the required bit, then use the appropriate alphanumeric key to make the change.
* Comprehensive data editing capabilities are provided. These enable data to be moved, copied exchanged etc. By using these, data can often be very quickly set up. Section 3E explains all of them.

Duration:

In **[fixed]** duration mode, the duration value cannot be changed on this menu. It is for reference purposes only. In **[variable]** mode, the duration of each pattern can be set here. For either duration mode, if the System Clock is externally sourced, duration values will be expressed in "Cyc" (cycles). Refer to the [Format] Allocation menu - Duration, for more information.

Serial Data Generator Configuration

Data [Pattern] Setup menu (Refer to Figure 3D-15)

The main points to be noted for "Serial" configuration are as follows:

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
Used Format Allocation:	Only three formats (non-user defined) are available. These are: **[BOTH]**, **[SER A]** or **[SER B]**. In each case, all 8 channels of the appropriate PODs are automatically displayed.
Data setting fields:	The basic principles of setting up and editing data are as for "Parallel" configuration. However, you should note the sequence at which the 8 bits of each serial word are output. It is as follows: from "channel 0 to channel 7", then back to channel 0 at the next address, for the next word.
Duration:	Note that the duration value at each address, irrespective of mode or System Clock source, applies to each of the 8 bits of the corresponding word(s). It also applies across both channels.

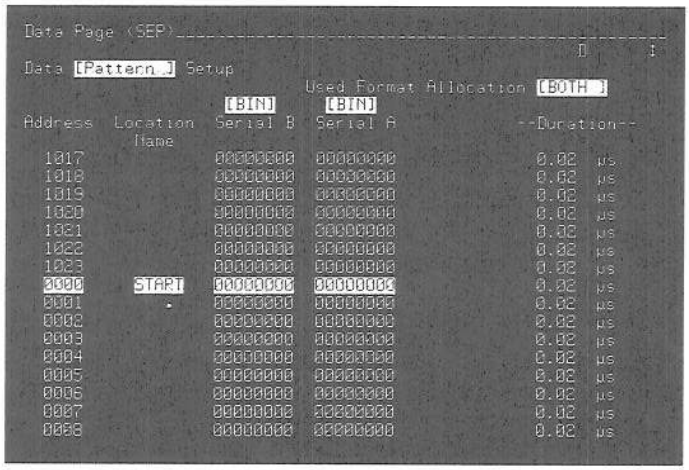


Figure 3D-15. Data **[Pattern]** Setup menu (Serial D.G. Config.)

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Data [Waveform] Setup menu (Refer to Figure 3D-16)

This menu provides an alternative method of setting up, editing and displaying data/timing relationships. Patterns which have been set up on the **[Pattern]** menu, are automatically converted into a timing diagram when the **[Waveform]** menu is selected. Switching from **[Waveform]** to **[Pattern]** menus will have the opposite effect. Normally, only a "window" within the complete address range will be displayed. The window can be scaled so that the display can be "stretched or compressed" as wished. Data can be set up or edited by simply moving a cursor to the required address and entering the desired data. In variable duration mode, duration values can also be set on this menu. The menu details are as follows:

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
Time/Division:	This setting can be considered as a magnification or zoom control for the display. The display area is divided into 10 sections along the horizontal axis. Within the display area, a section or "window" of the complete address range can be viewed. The time frame of any such window depends on the Time/Division setting. For example, with the default setting for Time/Division of 50 ns, the window time frame equates to 500 ns. Time/Division setting can be changed via the **NEXT[]/PREV[]** keys.
Cycles/Division:	The display area is scaled in cycles if the System Clock is externally sourced. The same principles apply as for Time/Division. **Display scaling - additional information** At the bottom of the display area, the complete address range is represented by a dotted line. The portion of the address range which the window contains is shown as a solid horizontal bar. A small "block" on the bar indicates the relative position of the Editing Cursor (see below) within the window. The length of the bar depends upon the current **Time/Division** (or **Cycles/Division**) setting. The window can be moved through the address range via the **ROLL** ← or → keys.
Address:	This field indicates the address of the bit which can currently be edited. It is the address where the currently active Editing Cursor is positioned. The address value can be changed in three ways: Either, by inputting a new one in the field or, by moving the Editing Cursor (see below) or, when the **ROLL** keys are used to shift the displayed window.
Label:	This field has two functions, either: (a) It is a display field for labels already assigned to addresses. That is, when such an address is accessed, its label will also be displayed. (b) New labels can be assigned to addresses. Note that, you cannot access a "labelled address" by inputting its label in the field. (If you try, an error message will be displayed.)
Editing Cursor:	Two Editing (graphics) Cursors are available: an "x" [x->], and a "o" [o->]. Whichever one is selected serves as the active cursor for editing purposes. Also, its position determines the Address, Label, level and Duration values which are displayed. Although only one Editing Cursor can be defined at any time, each can be positioned at specific address.

The Editing Cursors are displayed as two vertical bars,each with a "o" or an "x" header. They can be moved horizontally, left or right across the display area. Movement is in address increments (or decrements). Therefore, the distance moved is related to each duration value. Movement is controlled via the **CURSOR** ← or → keys.

As an example of how to position the Editing Cursor, and change a bit level, procede as follows:
First select the channel to be edited, this is done by positioning the flashing cursor in one of the channel label fields. For example, select A 0. Then press the **CURSOR** → key (5 times) to position the Editing Cursor at address 0005. To set the data bit high, press the numeric 1 key. Note how the flashing cursor moves down to channel A 1. This is due to the current Editor Mode setting.

Note: If the Editing Cursor is positioned at either end of the display, further attempts to move it will cause the window to shift.

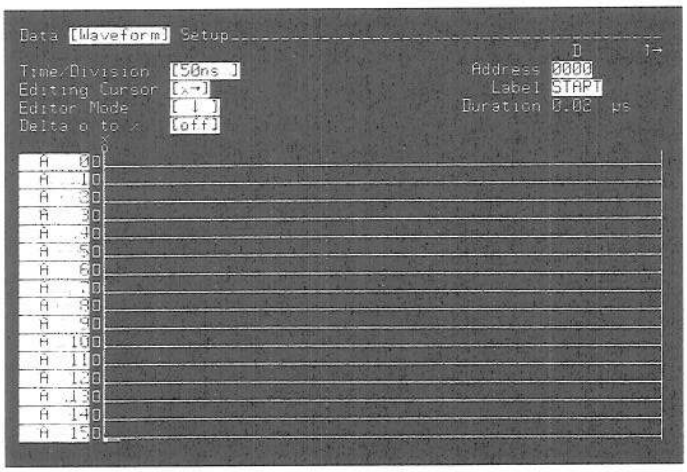


Figure 3D-16. Data **[Waveform]** Setup menu

Editor Mode:

Either vertical (downwards) [v], or horizontal [-->], can be set as the editing direction. [v] means that after each bit change, the (flashing) cursor will auto-step down to the next displayed channel (but same address). This enables you to quickly edit all data at any chosen address. In [-->] mode, after each bit change, the Editing Cursor simply steps to the next address of the channel currently being edited.
The two modes enable you to select whether to set up (or edit) data, channel by channel or address by address. Practise using both modes to see how the Editing Cursor moves after a bit change.

Duration:

This field is either for just displaying the duration (if **[fixed]** previously set), or entering values (if **[variable]** set). The actual function is therefore dependent upon the corresponding settings on the Data [Format] Allocation menu.

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Delta o to x:

When **[on]**, the sum (total) duration measured between the two graphics cursors will be displayed. This means that you can measure the total duration between any two addresses. It is particularly useful for veryifying the sum when [variable] duration is selected. To use it, just position the **o** and **x** cursors at the appropriate addresses and the sum duration will be displayed.

DISPLAY AREA DETAILS:

Channel display and selection:

General Information:
Up to 16 channels can be simultaneously displayed. Channels from any previously allocated Formats can be displayed anywhere within the display area. Each channel has a two part identifier. An example is: **A 5**, this identifies the Data Format Label as "A", the numeric value "5" identifies the channel as the sixth* one available from Format A.
*Note: Channel numbering begins with 0, the numbers relate to active channels of a Format, and have no direct relation to specific PODs.

If 8 or less channels are displayed, each channel will be allocated twice the normal vertical space. The default content and order of the fields is channels **A 0** to **A 15.**

It is possible that after use of **INSERT** or **DELETE** on the **[Format]** menu, the display order of channels on the **[Waveform]** menu will change. Also, if the first (top) Format has less than 16 channels active, channels from the next Format will be displayed and so on.

A major difference from the [Pattern] Setup menu is that, channels from more than one [Format] can be displayed. If for example Formats A and B have been allocated, any combination of channels A 0 to A 23, and B 0 to B 23 can be displayed.

Bit Condition [] Indication
Each channel has a "bit condition indicator", this comprises a box "[]" which can either be empty or filled. It indicates the bit status of the bit where the active Editing Cursor is positioned. An empty box indicates a "0" level, a filled one indicates a "1" level. The indicators are positioned immediately in front of the channel label fields. As the Editing Cursor is moved from address to address, the bit status of each channel will be indicated. This is of particular use if the display has been scaled so as to "compress" the patterns.

GUIDELINES ON HOW TO USE THE DISPLAY AREA:

How to Display a Channel in a Specific Location:
To display a channel in a specific location, do the following: First, move the (flashing) cursor into the appropriate field. Press **NEXT[]** or **PREV[]** until the required channel is displayed. If more fields need to be created (inserted), refer to the next paragraph.

How to Switch a Channel Display "Off":
This is done via the **NEXT[]/PREV[]** keys. It allows you to reduce the number of channels actually displayed. Those not currently required can be "switched off". This will cause the corresponding display areas to be cleared of any pattern details. The channel label field of such channels will contain the "label": "**Off**".

How to Delete/Insert Channels:
Channels can be deleted or inserted via the SHIFT and **DELETE** or **INSERT** keys. In either case, the following two preconditions must be satisfied:
1) The **Editor Mode** must be set to [\/] (vertical).
2) The cursor must be positioned in the appropriate channel field.
Then, to delete a channel, simply press the **SHIFT** and **DELETE** keys.
To insert a channel at position "n", position the cursor at n-1, then press **SHIFT** and **INSERT**. If 16 channels are already displayed, no futher "INSERTS" are allowed.
In both cases, note the difference in display details if 8 or less channels are displayed. (Refer to the General Information on Channel display and selection.)

How to Delete/Insert Addresses (Patterns):
As for the **[Pattern]** Setup menu, addresses (data patterns at an address) can also be deleted and/or inserted on the **[Waveform]** menu. In either case, the following two preconditions must be satisfied:
1) The **Editor Mode** must be set to [-->] (horizontal)
2) The cursor must be positioned in the appropriate channel field.
To **DELETE** data at an address:
Position the Editing Cursor at the address and press **SHIFT** and **DELETE**.

To **INSERT** a new data pattern after address n:
Position the Editing Cursor at n, then press **SHIFT** and **INSERT**. A new pattern (all zeroes) will be inserted at address n+1. Note, if **[variable]** Duration is set, the duration value will be equal to the Time/Division setting.
Data patterns from the original (n+1) address will all be shifted forward one address.

How to Exchange Channels:
Channel positions can be exchanged via the **SHIFT-CURSOR** (LABEL) ↑ or ↓ keys. For example, with the cursor currently in the channel positioned at "n", the following applies:
SHIFT-LABEL ↑ exchanges channel n with n-1.
SHIFT-LABEL ↓ exchanges channel n with n+1.

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Serial Data Generator

Data [Waveform] Setup menu (Refer to Figure 3D-17)

In the "Serial" configuration, the following additional points apply to the use of the **[Waveform]** menu:

Only the two channels: SER A and/or SER B can be displayed. Two different address fields: **Byte** and **Bit**, are provided. These are used as follows:

Byte Address: This address increments in the same way as in Parallel Configuration. Each discrete movement of the Editing Cursor (via the **CURSOR** ← or → keys) increments the Byte Address up or down one step.

Bit Address: This address normally steps up or down by a full 8 bits for each single step of the Byte Address. Since the Editing Cursor can be stepped through each bit of a Byte (see below), the corresponding Bit Addresses can also be displayed.

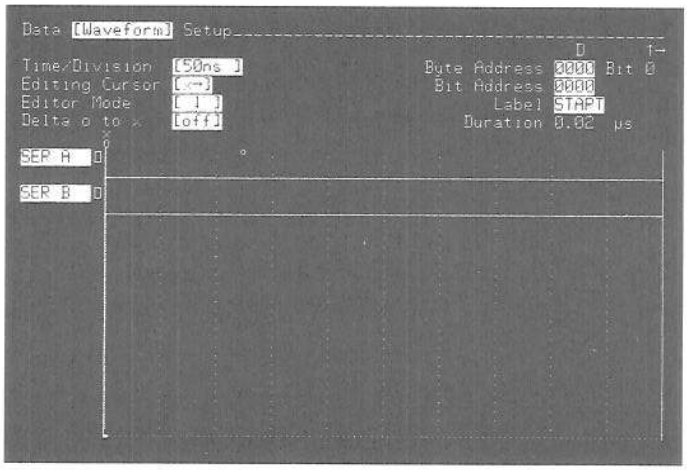


Figure 3D-17. Data **[Waveform]** Setup menu (Serial D.G. Config.)

Editing Cursor: The Basic concepts relating to positioning of the Editing Cursors etc. is as for Parallel Configuration. However, in addition to "normal" address positions, the Editing Cursors can be positioned at specific bits. This is done as follows:

Bit Addressing:

This can be done either by entering the required value in the Bit Address field or, by positioning the Editing Cursor via the SHIFT and **CURSOR** ← or → keys. In either case, it usually helps to first access the corresponding Byte address. Then, for graphical addressing, with the Editing Cursor positioned at the required Byte Address, use the **SHIFT** and **CURSOR** → key to step to the required bit.

NOTE: SHIFT ROLL

The **ROLL** ← or → keys have an additional capability in Serial mode. By pressing the **SHIFT** and **ROLL** ← or → keys, you can move the displayed window bit by bit across the display area. This means that you can step, bit by bit, through the data.

3D-6
PRGM (Program Page) Menus

This section describes the **PRGM** (Program Page) menus and how to use them. In addition to the menu descriptions, some setup examples are included. The information is presented under the following headings:

Overview of the Menus and Pattern Sequencing.

The Menus and How to Use Them.

Program Modules - Setting up

Virtual Memory Expansion.

Explanation of some Error Messages/Warnings

OVERVIEW OF THE MENUS AND PATTERN SEQUENCING

The **PRGM** (Program Page) comprises two menus: **Module** and **Trigger Event**. The menus enable pattern seqencing to be defined, up to 255 memory segments can be sequenced in any predetermined order.

On the **[Module]** Assignment menu, a complete program comprising modules and segments can be user defined. For each program segment, repetition times (number of times that particular segment is to be repeated) can be set. A segment may contain between 2 and 1024 successive patterns. Each pattern is defined by a "from" and "to" Address or Label. Segments can overlap one another and can be inserted and/or deleted by using the "INSERT" and "DELETE" edit capabilities. By suitably structuring and sequencing a program, the physical depth of the memory (1 k.bit) can be virtually increased. An explanation of how to achieve this is given at the end of the section.

On the **[Trigger Event]** Assignment menu, those segments to be sequenced following start and/or jump requirements, can be assigned. Refer to the CNTRL page, **[Input]** Trigger Word Assignment menu for more information about these

The Menus in Pattern Sequencing

When a START command (from any source) is given, pattern sequencing will commence from the segment as defined on the **Trigger Assignment menu**. The segment referred to, is the one whose label is assigned within the "On START execute" **[label]** field. An example of such a label is "PROG1" which is a default or Standard Settings one. Sequencing will continue through the segments until the first "end" command is reached. Thereafter, sequencing depends on whether Auto or Single cycle (Control Page Clock menu) is selected and also, the specific Program Page menu settings. The significance of these settings etc. is explained in the examples given later in this section.

NOTE: Single Step
Single Step (see front panel keys) can apply to either data addresses or program segments. When the Program Page **[Module]** Assignment is displayed, a Single Step command will cause the segments to be stepped through. This is indicated by the message "**Program Single Step...**" being displayed. Refer also to the **[Trigger Event]** Assignment menu description for "**INIT-Mode**" and "**CONT-Mode**" explanations. Whenever changes are made to either data or program segments/sequence etc., an Update" should be done prior to the next Single Step command. If not done, then after the Single Step command, the message "**Difference Display - Generator**" will be flashed. This is to remind you that a difference, in data/segment status, exists between the display details and current output content of the 8175A.

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THE MENUS AND HOW TO USE THEM

[Module] Assignment menu (Refer to Figure 3D-18)

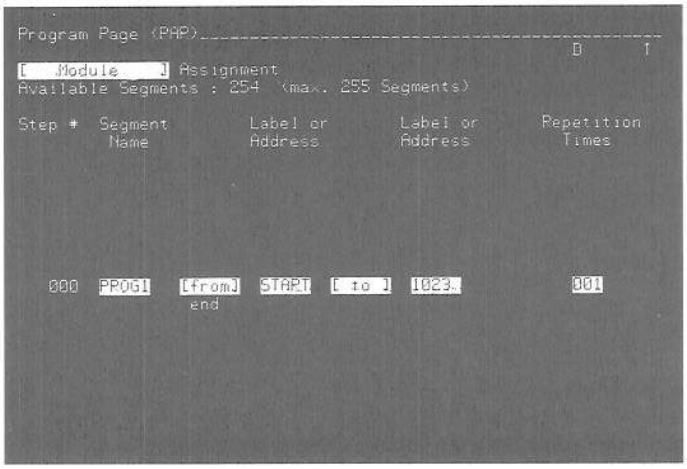


Figure 3D-18 [**Module**] Assignment Menu

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
Available Segments: x	This is not directly user settable. The value displayed indicates how many new segments can be set. This is dependent upon the total number of segments already defined and their Repetition Times. To illustrate this, if the first segment is repeated 255 times, then no more can be defined! As the available segments are used up, the value displayed decreases. The displayed value is given by: 255-(sum of all Repetition Times)
Step:	This is not directly user settable. Numbers are automatically allocated for each segment. They indicate the sequence of data pattern execution. Each successive number depends upon the immediately previous one and its Repetition Times. This is as follows: Step number = n + rep., where n = the previous segment step number and rep. = its Repetition Times.
Segment Name:	Up to 10 segments can have names assigned. Names can have up to five characters and must must be unique. The first character of a name must be alphabetic. The Standard Settings name is **PROG1**. A name is not essential but, if not given, then the corresponding segment cannot be assigned on the **[Trigger Event]** Assignment menu. (more information concerning this is given under the Trigger Event Assignment menu description)
[from]	"**from**" means that the segment concerned starts from the corresponding label or address. For any segment except the very first one, if the next line is not an "**end**" statement, "**from**" can be changed to "**end**". An "**end**" completes a program module. The **PREV[]/NEXT[]**keys are used to change "**from**" to "**end**" and vice-versa.

Label or Address:	This is the address or label from where the segment concerned starts. In the case of labels, only those previously defined (on the Data Page Pattern Setup) can be used. Settings are changed via the alpha-numeric keys.
[to]	This can be changed (via the **NEXT[]/PREV[]** keys) to "**next**". Then, in addition, the word "Steps" will be displayed after the corresponding value field. If a "to" address or label already exists, it will be replaced by the coresponding step count. An example of this is as follows: "from Address 100 to address 190" will change to: "from Address 100 next 90 Steps"
Label or Address:	This is either the last address of the segment concerned (if preceded by "to"), or the length of the segment (if preceded by "next"). It can either be represented as: a "**to**" address or (previously defined) label or, a "**next**" step value as previously explained.

NOTE: Addresses and Labels - The following four combinations are possible:

1.	from	Address	to	Address	n times
2.	from	LABEL	to	LABEL	n times
3.	from	LABEL	to	Address	n times
4.	from	Address	to	LABEL	n times

Repetition Times	This value indicates how many times the segment concerned will be repeated. The maximum number possible depends on the number of Available Segments. As any Repetition Times value is changed, so the Available Segments will change.

[Trigger Event] Assignment menu (Refer to Figure 3D-19)

This menu, has five setting fields. In each of the first four fields a label (Segment Name) can be set. The Standard Settings define only one segment: PROG1, therefore this appears in each field. Once you have set up some more segments, you can assign the required ones via the **NEXT[]/PREV[]** keys. The last field enables you to reference the start point for Address or Program Single-Step to this menu. The settings and how to use them are described on the next page.

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DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
On START execute:	The label set here identifies the segment from which cycling (data sequencing) will begin. Whileonly one segment (with the label: **PROG1**) exists, no change is possible.

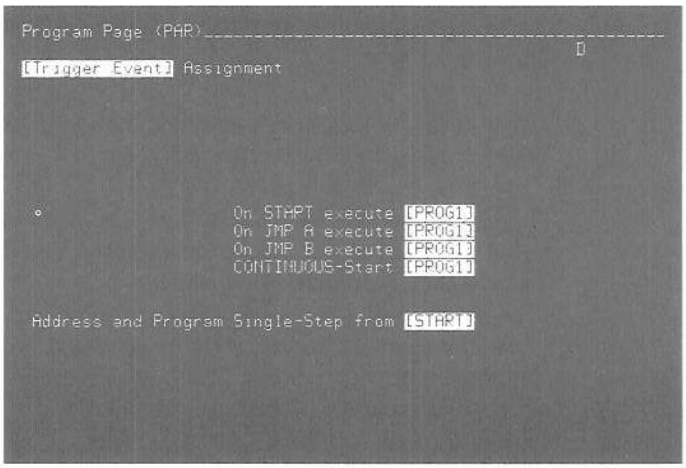


Figure 3D-19. **[Trigger Event]** Assignment Menu

On JMP A execute: The label set here identifies the segment which will interrupt the one currently active, when the jump "JMP A" conditions are satisfied. The jump conditions are as set on the Control Page **[Input]** Trigger Word Asignment menu.

On JMP B execute: Details are as for JMP A, except that JMP B applies.

CONTINUOUS-Start: The label set here, identifies the segment for continuous cycling. This means the one from where cycling will continue, after the first "**end**" in the overall program is reached. Note that, continuous cycling occurs only if **Auto Cycle** has been chosen as the cycle mode (see the Control Page [Clock] menu).

Address and Program Single-Step from **[START]**

One of the first three Trigger Event Assignments can be set in the field. The setting then determines in effect, from which address cycling will commence when Single Step is initiated.

Note the message that appears at the top of the display, whenever the cursor is positioned within the field. By pressing "**CLEAR ENTRY**", Single Step is reset to its initialization status. This means that the next time it is initiated, it will commence from the "**from**" address of the first segment. A message will be flashed, when Single Step is first initiated after a reset, to remind you that it is the "**INIT-Mode**". Subsequent Single Steps will then be identified (by a display message) as "**CONT-Mode**" continuous ones.)

Until you have set up some additional labelled segments on the Module Assignment menu, (or renamed **PROG**) only "**PROG**" can be assigned in any of the first four fields. The actual procedure for assigning labels has already been explained. The examples given later, illustrate how the **[Trigger Event]** Assignment menu settings can be used.

PROGRAM MODULES - PRINCIPLES OF SETTING UP

This section is designed to explain the basic principles of how to set up program modules. It uses two worked examples to illustrate the various steps to be followed. An explanation of the cycling sequence (how they run) for the examples is given at the end of each one.

Note the following general points:

1) Segment settings (including "**from**" and "**end**") can only be changed once the cursor is positioned within the particular segment. The segment must first be posiioned within the central inverse video field, this is done by pressing the appropriate **ROLL** key.

2) As soon as the cursor is moved out of the menu header field (**[Module]**) and into a segment line, the following message will be displayed at the top of the screen:

"INSERT to ADD new Program line"

Insertion and deletion of lines is explained in the examples.

Setting up a Simple Program Module

Example PRGM 1: Simple Module Assignment Menu Changes and Additions
The object of this example is to produce a program module with details as shown in Figure 3D-20A. It will include four segments, two of them to be allocated labels (for subsequent assignment on the **[Trigger Event]** Assignment menu). This requires changes to some existing settings and insertion of new segments. This program comprises an initialization module of two segments followed by the actual test routine. Suggested corresponding settings for the **[Trigger Event]** Assignment menu are shown in Figure 3D-20B. Since making these settings is very easy, no instructions are considered necessary or given. The segments' start and stop (from and to) addresses and repetition times are to be as shown below:

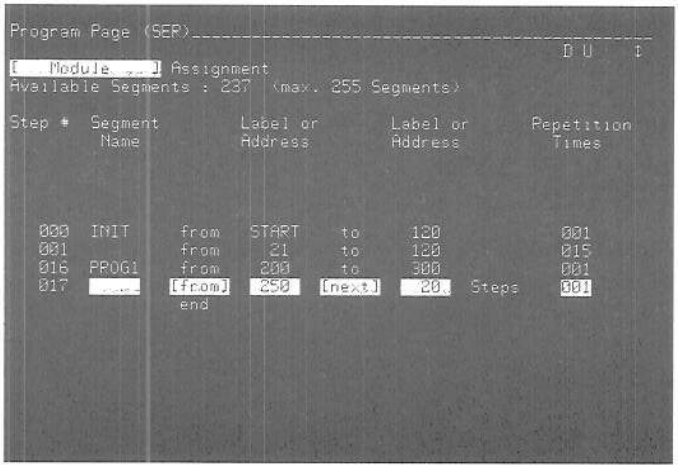


Figure 3D-20A. PRGM 1 Mod. Ass. Menu

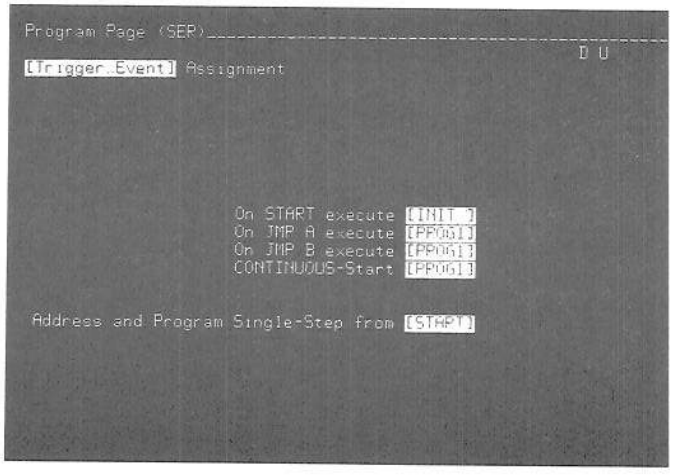


Figure 3D-20B. PRGM 1 Trig. Event Ass.

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Procedure:

1. Display the Program Page [**Module**] Assignment menu.
2. Use the **CURSOR** keys to position the cursor in the program segment (not the "end" line!).
3. Change the Segment Name to "INIT" via the alpahanumeric keys. Use the **DON'T CARE** key to delete the 1.
4. Move the cursor into the "**to**" Label or Address field. Change the value to 120. Do not worry if the error message: **Address>1023** is flashed as you input the new value. This can occur depending on how you input the new value, just use the **DON'T CARE** key to delete the digits not required.
5. Press the SHIFT (blue) and **INSERT** keys. This will cause a new blank segment to be inserted immediately after the original one. The cursor will move into the new segment.
6. Press the **CURSOR →** to move the cursor into the "**from**" Label or Address field. Input the value "21" to the field.
7. Move the cursor into the "**to**" field and set the value to "120".
8. Move the cursor into the Repetition Times field and set set the value to "015".
9. Press SHIFT, **INSERT**, this will cause another new blank segment to be inserted after the first new one.
10. Use the alphanumeric keys to name the segment "PROG1".
11. Set the "**from**" and "**to**" addresses to 200 and 300 respectively. Use the same principles as for the last new segment.
12. Insert another new segment as in (9) above.
13. Set the "**to**" address to 250.
14. Move the cursor into the "**to**" field and press **NEXT[]** to change the setting to **next.**
15. Move the cursor into the address field and set the value to "20".

The menu details should now be as shown in Figure 3D-20A. If any of the values are not correctly lined up in their columns, press the **PRGM** key. This will return the cursor to the menu header **[Module]** and correctly position all settings.

Explanation of how the Complete Program will Cycle

Remember that in practise, an **Update** would first be required! As previously mentioned, a START command will cause cycling to begin from the first segment of the Module Assignment. For the Module Assignment example shown, this will be from the segment labelled "INIT". Cycling will be as follows:

1. After a start command, cycling will begin from the address labelled "START" and continue through to address 120.
2. Addresses 21 to 120 will then be cycled and this loop repeated another 14 times.
3. PROG1, will then be cycled, this has loops from addresses 200 to 300 and 250 to 270 (next 20 Steps means the next 20 addresses).

When "end" is reached data cycling will STOP if Single Cycle was selected (Control Page). The last pattern (at address 270 for this example) will remain at the outputs. If Auto Cycle was selected, data cycling will continue from the address label assigned to "CONTINUOUS START" (PROG1 in this case) on the Trigger Event Assignment menu. From now on, data cycling will be:

from Address 200 to 300, (once) then:
from Address 250 to 270, (once) then back to Address 200 etc.

Setting up a Complex Program Module

This section explains, with the aid of a worked example, how to set up a fairly complex program module and the corresponding Trigger Event Assignment settings. It therefore provides the additional information needed to enable you to fully utilize the features of the two menus. This includes how to set up segments each with their own start and end addresses. The basis for the program settings is the previous Module Assignment menu settings example. Once you have made the additional settings, you will be conversant with all features of both menus.

A test program can comprise just one continuous sequence of segments with a single end address. However, in many cases an initialization routine followed by, the actual test routine are required. Also, within the test routine, branching to other segments may be required. Such features are necessary for example, when interactive testing of a DUT is to be done. In such cases, response to external trigger words will often be required. Program modules for this type of test will involve branching via the "**JMP**" routines. The following example,will help you to understand the operation and setting up of such modules.

Example PRGM-2: Complex Program Page Menu Settings

This example involve setting up, the requirements for using the 8175A in an interactive test. The menu settings required are shown in Figures 3D-21A and B. The **[Module]** Assignment menu comprises several segments, including some to be initiated via external (e.g. DUT) signal conditions. Figure 3D-21B shows a corresponding **[Trigger Event]** Assignment menu, whose settings are compatible with the Module Assignment one.

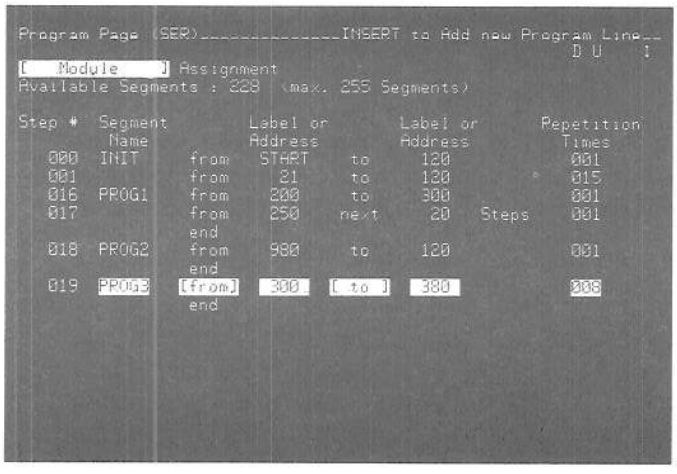


Figure 3D-21A. PRGM 2 Mod. Ass. Menu

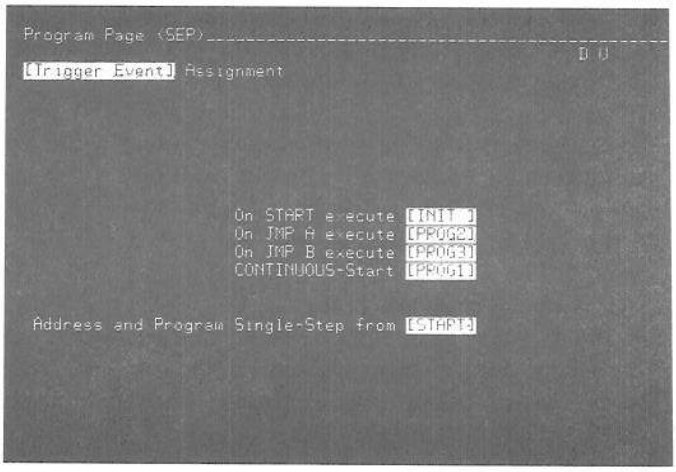


Figure 3D-21B. Trig. Event Ass. Details

Procedure:

As a first step, ensure that the Module Assignment menu settings for the previous example are still available. Then make the additional settings as follows, note that comments/explanations precede some of steps.

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How to insert a program segment and additional "end" line:

1. Position the cursor in the "**end**" line of the program. (Do this by pressing the **ROLL** ↑ key until "end" is displayed in inverse video, then move the cursor into the field)

2. Press the SHIFT and **INSERT** keys. This will cause a complete new segment including an "end" line to be inserted.

3. Use the alphanumeric keys to name the segment "PROG2".

4. Set the "**from**" and "**to**" addresses to 980 and 120 respectively.

5. Repeat steps (1) and (2) to insert another new segment.

6. Name the segment "PROG3".

7. Set the "**from**" and "**to**" addresses to 300 and 380 respectively.

8. Set the repetition times to 008.

The Module Assignment menu settings should now be as shown in Figure 3D-21A. You can now assign the labels (segments), as shown in Figure 3D-21B, on the Trigger Event Assignment menu. The following description explains the cycling sequence of the complete program.

Explanation of how the Complete Program will Cycle

Remeber that in practise, an **Update** would be required! As previously mentioned, a START command will cause cycling to begin from the first segment of the Module Assignment. For the Module Assignment example shown, this will be from the segment labelled "INIT". Cycling will be as follows:

1. After a start command, cycling will begin from the address labelled "START" and continue through to address 120.
2. Addresses 21 to 120 will then be cycled and this loop repeated another 14 times.
3. PROG1, will then be cycled, this has loops from addresses 200 to 300 and 250 to 270 (next 20 Steps means the next 20 addresses).

When the first "end" is reached data cycling will STOP if Single Cycle was selected (Control Page). The last pattern (at address 270 for this example) will remain at the outputs. If Auto Cycle was selected, data cycling will continue with the address label assigned to "CONTINUOUS START" (PROG1 in this case) on the Trigger Event Assignment menu.

JMP A and B routines (branching)

On the Trigger Assignment menu, labels "PROG2" and "PROG3" are assigned to JMP A and JMP B. Therefore, the segments corresponding to these labels will be initiated as soon as the assigned Input Trigger words occur. For example, when the Input Trigger word for JMP A occurs, this will cause PROG1 to be interrupted and cycling will continue from the first address of PROG2 (980). When the "end" of PROG2 is reached, cycling will continue by reverting back to the CONTINUOUS START module (PROG1). (Note that cycling recommences from the first or "from" address of this module, not the interrupted one.) The same principle applies for JMP B.

Refer to the CNTRL Page,**[Input]** Trigger Word Assignment menu for information on Input Trigger Word Assignment etc.

VIRTUAL MEMORY EXPANSION

Up to 255 memory segments can be sequenced in any desired order, and each segment may contain 2 to 1024 successive patterns. By utilizing these features, the actual memory depth of the 8175A can be virtually expanded. The principle is is most easily explained with the aid of an example. The one that follows is designed to illustrate the basic principles, and benefits of, virtual memory expansion.

Example PRGM 3. Virtual Memory Expansion
Assume that you need to output 50 different data patterns, each to be repeated 100 times. Initially, it would appear that a 5 kbit memory (50x100) is necessary. However, with virtual memory expansion it can be achieved with just 1 kbit. This is done as follows:

1. First, (on the DATA page) write each pattern 20 times into the memory to produce 50 pattern "blocks". Note, for each pattern, this can be done very quickly by writing the pattern and then using the **MODIFY** edit function to "copy" it to the next 19 addresses.

2. Now, on the **PRGM** Page, **[Module]** Assignment menu, define a memory segment for each of these 50 pattern "blocks". For each segment, set a Repetition Time of 5. The total segments used will therefore be 250 (50x5).

When the resulting program module is sequenced, although only a total of 1kbit of memory has been used, it appears as if 5kbit is available. This illustrates how the memory has been virtually expanded to 5kbit.

EXPLANATION OF SOME ERROR MESSAGES AND WARNINGS

The following explanations are for those messages/warnings etc., which can be displayed while you are practising making settings. (There are some other messages, but their meaning is self explanatory.)

ERROR label doesn't Exist: This message is displayed when you try to input a "**to**" or "**from**" Label which has not already been defined on the Data Page.

ERROR [end] still existing: This message is displayed when you try to change a "**from**" to an "**end**" when the immediately following line is "**end**".

ERROR Fix Problem First: This message is displayed when you try to move the cursor out of a field while one or more error conditions still exist. The "error condition" in this case might be only that label and/or address settings have not yet been entered.

ERROR Rept.> avail. Program Step: This message is displayed when you try to input a value which exceeds the currently available segments.

ERROR Maximum INSERT'S Used: This results when you try to insert another program line and all available segments have been used.

ERROR Difference between Labels: This message is displayed whenever the values/settings of the Label/Address fields, within a segment, are identical. (This condition can occur temporarily as you input new values.)

ERROR All Names Must be Unique: This message is displayed when you try to assign the same Segment Name to more than one segment.

WARNING Address Required This warning will be displayed until both the "**to**" and "**from**" Address/Label fields are filled.

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3E
The Edit Capabilities and How to use Them

GENERAL INFORMATION

The 8175A is provided with a powerful set of editing capabilities. They are accessed via the blue SHIFT and MAIN DISPLAY keys. These edit functions (or capabilities) relate primarily to the DATA page, however two of them (INSERT and DELETE) are also of significance for the PRGRM (Program) page. Regarding the Program Page, use of the functions is self explanatory. (Also, examples of how to use them are given within the Program Page menus explanation). One point to note for both pages, is that changes can be made while the 8175A is running without affecting the data currently being output. The changes are only transfered to the outputs once an **UPDATE** command has been given. This section relates only to the use of the edit functions in conjunction with the Data Page.

3E-1
OVERVIEW

By using the edit capabilities, the following can be achieved:
Single lines of data can be inserted, or deleted. Segments of data can be moved, or copied to other addresses. Segments of data can be modified en block; data can be exchanged between channels. Also, fixed data patterns with selectable start addresses and count increments can be input. In the case of Serial Data Generator configuration, PRBS sequences can be loaded with a few key strokes. In effect, for either configuration, the edit functions enable data and timing setups to be quickly and easily produced and edited.

The main* functions available are:

INSERT DELETE COPY MOVE MODIFY FCTN

*From the Data edit functions "COPY, MOVE and FCTN", further sub-functions are available. The sub-functions are accessed via the **NEXT[]/PREV[]** keys and are as follows:

COPY	MOVE	FCTN
COPY Address	MOVE Address	PRBS (Serial D.G.)
STORE	EXCHANGE Channel	INCR/DECR (Par. D.G.)
COPY Channel		

COPY, MOVE, MODIFY, FCTN apply only to the Data [Pattern] menu. Access to them is cursor position independent. This means that they can be accessed (and implemented) with the cursor in any position within the menu. For all of them, unlike INSERT and DELETE, entry fields are provided below the pattern display. These fields, which appear immediately after selection of the particular edit mode, are for entry of the appropriate address/data values etc.

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3E-2
BASIC PRINCIPLES OF EDITING

General

There are some basic points which you should note relating to use of the functions, these are as follows:

1. Except for **INSERT** and **DELETE**, any editing function result will apply **only** to those channels defined by the currently used Format (i.e. only to the POD/channel group currrently displayed.

2. All except, **INSERT** and **DELETE**, provide one or more fields for address, data and/or value entry.

3. **INSERT** and **DELETE** are initiated as soon as their corresponding keys are pressed (no "**EXEC**" is necessary).

4. **INSERT** and **DELETE**, can be accessed only when the cursor is positioned within a suitable field or display area. These are described later in the corresponding explanation.

   Note: In the case of the Data Page **[Format]** menu, a prompt "**INSERT to Add.**." is displayed at the top of the screen whenever the cursor is positioned such that INSERT or DELETE can be done.

5. All editing functions, except **INSERT** and **DELETE**, require that the **EXEC** key be pressed (after data and/or address entry etc.) to initiate the change(s).

6. For all editing functions, the change(s) will only become available for outputting after an **UPDATE** is done. The letter: "U" will be displayed on the 8175A screen to remind you to do this.

How to Cancel an Edit Function

The Edit functions COPY, MOVE, MODIFY and FCTN can easily be cancelled (even if some, or all of the fields have been filled). The procedure is as follows:
Simply press: SHIFT-**CLEAR ENTRY**. The current menu status will be retained. Cancellation of these edit functions/sub-functions will also result from:

pressing any **MAIN DISPLAY** key*
changing the Used Format Allocation
changing the data entry code (HEX BIN etc)

***Note:** If a different MAIN DISPLAY key (from the current one) is pressed, the current menu is exited!

The following pages provide detailed explanations of how to use all the Edit functions. For most of them "Before and After" display examples are used to simplify the explanations.

3E-3
INSERT/DELETE

How these functions can be used, depends on the menu concerned. As the names suggest, they provide an "insert or delete" capability. What can be inserted or deleted on any menu and, how to do it, is described in the following paragraphs. Note however the following points:

1. **INSERT** and **DELETE**, can be accessed only when the cursor is positioned within a suitable field or display area. These are menu dependent and are as follows:

   [Format] menu - a Data Format Label or channel row (Parallel D.G. only).
   [Pattern] menu - anywhere in the (inserse video) required Address/data row .
   [Waveform] menu - in a channel identifier field.

2. In the case of the Data Page **[Format]** menu, a prompt "**INSERT to Add..**" is displayed at the top of the screen whenever the cursor is positioned such that INSERT or DELETE can be done.

The use and effect of INSERT and DELETE regarding the different menus is as follows:

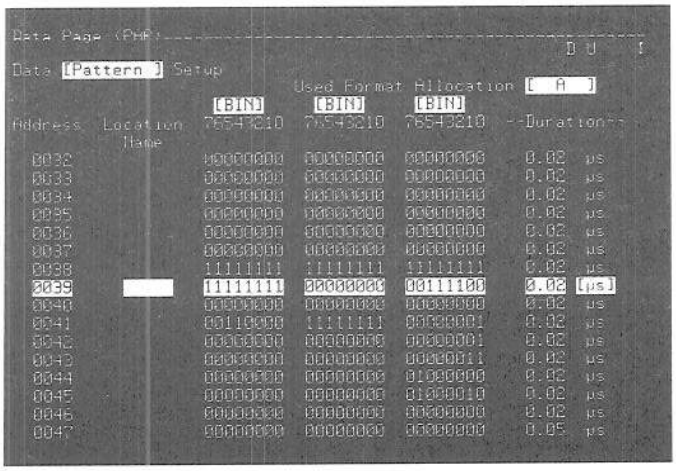
Data [Format] Allocation menu

On this menu, the functions enable either existing Data Format Labels to be deleted or, new ones to be added. Deletion needs no explanation. To insert (create) a new Format, simply move the cursor into the required position (can be between existing labels) and press: **INSERT**.

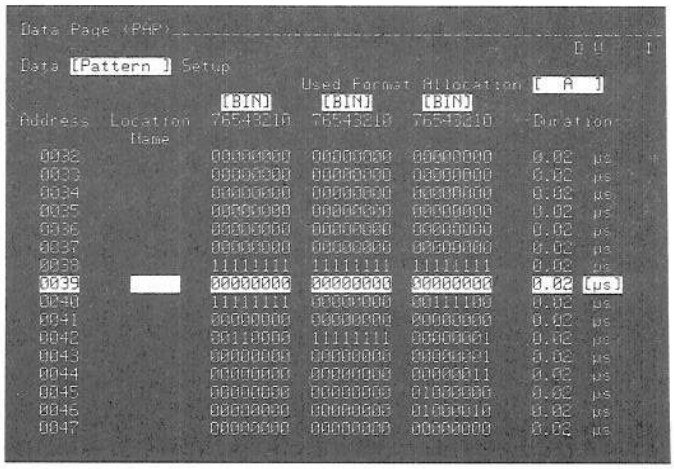
Data [Pattern] Setup menu.

On this menu, INSERT and DELETE enable either new lines of data to be inserted, or existing lines to be deleted, at an address. In either case, simply position the cursor in the appropriate Address/data row and press the required key. Note the following point, it has a special significance for the Program Page: Use of either function will result in existing data pattern/Address or Label relationships being changed. Therefore, you must ensure that any Program Segments which include such Addresse or Labels are changed as necessary. Use of the INSERT function is illustrated by the following "Before and After" display examples.

Example: INSERT Address (Pattern)
This illustrates the effect of an **INSERT** at Address 0039. Note how, after the **INSERT**, all patterns from 0039 onwards have been moved up one address.



INSERT Address (Pattern): Before **INSERT**



After **INSERT**

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Data [Waveform] Setup menu

On this menu INSERT and DELETE can be used for channel or address editing. For channel editing, they enable more channels to be displayed (INSERT) or deletion (DELETE) of existing ones. For address editing, insertion or deletion of addresses (data patterns) as for the **[Pattern]** Setup menu can be done. The two uses are explained in the following paragraphs.

Deletion/Insertion of Channels:
To insert or delete channels, the following two preconditions must be satisfied:
1. The **Editor Mode** must be set to [\/] (vertical).
2. The cursor must be positioned in the appropriate channel field.

Then, to delete a channel, simply press the **SHIFT** and **DELETE** keys.

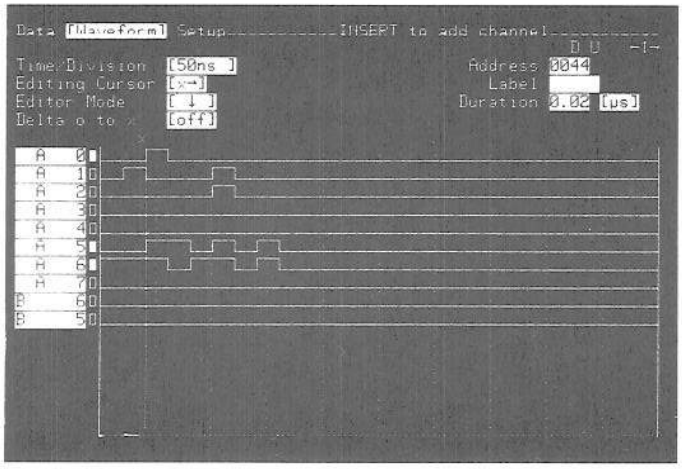
To insert a channel at position "n", position the cursor at n-1, then press **SHIFT** and **INSERT**. If 16 channels are already displayed, no futher "INSERTS" are allowed.
In both cases note that, depending on whether 8 or less channels are displayed, double the normal display height is allocated for each channel. See Example INSERT Channel.

Deletion/Insertion of Addresses (Patterns)
To insert or delete addresses (data patterns at an address), the following two preconditions must be satisfied:
1. The **Editor Mode** must be set to [-->] (horizontal)
2. The cursor must be positioned in the appropriate channel field.

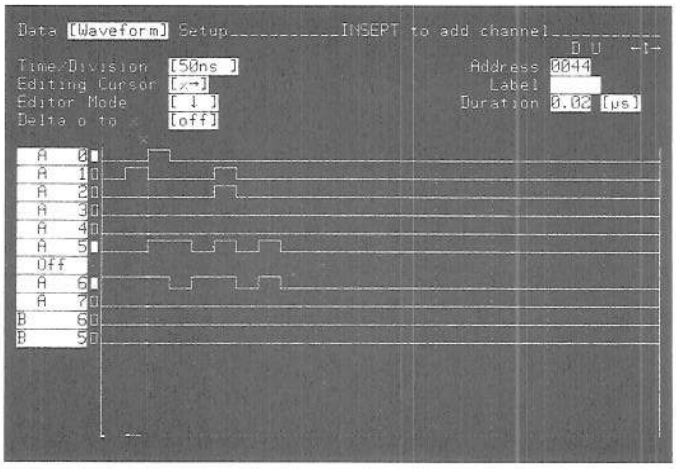
To **DELETE** data at an address:
Position the Editing Cursor at the address and press **SHIFT** and **DELETE**.

To **INSERT** a new data pattern after address n:
Position the Editing Cursor at address n, then press **SHIFT** and **INSERT**. A new pattern (all zeroes) will be inserted at address n+1. The existing patterns (from address n+1) will all be shifted forward one address. Note, if **[variable]** Duration is set, the duration value of the new pattern will be equal to the Time/Division setting. See Example INSERT Address.

Example: INSERT Channel (WF)
This example illustrates how to **INSERT** a channel after A 5. Note the Editor Mode setting. For the "Before" display, the cursor is positioned at A 5. Note how in the "After" display, the new channel is Off.



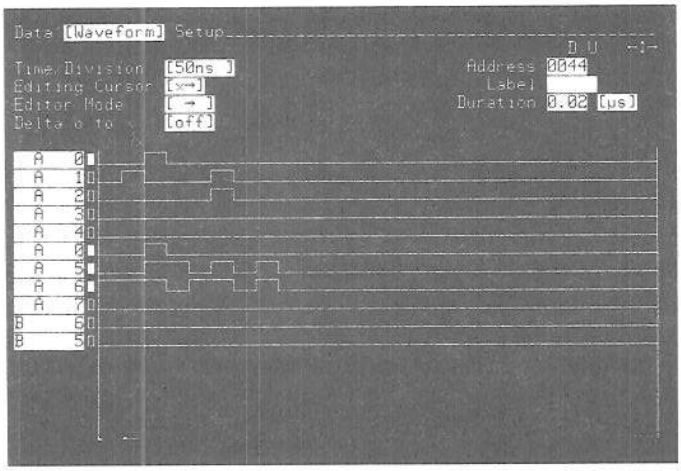
INSERT Channel (WF): Before **INSERT**



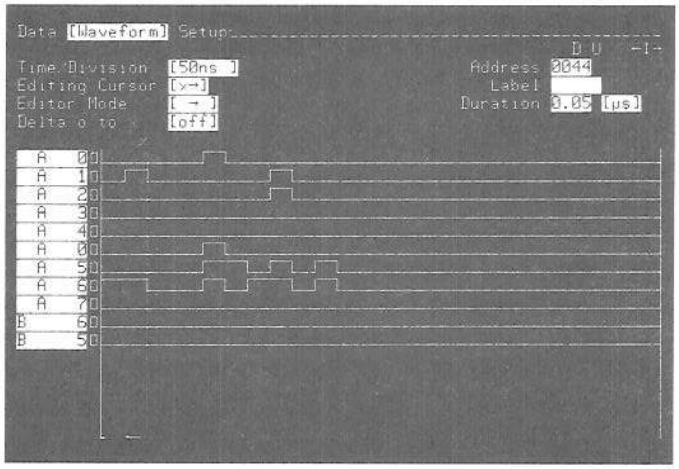
After **INSERT**

Example: INSERT Address (WF)

This example illustrates how to INSERT a new address (pattern) at Address 0044. Note the Editor Mode setting. Since the Duration is set to variable, the new pattern takes the Time/Division setting as its duration value.



INSERT Address (WF): Before **INSERT**



After **INSERT**

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3E-4
COPY

COPY comprises the three edit sub-functions: [COPY Address], [STORE] and [COPY Channel]. They apply only to the Data [Pattern] menu. Access to them is cursor position independent. This means that they can be accessed (and implemented) with the cursor in any position within the menu.

Note that for all these edit functions:
EXEC must be pressed, once the fields have been filled, to initiate the edit changes.
In addition, **UPDATE** must be pressed to transfer the new conditions to the outputs.

[COPY Address]
This edit function enables blocks of data (source data) defined by "**from**" and "**to**" addresses, to be copied to a position defined by a destination "->" address. Note the following points regarding the use of COPY Address:

1. The data block to be copied will be defined by the addresses set in the "**from**" and "**to**" fields. Addresses can be defined by either the actual location number or a label.

2. The destination address (or label) is to be set in the "->" field. It must be outside the data block defining addresses.

3. Data at addresses > the destination address will not be overwritten. This data (and that at the destination address) will be "shifted forward" when COPY is **EXE**Cuted. Note also (4):

4. If the destination address is before the "**from**" one, the block of source data will also be "shifted forward" when COPY is **EXE**Cuted.

5. Duration values will be copied along with the data.

6. Labels will not be copied.

[STORE]
This edit function enables blocks of data (source data), defined by "**from**" and "**to**" addresses, to be copied to a position defined by a destination "->" address. It is similar in many respects to the [COPY Address] function, but existing data will be overwritten. Note the following points regarding the use of STORE:

1. The data block to be copied (STORED) will be defined by the addresses set in the "**from**" and "**to**" fields. Addresses can be defined by either the actual location number or a label.

2. The destination address (or label) is to be set in the "->" field. It must be outside the block defining addresses.

3. Data at, and after the destination address will be overwritten.

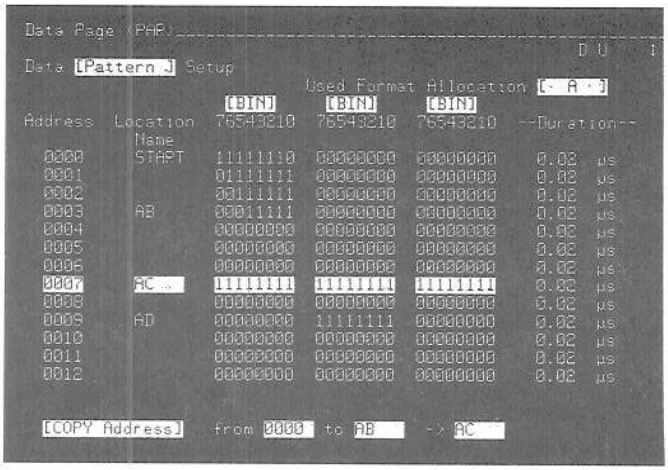
4. If the destination address is < the start (from) one, it will be overwritten. Also, note that even in this case the block of source data will not be "shifted forward".

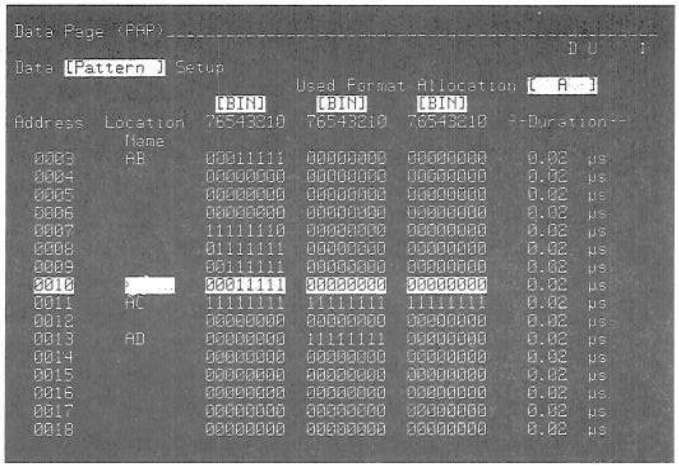
5. Duration values will be copied along with the data.

6. Labels will not be copied.

Example: COPY Address

This example shows how to copy a data block, defined by address 0000 and label AB, to destination AC.



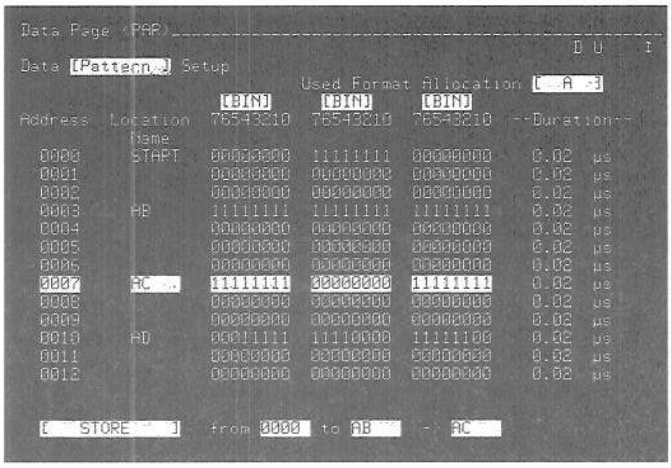


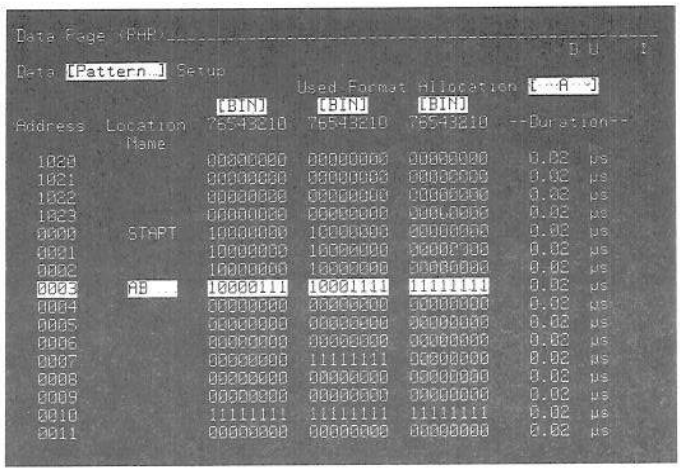
COPY Address: Before EXEC

After EXEC

Example: STORE

This example shows how to STORE a data block defined by the addresses 0000 and label AB. The destination address is defined as label AC. Note how after EXEC, the original data at addresses 0007 to 0010, is overwritten by the source data.





STORE: Before EXEC

After EXEC

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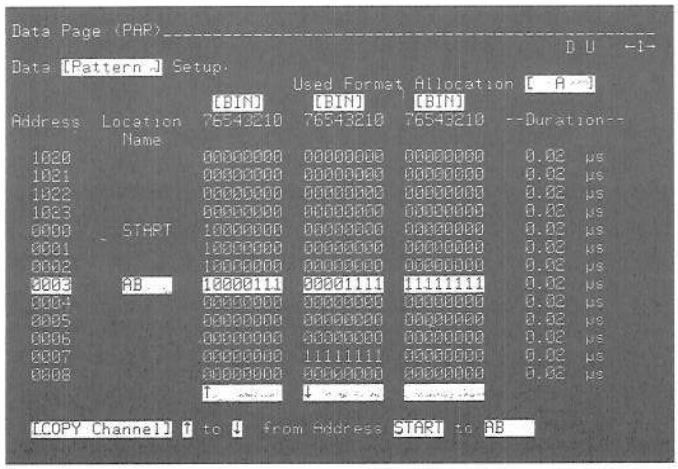
[COPY Channel]
This edit function enables individual channels of source data to be copied to another channel. The channels can extend over the compete memory depth. Note the following points:

1. The function can be accessed only if at least one POD/channel group is displayed in [BIN]. Also, at least two channels (in one or more groups) must be in [BIN]. Only POD/channel groups in [BIN] will be provided with a channel identifier field (see (2) below).

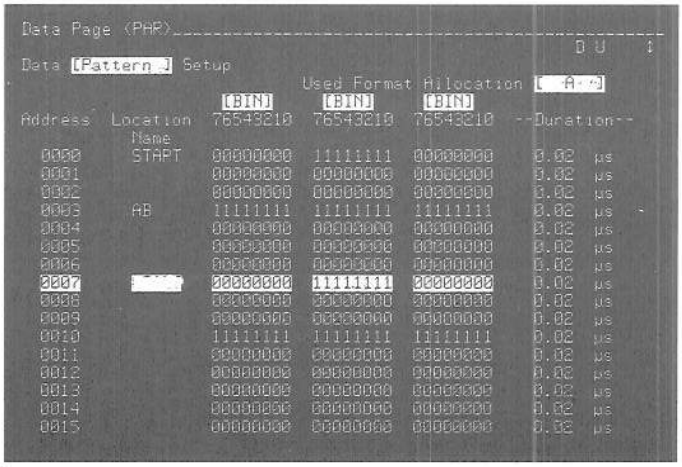
2. The channel to be copied is identified by the position of the ↑ arrow in one of the channel identifier fields. This is the field directly beneath the last pattern display of each POD/channel group. To position the ↑ arrow at the appropriate channel, the cursor must first be positioned in the arrow ↑ field in the bottom line. Then, use SHIFT and ← or → **ROLL** keys to position the ↑ arrow. Keep the SHIFT key pressed to enable fast movement of the ↑ arrow.

3. The destination chanel is identified by the position of the ↓ arrow in one of the channel identifier fields. Positioning of it is done as for the ↑ arrow. The only difference is that the cursor must first be positioned in the ↓ arrow field in the bottom line.

Example: COPY Channel
This example shows how to do the following:
A channel of data (channel 7 of POD 2), channel length: START to AB, is to be copied to destination: channel 7 of POD 1.



COPY Channel: Before EXEC



After EXEC

3E-5
MOVE

MOVE comprises the two edit sub-functions: MOVE Address and [EXCHANGE Channel]. They apply only to the Data [Pattern] menu. Access to them is cursor position independent. This means that they can be accessed (and implemented) with the cursor in any position within the menu.

Note that for both these edit functions:

EXEC must be pressed, once the fields have been filled, to initiate the edit changes.
In addition, **UPDATE** must be pressed to transfer the new conditions to the outputs.

MOVE Address

This edit function enables a data/timing block to be moved from its current location to a new one. Locations "vacated" when the block is moved will be filled as the other patterns move back or forwards as appropriate. Note the following points regarding the use of MOVE Address:

1. The data/timing block to be moved will be defined by the addresses set in the "**from**" and "**to**" fields. Addresses can be defined by either the actual location number or a label.

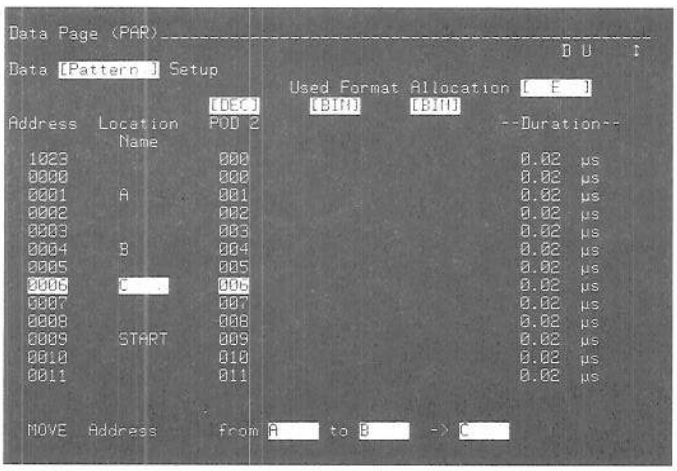
2. The destination address (or label) is to be set in the "->" field. It must lie outside the data block defining addresses.

3. The function wil not result in any data being destroyed. If the destination address > the "**to**" one, the following applies:
   All data from address "to"+1, up to the last new line to be occupied by the block, will "shift" back to occupy the vacated locations.
   If the destination address is < the "**from**" one, then it (destination address) plus all addresses up to "**from**-1" will move forward to occupy the vacated ones.
   Both of these cases are illustrated in the examples.

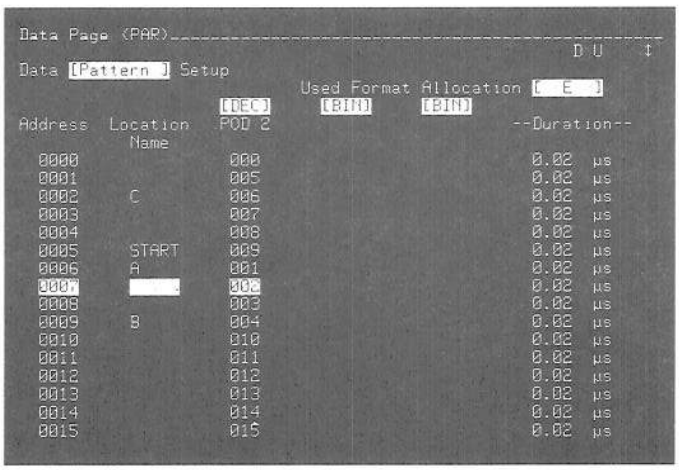
5. Duration values will be copied along with the data.

Example: Move Address (1)

This example illustrates the effect of moving the data/timing block defined by labels A and B. It is to be moved to destination C, which is greater than the "to" one. The data is displayed in [DEC] to aid explanation. Note how, after **EXEC**, the original data from addresses 0005 to 0009 has shifted back to occupy the vacated locations.



MOVE Address (1): Before **EXEC**

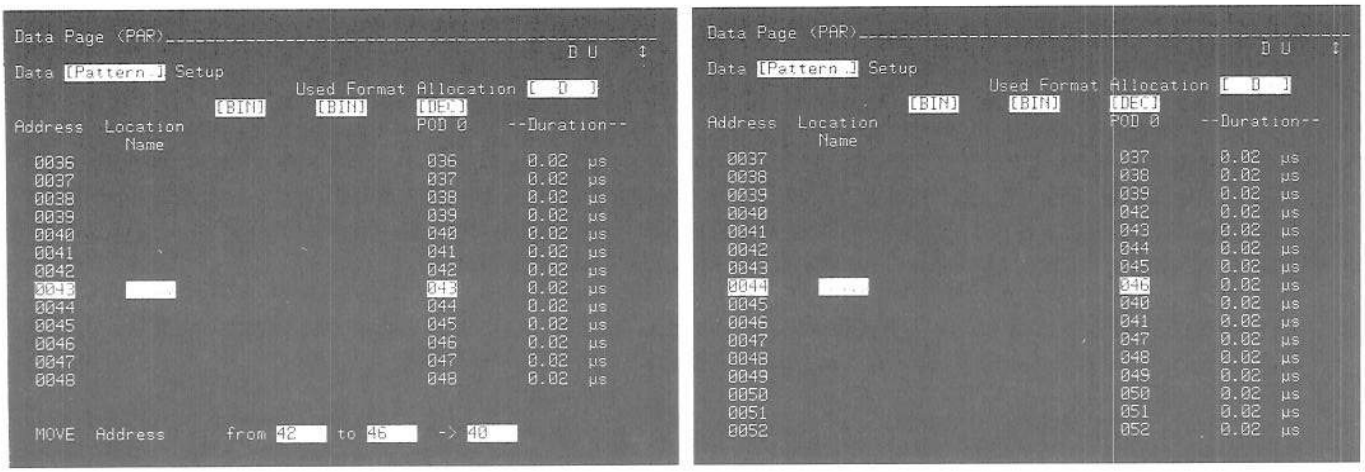


After **EXEC**

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Example: Move Address (2)
This example ilustrates the effect of moving a data/timing block to a destination address less than the "**from**" one. Note how after **EXEC**, the original data from addresses 40,and 41 is located at 45 and 46 respectively.



MOVE Address (2): Before **EXEC** After **EXEC**

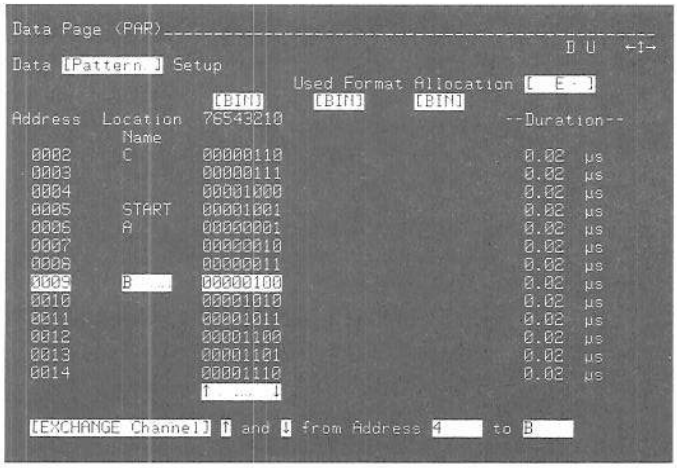
[EXCHANGE Channel]
This edit function enables channels of data to be exchanged. The channels can extend over the compete memory depth. Note the following points:

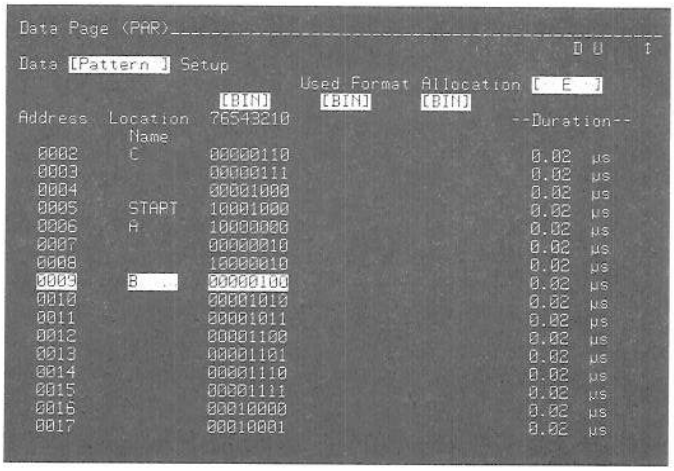
1. The function can be accessed only if at least one POD/channel group is displayed in [BIN]. Also, at least two channels (in one or more groups) must be in [BIN]. Only POD/channel groups in [BIN] will be provided with a channel identifier field (see (2) below).

2. The channels to be exchanged are identified by arrows in the channel identifier fields. This is the field directly beneath the pattern display of each POD/channel group. To position the ↑ arrow at the appropriate channel, the cursor must first be positioned in the arrow ↑ field in the bottom line. Then, use SHIFT and ← or → **ROLL** keys to position the ↑ arrow. Keep the SHIFT key pressed to enable fast movement of the ↑ arrow.

3. The second channel is identified by the position of the ↓ arrow in one of the channel identifier fields. Positioning of it is done as for the ↑ arrow. The only difference is that the cursor must first be positioned in the ↓ arrow field in the bottom line.

Example: Exchange Channel
This example shows how to exchange the data between channels 0 and 7 of POD 2. The channel length is from address 4 to B.





EXCHANGE Channel: Before **EXEC** After **EXEC**

3E-6
MODIFY

This edit function enables a data pattern and, if wished, a duration value to be set over a complete address block. Apart from its use for setting specific patterns, it provides a very fast way of resetting a data block to all 0's or 1's. Access to MODIFY is cursor position independent. This means that it can be accessed (and implemented) with the cursor in any position within the menu.

Note that:
EXEC must be pressed, once the fields have been filled, to initiate the edit changes.
In addition, **UPDATE** must be pressed to transfer the new conditions to the outputs.

In addition, the following points regarding the use of the function should be noted:

1. The function can be accessed only if at least one POD/channel group is displayed in [BIN]. Also, at least two channels (in one or more groups) must be in [BIN]. Only POD/channel groups in [BIN] will be provided with a data modification field.

2. A modification field is provided only for each POD/channel data group where MODIFY can be used. A modification field will be provided for Duration only if Duration is set to [variable]. The data modification fields have a default setting of a dot (.). This means that the channel will not be changed when MODIFY is **EXEC**uted. The same applies for the Duration field.

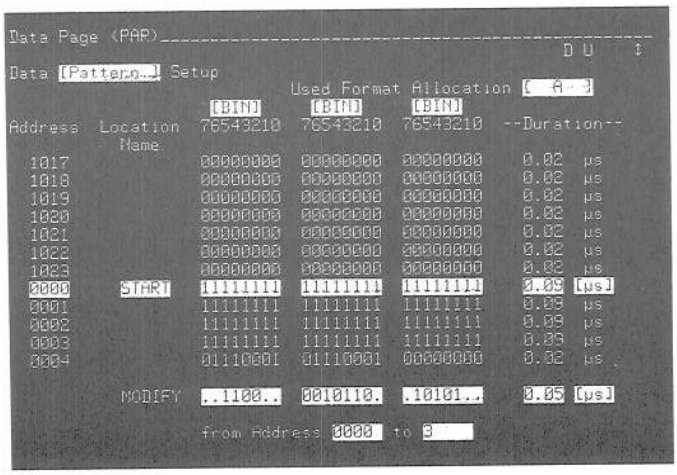
3. Each data channel should be set to 0 or 1 as required or, if to remain unchanged, a dot (.) should be set.

4. If Duration has been set to [variable], then a field is displayed for value entry.To set a value, first press **NEXT[]** or **PREV[]**. This will set a value of 0.02 us in the field. This value can then be changed as necessary.

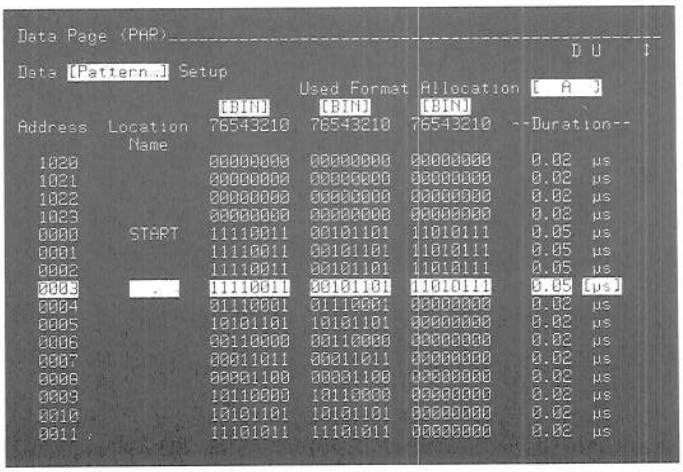
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Example: MODIFY
This example illustrates data and timing modification. The data to be modified can be seen on the "Before" and "After" display details.



MODIFY: Before **EXEC**



After **EXEC**

E-7
FCTN

FCTN comprises the two edit sub-functions: [INCREMENT]/[DECREMENT] and PRBS.They apply only to the Data [Pattern] menu. Access to them is cursor position independent. This means that they can be accessed (and implemented) with the cursor in any position within the menu.

Note that for both of these edit functions:
EXEC must be pressed, once the fields have been filled, to initiate the edit changes.
In addition, **UPDATE** must be pressed to transfer the new conditions to the outputs.

[INCREMENT]/[DECREMENT]
These functions enable an up count [INCREMENT] or down count [DECREMENT] sequence, as selected, to be applied to a data block. Note the following points regarding their use.

1. INCREMENT/DECREMENT apply only when the 8175A is configured as a Parallel Data Generator.

2. Selection of INCREMENT or DECREMENT is via the **NEXT[]/PREV[]** keys. The cursor must be positioned within the function field to allow this.

3. The up or down count will apply to the data block defined by the "**from**" (start) and "**to**" (end) addresses or labels.

4. The required incremental (or decremental) step value, must be set in the "**by**" field.

5. This will then be the value, by which each successive address within the data block will be incremented or decremented.

[INCREMENT]/[DECREMENT] continued

6. The starting value for the up or down-count, is that at the "**from**" address.

7. A "roll over" capability is available. This enables for example, INCREMENT from 1000 to 10.

8. Since, within any Format, channels can be active or disabled, the following points should be noted:

8a. For the chosen Format, at each address all currently active channels will be "compressed together" to form a line.

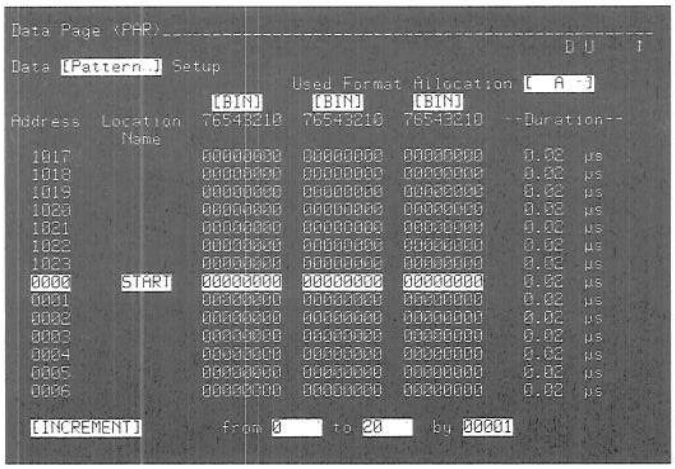
8b. Depending on the Format, bit patterns within such "compressed" channels can have different relative values. This is due to the MSB/LSB significance of any channel. It is illustrated by the second INCREMENT and the DECREMENT examples.

8c. As pattern width increases, more channels will be utilized to accomodate them.

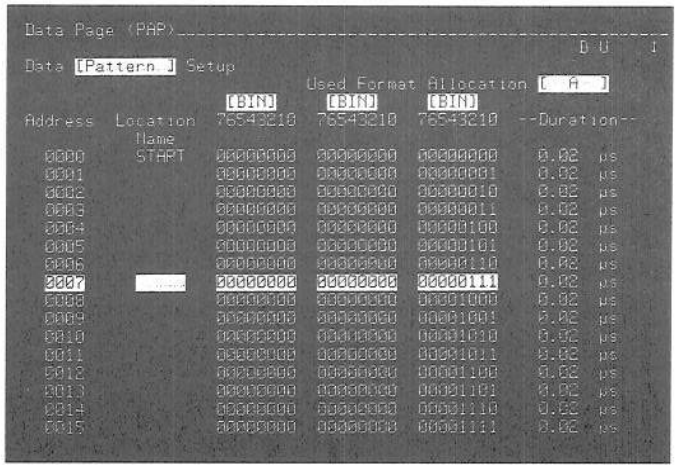
9. Note that, the INCREMENT/DECREMENT calculation is based on the binary equivalent of the channel combination. This is of special significance if for instance, any of the POD/channel groups are displayed in decimal. If for example only two channels of a particular POD are active, their decimal content, and displayed value, can never exceed 3.

Example: INCREMENT in Steps of 1

This illustrates how to set an up-count sequence, with a step value of 1, between Addresses 0000 and 0020. The initial value of the "**from**" address is 0.



INCREMENT in Steps of 1: Before EXEC



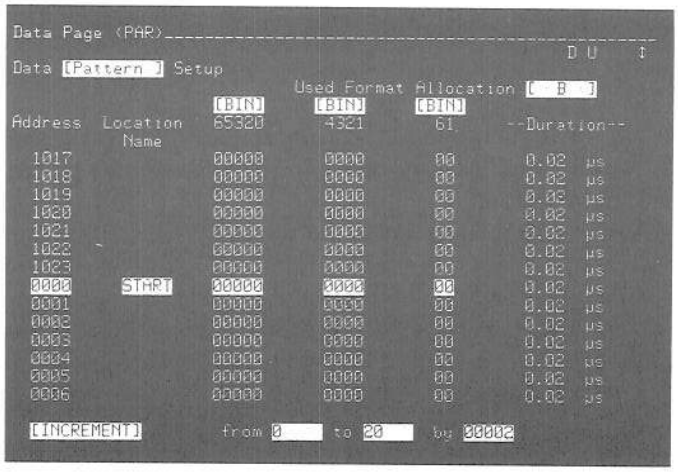
After EXEC

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Example: INCREMENT in Steps of 2

This illustrates a similar sequence as for the first example, but a step value of 2 and a different Format are used. Note how the patterns at address 0001 and higher, extend over channels of POD 2.



Data Page (PAR)

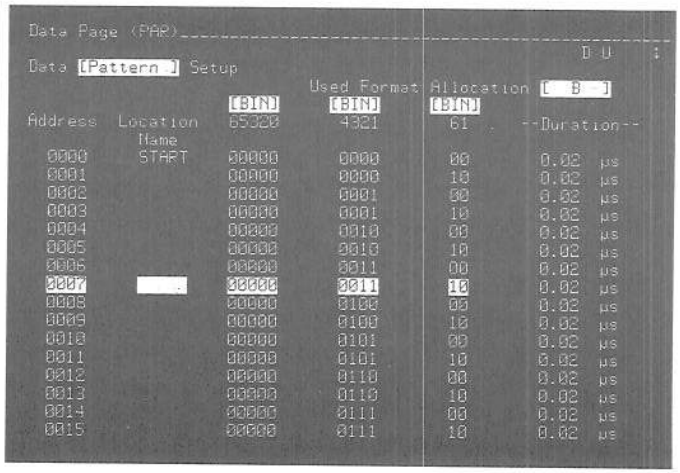
Data [Pattern] Setup

D U

Used Format Allocation [B]

Address	Location Name	[BIN] 65320	[BIN] 4321	[BIN] 61	--Duration--
1017		00000	0000	00	0.02 µs
1018		00000	0000	00	0.02 µs
1019		00000	0000	00	0.02 µs
1020		00000	0000	00	0.02 µs
1021		00000	0000	00	0.02 µs
1022		00000	0000	00	0.02 µs
1023		00000	0000	00	0.02 µs
0000	START	00000	0000	00	0.02 µs
0001		00000	0000	00	0.02 µs
0002		00000	0000	00	0.02 µs
0003		00000	0000	00	0.02 µs
0004		00000	0000	00	0.02 µs
0005		00000	0000	00	0.02 µs
0006		00000	0000	00	0.02 µs

[INCREMENT] from 0 to 20 by 00002



Data Page (PAR)

Data [Pattern] Setup

D U

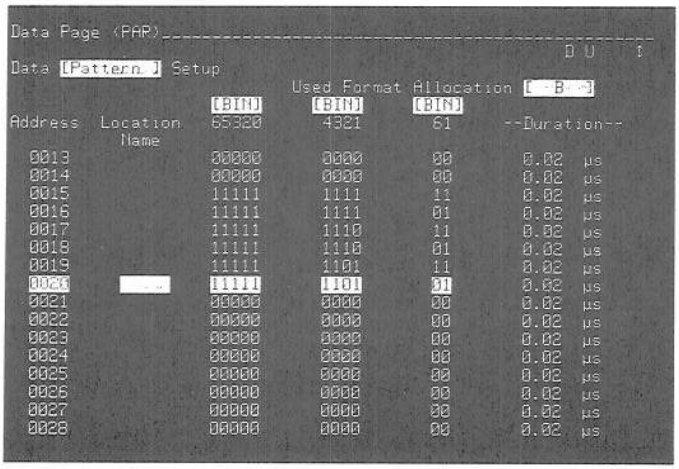
Used Format Allocation [B]

Address	Location Name	[BIN] 65320	[BIN] 4321	[BIN] 61	--Duration--
0000	START	00000	0000	00	0.02 µs
0001		00000	0000	10	0.02 µs
0002		00000	0001	00	0.02 µs
0003		00000	0001	10	0.02 µs
0004		00000	0010	00	0.02 µs
0005		00000	0010	10	0.02 µs
0006		00000	0011	00	0.02 µs
0007		00000	0011	10	0.02 µs
0008		00000	0100	00	0.02 µs
0009		00000	0100	10	0.02 µs
0010		00000	0101	00	0.02 µs
0011		00000	0101	10	0.02 µs
0012		00000	0110	00	0.02 µs
0013		00000	0110	10	0.02 µs
0014		00000	0111	00	0.02 µs
0015		00000	0111	10	0.02 µs

INCREMENT in Steps of 2: Before **EXEC** After **EXEC**

Example: DECREMENT in Steps of 2

This example illustrates the principles of using DECREMENT. Note the start value (at address 0015) and how it is decremented in steps of two. The basic principle is the same as for INCREMENT.



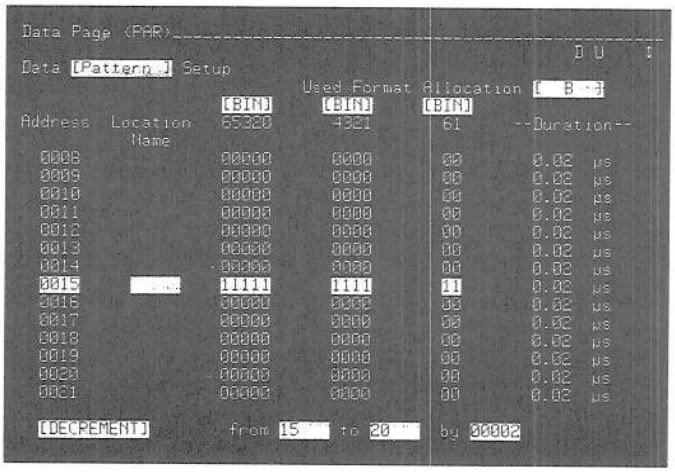
Data Page (PAR)

Data [Pattern] Setup

D U

Used Format Allocation [B]

Address	Location Name	[BIN] 65320	[BIN] 4321	[BIN] 61	--Duration--
0013		00000	0000	00	0.02 µs
0014		00000	0000	00	0.02 µs
0015		11111	1111	11	0.02 µs
0016		11111	1111	01	0.02 µs
0017		11111	1110	11	0.02 µs
0018		11111	1110	01	0.02 µs
0019		11111	1101	11	0.02 µs
0020		11111	1101	01	0.02 µs
0021		00000	0000	00	0.02 µs
0022		00000	0000	00	0.02 µs
0023		00000	0000	00	0.02 µs
0024		00000	0000	00	0.02 µs
0025		00000	0000	00	0.02 µs
0026		00000	0000	00	0.02 µs
0027		00000	0000	00	0.02 µs
0028		00000	0000	00	0.02 µs



Data Page (PAR)

Data [Pattern] Setup

D U

Used Format Allocation [B]

Address	Location Name	[BIN] 65320	[BIN] 4321	[BIN] 61	--Duration--
0008		00000	0000	00	0.02 µs
0009		00000	0000	00	0.02 µs
0010		00000	0000	00	0.02 µs
0011		00000	0000	00	0.02 µs
0012		00000	0000	00	0.02 µs
0013		00000	0000	00	0.02 µs
0014		00000	0000	00	0.02 µs
0015		11111	1111	11	0.02 µs
0016		00000	0000	00	0.02 µs
0017		00000	0000	00	0.02 µs
0018		00000	0000	00	0.02 µs
0019		00000	0000	00	0.02 µs
0020		00000	0000	00	0.02 µs
0021		00000	0000	00	0.02 µs

[DECREMENT] from 15 to 20 by 00002

DECREMENT in Steps of 2: Before **EXEC** After **EXEC**

PRBS

This edit function provides a means of generating a psuedo-random binary sequence. It applies only when the 8175A is configured as a Serial Data Generator. The sequence length can be set to between 8 and 8k bits. Note the following points especially (3), regarding the use of PRBS:

1. PRBS is accessable **only** when the 8175A is configured as a **Serial Data Generator**.

2. The sequence will begin from the address set in the "**from**" field.

3. For a PRBS to be output, the "**from**" field must contain at least one high "1" bit. If all "0's" then an error message will be displayed on **EXEC**.

4. The length of the PRBS sequence (in bits) is determined by the value N set in the **LENGTH EXP 2** field. Length will be (2 to power N) minus 1. With the default setting of "08", the length is (2 to the power 8) - 1, which equals 255 bits or 32 8 bit words. Note that, there will always be "blocks" of 8 bits available. This is because the last (or minus 1) bit, which in effect is the start point of the sequence, is included.

5. The PRBS is generated in a shift register with feedback taps. The register length (number of cells) will be N (as for (4) above). The shift register will be initialized, with the first N bits of data at the **from** address (if N > 8, then bits from the N+1 address will also be used as necessary).

6. The *'s define which cells within the register will be connected in the feedback loop.

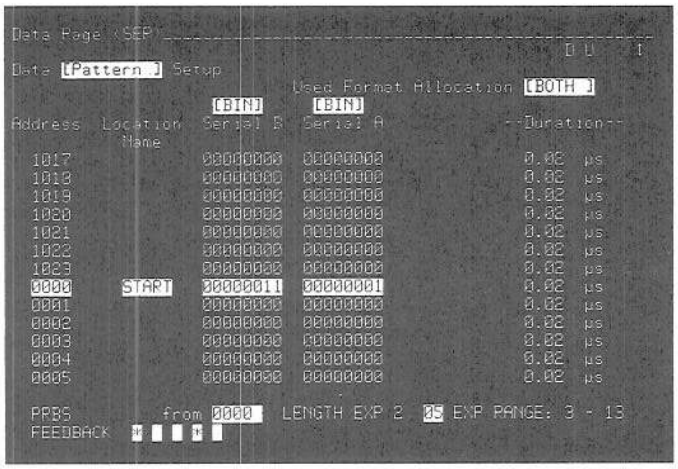
7. The default feedback conditions obtained for each "LENGTH EXP 2 value", provide "optimum feedback". This means that a true PRBS will be obtained. Also, in this case the minimum number of taps required for a PRBS are utilized. Other conditions can be user set but, they will not necessarily provide a true PRBS.

8. A change in the value of the initialization data, whilst keeping the feedback conditions constant, will not change the sequence content. It will change only the start and end points of the sequence.

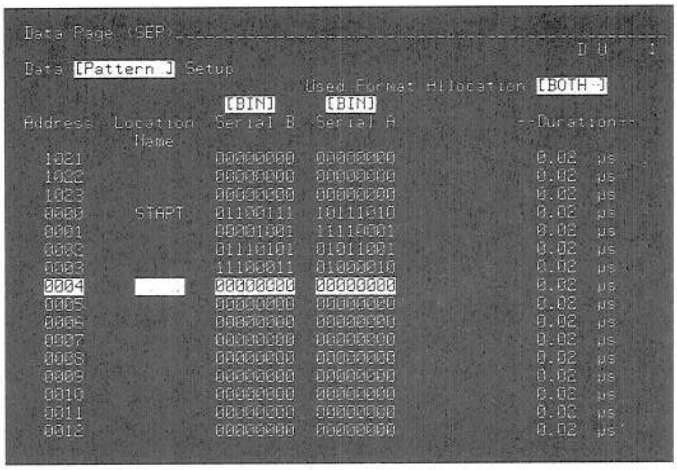
9. Sequence content can be produced only by changing the feedback conditions. Note point 7 above if you want to do this.

Example PRBS

This example shows the production of a PRBS in both serial ouput channels. Apart from the initialization values, all other conditions are default ones. The conditions are: start address 0000, sequence length 32 bits (EXP 2 **05**), feedback at positions 2 and 5. The initialization conditions for Serial A and B are 10000 and 11000 respectively.



PRBS: Before EXEC



After EXEC

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3F
Parallel: Master Slave operation

Two HP 8175A's can be operated in a "Master-Slave" configuration. This then doubles the available channels to 48. Synchronization is achieved by using the HP 15430 cable to interconnect the instruments. There are certain preconditions and restrictions to be observed when operating two 8175A's in parallel. These are described in the following paragraphs.

NOTE: It is recommended that both instruments are switched off whenever interconnecting, disconnecting them and/or setting the HP-IB switch conditions etc.

3F-1
GENERAL PRECONDITIONS AND ASSIGNMENT OF MASTER/SLAVE

First, one 8175A must be designated as the "Master" and the other as the "Slave". This is done by setting switch element 7 of the HP-IB System switch to 1 (Master) or 0 (Slave) as required. On both instruments, switch element 6 must be set to 0 i.e., normal self test. For HP-IB operation, each 8175A must have a unique HP-IB address set. Interconnect the two instruments via the HP 15430A cable. The instruments will only take their Master and Slave status when the switch status is read in at power-up. Then, the one designated as "Slave" will include the word (Slave) at the top of each menu, adjacent to the configuration indicator.

NOTE: If the interconnecting cable is disconnected at only one end, correct operation of the still connected instrument cannot be guaranteed. (Reflections back up the cable may occur.) Therefore, if not needed for parallel operation, **disconnect it completely**

3F-2
RESTRICTIONS ON SETTINGS AND FUNCTIONS

General Restrictions

On each instrument, for true parallel operation, almost all settings (except for data, Flag outputs and Clock related ones), on corresponding Master/Slave menus, should be the same. However, it is possible that for a particular application, you will need to set certain settings differently. Details of those which can differ, their significance and general restrictions are as follows:

In parallel operation, the Master 8175A behaves almost exactly as if in single instrument configuration. The only restrictions for the Master, concern Single Step operation. These, together with related Slave restrictions are as follows:

Address Single Step is possible for the Master but not recommended since, for the Slave 8175A it is inhibited.
Program Single Step is possible for both under certain limitations, these are:

In Single Cycle mode, Program Single Step control is disabled from the Slave. It is allowed from the Master which, will automatically control the Slave.

In Auto Cycle mode, it is disabled from the Slave and not recommended from the Master since the Slave is not synchronously controllable.

All other restrictions apply only to the Slave 8175A. START, STOP. CONTINUE etc are all controllable only from the Master. Details of the Slave restrictions are as follows:

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Slave 8175A Restrictions

CNTRL Page - [Clock] menu

Mode: **Auto** or **Single Cycle** are selectable but not **sychron** or **asychron**. These are only Master settable.

Trigger POD:
It will be disabled for trigger funtions but still operative for Flag outputs. External input is disabled.

START and/or STOP:
Controllable only from Master, therefore no Trigger control possible.

Trigger POD [asychronous]
This is only significant for Flag outputting.

Trigger POD Threshold TTL:
As above

Valid Trigger Word Duration: [20 ns]
As above

System Clock: [internal]:
The System Clock is always derived from the Master. Both external clock sources are disabled. Clock calibration cannot be done from the Slave.

Clock: All functions are available.

CNTRL Page - [Flag] Assignment menu

All Flag capabilities are avaiable.

PRGM Page - [trigger Event] Assignment menu

Address and Program Single-Step from:
This is disabled for the Slave

3G
Programming Information

INTRODUCTION

This section provides useful information and a selection of worked examples (based on the HP 9816, 26A or 36A Technical Computers), in BASIC, on programming the 8175A. These examples include also the programming method of doing Examples P-1 and P-2, G-1 to G-3 and the two PROGRAM page based ones. A complete list of HP-IB commands is given at the end of the Programming Information Section. Several examples of how to format some of the more complex commands are included within the list.

Two different methods of remote control of the 8175A are possible. One of them is the "normal" method wherebye, the instruction to change any setting etc. is sent in the form of one or more specific HP-IB commands. The majority, but not all such commands, are Page specific. The second method involves mainly the use of 8175A device dependent commands (keyboard mnemonics). The big difference here, is that commands to "position" the cursor within the appropriate setting field need to be sent. Then the particular setting value is input. In other words, it involves direct simulation of each and every manual key operation required for any setting value change .

Although a normal program can include cursor movement commands, for certain changes, only such commands are practical and/or possible. Such cases are described at the beginning of the examples section. Specific information, and worked examples relating to both types of programming, is given later in this section. Before doing the examples, note the following general points relating to programming.

3G-1
GENERAL POINTS

The 8175A can operate on the HP-IB as a talker or a listener (Note also that it can act as the HP-IB controller of a disc drive and/or printer. This is explained in section 3D-1 and Appendices B and C. It operates in the ASCII mode in which data, parameter and mode settings are transferred over the HP-IB as serial ASCII bytes. The ASCII message is then interpreted by the 8175A and executed accordingly.

The information within this section will generally be restricted to 8175A specifics. For detailed bus information, the user should refer to one of the following publications:

IEEE Interface Standard 488-1975
IEEE Std 728-1982 Recommended Practice for Code and Format Conventions
ANSI Interface Standard MC1.1
HP Publication 59401-90030
HP Publication 5952-0058.

3G-2
ADDRESS ASSIGNMENTS

When operating on the HP-IB (to be HP-IB controlled), an address must be reserved for 8175A use. This address (factory preset to decimal 20) is determined by the setting of switch elements 1 to 5 on the rear panel HP-IB switch. Also, switch element 1 must be set to the "8175A is controlled" position. The required positions for both of these settings can be seen in Figure 3G-1. (The positions of the other two switch elements is irrelevant unless operating two 8175A's in parallel.)

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At power-up, the 8175A checks address bits A1 through A5 of the rear panel switch, to determine its current addresses. This address is then internally stored, and is the one that the 8175A will respond to when addressed. The decimal equivalent of the setting will be displayed on the **[Peripherals]** menu of the SYSTEM Page. If the switch setting is changed at any time during the same powered-up period, the new value will not be accepted or displayed. The 8175A will continue to respond only to the original address setting. Therefore, if you need to change the address while the 8175A is switched on, remember to do a new power up cycle to read it in.

Table 3G-1 lists all possible addresses on the bus. Ensure when allocating addresses that no two instruments are given the same one.

Table 3G-1. Available Addresses (ATN true)

Available Addresses (ATN true)			
Data bus (D IO lines)		Address in ASCII	
Fixed 8 7 6	Selectable 5 4 3 2 1 DEC	Talk	Listen
O T L	0 0 0 0 0 0	@	SPACE
O T L	0 0 0 0 1 1	A	!
O T L	0 0 0 1 0 2	B	"
O T L	0 0 0 1 1 3	C	#
O T L	0 0 1 0 0 4	D	$
O T L	0 0 1 0 1 5	E	%
O T L	0 0 1 1 0 6	F	&
O T L	0 0 1 1 1 7	G	'
O T L	0 1 0 0 0 8	H	(
O T L	0 1 0 0 1 9	I	)
O T L	0 1 0 1 0 10	J	*
O T L	0 1 0 1 1 11	K	+
O T L	0 1 1 0 0 12	L	,
O T L	0 1 1 0 1 13	M	-
O T L	0 1 1 1 0 14	N	.
O T L	0 1 1 1 1 15	O	/
O T L	1 0 0 0 0 16	P	0
O T L	1 0 0 0 1 17	Q	1
O T L	1 0 0 1 0 18	R	2
O T L	1 0 0 1 1 19	S	3
O T L	1 0 1 0 0 20	T	4 <-- 8175A set to this address at factory (decimal 20)
O T L	1 0 1 0 1 21	U	5 <---Usually controller address
O T L	1 0 1 1 0 22	V	6
O T L	1 0 1 1 1 23	W	7
O T L	1 1 0 0 0 24	X	8
O T L	1 1 0 0 1 25	Y	9
O T L	1 1 0 1 0 26	Z	:
O T L	1 1 0 1 1 27	[	;
O T L	1 1 1 0 0 28	\	<
O T L	1 1 1 0 1 29	]	=
O T L	1 1 1 1 0 30	^	>
O T L	1 1 1 1 1 31	_	? <--- Forbidden settings (UNT, UNL commands)

L = 1 for listen address, 0 for talk address
T = 1 for talk address, 0 for listen address

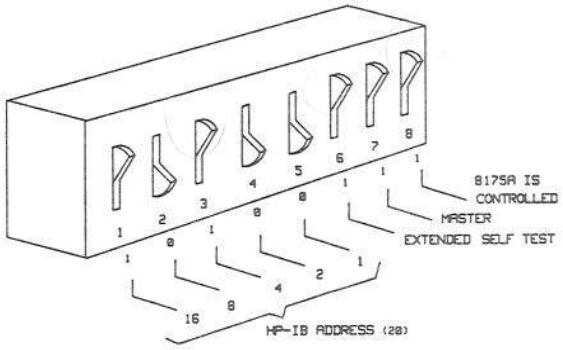


Figure 3G-1. HP-IB Switch Settings

3G-3
SERVICE REQUEST (SRQ)

Certain error and status conditions can (but do not have to) cause the 8175A to make a service request. They will cause this only if previously preset to do so (see Programming the SRQ mask). This means that it will set the SRQ control line true, to inform the controller that it needs attention. Normally, on the occurrance of an SRQ, the controller (if the program contains the appropriate statements) will respond by addressing the 8175A as a talker via a serial poll command e.g., N=SPOLL(720). The 8175A will then put a Status Byte on the data bus (DIO 0-8). The Status Byte will be interpreted and the necessary action taken.

Table 3G-2 defines the conditions which can cause an SRQ. It also shows their corresponding Status Byte bits. Occurence of any of the conditions, does not automatically reult in an SRQ. The condition(s) required to do so need to be selected or "masked". At power-up, all conditions are unmasked. Note that, once any error/status condition occurs (irrespective of whether masked or not), this is detected and stored by the 8175A. After the first SRQ and related serial poll, all such stored conditions will be reset. Subsequent occurrances of masked conditions can then be interpreted by discrete serial polls.

Programming the SRQ mask
Selection of which Status Byte(s) will cause SRQ, is done via the command "SRM NRx", where "NRx" is the masking value. Each Status Byte has its own mask code, this is a decimal value (corresponding to its binary value) as shown in Table 3G-2. The value "NRx" can be set to mask one or more Status Bytes. As an example, if only "READY 1" is to cause SRQ, the value would be "2". By setting the value to "6", either "COMPAT-ERROR" or "READY 1" will cause an SRQ. To disable all Status Bytes from causing SRQ, the value should be set to "0".

Table 3G-2. Status Bytes Definition

STATUS BYTE	BIT-No	DECIMAL CODE	DEFINITION
SELF TEST ERROR	8	128	Set if an error condition detected during the power-up cycle. This bit can be set only once during any "Power on" cycle.
SERVICE REQUEST	7	64	Set when any "masked" condition in this table occurs. Reset following a Serial poll or STB? command.
SYNTAX ERROR	6	32	Set when a false command syntax is used.
READY 2	5	16	Set when the program buffer is empty, indicates that the current program command has been completed.
KEY PRESSED	4	8	Set when an key is pressed during Remote operation.
COMPAT ERROR	3	4	Set when a command is incompatible with its range or another parameter value.
READY 1	2	2	Set when a Single Step has been completed.
PRINT COMPLETE	1	1	Set when a PRINT operation has been completed.

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3G-4
LOCAL, REMOTE AND LOCAL LOCKOUT

When in remote, to return the 8175A to local control, either the command "LO" or the computer dependent, Go to Local "GTL" command can be used. When in remote, the 8175A's "RETURN TO LOCAL" key can be inhibited by the (computer dependent) Local Lockout command.

3G-5
PROGRAMMING EXAMPLES

Introduction

As previously mentioned, two different methods of programming are possible. Examples illustrating both types are included in the following pages. However, the emphasis is on the normal method. For both types, note the following points.

Field Delimiters
(This applies for both types of programming)
Three basic field delimiters are allowed: ', () and ^. Also, "" is allowed for several types of controller e.g., the HP 9816A, 26A, and 36A.
The same delimiter must be used at the start and end of a field, except when () used. Then use (and) at start and end repectively!

Labels, names and/or descriptions must be delimited. This can be ilustrated by the following (STSTEM Page related) example, which shows how to store a data/parameter set in location "LOC1". The name "TEST PATTERN" is to be assigned to the set.

OUTPUT 720; "STO1,(TEST PATTERN)"

Mnemonics
Mnemonics can be sent using either upper case or lower case letters.
Multiple mnemonics commands must be delimited with semicolons e.g.,

"NX;CL;RD". or "PM0;CD;CR12;(0001)" etc.

The general principles of either type of programming can be illustrated by the following single line example whic is explained below.

OUTPUT 720; "RST;DM1"

Explanation:

OUTPUT	prepares the computer to output data (any command etc.)
720	is the device selector, it includes the interface select code for the internal HP-IB - 7, and the 8175A address - 20.
RST	is an "Action Message", in this case the command to reset all parameters and data to standard settings.
DM1	is the command to access the DATA Page [Pattern] setup menu.

The actual differences applicable to the two types of programming are explained in sections 3G-7 and 3G-8.

3G-6
WHERE DEVICE DEPENDENT COMMANDS MUST BE USED

There are certain situations where normal programming methods either cannot be used or, are impractical. In such cases, the device-dependent commands method should be used. These cases include whenever any Edit function is used, and/or the following menu settings need to be changed:

CONTROL Page, **[Clock]** menu:
To set either the Trigger POD or External Input Thresholds to fixed TTL or ECL.

DATA Page, **[Format]** Allocation menu:
To edit an existing data Format Label, since only insertion or deletion of complete FL's is possible via normal commands.

DATA Page **[Waveform]** Setup menu:
All settings.

PROGRAM Page, **[Module]** Assignment menu:
To change the "**to**" (between the **from** Address and to Address) to "**next**".
To insert (not Add) a new segment.
To edit an existing segment (otherwise Delete and Add etc. must be used).

PROGRAM Page, **[Trigger Event]** assignment menu:
To set the "Address and Program Single Step" conditions.

3G-7
DEVICE DEPENDENT COMMANDS PROGRAMMING

As previously mentioned, this method is cursor position dependent, and means that the cursor must first be positioned in the appropriate field, before the value can be changed. The device-dependent commands for keyboard functions are implemented in a mnemonics-per-keystroke format. They are all detailed in the list of HP-IB commands. To represent each and every cursor movement etc., within a program, means that even a fairly simple one will contain a large number of mnemonics. It is therefore not recommended that you use this method for any large programs!

To continue, any mnemonic can be followed by an ASCII number that indicates how many times to repeat that key. For example:
"CD3" will cause the "Cursor down" command to be executed three times.
Sending the command "NX10" is the same as pressing the NEXT key ten times.

Note: Data keys and Delimiting
To send data keys (i.e.numeric 0123456789ABCDEF or alphabetic values) the ASCII representation of those keys must be enclosed within field delimiters. For example, if the pattern "01001111" is to be sent after positioning the cursor in a particular field, it must be sent as shown:

```
OUTPUT 7xx;"(01001111)"
```

Examples

Note that in the following examples, the address 720 is used for the 8175A. Also, note how the 8175A is defined as "Dsg=720" at the begining of the programs. This makes the later assignment of a new address very easy, and also means that Dsg can be used within the programs instead of 720. The examples inclde the commands necessary to enable the patterns produced to be output.

The basic principles of this type of programming can be illustrated by the following single line example:

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OUTPUT 720;"DM1;CD3;CR32;(1)"

Explanation:

DM1	is the command to access the DATA Page [Pattern] setup menu.
CD3	is to move the Cursor Down 3 steps from its current position.
CR32	is to move the Cursor Right 32 steps.
(1)	is the data bit to be set, note how it is enclosed within field delimiters ( ).

The same principles apply to all programs done by this method. The following examples illustrate them. Note, if you STEP through the programs, rather than using RUN, you can observe the resulting changes on each menu.

Example 1: Basic Principles
This example shows the basic principles of how to set up a pattern, a program module and output the pattern. Data (a single 1) is to be set at Address 0000, chan. 0 of POD0. The default (Standard Setting) duration is used. Refer to the comments adjacent to the program lines for more information.

```
10    Dsg=720
20    OUTPUT Dsg;"RST"                    !Recall Standard Settings
30    OUTPUT Dsg;"DM0;CD2;(5.00)"         !Data P. Format, Period Sus
40    OUTPUT Dsg;"DM1;CD3;CR32;(1)"       !Data P. Pattern, set data in ch. 0 to 1
50    OUTPUT Dsg;"PM0;CD;CR12;(0004)"     !Prgm P. Module, set "to Address" to 4
60    OUTPUT Dsg;"CM0;CD;NX"              !Cntrl P. Clock, Auto Cycle
70    OUTPUT Dsg;"OM;NX"                  !Output P., Output PODs enabled
80    OUTPUT Dsg;"UP;SA"                  !Update, Start
90    END
```

Example 2: Changing Duration
This example is similar to the first one but involves changing the duration to 5 us and setting a different program module.

```
10    Dsg=720
20    OUTPUT Dsg;"RST"                    !Recall Standard Settings
30    OUTPUT Dsg;"DM1;CD3;CR32;(1)"       !Data P. Pattern, set data in ch. 0 to 1
40    OUTPUT Dsg;"PM0;CD;CR12;(0001)"     !Prgm P. Module, set "to Address" to 1
50    OUTPUT Dsg;"CM0;CD;NX"              !Cntrl P. Clock, Auto Cycle
60    OUTPUT Dsg;"OM;NX"                  !Output P., Output PODs enabled
70    OUTPUT Dsg;"UP;SA"                  !Update, Start
80    END
```

3G-8
NORMAL PROGRAMMING

The same basic principles apply here as for the simpler cursor position dependent method. However, note the following points regarding use of the list of HP-IB commands:

A complete command must consists of:

(1) in all cases: a mnemonic, e.g. **DUR**
+ (if required):
(2) data or digit or character,e.g.) **0**
+ (if applicable):
(3) a value and units, e.g. **10us**

For the above case (DATA Page duration to be set at 10 us fixed), the command would be as follows:

OUTPUT 720;"DUR0,10 us"

Just to illustrate the differences between the number of commands required for each type of programming, refer to the single line examples below. They both assume the same initial conditions.

Device dependent commands method: OUTPUT 720;"DM1;CD3;CR32;(1)"

Normal method: OUTPUT 720;"CHD0,,,1"

Note how, with normal programming, only one command is required and it is not necessary to access the menu in order to set the data.

Examples - Introduction

The first example in this section is designed to show you the basic concept of programming the 8175A. Since in most cases, any program will require data to be set up, you need to know how to use the associated commands. This is explained in the second example which comprises four parts. Each shows a different aspect of data setting. After these, come the program versions of examples P-1, P-2, and G-1 to G-3 in sections 3B and 3C respectively. Then the two PRGM Page examples are covered. Additional examples covering several Edit features etc. are also given.

Example 3: Basic Programming Concepts
This example shows how to set up and output a pattern. It requires the minimum number of settings/changes to the Standard Settings conditions to be made. However, it illustrates the basic concepts of programming.
A data pattern is to be set which, when displayed on an oscilloscope, will appear as a simple square wave with pulse duration 0.02 us and amplitude + 2.0 V. The settings to be made are as follows:

Standard Settings are to be recalled.
Data comprising one 1 and one 0, is to be set at Addresses 0000 and 0001 respectively, in channel 1 of POD1. (The 0 bit does not actually have to be set since the Standard Settings set all data to 0's.)
A program module is to be set which will enable data cycling between Addresses 0000 and 0001.
The data cycling mode is to be set to "Auto Cycle", this enables data to be cycled continuously following a START command.

The commands required to set these and the output enabling conditions, are as follows:

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```
10    Dsg=720
20    OUTPUT Dsg;"RST"
30    OUTPUT Dsg;"CHD0,,,1"
40    OUTPUT Dsg;"PM0;CD;CR12;(0001)"
50    OUTPUT Dsg;"CYM1"
60    OUTPUT Dsg;"POD1"
70    OUTPUT Dsg;"UP;SA"
80    END
```

Explanation of lines:

10 enables the abreviation "Dsg" to be used within the program.

20 recalls the Standard Settings

30 **CHD** change data command (Address 0000 set as part of RST, normally the "TSA" command used to define the address. See next example)
0 defines used base code as binary
, , , 1 means leave PODS 2 and 1 as they are, and set a "1" in first channel of POD 0.

40 set the "to" Address of the Program module to 0001. Note that Cursor move commands (**CD** and **CR12**) are used here. This is because a setting within an existing segment is to be changed (no new segment is being added).

50 sets the data cycling mode to Auto cycle.

60 enables all PODS.

70 does an Update, then START.

Example 4: Use of Data Pattern Setting Commands
This is a four part example designed to illustrate the use of those commands associated with data pattern setting. Each program part includes a **PAUSE** to enable you to observe the corresponding changes.

```
30    !   The following shows you, how to write at Address 10, POD 1,
40    !   the Pattern 00110101 with the Label "TEST".
50    !   Note after (TEST) the ,, which identify POD 2 as being unchanged.
60    !   POD 0 does not need to be included.
70    !
80    Dsg=720
90    OUTPUT Dsg;"RST"
100   OUTPUT Dsg;"DM1;TSA10;CHD0,(TEST),,00110101"
110   PAUSE
120   !
130   !
140   !   The following shows you, how to change at Address 10, the data of
150   !   POD 2 to: 11100110. The Pattern in POD's 1 and 0 will not be changed.
160   !   The Label "TEST" does not have to be used!
170   !
180   OUTPUT Dsg;"TSA10;CHD0,11100110"
190   PAUSE
```

```
220   !   The following shows you, how to change at Address 10, the data
230   !   Pattern of POD 1 to 10101010 and POD 0 the Pattern 00001111.
240   !   The Label "TEST", is changed to "TEST1".
250   !
260   OUTPUT Dsg;"TSA10;CHD0,(TEST1),,10101010,00001111"
270   PAUSE
280   !
290   !
300   !   The following shows you, how to set up at the Addresses given,
310   !   the following Patterns and Label.
320   !   Address 12, POD 0: 01010101
330   !   Address 13, POD 0: 10101010
340   !   Address 14, POD 0: 11110000 and the Label "TEST2"
350   !
360   OUTPUT Dsg;"TSA12;CHD0,,,01010101,,,10101010,(TEST2),,,11110000"
370   END
```

Note that after each data pattern is set, the Address auto-increments

Example 5: Assigning a new Format, Data and Duration Setting

This is also a four part example, it shows first of all, how to assign a new Format and set Duration to "variable". This is followed by changing the displayed Format to the new one; then how to set up some data over several addresses; finally, specific duration values are set.

```
10    !   Format Allocation
20    !
30    !   The following shows you, how to assign a new Format and assign it the
40    !   Label "  B  ". Channel 0, POD 0 is to be the single active channel.
50    !   The Duration is set variable. Note how the PODs 2 and 1 are not used
60    !   by leaving their ,,, positions empty.
70    !
80    Dsg=720
90    OUTPUT Dsg;"RST"
100   OUTPUT Dsg;"DM0;DUR1;IFM(  B  ),,,1"
110   PAUSE
120   !
130   !
140   !   Pattern menu
150   !
160   !   The following shows you, how to change the displayed format to
170   !   Format Label "  B  ". The leading and trailing spaces around B are
180   !   only to centralize B in the label field.
190   !
200   OUTPUT Dsg;"DM1;CFM(  B  )"
210   PAUSE
220   !
230   !
240   !   The following shows you, how to set up the Pattern 1010101 in POD 0
250   !   channel 0 from Address 5 to Address 11. Since PODs 2 and 1 are not
260   !   defined, the pattern is automatically set in POD 0.
270   !
280   OUTPUT Dsg;"TSA5;CHD0,(TEST),1,0,1,0,1,0,1"
290   PAUSE
```


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Example 5 continued (Setting the Variable Durations)

```
320   !   Variable Duration example:
330   !
340   !   The following shows you, how to set the following Durations:
350   !   Address  5: .5  us
360   !   Address  8: .3  us
370   !   Address 10: .15 us
380   !   Address 11: .27 us
390   !   Durations at Addresses 6,7 and 9 are to remain at their default
400   !   value of .02 us.
410   !
420   OUTPUT Dsg;"TSA5;CHT.5US,,,.3US,,.15US,.27US"
430   END
```

EXAMPLES 6 TO 10: INTRODUCTION

The following five examples illustrate how to set up the same patterns and conditions as for "front panel operation " examples P-1, P-2 and G-1 to G-3 in sections 3B and 3C. Therefore, refer to the original examples before starting these if you wish. These programs are in fact combined together, to produce an overall one with four sequential segments and a final self-contained program. The first four parts should therefore be done in the sequence shown, to ensure that the correct initial conditions for each exist. The overall program can be written in 18 lines. It is only because the comments are included within the programm sections, that it appears to be so long! Note in the first two examples (6 and 7), how menu display commands are included even though not necessary. Their only purpose is to enable the menu changes to be seen. The PAUSE commands enable the status at the completion of particular commands etc. to be observed.

OUTPUTTING THE EXAMPLES

If you want to ouput any individual patterns, just add the lines (730 to 760) after the appropriate PAUSE point. Note, to output Example Prog 10, the "to" Address in line 730 should be set to 0005.

Example 6
This explains how to program the conditions for Example P-1. It involves setting up a simple data pattern, and makes use of almost all Standard Settings. Note that the **[Pattern]** Setup menu display command is included; in practise it would not be necessary to do this.

```
40    Dsg=720
50    OUTPUT Dsg;"RST"
60    OUTPUT Dsg;"DM1;TSA1;CHD0,,,1,,,0,,,1,,,0,,,1,,,0,,,1"
70    PAUSE
80    !
90    !   Line 40 enables the abbreviation "Dsg" to be used in the program
100   !     lines instead of the number 720.
110   !   Line 50 recalls the Standard Settings.
120   !   Line 60, DM1 displays the Pattern Setup menu, TSA1 sets Address 0001
130   !     as Start Address. CHD0 is a change Base, Label and Data Command
140   !     - 0 means Base = Binary. Data is always set in POD 0 channel 0.
150   !     Then auto Roll up to next Address etc.
```

Example 7
This explains how to program the conditions for Example P-2. It involves setting a new duration value, creating a new Data Format and assigning it etc.

```
210   OUTPUT Dsg;"DM0;DUR0,1US;IFM(B),,,10"
220   PAUSE
230   OUTPUT Dsg;"DM1;CFM(B);TSA1;CHD0,1,1,0,1,0,0,1"
240   PAUSE
250   !
260   !   Line 210, DM0 displays the Format Allocation menu, DUR0,1US sets
270   !     fixed Duration with the Period of 1us. IFM inserts a new Format
280   !     Label named "B". PODs 2 and 1 are skipped, the only active
290   !     channel is POD 0, channel 1.
300   !   Line 230, DM1 displays the Pattern Setup menu, CFM"B" changes the
310   !     displayed Format, TSA1...see above.
```

Example 8
This explains how to program the conditions for Example G-1, which is a graphics capabilities based one. It shows the use of those commands required to enable a pattern to be displayed in the form of a timing diagram. This (as explained earlier) involves mainly the use of "Cursor movement" commands. When studied in relation to the **[Waveform]** menu, the program is self explanatory. Note the use of the **NEXT[]/PREV[]** keys commands: NX and PV respectively.

```
370   OUTPUT Dsg;"DM2;CD;NX2;CR;(0000);CD4;PV2;CD;PV"
380   PAUSE
390   !
400   !   Line 370, DM2 displays the Waveform Setup menu, the various cursor
410   !     movement commands (CD...) move the cursor into the appropriate
420   !     fields for value setting.
```

Example 9
This is also a graphics one, and shows how to program the conditions for Example G-2. It includes the basics of how to change or edit the data of an existing timing diagram (the one from Example Prog 3).

```
480   OUTPUT Dsg;"CU3;NX;CD2;CR;(0);(0);(1);(0);(1);(1)"
490   PAUSE
500   !
510   !   Line 480, sets data.
```


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Example 10
This shows how to program the conditions for Example G-3. It is a self contained program, and therefore does not require any pre-conditions. Note how, the duration is set to variable (with default value 0.02 us), then the data pattern is set and finally, the different durations are set.

```
570   OUTPUT Dsg;"RST"
580   OUTPUT Dsg;"DUR1;DM2;CD3;NX;CD2"
590   PAUSE
600   OUTPUT Dsg;"CR;(1);(0);(1);(0);(1)"
610   PAUSE
620   OUTPUT Dsg;"CU2;CR;RU;(0.08);CL3;RU2;(0.10)"
630   !
640   !   Line 570 recalls Standard Settings.
650   !   Line 580, DUR1 sets Duration variable, DM2... displays the Waveform
660   !     Setup menu and moves the cursor into the wished field.
670   !   Line 600 sets data.
680   !   Line 620 sets timing.
```

How to Output the Examples
The following four lines show the additional commands required to output any of the five previous examples. Note, for Example Prog10, the "to Address" should be set to 0005 (instead of 0007).

```
710   !   For any of these examples, to output the data (and view it on a
720   !   Scope etc.) just add the following lines:
730   !     OUTPUT Dsg;"PM0;CD;CR12;(0007)"     !set "to Address"
740   !     OUTPUT Dsg;"CYM1"                   !Auto Cycle
750   !     OUTPUT Dsg;"POD1"                   !All Outputs enable
760   !     OUTPUT Dsg;"UP;SA"                  !Update, Start
770   END
```

PRGM PAGE BASED EXAMPLES

The following two examples show how to program the same conditions as for Examples PRGM 1 and 2 in section 3D-6. Neither example requires that any data be set up.

Example 11
This shows how to program the same conditions as for Example PRGM 1 in section 3D-6. It covers the basics of setting up a program module and the corresponding Trigger Event settings.

```
10    Dsg=720
20    !
30    ! Module Assignment Setup
40    !
50    OUTPUT Dsg;"RST"
60    OUTPUT Dsg;"PM0;CD;(INIT );CR7;(0120)"
70    OUTPUT Dsg;"IN;CR6;(0021);CR2;(0120);CR;(015)"
80    OUTPUT Dsg;"IN;(PROG1);CR;(0200);CR2;(0300)"
90    OUTPUT Dsg;"IN;CR6;(0250);CR2;(0270);CL5;NX"
100   !
110   ! Trigger Event Assignment
120   !
130   OUTPUT Dsg;"OSTA(INIT )"
140   OUTPUT Dsg;"OJPA(PROG1)"
150   OUTPUT Dsg;"OJPB(PROG1)"
160   OUTPUT Dsg;"OCON(PROG1)"
170   END
180   !
190   ! Module Assignment Setup Comments
200   !
210   ! 10: HP-IB address of the Digital Signal Generator.
220   ! 50: Recall Standard Settings.
230   ! 60: Changes the program segment name to "INIT " with the start label
240   !     "START" and the end address 120.
250   ! 70: Inserts a segment with start address 21, end address 120
260   !     and 15 repetitions.
270   ! 80: Inserts a segment named "PROG1" from 200 to 300.
280   ! 90: Inserts a segment which runs from 250 and the next 20 steps.
290   ! Remark: If you want to program the number of steps, you can do it
300   !         only with the cursor.
310   ! 130: On START execute "INIT ".
320   ! 140: On JMP A execute "PROG1".
330   ! 150: On JMP B execute "PROG1".
340   ! 160: On CONTINUOUS-start do "PROG1".
```


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Example 12

This shows how to program the same conditions as for Example PRGM 2. It covers how to set up a fairly complex program module and the corresponding Trigger Event settings.

```
10    Dsg=720
20    !
30    ! Module Assignment Setup
40    !
50    OUTPUT Dsg;"RST"
60    OUTPUT Dsg;"PM0;CD;(INIT );CR7;(0120)"
70    OUTPUT Dsg;"IN;CR6;(0021);CR2;(0120);CR;(015)"
80    OUTPUT Dsg;"IN;(PROG1);CR;(0200);CR2;(0300)"
90    OUTPUT Dsg;"IN;CR6;(0250);CR2;(0270);CL5;NX;RU"
100   OUTPUT Dsg;"IN;(PROG2);CR;(0980);CR2;(0120);CL11;RU"
110   OUTPUT Dsg;"IN;(PROG3);CR;(0300);CR2;(0380);CR;(008)"
120   !
130   ! Trigger Event Assignment Setup
140   !
150   OUTPUT Dsg;"OSTA(INIT )"
160   OUTPUT Dsg;"OJPA(PROG2)"
170   OUTPUT Dsg;"OJPB(PROG3)"
180   OUTPUT Dsg;"OCON(PROG1)"
190   END
200   !
210   ! Module Assignment Setup Comments
220   !
230   ! 10: HP-IB address of the Digital Signal Generator.
240   ! 50: Recall Standard Settings.
250   ! 60: Changes the program segment name to "INIT " and the end address
260   !     to 120.
270   ! 70: Inserts a segment with start address 21, end address 120
280   !     and 15 repetitions.
290   ! 80: Inserts a segment named "PROG1" from 200 to 300.
300   ! 90: Inserts a segment which runs from 250 and the next 20 steps and
310   !     ends the first module.
320   ! 100: The second module "PROG2" runs from 980 to 120.
330   ! 110: The third module "PROG3" runs from 300 to 380 with 8 repetitions.
340   !
350   ! Trigger Event Assignment
360   !
370   ! 150: On START execute "INIT ".
380   ! 160: On JMP A execute "PROG2".
390   ! 170: On JMP B execute "PROG3".
400   ! 180: On CONTINUOUS-Start execute "PROG1".
```

EXAMPLES INVOLVING EDIT CAPABILITIES

The following examples ilustrate how to program some of the more complex Edit capabilities. Before doing any of them, it is recommended that you refer to section 3E and note any pre-conditions etc. regarding their use. In all the examples except the "Modify" one, note the "(0007)" setting after each Execute (EX) command. It causes Address 0007 to be displayed within the central inverse video field, and so enables the effect of each change to be instantly displayed. All the examples except "Modify", include an "Increment" edit function as a first step to set the initial conditions. In all these cases, the Increment is done between Adresses 0000 and 0015, with a start value (at Address 0000) of 0000.

Example 13: COPY - COPY Address

```
10    Dsg=720
20    OUTPUT Dsg;"DM1;FU;CR;(0000);CR;(0015);EX;(0007)"
30    PAUSE
40    OUTPUT Dsg;"CP;CR;(0000);CR;(0003);CR;(0008);EX;(0007)"
50    !
60    ! 20: Set an upcount sequence with Increment
70    ! 40: Copy 0000...0003 ==> 0008
80    !
90    END
```

Example 14: COPY - STORE

```
10    Dsg=720
20    OUTPUT Dsg;"DM1;FU;CR;(0000);CR;(0015);EX;(0007)"
30    PAUSE
40    OUTPUT Dsg;"CP;NX;CR;(0000);CR;(0003);CR;(0008);EX;(0007)"
50    !
60    ! 20: Set an upcount sequence with Increment
70    ! 40: Storing 0000...0003 ==> 0008
80    !
90    END
```

Example 15: COPY - COPY Channel

```
10    Dsg=720
20    OUTPUT Dsg;"DM1;FU;CR;(0000);CR;(0015);EX;(0007)"
30    PAUSE
40    OUTPUT Dsg;"CP;NX2;CR;RL;CR;RL6;CR;(0000);CR;(0015);EX;(0007)"
50    !
60    ! 20: Set an upcount sequence with Increment
70    ! 40: Copy POD 0, Channel 0 to Channel 6
80    !
90    END
```


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Example 16: MOVE - MOVE Address

```
10    Dsg=720
20    OUTPUT Dsg;"DM1;FU;CR;(0000);CR;(0015);EX;(0007)"
30    PAUSE
40    OUTPUT Dsg;"DM1;MV;CR;(0004);CR;(0007);CR;(0008);EX;(0007)"
50    PAUSE
60    OUTPUT Dsg;"DM1;MV;CR;(0008);CR;(0011);CR;(0004);EX"
70    !
80    ! 20: Set an upcount sequence with Increment
90    ! 40: Moving Address 0004...0007 to 0008...(0011)
100   ! 60: Moving Address 0008...0011 back to 0004...(0007)
110   !
120   END
```

Example 17: MOVE - EXCHANGE Channel

```
10    Dsg=720
20    OUTPUT Dsg;"DM1;FU;CR;(0000);CR;(0015);EX;(0007)"
30    PAUSE
40    OUTPUT Dsg;"MV;NX;CR;RR16;CR2;(0000);CR;(0015);EX;(0007)"
50    !
60    ! 20: Set an upcount sequence with Increment
70    ! 40: Exchanging POD 0, Channel 7 with Channel 0
80    !
90    END
```

Example 18: MODIFY

```
10  Dsg=720
20  OUTPUT Dsg;"DM1;MD;(000000000000000000000000);CR;(0000);CR;(1023);EX;ST;UP"
30  !
40  ! 20: Set all data to 0 via Modify
50  !
60  END
```

LIST OF 8175A HP-IB COMMANDS

This list details all the commands required for operating the 8175A on the HP-IB. The commands are listed in the following order:

Commands of the SYSTEM Page	3-100
Commands of the CONTROL Page	3-100
Commands of the TIMING Page	3-103
Commands of the OUTPUT Page	3-103
Commands of the DATA Page	3-104
Commands of the PROGRAM Page	3-106
Page Independent Commands	3-106
Action Messages	3-107
Query Messages	3-108
Learn String Commands	3-109
Service Request Messages	3-110
Universal Commands	3-110

NOTE: In this list, the term "NR" in the data column of certain commands, means that a numeric (representation) value appropriate to the particular setting can, or must be included. Specific requirements are explained as and where necessary.

Also, within the data column any characters shown enclosed within brackets ( ), are optional. They indicate that the corresponding data can, but does not have to, be included.

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Commands of the SYSTEM Page

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Comment ref.
System Page **Configuration** menu	SM	0	-	
System Page **Peripheral** menu	SM	1	-	
System Page **Storage** menu	SM	2	-	
Parallel Data Generator	GEN	0	-	
Serial Data Generator	GEN	1	-	
Type of printer connected - None	PRT	0	-	
Type of printer connected - Text	PRT	1	-	
Type of printer connected - Graphics	PRT	2	-	
Beeper off	BP	0	-	
Beeper on	BP	1	-	
Store to Location LOC1 or LOC2, description is optional	STO	N	-	C1
Recall from Location LOC1 or LOC	RCL	N	-	
Exchange with Location LOC1 or LOC2, description is optional	XCH	N	-	C1
Preset to Standard Settings	PRE	-	-	

Comments:

C1: The description is a label assigned to the configuration to be stored. A maximum of 21 characters is allowed, the first (non blank) character must be alphabetic. The following example shows the commands required to store the current settings in location LOC1, and assign it the name "TEST PATTERN 1".

"STO1,(TEST PATTERN 1)"

Commands of the CONTROL Page

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Comments ref.
Control Page **Clock** menu	CM	0	-	
Control Page **Input Trig. Word Ass.** menu	CM	1	-	
Control Page **Flag Assignment** menu	CM	2	-	
Control Page **Simulate Trig. Functs.** menu	CM	3	-	
System Clock internal	SCLK	0	-	
System Clock external from Input POD	SCLK	1		
System Clock external from rear panel BNC	SCLK	2		
Clock off	CLK	0	-	
Clock on (, clock per. in int. clk mode)	CLK	1 (NR)	ns, us, ms, s	C2
Clock on (, clock cycs in ext. clk mode)	CLK	1 (NR)		C2
Gate Mode - Start and/or Stop from T. POD	GMOD	0	-	
Gate Mode - Start and/or Stop from ext. Input on Front Panel	GMOD	1	-	
Gate Edge - rising Edge	GED	0	-	
Gate Edge - falling Edge	GED	1	-	
Gate Edge - both Edges	GED	2	-	
Gate Edge - Start on rising Edge, Stop on falling Edge	GED	3	-	

Gate Edge - Start on falling Edge, Stop on rising Edge			GED	4	-	
Synchronous Trigger POD on rising Edge			IPOD	0	-	
Synchronous Trigger POD on falling Edge			IPOD	1	-	
Asynchronous Trigger POD			IPOD	2	-	
POD threshold variable			PTHR	+/-NR	V	C1
BNC threshold variable			BTHR	+/-NR	V	C1
Single Cycle			CYM	0	-	
Auto Cycle			CYM	1	-	
Start mode asynchron.			STM	0	-	
Start mode sychron.			STM	1	-	
Clock Calibration			FCAL	-	-	
Trigger Filter 20 ns			TDUR	0	-	
Trigger Filter 50 ns			TDUR	1	-	
Trigger Filter 100 ns			TDUR	2	-	
Trigger Filter 200 ns			TDUR	3	-	
Trigger Filter 500 ns			TDUR	4	-	
The Trigger is determined by n-Words (1<=n<=4)			TW	n		C3
Trigger POD is disabled			TR	0		
Trigger POD is enabled			TR	1		
External Input is disabled			INP	0		
External Input is enabled			INP	1		
START	Trigger Word Assignment		TSTA	P1(,P2,P3,P4)		C4
STOP	Trigger Word Assignment		TSTP	P1(,P2,P3,P4)		C4
CONTINUE	Trigger Word Assignment		TCON	P1(,P2,P3,P4)		C4
JMP A	Trigger Word Assignment		TJPA	P1(,P2,P3,P4)		C4
JMP B	Trigger Word Assignment		TJPB	P1(,P2,P3,P4)		C4
TRISTATE ON	Trigger Word Assignment		TTON	P1(,P2,P3,P4)		C4
TRISTATE OFF	Trigger Word Assignment		TTOF	P1(,P2,P3,P4)		C4
TRISTATE ASYNCHRON Trigger Word Assignt.			TTAS	P1(,P2,P3,P4)		C4
Simulate START (with associated Flag P sent in base B)			STA	(B,P)		C5
Simulate STOP (with associated Flag P sent in base B)			STP	(B,P)		C5
Simulate CONTINUE (with associated Flag P sent in base B)			CON	(B,P)		C5
Simulate JMP A (with associated Flag P sent in base B)			JPA	(B,P)		C5
Simulate JMP B (with associated Flag P sent in base B)			JPB	(B,P)		C5
Simulate TRISTATE ON (with associated Flag P sent in base B)			TON	(B,P)		C5
Simulate TRISTATE OFF (with associated Flag P sent in base B)			TOF	(B,P)		C5
Transparent Flag Mode			FLM	0	-	Latched
Flag Mode		FLM	1	-		
Transfer Flag Start Address			TFA	NR	-	C6
Transfer Flag Data			FLD	B,D.....,D		C7
Transfer Flag latched or unlatched Symbol			FLL	D,.....,D		C8

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Comments:

C1: POD and BNC Thresholds can be programmed only with variable levels, not with fixed ECL or TTL levels.
e.g. "PTHR 5V"; "PTHR 5" (unit will by default be V); "PTHR -300mV"

C2: If **Clock on** is selected, the following can, if wished be sent:
a) For internal system-clock: the period of the clock (between 0.02 ... 999 us)
e.g. "CLK1, 20us"
b) For external system-clock: the duration of the clock expressed in cycles of the supplied system clock (between 2 ... 999 cycles). In this case no suffix is allowed.
e.g. "CLK1,20"

C3: Only digits 1 to 4 are allowed.

C4: P1 to P4 means Pattern 1 to Pattern 4. If D7 to D0 are the bit-positions in such a pattern, the data transfer must occur in the following order:
P1D7, P1D6 ... P1D0, [P2D7 ... P2D0, P3D7 ... P3D0, P4D7 ... P4D0]
The content of each byte (D7 through D0) could be 0 , 1 , X or ".", but patterns containing "."s mixed with 0, 1 and X are regarded as erraneous input (only if all 8 bit positions of a pattern are sent as "." is no error detected). Also, pattern of only "X's" is **not** allowed.
Number of words sent must match TW n value.
Min. number of bytes to be transfered = 1
Max. number of bytes to be transfered = 32

Example of assignment of individual Trigger Words:
"TSTAXXXX1111;TSTP10000000;TCON00000000;TJPA00001100;
TJPB00000010;TTON00000001;TTOF00110011;TTAS01010101"

Example of assignment of 4 Patterns (Trigger Words) to trigger START:
"TSTA 00001111,11111111,01011111,10101111"

C5: The data-base B and the Flag-data P are optional. Without data, only the function will be simulated. B defines the data-base (B=0 -> BIN; B=1 -> OCT, B=2 -> DEC; and B=3 -> HEX) used for the transfer of the corresponding output flag P. P must be between 0 and 255 (decimal).

C6: The value of TFA must be between 0 and 255. This command is (or can) be used together with FLD and FLL.
CAUTION: The commands "FLD" and "FLL" both modify the address defined by "TFA"!

C7: B stands for the used data-base. Base can be 0 (BIN), 1 (OCT), 2 (DEC) or 3 (HEX). "D" represents the Flag-data. Note the following points regarding setting of Flag patterns:
a) must be matched to the defined data-base.
b) can only be sent to flag-addresses up to, and including, 255.
c) The start address should, if sent, be defined with TFA. After "FLD" this Address is modified to the next Flag-Address after the last address modified by the "FLD" command.
d) It is possible to leave some flags unchanged by sending no number before the appropriate ",". For example:
FLD 2,3,,4

(2) would define a decimal data-base for data-transfer,
(3) would modify the flag-pattern of address n (defined by "TFA") to 3,
flag-pattern of address (n+1) would be left unmodified
(4) would modify flag-pattern of address (n+2) to 4,
and would then define address (n+3) as the next flag-pattern to be written to.

Example of setting Flag Patterns, in Latched Flag mode, at two (Trigger) addresses:
"FLM1; TFA221;FLD 0,10101010; TFA 170;FLD 0,01010101"

Example of how to "Latch" the patterns at the addresses shown:
"TFA 221; FLL1; TFA;FLL1"

C8: This transfer sets flag pattern(s) to latched (D=1, Display=*) or unlatched (D=0, Display=.). The start address, if sent, must be defined with TFA. After "FLL", this address is modified to the next flag-address after the last address modified by the "FLL" command.

Commands of the TIMING Page

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Comments ref.
Timing Page **Fine Timing** off	TM	0	-	
Timing Page **Delay Mode**	TM	1	-	
Fine Timing Delay on Channel X with Value Y in ns	DEL	CHN, Val.	ns, us, ms s	C1

Comments:

C1: CHN must be 0 thru 3 and the value must be in the Range:
20 ... 40 ns for Parallel D.G.,
0 ....20 ns for Serial D.G.
Example: "DEL0,30ns;DEL1,32ns"

Commands of the OUTPUT Page

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Remarks and comment ref.
Output Page menu	OM	-	-	
Disable all PODS	POD	0	-	
Enable all PODS	POD	1	-	
High Level TTL/CMOS POD from internal source	HILP	0 (,NR	V)	C1
High Level TTL/CMOS POD from external source	HILP	1		C1

Comments:

C1: HLP—>0—2.0 . . . . . .9.9 V—
—>1———————————————

If set, the value for HILP 0 must be between 2.0 V and 9.9 V.
For HLP 1, no value is allowed.

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Commands of the DATA Page

NOTE: Several examples illustrating the use of DATA Page commands are included in the section 3G.

Description/Requirement	COMMAND DETAILS: mnem	data	• Unit	Comments ref.
Data Page **Format** Allocation menu	DM	0	-	
Data Page **Pattern** Setup menu	DM	1	-	
Data Page **Waveform** Setup menu	DM	2	-	
Fixed Pattern Duration (with Period)	DUR	0 (,NR	ns,us,ms,s)	C1
Variable Pattern Duration	DUR	1	-	
Insert new Format Label with assignment of active channels	IFM	"LABEL", P2,P1,P0	-	C2
Delete Format Label	DFM	"LABEL"	-	C3
Change Format Label used on Pattern menu	CFM	"LABEL"	-	C3
Transfer Start Address	TSA	NR	-	C4
Change Label and Data (transfer in base B)	CHD	B,"L",D.....,D		C5
Change Timing	CHT	NR (,NR..,NR)	ns,us,ms,s	C6

C1: The Period value is optional. If no Period value set, the pattern duration will change to "fixed" with last fixed value. (If External Clock used, since the period value is in cycles, no units allowed.)

C2: The Label should not have more than 5 characters, the first must be from type alpha (A ... Z).
CAUTION: Spaces defined as part of a label are handled like alphanumeric-characters. That means
- leading spaces are not suppressed (therefore " A " is not identical to "A ")
- don't forget to count spaces (for example " ABCDE" is too long).

P2 thru P0 means Pattern 2 thru Patern 0. (If, for example, D7 thru D0 represent the bit position within each (POD) pattern, the data transfer must occur in the following order:
"LABEL", P2D7 P2D6 P2D5 ... P2D0, P1D7 ... P1D0, P0D7 ... P0D0
Leading zeros of a pattern do not have to be sent.
The pattern sent will be used to define the status of each pattern element of P0D2 ... P0D0. If required, one or two POD-positions can be left out, but there must be at least one active channel (set to "*") for the 3 POD's.
e.g.: IFM (LABEL), 1010; defines a format label with folowing features:
a) name "LABEL"
b) POD2 is skipped (and therefore per default preset to "... ...")
c) POD1 is defined to "...*.*."
d) POD0 is not sent and will therefore stay at it's default value ("... ...")

C3: Only existing format labels can be deleted or changed. (see also CAUTION of comment C2).

C4: The number must be between 0 and 1023. The command can be used in conjunction with CHD and CHT.
CAUTION: The "CHD" and the "CHT" commands both modify the line defined by "TSA"!

C5: B defines the used Base: B=0 -> BIN; B=1 -> OCT; B=2 -> DEC; B=3 -> HEX.
L (optional) is a label with max. 5 characters. (It is possible to include further labels between the data-pattern, but they must be located so that they stand at the beginning of a new data-line. If for example only POD2 and POD1 are active, it would be allowed to send :
CHD2, "L1", 3, 4, "L2", 5, 6, 7, 8, "L3", 9, 10

In this case, "L2" applies for data 5 and 6, then at the next address, no label is assigned, just data 7 and 8.

Any data pattern sent:

a) must be matched to the defined data-base B.

b) must be matched to the BIT-allocation of the actual Format used. This means for example, if POD2 has an active bit allocation of:
"*.*.*.*.", then only patterns between 0 and 15 can be sent to P0D2.

c) will be stored according to the actual FORMAT used. This means for example, if POD1 is inactive and (in decimal base) the data: 16, 17, 18, is sent, then 16 will will go to POD2, 17 will go to POD0 and 18 to next address, and POD2

d) will be located at the data-line defined with the last "TSA" command.
(Because "CHD" stores the sent data-patterns, it also increments this address. After "CHD", this position therefore would be the next data-line after the last line written to by "CHD"]

e) may not exceed the address of POD0 in data-line 1023

f) it is possible to leave some data patterns unchanged by leaving out values between the appropriate , ,.

C6: The first timing -value is assigned to the data-line assigned with the last "TSA" command. After "CHT", this position is modified to the next data-line after the last line written to by "CHT".
(It is possible to leave some timing-values unchanged, this is done by not including a value between the appropriate ", ,". For example:
"CHT 0,2us,,9us"
would change timing of line n (specified with "TSA") to 0.2 us,
would leave timing of line (n+1) unchanged,
would change timing of line (n+2) to 9 us.
After this command , the data-line (n+3) would be selected for next transfer]

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