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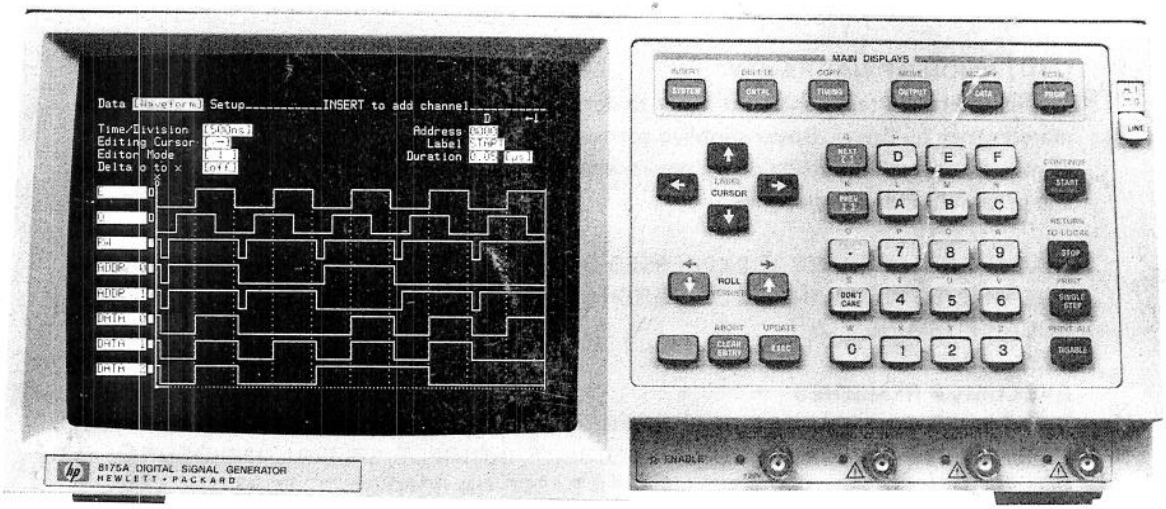
HPからAgilent へと変更しております。
（例：旧製品名 HP 8648は、現在 Agilent 8648として販売いたしております。）

Agilent Technologies

OPERATING AND PROGRAMMING MANUAL

8175A DIGITAL SIGNAL GENERATOR



HEWLETT PACKARD

HP 8175A

HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

For products returned to HP for warranty service, Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

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ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

HEWLETT PACKARD

OPERATING AND PROGRAMMING MANUAL

8175A DIGITAL SIGNAL GENERATOR (Including Option 001)

This manual applies directly to all instruments.

HERRENBERGER STR. 110, D-7030 BOBLINGEN
FEDERAL REPUBLIC OF GERMANY

MANUAL PART No. 08175-90006
MICROFICHE PART No. 08175-95006

PRINTED: MAY 1985

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SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

GENERAL – This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

OPERATION – BEFORE APPLYING POWER comply with the installation section. Additionally, the following shall be observed:

Do not remove instrument covers when operating.

Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers and devices connected to it should be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible, and when inevitable, should be carried out only by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation is present. Do not replace components with power cable connected.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or perform any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

To prevent CRT implosion, avoid rough handling or jarring of the instrument. Handling of the CRT shall be done only by qualified maintenance personnel using approved safety mask and gloves.

SAFETY SYMBOLS

The apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.

Indicates dangerous voltages.

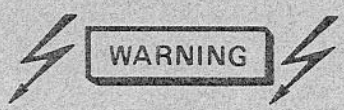
Earth terminal

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice or the like, which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.



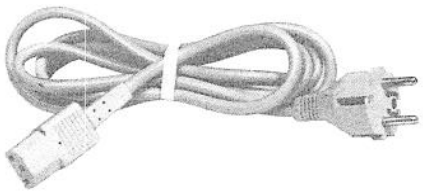
Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing, and adjusting.

8175A

Accessories

4x HP 15462A
1x HP 15463A

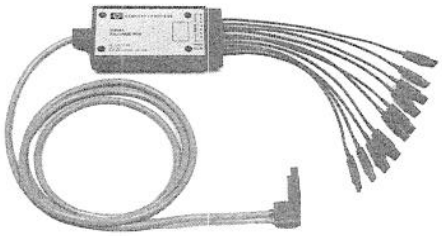
FUSE



POWER CORD

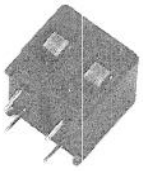
15463A TRIGGER POD (includes 15463-63201 lead set and 10230-62101 probe tips)

15462A TTL/CMOS POD (progr, high level, includes 1 ea. 15429A)



15463-63201
lead set

15429A
solder-in receptacles for connection to a PC board, 5x2 ea.



10230-62101
probe tip, 1 ea. (10 necessary per POD)

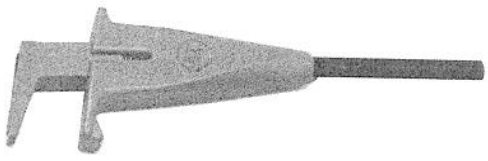
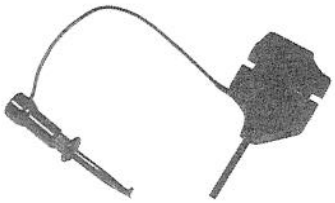
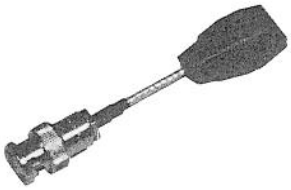


Figure 1-1. 8175A and Supplied Accessories

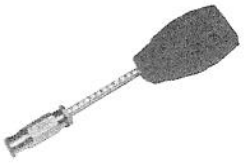
15408A
plug-on grabbers with ground leads, 5 ea.



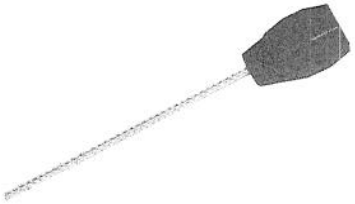
15409A
plug-on BNC adaptors, 5 ea.



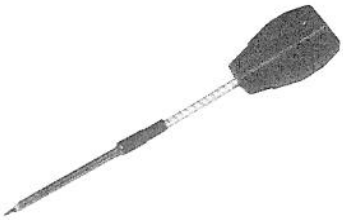
15410A
plug-on SMB adaptors, 5 ea.



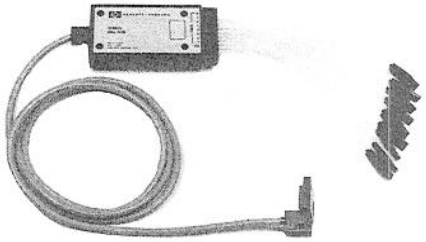
15411A
plug-on coax open-end adaptors, 5 ea.



15415A
plug-on miniprobes, can be used with HP 10024A IC test clip, 5 ea.



15461A ECL POD (fixed ECL level, includes 1 ea 15429A)



HP 15430A
cable for synchronized master slave operation of two ea, HP 8175A

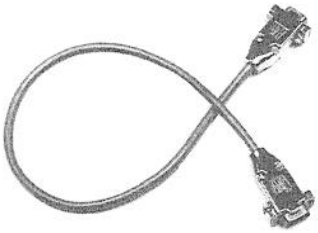
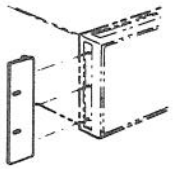


Figure 1-2. Available Connector and Cable Accessories



Rack flange
Order Option 908
(H.P. Part No.
5061–0078)

Figure 1-4. Rack Mounting Accessory

CHAPTER 1
GENERAL INFORMATION

1-1 INTRODUCTION

This Operating Manual contains information required to install, operate and test the Hewlett-Packard Model 8175A. (Service related information is located in the corresponding sections of the complete manual set).

Figures 1-1 and 1-2, show the mainframe, the accessories supplied with each and those available.

Manual Contents

The contents of this manual are as follows:

Chapter 1 covers instrument identification, description, options, accessories, specifications and other basic information.

Chapter 2 provides installation instructions for the 8175A and its accessories. It also includes information about initial inspection and damage claims, preparation for use, packaging, storage and shipment.

Chapter 3 is sub-divided into several sections, the purpose of the chapter is to familiarise you with operation of the 8175A. Manual operation of the 8175A is covered with the aid of a "Getting Started" section which includes several worked examples. The section is designed to help you learn the basics of instrument operation as quickly as possible. Comprehensive descriptions of all Main Displays, their menus, edit capabilites and how to use them are included. Remote (or programmable) operation is described, also with the aid of several worked examples.

Appendices A-1 and **2** Describe all display messages which may appear on the generator screen during operation (A-1) and power-up (A-2).

Appendix B explains how to control a printer.

Appendix C explains how to control the disc memory accessory.

Chapter 4 details performance testing of the instrument.

1-2 SPECIFICATIONS

Instrument specifications for the 8175A are listed in Table 1-2. These specifications are the performance standards or limits against which the instrument are tested.

1-3 SAFETY CONSIDERATIONS

The Model 8175A is a Safety Class 1 instruments (instrument with an exposed metal chassis that is directly connected to earth via the power supply cable).

Before operation, the instrument and manual, including the red safety page, should be reviewed for safety markings and instructions. These must then be followed to ensure safe operation and to maintain the instrument in a safe condition.

1-4 INSTRUMENTS COVERED BY THE MANUAL

Attached to the rear of the instrument is a serial number plate (Figure 1-3). The first four digits of the serial number only change when there is a significant change to the instrument. The last five digits are assigned to instruments sequentially. The contents of this manual apply directly to the instrument serial number quoted on the title page (or to all instruments if stated).
For instruments with higher serial numbers, refer to the Manual Change sheets supplied with this manual. In addition to change information, the Manual Change sheets may contain information for correcting any errors in the manual.

Figure 1-3. Serial Number Plate

To keep this manual as up-to-date and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Change supplement. The supplement for this manual is identified by a print date and part number, both of which appear on title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-5 DESCRIPTION

The 8175A is a digital signal generator which can deliver parallel and serial data with programmable patterns and pattern durations. It can interact with a device under test and so provide simulation of a wide range of data paths in digital systems. Some key features of the 8175A are as follows:

Versatility	**Performance**
Parallel data patterns	24 ch. / 1 kbit ea. / 50 MBit ea.
Serial data streams	2 ch. / 8 KBit ea. / 100 MBit ea.
Virtual Memory Expansion	255 memory segments, can sequence between 2 to 1024 patterns ea.
Programmable Pattern Durations	20 ns to 9.99 s range / 10 ns res., individually programmable
Interaction with DUT	8 Bit Trigger / 8 Flags
Most logic families	TTL/CMOS variable; ECL fixed
Master/Slave operation	2 ea HP 8175A's fully synchronized
Fine Timing option	100 ps delay resolution on 4 channels
Manual and automated operation	large CRT, menu driven; waveform graphics, data editor, mass storage, hardcopy, HP-IB (*) interface

*Hewlett-Packard Interface Bus, Hewlett-Packard's implementation of IEEE Standard 488 "Standard Digital Interface for Programmable Instrumentation.

1-6 OPTIONS

These are as follows:

001 Fine Timing (100 ps resolution on four channels)

D04 Deletes standard POD set (order PODS separately)

908 Rack Flange Kit (PN 5061-9678), see Figure 1-4

910 Additional Operating/Programming/Service Manual (PN 08175-90001)

916 Additional Operating and Programming Manual (PN 08175-90006)

1-7 ACCESSORIES SUPPLIED

The 8175A is supplied complete with the following items (see Figure 1-1):

Fuses (one fitted and one supplied):

4A fuse (F 4A, 250 V) for 230V operation 2110-0055

8A fuse (F 8A, 125 V) for 115V operation 2110-0036

Power Cable (see Figure 2-2)

4 each HP 15462A TTL/CMOS PODS (for all data channel and flag outputs)

1 HP 15463A TRIGGER POD (for trigger input)

1-8 ACCESSORIES AVAILABLE

A Rack Flange kit, HP part number: 5161-9678 is available, see Figure 1-4.

In addition to the PODS supplied with the instrument, various other connector and POD accessories are available for use with it. These are as follows:

PODS
HP 15461A ECL POD (fixed ECL level, includes 1 ea HP 15429A)
HP 15462A TTL/CMOS POD (progr. High Level, includes 1 ea HP 15429A)
HP 15463A TRIGGER POD (includes lead set and 9 probe tips)

Adaptors
The following adaptors, are available: (see Figure 1-2)

Adaptors for HP-15461A and 15462A
HP 15408A plug-on grabbers with ground leads, 5 ea
HP 15409A plug-on BNC adaptors, 5 ea
HP 15410A plug-on SMB adaptors, 5ea
HP 15411A plug-on coax open-end adaptors, 5 ea
HP 15415A plug-on miniprobe, can be used with HP 10024A IC testclip, 5 ea
HP 15429A solder-in receptacles for connection to a PC board, 5x2 ea

Adaptors for HP 15463A
HP PN 15463-63201 lead set
HP PN 10230-62101 probe tip, 1 ea
(10 ea required per POD)

Miscellaneous
Cable for sychronized master/slave operation
of two ea 8175A's
HP Protective Cover (protects front cover)

The following peripherals are also available:

HP 2225A	Thinkjet graphics printer
HP 9122/D	Dual, double sided 3.5 inch flexible disc drive
HP 92192A	box of ten blank 3.5 inch double sided discs
HP 10833A/D	1 meter (3.5 ft)/0.5 meter (1.6 ft) HP-IB cable

1-9 RECOMMENDED TEST EQUIPMENT

Equipment required to maintain the 8175A is given in Table 1-1. Alternative equipment may be substituted, provided that it meets or exceeds the critical specifications listed in the table.

Table 1-1 Recommended Test Equipment

INSTRUMENT	REQUIRED CHARACTERISTCS	RECOMMENDED MODELS)	USE*
Oscilloscope	275 MHz Bandwidth	HP 1725A/1722B	P,A,T
Probe	10:1 8 pF	HP 10017A	P,A,T
DVM	0.1 V Range, >10 M	HP 3456A/3455A	P,A,T
Counter	50 MHz START/STOP TI A to B	HP 5335A/5345A	P,A,T
Signature Multimeter		HP 5005A/5004A	T
Pulse Gen.	50 MHz, Wid<10 ns	HP 8112A	P
Pulse Gen.	100 MHz	HP 8007B	P
Power Supply		HP 6205A/6237A	A,T
Time Marker	2 ns		P
Logic Probe	ECL	HP 10525E	T
Logic Probe	TTL	HP 10252T	T
Controller	HP 200 Series Basic Compatible HP-IB Interface	HP 9816/9836	P,A
ET's	2 S.A. Extender Boards	HP 08175-66522 HP 08175-66523	T
Torque Indicating Screwdriver		8730-0012, 8830-0013 8710-0902, -0901	T
Solder-in Receptacle		HP 15429A	P
Plug-on BNC adaptor		HP 15409A	P
BNC Tee		HP 1250-0781	P
BNC F to F		HP 1250-0080	P
BNC M to M		HP 1250-0216	P
BNC to Probe Adaptor		HP 1250-1454	P
BNC Connector RF		HP 1250-0018	P
Probe Tip		HP 10230-62101	P
Coax Test PT		HP 1250-1737	P

* P=Performance Test A=Adjust T=Troubleshooting

Specifications describe the instrument's warranted performance. Non-warranted values are described as 'typical'. All specifications are valid at the end of the output pod cables, at the probes of the input pod or at the respective BNC connectors of the mainframe. All specifications are valid in a 0° C to 55° C temperature range.

PARALLEL/SERIAL DATA GENERATOR

Parallel or serial operating mode can be selected.

DATA CAPACITY

	parallel	serial
NUMBER OF CHANNELS:	24	2
BITS PER CHANNEL:	1024	8192
MAX. BIT RATE PER CHANNEL:	50 Mbit/s NRZ	100 Mbit/s NRZ

TIMING

In PARALLEL mode the duration of each individual pattern is programmable. The duration is equal for all data channels. In SERIAL mode the duration of the data bits is programmable with 8 successive bits always having the same duration. The duration is equal for both channels.

PATTERN DURATION (with internal clock):

Range	Resolution
(10)[1], 20 ns — 9.99 µs	10 ns
10 µs — 999 µs	1 µs
1 ms — 99.9 ms	100 µs
0.1 s — 9.99 s	10 ms

[1]) 10 ns in serial mode with fixed timing

Accuracy: ±0.05% of progr. value ±2.5 ns (asynchronous start)
±0.5% of progr. value ±2.5 ns (synchr. start, clock cal.)
±3% of progr. value ±2.5 ns (synchr. start no clock cal.)

Jitter (max.): 0.1% of progr. value + 150 ps

PATTERN DURATION (with external clock):
Period of external clock x m

Range (m = No. of ext. clock cycles)			Resolution
(1)2[2]	to	999 /	1 period
1.000	to	99.900 /	100 periods
100.000	to	9.990.000 /	10.000 periods
10.000.000	to	999.000.000 /	1.000.000 periods

[2]) min. Pattern Duration in serial mode: 10 ns
min. Pattern Duration in parallel mode: 20 ns

CLOCK

The clock has a programmable period. It is available on line 7 of the pod for the output flags. The clock is derived from an internal system clock or from an external clock. See EXTERNAL CLOCK (BNC) and HP 15463A TRIGGER POD specifications.

Note: In serial mode an additional Serial Clock is available on pod 0, channel 1 providing a pulse at every bit.

PERIOD (with internal clock):

Range	Resolution
20 ns - 9.99 µs	10 ns
2 µs - 999 µs	1 µs

Accuracy: ±0.05% of progr. value ±2.5 ns (asynchronous start)
±0.5% of progr. value ±2.5 ns (synchr. start, clock cal.)
±3% of progr. value ±2.5 ns (synchr. start, no clock cal.)

PERIOD (with external clock):
Period of external clock x m

Range (m): 2 ... 999 [x 1]
2 ... 999 [x 100]

SKEW between channels of
ECL pods: ≤ 6 ns; typical ≤ 3 ns
TTL/CMOS pods: ≤ 7 ns; typical ≤ 3 ns

Maximum time difference between the leading or trailing data bit edges of the same memory address with Fine Timing (opt. 001) off.

OPTION 001 FINE TIMING

Option can be retroffitted at HP service office.

PARALLEL DATAGENERATOR

CHANNELS: 0,1,2 and 3 of pod 0

DELAY (range/resolution): 20 ns to 40 ns / 100 ps
vs same channel with Fine Timing 'OFF'

Accuracy: ± 5% of progr. value ± 1 ns

SERIAL DATAGENERATOR

CHANNELS: 0 and 2 of pod 0

DELAY (range/resolution): 0 ns to 20 ns / 100 ps
vs same channel progr. to 0 ns Delay

Accuracy: ±5% of progr. value ± 2 ns

HP 15462A TTL/CMOS POD
(DATA OR FLAG OUTPUT POD)

NO. OF CHANNELS: 8

MAX. BIT RATE PER CHANNEL: 50 Mbit/s NRZ

LEVELS

Following level specifications apply for pattern durations and clock periods ≥50 ns, into open.

HIGH LEVEL (range/resolution): 2.4 V - 9.9 V/100 mV

Accuracy: ±5% of programmed value ±300 mV

LOW LEVEL: ≤0.7 V

Programmed high level is valid for all pods connected. High level of an individual pod can also track an external voltage applied to this pod. Ext. level overwrites progr. level if greater. The full level ranges can be achieved provided transition times do not violate pattern duration or clock width. To avoid violation transition times have to be shorter than pattern durations or clock width. Transition times depend on load terminations as specified below.

TRANSITION TIMES

into open: ≤3 ns + high level x 1.2 ns/V

into 50 pF: ≤9 ns + high level x 1.8 ns/V

FAN-OUT PER CHANNEL (typical): 10 LS TTL

OVERSHOOT, RINGING ≤ 20% of amplitude (into open)

MAX. EXTERNAL VOLTAGE AT OUTPUTS: -3 V / + 10 V

DISABLE / ENABLE CHARACTERISTICS (TRI-STATE)

T(ON), T(OFF): ≤ 30 ns

(Time difference between occurrence of external ON or OFF signal at an output pod (TRIST) until outputs are disabled or enabled; High level of ext. signal ≤ High level at outputs)

LEAKAGE CURRENT: ≤20 μA

RESIDUAL CAPACITANCE: ≤ 40 pF

TRI-STATE INPUT at the output pod (TRIST)

IMPEDANCE (typical): 10 kOhm / 50 pF

THRESHOLD: 35% of programmed or ext. high level

Min. overdrive: 600 mV

MAX. EXTERNAL VOLTAGE AT INPUTS (TRIST, HIL): 0 V to 10 V

HP 15461A ECL POD
(DATA OR FLAG OUTPUT POD)

NO. OF CHANNELS 8

MAX. BIT RATE PER CHANNEL: 100 Mbit/s NRZ

LOW LEVEL: ≤ -1.60 V

HIGH LEVEL: ≥ -1.02 V

TRANSITION TIMES (20% - 80%; into 22 pF): ≤ 3 ns

FAN-OUT PER CHANNEL (typical): 5 ECL

OVERSHOOT, RINGING: (into 22 pF): ≤ 20% of amplitude

MAX. EXTERNAL VOLTAGE AT OUTPUTS: ±5 V

DISABLE / ENABLE CHARACTERISTICS (ECL common LOW)

T(ON) T(OFF) ≤15 ns

(Time difference between occurence of external ON or OFF signal at an output pod ($\overline{EN}$) until outputs are enabled or disabled.)

ENABLE/DISABLE INPUT ($\overline{EN}$)

IMPEDANCE (typical): 60 kOhm / 50 pF

INPUT CHARACTERISTICS: ECL compatible

MAX. EXT. VOLTAGE AT INPUT ($\overline{EN}$): 0 V to -5 V

HP 15463A TRIGGER POD
(TRIGGER WORD INPUT POD)

This pod is used for external status and/or output flag control. In synchronous mode, it reads trigger words in at positive or negative transitions of a clock applied to this pod. In asynchronous mode it accepts trigger words without clock. The applied clock may be used as an alternative to the internal clock or to the external clock via BNC.

MAX. CLOCK RATE: 25 MHz

IMPEDANCE (typical): 100 kOhm / 5 pF

THRESHOLD

(range/resolution): -9.9 V to + 9.9 V / 100 mV

Accuracy: ±2.5% ±120 mV

Min. overdrive: 250 mV or 30% of input amplitude, whichever is greater

Min. swing: 600 mV (P-P)

MAX. INPUT VOLTAGE: ±40 V

EXTERNAL INPUT (BNC)

This is a connector at the front panel which, on application of a suitable signal, can be used to START datacycling on positive, negative or both transitions or, to START and STOP cycling with selectable transitions.

IMPEDANCE: 10 kOhm / 50 pF

THRESHOLD

(range/resolution): -9.9 V to + 9.9 V / 100 mV

Accuracy: ±5% of progr. value ±250 mV

Min. swing: 600 mV (P-P)

Min. overdrive: 250 mV or 30% of input amplitude, whichever is greater

MAX. INPUT VOLTAGE: ±20 V

EXTERNAL CLOCK (BNC)

The applied clock may be used as an alternative to the internal system clock or the external clock via the input pod.

CLOCK RATE (range): DC to 100 MHz

All other specifications see EXTERNAL INPUT (BNC).

EXTERNAL REFERENCE (BNC)

The internal timing reference (crystal) can be replaced by an external signal applied to a rear panel connector (1 MHz). Accuracy must be better than 0.01%.

INPUT CHARACTERISTICS: LS TTL compatible

MAX. INPUT VOLTAGE: ±20 V

Supplementary Specifications (describe typical non-warranted performance).

DELAYS

from / to	Clock out (pod)	Data out (pod)
Ext. Clock in (pod):	150 ns	140 ns
Ext. Clock in (BNC):	110 ns	100 ns
Clock out (pod):[3])	—	10 ns

[3]) Time positive transition of clock is delayed with respect to a leading data bit transition (clock period = pattern duration).

RESPONSE TIMES (to perform action via pod)

CONT, STOP, TRISTATE ON/OFF: ≤ 170 ns [4]) + trig. word duration

START, JMP A, JMP B: ≤ 170 ns [4]) + trig. word duration + 9 clock periods [5])

OUTPUT FLAGS: ≤ 100 ns [4]) + trig. word duration

[4]) Trigger word duration: 20, 50, 100, 500 ns.
Time window during which a trigger word has to be stable.

[5]) Clock period constant with internal clock: 10 ns; otherwise use clock period of external clock

START via BNC: ≤ 100 ns + 9 clock periods

STOP via BNC: ≤ 100 ns

DATA MEMORY
(LOAD, EDIT, UPDATE, SEQUENCING)

The memory can be loaded, manually or via HP-IB. The following complete data and parameter set-up's are readily accessible: Standard setting (memory cleared), active setting, 2 previously stored settings.
These settings are retained in a battery backed-up memory for up to 3 weeks when power is off.
Various editing functions allow to set, modify, move and copy blocks of data between addresses or channels. The following fixed patterns are available:
Up-counter/down-counter, definable increments and start/stop address; in parallel mode.
PRBS; length is 2 (exp n), n = 3 to 13 in serial mode.
Data codes include BIN, OCT, HEX, DEC

Data can be edited while the instrument is running without affecting the data currently being output. This is also possible via HP-IB. The changes become active after an UPDATE command with status STOP.

Parameters waiting for an UPDATE are: Data patterns and timings, cycling definitions and input trigger/output flag assignments.

1-255 segments can be sequenced; segments are user definable in the 0000 to 1023 address range; segments may overlap.
START, CONTINOUS START, JMP A AND JMP B (BRANCHING) refer to user-assigned segment names.

HP-IB CAPABILITY

The following HP-IB interface functions are implemented:
SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0.

HP-IB PROGRAMMING TIMES (typical):
Times are measured by using the HP 9836A as an HP-IB controller. Reloading refers to programming a setting which once was set-up in the HP 8175A and transfered to the controller.

COMPLETE RELOAD TIME: 1.8 s

DATA/TIMING/PROGRAM RELOAD TIME: 800 ms
(Software and hardware update)

DATA/TIMING/PROGRAM RELOAD TIME: 180 ms
(Hardware update only)

FLEXIBLE DISC DRIVE ACCESS

Storage of set-ups and data on a flexible disc. Up to 256 settings can be managed depending on disc space.

HARD COPY

Any display can be copied to a graphics printer.

PARALLEL OPERATION

Two HP 8175A's can be operated in master-slave configuration, thus doubling the channel count to 48 channels. Synchronization is provided by the HP 15430A cable.

GENERAL

ENVIRONMENTAL

STORAGE TEMPERATURE:	- 40 C to + 65 C
OPERATING TEMPERATURE:	0 C to + 55 C
HUMIDITY (0 C to + 40 C):	95% R.H.

CALIBRATION

Within a recalibration period of 1 year the instrument is warranted to meet all specifications described after a warm-up time of 30 min. The pattern duration accuracy and the clock accuracy can be enhanced by the inbuilt autocalibration feature. To stay within that higher accuracy, autocalibration is recommended to be repeated every 0.5 hours and also as soon as environmental conditions have changed.

POWER: 115/230 V ac; - 22% + 10%
48-66 Hz; 630 VA max.

WEIGHT: Net 17,5 kg (38.8 lb)
Shipping 24,0 kg (53 lb)

DIMENSIONS
MAINFRAME: 190 mm high, 426 mm wide, 584 mm deep (7.5 x 16.75 x 23 in)

PODS:

CABLE LENGTH	15461A	15462A	15463A
mainframe to pod:	1.6 m	1.6 m	1.6 m
pod to end of cable:	0.2 m	0.2 m	0.25 m

CHAPTER 2
INSTALLATION

WARNING

The instrument weighs 17.5 kg (38.8 lbs). Care must be exercised when lifting to avoid personal injury.

2-1 INTRODUCTION

This section provides installation instructions for the 8175A and its accessories. It also includes information about initial inspection and damage claims, preparation for use, packaging, storage and shipment.

2-2 INITIAL INSPECTION

Inspect the shipping container for damage. If the container or cushioning is damaged, it should be kept until the contents of the shipment have been checked for completeness, and the instrument has been verified mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1 plus any accessories that were ordered with the instrument. Procedures for checking the electrical operation are given in Chapter 4. If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument does not pass the operator's checks, notify the nearest Hewlett Packard Office. Keep the shipping materials for carriers inspection. The HP office will arrange for repair or replacement without waiting for settlement.

2-3 PREPARATION FOR USE

WARNING

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, connectors etc).

2-4 Power Requirements

The instrument requires a power source of 115/230 V rms (+10% -22%) at a frequency of 48 - 66 Hz single phase. The maximum power consumption is 630 VA.

2-5 Line Voltage Selection

CAUTION

BEFORE SWITCHING ON ANY OF THE INSTRUMENTS, make sure that they are set to the local line voltage.

Figure 2-1 provides information for line voltage and fuse selection:

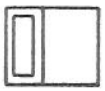
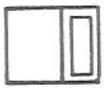
VOLTAGE:	230 V	115V	230V	115V
FUSE:	4 A	8 A		

Figure 2-1 Switch settings for Line Voltages

2-6 Power Cable

In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate a.c. power receptacle, this cable grounds the instrument cabinet. The type of power cable shipped with each instrument depends upon the country of destination. Refer to Figure 2-2 for the part number of the power cable available.

WARNING

To avoid the possibility of injury or death, the following precautions must be followed before the instrument is switched on.

a) If this instrument is to be energised via an autotransformer for voltage reduction, ensure that the common terminal is connected to the grounded pole of the power source.

b) The power cable plug shall only be inserted into a socket outlet provided with a protective ground contact. **The protective action must not be negated by the use of an extension cord without a protective conductor.**

c) Before switching on the instrument, the protective ground terminal of the instrument must be connected to the protective conductor of the power cable. This is verified by checking that the resistance between the instrument chassis and the frontpanel and the ground pin of the power cable is zero Ohms.

The following work should be done by a qualified electrician and all local electrical codes must be strictly observed.
If the plug on the cable does not fit the power outlet, or the cable is to be attached to a terminal block, cut the cable at the plug end and re-wire it. The colour coding used in the cable will depend on the cable supplied (see Figure 2-2).

If a new plug is to be connected, it should meet local safety requirements and include the following features:

Adequate load-carrying capacity (see table of specifications in Section 1).

Ground connection.

Cable clamp.

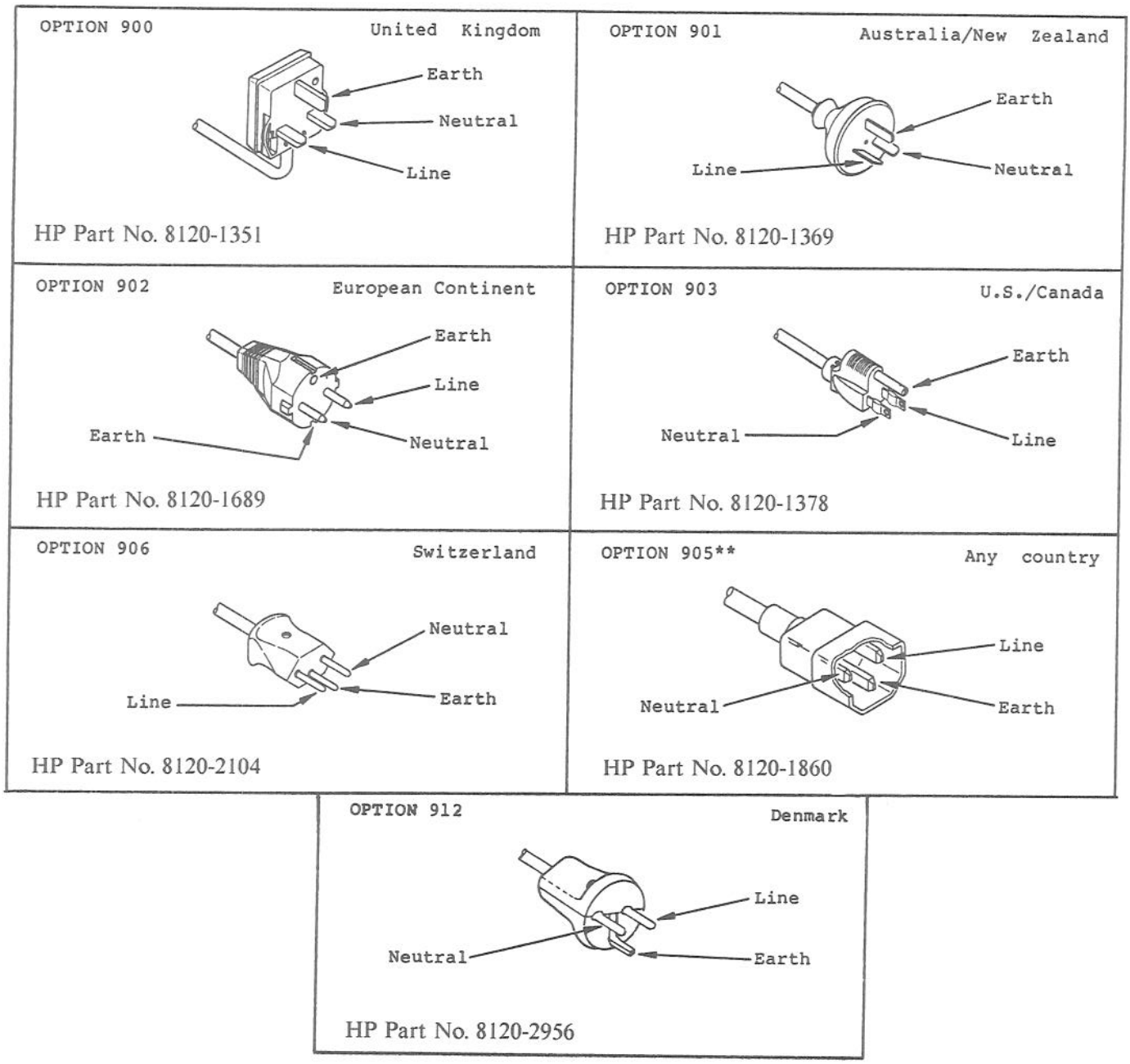


Figure 2-2. Mains Plug Contact Configuration for HP Option Numbers

* In the U.S.A. a 230-volt mains might not include a neutral conductor. In this case it is recommended that the blue conductor of the standard power cord be connected to the terminal normally used for neutral (line 1).

** Plug option 905 is frequently used for interconnecting system components and peripherals.

2-7 HP-IB Connector

The rear panel HP-IB connector (Fig 2-3), is compatible with the connector on Cable Assemblies 10833A, B, C and D. If a cable is to be locally manufactured, use connector male, HP part number 1251-0293.

2-8 HP-IB Logic Levels

The 8175A HP-IB lines use standard TTL logic, the levels being as follows:

True = Low = digital ground or 0V dc to 0.4V dc,

False = High = open or 2.5V dc to 5V dc.

All HP-IB lines have LOW assertion states. High states are held at 3.0V d.c. by pull-ups within the instrument. When a line functions as an input, approximately 3.2mA of current is required to pull it low through a closure to digital ground. When a line functions as an output, it will sink up to 48mA in the low state and approximately 0.6mA in the high state.

CAUTION

NOTE: Isolation, the HP-IB line screens are not isolated from ground.

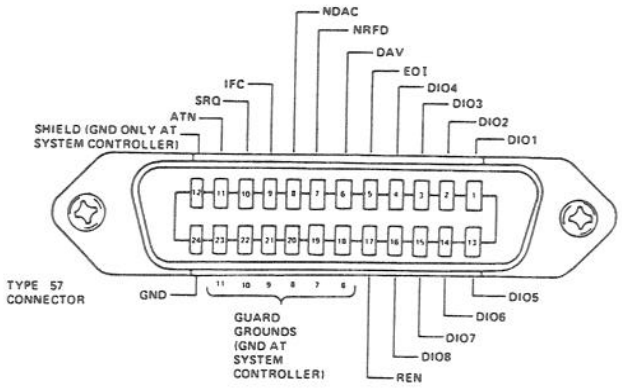


Figure 2-3. HB-IB Connector

2-9 Operating Environment

The operating temperature limits are 0 degrees C to + 55 degrees C. The specifications also apply over this range.

2-10 RACK MOUNTING

Figure 1-4 and paragraph 1-8 details the Rack Flange kit.

2-11 CLAIMS FOR DAMAGE

If physical damage is evident or if the instrument does not meet specification when received, notify the carrier and the nearest Hewlett-Packard Sales/ Service Office. The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

2-12 Storage and Shipment

The instrument can be stored or shipped at temperatures between minus 40 deg C and plus 65 deg C. The instrument should be protected from temperature extremes which may cause condensation within it.

If the instrument is to be shipped to a Hewlett-Packard Sales/Service Office, attach a tag showing owner, return address, model number and full serial number and the type of service required. The original shipping carton and packing material may be re-usable. However the Hewlett-Packard Sales/Service Office will also provide information and recommendations on materials to be used if the original packing is no longer available or re-usable. General instructions for re-packing are as follows:

1. Wrap instrument in heavy paper or plastic.

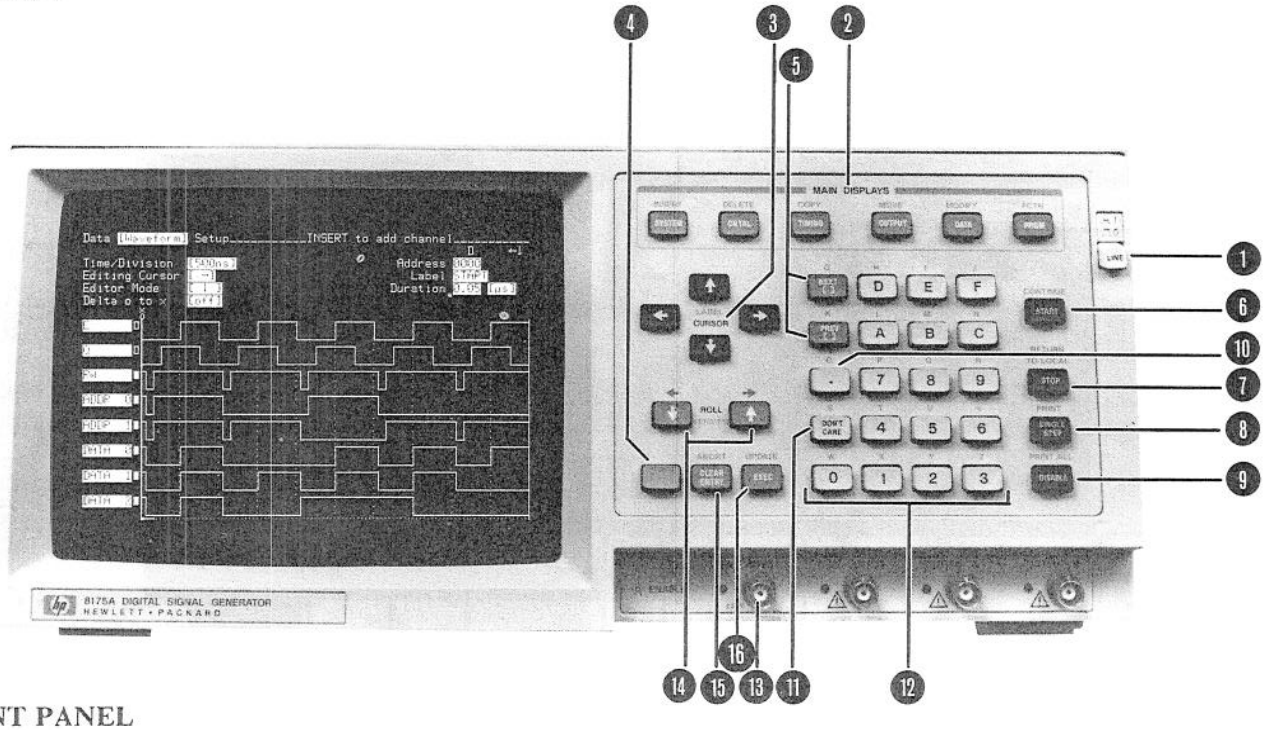
2. Use strong shipping container. A double wall carton made of 350-pound test material is adequate.

3. Use enough shock-absorbing material (3 to 4 inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside container. Protect control panel with cardboard.

4. Seal shipping container securely.

5. Mark shipping container **FRAGILE** to encourage careful handling.

6. In any correspondence, refer to instrument by model number and serial number.



FRONT PANEL

(1) Line power on/off push button swich.

(2) **MAIN DISPLAYS.** Six keys which enable selection of the 8175A "Pages". Each Page comprise one or more sub-pages or "**menus**". **SYSTEM** comprises three menus. These enable the instrument configuration to be set, status of peripherals to be input, and control of internal and external storage operations. **CNTRL** comprises four menus for setting: clock, input trigger, flag conditions and simulation of trigger functions. **TIMING** enables (in instruments with the Fine Timing Option fitted): delay to be applied to two or four channels (depends on selected configuration). **OUTPUT** enables high level of TTL/CMOS PODS to be set, and provides enable/disable control for all output PODS. **DATA** comprises three menus which enable data to be set up and displayed. The data can be set up and/or displayed as patterns or waveforms (timing diagrams). **PRGM** comprises two menus which enable pattern sequencing to be defined.

All six **MAIN DISPLAYS** keys have secondary functions. They are the "**EDIT**" functions as detailed in blue above the keys. They are accessed via the (blue) SHIFT KEY. Refer to section 3E in this manual for detailed information.

(3) **CURSOR.** These keys enable the flashing cursor to be moved from field to field in the menus. The (blue) SHIFT and CURSOR or keys, allow fast movement of the cursor into the next inverse video field. SHIFT + CURSOR or enables interchange of LABELS (DATA Page menus).

(4) Blue key. This key activates the blue SHIFT function assigned to each keyboard key. A momentary press activates the SHIFT function for the next keystroke. The SHIFT function will continue as long as the blue key is pressed.

(5) **NEXT []** and **PREV []** keys. With these, any setting/value/condition contained within brackets **[]**, can be changed.

(6) **START**, starts data cycling from the program segment defined on the **PRGM** Page menus.
CONTINUE, continues data cycling (after a STOP) from the STOP address (see item 7)

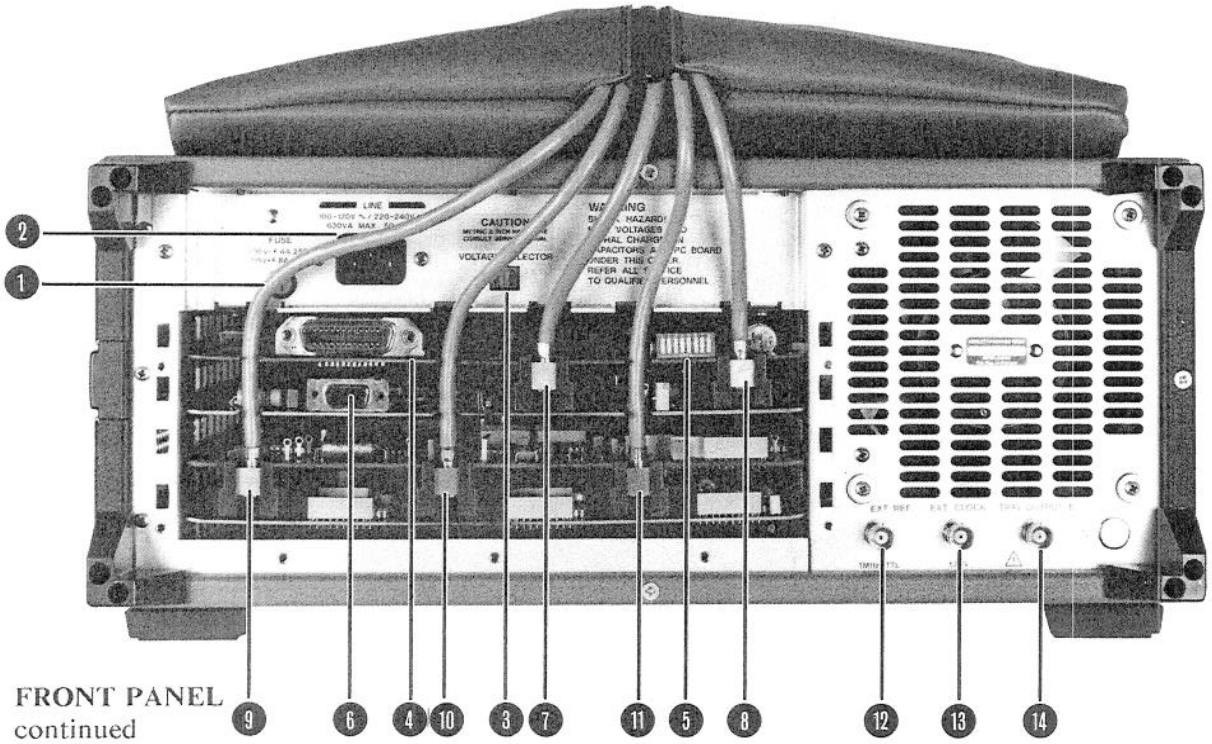
(7) **STOP**, stops data cycling at the address currently being output. This pattern will then be held at the outputs. **RETURN TO LOCAL**, returns the 8175A from HP-IB control to local control.

(8) **SINGLE STEP**, lets you step one address (or program segment) at a time, through a a program. **PRINT**, enables the current display content to be printed on an HP-IB printer.

(9) **DISABLE**, disables all output. **PRINT ALL**, enables the a whole page e.g., the whole pattern setup of the Data Page to be printed.

(10) . (decimal point) for normal numeric entry purposes and, (detailed on CNTRL Page - **[Input]** Trig. Word Ass. menu) special function.

Figure 3-1. 8175A Controls, Connectors and Display



FRONT PANEL
continued

(11) **DON'T CARE.** In a text field enters a space in lieu of a character or, (CNTRL Page **[Input]** Trig. Word Ass. pattern setting menu) an "X" in lieu of a 1 or 0.

(12) Alphanumeric keyboard for data and text entry.

(13) BNC Connector for external Start/Stop control

(14) **ROLL** keys, enable data, waveform and module displays to be moved: left, right, up or down depending on the display. They also provide a vernier increment/decrement function for certain numeric settings. Arrows in the upper right hand corner of the display indicate which ROLL keys are currently operational.

(15) **CLEAR ENTRY**, sets a default (Standard Setting) value in the field. **ABORT** deletes functions without executing them.

(16) **EXEC** executes functions and clock calibration. **UPDATE** enables new settings/data/conditons etc. to be deliverd to the outputs.

REAR PANEL CONNECTORS (Note: rear cover plate removed in this view)

(1) Fuse 4A/230V or 8A/115V

(2) Power line voltage receptacle.

(3) Line voltage selector sliding switch, to be set to local line voltage.

(4) HP-IB interface connector.

(5) Switch for setting HP-IB address and mode.

(6) Connector for interfacing a second 8175A (for master-slave operation).

(7) Connector for Trigger POD.

(8) Connector for Flag output POD.

(9) Connector for Output POD 0.

(10) Connector for Output POD 1.

(11) Connector for Output POD 2.

(12) BNC connector for an external reference clock signal (1 MHz TTL).

(13) BNC connector for inputting an external System clock signal.

(14) This connector not used in current version.

CHAPTER 3
OPERATING

3A
Introduction

The purpose of Chapter 3 is to familiarise you with operation of the 8175A Digital Signal Generator. It includes a "Getting Started" section, this will enable you to start using the 8175A as soon as possible. Operating information for the Fine Timing Option is also included (in section 3D-3).

Briefly, the content of Chapter 3 is as follows: It begins with an overview of the operating information. This is followed by an explanation of front and rear panel controls, operator checks etc. Then, "hands on" operating information, under the title: **Getting Started** is described. This covers the basic requirements for setting up (and outputting) data patterns. Graphical display techniques (how to set up timing diagrams etc.) are covered by a separate section. However, in both cases, worked examples are used to illustrate the various requirements. It is recommended that you work through the two sections in the logical order.

OPERATING INFORMATION OVERVIEW

The operating information is presented, in sub-sections under the following headings.

3A. Introduction

3B. Getting Started (includes Setting up Data Patterns)

3C. How to set up Timing Diagrams

3D. The Menu Map and How to use the Menus

3E. The Edit Capabilities and How to use Them

3F. Operating two 8175A's in Parallel - Points to Note

3G. Programming (HP-IB Controlled Operation) Information

The following appendices are included at the end of Section 3:

Appendix A-1. Error and Status Messages - Instrument use Related
Appendix A-2. Error and Status Messages - Power-up Self Test Related
Appendix B. Using a Printer
Appendix C. Using the Disc Memory Accessory

In sections 3B and 3C, **BOLD** text is used in the examples etc. to highlight certain words. These include specific front panel keys and display fields within menus etc. Also,the symbols: ↑ ↓ → ← , are used to identify which **CURSOR** and/or **ROLL** keys to use.

If you have operated one of the HP 1630(X) Logic Analyzers, you will already know the basic operating concept of the 8175A. Whatever your previous knowledge, once you have learned the basics (as covered by 3B), you can refer to the other sub-sections as necessary for specific information. They will enable you to quickly locate any particular topic.

A separate section (3G) is included which deals with operating the 8175A on the HP-IB. This includes essential programming information and several worked examples. etc.

3A-1
SPECIAL OPERATING POINTS

DO NOT apply power to an 8175A until you have read (and, as necessary, confirmed) the following points.

CAUTION

a) Read safety summary at front of this manual

b) To avoid instrument damage, ensure that the voltage selector switch is set correctly for the local line voltage. If it is necessary to change the setting at any time, the instrument must be switched off and the power cable disconnected.

/!\ **Maximum allowable voltages at inputs and outputs:**

Refer to the Specifications (Table 1-2) for the maximum allowable external voltages which can be applied to POD inputs and ouputs.

EXT REF: Maximum allowable input voltage: +/- 20 V

The BNC connectors marked with a /!\ symbol are not applicable to this model 8175A. (They are not internally connected.)

3A-2
CONTROLS CONNECTORS AND DISPLAY

A brief explanation of the function of the 8175A controls, connectors and display is given in Figure 3-1. Take time to read through it before continuing with the following paragraphs. Refer to it later as necessary.

NOTE: PODS - Identification and Connection/Disconnection

If you need to connect/disconnect or change any of the PODs, take special note of the rear view of the 8175A. The connection points of all PODs are clearly labelled on the removeable cover plate. Note The two types of data and/or flag output PODs (TTL/CMOS and ECL) and the Trigger POD have identifying legends on their bodies. Self adhesive labels are supplied with the output PODs, these enable you to label them as appropriate.

Connection/disconnection of PODs:
First, the 8175A must be switched **off**.
Unscrew the securing screws identified on the cover plate and remove the plate.
Carefully unplug/plug in (as appropriate) the required POD connectors.
Install the cover plate back in position, taking care to route the POD cables through their corresponding grommets in the plate. Secure the plate firmly with its screws.

3A-3
OPERATING CONCEPT A BRIEF OVERVIEW

The 8175A operates on a "cursor driven" concept. This means that to change any setting, the cursor must first be moved into the field where the current value is displayed. The new value or condition is then input via the keyboard.

Briefly, to change any setting in the 8175A, the procedure is as follows:
First, access the appropriate page or MAIN DISPLAY. Each of these includes one or more sub-pages or menus. Now, select the required menu (each one covers a selection of settings). Once you have selected the menu, the particular setting can be accessed and its value changed via cursor movement etc. as mentioned in the opening paragraph.

A brief explanation of how the MAIN DISPLAYS, menus and their settings interact follows. Note that all the Main Displays and their menus are detailed on the Menu Map in section 3D.

MAIN DISPLAYS
Six MAIN DISPLAYS or **Pages** are available, they are accessed via the correspondingly labelled **MAIN DISPLAYS** keys and are as follows:

SYSTEM CNTRL TIMING OUTPUT DATA PRGM

MENUS
The menus within a page are accessed via the **NEXT[]/PREV[]** keys. The currently displayed menu of any page is always identified by its name in inverse video in the top left hand corner of the screen.

MENU SELECTION
A new menu is called up by positioning the cursor in the current menu label e.g., [**Configuration**], and using the **NEXT[]/PREV[]** keys to select a new one.

SETTINGS FIELDS AND THEIR CONTENTS
A selection of setting fields are available on each menu. The current value or condition of each setting is shown in its corresponding field. The fields (inverse video) are positioned either, directly adjacent to, or below the corresponding setting titles. Values/condition of the settings are displayed on the screen in inverse video.

VALUE/CONDITION CHANGING
To change a setting value or condition, the cursor must first be moved into the corresponding field. Then, either an alphanumeric or **NEXT[]/PREV[]** key as appropriate is used to make the change. Which type of key applies is illustrated by the following examples:

Settings within brackets, e.g., **[Configuration]**, **[enabled]**, are changed via the **NEXT[]/PREV[]** keys.

Settings not within brackets e.g., Address **1000**, are changed via the alphanumeric keys. (Some slight exceptions to this second rule concerning the DATA Page [Waveform] menu, are explained later.)

For the DATA and PRGRM pages, a powerful set of editing capabilities is provided. They enable data to be inserted, deleted, modified etc. Full details of the capabilties and how to use them are given in section 3E.

3B
Getting Started

INTRODUCTION

This section explain the basics of how to start using the 8175A. It begins with a brief explanation of power up sequence and initial configuration. It then goes on to explain, with the aid of worked examples, how to set up data patterns. (Instructions on using the graphical setting up and display capabilities of the 8175A, are covered in section 3C.) In both cases, worked examples based on the Standard Settings, are used to explain the various steps. It is recommended that after completing those in 3B, you go on to 3C.

For all the examples, the steps to be taken to output the resulting data patterns are also included.

The contents of section 3B are listed under the following headings:

In order to start using the 8175A, you do not need to know how to use all the menus etc. It is sufficient at first, just to understand the basic principle of how to set up data in pattern form. You can then go on to learn about the graphical capabilities and how to use them.

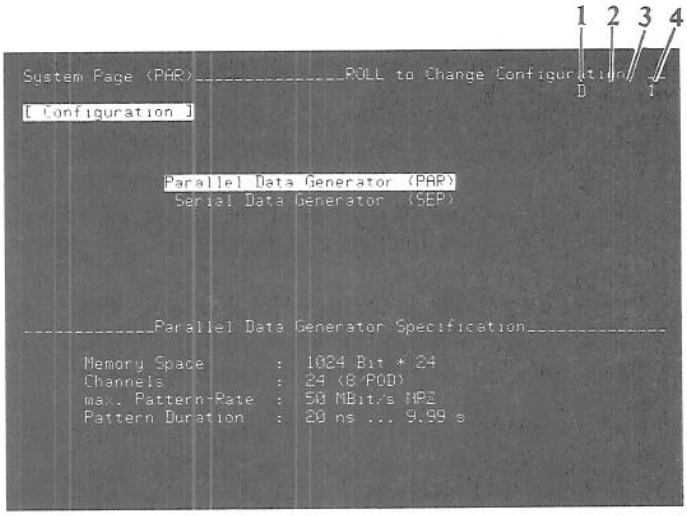
3B-1
POWER-UP AND INITIAL CONDITIONS

Press the **LINE** switch. Do not press any other front panel keys. You will hear the cooling fans start up and the LED's adjacent to the front panel BNC connectors will illuminate. During power-up, an automatic self test routine is performed. The message: **"Self Test Running"** will appear on the screen and remain until the test is completed. If any failure is detected, it will result in an appropriate error message being displayed on the screen. These messages (together with the procedure to follow) are listed in Appendix A-2.

On completion of the power-up sequence, the System Page **[Configuration]** menu will be displayed. This is illustrated in Figure 3B-1. It will include the message **"Power-Up Complete"** on the top line.

Initial Configuration

The configuration at power up is always the same as when last switched off. The position of the bright bar (inverse video) in the center of the display area indicates the current configuration. It is also shown in (), adjacent to every page name, at the top left hand side of the display. The 8175A automatically recalls the complete parameter and data set, which was current at switch off, whenever power is re-enabled. The outputs are automatically disabled. This is indicated by the **"D"** in the top right hand corner of the display.



STATUS INDICATORS Explanation:

1. "**D**" here indicates that the outputs are disabled (explained in 3B-5, point 7).
2. A "**U**" here indicates that an update is necesary (explained in 3B-5, point 6).
3. A ▨ in this location indicates that the 8175A is active (e.g. after START, explained in 3B-5, point 8).
4. If arrow(s) displayed here, it means that **ROLL** (or VERNIER if appropriate) action, via the keys indicated is possible.

Figure 3B-1. Power up Display Details and Explanation of Status Indicators

Note the cursor, this is the flashing block which at present is positioned within the "**[Configuration]**" field. The position of the cursor always identifies a variable. Configuration can be changed by pressing one of the front panel **ROLL** ↑ or ↓ keys. (It can also be changed via the **CURSOR** ↑ or ↓ keys).

3B-2
FIRST STEPS

General Points

When learning how to operate the 8175A, it is best to begin with a set of known parameter values and operating conditions etc. The **Standard Settings** provide the ideal starting values. Therefore you should start by recalling them. The actual values/conditions etc. can be determined by referring to section 3D. It shows all menus as in the "Recall Standard Settings" condition.

How to Recall the Standard Settings

The Standard Settings are accessed via the System Page. To recall them, procede as follows, (If the **SYSTEM PAGE** is currently displayed, start at step 2:

1. Press the **SYSTEM** key. This selects the System Page.
2. Press the **NEXT[]** key one or more times, until the **[Storage]** menu is displayed.
3. Press the **CURSOR** ↓ key once. This positions the cursor in the storage function field.
4. Press the **NEXT[]** key until: **[recall]** Standard Settings is displayed in the field.
5. Press the **EXEC** key, this activates the function. The message: Transfer in Process will be displayed very briefly. When this message is replaced by the original one, ("Press **EXEC** to Activate Function"), you can continue.

With the Standard Settings recalled, you now have a reference point from which to start practising using the keyboard controls. You can recall them at any time to put the 8175A back to a "known condition".

NOTE: When the Standard Settings are recalled, **all data is set to 0.**

3B-3
CONFIGURATION (PARALLEL/SERIAL) AND MENU SELECTION

The differences between Parallel and Serial Configuration are highlighted on the **SYSTEM** page **[Configuration]** menu. Specific menu differences can be seen in sections 3D-3 and 3D-5, these detail the **TIMING** and **DATA** Page menus respectively. For each Configuration setting, select and examine the menus available via each **MAIN DISPLAY** (Page) key. Within each menu, access some settings and practise changing a few of them.

If you make a mistake which results in an error message being displayed, don't worry. If you cannot understand the meaning refer to appendix A-1 for an explanation. In any case, try to reset a correct or acceptable value. If you are unable to do this, recall the Standard Settings as previously described (steps 1-5). Then try again to change the value.

NOTE:The cursor control and **NEXT[]/PREV[]** keys, can either be pressed several times or, held down until the new position or value is reached.

3B-4
SETTING UP DATA PATTERNS

Introduction

This sub-section describes how to actually set up data patterns. You should note that, irrespective of any other settings to be made, you cannot output any data before you have input some! (Recall of Standard Settings sets all data to 0). The examples, included here therefore concentrate on showing you how to do this. Although at first glance the examples may appear rather long, it is only due to the fact that each individual step is described. They are in fact simple to set up.

NOTE 1: **Outputting the example patterns**
The examples are designed to explain how to set up the particular pattern etc. in the 8175A. If you also want to output the patterns, the steps to be taken are described at the end of 3B-5.

NOTE 2: **Programming the examples**
The same examples are also included in the Programming Information section. (They are identified by their corresponding numbers.) This gives you the opportunity to see the benefits of both types of operation.

EXAMPLES: INTRODUCTION
One of the first things you need to learn is how to set up (input) data. This, together with how to allocate labels, identify active Pods etc. is explained in Example P-1. Often,when using the 8175A, it will not be necessary to display all 24 channels of data. By displaying only those required for the particular test setup, data inputting can usually be made easier and quicker. Also, it makes it easier to "read" the display if only those channels required are displayed. Example P-2 includes an explanation of how to display (or Format) specific channels. It goes on to cover data inputting with the new format and, how to change a function value and its units. It is recommended that you try both examples. By doing this, you will see the advantages of re-formatting the data display (part of Example P-2).

Example P-1: Setting up Data - Basic Principles:
The simplest method of setting data is to call up the **Data [Pattern]** Setup menu, then, for each bit to be set, position the cursor at the appropriate Address/Pod/Channel location and set a 0 or 1 as required.
This example explains how to set up data at several addresses of a particular channel, for this case, channel 0 of Pod 0. The resulting pattern, if viewed on an oscilloscope, will appear as a "square wave" with pulse duration 0.02 us. (Standard Setting value). It will be set up between addresses 0000 and 0007. The required pattern is shown in Figure 3B-2.

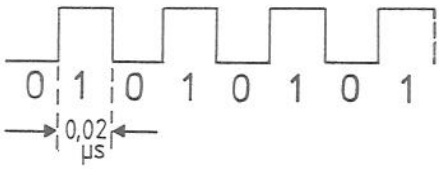


Figure 3B-2 Pattern Details of Example P-1

Procedure (Standard Settings previously recalled):

1. Press the **DATA** key. This accesses the Data Specification **[Format]** menu.

2. Press the **NEXT[]** key once. The Data **[Pattern]** Setup menu will be displayed. This is the menu where data for pattern setups is input.

3. Press the **ROLL ↑** arrow key to roll Address 0001 into the central inverse video field.

4. Press and hold the **CURSOR ↓** arrow key to move the cursor into the Address 0001 field.

NOTE: Alternative Method of Accessing an Address:

You can also access any address as follows:
Press (and hold) the **CURSOR ↓** key until the cursor enters the (inverse video) address field, then either:
a) Input the complete required new address via the numeric keys.
or:
b) Move the cursor (via the **CURSOR →** key) to each number to be changed and input the required new value.

To continue with the example:

5. Press and hold the **CURSOR →** key until the cursor comes to rest in the first data channel. This is channel 0 of Pod 0 at extreme right hand side of display.

6. Press numeric key 1 to set a 1. The display will then auto-roll to Address 0002. The cursor will move left into channel 23 (channel 7 of Pod 2).
(Note that, a "U" will appear in the top right hand corner of the display alongside the "D". Refer to the note below.)

7. Press and hold down the **CURSOR →** key until the cursor lies in channel 0 again. Leave this data bit as a 0.

8. Press the ROLL ↑ key once. The cursor will now lie in channel 0 of Address 0003.

Repeat steps 6 to 8 four times. You will then have set an 8 bit pattern (01010101) in Pod 0 channel 0, reading from Address 0000 down to 0007 (the addresses will increment sequentially).

The Data **[Pattern]** Setup menu details should now be as shown in Figure 3B-3. Note that the display has been rolled up one address for clarity in Figure 3B-3.

NOTE: "U" significance and how to output the Pattern:
For an explanation of "U" (Update required) and how to output the pattern, refer to 3B-5. It is at the end of section 3B.

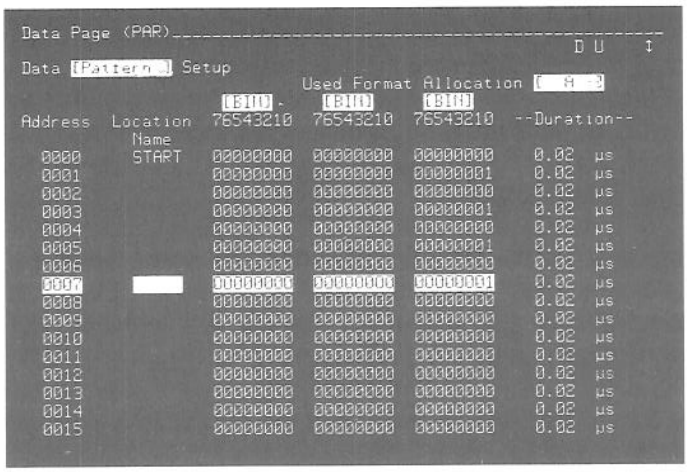


Figure 3B-3 Data [Pattern] Setup Menu Details of Example P-1

Example P-2: Data Formatting, Label creation and Value Changing

This example shows the basics of data formatting and how to change and create labels. This means how specific channels can be selected for display. A slightly different pattern from that for Example (P-1) will be used and also, a different duration (1 us). A new Format, labelled B and including just channel 1 of Pod 0 is to be created. The pattern as shown in Figure 3B-4, is to be set in this channel. The example also explains how to change a numeric setting (Timing) value and its units. One of the uses of the Edit function "INSERT" is explained.

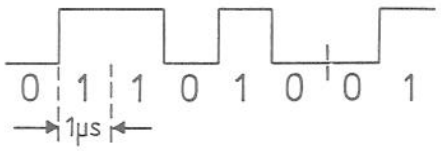


Figure 3B-4 Pattern Details for Example P-2

Procedure:
(If you have just completed Example 1, then procede from instruction 1 below. Otherwise, recall the Standard Settings as described at the beginning of 3B-2, press the **DATA** key then procede from step 2.)

1. Press the **DATA** key (to return the cursor to the menu field) then press the **NEXT[]** key until the Format Allocation menu is displayed.

2. Press the **CURSOR ↓** key to place the cursor in the Period field.

3. Change the value to 1 by pressing numeric 1 key.

The same principle is used for all numeric value changes. To change a units setting, e.g., us, do the following:

Position the cursor in the units field and press **NEXT[]** one time. This changes the µs to ms.

Since we want a 1 µs duration for this example, if you have changed the units to ms, change them back to µs. Do this by pressing **PREV[]** one time.

As already mentioned, data is to be set in channel 1 of Pod 0. Note, in the central part of the display area, details of the POD/channel identifiers. (POD0 1 and 2 and channels: 7.....0)

Data Format Label (A), shows all 24 data channels active*. Use of this label will result in all 24 channels being displayed. This is unnecessary and, in fact, data inputting is easier if only the required one is displayed.

***NOTE: active/inactive channels**
(A "." indicates channel inactive, i.e. not displayed, an asterix (*) means active or displayed.)

It is obviously possible to change the format corresponding to Label A. However, for this example leave it as it is and set up a new one. It is easy to do and will give you some more experience in operating the 8175A.

NOTE: Data Format - its Significance
The actual data format chosen has no effect on the data at the 8175A outputs (pod outputs). Data format relates only to which POD/channel combination will be displayed on,the screen.

To continue with setting up a new data format, procede as follows:

4. Press the **CURSOR** ↓ key again to place the cursor in the Data Format Label field.

Creating a New Label:

5. Press the blue **SHIFT** key then the **SYSTEM** key to activate its shift function: **INSERT**. You have now created a new label field. It has no label (name) and all channels are shown as inactive. To allocate a name and activate a Pod, do the following:

Naming a Label:

6. To name the label: "B", press the **B** key. Note that, due to the five positions within the field, up to five different **B** labels are possible e.g., B..., ..B.. etc).

7. Press the **CURSOR** → key and hold down until the cursor lies in channel 1 of POD 0. Press the **NEXT[]** key to change the "." to an "*". The channel is now active.

Figure 3B-5 shows the Data **[Format]** Allocation menu details after Label B has been created.

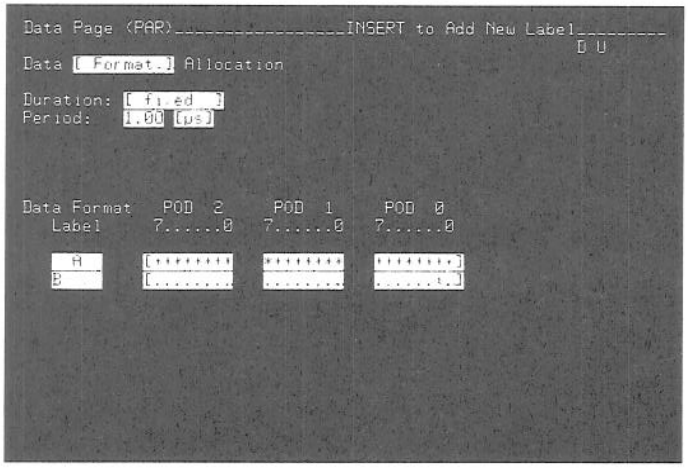


Figure 3B-5 Data [Format] Allocation Menu with Label B

Inputting the Data:

8. Press the **DATA** key once. This will cause the cursor to move back to the Format field.

9. Press the **NEXT[]** key once. The Data Page **[Pattern]** Setup menu will be displayed. Data patterns are input and displayed on this menu.

You will notice that the current display shows all 24 channels. This is because Data Format A is still allocated as the "Used Data Format". Change it to B as follows:

10. Press the **CURSOR ↓** once. This places the cursor in the Used Data Format field.

11. Press **NEXT[]** once to change the setting to **B**. Note how, at the top of the data column, the number 1 is displayed. This identifies the channel as number 1 of Pod 0.

Steps (12) onwards illustrate how, by displaying only the channel required, data can now be set up very quickly.

12. Press and hold the **ROLL ↑** or **↓** key as appropriate, until Address 0001 appears in inverse video.

13. Press and hold the **CURSOR ↓** key to move the cursor into Address 0001 Address field.

NOTE: Alternative Method of Accessing an Address:

You can also access any address as follows:
Press (and hold) the **CURSOR ↓** key until the cursor enters the (inverse video) address field, then either:
a) Input the complete required new address via the numeric keys.
or:
b) Move the cursor (via the **CURSOR →** key) to each number to be changed and input the required new value.

To continue with the example:

14. Press and hold the **CURSOR →** key to move the cursor into the data channel.

15. Press numeric key 1 to set a 1. The display will then auto-roll to Address 0002.

16. Press the numeric 1 key, the display will then auto-roll to Address 0003.

Continue to input the remainder of the data until you have input: 01101001 between Address 0000 to 0007.

Figure 3B-6 shows how the Data [Pattern] Setup menu should appear on completion of Example P-2.

NOTE: If you wish to output this example, refer to 3B-5. It is at the end of section 3B.

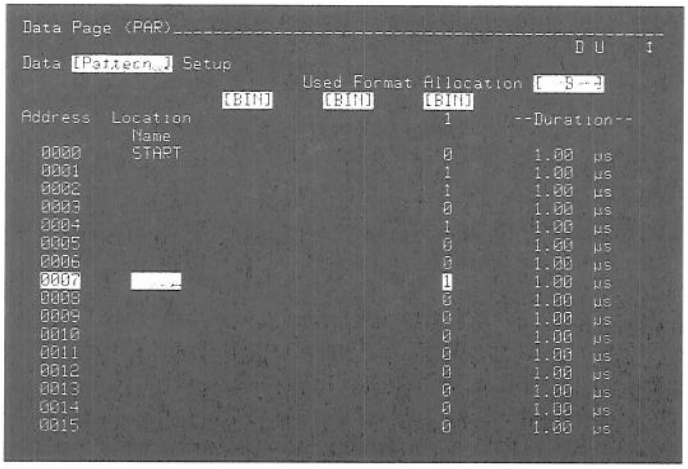


Figure 3B-6 Data [Pattern] Allocation Menu Details for Example P-2.

When you have completed examples P-1 and P-2, you have used most of the Pages, menus and settings associated with pattern setting and display. It is now recommended to proceed to section 3C. It covers the graphical capabilities. (The first example in 3C follow straight on from example P-2 in this section.)

3B-5
HOW TO OUTPUT DATA (DATA CYCLING)

NOTE: If at present, you just want to know how to output the data patterns of examples P-1, 2 and G-1, 2 and 3, refer directly to the end of this sub-section. You can read the following paragraphs later.

To be able to output any data pattern, certain preconditions have to be met. Some data must first be set and in addition, certain specific conditions and controls have to be set. The minimum preconditions to be met, and the appropriate Pages/menus to access, for outputting data are as follows. The Standard Settings value/condition of each of the settings concerned is also given.

Preconditions for Data to be Output

1. **Data:** **(DATA PAGE - [Pattern] or [Waveform] Setup menus)**
   A data pattern or stream must exist. Therefore, some specific data always has to be input to the Data page. (Even though just 0's or 1's alone are in fact data, they cannot be considered to be a pattern!).
   Standard Settings data is all zero.

2. **Mode:** **(CNTRL Page - [Clock] menu)**
   A cycling mode needs to be assigned. For continuous cycling, [Auto Cycle] should be set.
   Standard Settings mode is [Single Cycle], this will only enable one complete cycle of data outputting after a START command.

3. **Clock:** **(CONTRL Page - [Clock] menu)**
   All data cycling requires the presence of internal or external clock pulses. A clock can also be generated manually by pressing the **SINGLE STEP** KEY.
   Standard Settings value for System Clock is [internal].

4. **Duration:** **(DATA Page - [Format], [Pattern] or [Waveform] Setup menus)**
Depending on the type of output pattern required, either fixed or variable duration must be selected. Then the required value can be input.
Standard Settings for duration are **[fixed]** and **0.02 us**.

5. **Sequencing:** **(PRGM Page - [Module] Assignment menu)**
To enable sequencing to be defined, a Program Module has to be assigned. Also, Trigger Events might need to be assigned. A Program Module must have one or more Segments, each with start and finish addresses and a "Repetition Times" value. The Trigger Event Assignments will be selected from the Program Module Segments.
Standard Settings provide a module (PROG1) with one Segment, running from address 0 to 1023, and repeated one time. All Trigger Event Assignments utilize this module.

6. **Update:** **(Front Panel Key)**
A "**U**" displayed in the top right hand corner of the screen, is a reminder that an "update" is required. A special feature of the 8175A, is that you can preset many settings/conditions e.g. such as data patterns, cycling conditions etc. to a new status while the 8175A is active. These new conditions etc., can then be transferred to the outputs (via an update) when convenient. Until done, the new conditions cannot be output. Update is done via the blue SHIFT and **EXEC** keys. The 8175A must be stopped "STOP" for Update to be done. It is not necessary to do an Update for each individual data/setting change. It is best to wait until you have completed all necessary changes to the current data/settings etc.

7. **POD Outputs:** **(OUTPUT Page)**
Until the output PODS are enabled, no data can be output.
Standard Settings condition is that the outputs are all **[disabled]**. The **[disabled]** status is always indicated by a "**D**" in the top right hand corner of the display.

8. **Start Data Cycling**
To start data cycling, and hence actual outputting of the data patterns, **START** must be initiated. In **[Auto Cycle]** mode (or **[Single Cycle]** with long duration), a small "cycling active" indicator will be displayed in the top right hand corner of the screen.

Settings to be made to Output the Examples:

For the examples in sections 3B and 3C (P-1 to P-2 and G-1 to G-3), almost all pre-conditions for data outputting are automatically met by recalling the Standard Settings. Therefore, provided that only those settings etc. as required for the examples have been made, the additional steps necessary are as follows:

Procedure:

1. Connect the required channels of Output POD 0 to the oscilloscope, and set volts/div and timebase as appropriate. (The specific channels concerned are identified in each example).

2. Set the following Page/menu/setting conditions:

CNTRL->	**[Clock]**	Mode:	**[Auto-Cycle]**
PRGM->	**[Module]** Assignment: set		**[to]** Address: **0007** (0005 for example G-3)
OUTPUT->	All Output PODs are		**[enabled]**

3. Do an "update": Press (blue) SHIFT and **EXEC**. (See precondition (6) above)

4. Press **START**.

3C
How to set up Timing Diagrams (Waveform Setups)

INTRODUCTION

This section explain the basics of using the graphical setting up and display capabilities of the 8175A. This means how to set up and display data/timing relationships in the form of timing diagrams. The basic operating principles of the 8175A are not repeated here. Refer to sections 3A and/or 3B as necessary for such information. Worked examples are used to explain the various procedures.

The information in this section is presented under the following headings:

3C-1
TIMING DIAGRAMS GENERAL POINTS

Instead of setting up, and/or displaying data/timing relationships in "numeric" form, timing diagrams can be used. This involves the use of the Data [Waveform] Setup menu. The use of this 8175A capability simplifies the inputting, editing and interpretation of complex timing setups. It enables timing diagrams to be represented exactly as they are in logic circuit descriptions. 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 from scratch or edited, by simply moving a cursor to the required address and entering the desired data. In variable duration mode, duration values can be also be set on the **[Waveform]** menu.

NOTE: THE EXAMPLES

As regards setting up and/or editing timing diagrams, the basic techniques are the same. The first two examples (G-1 and 2) are for fixed duration. They require the pattern from Example P-2 in section 3B. G-3 is for variable duration, and does not depend on any other example having been done.

3C-2
TIMING DIAGRAMS FOR FIXED DURATIONS

In the fixed duration mode, all patterns have a common (programmable) duration value. For every separate time interval, a new data memory location has to be used. Therefore, in this mode, the main advantage of using timing diagram representation are that the data/timing relationships can be "seen". Also, unlike [Pattern] menu displays, by using the [Waveform] menu, more than one Format can be simultaneously displayed.

FIXED DURATION EXAMPLES: INTRODUCTION

The first example (G-1) covers basic graphical display techniques. It involves simply displaying the data pattern produced by Example P-2 as a timing diagram. Example G-2 then explains how to edit the timing diagram produced in G-1.

Example G-1: Basic Graphical Display Techniques
This example explains the basics of displaying a pattern grapically. It makes use of the pattern from Example P-2, therefore, if you have not yet attempted Example P-2, or have deleted the pattern, set/reset it up before proceeding further.

1. Access the DATA Page by pressing the **DATA** key.

2. Press the **NEXT[]** key to access the Data **[Waveform]** Setup menu. This is the menu where data patterns can be graphically set up and displayed.

Display Scaling
Before the existing pattern(s) can be viewed, it is necessary to scale the display area correctly. This involves changing the Time/Division setting. It can be considered as a magnification or "zoom" factor. In addition, some other settings normally need to be made before any pattern can be properly displayed. For this example, it involves changing only the Address setting.

The reason for changing the Time/Division setting is as follows:

Since the screen is divided into 10 divisions, the total width (for the 50 ns/Division) represents:

10x50 ns = 500 ns

The current bit pattern duration is 1 us, (1000 ns) so therefore only half a duration can at present be displayed. To enable the complete pattern to be displayed, change the scaling as follows:

3. Press the **CURSOR ↓** key one time to move the cursor into the Time/Division field.

4. Press the **NEXT[]** key two times to change the value to 5 us.

To change the Address setting, procede as follows:

5. Press the **CURSOR →** key once. This moves the cursor into the Address field.

6. If Address 0000 is not currently displayed, set it via the numeric **0** key. This will cause the first 8 addresses to be "shifted" back into view. The editing cursor will now be positioned at Address 0000 instead of at 0008.

The display details should now be as shown in Figure 3C-1. Note that, if you did Example P-2 by first recalling the Standard Settings, no pattern will exist for label **A 0**.

We want to display the pattern of the single channel of Format Label **B** . At present, the channels displayed are all for Format A. These are identified as **A 0** to **A 15** in the column on the extreme left hand side of the display area. A more detailed explanation of why only "A" channels are currently displayed etc., is given in the corresponding Menu Map section. At present, it is sufficient to know just how to display the channel required. This is done as follows:

Changing a label/channel:
7. Press, and hold, the the **CURSOR ↓** key until the cursor lies in the uppermost pattern-identifying-field. This is at present labelled **A 0**.

8. Press the **PREV[]** key twice. This will change the label details to **B**. No numeric identifier is displayed since there is only one channel active. The data/timing relationship of Example P-2 will now be displayed. The display details will be as shown in Figure 3C-2.

NOTE: If you wish to output the pattern of this example, refer to 3B-5. It is the last part of Section 3B.

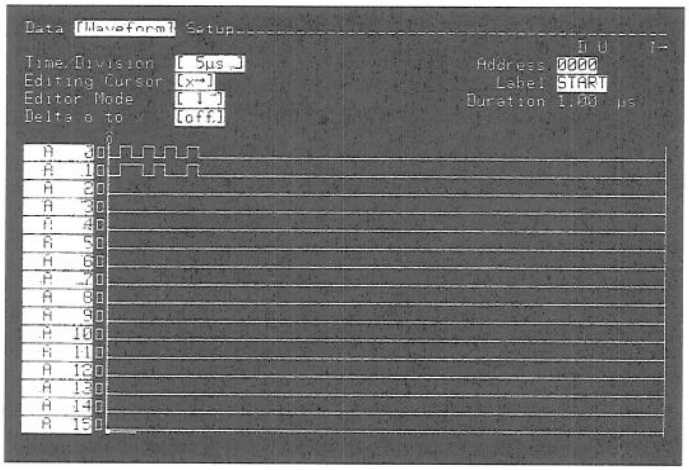


Figure 3C-1. Data [Waveform] Setup at step 6 of Example G-1

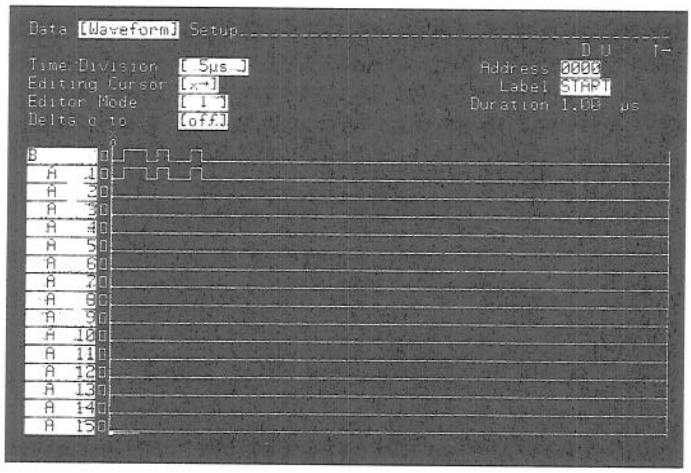


Figure 3C-2. Example G-1 Display Details

As you will notice, the same pattern is displayed twice. This is because Data Format Label A includes all channels, and A 1 is channel 1 of Pod 0 as is B. If you still have the pattern of Example P-1, you can display it instead of A 1. It is done as follows:

Move the cursor one label lower to A 1, then press **PREV[]** one time. The label will change to A 0 and the corresponding pattern will be displayed.

Example G-1 showed you the basics of how to display a timing diagram, and change some of the menu settings. Once you have mastered the basic settings etc., it is quite easy to move on to editing an existing diagram and/or setting up new one. More detailed information on how to use the features of this menu are given in the corresponding Menu Map section. However, you can familiarise yourself with many of the features without referring to the Menu Map. Example G-2 shows the basic principles of editing an existing timing diagram. The same basic principles also apply to setting up a new one.

Example G-2: Basic Graphical Editing Techniques

This example explains how to change or edit an existing timing diagram. It uses the one produced in Example G-1. Therefore, either ensure that the timing diagram is still available or, re-do Example G-1 before proceeeding further. The object of the example is to produce the timing diagram shown in Figure 3C-3. The duration will be left as "fixed". On the [Waveform] Setup menu, the diagram to be edited is that currently labelled as "**B**".

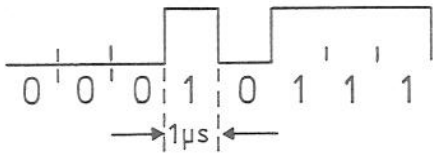


Figure 3C-3. Pattern/Timing Requirements of Example G-2

To edit any timing diagram, the editing cursor must first be positioned at the appropriate address. Note that, the address where the editing cursor is positioned, is always displayed in the Address field. Also, the status or level of each bit is indicated by either:
for 0: an empty [] or, for 1: a filled [].

The bit level indicator is positioned immediately to the left of the Editing Cursor "home position". As the Editing Cursor is moved through the address range, the bit level indicator of each channel will be seen to change accordingly.

The "default" Editing Cursor (Standard Settings) is the "x" one. You do not need to change this at present. However, to make editing of the "**B**" pattern easier, the Editor Mode should be changed to -->. This is done as follows:

Procedure: (Note, this starts at (9) since it continues directly from the end of Example G-1.

9. Position the cursor in the Editor Mode field. Press **NEXT[]** one time. The mode will change to: -->.

The significance of this is that as you input data, the cursor will stay in the horizontal plane. In the previous mode, the cursor would move vertically down after each data input operation.

11. Position the cursor in the (**B**) labelled field. Note the current bit status. Press the **CURSOR →** key one time. This moves the Editing cursor to the waveform transition at Address 0001.

12. Press the **0** key two times. Notice how the Editing Cursor moves one address step after each data change/input.

13. Press the **1** key, then the **0** and finally the **1**, two times. The pattern should now be as shown in Figure 3C-4.

Note that, when you need to move the Editing Cursor to a new position, (no data change) either a step or continuous movement can be made.

NOTE: If you wish to output the pattern of this example, refer to 3B-5. It is the last part of Section 3B.

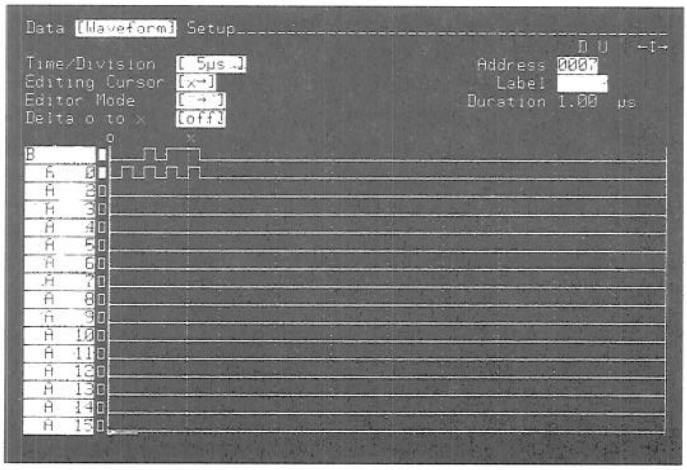


Figure 3C-4. Timing Diagram for Example G-2.

Practise inputting some more data to get familiar with the corresponding controls. To change or input data to the "A 0 diagram", just move the (flashing) cursor into its label field and then use the same techniques as you did for **B** in example G-2.

3C-3
TIMING DIAGRAMS FOR VARIABLE DURATIONS

Introduction

In fixed timing mode (as used for all the previous examples) a new data location is used for every time interval. When variable duration is used, a new data memory location only needs to be used when a channel changes state. Example 3C-3 covers the basics of how to set up a timing diagram involving variable durations. More detailed information on this, plus how to use the related editing features etc., is included in the appropriate Data Page menu descriptions and also in section 3E (Edit Capabilities).

Example G-3: Variable Durations
Waveform patterns which include very short data durations combined with long steady state conditions, are best set up with variable duration. An example of such a waveform pattern is shown in Figure 3C-5. This is the pattern to be set for Example G-3. Note that, for this example, each separate duration requires only one data bit.

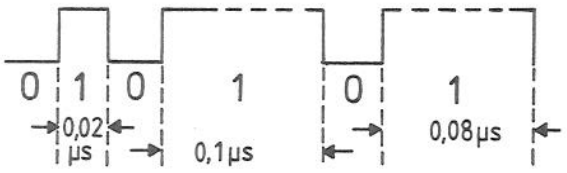


Figure 3C-5. Timing Diagram for Variable Duration Example (G-3)

To set up such a pattern graphically, involves the same basic procedure as for a fixed duration type. The main difference in the procedures are that the following additional settings need to be made:

[Format] menu:	Duration must be set to: **[variable]**
[Waveform] Setup menu:	The Specific duration values need to be input. (They can of course be input on the Pattern Setup menu, but it is easier and more practical to do it on the Waveform Setup.)

NOTE: General Points
To set up a variable duration timing diagram from scratch, it is best to first set the data, then the individual duration values. To minimise the time needed to set duration values, the most frequently occurring duration should be noted and set first. This can then be taken as a "base" value. The non-base value durations can then be set later. This "base" value can be set either before or after the data has been input. (If several individual base values need to be set, the quickest method is via one of the Edit features (MODIFY). Refer to section 3E for an explanation of how to do this. For this example, the default value (0.02 us) is used as the base value. This value is automatically set when duration is set to variable.

Procedure:

1. Recall the Standard Settings.
2. Select the DATA Page, **[Format] Allocation** menu.
3. Move the cursor into the Duration field. Press **NEXT[]** to change setting to **[variable]**. This will also result in the duration being set to the default value of 0.02 us (not shown on this menu).
4. Press the **DATA** key one time followed by **NEXT[]** two times. The Data **[Waveform]** Setup menu will now be displayed.
5. Change the Editor Mode to -->.
6. Press the **CURSOR** ↓ key until the cursor enters the first waveform label field. This is the one labelled "A 0".
7. Press the **CURSOR** → key one time then set a 1. Input the rest of the data until the pattern: 010101 has been set.

To set the non 0.02 us durations:

9. Move the Editing Cursor back to Address 0003.
10. Move the (flashing) cursor into the Duration field.
11. Set the Duration to 0.1 us.
12. To set the next duration value, leave both cursors where they are. Change the Address by means of the ROLL ← key, to 0005 (Address could also have been changed via the Address field). Note how the current address window moves left. Since only the window moves and not the cursor, it (the cursor) will lie on a different address, in this case 0005.
13. To change the duration, simply set the value to 0.08 us.
14. To display the complete timing diagram, press and hold the **ROLL** → key until it rolls into view.

NOTE: If you wish to actually output this example, refer to 3B-5. It is the last part of Section 3B.

The display details should now be as shown in Figure 3C-6.

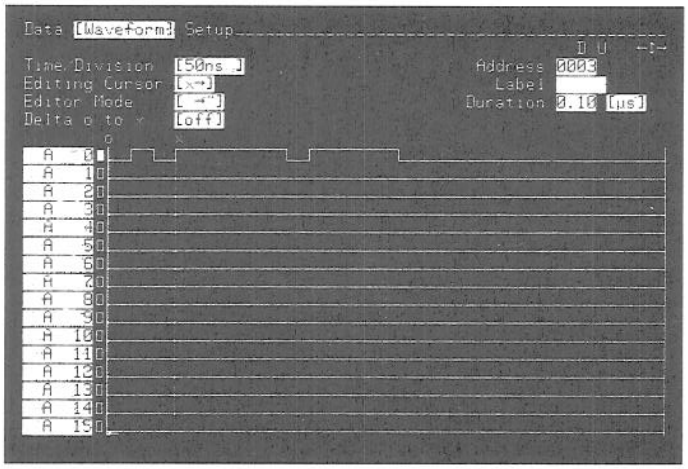


Figure 3C-6. Display Details of Example G-3

8175A MAIN DISPLAYS MENU MAP

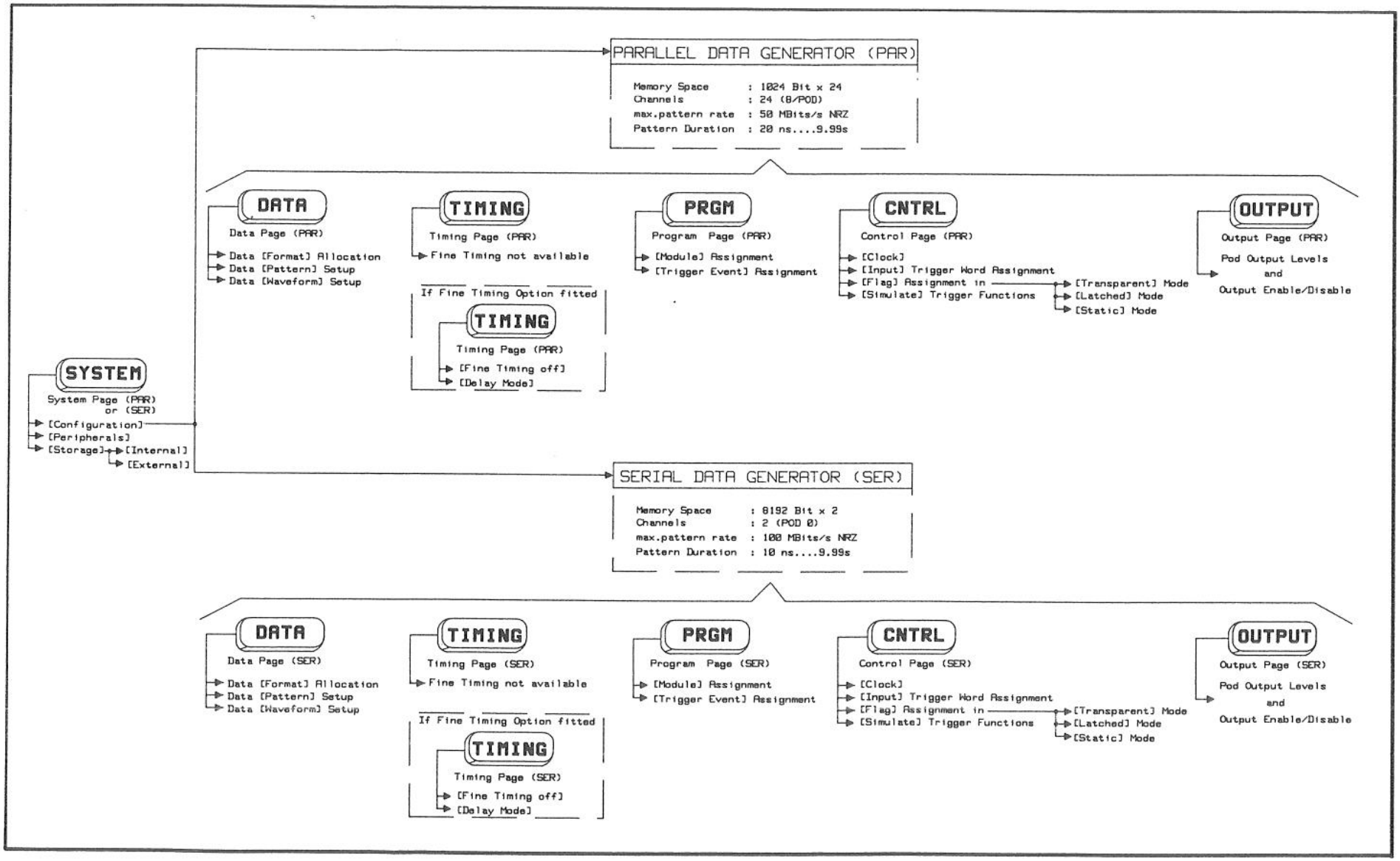


Figure 3D. 8175A Menu Map

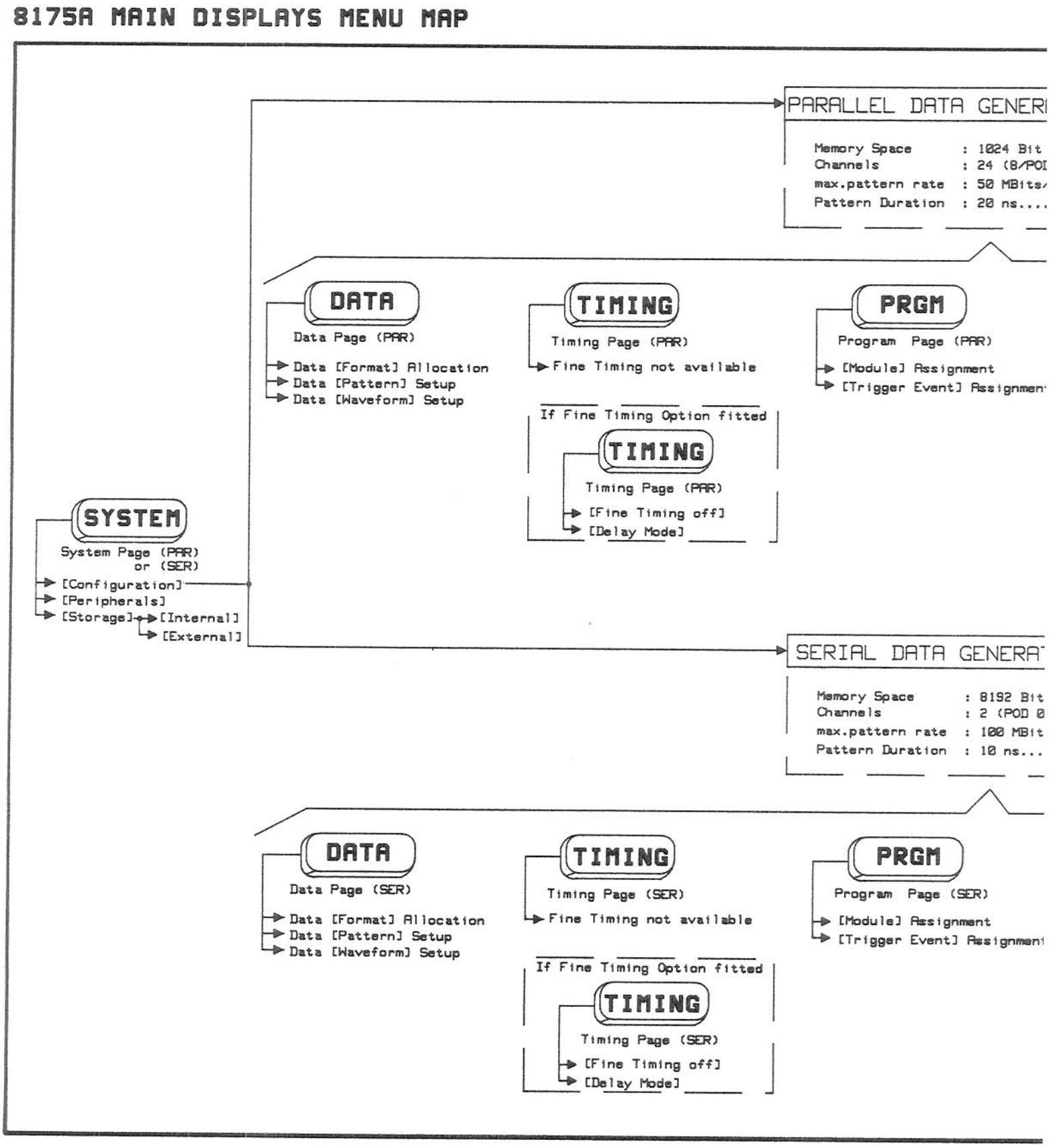
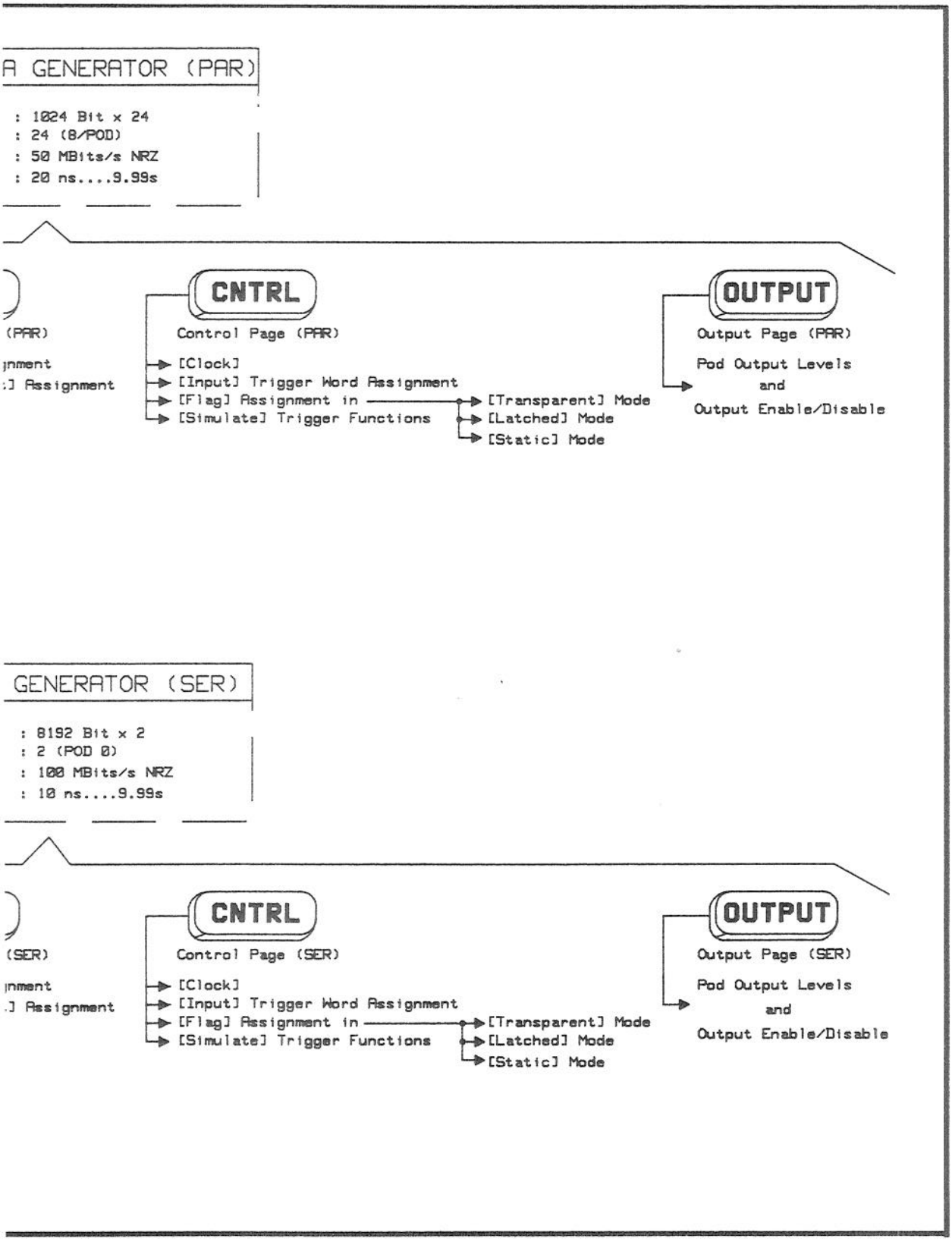


Figure 3D. 8175A Menu Map


A GENERATOR (PAR)
: 1024 Bit x 24
: 24 (8/POD)
: 50 MBits/s NRZ
: 20 ns....9.99s
(PAR)
nment
:] Assignment
CNTRL
Control Page (PAR)
[Clock]
[Input] Trigger Word Assignment
[Flag] Assignment in
[Simulate] Trigger Functions
[Transparent] Mode
[Latched] Mode
[Static] Mode
OUTPUT
Output Page (PAR)
Pod Output Levels
and
Output Enable/Disable
GENERATOR (SER)
: 8192 Bit x 2
: 2 (POD 0)
: 100 MBits/s NRZ
: 10 ns....9.99s
(SER)
nment
.] Assignment
CNTRL
Control Page (SER)
[Clock]
[Input] Trigger Word Assignment
[Flag] Assignment in
[Simulate] Trigger Functions
[Transparent] Mode
[Latched] Mode
[Static] Mode
OUTPUT
Output Page (SER)
Pod Output Levels
and
Output Enable/Disable

3D
The Menu Map and How to use the Menus

THE MENU MAP

The first part of this section comprises Figure 3D, which is the "Menu Map"of the 8175A. This shows all of the menus available in the 8175A for both Configurations. Each menu is shown below the front panel (MAIN DISPLAYS) key that calls it to the screen. Four of the Pages: **SYSTEM, CNTRL, OUTPUT** and **PRGM** (and their menus) are configuration independent. This means that their settings fields etc. are the same irrespective of whether Parallel or Serial Data Generator configuration is selected. The **SYSTEM** Page **[Configuration]** menu is always automatically displayed on power up.

Apart from setting the configuration (one of the first steps when using the 8175A), there is no specific sequence of Page/menu selection which should be followed. The sequence reading left to right, as shown on the Menu Map is only a suggested one.

INTRODUCTION TO USING THE MENUS

The menus of the 8175A are accessed via the six **MAIN DISPLAYS** keys on the front panel. Each key accesses the corresponding Page, each Page comprises one or more menus. Once you have learned which menus "belong" to each Page, operation of the 8175A is very easy. This section of the manual gives a comprehensive description of all available menus. It will be of use initially, when learning how to operate 8175A, and also afterwards as a reference .

Some of the menus include settings whose use is explained with the aid of examples. This concerns mainly CNTRL (Control), DATA and PRGM (Program) Page related menu settings.

The Pages and their menus are described in the same order as the **MAIN DISPLAYS** keys front panel identifiers. Refer to the Menu Map as necessary for menu distribution information. Unless otherwise mentioned, all figures showing menu contents are the **Standard Settings** or "default" conditions.

When working with the Data Page menus, section 3E which covers the Edit capabilities is of special significance.

NOTE: Parallel or Serial Configuration

In the following explanations, all main menu views and contents explanations are based on Parallel Configuration. Any differences for Serial Configuration are highlighted. For those cases where major differences apply, a separate sub-section is included at the end of each corresponding menu description. This applies only to the three Data Page menus.

3D-1
SYSTEM (System Page) Menus

This section describes the SYSTEM (System Page) menus and how to use them. The System Page comprises three menus: **[Configuration]**, **[Peripherals]** and **[Storage]**. The first two menus enable you to set the required configuration, and to input (to the 8175A) data relating to peripherals. The third menu - **[Storage]** - covers internal and external storage capabilities. Details of the menus and how to use them are as follows:

THE MENUS AND HOW TO USE THEM

[Configuration] menu (Refer to Figure 3D-1)

DISPLAY CONTROL FIELDS — SETTINGS EXPLANATION

General information
Whichever configuration is set, the corresponding basic specification will be displayed on the menu. Some further details of configuration are as follows:

Parallel Data Generator
In this configuration, programmable parallel data patterns can be output. Each pattern can be up to 24 channels wide. The available memory depth per channel is 1 kbit. The duration of each individual pattern is programmable.

Serial Data Generator
In this configuration, 2 channels of serial data can be output. The data from each channel, is output in words of 8 successive bits. 16 of the 24 bits corresponding to each address are used for each pair of serial words. This results in an available memory depth per channel of 8 kbit. The duration of the data bits is programmable, each 8 successive bits automatically have the same duration. Each duration value applies across both channels.

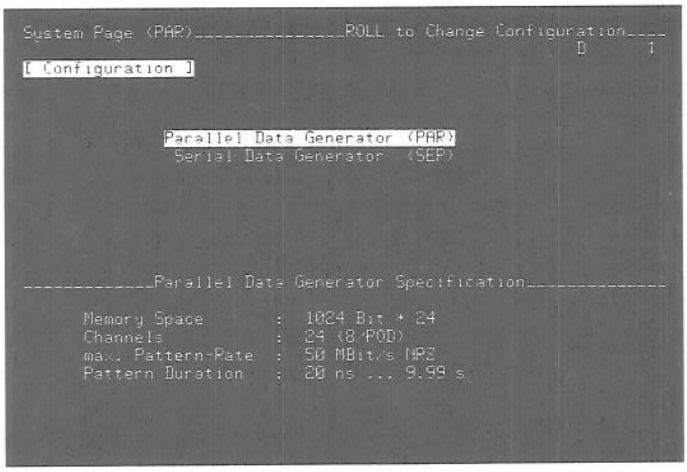


Figure 3D-1. **[Configuration]** menu

[Peripherals] menu (Refer to Figure 3D-2)

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
System Controller:	Either "HP-IB" or, "8175 is controller" will be displayed here. It depends on whether the 8175A is set either, to be controlled (by a system controller) or, to be the (HP-IB) controller. The setting is made on the rear panel mounted HP-IB System switch. Details of the settings are as follows (switch positions for 1 and 0 can be identified in the figure below): for 8175A to be **HP-IB CONTROLLED**, set switch 8 to 1. for 8175A to be the **HP-IB CONTROLLER**, set switch 8 to 0*. The 8175A checks the switch status only during the power on sequence. Therefore, a new setting will not be acknowledged unless followed by a new power on sequence. ***NOTE:** For **manual** operation of the 8175A, if a disc drive and/or printer is to be connected, the 8175A must be set as the "CONTROLLER".

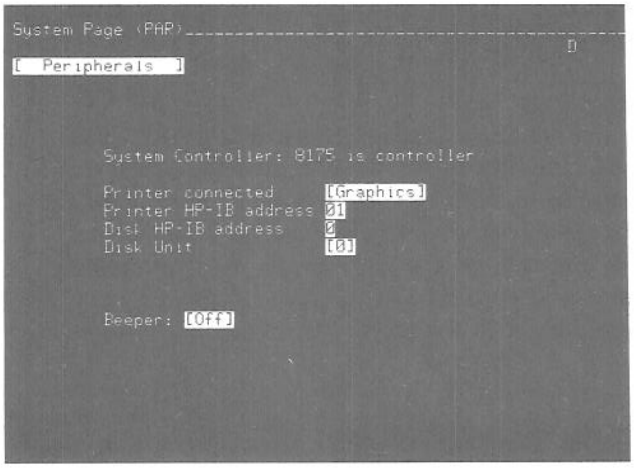
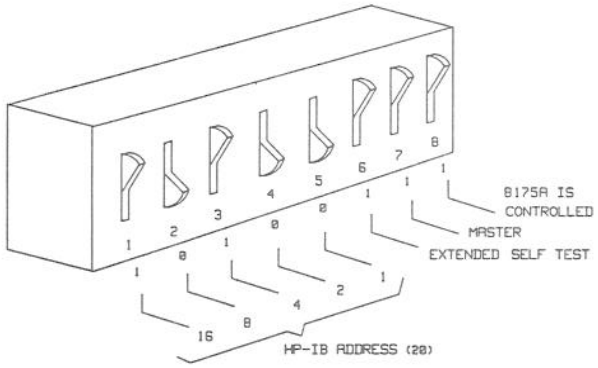


Figure 3D-2. **[Peripherals]** menu



HP-IB Switch: Settings Explanation

Digital Signal Generator HP-IB Address:

This field is displayed only if the 8175A is set to be HP-IB controlled. (Refer to the previous explanation of "**System Controller**"). The value displayed will be the decimal equivalent of the HP-IB Address setting. 5 bits are available on the (rear panel mounted) switch for the address. A value from 0 to 31 is therefore possible. At power on, the 8175A checks the status of the 5 bits and displays their decimal equivalent value.

Printer connected:

[Text] or **[Graphics]** printers are selectable. Note that in Figure 3D-2, "Graphics" is shown. For Standard Settings this will be "None". A **Graphics** printer enables copies of all displays, including Data Page timing diagrams, to be printed. A **Text** printer will not

print any graphics details, including inverse video fields etc. A "Text print" is generally significantly faster than a graphics one. The printer type that you set, determines the code for information transfer from the 8175A to an external printer. Specific information on connection and use of a printer is given in Appendix B.

Printer HP-IB address: This defaults to 01, however it can be manually set to any number between 00 and 31 if no other instrument is assigned to that address. If the 8175A is set to address 01, then the printer defaults to 02. Refer to Appendix B for more information concerning the printer HP-IB address.

Disk HP-IB address: This defaults to the lowest available HP-IB address (i.e., defaults to 2 if the 8175A is set to address 0; otherwise will be at address 0. Any number between 0 and 7 may be manually entered. Ensure that it is the same as the actual HP-IB address on the particular disc drive used.

Disk Unit: This is the specific disc unit number within the disc drive that 8175A is using. It defaults to 0.

Beeper: When **[On]**, this provides an audible indication of an operator caused **ERROR** or **WARNING** condition. When **[Off]**, the beeper is disabled at all times.

[Storage] menu (Refer to Figure 3D-3)

This menu covers all settings associated with storage capabilities. **[internal]** and **[external]** storage submenus are selectable. Internal storage capabilities include store, recall and exchange of complete data and parameter settings. A set of Standard Settings is also available via the internal storage. External storage enables you to store test data on a flexible disc. It involves the use of an HP 9121S/D or 9122S/D Flexible Disc Drive. Fast reloading of test data or reconfiguration of the 8175A is then possible. Specific information relating to the corresponding (**[Storage] [external]**) menu details, and how to use this feature are given in Appendix C.

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
[Storage] [internal]	Note: [internal] or [external] fields are selectable only if the 8175A is set as the System Controller. Otherwise, [Storage] is fixed as "internal"

[store] in Location **[LOC1]** Description: The Location can be set as either **[LOC1]** or **[LOC2]** via the NEXT/PREV keys. **[store]** provides storage for two complete data/parameter sets. To store the current set in either location, enter the location number and, if you wish, a description then press **EXEC**.

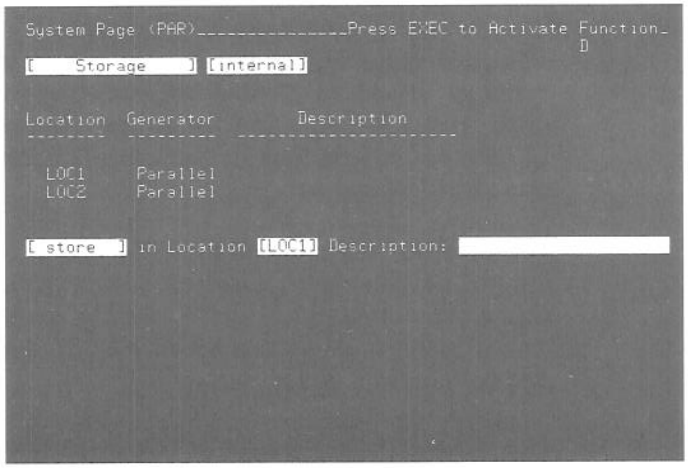


Figure 3D-3. **[Storage] [internal]** menu

[recall] from location **[LOC1]**:

This enables you to recall either of the two sets previously stored.

[exchange] with Location **[LOC1]** Description:

This enables you to exchange the current data/parameter set with one of the stored ones.

[recall] Standard Settings:

This enables you to recall a complete set of known parameter values (data memory will be cleared).

NOTE: When any of the above recall/exchange functions are used, the configuration header (PAR or SER), will be automatically updated according to generator type recalled etc.

3D-2
CNTRL (Control Page) Menus

This section describes the CNTRL (Control Page) menus and how to use them. Due to some special points relating to their use in 8175A operation, a fairly detailed overview is necessary. Therefore, the information is presented under the following two headings:

Overview of the Menus

The Menus and How to Use Them

OVERVIEW OF THE MENUS

The Control Page comprises four menus: **[Clock], [Input], [Flag]** and **[Simulate].** The menu contents are independent of the 8175A configuration. The first menu (**[Clock]**) covers mode, clock and general Input POD related settings. The other three menus enable all settings related to input trigger, trigger conditions simulation and output flag assignment to be set.

If Input Trigger and Output Flag capabilities are not required (for a particular application), then only the **[Clock]** menu needs to be considered. On this menu also, all Trigger POD related settings can be ignored. Cycling (outputting) of data can then be explained as follows:

DATA CYCLING - MODE SIGNIFICANCE

Following a **START** command, irrespective of the mode set, data cycling will commence from the first segment assigned on the Program Page Assignment menu. If **Single Cycle** is set, when the first "end" in the program module is reached, data cycling will stop. It will be started again on the occurance of a new trigger event (this can be via the keyboard or from an external source). If **Auto Cycle** is set, data cycling will continue with the address label assigned to "CONTINUOUS START" on the Program Page, Trigger Event Assignment menu. The significance of "**asynchron**" or "**synchron**" startable etc. is explained later in the detailed description of menus.

INPUT TRIGGER AND FLAG CAPABILITIES:

Input Trigger Word Assignment

Status and data cycling can be externally controlled, e.g., in response to particular DUT output conditions. The interface for this is a Trigger POD, up to eight different actions can be triggered in this way. Each action can be initiated by up to four (8 bit user defined) valid input patterns or words.

Flag Assignment

As well as providing a data cycling and status control capability for the 8175A, each incoming Trigger Word can initiate an 8 bit user defined Output Flag pattern. Using this capability, the occurance of particular signals can be confirmed and, as necessary, feedback provided to the DUT or test system.

THE MENUS AND HOW TO USE THEM

[Clock] menu (Refer to Figure 3D-4)

The [Clock] menu includes mode, clock and general Trigger POD related settings. The settings are as follows:

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
Mode:	This determines whether, after a START command, the 8175A will cycle data only once (**Single Cycle**) or continuously (**Auto Cycle**). Asychronous or synchronous starting can be selected for either mode*. The setting determines for how long (after a START command) Data outputting will be delayed. This is explained as follows: in **[synchron]**, data cycling commences after a specified delay. in **[asynchron]**, an additional delay of up to 1 clock period (10 ns for internal clock) can occur. * These starting capabilities are System Clock source dependent. If externally sourced, only **[asynchron]** is possible. (Refer to the System Clock explanation (page 3-31)for more information.)
Trigger POD	If set to **[enabled]**, then external bit patterns can be read in via the pod, to the 8175A. These can be used to control status, data cycling and also to initiate Flag outputs.
START and/or STOP from:	This setting determines from which additional* source, **START** and/or **STOP** commands will be accepted. If set to **[Trigger POD]**, in addition to START and STOP, six other functions are available. These are all listed on the **[Input] Trigger Word Assignment** menu. * In manual operation, the front panel START and STOP controls are always operative. If **[external input]** selected as source, note the following points: A suitable signal must be applied via the corresponding front panel BNC connector (refer to the specifications for more details). The input must be **[enabled]** via the corresponding field. The LED adjacent to the BNC connector will then illuminate. The required START and/or STOP trigger conditions must be set (or default setting used). Note also, if this mode is set, then Trigger POD derived patterns will be disabled from controlling instrument status etc. Flag Patterns however, can still be obtained if the Trigger POD is set to "**enabled**".
Trigger POD [ ] on [ ] Edge:	When **[synchronous]** set, a clock signal* must be applied to the pod to read in the bit patterns. Patterns are then read in at the [^] or [v] Edge of the clock signal. When **[asynchronous]** set, it accepts bit patterns without a clock signal. * (See also "System Clock" explanation.)

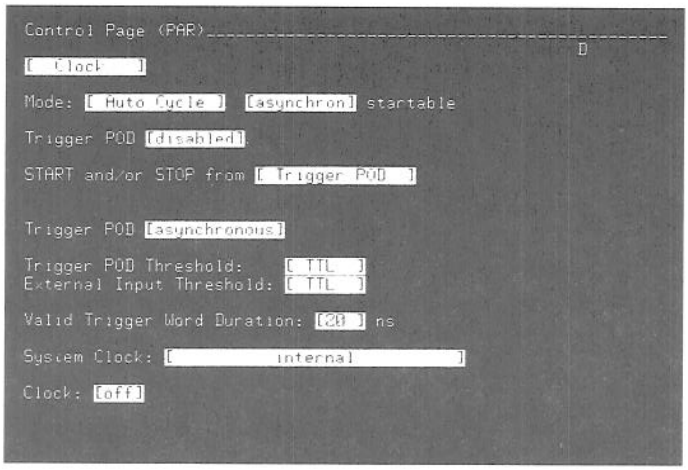


Figure 3D-4. **[Clock]** menu

Trigger POD Threshold:
External Input Threshold:

For each type of input the following thresholds are available: Fixed TTL or ECL, or variable between +/- 9.9 V in 0.1 V increments. Note that, the **VERNIER** function of the **ROLL** keys can be used to set the value.

Valid Trigger Word Duration:

This is a delay, or time during which a valid trigger word (or bit pattern) must be stable. Only then, can it initiate an action. The value can be set (via the **NEXT/PREV** keys) to between 20 ns and 500 ns. For Trigger POD **[synchronous]**, the delay is timed from the appropriate clock signal edge. (See explanation of "Trigger POD **[synchronous]**" etc.) For **[asynchronous]**, the delay is timed from occurance of the new pattern.

System Clock:

This is the clock signal from which all timing related functions including Pattern Duration, Clock etc. are derived. Three alternative sources are available, details are as follows:

[internal]
This is the default source, it is a clock signal of 100 MHz. Note, for this clock source a **[Clock Calibration]** feature is available. It is available only when the operating Mode is set to **[synchron]** startable. (In **[asynchron]** the field is not displayed.) It enables the frequency to be auto-calibrated* so increasing the accuracy of derived signals. (Refer to the specifications for actual values). To calibrate the frequency, move the cursor into the **[Clock Calibration]** field and press the **EXEC** key. The message "**RUNNING AUTOCAL**" will be briefly displayed after the key is pressed.

* In **[asynchron]** mode, the clock frequency is continuously calibrated. Therefore, no additional operator action is necessary.

[Clock] menu continued

external...
General: If either "external" clock source setting is selected, "**[synchron]** startable" is not possible. This is of significance for the Mode setting at the top of the menu. The corresponding setting field will be deleted from the display.
[external from Input POD]
This enables the System Clock to be supplied, via the Trigger POD. An external source, frequency range from DC to 25 MHz should be applied.

[external from rear panel BNC]
This enables the System Clock to be supplied, via the rear panel **EXT CLOCK BNC** connector. A source of frequency range: DC to 100 MHz should be applied.

For both **[external...]** sources, if frequency is < 4 Hz or >100 MHz, appropriate Warning menssages will be flashed. Refer to the specifications for more information.

Clock:

This is a user clock with programmable period, independent of the data rate. It is available on data line 7 of the Flag Output pod. It is System Clock derived and therefore, its period and accuracy depend upon whether internal or external clock sources are used. The value can be set via either the numeric keys or, the VERNIER function of the **ROLL** keys. Note that, when the System Clock is externally sourced, the period of the (user) clock is determined by setting values in two fields. The first field is for inputting a numeric value, the second is for a multiplying factor of 10 or 100.

Refer to the Specifications for more information.

[Input] Trigger Word Assignment menu (Refer to Figure 3D-5)

This menu enables you to assign the patterns (Trigger Words) which will initiate any of the eight available control functions. It is displayed if "START and/or STOP" (see [Clock] menu description) is set from **[Trigger POD]**. Details are as follows:

DISPLAY CONTROL FIELDS **SETTINGS EXPLANATION**

The Trigger is determined by **[n]** Word(s)

The value set here determines how many different words (up to a maximum of 4) can initiate each control function. Note that, if the value is > 1, any word assigned to a function can initiate it.

Start, Stop...Tristate asyn:

The field(s) adjacent to each function are for setting (assigning) a corresponding pattern (Trigger Word). These patterns (if Trigger Word Duration requirement etc. are satisfied) will then initiate the corresponding function. The default condition for each pattern consists of ".....". Such a pattern cannot trigger a function. To trigger a function, a pattern must comprise a combination of 0, 1 or X characters. "X" means that either a 1 or a 0 will be recognised as a trigger input from the POD. "X" is input via the **DON'T CARE** key.

A brief explanation of the functions is as follows:

Start, Stop and Continue

These perform the same function as the corresponding front panel keys. "JMP A and JMP B" refer to program segments (see PRGM Page: Module Assignment menu description).

Tristate on and Tristate off

These provide an alternative (to Output Page menu or front panel control) means of "disabling or enabling" the **data** Output Pods (not the Flag one). In either case, once either function has been initiated, it remains active until the opposite Tristate capability is triggered.

Tristate asyn

This provides another method of Tristating (disabling) the **data** Output Pods. The difference from **Tristate on** is: **Tristate asyn.** remains active only as long as its corresponding Trigger Word is present.

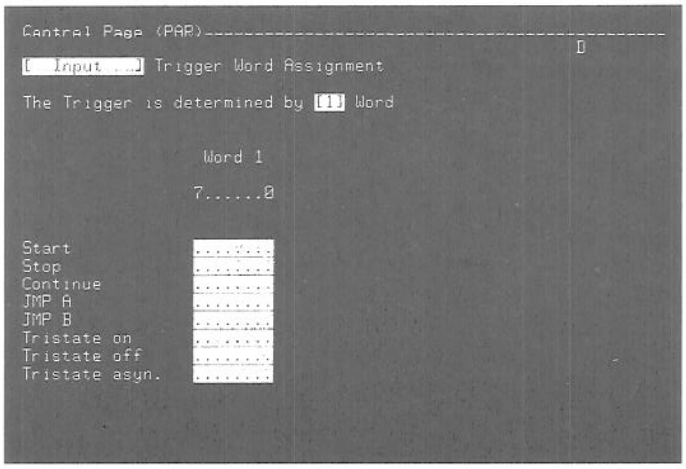


Figure 3D-5. **[Input]** Trigger Word Assignment menu

Error Messages (Pattern related)

When you start to input a trigger pattern, an error message will flash, (and remain) until all eight characters have been input. This is because the pattern will temporarily include a combination of dots (.) and other characters. You cannot exit a pattern field, or update the menu settings, without fixing any current error condition. If you try, a message will be flashed to remind you!

Error Messages (Exclusive function related)

Another possible cause of an error message can be a conflict between fields. This is explained as follows:

All functions except "Tristate asyn." are exclusive. Exclusive functions are ones which should never be initiated by the same trigger word. For example, Start and Stop should never be simultaneously initiated! In other words, a pattern assigned to trigger an exclusive function, should not be assigned to any other exclusive one. If, the same pattern* is assigned to one or more exclusive functions, an error message will be displayed. the message is:

(ERROR Conflict between Fields)
Exiting, or updating of the menu while an error condition still exists, is not allowed.

* Remember that "X" can be considered as either 0 or 1. Therefore, patterns which contain X's can conflict with others which contain only 0's and/or 1's. An example of this is as follows:

10001XXX will conflict with 10001111, 10001000, 10001101 etc.

Enter field # to show conflicts:

During pattern setting/assignment, it is possible that conflicting patterns will be set. Such patterns will be identified by their reference numbers being displayed to the right of the pattern. (See the note* for explanation of this.) Note that, those patterns first detected as being in conflict with one another, will also all be automatically identified by an an asterix (*). Subsequent "new" conflict patterns will only be identified by their numbers. An example of this is illustrated by Figure 3D-6.

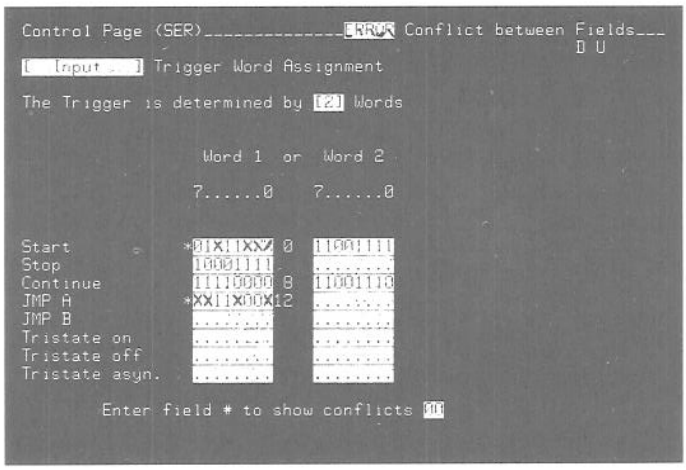


Figure 3D-6. Conflict Patterns (0 and 12) auto-identification

To confirm which patterns are in conflict with one another, is done as follows: Input a suspect conflict pattern number in the field at the bottom of the display. All patterns which are in conflict with it will then be identified by an *. Figure 3D-7 illustrates an example of this. Note that although 8 conflicts only with 12, Figure 3D-6 shows that 12 also conflicts with 0.

***NOTE: Pattern reference numbers**
Each pattern is allocated a number between 0 and 31. Whether or not a pattern is currently displayed has no influence on its number. The numbers run from left to right and top to bottom, across the display as follows: ..... 0 ..... 1 ..... 2 3
..... 4 ..... 5 etc.

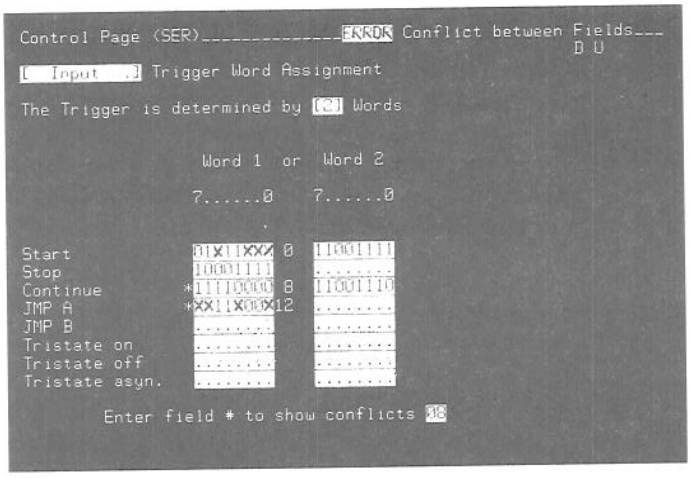


Figure 3D-7 Use of "Enter field#" to Identify Conflict Patterns

[Flag] Assignment menu (Refer to Figure 3D-8)

This menu enables you to assign Flag Patterns. These are patterns which can be output (from the Flag Output POD) on occurrance of the initiating Trigger Words. Each of the 256 Trigger Words can have any one of the 256 Flag Patterns assigned to it. Flag patterns can be assigned for Transparent, Latched or Static outputting. Trigger Words also assigned (on the Trigger Word Assignment menu) to initiate control function(s), will be clearly identified on the display. Specific menu details are as follows:

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
[Flag] Assignment in [?] Mode:	**[Transparent]** This means that every Trigger Word can initiate a new Flag Pattern. Each pattern will remain until the next Trigger Word. **[Latched]** This means that only selected Trigger Words will initiate a new Flag Pattern. Each selected (or enabled) pattern remains "latched" at the output until a new one is initiated. An additional "status" column is displayed to identify, and permit selection of, the appropriate Patterns. The default condition is that no patterns are latched and a default Flag Pattern of all 0's is produced. Disabled patterns are indicated by a "." in the status column. To enable a pattern, move the cursor into the status column, then change the "." to a "*" via the **NEXT/PREV** keys. Refer also to the Trigger Word and Flag Pattern explanation later in this description. **NOTE**: When **Transparent Mode** is set, although the additional column is not displayed, the contents are retained. **[Static]** In this mode, Flag patterns are independent of Trigger Words. See the **[Simulate]** menu explanation for information.

Trigger Word Flag Pattern References
[BIN] [BIN]

Trigger Word
The first column (Trigger Words) cannot be changed, only accessed. To access a word, either roll the display or, position the cursor in any word then input the value that you want to access.

Note that, data in each column can be displayed in either, BIN, OCT, DEC or HEX. Use the **PREV/NEXT** keys to change the base code as required.

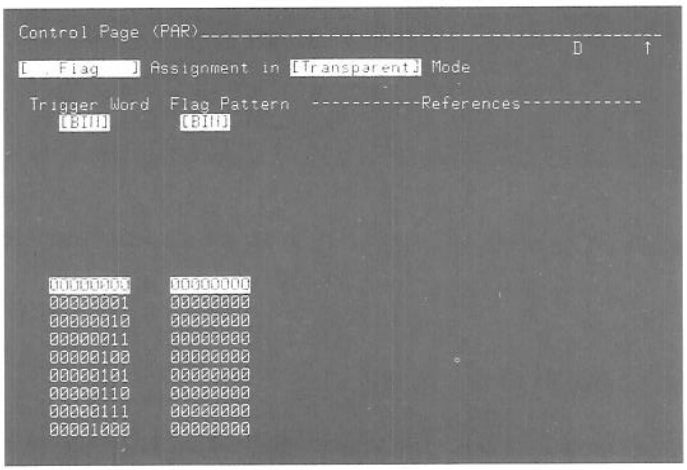


Figure 3D-8. **[Flag]** Assignment menu

Flag Pattern
Up to 256 Flag Patterns are available for assignment. The base code is user settable.

References
Control functions which are Trigger Word assigned, will be displayed under this heading.

Latched Channels Indication
When Latched Mode is set, an additional column of symbols is displayed. The default symbol for each Trigger Word is ".". This means that, the corresponding Flag Pattern is disabled. An "*" indicates that the particular Flag Pattern is enabled (for latching). The symbols can be changed via the **NEXT/PREV** keys, as described under the "Latched Mode" description.

[Simulate] Trigger Functions menu (Refer to Figure 3D-9)

This menu enables you to simulate the effect of Trigger Word occurance for seven Functions. All Functions except Tristate asyn. can be simulated. Simulation lets you "release", or initiate, any of the available functions. This means that program sequences for example, can be tested without having the DUT connected. Flag outputs corresponding to the particular Trigger Function conditions can also be simulated. Output flags so produced will remain active as long as the Function is active.

NOTE: While this menu is displayed, the Trigger POD and EXT INPUT from front panel are disabled.

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**.

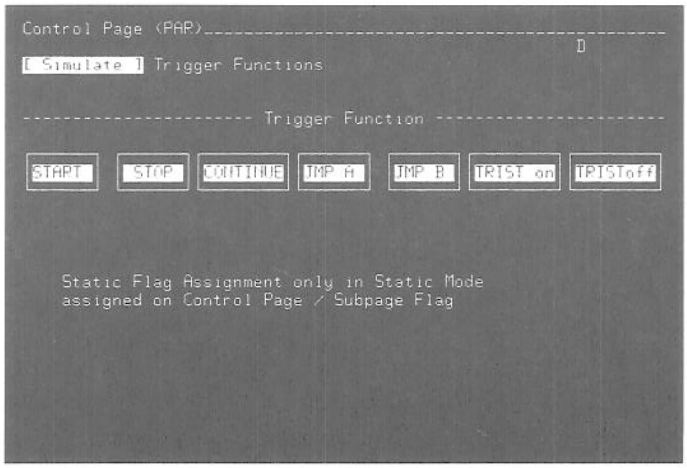


Figure 3D-9. **[Simulate]** Trigger Functions

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.

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.

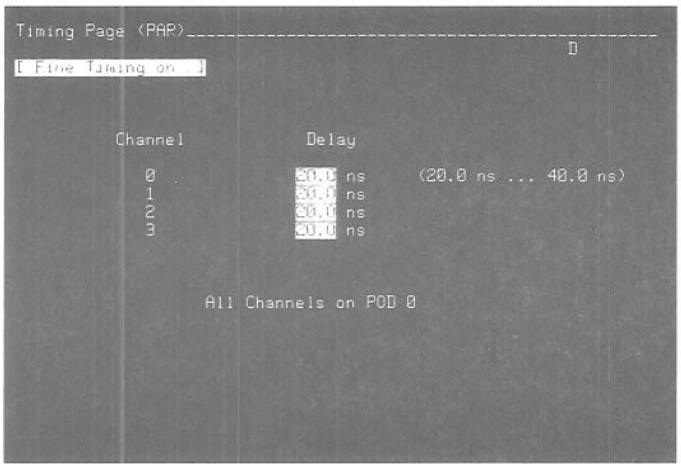


Figure 3D-10A. **[Fine Timing On]** (PAR)

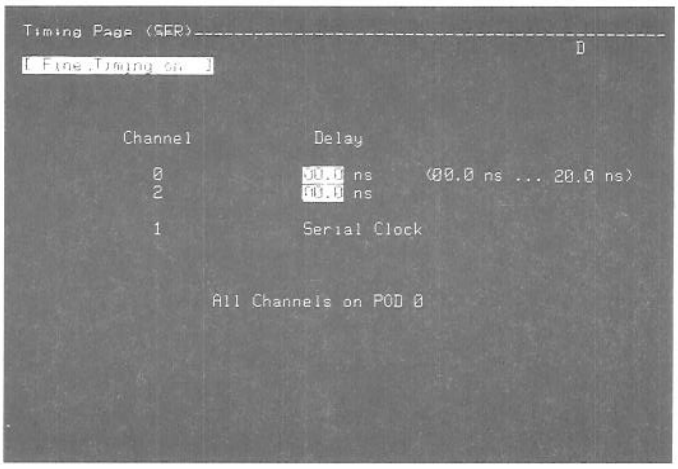


Figure 3D-10B. **[Fine Timing On]** (SER)

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.

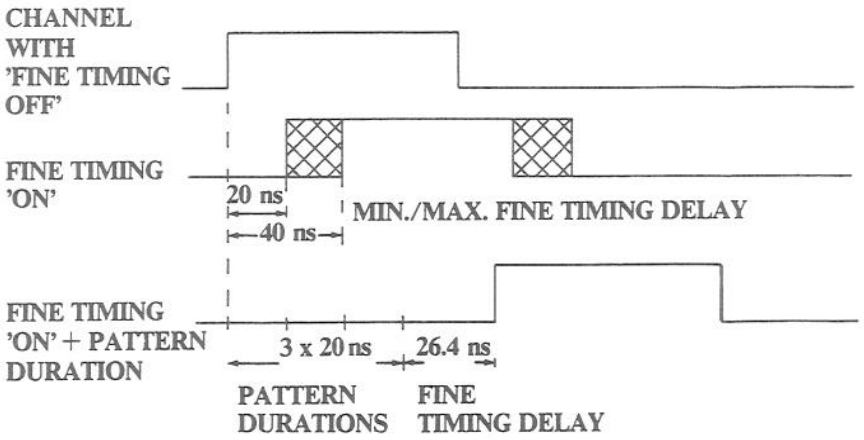


Figure 3D-10C. Illustration of Fine Timing

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 <u>all</u> 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.

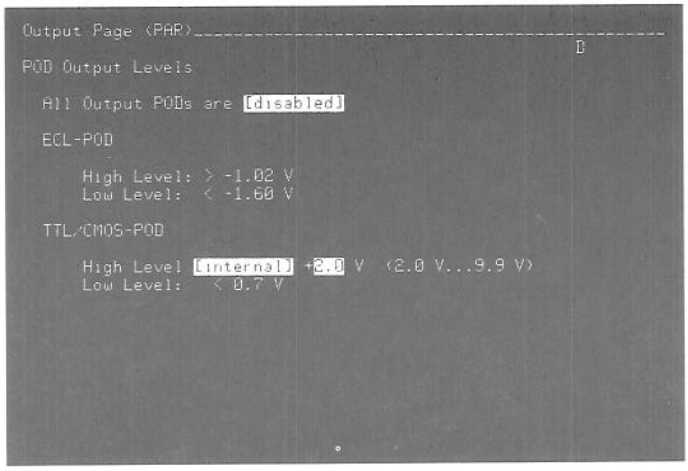


Figure 3D-11 Output Page menu

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)

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.

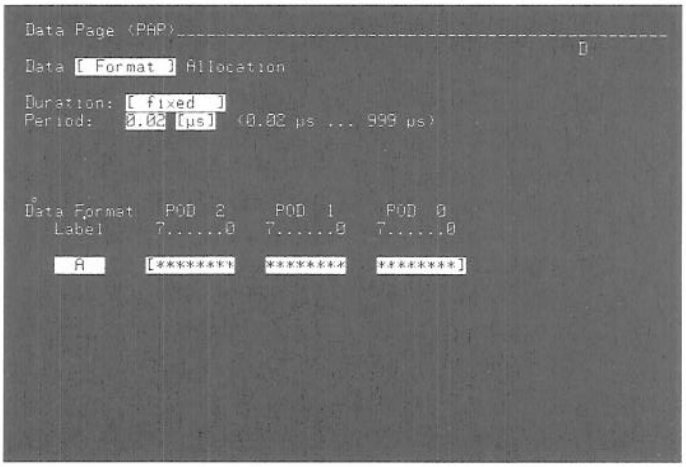


Figure 3D-12. Data **[Format]** Allocation menu

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.

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.

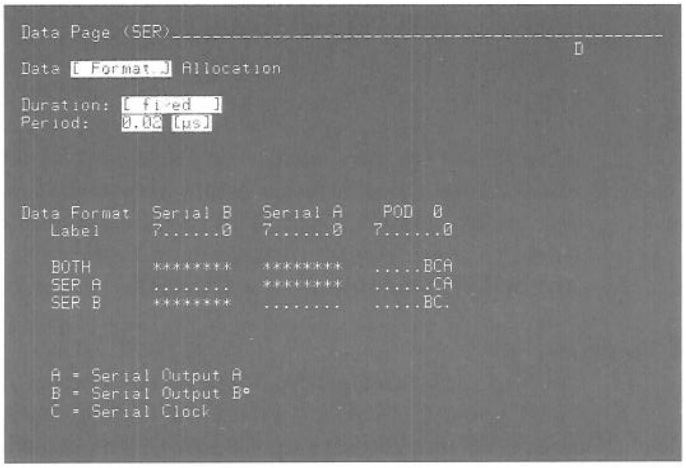


Figure 3D-13. Data **[Format]** Allocation menu (Serial D.G. Config.)

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.

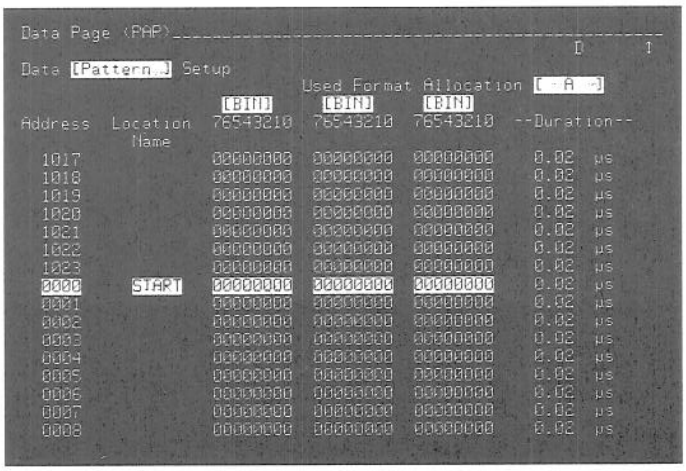


Figure 3D-14. Data **[Pattern]** Setup menu

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.

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.

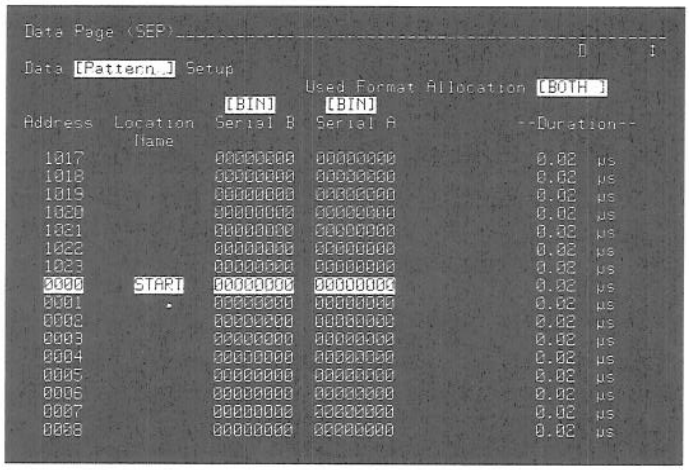


Figure 3D-15. Data **[Pattern]** Setup menu (Serial D.G. Config.)

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.

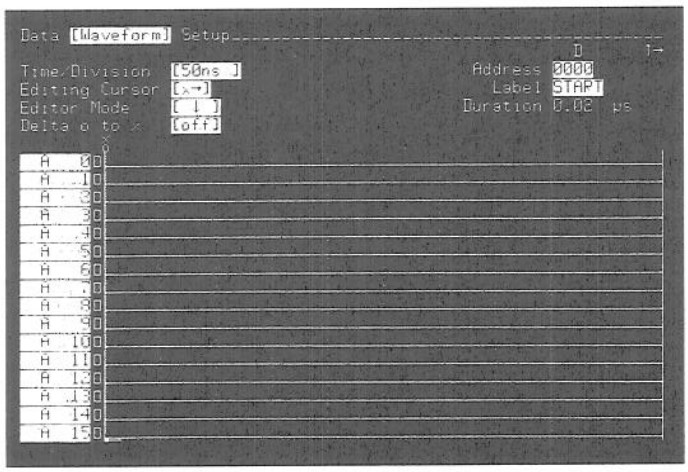


Figure 3D-16. Data **[Waveform]** Setup menu

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.

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.

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.

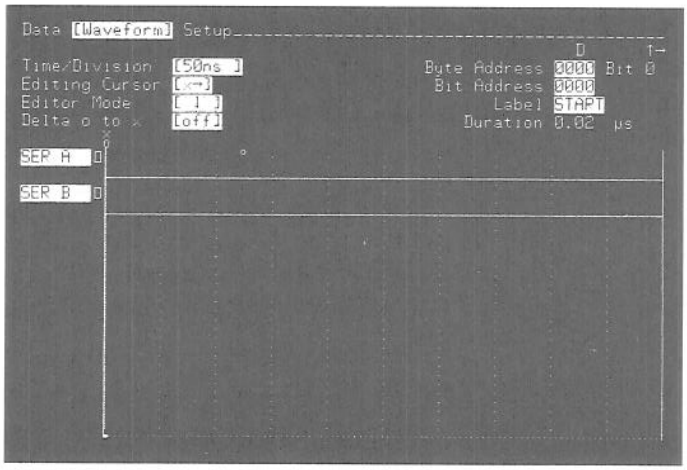


Figure 3D-17. Data **[Waveform]** Setup menu (Serial D.G. Config.)

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.

THE MENUS AND HOW TO USE THEM

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

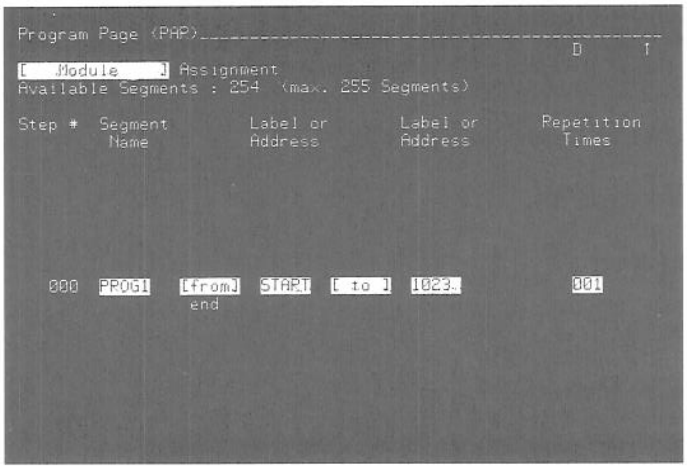


Figure 3D-18 [**Module**] Assignment Menu

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.

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.

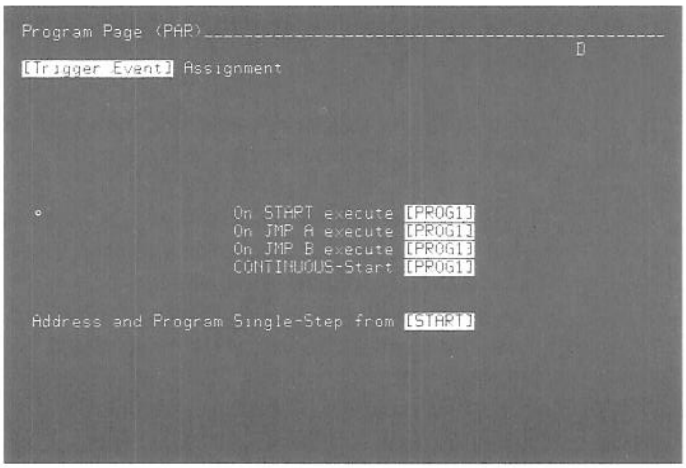


Figure 3D-19. **[Trigger Event]** Assignment Menu

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:

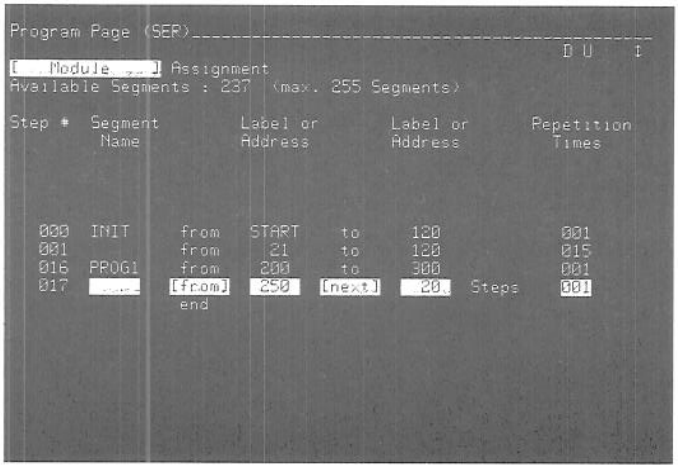


Figure 3D-20A. PRGM 1 Mod. Ass. Menu

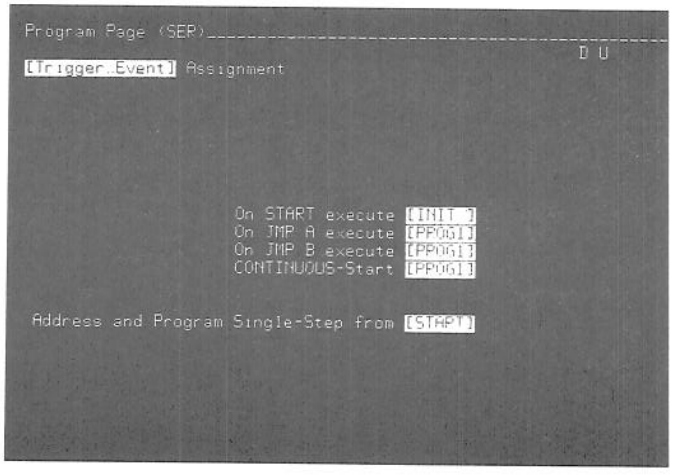


Figure 3D-20B. PRGM 1 Trig. Event Ass.

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.

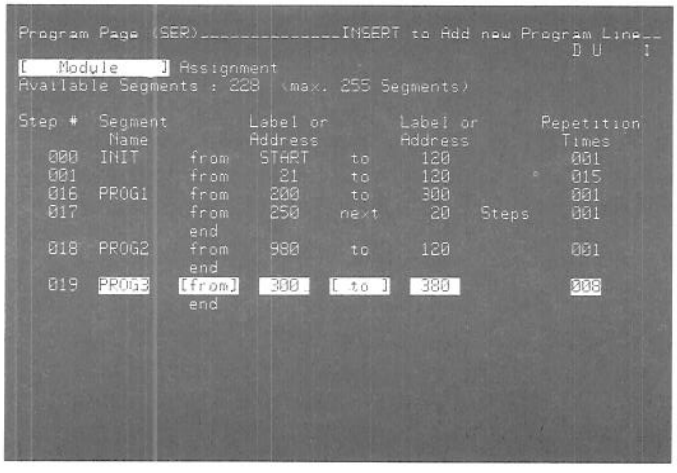


Figure 3D-21A. PRGM 2 Mod. Ass. Menu

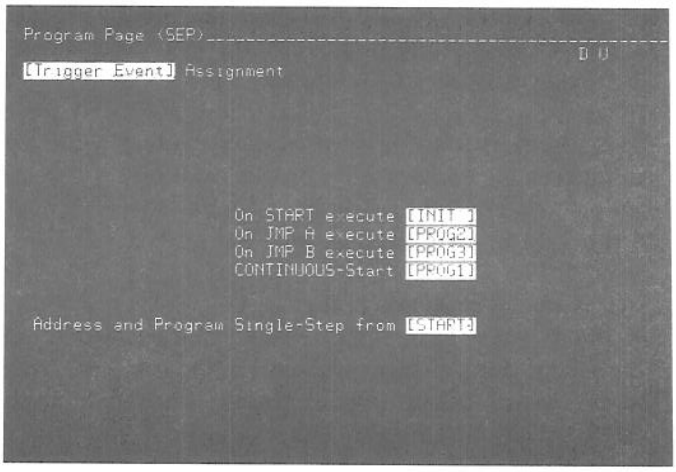


Figure 3D-21B. Trig. Event Ass. Details

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.

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.

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.

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:

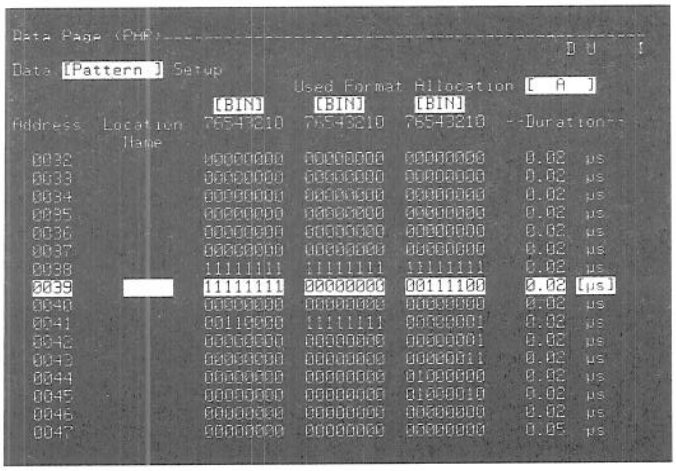
Data [Format] Allocation menu

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**.

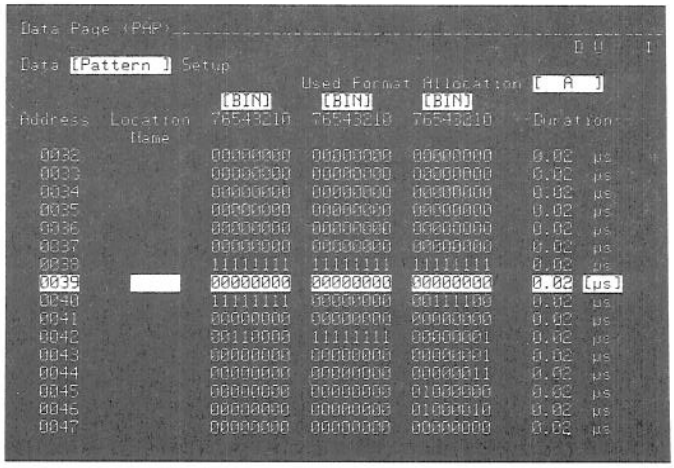
Data [Pattern] Setup menu.

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**

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.

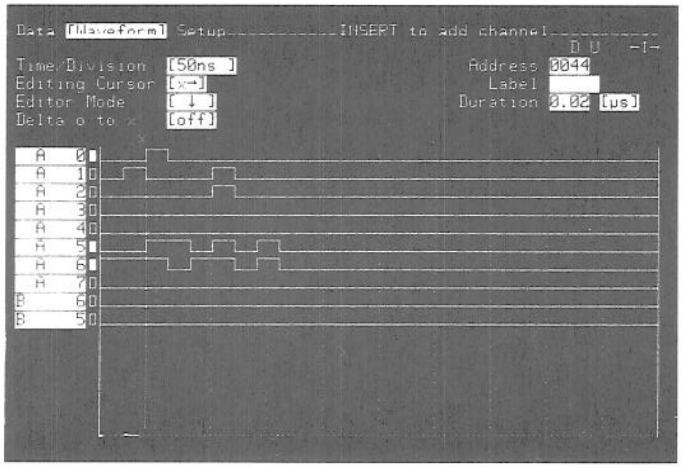
To insert a channel at position "n", position the cursor at n-1, then press **SHIFT** and **INSERT**. If 16 channels are already displayed, no futher "INSERTS" are allowed.
In both cases note that, depending on whether 8 or less channels are displayed, double the normal display height is allocated for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

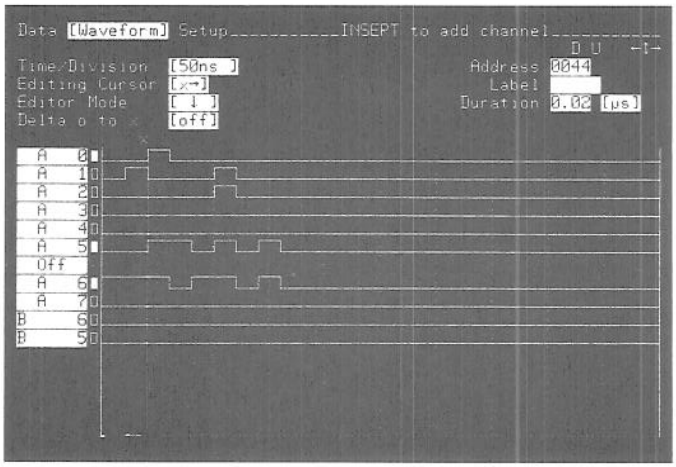
To **DELETE** data at an address:
Position the Editing Cursor at the address and press **SHIFT** and **DELETE**.

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.

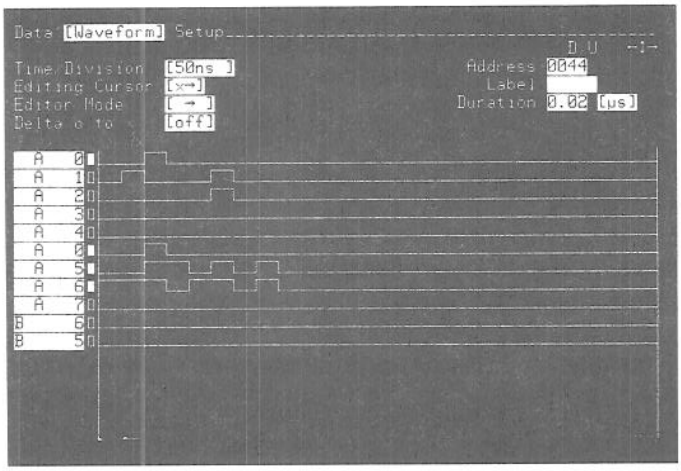


INSERT Channel (WF): Before **INSERT**

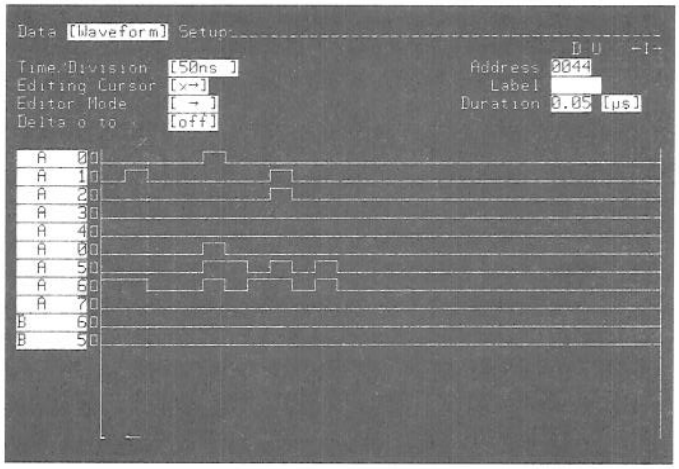


After **INSERT**

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**

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.

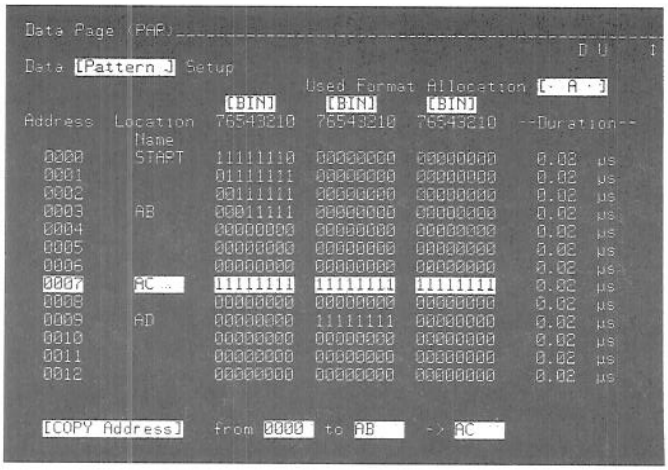
4. If the destination address is < the start (from) one, it will be overwritten. Also, note that even in this case the block of source data will not be "shifted forward".

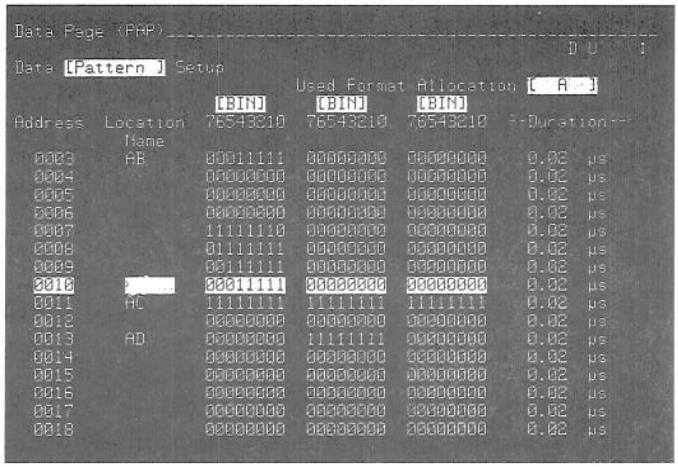
5. Duration values will be copied along with the data.

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.



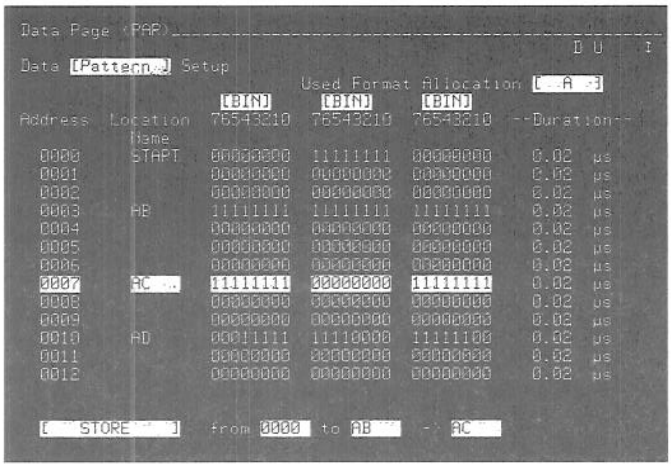


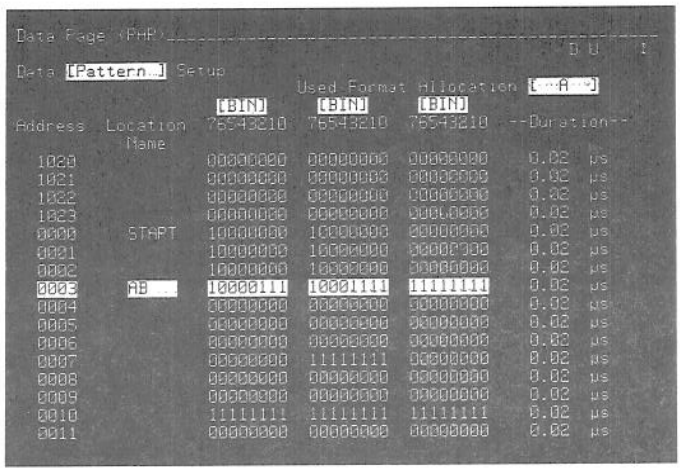
COPY Address: Before EXEC

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

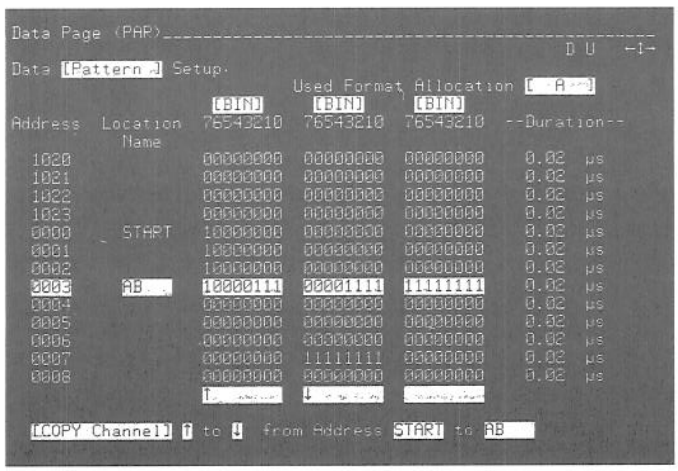
[COPY Channel]
This edit function enables individual channels of source data to be copied to another channel. The channels can extend over the compete memory depth. Note the following points:

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).

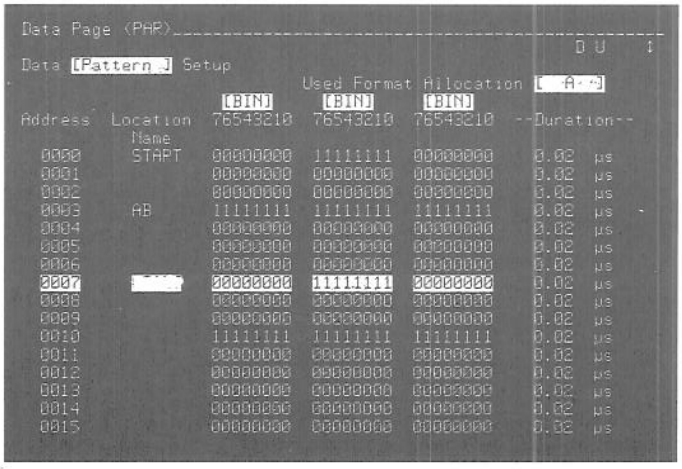
2. The channel to be copied is identified by the position of the ↑ arrow in one of the channel identifier fields. This is the field directly beneath the last pattern display of each POD/channel group. To position the ↑ arrow at the appropriate channel, the cursor must first be positioned in the arrow ↑ 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.

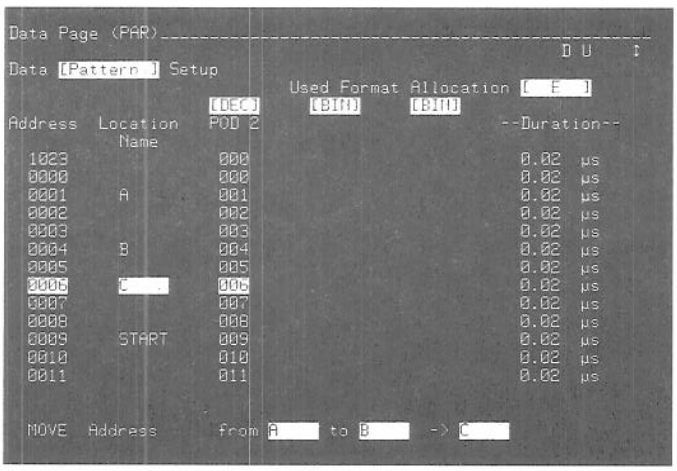
2. The destination address (or label) is to be set in the "->" field. It must lie outside the data block defining addresses.

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.

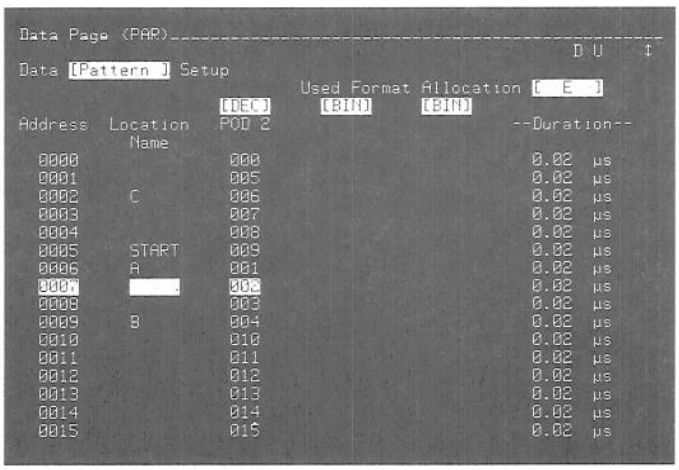
5. Duration values will be copied along with the data.

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.

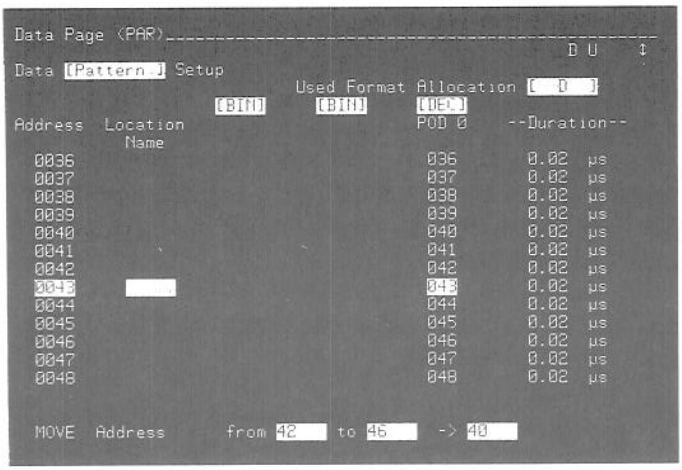


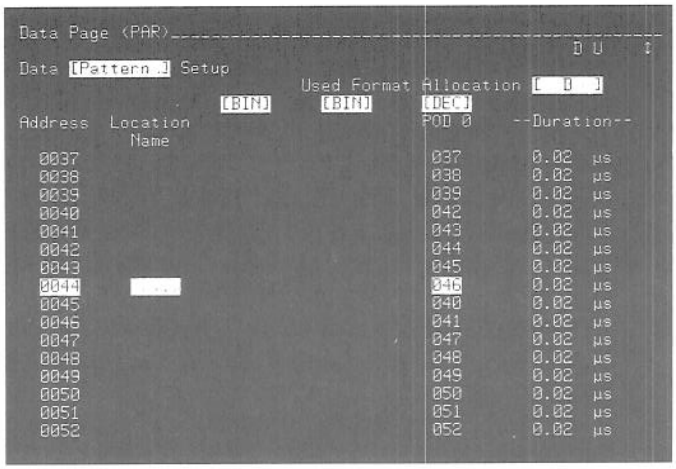
MOVE Address (1): Before **EXEC**



After **EXEC**

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**

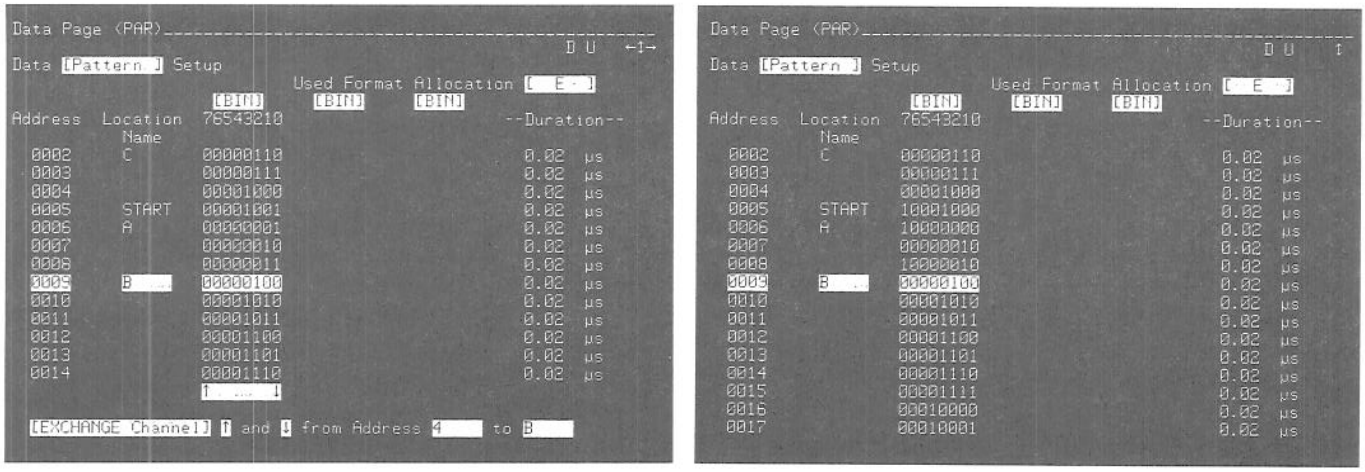
[EXCHANGE Channel]
This edit function enables channels of data to be exchanged. The channels can extend over the compete memory depth. Note the following points:

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:

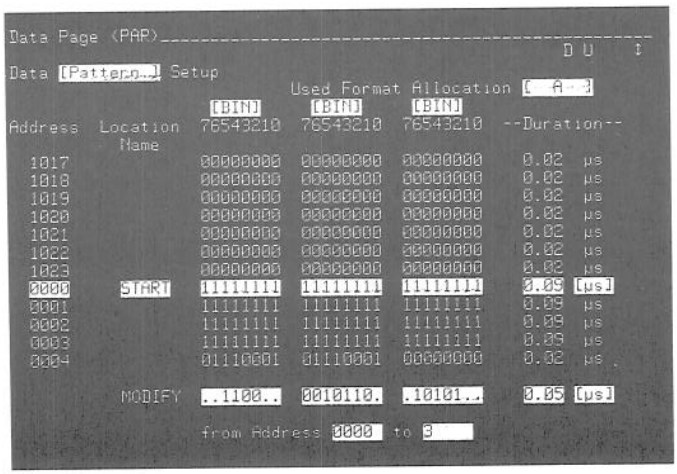
1. The function can be accessed only if at least one POD/channel group is displayed in [BIN]. Also, at least two channels (in one or more groups) must be in [BIN]. Only POD/channel groups in [BIN] will be provided with a data modification field.

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.

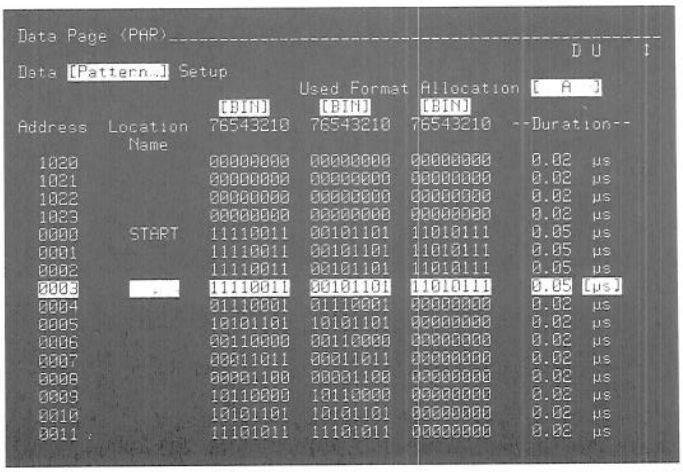
3. Each data channel should be set to 0 or 1 as required or, if to remain unchanged, a dot (.) should be set.

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.

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.

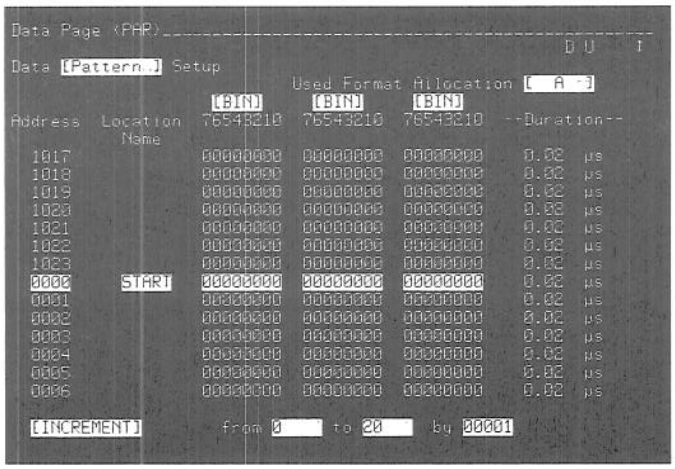
8b. Depending on the Format, bit patterns within such "compressed" channels can have different relative values. This is due to the MSB/LSB significance of any channel. It is illustrated by the second INCREMENT and the DECREMENT examples.

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

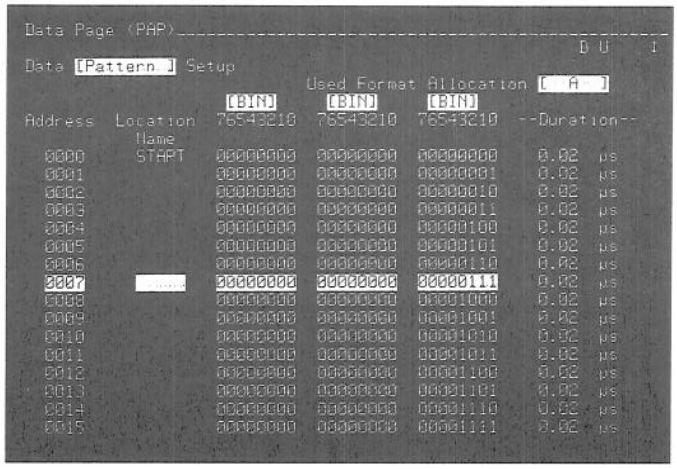
9. Note that, the INCREMENT/DECREMENT calculation is based on the binary equivalent of the channel combination. This is of special significance if for instance, any of the POD/channel groups are displayed in decimal. If for example only two channels of a particular POD are active, their decimal content, 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.

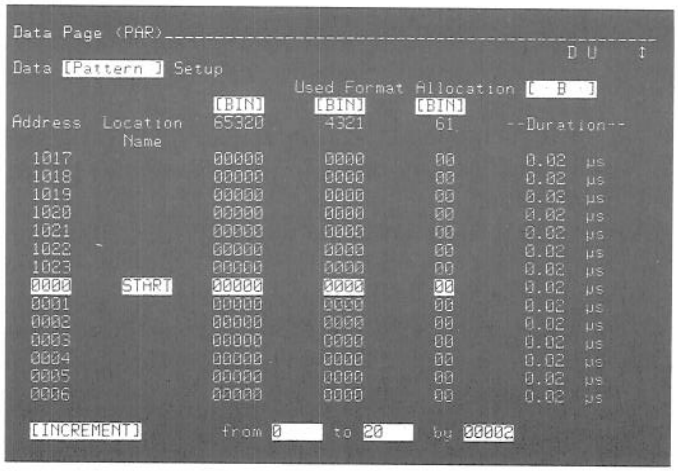


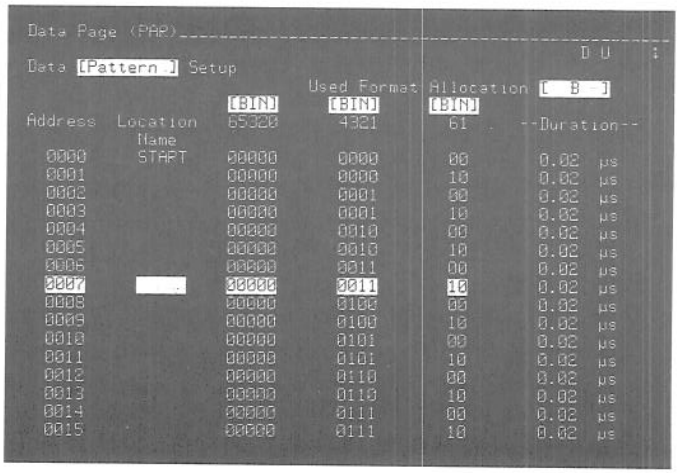
INCREMENT in Steps of 1: Before EXEC



After EXEC

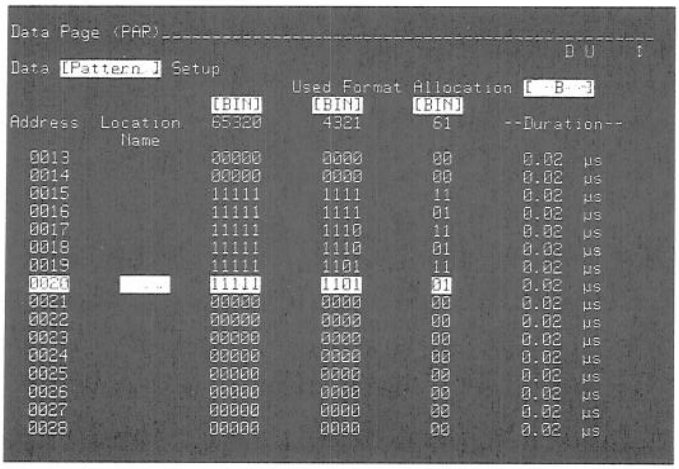
Example: INCREMENT in Steps of 2
This illustrates a similar sequence as for the first example, but a step value of 2 and a different Format are used. Note how the patterns at address 0001 and higher, extend over channels of POD 2.

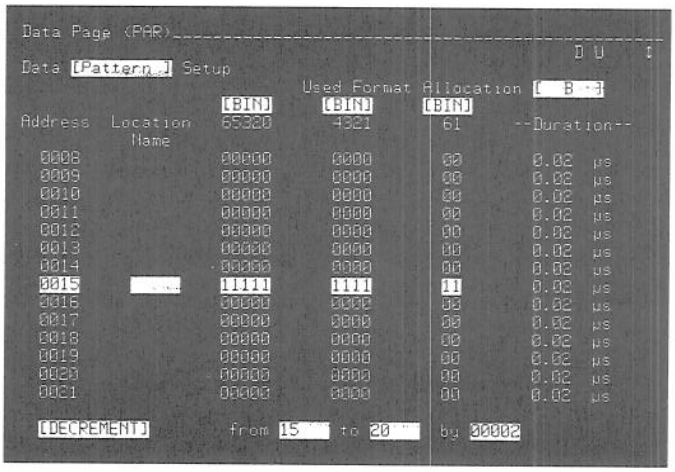




INCREMENT in Steps of 2: Before **EXEC** After **EXEC**

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.





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.

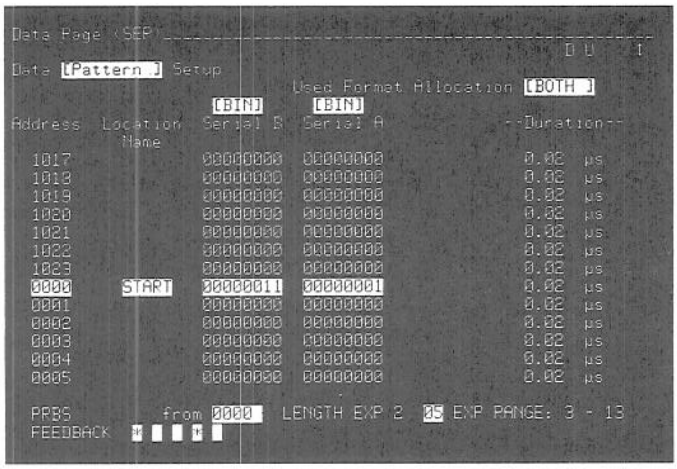
7. The default feedback conditions obtained for each "LENGTH EXP 2 value", provide "optimum feedback". This means that a true PRBS will be obtained. Also, in this case the minimum number of taps required for a PRBS are utilized. Other conditions can be user set but, they will not necessarily provide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

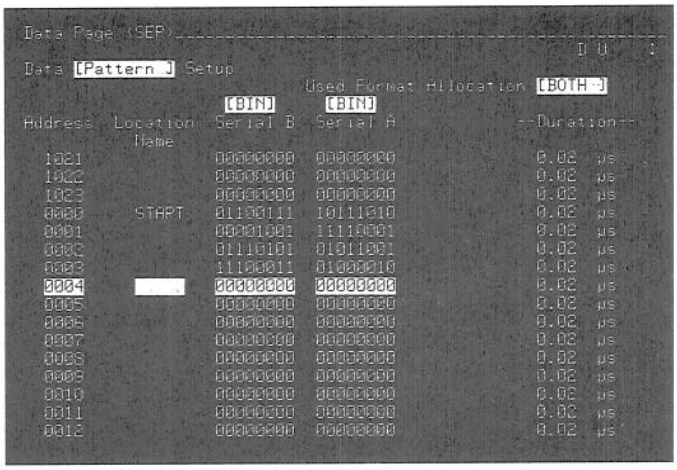
9. Sequence content can be produced only by changing the feedback conditions. Note point 7 above if you want to do this.

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

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:

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-lB (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.)

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

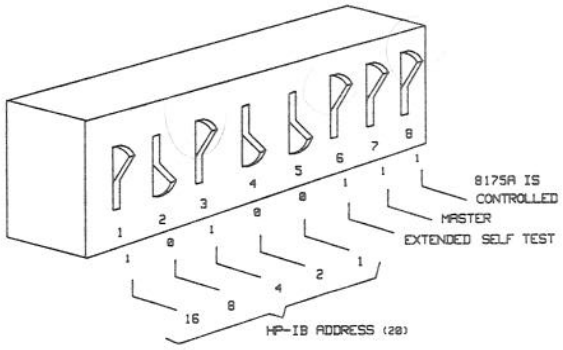


Figure 3G-1. HP-IB Switch Settings

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.

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:

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:

```
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
```

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.
```

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".
```

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
```

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;(0009);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:

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.

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

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.

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]

Commands of the PROGRAM Page

NOTE: Refer to section 3G-8, Example 11 and 12 to see how to use some of the following commands.

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Comments ref.
Program Page **Module** Assignment menu	PM	0	-	
Program Page **Trigger Event** assign. menu	PM	1	-	
Delete program module named "Label"	DPM	"Label"		C1
Add program module named "L" after last end	APM	"L","FA","SA",R		C2
Address Single Step	ASS			
Program Single Step	PSS			
Single Step from Start	SSM	0		
Single Step from JMP A	SSM	1		
Single Step from JMP B	SSM	2		
On START executive LABEL	OSTA	"LABEL"	-	C3
On JMP A executive LABEL	OJPA	"LABEL"		C3
On JMP B executive LABEL	OJPB	"LABEL"	-	C3
On CONT execute LABEL	OCON	"LABEL"		C3

Comments:

C1: Only available labels can be used. The delete-operation starts with the prgramm-line assigned to this label and ends with the next "end"-line (so called "programm-module".

C2: Only new labels can be used. "FA" and "SA" stand for "First Address" and "Last Address". Real addresses < 0 <= addr <=1023 (already defined) labels of the Data Page. The repetition of the program line is determined by R (1 <= R <= 255).

It is possible to transfer more than one program line within one command, but it must always be a complete defined line consisting of label, first and last address and repetition. (The label of the first line must be an alpha-label, the labels of the following lines can be skipped either by just sending ", ," or blank-labels. For example "" is sufficiant for sending a blank-label).

C3: Only available labels can be used.

PAGE INDEPENDENT COMMANDS

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Comments ref.
Cursor left	CL	-	-	C1
Cursor right	CR	-	-	C1
Cursor up	CU	-	-	C1
Cursor down	CD	-	-	C1
Label left	LL	-	-	C1
Label right	LR	-	-	C1
Label up	LU	-	-	C1
Label down	LD	-	-	C1
Roll left	RL	-	-	C1
Roll rigt	RR	-	-	C1
Roll up	RU	-	-	C1

Roll down	RD	-	-	C1
Clear entry	CE	-	-	C1
Update Hardware	UP	-	-	C1
Execute	EX			
Next ()	NX	-	-	C1
Previous	PV	-	-	C1
Decimalpoint	DP	-	-	C1
Don't care	DC	-	-	C1
START	SA	-	-	C1
STOP	ST	-	-	C1
Single Step	SS	-	-	C1
CONTINUE	CO	-	-	C1
PRINT SCREEN	PR	-	-	C1
PRINT ALL	PA	-	-	C1
DISABLE all outputs	DO	-	-	C1
LOCAL	LO	-	-	C1
Cursor Home	CH	-	-	
Display blank	DB	-	-	C2
Display read	DR	-		C3
Display write	DW	-		C4
Send buffered key (Returns Key-Command)	KE	-	-	
Edit Function INSERT	IN	-	-	
Edit Function DELETE	DE	-	-	
Edit Function COPY	CP	-	-	
Edit Function MOVE	MV	-	-	
Edit Function MODIFY	MD	-	-	
Edit Function FUNCTION	FU	-	-	
Power up, defaults all instruments Menus	PU	-	-	
Abort Key	AB			

Comments:

C1: This commands functions as detailed in front panel keys description at beginning of chapter 3.

C2: Display is only useful in special cases. So, before using ensure that Error message is active. Leave this function by calling "SMO" to activate Message-Process again.

C3: SYNTAX: DR <Row>, <Col>, <Byte_Count>
Where Byte_Count has maximum integer value of 1472 (23 Rows * 64 Columns)
Row is integer value with range 1 to 23
Col is integer value with range 1 to 64

C4: SYNTAX: This can be illustrated by the following to examples:
"DW 1,1,(String)" --> normal video
"DWI 1,1,(string) --> inverse video
In both cases, 1,1, are Row and Column data, and I is optional parameter specifying that string be displayed in inverse video.

ACTION MESSAGES

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Comments ref.
Reset all parameter and data to standard setting	RST	-	-	
Device Trigger, the same function as START (KEY or POD)	TRG	-	-	
The same action as DW	DSP	ROW,COL, "STR"	-	
Works like DCL or SDC	CLR	-	-	C1

Comments:

C1: CLR reset all Error information related to HP-IB (Status-Byte) and stops the active machine (like ST).

QUERY MESSAGES

These commands are a subset of "HP Common Instrument Capabilities"

Description/Requirement	mnem	data	COMMAND DETAILS: Unit	ref.	Comments
Returns the identification "HP8175A"	IDN?	-	-		C1
Returns Status Byte content	STB?	-	-		C2
Returns Error number	ERR?	-	-		C3
Returns buffered key, the same as KE	KEY?	-	-		
Returns display content, the same as DR	DSP?	ROW,COL,COUNT			-
Returns HP 8175A status information					C4

Comments:

C1: Returns

-- manufacturor	HP
-- Model Number	8175A
-- serial-number	0
-- firmware-level	1.0
-- FSCM number	0
-- number which identifies installed option like .. FINE TIMING-option	001

C2: Returns the content of the actual STATUS-BYTE currently stored in the IEC interface-chip (see definition below). Like a SERIAL POLL, this command resets the Status Byte only if the 8175A has set the SRQ.

C3: Returns the actual error-code number of the message displayed in the 8175A.

C4: Returns status-information with the following syntax:
STATUS (DATA ADDRESS, PROGRAM ADDRESS)
with STATUS=0 if stopped, 1 if running
DATA ADDRESS and PROGRAM ADDRESS are only available if the machine is stopped (STATUS =0).

LEARN STRING COMMANDS

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Comments ref.
Returns the whole Parameter set from defined location	SET?	LOC	-	C1
Accepts the restored parameter set in defined location	SET	LOC,#ALLD...D		C1
Returns DATA/TIMING and PROGRAM set from defined location	TD?	LOC		C2
Accepts the restored DATA/TIMING and PROGRAM set	TD	LOC,#ALLD...D		C2
Returns Flag Data with latched or transparent symbols	TF?	LOC	-	C3
Accepts FLAG DATA	TF	LOC,#ALLD...D		C3
Returns Input Trigger data	TQ?	LOC	-	C4
Accepts Input Qualifier data	TQ	LOC,#ALLD...D		C4

Comments:

C1: The parameter set contains Configuration and the value of all parameters (Standard and option). The location defines the source:

LOC=0 =>ACTUAL PARAMETER SET or
LOC=1 or 2 =>PARAMETER SET stored in location 1 or 2.
Without question mark the set can be restored in the same order.

C2: DATA/TIMING and PROGRAM data must be packed together. HP8175A accepts the whole string . The location defines the source:
LOC=0 => DATA/TIMING + PROGRAM of actual SET
LOC=1 or 2 => DATA/TIMING + PROGRAM of location 1 or 2
LOC3 => DATA/TIMING + PROGRAM of actual SET but preformatted for the **HARDWARE**!
Without question mark the set can be restored in the same order.
CAUTION: You can't restore a set read from location (0..2) into HARDWARE (LOC 3) or vice versa.

C3: Returns the content of OUTPUT FLAG's (and latched or unlatched symbols depending on flag-mode). The location defines the source:
LOC=0 => FLAG's of actual SET
LOC=1 or 2 => FLAG's of location 1 or 2
LOC=3 => FLAG's and TRIGGER of actua SET but preformatted for the **HARDWARE**!
Without question mark the set can be restored in the same order.
CAUTION: You can't restore a set read from location (0..2) into HARDWARE (LOC 3) or vice versa.

C4: Returns the content of INPUT TRIGGER.
The location defines the source:
LOC=0 => TRIGGER of actual SET
LOC=1 or 2 => TRIGGER of location 1 or 2
LOC=3 => FLAG's and TRIGGER of actual SET but preformatted for the **HARDWARE**! (handled identical to TF 3 or TF? 3)
Without question mark the set can be restored in the same order.

C5: The syntax for the returned Status is: STATUS (,DATA ADDR., PROGRAM ADDR.); STATUS = 0 -> STOPPED, STATUS = 1 -> RUNNING. DATA ADDR and PROGRAM ADDR is only available if machine stopped.

SERVICE REQUEST MESSAGE

Description/Requirement	COMMAND DETAILS: mnem	data	Unit	Comments ref.
Mask Service Request	SRM	NRx	-	C1

Comments:

See section 3G-3 in this manual, for information about programming the SRQ mask.

UNIVERSAL COMMANDS

For all these commands the attention bus line (ATN) must be "true".

GTL	Go to Local
SDC	Selective Device Clear (same as CLR), Clear I/O-Buffer, stop any current Operation
DCL	Device Clear (same as CLR)
GET	Group Executive Trigger (same as TRG)
LLO	Local Lockout
SPE	Serial Poll Enable
SPD	Serial Poll Disable

Appendix A
Error Messages

This appendix comprises two sub-appendices. The first (A-1), explains "power-up self test" detected error messages. The second (A-2), lists the messages and warnings which may be displayed as a result of operator action.

Appendix A-1
Power-up Detected Error Messages

This sub-appendix explains the error messages which may be displayed, following a fault detected during the power-up self test routine. The possible messages are as follows:

ERROR MESSAGES ON POWER-UP

Processor Board ERROR

Clock Board ERROR

Data Board ERROR

In the event of any error message being displayed, it is recommended that the user contact the nearest Hewlett Packard Sales/Service Office. However, the following points should also be noted:

To confirm that an error condition exists, switch the 8175A off and on again. If the error message is again displayed, then you can under certain conditions continue using the 8175A. A choice of whether to continue using the 8175A or not will be given. This is done via the messages:

"cannot continue"
and
"press any key to continue"

Any error message indicates that a fault exists within the instrument, therefore, remember this if you decide to continue.

NOTE: There is in fact, a built in "Extended Self Test" capability which enables the fault to be localised. This is detailed in the Service manual.

Appendix A-2
Operator Action Related Error Messages

This appendix details the Error and Warning messages which may be displayed due to operator action. Almost of the messages are either self-explanatory, or explained in the relevant Menu Map section. Therefore, where an explanation is necessary, genearally a reference is made to the relevant page(s) in the manual. Two lists are include here, the second one includes the numeric error codes corresponding to each message etc. These are the codes returned when the HP-IB command "ERR?" is sent to the 8175A (see Query Messages section in list of HP-IB Commands). They therefore enable the corresponding message to be identified.

Alphabetic List of Messages

Message	Comments
Address > 1023	
Address Single Step CONT-Mode	see page 3-55
Address Single Step INIT-Mode	see page 3-55
Delete To Remove Channel	
Delete To Remove Field	
Delete To Remove Segment Line	
Difference Display-Generator	see page 3-55
Error Address From > Address To	
Error All Names Must Be Unique	
Error Alpha Character expected	
Error Conflict Between fields	
Error Data Value Too Large	
Error Declare Printer Type	
Error Difference Between Labels	
Error Don't Care Not Allowed	
Error [end] Still Existing	
Error Entire Word Don't Care	
Error Empty Storage Location	
Error Fill Fields Before new Insert	
Error Fix Configuration Problems First	
Error Fix Problems First	
Error Generator Doesn't Fit	
Error Illegal File Name	
Error Invalid Conflict Number	
Error Invalid Duration Value	
Error Label Or Address Required	
Error Memory Exceeds	
Error Min. One 'End' Required	
Error Numeric Entry Required	
Error No '.' Between 0,1 or x	
Error No PRBS Seq. Producable	
Error Out Of Range	
Error Resolution 10ns	
Error Resolution 1us	
Error Resolution 100us	
Error Resolution 100ms	
Error Resolution 1 Cycle	
Error Resolution 0,1 KCycles	
Error Resolution 10 KCycles	
Error Resolution 1 MCycle	
Error Repetition > Avail. Program Steps	
Error Repetition Must Be > 0	
Error Space Between Digits	
Error Use Alphanumeric Keys	
Error Use Graphic-Printer	
Error Use Hex Keys	
Error Use [Next] [Prev] Keys	
Error Use 0 thru 7	
Error Use 0 thru 3	
Error Use 2 thru 4	
Error Use 2 thru 9	

Error Use 0 thru 2
Error Use 0, 1 or '.'
Error Use 0, 1 '.' or Don't Care
Error Use 0, 1 or [Prev] [Next]
Error Use 2 or 1
Error Use 2 or 3
Error Value Is Too Large
Error Value Is Too Low
Error Value Not Allowed
Error Value Out Of Range
Insert To Add Channel
Insert To Add New Segment Line
Invalid Clock Setting
Label Doesn't Exist see page 3-63
Move In Execution
Number Expected
One, * Required
Press Clear Entry To Reset SST
Press EXEC To Active Function
Press EXEC To Start Autocal
Press EXEC To Start FREQ-CAL
Press EXEC To Release Function
Printer Down
Power-up Complete
Program Single Step CONT-Mode see page 3-55
Program Single Step INIT-Mode see page 3-55
Reset Single Step see page 3-58
Roll To Change Configuration
Running Autocal see page 3-31
Running Press Stop Key First
To Continue LOAD, Press EXEC
To Continue, Press EXEC
To Overview, ex, File, Press EXEC
Transfer Failed
Transfer In Process
Use SHIFT-ROLL To Select Channel
Wait File Not Found
Wait Function In Progress
Wait Print In Progress
Warning Actual Setting Destroyed
Warning Address Required
Warning Clock Calibration Failed
Warning Clock Error Press Start
Warning Clock Too Fast
Warning Clock Too Slow
Warning End Of DATA-Setup
Warning Ignored In Slave-Mode
Warning INS/DEL In Pending Line Only
Warning Label Name Required
Warning Maximum Insert's Used
Warning Max. Segment Labels Used
Warning No Binary Channel Available
Warning Segment Name Required
Warning System HP-IB Controlled

Error Code/Message Cross Reference

Error Code	Message	
1	Power Up Complete	
2	"_",0	
3	Command ignored	
4	Value Not Allowed	
5	Use [NEXT] [PREV] Keys	
6	Numeric Entry Required	
7	Use Hex Keys	
8	Use Alphanumeric Keys	
9	Press STOP Key First	
10	Fix Problems First	
11	DON'T CARE Not Allowed	
12	Use 0 or 1	
13	Print In Progress	
14	Use 0 thru 7	
15	Printer Down	
16	Use 0 thru 3	
17	Use 2 thru 4	
18	Value is Too Large	
19	Alpha Character Expected	
20	Use 2 or 3	
21	All Names Must Be Unique	
22	ROLL To Change Configuration	
23	Fix Configuration Problem First	
24	INSERT To Add New Label	
25	DELETE To Remove Field	
26	Label Name Reqired	
27	Value Is Too Low	
28	Maximum INSERT's Used	
29	HP-IB Address Conflict	Displayed if either the Disc Drive and/or Printer HP-IB actual addresses not as set on 8175A, and attempt made to store or print etc.
30	Machine Type Changed	Disc Drive related, if configuration to be loaded back to 8175A is different from actual.
31	Value Out Of Range	
32	Press EXECUTE To Start Autocal	
33	AUTOCAL	
34	Use 2 thru 9	
35	Use 0 thru 2	
50	One, * Required	
51	Use 0, 1 or "."	
52	Press EXECUTE to start FREQ-CAL	
53	Space between Digits	
54	Number Expected	
55	Address > 1023	
56	Label doesn't Exist	
57	Value Is Too Large	
58	Min. One 'end' Required	
59	Address Required	

60 Entire Word DON'T CARE
61 Use SHIFT-ROLL To Select Channels
62 Label Or Addr. Required
63 Function In Execution
64 Data Value Too Large
65 Address from > Address to
66 Memory Exceeds
67 End Of DATA-Setup
68 Fill Fields before new INSERT
69 INSERT To Add New Segment Line
70 MOVE In Execusion
71 Range Overlap
72 Invalid Conflict Number
73 Rept. > avail. Program Steps
74 [end] Still Existing
75 Difference Between Labels
76 Disp Scale/Dur. Incompat
77 Press Update First
78 Use 0,1 '.' or DON'T CARE
79 No '.' Between Fields
80 Conflict Between Fields
81 Press EXEC To Release Function
82 Press EXEC To Check Disc
83 Press EXEC To Activate Function
84 Transfer Failed
85 Transfer in Progress
86 Actual Setting Destroyed
87 Empty Storage Location
88 General doesn't Fit
89 Clock Calibration Failed
90 Use 0,1 or [PREV] [NEXT]
91 Max. Segment Labels Used
92 Resolution 10 ns
93 Resolution 1 us
94 Resolution 100 us
95 Resolution 10 ms
96 Resolution 1 Cycle
97 Resolution 0,1 kCycle
98 Resolution 10 kCycles
99 Resolution 1 MCycle
100 Invalid Duration Value
101 Out Of Range
102 No PRBS Seq. Producable
103 Out Of Range
104 Reset Single Step
105 Use Graphics-Printer
106 Declare Printer Type
107 Press CLEAR ENTRY To Reset SST
108 Program Single Step
109 Valid Module Required
110 Max. Segment Labels Used
111 Address Single STep
112 Ignored In Slave-Mode
113 Clock Too Fast

114 Clock Too Slow
115 Clock Error
116 System HP-IB Controlled
117 INS/DEL In Pending Line Only
118 INSERT To Add Channel
119 DELETE To Remove Channel
120 Segment Name Required
121 DELETE To Remove Segment Line
122 No Binary Channel avail.
123 To Continue LOAD, Press EXEC
124 To Overwrite ex. File. Press EXEC
125 To Confirm, Press EXEC
126 Illegal File Name
127 File Not Found

Appendix B
Using A Printer

INTRODUCTION

This appendix describes how to use an HP 2225A Thinkjet graphics printer in conjunction with the 8175A. The generator can be connected through an HP-IB interface cable to such a printer (and other types) that understands the HP-IB command set. The generator can control the printer to obtain hard copies of any its displays, as well as hard copies of the entire content of its data memory. This appendix lists the steps required to connect an HP 2225A to the generator and obtain hard copy.

Note that,a **Graphics** printer enables copies of all displays, including Data Page timing diagrams, to be printed. A **Text** printer will not print any graphics details, including inverse video fields etc. A "Text print" is generally significantly faster than a graphics one. The printer type that you set, determines the code for information transfer from the 8175A to an external printer.

The speed with which you can obtain a copy of a display depends upon which printer you are using. The complexity of the display you want to copy, and whether you are using a text or graphics printer. Use the following information as a guide to estimating the printer speed of your system.

Approximate time required to print the following using an HP 2225A Thinkjet graphics printer (note that the first three examples are for "Text" prints):

Small menu (e.g., Clock menu),	Text	9 sec. approx.
Large menu (e.g., Data Pattern Setup)	Text:	16 sec. approx.
Complete Data Settings (Print all)	Text:	17 min.
Timing Diagram (Waveform Setup)	Graphics:	47 sec.

OBTAINING HARD COPY FROM A PRINTER

The following procedure is written to help you hook up a printer through an HP-IB interface cable, and obtain hard copies of displays.

1. Connect an HP-IB interface cable between the generator rear panel and the printer.

2. Set address switch on the generator rear panel HP-IB System switch to the "8175A is Controller" position (switch element 8 to 0).

3. Set the printer to the "Listen Only" mode.

4. Turn on operating power at the printer.

5. Turn generator LINE power off and then on again. When the generator executes its power-up routine, it will read the position of the address switches. To check this, select the SYSTEM Page **[Peripherals]** menu , and see that the display says, "System Controller: 8175A is controller".

6. On the same menu, set (via the **NEXT[]/PREV[]** keys) a printer in the "Printer connected" field. **[Text]** or **[Graphics]** printers are selectable.

7. Set up a display on the generator that you would like to copy and press the shift **PRINT** keys. The generator will send the commands required to obtain a complete copy of the display. If you copied a data pattern display, note that the line number which was in inverse-video is underlined in the print using HP-text and in inverse-video using HP-graphics.

9. You can obtain a copy of the data memory beyond the portion shown on the display, if desired. To do this, display the **[Pattern]** menu on screen. Then use the ROLL keys to get the first line of the desired copy on screen (if you want to start your copy at the line 0100, roll the display to the point where line 0100 is the top line on screen).

10. Press the blue shift key and **PRINT ALL** key. The generator will activate the printer and start printing with the top line on screen. It will continue to send print information to the printer until the entire content of the data memory has been printed. It will resend the heading information each time it starts a new page.

11. You can stop the print before the entire 1K memory has been printed, if desired. To do this, press the 8175A **STOP** key. When you press the **STOP** key, the generator will stop sending new information to the printer buffer. The information for the lines on screen will already be in the printer buffer. The print will continue until the last line of the present display is printed. Then it will halt.

USING A CONTROLLER TO OPERATE THE GENERATOR AND PRINTER

The printer can also be controlled via the computer, by sending HP-IB commands. This involves the following procedure:

First reset the generator address switch to the HP-IB CONTROLLED position. Set a suitable address on the printer. (Printer HP-IB address: This defaults to 01, however it can be manually set to any number between 00 and 30 if no other instrument is assigned to that address.)
Cycle the generator LINE power. Check to see that SYSTEM Page **[Peripherals]** menu shows that the generator is controlled and that it lists the printer address.

To program the commands, refer to the following program example which illustrates how to control the printer from the controller. Note that PR or PA can be used depending on the requirement.

Note that, the Status Byte (Bit 1, Print Complete) can be used to tell the controller when the print is complete. Mask Bit as explained in the Programming information section (page 3-85) to achieve this.

```
10   SEND 7;UNL                !UNLISTEN
20   SEND 7;MTA LISTEN 20      !Controller TALKER ADDRESS, 8175A LISTEN ADDRESS=20
30   SEND 7;DATA "PR",13,10    !SEND DATA "PRINT" WITH CR/LF (PR or PA)
40   SEND 7;TALK 20            !8175A TALK ADDRESS=20
50   SEND 7;UNL                !UNLISTEN
60   SEND 7;LISTEN 1           !PRINTER LISTEN ADDRESS=1
70   SEND 7;DATA               !SET ATN TO FALSE
80   END
```

Appendix C
Using The Disc Memory Accessory

CONTENTS

INTRODUCTION

This appendix describes how to use an HP 9121S/D or 9122S/D Flexible Disc Drive as an accessory to store and load data patterns etc. It includes a shortform description of how to start using the disc drive. This goes through the basic steps necesassary for storing a file on disc.

The Disc Drive can be controlled directly by the 8175A when it (the 8175A) is set to be the HP-IB controller. Various prompts/Warnings and Error messages etc., enable easy control of all functions associated with the Disc·Drive.

If either of the dual type disc drives (D) is used, note that the 8175A can be addressed to only one of the disc units at a time.

CONNECTING THE DISC DRIVE

To connect the disc drive, do the following:

1. Connect power to the disc drive.

2. Connect an HP-IB cable form the signal generator HP-IB output to the disc drive HP-IB connector.

3. Set the HP-IB address switches on the rear panel of the disc drive to the desired operating address. More than one disc drive may be connected to the HP-IB, however, each must have a unique address assignment. Note, if you also want to control a printer at the same time, ensure that all addresses are unique!

4. Apply power to the disc drive. When power is applied to the disc drive it goes through an initialization sequence which causes the indicator lamps to momentarily light.

5. Install one or two (as appropriate) flexible discs into the disc drive by pressing the disc all the way into the disc drive unit.

SETTING THE 8175A AS THE HP-IB CONTROLLER

To be able to control the dsic drive from the 8175A, the 8175A must be set as the HP-IB controller. This is done by simply setting switch element 8 on the (rear panel mounted) HP-IB System switch to 1. The 8175A checks the status of this switch only during the power on sequence, so you may need to switch the 8175A off and on again.

INPUTTING THE DISC DRIVE ADDRESS TO THE 8175A

The disc drive address, and the identifying number of the specific disc unit to be used, must be manually input to the 8175A. You do this via the corresponding fields on the **SYSTEM** Page [Peripherals] menu.

HOW TO START USING THE DISC DRIVE

This section is intended as a quick "Getting Started" explanation of how to use the disc drive. It describes the basic steps necessary to enable you to start using the disc drive as soon as possible. Detailed descriptions of the **[Storage] [external]** menu and how to Load, Store, Find, Delete and Format, are given after this section. You should refer to them as necessary.

To start using the disc drive (with an unformatted disc), steps 1 to 5 as previously mentioned must first be done. Then access the **SYSTEM** Page **[Storage]** menu and select **[external]** via the **PREV[], NEXT[] keys**. The 8175A will search for the disc and then display the **[Storage] [external]** menu. The basic details of the menu are described in conjunction with Figure C-1.

How to Format a disc
Before storing any settings on a new disc, the disc needs to be formatted to LIF format. This is done by positioning the cursor in the Operation field and selecting **[Format disc]**. Then press **EXEC** and move the cursor into the new setting field which will be displayed. Input a "Y" to confirm. You can now store a file on the disc, as described in the next paragraph.

How to Store a disc file
Select the Store capability of the Operation field. The **[Store]** related menu details are shown in Figure C-1. To store for example, the current display settings, do the following:

set **from Location** to **ACT**
set **File Name** (any name, 1 to 10 characters long, first must be alpha.)
set **File Type** **all**
set **Description** (optional, up to 26 characters)

Then, to actually store the data:

Press **EXEC**, the 8175A will first check the disc, then store the data. When storage is completed, the file information will be displayed under the appropriate File directory headings. If the message "No LIF directory" is displayed, then reformat the disc. (It means either, in the case of a new disc that it was not correctly formatted or, for a used disc, that it was previously formatted in some other non-LIF format)

THE STORAGE OPERATIONS MENU

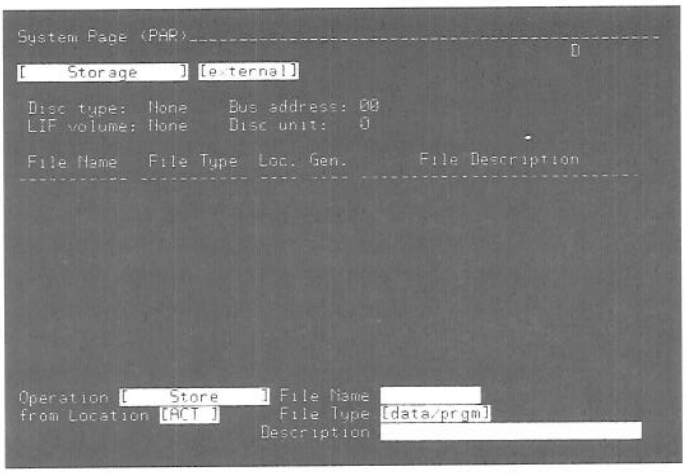


Figure C-1. **[Storage][external]** menu

Figure C-1 shows the menu as in the **[Store]** configuration. The first fields described in the following explanation are all display ones, i.e., no values can be directly set in them by the user. The lower part of the display includes all fields associated with actual storage, loading, formating etc.

DISPLAY CONTROL FIELDS	SETTINGS EXPLANATION
Disc type:	This defaults to None. When a disc is installed in the drive, and the drive has been checked (following: a disc operation such as **[Store]**, **[Delete]** etc.,or a change from **[internal]** to **[external]**, or pressing EXEC when cursor in the **[Storage]** field, then the model number of the particular disc drive will be displayed.
Bus address:	This defaults to the lowest available HP-IB address (i.e., defaults to 2 if the 8175A is set to 0, otherwise will be at address 0). It displays the actual disc drive address (when a disc is installed etc.) as set on the [Peripherals] menu.
LIF volume:	This defaults to None. A "word" will be displayed e.g., L8175A (if the 8175A initialized the disc) when the disc is read. It identifies the instrument which initialized the disc.
Disc unit:	This defaults to 0. It will display the unit number as set on the **[Peripherals]** menu when a disc is installed etc.

File Directory Details
The File directory details for each file, depend upon the settings in the corresponding **[Store]** fields. Details are as follows:

Operation:	The setting in this field determines which type of operation will be done. Each operation is described within this appendix. The **[Store]** related setting fields and their significance, are as follows:
File Name:	An appropriate File name, between 1 and 10 alphanumeric characters long, begining with an alpha character, must be set here.
from Location:	Four different source locations for the data are to be stored are available. Use the **NEXT[]/PREV[]** keys to select: **ACT** means the current display settings. **ACT*** means the hardware (output) settings. **LOC1** means from internal storage LOC1. **LOC2** means from internal storage LOC2. Note that when **ACT*** data is loaded into the 8175A it will be transferred directly to the hardware.
File Type:	Four different file types are available. Only "all" will result in the complete instrument settings being stored. For each of the others, specific types of data and/or parameters will be stored. This means also, that limited updates of the 8175A can be done, leaving for example current data settings unchanged. **data/prog** means just settings associated with the DATA and PRGM Pages menus. **flags** means only Flag settings. **trigger** means only Trigger Word Assignment menu settings.
Description:	A description, up to 26 alphanumeric characters long (as from the 8175A alphanumeric keyboard) can be user set.

The following paragraphs explain how to do Load, Store, Find, Delete and Format.

HOW TO LOAD A DISC FILE

1. Display the **[Storage] [external]** menu. This will result in the directory of the files being displayed.

2. Move the cursor into the Operation field and press the **NEXT[]/PREV[]** keys until **[Load]** is displayed. Select an existing file from those displayed. Note that a file with file Type "unknown" cannot be loaded into the 8175A. Enter the file name in the appropriate field and press EXEC to load the file from the disc. You can then select the destination location for the file. Finally, to actually load the file, press EXEC again.

HOW TO STORE A NEW DISC FILE

1. Display the **[Storage] [external]** menu. This will result in the directory of the files being displayed.

2. Move the cursor into the Operation field and press the **NEXT[]/PREV[]** keys until **[Store]** is displayed. Input the data to the various fields as required. This is described under "How to Start Using the Disc Drive" in the the opening sections.

3. Press **EXEC** to store the file on the disc.

HOW TO FIND A DISC FILE

1. Display the **[Storage] [external]** menu. This will result in the directory of the files being displayed.

2. Position the cursor in the Operation field and select **[Find]**.

3. Move the cursor into the File Name field and enter the name of the file that is to be found.

NOTE

If the file cannot be found, the message **"File not found"** will be displayed.

4. Press the EXEC key to actually find the file name in the directory. It will be indicated by a pointer >.

NOTE

The file name is located in the directory, however, the file must be loaded into the 8175A memory in a separate operation. If the file is not found, the directory pointer will be left pointing to the file that is alphabetically following the file that could not be found.

HOW TO DELETE A DISC FILE

1. Display the **[Storage] [external]** menu. This will result in the directory of the files being displayed.

2. Position the cursor in the Operation field and press the **NEXT[]/PREV[]** keys until **[Delete]** is displayed in the field.

3. Move the cursor into the Name field and enter the name of the file to be deleted. Press the EXEC key once, a prompt "To, confirm press EXEC"will be displayed. Press **EXEC** again to actually start the delete operation.

HOW TO FORMAT A DISC

CAUTION

Anything stored on the disc that is being formatted will be erased during the Format Disc operation.

When a disc is formatted the disc directory is set up to contain a maximum of 255 file name entries. The number of data files that can be stored on a disc is determined by amount of data to be stored. Normally it will be impossible to store enough data on the disc to fill the directory. The disc is formatted as follows:

1. Display the **[Storage] [external]** menu. This will result in the directory of the files being displayed.

2. Press **PREV[]/NEXT[]** keys until **[Format disc]** is displayed. No other selections are required.

3. Press the **EXEC** key. The message "Enter "Y" to confirm " will be displayed. The cursor must be moved to the entry field following the >, and a "Y" placed in that field.

CHAPTER 4
PERFORMANCE TEST

4-1 INTRODUCTION

4-2 The test procedures detailed in this section are for electrical performance of HP 8175A units using the instrument specifications of Table 1-2 as performance standards. Access to the interior of the instruments is not necessary for any of the following tests.

4-3 EQUIPMENT REQUIRED

4-4 Equipment necessary for performance testing is listed in Table 1-1, Recommended Test Equipment. Alternative test equipment may be substituted for recommended models, provided that it satisfies the critical specifications given in the table.

4-5 TEST RECORD

4-6 A tabulated Test Record listing all of the tested specifications and their acceptable limits is provided at the end of the procedures. Test results recorded at incoming inspection will provide a reference for periodic calibration, troubleshooting and after-repair testing.

4-7 PERFORMANCE TEST

4-8 During any performance test, all shields and connecting hardware must be in place. All tests are designed to verify the published specifications. It is recommended that tests be performed in the sequence given, and that all data be recorded on the test record provided at the end of the test procedures.

4-9 Each test is arranged in the order that its specification appears in Table 1-2. Note that the instrument should be given a 30 minute warm-up period before the commencement of any of the following tests.

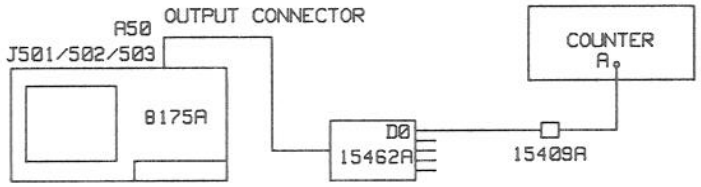
4-10 DATA CAPACITY TEST

Specification	parallel	serial
Number of channels	24	2
Bits per channel	1024	8192
Max. Bit rate per channel	50 Mbits/NRZ	100 Mbits/NRZ

Equipment:

8175A, Output Pod, Counter, 15409A

Test set up:



Procedure:

8175A: Recall Standard Settings
SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] >NEXT = [recall] Standard Settings >
EXEC

SYSTEM > NEXT = [Configuration] > CURSOR↓ = Serial Data-Generator (Ser) >
DATA > NEXT = Data [Pattern] Setup >
blue > DATA = MODIFY > 10101010 10101010 > from Address > 0 to 1023 > EXEC >
DATA > PREV = [Format] > CURSOR↓ = Period 0.02 [us] > 0.1 >
blue > EXEC = UPDATE
OUTPUT = [disabled] > NEXT = [enabled]

Counter:

TRIG LVL A 1.2, TOT A, Z=1 MOhm, GATE MODE, MANUAL

Serial Configuration Test:

1. Connect POD 0 Ch. 0 to the A input of counter and press on 8175A START.
   The counter reading must be = 4096.
   Connect POD 0 Ch. 2 to the counter. Reset counter.
   After pressing 8175A START, counter reading must be = 4096.

2. Set 8175A:
   DATA > NEXT >
   blue > DATA = MODIFY > 01010101 01010101 from Address > 0 to 1023 > EXEC >
   DATA > PREV = [Format] > CURSER↓ = Period > 0.05 [us] >
   blue > EXEC = UPDATE
   Reset counter. After pressing 8175A START, counter reading must be = 4096

3. Connect POD 0 Ch. 0 to the counter. Reset counter.
   After pressing 8175A START, counter reading must be = 4096.
   Set 8175A: Period to 0.01 us UPDATE > START.
   Counter reading must be = 4096.

Parallel Configuration Test: (same test setup)

4. Set 8175A:

   SYSTEM > CURSOR↑ = Parallel Data Generator >
   DATA > NEXT > CURSOR↓ = Address 1023 > CURSOR→ = Used Data Format >
   ROLL↑ > CURSOR→ = POD0 CH7 > 01010101 >
   10101010 10101010 10101010 (Address 0001) >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0001 > 0002 > EXEC >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0003 > 0004 > EXEC >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0007 > 0008 > EXEC >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0015 > 0016 > EXEC >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0031 > 0032 > EXEC >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0063 > 0064 > EXEC >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0127 > 0128 > EXEC >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0255 > 0256 > EXEC >
   blue > TIMING = COPY > Copy Address from > 0000 to > 0511 > 0512 > EXEC >
   blue > EXEC = UPDATE > START

5. Press 8175A START key and check each Channel of POD0, POD 1 and POD 2 for a counter reading of 512 (Pressing 8175A START).

6. Change as shown below:

Address	POD 2	POD 1	POD 0
0000	10101010	10101010	10101010
0001	01010101	01010101	01010101

   and copy it the same way as before.
   Check each Channel of POD 0 , POD 1 and POD 2 for a counter reading of 512 (pressing 8175A START).

4-11A PATTERN DURATION WITH INTERNAL CLOCK PARALLEL MODE

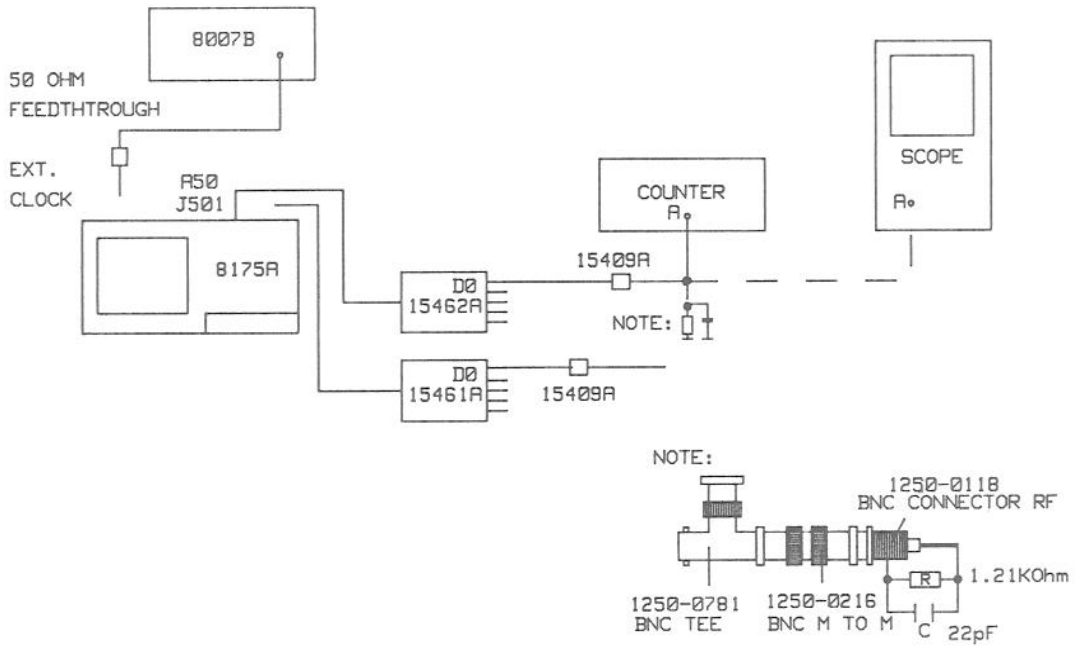
Specification:

Range	Resolution	Accuracy
(10)* 20 ns - 9.99 us	10 ns	± 0.05% of prog. duration ± 2 ns (asynchron startable)
10 us - 999 us	1 us	
1 ms - 99.9 ms	100 us	
100 ms - 9.99 s	10 ms	± 0.5% of prog. duration ± 2 ns (synchr. startable, Clock Calibration)
*10 ns in serial mode with fixed timing		
		± 3% of prog. duration ± 2 ns (synchr. startable, no Clock
Calibration)		

Equipment:

8175A Output POD, Counter, Time Mark Generator, Oscilloscope, 15409A

Test set up:



Procedure:

8175A: Recall Standard Setting

SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Settings > EXEC

CNTRL = [Clock] > CURSOR↓ = Mode [Single Cycle] > NEXT = [Auto-Cycle] >
DATA = [Format] > CURSOR↓ = Label A >
blue > SYSTEM = INSERT new Label > B > CURSOR→ = POD 0/Ch 0 > NEXT = * >
DATA > NEXT = Data [Pattern] Set up > CURSOR↓ = Used Format Allocation [A] > NEXT
=[B] > CURSOR↓ = Address 0000 > CURSOR→ = Data 0 > 0 > 1 (Address 0001 = 1) > ROLL
VERNIER↓ 2x = Address 0000 >
PRGM = Module > CURSOR↓ = Segment Name PROG 1 > CURSOR→ = Label or Address
1023 > 0001 >
blue > EXEC = UPDATE >
OUTPUT = [disabled] > NEXT = [enabled] >
SYSTEM > NEXT = [store] in location [LOC1] Description > CURSOR→ = Description > P D
> EXEC > START

Set Counter:

Trigger Level A und B 1.2V
Time A --> B
Auto Trigger OFF
Gate Mode Min
Channel A⁄ and B\ , Z=1 MOhm, COM A
Statistics Mean

1. Using the time mark generator, check the oscilloscope time base accuracy in the 0.05 usec/Div x 10 Range. Note error and take timebase error into account.
   Connect POD 0 Channel 0 to oscilloscope and check for 20 ns.
   Connect POD 0 Channel 0 to the A input of counter.
   Program counter time offset so that 20.0 ns duration (+- noted error) is displayed.
   E.G. OFFSET > (CHS) > x.x > EEX > CHS > 9 > ENTER.

2. Measure pattern duration in Mode:
   [Auto-Cycle] [asynchron] startable against Table 4-1

   Set 8175A:
   Data Page (PAR)
   Data [Format] Allocation

   After each new Period Setting press STOP > UPDATE > START

   Table 4-1

Period	Counter Reading low limit	high limit
0.05 us	47.975 ns	52.025 ns
0.09 us	87.955 ns	92.045 ns
0.10 us	97.955 ns	102.05 ns
0.5 us	497.75 ns	502.25 ns
0.9 us	897.55 ns	902.45 ns
1.00 us	997.5 ns	1.0025us
5.00 us	4.995 us	5.004 us
9.00 us	8.993 us	9.007 us
50.0 us	49.97 us	50.03 us
100 us	99.95 us	100.05 us
500 us	499.75 us	500.25 us
900 us	899.55 us	900.45 us
10.0 ms	9.995 ms	10.005 ms
1.00 ms	999.5 ms	1.0005ms
9.99 ms	9.985 s	9.995 s

3. Same test set up:
Measure pattern duration in Mode:
[Auto-Cycle] [synchron] startable. (See Table 4-2).
Set 8175A:
CNTRL > CURSOR→ 2x > NEXT = [Auto-Cycle] [synchron] startable > DATA = Period

After each new Period Setting press STOP > UPDATE > START

Table 4-2

Period	Counter Reading low limit	high limit
0.10 us	95.00 ns	105.00 ns
1 us	968 ns	1.032 ns
9.00 us	8.953 ns	9.047 us
100 us	97 us	103 us
900 us	895.5 us	904.5 us
10 ms	9.7 ms	10.3 us
1 s	970 ms	1.03 s

4. Same test set up:
Measure pattern duration in Mode:
[Auto-Cycle] [synchron] startable with [Clock Calibration]. (See Table 4-3).
Set 8175A:
CNTRL = [Auto-Cycle] [synchron] startable >
Data = Period > 0.1 (after the first Period setting) > STOP > UPDATE >
CNTRL > CURSOR→ = [Clock Calibration] > EXEC > START

After each new Period Setting press STOP > UPDATE > START

Table 4-3

Period	Counter Reading low limit	high limit
0.10 us	97.5 ns	102.5 ns
1 us	993 ns	1.007 us
9.00 us	8.728us	9.272 us
100 us	99.5 us	100.5 us
900 us	873 us	927 us
10 ms	9.95 ms	10.05 ms
1 s	995 ms	1.005 s

4-11B PATTERN DURATION WITH INTERNAL CLOCK SERIAL MODE

5. Same Test set up
Set 8175A:
SYSTEM = [Configuration] > CURSOR↓ = Serial Data Generator (SER)

CNTRL Mode: [Auto-Cycle]
or [Auto-Cycle] [synchron] startable
or [Auto-Cycle] [synchron] startable with [Clock Calibration]

DATA = [Format] >CURSOR↓ = Period > 0.1 [us]

DATA > NEXT = Data [Pattern] Set up > CURSOR→ = Both > NEXT = SER A > CURSOR↓ = BIN > PREV = HEX > CURSOR↓ = ADDRESS 0000 > CURSOR→ = Data 00 > 55 > 55 (Address 0001 = 55) > ROLL VERNIER↓ 2x

DATA > PREV = [Format] > CURSOR↓ = Period > STOP > UPDATE > START

6. Measure serial pattern duration with scope in each mode against Tabel 4-4.
After each new Period setting press STOP > UPDATE > START.

Table 4-4

Period	Counter Reading low high	low high	low high
.10 us	97.95ns 102.05ns	95.00ns 105.00ns	97.5ns 102.5ns
.02 us	17.99ns 22.01ns	17.4 ns 22.6 ns	17.9ns 22.1 ns
* .01 us	7.995ns 12.005ns	7.70 ns 12.3 ns	7.95ns 12.05ns
	auto-cycle asynchr. start	auto-cycle synchr. start	** auto-cycle synchr. start with clockcal.

Note:
* Serial Pattern Duration of 0.01 µs only possible with Pod 15461A!
** After changing the Mode (e.g. asynchron, synchron), a new Clock Calibration is necessary.

(Measure slower period settings with counter, specifications see Tables 4-1/ 4-2/4-3.)

4-11C PATTERN DURATION WITH EXTERNAL CLOCK PARALLEL MODE

7. Same Test set up: and 8007B

   Set 8175A:
   SYSTEM > PREV = [Storage] > CURSOR↓ = [store] > NEXT = [recall] from Location [LOC 1] > EXEC >
   CNTRL > CURSOR↓ = System Clock [internal] > PREV = [external from rear panel BNC] >
   DATA 2x > NEXT = Data [Format] Allocation > CURSOR↓ = Period 2 [Cyc]

   Set 8007B:

   Period 10 ns, Width min, Delay min, TT min, Ampl. +2V, NORM, +, OFFSET OFF

   Connect 8007B output signal via 50 Ohm feed through to the EXT CLOCK BNC input 8175A rear panel.

8. Measure pattern duration of Pod 15462A against Table below:

   Table 4-5

Period (Press START after each new setting!)	Counter Reading approx.
2 [Cyc]	20 ns
50 [Cyc]	500 ns
5 [KCyc]	50 us
5 [MCyc]	50 ms
50 [MCyc]	500 ms

9. On Data Page (PAR) > CURSOR↑ = Duration : [fixed] > NEXT = [variable] >
   DATA > NEXT = Data [Pattern] setup > CURSOR↓ = Address 0000 > CURSOR→ = Duration 2 > 10 > ROLL↑ > 100 >
   STOP > blue > EXEC = UPDATE > START

10. Measure on counter 1 us
    Change on counter the trigger slope: Channel A ⟍, Channel B ⟋.
    Counter reading = 100 ns.

4-12 CLOCK TEST

4-12A PERIOD WITH INTERNAL CLOCK

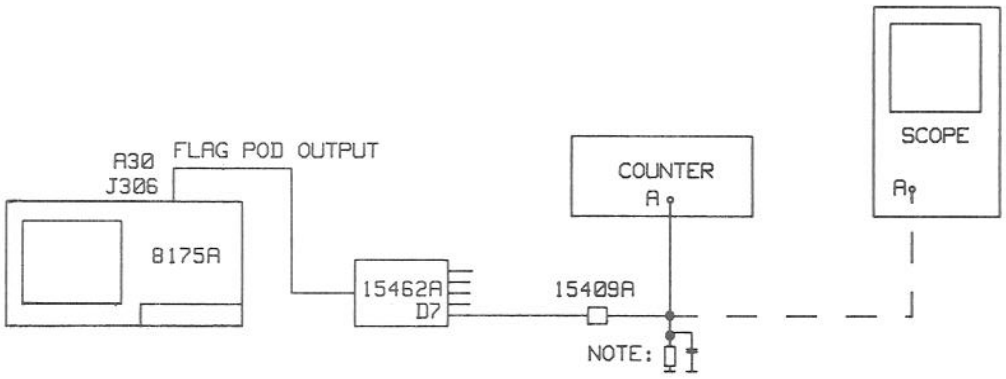
Specification:

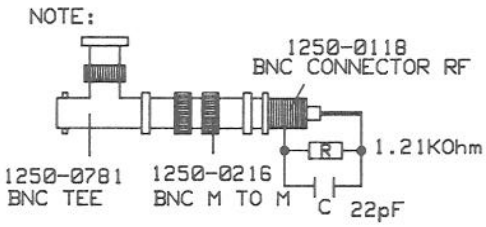
Range	Resolution	Accuracy
20 ns - 9.99 us	10 ns	± 0.05% of progr. value (asynchron startable)
10 us - 999 us	1 us	± 0.5% of progr. value (synchron startable, Clock Calibration)
		± 3% of progr. value (synchron startable, no Clock Calibration)

Equipment:

8175A, Output Pod, Counter, Time Mark Generator, Oscilloscope, 15409A

Test set up:





Procedure:

Set 8175A: Recall Standard Settings

SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Setting > EXEC

CNTRL > CURSOR↓ = Mode [Single Cycle] > NEXT = [Auto-Cycle] > CURSOR↓ = Clock [off] > NEXT = [on] >
OUTPUT = [disabled] > NEXT = [enabled] > START

1. Scope and Counter:

   Using the time mark generator, check the oscilloscope time base accuracy in the 0.02 usec/Div x 10 Range. Note error and take time base error into account.
   Connect Flag Pod channel 7 to oscilloscope and check for 20 ns.
   Set counter to PER A, Z = 1 MΩ , TRIG LVLA 1.2.
   Connect Flag Pod Channel 7 to the A Input of counter, and program counter time offset so that 20.0 ns period (+- noted error) is displayed.

2. Measure Clock period in either

   Auto Cycle [asynchron] startable
   or Auto Cycle [synchron] startable
   or Auto Cycle [synchron] startable with [Clock Calibration]
   against Table below.

   Table 4-6

Period of clock	auto-cycle [asynchron] startable		auto-cycle [synchron] startable		auto-cycle [synchr. startable] Clock Cal.	
	Counter Reading					
	low	high	low	high	low	high
* .10us	99.95 ns	100.05 ns	97.0 ns	103.0 ns	99.5 ns	100.5 ns
1.00us	999.5 ns	1.0005 us	970 ns	1.030 us	995 ns	1.005 us
9.00us	8.993 us	9.007 us	8.953us	9.047 us	8.728us	9.272us
**						
100 us	99.95 us	100.05 us	97 us	103 us	99.5 us	100.5us
999 us	998.5 us	999.5 us	969 us	1.029 ms	994 us	1.004ms

* Resolution [10 ns]
** Change Resolution to [1 us]

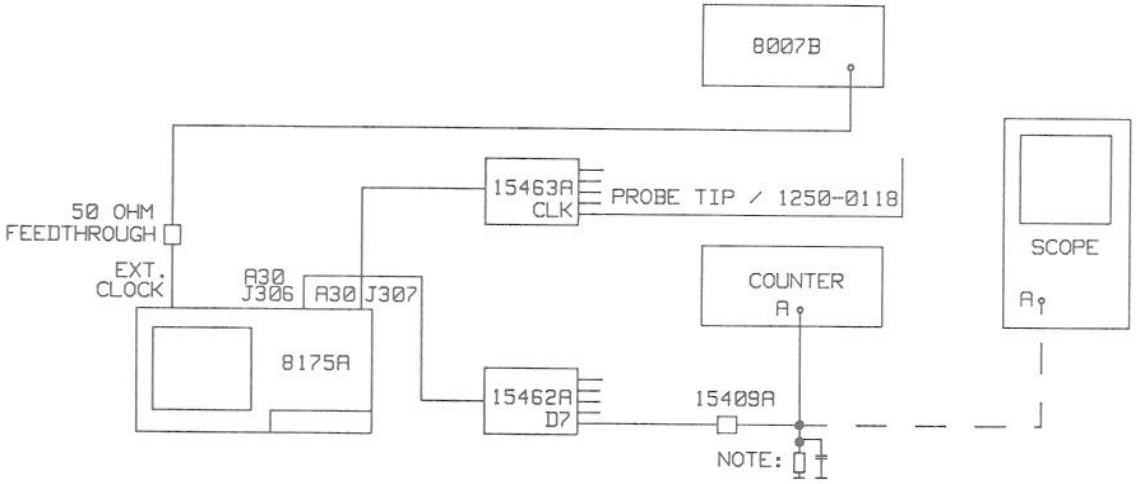
4-12B PERIOD WITH EXTERNAL CLOCK (BNC) / TRIGGER POD

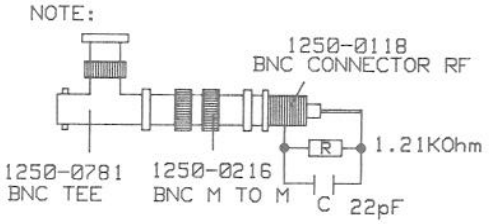
3. **Specification:** Range 2...999 [x1] x period of external clock
2...999 [x100] x period of external clock

Equipment:

Same as before and 8007B

Test set up:





Procedure:

Set 8007B
PER 100 ns, Pulse Width 50 ns, Ampl +2V, NORM, Polarity +, Delay min, Transitiontime min.

Set 8175A: CNTRL = Control Page (PAR)
System Clock: [external from rear panel BNC]

4. Measure 8007B Period for 100.00 ns with counter.
Connect 8007B output via 50 Ω feedthrough to the EXT. CLOCK BNC input 8175A rear panel.
Measure clock period of 8175A against Table 4-7.
Press START after each new setting.

Table 4-7

8175A Period of clock	Counter Reading
2 [x1]	200.00 ns
10 [x1]	1.00 us
50 [x1]	9.00 us
100 [x1]	10.00 us
500 [x1]	50.00 us
999 [x1]	99.90 us
2 [x100]	20.00 us
10 [x100]	100.00 us
50 [x100]	500.00 us
100 [x100]	1.00 ms
500 [x100]	5.00 ms
999 [x100]	9.99 ms

5. Set 8175A back to 2 [x1] x Period of external clock.
Remove cable with 50 Ω feedthrough from EXT. CLOCK BNC Input.
Connect 8007B output signal via 1250-0118 and probe tip 10230-62101 to the clock input of trigger pod 15463A.

6. Set 8175A: CNTRL = Control Page (PAR)

System Clock: [external from Input POD]

Make the same settings as above and measure 8175A Clock period against Table above.

7. Set 8007B to 25 MHz (Width > 20 ns) measured with counter.(Max. Clock Rate Input).
Connect 8007B output to the Trigger Pod as before and measure at counter 12.5 MHz.

8. Connect 8007B output signal to counter.
Set 8007B to 100 MHz, Pulse Width min.
Set Counter to FRQA.
Measure with Counter the 8007B Rate for 100.0 MHz.

9. Connect 8007B output via 50 Ω feedthrough to the EXT. CLOCK BNC Input 8175A rear panel.
Measure at counter 50.0 MHz.

4-12C CLOCK WITH EXTERNAL REFERENCE (BNC)

10. Set 8007B Period to 1 us, Pulse width 500 nsec.
Set Counter to PER A.
Measure with counter the 8007B Period for 1.000 us and with Scope the Pulse Width for 500 ns.

11. Set 8175A: CNTRL = Control Page (PAR)
System Clock: [internal]
Period of Clock = 0.02 us Resolution [10ns]
START

12. Confirm on counter a reading of 20.000 ns.

13. Connect 8007B output to the EXT REF BNC Input at 8175A rear panel.
Observe on counter a change in reading: approx 20 ns

4-13 External Input (BNC)

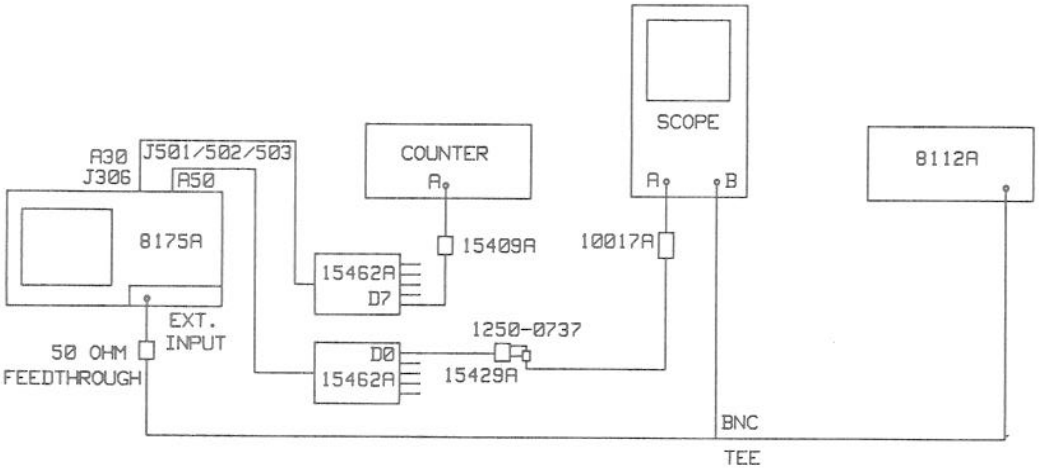
Specification:

Threshold (range / resolution)	- 9.9V to + 9.9V / 100mV
Accuracy	± 5% of progr. value ± 250mV
Min. Swing	600mV (P-P)
Min. Overdrive	250mV or 30% of input amplitude, whichever is greater

Equipment:

8175A, Output Pods, Counter, Scope, 8112A, 10017A, 15409A, 15429A

Test set up



Procedure:

8175A: Recall Standard Settings
SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Settings > EXEC

CNTRL > CURSOR↓ = Mode > NEXT = [Auto Cycle] >CURSOR↓ = START and/or STOP from > NEXT = [external Input] > CURSOR↓ = Clock > NEXT = [on] >
DATA > CURSOR↓ = Period: > 10 [us] >
DATA > NEXT = Data [Pattern] Setup > CURSOR↓ = Address 0000 > CURSOR→ = POD 2/CH 7 > 1 24x >
PRGM > CURSOR↓ = PROG 1 > CURSOR→ = Label or Address 1023 > 0001 >
blue > EXEC = UPDATE >
OUTPUT = [disabled] > NEXT = [enabled] >
CNTRL 2x > CURSOR→ = external Input [disabled] > NEXT = [enabled] > CURSOR↓ = with START on [↑] Edge

Set Counter:

TRIG LVLA 1.2V, PERA, Z=1MΩ

Set Scope:

Time/Div = .1 ms
ALT, INT, TRIG B CH A 1V/DIV
CH B .1V/DIV

Set 8112A:

PER 500 us	DTY 50%
HIL +2V	LOL 0V
fix TT	enable OUTPUT
Mode=TRIG	WID 999 ms

1. Observe the scope while pressing the 8112A MAN key once.
   With the positive going edge of the 8112A signal the 8175A will start.
   (On scope you see the 8175A Data signal, on counter the internal clock 20.00 ns).

2. Press the 8175A STOP > NEXT = with START on [↓] Edge.

3. Observe scope while pressing 8112A MAN once.
   With the negativ going edge of 8112A output signal the 8175A will start.
   Counter reading = 20.000 ns.

4. Press 8175A STOP > NEXT = with START on [↕] edge.

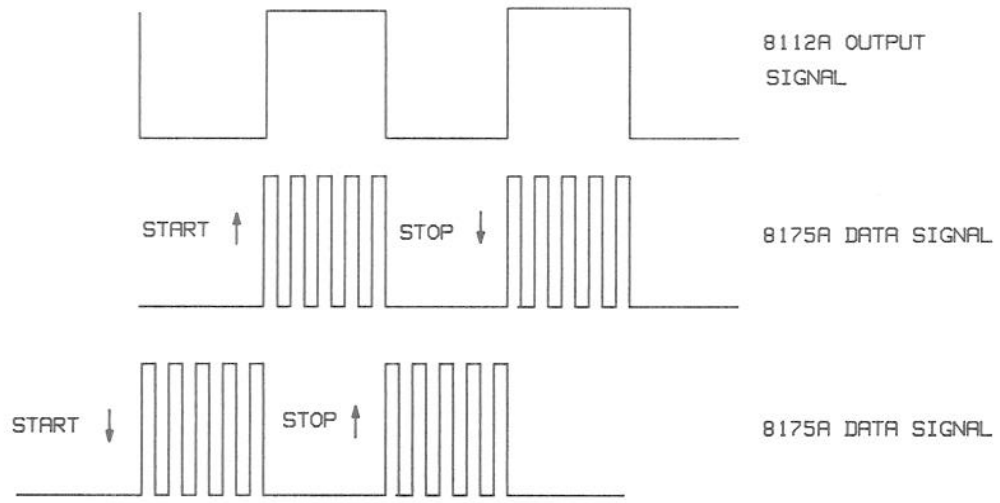
5. Observe scope while pressing 8112A MAN once.
   After the 8175A has started at the positive going edge of 8112A output signal, press the 8175A STOP and observe that 8175A will start again at the negative going edge of the 8112A output signal.

6. Press the 8175A STOP > NEXT = with START ON [↑ and STOP ↓] edge.
   Set 8112A Mode: NORM.

7. Confirm on scope that, during the positive 50% DTY of 8112A output signal the 8175A is started.

8. Press on 8175A NEXT = with START on [↓ and STOP on ↑] edge.

9. Confirm on scope that during the negative 50% DTY of 8112A output signal the 8175A is started.



10. Press 8112A output DISABLE
    Set 8112A: LOL -1.8V HIL -0.8V
    Set 8175A: CURSOR↓ = External Input Threshold [TTL] > NEXT = [ECL]

11. Enable 8112A output signal and observe on scope that, 8175A starts at the negative going edge and stops at the positive going edge in respect to the 8112A output signal.

12. Press 8175A NEXT = [+] 0.0V
    Set 8112A: HIL +0.3V LOL -0.3V

13. Observe on scope that 8175A starts at the negative going edge and stops at the positive going edge in respect to the 8112A output signal.

14. Disconnect 8112A output from 8175A EXT INPUT BNC.
    Disconnect 50 Ω feedthrough.
    Set 8175A: CURSOR→ = [+] 0.0V > 9.9.
    Set 8112A: HIL +5.5V LOL +4.5V.

15. Connect 8112A output to 8175A EXT INPUT BNC and observe on scope that 8175A starts at the negative going edge and stops at the positive going edge in respect to the 8112A output signal.

16. Set 8112A: DISABLE, LOL -5,5V, HIL −4,5V
    Set 8175A: CURSOR← = [+] > NEXT = [-]

17. ENABLE 8112A output and observe on scope that, 8175A starts at the negative going edge and stops at the positive going edge in respect to the 8112A output signal.

4-14 SKEW

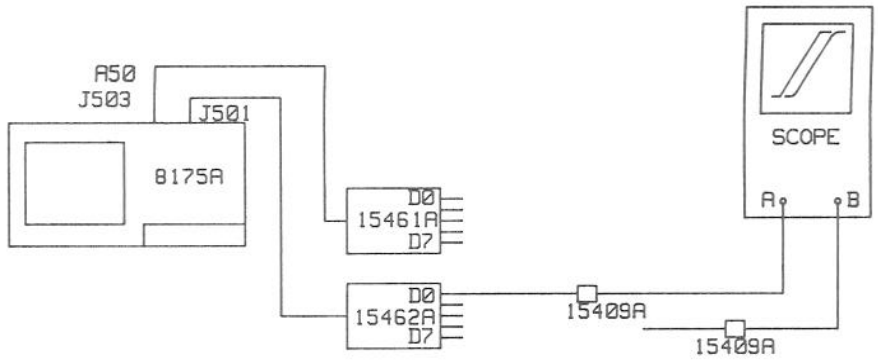
Specification:

ECL Pods:	< = 6 ns; typical < = 3 ns
TTL/CMOS Pods:	< = 7 ns; typical < = 3 ns

Equipment:

8175A, Output Pods, Oscilloscope, Time Mark Generator, 15409A 2x

Test set up:



Procedure:

8175A: Recall Standard Settings:

SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Settings> EXEC

CNTRL = [Clock] > CURSOR↓ = Mode > NEXT = [Auto Cycle] > DATA > NEXT = Data [Pattern] setup > CURSOR↓ = Address 0000 > ROLL VERNIER↑ = Address 0001 > CURSOR→ = POD 2 > 11111111 (POD 1) 11111111 (POD 0) 11111111 > PRGM = Module > CURSOR↓ = PROG 1 > CURSOR→ = Label or Address 1023 > 0001 > OUTPUT > = [disabled] > NEXT = [enable] > blue > EXEC = UPDATE > START

1. Scope

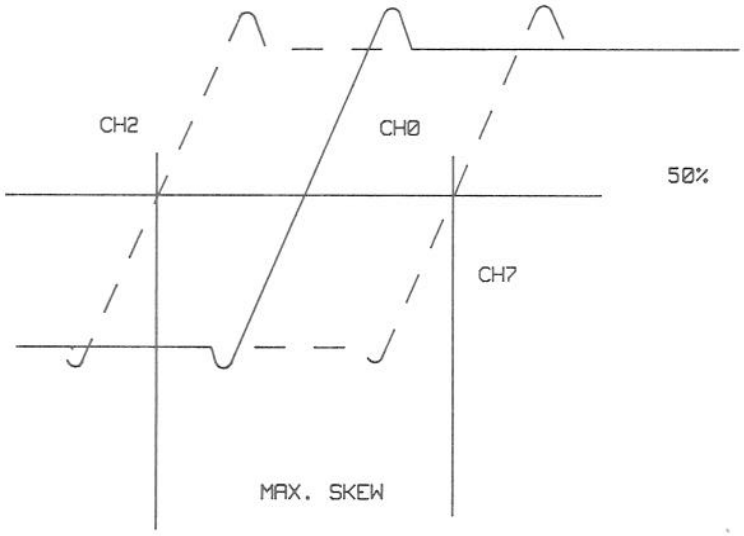
   Using the time mark generator, check the oscilloscope time base accuracy in the 10 nsec/DIV x 10 Range. Note error and take time base error into account.
   Connect POD 0 Channel 0 to oscilloscope input A, internal trigger, trigger channel A. Set scope to alternate, and both channels to DC.
   Connect in turn all other Data Channels of Pod 0 to oscilloscope channel B input.

2. With reference to the positive going edge of Channel 0, measured at 50% of amplitude, check skew for:

   ECL Pod < = 6 ns; typical < = 3 ns
   TTL Pod < = 7 ns; typical < = 3 ns

3. Check also Pod 1 Channel 0 - 7 and
   Pod 2 Channel 0 - 7

   Note: Take possible oscilloscope inter channel delay into account.



4-15 Fine Timing Option (Delay Mode)

Specification:

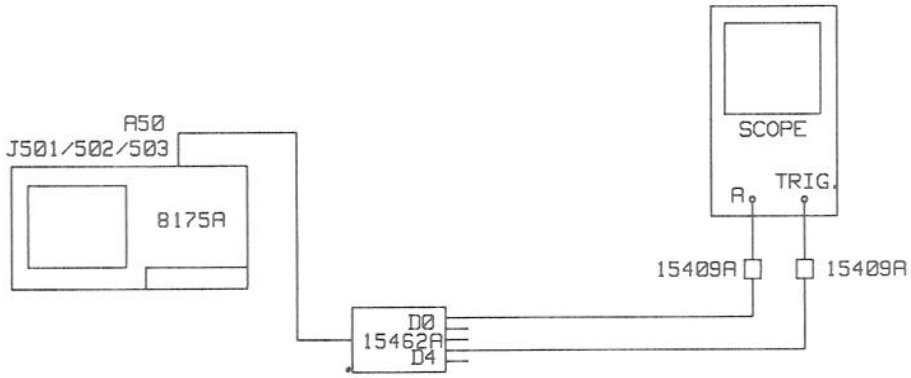
Channels 0, 1, 2 and 3 of Pod 0

Range	Resolution	Accuracy
20 ns - 40 ns	100 ps	± 5% of progr. value ± 1 ns

Equipment:

8175A, Output Pod, Scope, Time Mark Generator, 15409A 2x.

Test setup:



Procedure:

8175A: Recall Standard Settings:

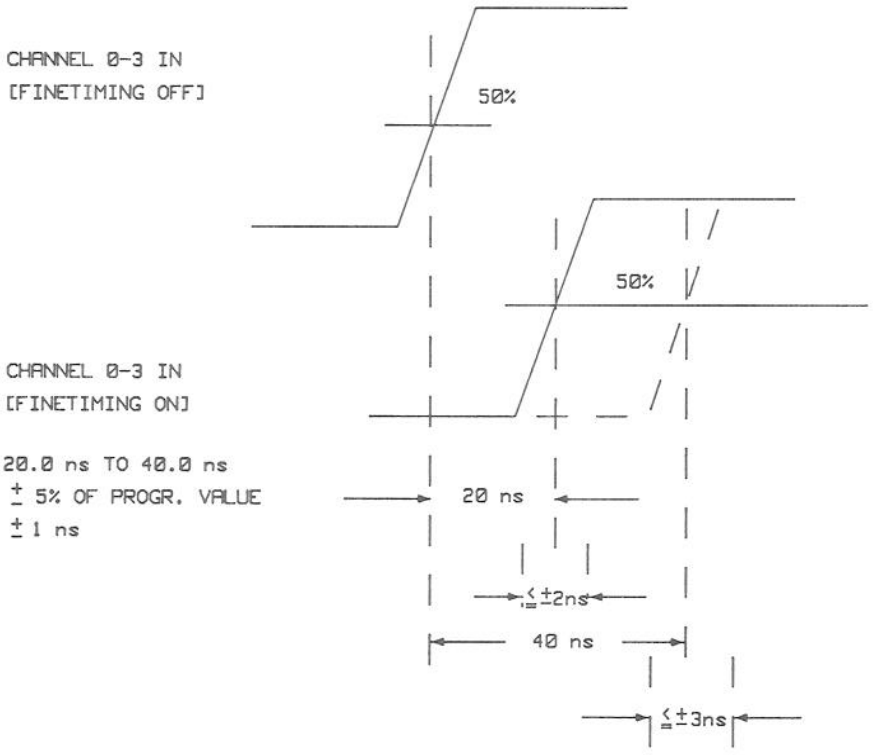
SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard settings > EXEC

CNTRL > CURSOR↓ = Mode [Single Cycle] > NEXT = [Auto Cycle] >
DATA > NEXT = Data [Pattern] Setup > CURSOR↓ = Address 0000 > CURSOR→ = Pod 2/Ch 7 > 1 24x >
DATA > PREV = [Format] > CURSOR↓ = Period: 0.02 [us] > 0.1 >
PRGM > CURSOR↓ = PROG 1 > CURSOR→ = LABEL or Address 1023 > 0001 >
blue > EXEC = UPDATE >
OUTPUT = [disabled] > NEXT = [enabled] >
TIMING > NEXT = [Fine timing on] > START

1. Using the time mark generator, check the oscilloscope time base accuracy in the 50 nsec/DIV x 10 Range. Note error and take timebase error into account.

2. Connect Pod 0 Channel 4 to oscilloscope Ext. Trigger Input. Set scope to external trigger, Mag x 1. Connect Pod 0 Channel 0 to 3 in turn to oscilloscope channel A input.

   With reference to the positive going edge of each channel in [Fine Timing off] mode: Check for a delay of 20 ns ± 2 ns, when 8175A is switched to [Fine Timing on].



3. Check delay of each channel against Table below:

   Table 4-8

8175A setting	Scope Reading low limit	high limit
25 ns	22.75 ns	27.25 ns
30 ns	27.5 ns	32.5 ns
35 ns	32.25 ns	37.75 ns
40 ns	37.00 ns	43.00 ns

4. Set 8175A delay to 20 ns and step with a resolution of 100 ps e.g. VERNIER↑ to 25.9 ns. Confirm that displayed delay increases.

4-16 Level Test

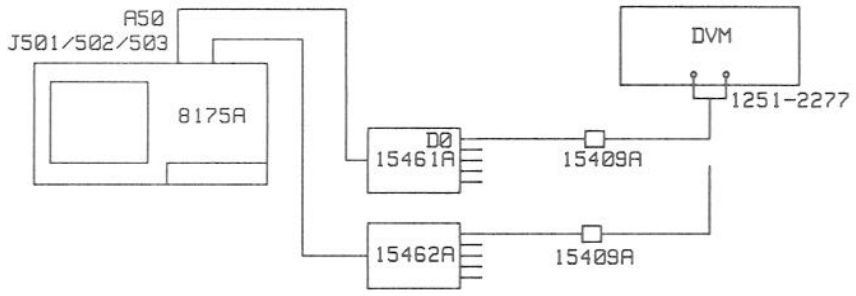
Specification:

	HP 15462A	HP 15461A
High level:	+ 2.4V/-9.9V	⩾ -1.02V
Resolution:	100 mV	
Low level :	⩽ 700 mV	⩽ -1.60V
Accuracy :	5% of progr. value ± 300 mV	

Equipment:

8175A, Output Pods, DVM, 15409A

Test set up:



Procedure:

8175A: Recall Standard Settings

SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Settings > EXEC

DATA > NEXT = Data [Pattern] setup > CURSOR↓ = Address 0000 > CURSOR→ = Pod 2/ Ch 7 > 1 24x >
PRGM > CURSOR↓ = PROG 1 > CURSOR→ = Label or Address 1023 > 0001 >
blue > EXEC = UPDATE >
OUTPUT = [disable] > NEXT = [enable] > CURSOR↓ = [internal] > CURSOR→ = +2V

1. Measure the high level and low level at all channels of the output pod (depending on the Model) against Table below.
   Use the 8175A SINGLE STEP key to show the levels on DVM.

   Table 4-9

Output Pod	High Level		Low Level
15461A	>=- 1.02V		<=- 1.60V
15462A	low limit	high limit	
+ 2.4 V	+ 1.98 V	+ 2.82 V	>= 0.7 V
+ 3 V	+ 2.55 V	+ 3.45 V	>= 0.7 V
+ 5 V	+ 4.45 V	+ 5.55 V	>= 0.7 V
+ 9.9 V	+ 9.10 V	+10.695V	>= 0.7 V

4-17 Transition times

Specification:

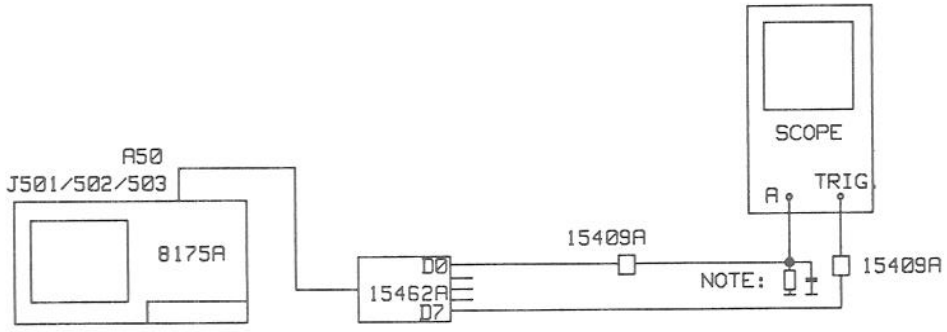
Table 4-10

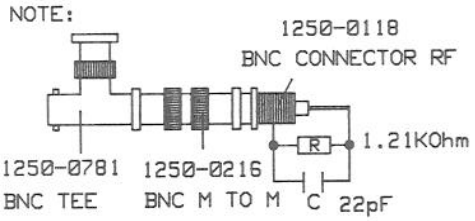
	15462A			15461A
	into open	into 50 pF		into 22pF
TT 10%-90%	<=3 ns + high level x 1.2 ns/V	<=9 ns + high level x 1.8 ns/V	TT 20%-80%	<= 3 ns
overshoot ringing	20% of amplitude into open		overshoot ringing	20% of amplitude

Equipment:

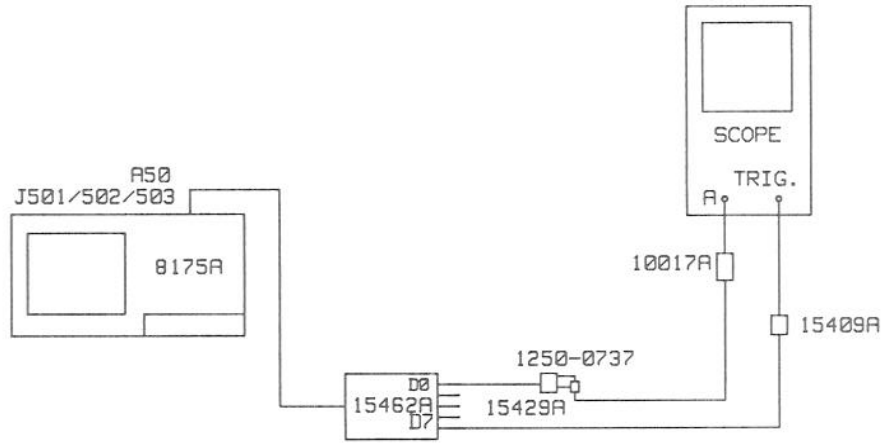
8175A, Output Pod, 10017A, 15409A 2x, 15429A

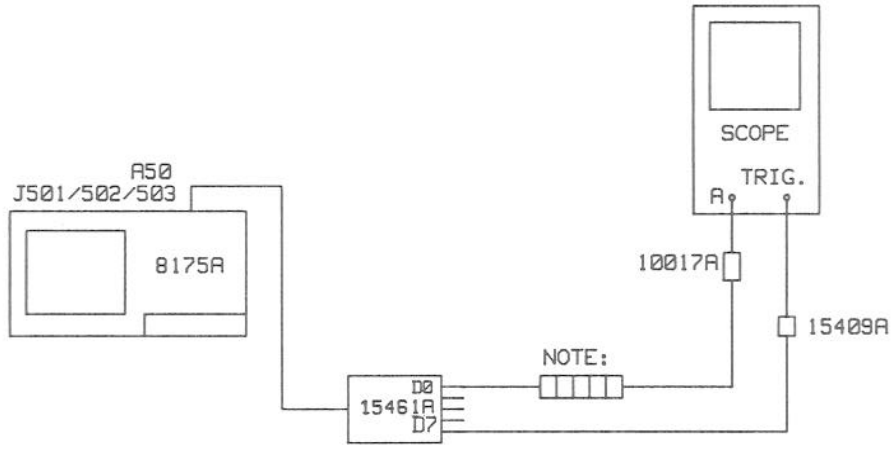
Test set up for into "50 pF":





Test set up for "into open":





NOTE:

15409A/1250-0080/1250-0216/1250-0080/1250-1454

BNC F TO F	BNC M TO M	BNC F TO F	BNC TO PROBE ADAPTER

Procedure:

8175A: Recall Standard Settings

SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Settings > EXEC

CNTRL > CURSOR↓ = Mode [Single Cycle] > NEXT = [Auto Cycle] >
DATA > NEXT = Data [Pattern] Setup > CURSOR↓ = Address 0000 > CURSOR→ = Pod 2/Ch 7 > 1 24x >
DATA > PREV = Data [Format] Allocation > CURSOR↓ = Period > 0.10 [us] >
PRGM > CURSOR↓ = Label or Address 1023 > 0001 >
blue > EXEC = UPDATE >
OUTPUT = [disable] > NEXT = [enable] > START

Scope: Time / DIV: .02 usec Mag x 10
Trigger: Ext. +, Channel A : AC

1. Using the time mark generator, check the oscilloscope time base accuracy in the 0.02 usec/DIV x 10 Range. Take time base error into account.

2. Connect test set up for "into open".
Measure transition times of all data channels against Tabel below.

Note:
Transition times for the 15462A TTL/CMOS Pod are specifite from 10% to 90% of progr. high level, for the 15461A ECL Pod from 20% to 80% of fixed ECL level.

Table 4-11

8175A TTL/CMOS High Level	15462A	15461A
+2.4 V + 5V +9.9 V	<= 5.88 ns <= 9 ns <= 14.88 ns	<= 3 ns

3. Measure Preshoot, Overshoot and Ringing at all data channels of Pod 15461A and Pod 15462A
for ⩽ 20% of amplitude.

4. Connect Pod 15462A as shown in test set up "into 50 pF".

5. Set 8175A TTL/CMOS high level to +5.0V.
Measure transition times of all data channles for ⩽ 18 ns.

4-18 TTL Leakage Current

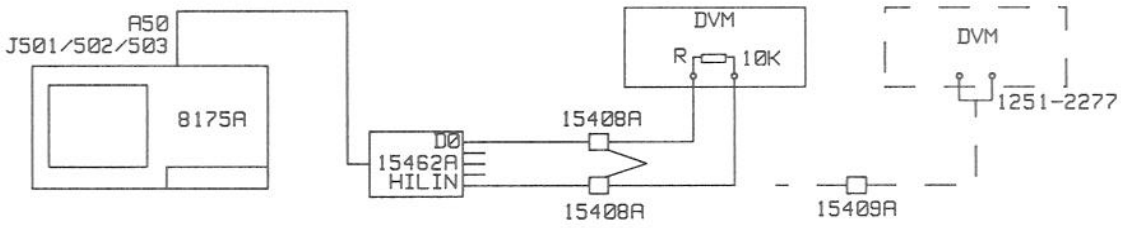
Specification:

Leakage Current ⩽ 20 uA.

Equipment:

8175A, Output Pod, Multimeter, 15408 2x

Test set up:



Procedure:

8175A: Recall Standard Settings:

SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Settings > EXEC

CNTRL > PREV = [Simulate] Trigger Functions > CURSOR→ = TRIST on > EXEC > OUTPUT = [disable] > NEXT = [enable] > CURSOR↓ > CURSOR→ = +2.0V > 9.9

Set DVM to 20.0 V Range (Input resistance ⩾ 10 MΩ).

1. Measure with a 15409A and a 1251-2277 connected to the HIL IN cable the voltage comming out of the 15462A Pod: approx. +10V.

2. Connect the equipment as shown in test set up.
   Set DVM to 0.1V Range and measure the voltage above the terminated 10kΩ Resistor.
   The leakage current is defined as:

   ILEAKAGE = measured voltage / 10 kΩ ⩽ 20 uA

3. Repeat the above described test for all Pod output channels

4-19 TRIST T(ON), T(OFF) Pod 15462A

Specification:

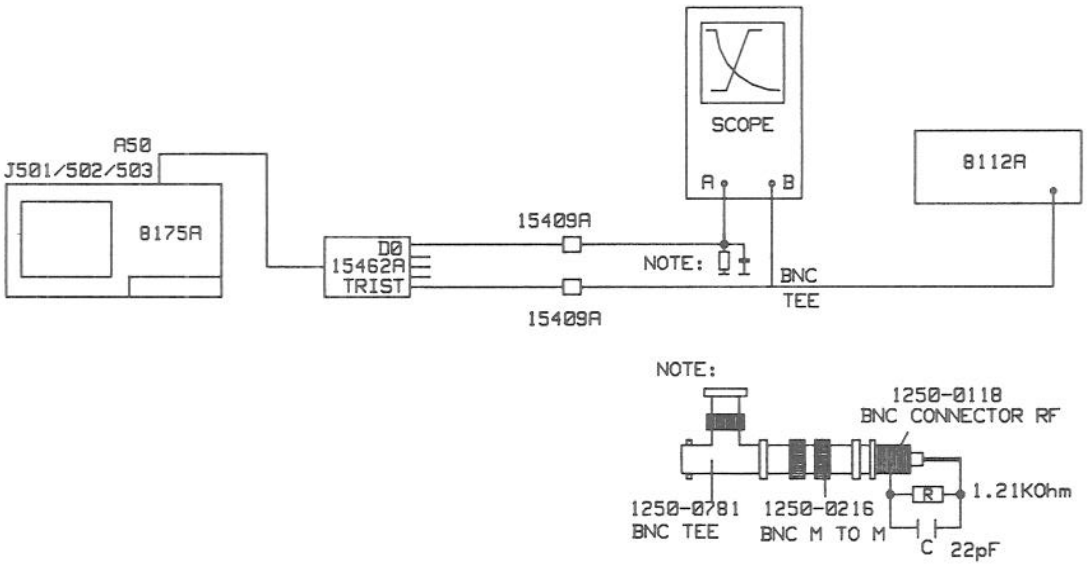
T(ON), T(OFF) ⩽ 30 ns

Time difference between occurence of external ON of OFF signal at an output pod (TRIST) until outputs are disabled or enabled.

Equipment:

8175A, Output Pod, Scope, 8112A, 15409A 2x

Test set up:



Procedure:

8175A: Recall Standard Settings

SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Settings > EXEC

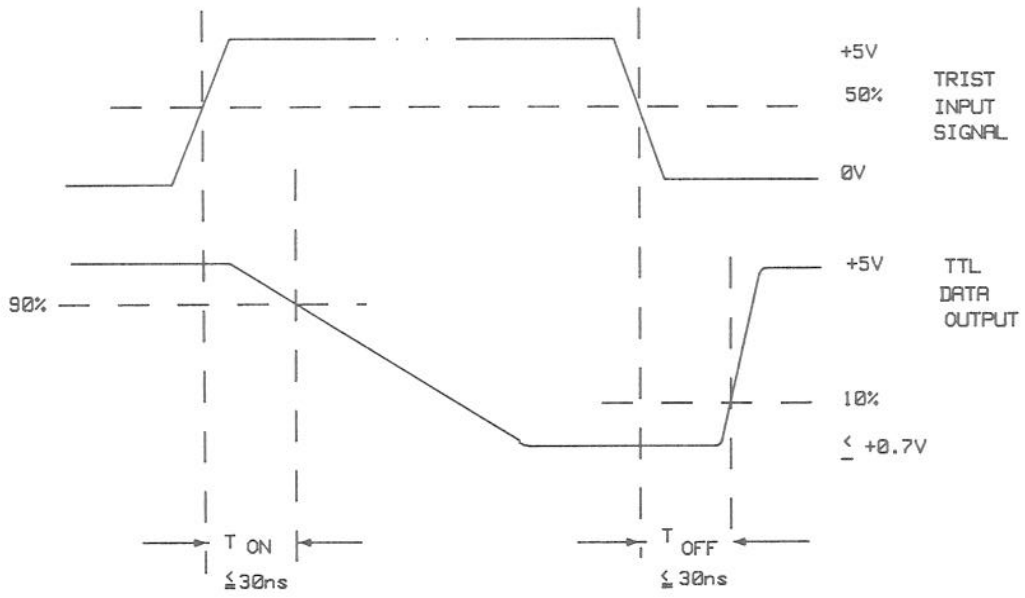
CNTRL > CURSOR↓ = Mode > NEXT = [Auto Cycle] >
DATA > NEXT = Data [Pattern] Setup > CURSOR↓ = Address 0000 > CURSOR→ = Pod 2/Ch 7 > 1 24x > Address 0001 also all 1 >
PRGM > CURSOR↓ > PROG1 > CURSOR→ = Label or Address 1023 > 0001 >
OUTPUT = [disabled] > NEXT = [enable] > CURSOR↓ > CURSOR→ = +2.0V > 5 >
blue > EXEC = UPDATE > START

8112A:	PERIOD:	2 us
	Delay:	min
	DTY	50%
	TT	fix
	HIL	+5V
	LOL	0V

Scope:

Time/DIV: .01 usec, Trigger INT +, ALT B.
Channel A: 1 V/DIV, DC,
Channel B: 1 V/DIV, 50 Ω.

1. Measure the propagation Delay of the output signal with respect to the TRIST input signal (see Figure). Use Scope Trigger to measure T(OFF).



2. With same test set up measure the threshold level. Vary the TRIST input amplitude slowly down, until the Data Output is no longer stable. This must be at 35% of progr. high level ± 800 mV.

Table 4-12

TTL/CMOS Pod 8175A High Level internal	min. TRIST input LOL 0v HIL
+ 2.4 V	+ 0.8V + 800 mV
+ 5.0 V	+1.75V +-800 mV
+ 9.9 V	+3.46V +-800 mV

3. Repeat the above described test for all Pod output channels.

4-20 $\overline{EN}$ T(ON), T(OFF) Pod 15461A

Specification:

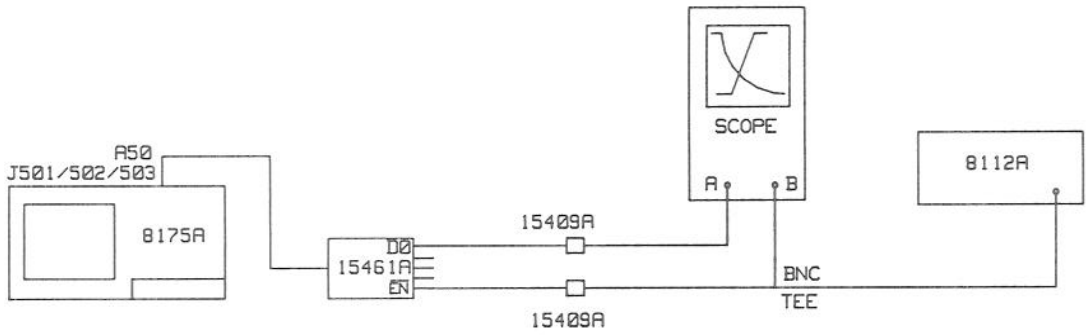
T(ON), T(OFF) ⩽ 15 ns

Time difference between occurence of external ON or OFF signal at an output pod ($\overline{EN}$) until outputs are enabled or disabled.

Equipment:

8175A, Output Pod, Scope, 8112A, 15409A 2x

Test set up:



Procedure:

8175A: same setting as for
Trist. T(ON), T(OFF)

Scope: same setting as for
Trist. T(ON), T(OFF)

8112A: HIL = - .8V
LOL = - 1.8V

1. Measure the propagation delay of the output signal with respect to the $\overline{EN}$ input signal (see figure below).

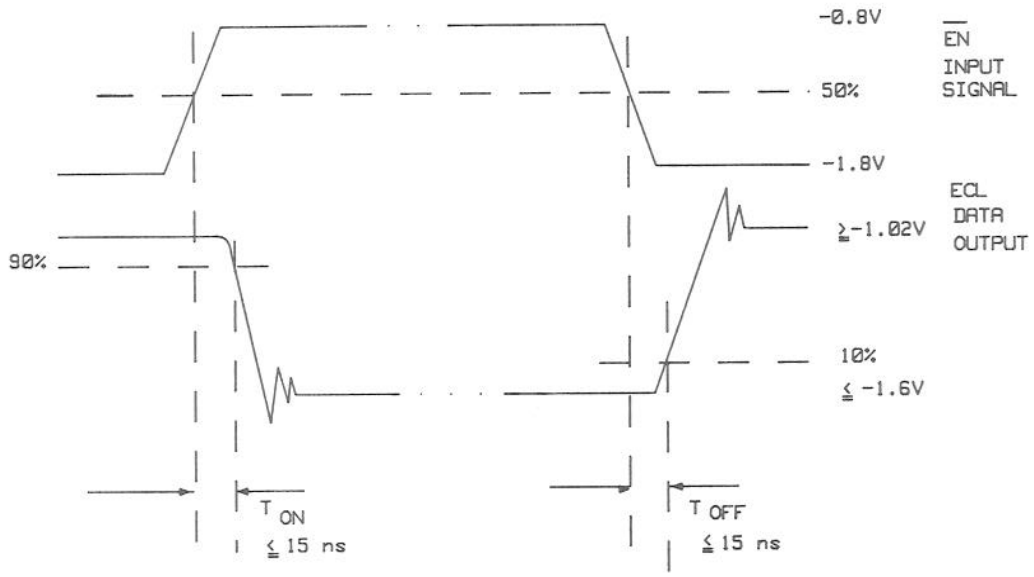


Figure Propagation delay T(ON)/T(OFF) with respect to $\overline{EN}$ input signal

2. Repeat the above described test for all Pod output channels

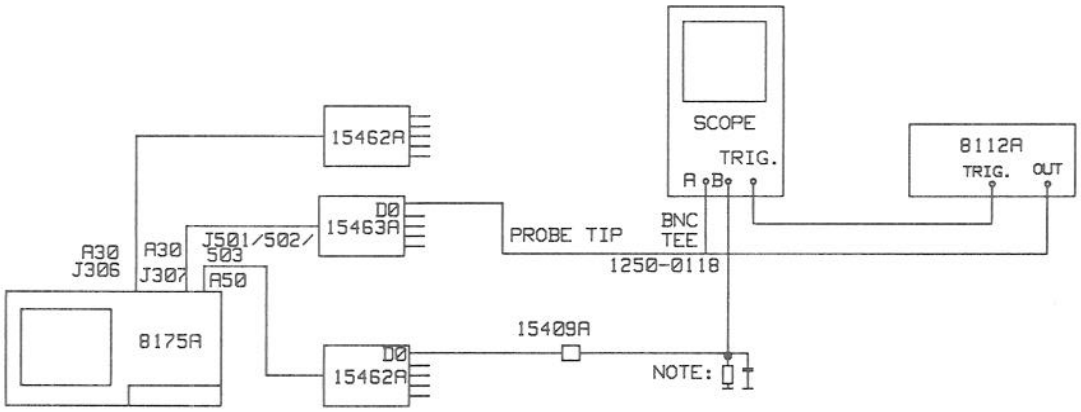
4-21 Trigger Pod

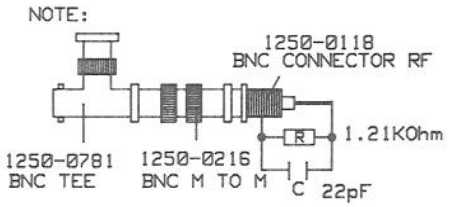
A. **Trigger Word**
Start/Stop Function

Equipment:

8175A, Output Pod, Trigger Pod, Scope, 15409A, 8112A

Test set up:





Procedure:

8175A: Recall Standard Settings

SYSTEM > NEXT = [Storage] > CURSOR↓ = [store] > NEXT = [recall] Standard Settings > EXEC

CNTRL > CURSOR↓ = Mode > NEXT = [Auto Cycle] > CURSOR↓ = Trigger Pod [disabled] > NEXT = [enabled] > CURSOR↓ = Trigger Pod Threshold: [TTL] > NEXT 2x = [+] 0.0V > CURSOR→ > 1 >
CNTRL > NEXT = [Input] Trigger Word Assignment > CURSOR↓ = Start > DON'T CARE 7x > 1 > DON'T CARE 7x > 0 >
DATA > CURSOR↓ = Period > 1 > NEXT = [ms]
DATA > NEXT = Data [Pattern] setup > CURSOR↓ = Address 0000 > CURSOR→ = Pod 2/Ch 7 > 1 24x >
PRGM > CURSOR↓ = PROG 1 > CURSOR→ = Label or Address 1023 >0001 >
blue > EXEC = UPDATE >
OUTPUT = [disable] > NEXT = [enabled]

Set 8112A:

Mode	Norm	DTY	50%
PER	50 ms	HIL	+2V
TT	fix	LOL	0V

Set Scope:

Ext. Trigger, CHOP, Time: 5ms/DIV
CHA: 1V/DIV, 50 Ohm CHB: 1V/DIV DC

1. Connect 8112A output signal via BNC TEE, 1250-0118 probe tip to scope and Trigger Pod 15463A.
   Confirm on Scope that during the positive part of 8112A signal, the 8175A produces an output pattern.
   Disable 8112A output signal.

2. Set 8175A:

   CNTRL 2x > NEXT = [Flag] Assignment in [Transparent] Mode > CURSOR↓ = Trigger Word 0000 0000 > CURSOR→= Flag Pattern > 1 8x >
   blue > EXEC = UPDATE

3. Connect the Flag Pod Ch0 to 15409A on scope CHB (instead of Output Pod).

4. Enable 8112A output and confirm on scope that an inverted signal in respect to the 8112A output signal, is produced.

5. Check all Flag Pod channels.

6. Reconnect output Pod Ch0 to Scope.
   Disable 8112A output.

B. Tristate on/off Function

1. Same Equipment and test set up as for A.
   Set 8175A:

   CNTR [Input] Trigger Word Assignment

   CURSOR↓ = Start > . 8x > . 8x (for Stop) > CURSOR↓ = Tristate on > DON'T CARE 7x > 1 > DON'T CARE 7x > 0 (for Tristat off) >
   blue > EXEC = UPDATE > START

2. Enable 8112A output signal and confirm on scope that, during the positive part of 8112A signal the 8175A Data Output is tristated.
   Disable 8112A output.

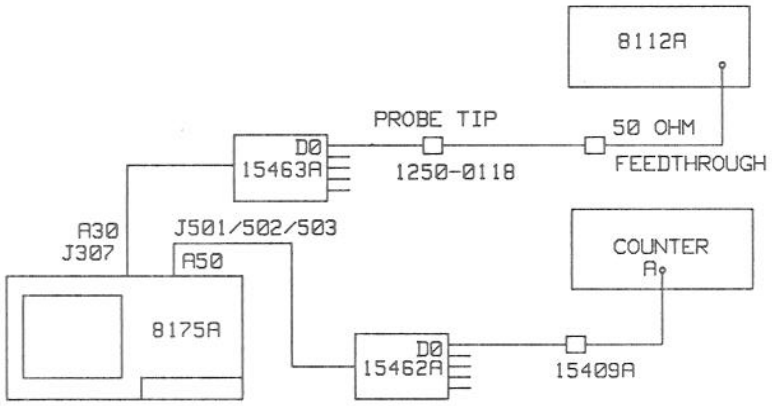
C. Trigger Word

JMPA/JMPB Function

Equipment:

8175A, Output Pod, Trigger Pod, Counter, 8112A

Test set up:



Procedure: 8175A

DATA = Data [Pattern] Setup >
blue > PRGM = FCTN > [INCREMENT] > CURSOR→ = from 1 to 1023 > EXEC >
DATA > PREV = Data [Format] Allocation > CURSOR↓ = Duration [fixed] > NEXT = [variable] > CURSOR↓ = Data Format Label A >
blue > SYSTEM = INSERT > B > CURSOR→ = Pod 0/Ch 0 > NEXT = * >
DATA > NEXT = Data [Pattern] Setup > CURSOR↓ > NEXT = B > CURSOR↓ = Address 1023 > ROLL↑ = Address 2 > CURSOR→ = Location Name > PROG 2 >
blue > DATA = MODIFY > CURSOR→ = Duration > NEXT = 0.02 [us] > 0.1 > CURSOR→ = [us] > NEXT = [ms] > CURSOR→ = from Address > 2 to 512 > EXEC >
ROLL↑ = Address 0513 > CURSOR→ = Location name > PROG 3 >
blue > DATA = MODIFY > CURSOR > NEXT = 0.02 [us] > 0.2 > CURSOR→ > NEXT = [ms] > CURSOR→ = from Address 513 to 1023 > EXEC >
PRGM = [Module] Assingment > CURSOR↓ = PROG 1 > ROLL↑ = [end] >
blue > SYSTEM = INSERT > PROG 2 from 2 to 512 Repetition Times 100 > ROLL↑ = [end] >
blue > SYSTEM > INSERT > PROG 3 from 513 to 1023 Repetition Times 050 >
PRGM > NEXT = [Trigger Event] Assignment > CURSOR↓ = On JMPA execute [PROG 1] >
NEXT = [PROG 2] > CURSOR↓ = On JMPB execute > PREV = [PROG 3] >
CNTRL 2x > NEXT = [Input] Trigger Word Assignment > CURSOR↓ = JMPA > DON'T CARE 7x > 1 > DON'T CARE 6x > 1 0 > . 8x > . 8x
blue > EXEC = UPDATE > START

Set Counter:

TRIG LVL both +1.2V
TIME A --> B, COM A, Z=1MΩ
CHANNEL A ⎍, CHANNEL B ⎎

Set 8112A:	Mode	TRIG
	WID	30 ns
	LOL	0V
	HIL	+2V
	TT	⎍ fix
		ENABLE

1. Measure at Counter 20 ns Pattern Duration with the 8112A output signal supplied via 50Ω feedthrough, 1250-0118 and probtip to CH0 of the Trigger Pod.
   Press the 8112A MAN pushbottom once.
   Observe on counter a reading of 100.00 us.
   After a view seconds counter will show again 20 ns.

2. Connect 8112A output signal to CH1 of 15463A.
   Press 8112A MAN again and observe on counter a reading of 200.00 us for a short time.

D. Valid Trigger Word Duration

1. Set 8175A:

   CNTRL > NEXT = [Clock] > CURSOR↓ = Valid Trigger Wod Duration [20] ns > NEXT = [50] ns.

   Connect 8112A output signal to 15463A CH0.

2. Press 8112A MAN key once, counter reading should show 20 ns.

3. Change 8112A: WID 60 ns
   Press 8112A MAN key once, counter reading should be 100.00 us.
4. Check also [100] [200] and [500] ns Trigger Word Duration, with the supplied 8112A signal width of 100 ns, 200 ns and 500 ns.
   After each new setting press 8112A MAN key once.

E. Pod Input Threshold

Treshold (range/resolution)	-9.9V to +9.9V/100mV
Accuracy	± 2.5% of progr. value ± 120mV
Min. Swing	600mV (P-P)
Min. Overdrive	250 MV or 30% of input amplitude, which ever is greater

Same test set up and settings as before:

1. Set 8112A: LOL -1.8V HIL -0.8V
   Set 8175A:

   CNTRL > = [Clock] > CURSOR↓ = Trigger Pod Threshold [TTL] > NEXT = ECL > START

2. Counter reading is 20 ns. After pressing 8112A MAN key once, counter should show 100 us for a short time.

3. Disconnect 8112A output from 15463A CH0.
   Disconnect 50Ω feedthrough and reconnect 8112A output to CH0.

4. Set 8175A: on Control Page (PAR)
   Pod Input Threshold: [+] 9.9V
   Set 8112A: HIL +5.5V LOL +4.5V

5. Counter reading is 20 ns. After pressing 8112A MAN pushbottom once, counter shows 100 us for a short time.

6. Set 8175A: Pod Input Threshold [-] 9.9V
   Set 8112A: LOL -5.5V HIL -4.5V
   Procedure and Counter readings same as before

7. Set 8175A: Pod Input Threshold [-] 1.0V
   Set 8112A: HIL =0.40V LOL -0.7V
   Procedure and Counter readings same as before.

PERFORMANCE TEST RECORD

Hewlett & Packard Model 8175A
Digital Signal Generator
Serial Number

Test Performed By
Date
Reference Temperature

Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-10	**Data Capacity Test**				
Step 1	Counter Reading				
	POD0-CH0	4096			4096
	POD0-CH2	4096			4096
Step 2	POD0-CH2	4096			4096
Step 3	POD0-CH0	4096			4096
	POD0-CH0	4096			4096
Step 5	POD0-CH0	512			512
	POD0-CH1	512			512
	POD0-CH2	512			512
	POD0-CH3	512			512
	POD0-CH4	512			512
	POD0-CH5	512			512
	POD0-CH6	512			512
	POD0-CH7	512			512
	POD1-CH0	512			512
	POD1-CH1	512			512
	POD1-CH2	512			512
	POD1-CH3	512			512
	POD1-CH4	512			512
	POD1-CH5	512			512
	POD1-CH6	512			512
	POD1-CH7	512			512
	POD2-CH0	512			512
	POD2-CH1	512			512
	POD2-CH1	512			512
	POD2-CH2	512			512
	POD2-CH3	512			512
	POD2-CH4	512			512
	POD2-CH5	512			512
	POD2-CH6	512			512
	POD2-CH7	512			512
Step 6	POD0-CH0	512			512
	POD0-CH1	512			512
	POD0-CH2	512			512
	POD0-CH3	512			512
	POD0-CH4	512			512
	POD0-CH5	512			512
	POD0-CH6	512			512
	POD0-CH7	512			512

PERFORMANCE TEST RECORD

Hewlett & Packard Model 8175A
Digital Signal Generator
Serial Number

Test Performed By
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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
	POD1-CH0	512			512
	POD1-CH1	512			512
	POD1-CH2	512			512
	POD1-CH3	512			512
	POD1-CH4	512			512
	POD1-CH5	512			512
	POD1-CH6	512			512
	POD1-CH7	512			512
	POD2-CH0	512			512
	POD2-CH1	512			512
	POD2-CH2	512			512
	POD2-CH3	512			512
	POD2-CH4	512			512
	POD2-CH5	512			512
	POD2-CH6	512			512
	POD2-CH7	512			512

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-11A	**Pattern Duration with internal Clock Parallel Mode**				
Step 1	POD0-CH0	17.99ns			22.01ns
Step 2	Auto-Cycle asynchron startable				
	Period				
	0.05us	47.975ns			52.025ns
	0.09us	87.995ns			92.045ns
	0.10us	97.955ns			102.05ns
	0.5 us	497.75ns			502.25ns
	0.9 us	897.55ns			902.45ns
	1.00us	997.5 ns			1.0025us
	5.00us	4.995 us			5.004 us
	9.00us	8.993 us			9.007 us
	50.0us	49.97 us			50.03 us
	100.us	99.95 us			100.05us
	500 us	499.75us			500.25us
	900 us	899.55us			900.45us
	10.0ms	999.5 ms			10.005ms
	1.00ms	9.995 ms			1.0005s
	9.99ms	9.985 s			9.995 s
Step 3	Auto-Cycle synchron startable				
	Period				
	0.10us	95.00ns			105.00ns
	1 us	968 ns			1.032 us
	9.00us	8.953ns			9.047 us
	100 us	97 us			103 us
	900 us	895.5us			904.5 us
	10 ms	9.7 ms			10.3 us
	1 s	970 ms			1.03 s

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
Step 4	Auto-Cycle synchron startable with Clock Calibration				
	Period				
	0.10us	97.5 ns			102.5ns
	1 us	993 ns			1.007us
	9.00us	8.728us			9.727us
	100 us	99.5 us			100.5us
	900 us	873 us			927 us
	10 ms	9.95 ms			10.05ms
	1 s	995 ms			1.005s

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-11B	**Pattern Duration with internal Clock Serial Mode**				
	Auto-Cycle asynchron startable				
	Period				
	.10 us	97.95 ns			102.05ns
	.02 us	17.99 ns			22.01 ns
	.01 us	7.995 ns			12.005ns
	Auto-Cycle synchron startable				
	Period				
	.10 us	95.00 ns			105.00 ns
	.02 us	17.4 ns			22.6 ns
	.01 us	7.7 ns			12.3 ns
	Auto-Cycle synchron startable with Clock Calibration				
	Period				
	.10 us	97.5 ns			102.5 ns
	.02 us	17.9 ns			22.1 ns
	.01 us	7.95 ns			12.05 ns
4-11C	**Pattern Duraton with external Clock**				
Step 8	Period	approx.			approx.
	2 Cyc.	20 ns			20 ns
	50 Cyc.	500 ns			500 ns
	5 KCyc.	50 us			50 us
	5 MCyc.	50 ms			50 ms
	50 MCyc.	500 ms			500 ms
Step 10	variable Duration				
		1 us 100ns			1 us 100ns

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-12	**Clock Test**				
4-12A	**internal Clock**				
Step 1	Period of Clock				
	0.02 us	17.99ns			22.01ns
Step 2	Auto-Cycle asynchron startable				
	Period of clock				
	.10 us	99.95ns			100.05ns
	1.00 us	999.5ns			1.0005us
	9.00 us	8.993us			9.007 us
	100 us	99.95us			100.05us
	999 us	998.5us			999.5 us
	Auto-Cycle synchron startable				
	Period of Clock				
	.10 us	97.0 ns			103.0 ns
	1.00 us	970 ns			1.03 us
	9.00 us	8.953us			9.047 us
	100 us	97 us			103 us
	999 us	969 us			1.029 ms
	Auto-Cycle synchron startable				
	Period of Clock				
	.10 us	99.5 ns			100.5 ns
	1.00 us	995 ns			1.005 us
	9.00 us	8.728us			9.272 us
	100 us	99.5 us			100.5 us
	999 us	994 us			1.004 ms

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-12B	**External Clock BNC**				
Step 4	Period of Clock				
	2 x 1	200.00us			200.00us
	10 x 1	1.00 us			1.00 us
	50 x 1	5.00 us			5.00 us
	100 x 1	10.00 us			10.00 us
	500 x 1	50.00 us			50.00 us
	999 x 1	99.90 us			99.90 us
	2 x 100	20.00 us			20.00 us
	10 x 100	100.00us			100.00us
	50 x 100	500.00us			500.00us
	100 x 100	1.00 ms			1.00 ms
	500 x 100	5.00 ms			5.00 ms
	999 x 100	9.99 ms			9.99 ms
Step 6	External Clock Pod				
	Period of Clock				
	2 x 1	200.00us			200.00us
	10 x 1	1.00 us			1.00 us
	50 x 1	5.00 us			5.00 us
	100 x 1	10.00 us			10.00 us
	500 x 1	50.00 us			50.00 us
	999 x 1	99.90 us			99.90 us
	2 x 100	20.00 us			20.00 us
	10 x 100	100.00us			100.00us
	50 x 100	500.00us			500.00us
	100 x 100	1.00 ms			1.00 ms
	500 x 100	5.00 ms			5.00 ms
	999 x 100	9.99 ms			9.99 ms
Step 7	Max. Clock Rate Input Pod	12.5 Mhz			12.5 MHz
Step 8	Max. Clock Rate	50.0 MHz			50.0 MHz
4-12C	**Clock with external Reference BNC**				
Step 13		approx. 20 ns			approx. 20 ns

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-13	**External Input BNC**				
Step 1	START on Edge ↑		Y/N	Y/N	
Step 3	START on Edge ↓		Y/N	Y/N	
Step 5	START on Edge ↕		Y/N	Y/N	
Step 7	START on ↑ STOP on ↓ Edge		Y/N	Y/N	
Step 9	START on ↓ STOP on ↑ Edge		Y/N	Y/N	
Step 11	Threshold ECL		Y/N	Y/N	
Step 13	Threshold 0.0V		Y/N	Y/N	
Step 15	Threshold +9.9V		Y/N	Y/N	
Step 17	Threshold -9.9V		Y/N	Y/N	

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit TTL/CMOS	High Limit ECL
4-14	**Skew**					
Step 2	POD0-CH0				7ns	6ns
	POD0-CH1				7ns	6ns
	POD0-CH2				7ns	6ns
	POD0-CH3				7ns	6ns
	POD0-CH4				7ns	6ns
	POD0-CH5				7ns	6ns
	POD0-CH6				7ns	6ns
	POD0-CH7				7ns	6ns
Step 3	POD1-CH0				7ns	6ns
	POD1-CH1				7ns	6ns
	POD1-CH2				7ns	6ns
	POD1-CH3				7ns	6ns
	POD1-CH4				7ns	6ns
	POD1-CH5				7ns	6ns
	POD1-CH6				7ns	6ns
	POD1-CH7				7ns	6ns
	POD2-CH0				7ns	6ns
	POD2-CH1				7ns	6ns
	POD2-CH2				7ns	6ns
	POD2-CH3				7ns	6ns
	POD2-CH4				7ns	6ns
	POD2-CH5				7ns	6ns
	POD2-CH6				7ns	6ns
	POD2-CH7				7ns	6ns

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-15	**Fine Timing Option**				
Step 2	Delay				
	POD0-CH0	18 ns			22 ns
	POD0-CH1	18 ns			22 ns
	POD0-CH2	18 ns			22 ns
	POD0-CH3	18 ns			22 ns
Step 3	POD0-CH0				
	Delay				
	25 ns	22.75ns			27.25ns
	30 ns	27.50ns			32.5 ns
	35 ns	32.25ns			37.75ns
	40 ns	37.00ns			43.00ns
	POD0-CH1				
	Delay				
	25 ns	22.75ns			27.25ns
	30 ns	27.50ns			32.5 ns
	35 ns	32.25ns			37.75ns
	40 ns	37.00ns			43.00ns
	POD0-CH2				
	Delay				
	25 ns	22.75ns			27.25ns
	30 ns	27.50ns			32.5 ns
	35 ns	32.25ns			37.75ns
	40 ns	37.00ns			43.00ns
	POD0-CH3				
	Delay				
	25 ns	22.75ns			27.25ns
	30 ns	27.50ns			32.5 ns
	35 ns	32.25ns			37.75ns
	40 ns	37.00ns			43.00ns

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-16	**Level Test**				
	ECL Pod 15461A				
Step 1	High level				
	CH0	-1.02V			
	CH1	-1.02V			
	CH2	-1.02V			
	CH3	-1.02V			
	CH4	-1.02V			
	CH5	-1.02V			
	CH6	-1.02V			
	CH7	-1/02V			
	Low Level				
	CH0				-1.6V
	CH1				-1.6V
	CH2				-1.6V
	CH3				-1.6V
	CH4				-1.6V
	CH5				-1.6V
	CH6				-1.6V
	CH7				-1.6V
	TTL/CMOS Pod 15462A				
Step 1	High Level +2.4V	+1.98V			+2.82V
	Low Level				+0.7 V
	High Level +3V	+2.55V			+3.45V
	Low Level				+0.7V
	High Level +5V	+4.45V			+5.55V
	Low Level				+0.7V
	High Level +9.9V	+9.10V			+10.695V
	Low Level				+0.7V

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-17	**Transition Times "into open"**				
Step 2	ECL Pod 15461A 20%-80%				3 ns
	TTL/CMOS Pod 15462A				
	High Level				
	+2.4V				5.88 ns
	+5V				9 ns
	+9.9V				14.88 ns
Step 3	Overshoot, Preshoot and Ringing				20%
Step 5	Transition Time **"into 50 pF"**				
	TTL/CMOS POD 15462A				
	High Level +5V				18 ns
4-18	**TTL Leakage Current**				
Step 3	CH0				20 uA
	CH1				20 uA
	CH2				20 uA
	CH3				20 uA
	CH4				20 uA
	CH5				20 uA
	CH6				20 uA
	CH7				20 uA

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-19	**TRIST T(ON) T(OFF) Pod 15462A**				
Step 1	T(ON)				
	CH0				30 ns
	CH1				30 ns
	CH2				30 ns
	CH3				30 ns
	CH4				30 ns
	CH5				30 ns
	CH6				30 ns
	CH7				30 ns
	T(OFF)				
	CH0				30 ns
	CH1				30 ns
	CH2				30 ns
	CH3				30 ns
	CH4				30 ns
	CH5				30 ns
	CH6				30 ns
	CH7				30 ns
Step 2	Threshold Level of TRIST input				
	CH0 internal High Level				
	+9.9V	+2.66V			+4.26V
	+5.0V	+0.95V			+2.55V
	+2.4V	+0.8V			+1.6V
	CH1 internal High Level				
	+9.9V	+2.66V			+4.26V
	+5.0V	+0.95V			+2.55V
	+2.4V	+0.8V			+1.6V
	CH2 internal High Level				
	+9.9V	+2.66V			+4.26V
	+5.0V	+0.95V			+2.55V
	+2.4V	+0.8V			+1.6V

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
	CH3 internal High Level				
	+9.9V	+2.66V			+4.26V
	+5.0V	+0.95V			+2.55V
	+2.4V	+0.8V			+1.6V
	CH4 internal High Level				
	+9.9V	+2.66V			+4.26V
	+5.0V	+0.95V			+2.55V
	+2.4V	+0.8V			+1.6V
	CH5 internal High Level				
	+9.9V	+2.66V			+4.26V
	+5.0V	+0.95V			+2.55V
	+2.4V	+0.8V			+1.6V
	CH6 internal High Level				
	+9.9V	+2.66V			+4.26V
	+5.0V	+0.95V			+2.55V
	+2.4V	+0.8V			+1.6V
	CH7 internal High Level				
	+9.9V	+2.66V			+4.26V
	+5.0V	+0.95V			+2.55V
	+2.4V	+0.8V			+1.6V

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-20	**$\overline{EN}$ T(ON) T(OFF) Pod 15461A**				
	T(ON)				
	CH0				15 ns
	CH1				15 ns
	CH2				15 ns
	CH3				15 ns
	CH4				15 ns
	CH5				15 ns
	CH6				15 ns
	CH7				15 ns
	T(OFF)				
	CH0				15 ns
	CH1				15 ns
	CH2				15 ns
	CH3				15 ns
	CH4				15 ns
	CH5				15 ns
	CH6				15 ns
	CH7				15 ns

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Test Number	Title	Low Limit	Actual Reading measured	Actual Reading corrected	High Limit
4-21	**Trigger Pod**				
A	**START/STOP**				
Step 1			Y/N	Y/N	
Step 4	Flag Pod CH0		Y/N	Y/N	
Step 5	CH1		Y/N	Y/N	
	CH2		Y/N	Y/N	
	CH3		Y/N	Y/N	
	CH4		Y/N	Y/N	
	CH5		Y/N	Y/N	
	CH6		Y/N	Y/N	
	CH7		Y/N	Y/N	
B	**Tristate on/off**				
Step 2			Y/N	Y/N	
C	**Trigger word JMPA/JMPB**				
Step 1			Y/N	Y/N	
Step 2			Y/N	Y/N	
D	**Valid Trigger Word Duration**				
Step 3	Duration 50 ns		Y/N	Y/N	
Step 4	Duration				
	100 ns		Y/N	Y/N	
	200 ns		Y/N	Y/N	
	500 ns		Y/N	Y/N	
E	**Pod Input Threshold**				
Step 2	ECL		Y/N	Y/N	
Step 5	+9.9V		Y/N	Y/N	
Step 6	-9.9V		Y/N	Y/N	
Step 7	-1.0V		Y/N	Y/N	

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