

**PRELIMINARY**

PDH / DSn  
Operating Manual

HP 37717C  
Communications  
Performance Analyzer

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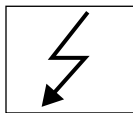
## WARNING

For details of safety, see  
Safety information at the  
front of this manual.

### Warning Symbols Used on the Product



The product is marked  
with this symbol when the  
user should refer to the  
instruction manual in order  
to protect the apparatus  
against damage.



The product is marked  
with this symbol to  
indicate that hazardous  
voltages are present



EN 60825 1991

The product is marked  
with this symbol to  
indicate that a laser is  
fitted. The user should  
refer to the laser safety  
information in the  
Calibration Manual.

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**HP 37717C Communications  
Performance Analyzer**

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## About This Book

**The HP 37717C PDH /DSn Operating Manual** explains the following :

- How to select and use the PDH / DSn features provided with the PDH /DSn options
- How to make PDH / DSn measurements

For some operations and measurements, information from one of the following associated books may be required:

**“The HP 37717C Mainframe Operating Manual”** explains how to obtain the required display, how to use the front panel keys, how to interpret the status indicators, how to connect to external equipment and how to perform instrument tasks associated with the HP 37717C irrespective of the option configuration.

**“The HP 37717C SDH / SONET Operating Manual ”**describes the selection of SDH / SONET features and how to perform SDH / SONET tests with the HP 37717C Communications Performance Analyzer.

**“The HP 37717C Jitter Operating Manual”** describes the selection of Jitter features and how to perform Jitter tests with the HP 37717C Communications Performance Analyzer.

**“The HP 37717C ATM Operating Manual”**describes the selection of ATM features and how to perform ATM tests with the HP 37717C Communications Performance Analyzer.

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## Contents

### **1 About the HP 37717C**

Instrument Options 2  
Installing Upgrade Modules 7  
Power Requirements 7

### **2 Getting Started**

Introduction to the 37717C Front Panel 11  
Selecting Displays 12  
Changing the Displayed Folder 16  
Changing the Instrument Settings 17  
Other Front Panel Keys 26  
Status Indicators 27  
Connectors 30  
Basic Error Measurement Example 34

### **3 Mainframe Features**

Storing Measurement Data 40  
Graphics 41  
Logging Results 49  
Internal Printer (Option UKX) 56  
External HP 550C DeskJet Printer 60  
Autosetup 62  
Stored Settings 63  
Disk Drive 75  
Coupling Transmit and Receive Settings 87  
Suspending a Test on Signal Loss 87  
Time & Date 88  
Keyboard Lock 89  
Beep On Received Error 90

Analysis Control (Option UKK[USB] only) 90  
Self Test 91

## **4 Appendix A - Logging Messages**

Logging Devices 96  
Results Logging 96

## **5 Appendix B - Results Definitions**

Trouble Scan 106  
Alarm Scan (Options UKJ[USA], UKL[USC]) 107  
Short Term Results 108  
Cumulative Results 111  
ATM Results 113  
PDH Error Analysis G.821, G.826, M2100, M2110, M2120 115  
SDH Error Analysis (Option US1[US5], A1T[A1U]) 126  
Physical Layer Error Analysis (Options US1[US5], A1T[A1U], UKZ ) 136  
Jitter Results (Options UHN[US9], A1M[A1Q], A1N[A1R], A1P[A1S]) 143  
Alarm Seconds 144  
Frequency Measurement 147

## **6 Appendix C - Self Test Fail Numbers**

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# 1

## **Introduction to PDH / DSn page 2**

## **Options With PDH / DSn Capability page 3**

Unstructured PDH Generation and Measurement. Option UKK (USB) page 3

Structured PDH Generation and Measurement. Options UKJ (USA) and UKN (USE) page 4

DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. Option UKZ page 5

E1, E3 and E4 Transmit and Receive Interfaces for ATM Payloads. Option UKN (USE) page 6

Binary Interfaces. Option UH3 (US7) page 7

Multiple PDH Outputs. Option UHC (US6) page 8

## **PDH / DSn Display Reference page 9**

Unstructured PDH Generation and Measurement. Option UKK (USB) page 9

Structured PDH Generation and Measurement. Options UKJ (USA) or UKN (USE) page 11

DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. Option UKZ page 15

E1, E3 and E4 Transmit and Receive Interfaces for ATM Payloads. Option UKN (USE) page 19

Binary Interfaces. Option UH3 (US7) page 22

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## **HP 37717C PDH / DSn Features**

Information on the optional modules including selection of the features available.

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## **Introduction to PDH / DSn**

The Plesiochronous Digital Hierarchy (PDH / DSn) is still the dominant technology in most existing telecommunications networks throughout the world, although it is being replaced in many networks by Synchronous Digital Hierarchy (SDH) or SONET networks. PDH / DSn networks were developed at a time when point-to-point transmission was the predominant network requirement. To support this requirement, the standard approach to network management and maintenance was to use manual distribution frames for access to individual signals. This is now considered out of date and consequently SDH / SONET is now the preferred network topology for new installations.

However PDH / DSn networks will exist for a long time to come even in networks where SDH /SONET is the preferred technology. PDH is the ETSI international standard, based on 2 Mb/s, defined by the ITU-T, and covers the hierarchal transmission rates of 2 Mb/s, 8 Mb/s, 34 Mb/s and 140 Mb/s. DSn is the ANSI standard covering transmission rates of 1.544 Mb/s (DS1) and 44.736 Mb/s (DS3). PDH is asynchronous at 8 Mb/s, 34 Mb/s and 140 Mb/s. In order to access a signal, for rerouting or test purposes, the whole line signal structure must be demultiplexed step by step down to the 2 Mb/s level, because of the asynchronous nature of the multiplexing.

At each multiplexing step, the bit rate of the individual tributary signals is controlled within specified limits and is not synchronized with the multiplex equipment. Because the bit rates of the individual tributaries are controlled within specific limits this type of multiplexing is referred to as Plesiochronous i.e. nearly synchronous. The individual tributaries are synchronized with the equipment at each multiplex step by the process of positive bit stuffing justification.

In new SDH / SONET networks, PDH / DSn signals are mapped into virtual containers / tributaries before being transported as part of the SDH / SONET payload. The SDH / SONET payload must then be demapped into a PDH / DSn tributary signal.

Therefore all PDH / DSn , SDH / SONET and mixed PDH/SDH DSn / SONET networks require test sets which have PDH / DSn interfaces and PDH / DSn test capability.



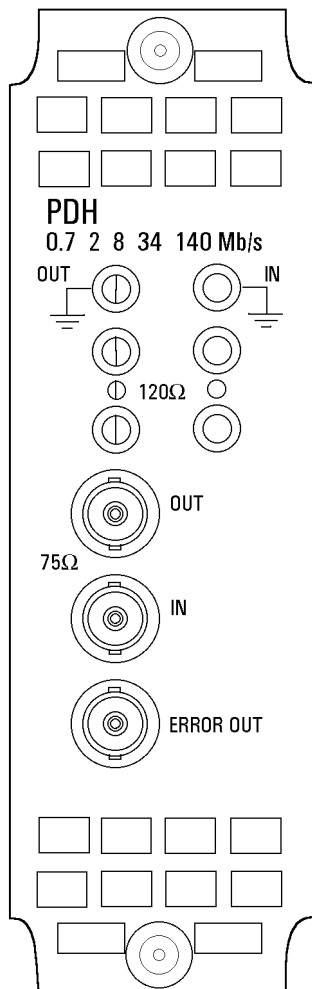
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## Options With PDH / DS<sub>n</sub> Capability

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### Unstructured PDH Generation and Measurement. Option UKK (USB)



Option UKK (USB), Unstructured PDH, provides generation and measurement of unstructured PDH at interface rates of 704 kb/s, 2.048 Mb/s, 8.448 Mb/s, 34.368 Mb/s and 139.264 Mb/s.

Allows the addition of Frequency Offset to the PDH signal

Provides 75  $\Omega$  unbalanced or 120  $\Omega$  balanced input and output interfaces.

Allows selection of PRBS, WORD or USER patterns

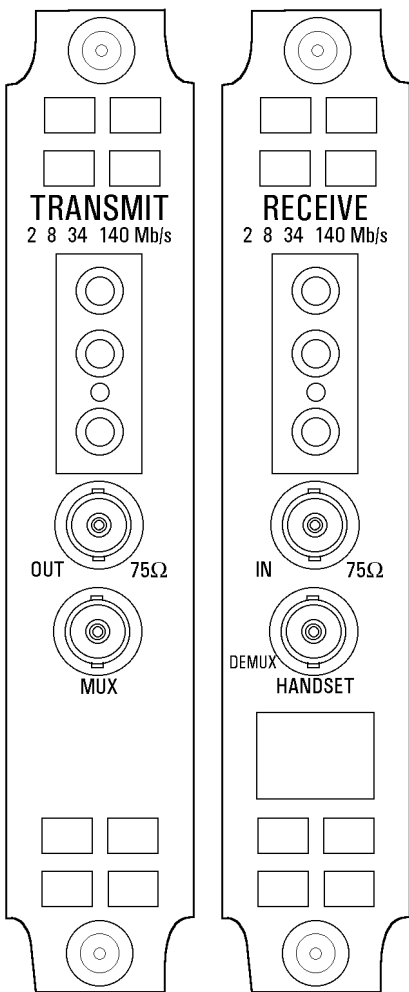
Allows selection of Line Code AMI, HDB3 or CMI

Provides an ECL pulse each time an error occurs (Error Out)

**Structured PDH Generation and Measurement. Options UKJ (USA) and UKN (USE)**

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**Structured PDH Generation and Measurement. Options UKJ (USA) and UKN (USE)**



Options UKJ (USA) and UKN (USE), provide generation and measurement of Structured or Unstructured PDH at interface rates of 2.048 Mb/s (E1), 8.448 Mb/s (E2), 34.368 Mb/s (E3) and 139.264 Mb/s (E4).

Structured test signal rates of 64 kb/s, 2.048 Mb/s, 8.448 Mb/s and 34.368 Mb/s are provided.

Frequency Offset can be added at the interface rates.

Line rate frequency can be measured.

Provides 75  $\Omega$  unbalanced or 120  $\Omega$  balanced input and output interfaces.

Allows selection of PRBS, WORD or USER patterns

Allows selection of Line Code AMI, HDB3 or CMI

Interface and test signal rates can be Framed or Unframed

MUX connector allows a 2 Mb/s signal from external equipment to be inserted into the HP 37717C test signal.

DEMUX connector allows a 2 Mb/s signal from the HP 37717C to be Dropped to external equipment.

Option UKN (USE) also provides generation and measurement of PDH signals with ATM payloads. Option UKN (USE) therefore provides all of the PDH facilities described here with the additional facilities described on page 6.

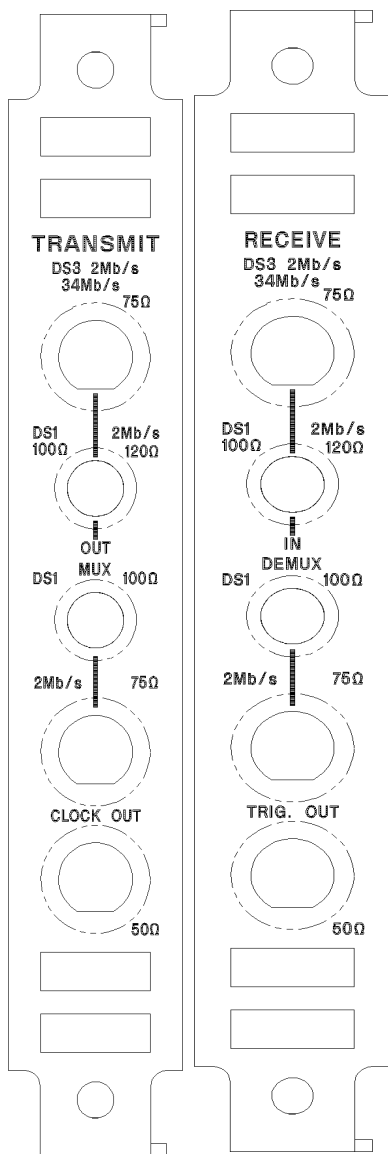
Information on the ATM capabilities of the UKN (USE) module is given in "The ATM Operating Manual"

**Option UKJ (USA)**

**DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. Option UKZ**

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**DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. Option UKZ**



Option UKZ, provides generation and measurement of PDH /DS<sub>n</sub> signals with ATM payloads at interface rates of: 1.544 Mb/s (DS1), 44.736 Mb/s (DS3), 2.048 Mb/s (E1), and 34.368 Mb/s (E3) .

Frequency Offset can be added at the interface rates.

Line rate frequency can be measured.

Provides the following RZ input and output interfaces:

DS3 and E3: 75 Ω unbalanced

E1: 75 Ω unbalanced, 120 Ω balanced.

DS1: 100 Ω balanced.

Allows selection of Line Code as AMI, HDB3, B3ZS or B8ZS

Provides Input sensitivity level selection.

Provides output level control for DS1 and DS3.

Allows error and alarm injection at the physical and ATM layers.

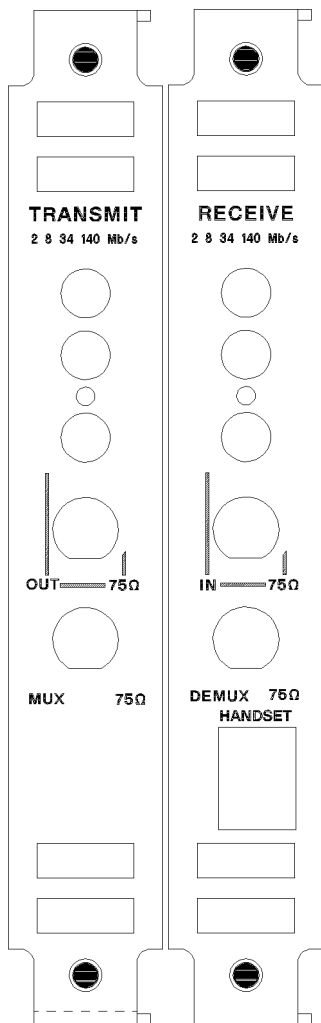
Allows selection of PCLP or Direct mapping at DS3.

Information on the ATM capabilities of this module is given in “The ATM Operating Manual”

**E1, E3 and E4 Transmit and Receive Interfaces for ATM Payloads.  
Option UKN (USE)**

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**E1, E3 and E4 Transmit and Receive Interfaces for ATM Payloads.  
Option UKN (USE)**



Option UKN (USE) provides generation and measurement of PDH signals with ATM payloads at rates of 2.048 (E1), 34.368 (E3) and 139.264 (E4) Mb/s.

Frequency Offset can be added at the interface rates.

Line rate frequency can be measured.

Provides the following input and output interfaces:

E1: RZ, 75 Ω unbalanced and 120 Ω balanced.

E3: RZ, 75 Ω unbalanced.

E4: CMI 75 Ω unbalanced.

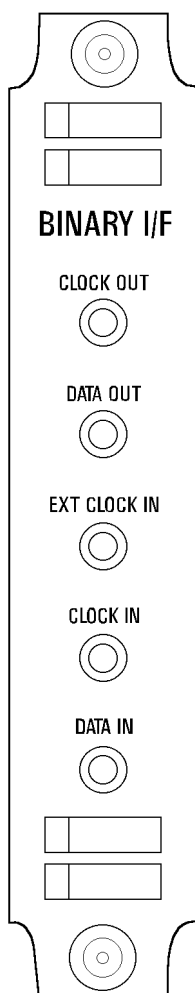
Allows selection of E1 Line Code AMI, HDB3.

Allows selection of CRC-4 Multiframe at E1.

Information on the ATM capabilities of this module is given in “The ATM Operating Manual”

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## Binary Interfaces. Option UH3 (US7)



Option UH3 (US7) provides binary NRZ interfaces for the structured PDH module option UKJ (USA), and the unstructured PDH module option UKK (USB).

The interfaces can operate at any of the standard rates  $\pm 100$  ppm.

When used with option UKK (USB), with an external binary clock input, the interfaces can operate at any rate in the range 700 kb/s to 170 Mb/s.

TTL signal levels, at data and clock ports, and external clock port, are valid from 700 kb/s to 50 Mb/s,  $75\Omega$  to ground.

ECL signals, at data and clock ports, and external clock port, are valid from 700 kb/s to 170 Mb/s,  $75\Omega$  to -2V.

The external clock input may be used to clock **coded** data from the PDH / DS<sub>n</sub> transmitter at standard rates. In addition if Option UKK (USB), Unstructured PDH, is fitted can clock **coded** data in the range 700 kb/s to 170 Mb/s.

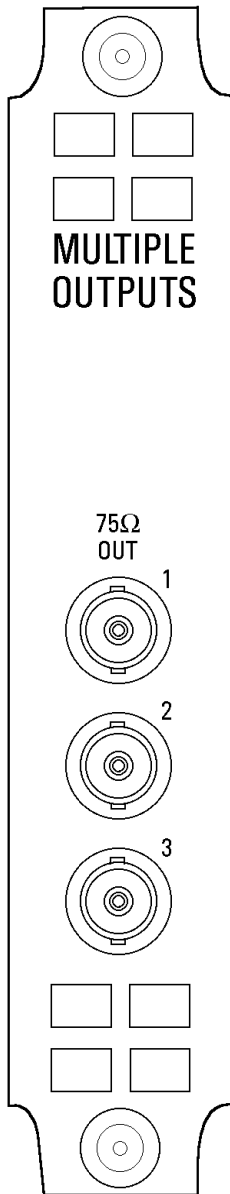
Simultaneous jitter of binary clock and binary data outputs is possible (2, 8, 34 & 140 Mb/s) if Option UHK (USB) or A3K, Jitter Generator, is fitted.

Jitter measurement on the binary clock input is possible (2, 8, 34 & 140 Mb/s  $\pm 100$  ppm) if Option UHN, A1M, A1N or A1P, Jitter Measurement, is fitted.

Frequency measurement of the external clock input and binary clock input is provided.

---

## Multiple PDH Outputs. Option UHC (US6)



Option UHC (US6), Multiple PDH Outputs, provides three additional 75Ω PDH outputs.

OUT 1 is delayed by 4 bits relative to the main PDH OUT.

OUT 2 is delayed by 8 bits relative to the main PDH OUT.

OUT 3 is delayed by 12 bits relative to the main PDH OUT.

NOTE: When used with Option UKZ, multiple outputs are available at the 2 and 34 Mb/s E1 and E3 rates.

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## PDH / DS<sub>n</sub> Display Reference

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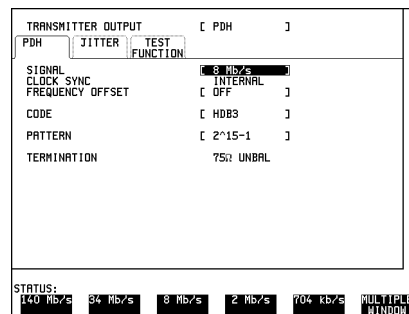
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### Unstructured PDH Generation and Measurement. Option UKK (USB)

A choice of 5 SIGNAL rates is available.

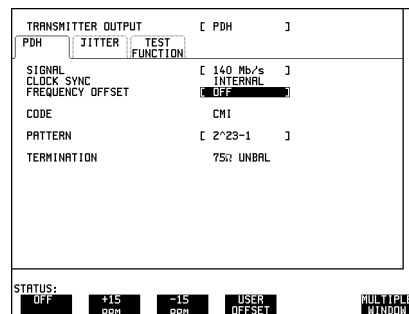
The clock is normally synchronised to an internal clock.

When 2 Mb/s is selected the clock RECOVERED by the Receiver can be used as the synchronisation source.



FREQUENCY OFFSET can be added at preset CCITT values or as User defined values in the range  $\pm 100$  ppm.

The preset value will change according to the PDH signal rate selected.



## HP 37717C PDH / DS<sub>n</sub> Features

### Unstructured PDH Generation and Measurement. Option UKK (USB)

PATTERN allows a choice of PRBS and WORD patterns.

Line CODE and TERMINATION can be selected to match the requirements of network equipment.

Errors of the type selected on the TEST FUNCTION display can be added to the PATTERN singly by pressing **[SINGLE]** or at a selectable RATE.

TEST MODE allows Bit Error measurements to be made with the network equipment Out Of Service or Frame error measurements to be made with the network equipment In Service.

When In Service is selected the only PATTERN available is LIVE TRAFFIC.

If 2 Mb/s is selected as the SIGNAL rate, a choice of of 2 Mb/s FRAMING type is provided.

TRANSMITTER OUTPUT		[ PDH ]
PDH	JITTER	TEST FUNCTION
SIGNAL	[ 2 Mb/s ]	
CLOCK SYNC	[ INTERNAL ]	
FREQUENCY OFFSET	[ OFF ]	
CODE	[ HDB3 ]	
PATTERN	[ 2 <sup>15</sup> -1 ]	
TERMINATION	[ 75Ω UNBAL ]	
STATUS:		
[ 2 <sup>15</sup> -1 ]	[ ALL ZEROS ]	[ ALL ONES ]
	[ MORE ]	[ MULTIPLE WINDOW ]

RECEIVER INPUT		[ PDH ]
PDH	JITTER	
SIGNAL	[ 2 Mb/s ]	
LEVEL	[ TERMINATE ]	
TEST MODE	[ OUT OF SRVC ]	
CODE	[ HDB3 ]	
PATTERN	[ 2 <sup>15</sup> -1 ]	
TERMINATION	[ 75Ω UNBAL ]	
STATUS:		
[ OUT OF SERVICE ]	[ IN SERVICE ]	[ MULTIPLE WINDOW ]

RECEIVER INPUT		[ PDH ]
PDH	JITTER	
SIGNAL	[ 2 Mb/s ]	
LEVEL	[ TERMINATE ]	
TEST MODE	[ IN SERVICE ]	
FRAMING MODE	[ PCM30 ]	
CODE	[ HDB3 ]	
PATTERN	[ LIVE TRAFFIC ]	
TERMINATION	[ 75Ω UNBAL ]	
STATUS:		
[ PCM30 ]	[ PCM31 ]	[ PCM31CRC ]
[ PCM30CRC ]		[ MULTIPLE WINDOW ]



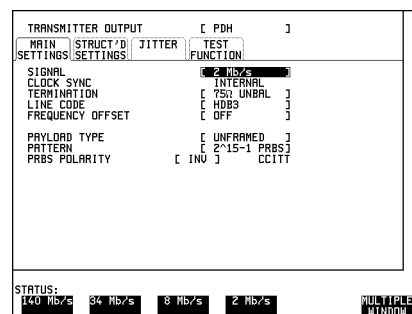
**Structured PDH Generation and Measurement. Options UKJ (USA) or UKN (USE)**

**Structured PDH Generation and Measurement. Options UKJ (USA) or UKN (USE)**

A choice of four SIGNAL rates is available.

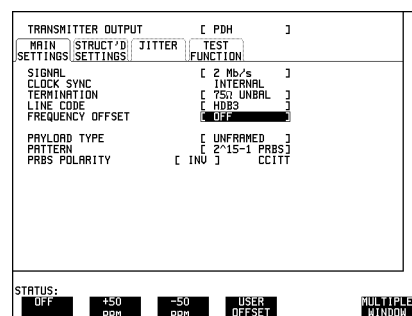
The clock is synchronised to an internal clock.

TERMINATION and Line CODE selections should match the requirements of the network equipment.



FREQUENCY OFFSET can be added at preset CCITT values or as User defined values in the range  $\pm 100$  ppm

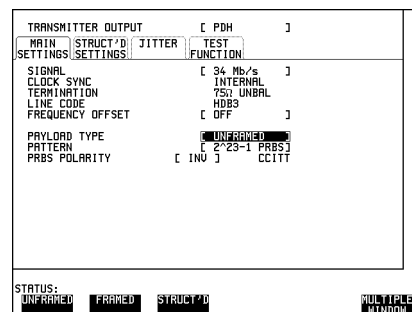
The preset value will change according to the PDH signal rate selected.



PAYLOAD TYPE determines whether the PDH signal is Unframed (Unstructured), Framed or Structured.

PATTERN allows a choice of PRBS and WORD patterns.

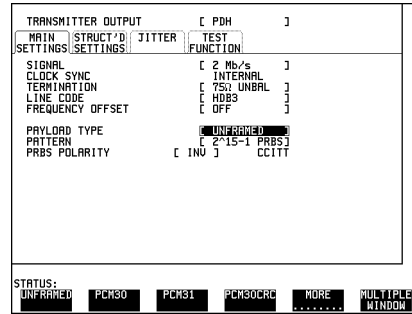
PRBS POLARITY allows a choice between Inverted (CCITT recommended) and Normal.



HP 37717C PDH / DS<sub>n</sub> Features

**Structured PDH Generation and Measurement. Options UKJ (USA) or UKN (USE)**

If 2Mb/s SIGNAL rate is selected the choice of Framing type is included in the PAYLOAD TYPE menu..

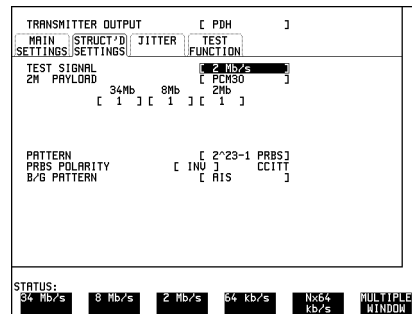


If STRUCTURED is selected a new display of **STRUCTURED SETTINGS** is obtained.

TEST SIGNAL allows a choice of rates (sub interface rate) at which testing is performed.

The example shown is for a 140 Mb/s main signal rate.

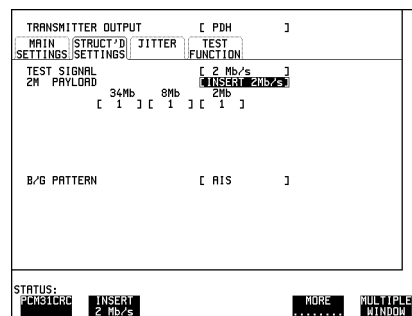
If 2Mb/s TEST SIGNAL rate is selected the choice of Framing type is included in the 2M PAYLOAD menu.



The 2M PAYLOAD menu includes a choice of INSERT 2Mb/s which allows an external 2 Mb/s Test Signal, presented at the MUX port, to be inserted into the structured PDH signal.

The capability to DROP the 2 Mb/s Test Signal to external equipment, via the DEMUX connector, is provided on the

**RECEIVE STRUCTURED SETTINGS** display 2M PAYLOAD menu.



HP 37717C PDH / DS<sub>n</sub> Features

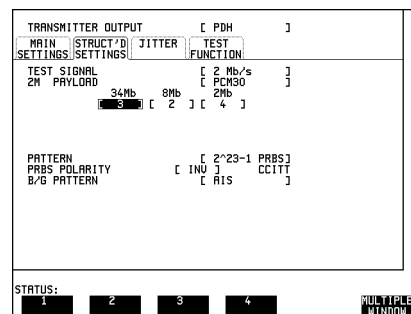
**Structured PDH Generation and Measurement. Options UKJ (USA) or UKN (USE)**

34Mb, 8Mb and 2Mb allow selection of the tributary of interest.

PATTERN allows a choice of PRBS and WORD patterns.

PRBS POLARITY allows a choice between Inverted (CCITT recommended) and Normal.

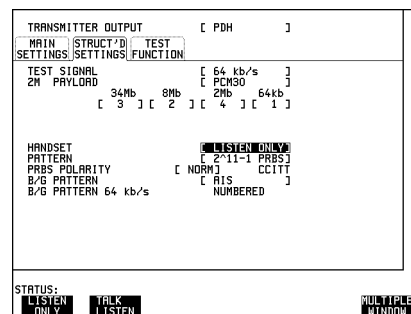
B/G PATTERN selection determines the pattern inserted in the non test tributaries.



If Transmit and Receive TEST SIGNAL 64 kb/s is selected the 2 Mb/s Framing choice is made from the 2M PAYLOAD menu.

A telephone HANDSET can be connected to the 64 kb/s channel and used to LISTEN or TALK and LISTEN.

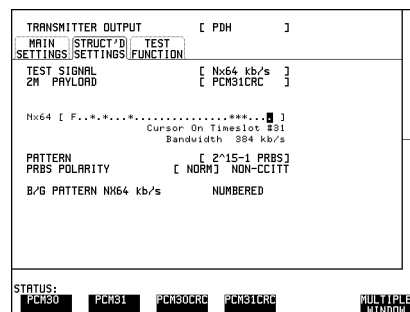
The B/G PATTERN in the non test 64 kb/s channels is always NUMBERED.



When N X 64kb/s is selected a test pattern can be inserted across a number of Timeslots even if the selected Timeslots are non contiguous.

The required Timeslots are selected using **DESELECT ALL**, **DESELECT**, **SELECT**, **←** and **→**.

In this example timeslots 3, 5, 9, 25, 26 and 27 are selected.



## HP 37717C PDH / DS<sub>n</sub> Features

### Structured PDH Generation and Measurement. Options UKJ (USA) or UKN (USE)

If the receiver input is derived from the network equipment monitor point then **SIGNAL IN** is pressed until the MONITOR indicator is lit.

The received signal will be 20 to 30 dB below the normal level. To return the received signal to normal GAIN is required at the receiver input.

The received signal may also require equalization to compensate for cable losses.

RECEIVER INPUT	[ PDH ]
MAIN SETTINGS	STRUCT'D JITTER
SIGNAL	[ 2 Mb/s ]
TERMINATION	[ 75Ω UNBAL ]
LINE CODE	[ HDLC ]
LEVEL	[ MONITOR ]
EQUALIZER	[ OFF ] GAIN [ 20 dB ]
PAYLOAD TYPE	[ UNFRAMED ]
PATTERN	[ 2 <sup>15</sup> -1 PRBS ]
PRBS POLARITY	[ INU ] CCITT

STATUS: UNFRAMED PCRS0 PCRS1 PCRS0CRC MORE MULTIPLE WINDOW

The **TRANSMIT TEST FUNCTION** allows the addition of errors.

Bit, Code or FAS (Frame) errors can be added dependent upon the SIGNAL and PAYLOAD TYPE selections.

Errors of the type selected on the TEST FUNCTION display can be added to the PATTERN singly by pressing **SINGLE** or at a selectable RATE.

TRANSMITTER OUTPUT	[ PDH ]
MAIN SETTINGS	STRUCT'D JITTER TEST FUNCTION
TEST FUNCTION	[ PDH ] ERRORS
ERROR ADD TYPE	[ BIT (TEST) ]
RATE	[ OFF ]

STATUS: BIT (TEST) FAS (LINE) CODE MULTIPLE WINDOW

**DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. Option UKZ**

**DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. Option UKZ**

A choice of four PDH / DS<sub>n</sub> SIGNAL rates is available

The clock may be synchronised to an internal clock or the received clock.

TERMINATION and Line CODE selections should match the requirements of the network equipment.

For DS1 and DS3 signal rates, the OUTPUT LEVEL can be selected. At DS3 the CONVERGENCE LAYER can be configured

When SDH / SONET modules are fitted, additional transmission and reception rates are available. For example STM-1 and OC-3c transmission and reception is available via the SDH Overhead / Stress module A1T plus an optical module such as UH1.

FREQUENCY OFFSET can be added at preset values or as User defined values in the range  $\pm 100$  ppm

The preset value will change according to the PDH / DS<sub>n</sub> signal rate selected.

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	DS3	[ INTERNAL ]
CLOCK SYNC		[ INTERNAL ]
OUTPUT LEVEL		[ DSX-3 ]
TERMINATION		[ 75 $\Omega$ UNBAL ]
LINE CODE		[ B3ZS ]
FREQUENCY OFFSET		[ OFF ]
CONVERGENCE SUB-LAYER		[ DIRECT ]
SCRAMBLING		[ ON ]

STATUS: DS3 34 Mb/s 2 Mb/s DS1 MULTIPLE WINDOW

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	DS3	[ INTERNAL ]
CLOCK SYNC		[ INTERNAL ]
OUTPUT LEVEL		[ DS3-H ]
TERMINATION		[ 75 $\Omega$ UNBAL ]
LINE CODE		[ B3ZS ]
FREQUENCY OFFSET		[ OFF ]
CONVERGENCE SUB-LAYER		[ DIRECT ]
SCRAMBLING		[ ON ]

STATUS: SIS-3c STM-1 DS3 34 Mb/s MORE MULTIPLE WINDOW

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	[ 34 Mb/s ]	[ INTERNAL ]
CLOCK SYNC		[ INTERNAL ]
TERMINATION		[ 75 $\Omega$ UNBAL ]
LINE CODE		[ HDB3 ]
FREQUENCY OFFSET		[ OFF ]
TRAIL TRACE		[ TEST HP37717C ]
SCRAMBLING		[ ON ]

STATUS: OFF +20 ppm -20 ppm USER OFFSET MULTIPLE WINDOW

HP 37717C PDH / DSn Features

**DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. Option UKZ**

At the 34Mb/s SIGNAL rate a TRAIL TRACE facility is available. The default signal, HP37717C, may be replaced with a selectable message.

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	[ 34 Mb/s ]	[ INTERNAL ]
CLOCK SYNC		[ INTERNAL ]
TERMINATION		[ 75Ω UNBAL ]
LINE CODE		[ HDB3 ]
FREQUENCY OFFSET		[ OFF ]
TRAIL TRACE		[ YES ] HP37717C
SCRAMBLING		[ ON ]

STATUS:  
 TEST     USER     MULTIPLE WINDOW

If the DS3 SIGNAL rate is selected the choice of CONVERGENCE SUB-LAYER is provided (Direct or PLCP mapping).

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	[ DS3 ]	[ INTERNAL ]
CLOCK SYNC		[ INTERNAL ]
OUTPUT LEVEL		[ DS3-HI ]
TERMINATION		[ 75Ω UNBAL ]
LINE CODE		[ B3ZS ]
FREQUENCY OFFSET		[ OFF ]
CONVERGENCE SUB-LAYER		[ PLCP ]
LINE SIGNAL STATUS(G1)		[ 000 ]
CYCLE/STUFF COUNT		[ NOMINAL ]
GROWTH BYTES	[ 21 ]	[ 11111111 ]
SCRAMBLING		[ ON ]

STATUS:  
 DIRECT     PLCP     MULTIPLE WINDOW

If the 2Mb/s SIGNAL rate is selected, CRC-4 Multiframing may be selected. SCRAMBLING may be selected ON or OFF at any of the SIGNAL rates.

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	[ 2 Mb/s ]	[ INTERNAL ]
CLOCK SYNC		[ INTERNAL ]
TERMINATION		[ 75Ω UNBAL ]
LINE CODE		[ HDB3 ]
FREQUENCY OFFSET		[ OFF ]
CRC-4 MULTIFRAME		[ OFF ]
SCRAMBLING		[ ON ]

STATUS:  
 OFF     ON     MULTIPLE WINDOW

HP 37717C PDH / DS<sub>n</sub> Features

**DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. Option UKZ**

The **TRANSMIT TEST FUNCTION** allows the addition of errors and alarms at the physical and ATM layers.

The types of error available for selection will depend on the SIGNAL rate selected. The example shown is for DS1 which includes excess zeros (EXZ).

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
TEST FUNCTION [ PDH ]		ERR & ALARM
ERROR ADD TYPE	[ FAS (LINE) ]	
RATE	[ OFF ]	
PRESS <b>SIGNAL</b> KEY TO ERROR	[ 1 FRAME ]	
ALARM TYPE	[ OFF ]	

STATUS: FAS (LINE) CODE CRC EXZ MULTIPLE WINDOW

The alarms which may be generated also depend on the SIGNAL rate selected.

The example shown here is for DS3.

The Far End Alarm and Control (FEAC) function allows alarm conditions and control codewords to be transmitted.

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
TEST FUNCTION [ PDH ]		ERR & ALARM
ERROR ADD TYPE	[ FAS (LINE) ]	
RATE	[ OFF ]	
PRESS <b>SIGNAL</b> KEY TO ERROR	[ 1 FRAME ]	
ALARM TYPE	[ FEAC ]	
FEAC CODE TYPE	[ LOOPBACK ]	
MESSAGE	[ DEACTIVATE DS1 JE ]	
REPEAT (TIMES)	[ 10 LOOP ]	
TRANSMIT NEW CODE	[ OFF ]	

STATUS: RAT FEAC IDLE MORE MULTIPLE WINDOW

To make measurements on PDH / DS<sub>n</sub> signals with ATM payloads, set the **RECEIVE PHYSICAL LAYER** to the interface SIGNAL RATE. MONITOR and TERMINATE LEVELS should be set to match the signal level.

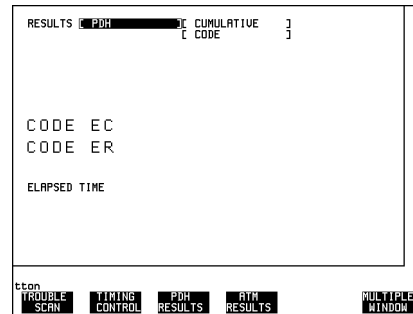
RECEIVER INPUT		ATM
PHYSICAL LAYER	ATM LAYER	
SIGNAL	[ DS1 ]	
TERMINATION	[ 100% BAL ]	
LINE CODE	[ B2B2S ]	
LEVEL	[ TERMINATE ]	
CELL SCRAMBLING		[ OFF ]

ttion DS3 34 Mb/s 2 Mb/s DS1 MULTIPLE WINDOW

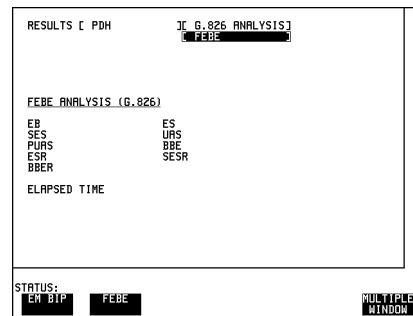
HP 37717C PDH / DSn Features

**DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM  
Payloads. Option UKZ**

Select **RESULTS** **PDH RESULTS**



Then select the type of result required.



Information on the ATM features of this module is given in “The ATM Operating Manual”



**E1, E3 and E4 Transmit and Receive Interfaces for ATM Payloads.  
Option UKN (USE)**

---

**E1, E3 and E4 Transmit and Receive Interfaces for ATM Payloads.  
Option UKN (USE)**

A choice of three PDH SIGNAL rates is available

The clock may be synchronised to an internal clock or the received clock.

FREQUENCY OFFSET can be added at preset values or as User defined values in the range  $\pm 100$  ppm. The preset value will change according to the PDH signal rate selected.

A Trail Trace facility is available at the 140 and 34 Mb/s rates.

TERMINATION and Line CODE are preset at 140 and 34 Mb/s. at the 2 Mb/s rate the Termination and line code selections should match the requirements of the network equipment.

At the 2 Mb/s rate CRC-4 Multiframe can be selected .

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	140 Mb/s	[ INTERNAL ]
CLOCK SYNC		INTERNAL
TERMINATION		75% UNBAL
LINE CODE		CMI
FREQUENCY OFFSET		[ OFF ]
TRAIL TRACE		[ TEST HP37717C ]

STATUS:  
140 Mb/s    34 Mb/s    2 Mb/s    MULTIPLE WINDOW

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	2 Mb/s	[ INTERNAL ]
CLOCK SYNC		INTERNAL
TERMINATION		[ 75% UNBAL ]
LINE CODE		[ B1B3 ]
FREQUENCY OFFSET		[ OFF ]
CRC-4 MULTIFRAME		[ OFF ]

STATUS:  
H0B3    AMI    MULTIPLE WINDOW

HP 37717C PDH / DS<sub>n</sub> Features

**E1, E3 and E4 Transmit and Receive Interfaces for ATM Payloads.  
Option UKN (USE)**

When SDH / SONET modules are fitted, additional transmission and reception rates are available. For example STM-1 OPTICAL and STM-1 (ELECTRICAL) transmission and reception is available via the SDH Overhead / Stress module A1T plus an optical module such as UH1.

TRANSMITTER OUTPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	TEST FUNCTION
SIGNAL	[ 2 Mb/s ]	[ INTERNAL ]
CLOCK SYNC		[ INTERNAL ]
TERMINATION		[ 75Ω UNBAL ]
LINE CODE		[ HDB3 ]
FREQUENCY OFFSET		[ OFF ]
CRC-4 MULTIFRAME		[ OFF ]

STATUS: **STM-1** 140 Mb/s 8x Mb/s 2 Mb/s MULTIPLE WINDOW

To make measurements on PDH signals with ATM payloads, set **RECEIVE** to **ATM** and select the interface SIGNAL RATE. MONITOR and TERMINATE LEVELS are available.

RECEIVER INPUT		[ ATM ]
PHYSICAL LAYER	ATM LAYER	
SIGNAL		[ 140 Mb/s ]
TERMINATION		[ 75Ω UNBAL ]
LINE CODE		[ CMI ]
LEVEL		[ TERMINATE ]

STATUS: **PDH** **ATM** MULTIPLE WINDOW

Select **RESULTS** **PDH RESULTS**

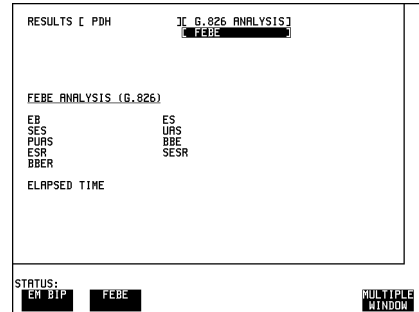
RESULTS	[ PDH ]	[ SHORT TERM ]
		[ EM BIP ]
EM BIP EC		
EM BIP ER		
ELAPSED TIME		

STATUS: **PROBLE** **SEARCH** **CONTROL** **PDH RESULTS** **ATM RESULTS** MULTIPLE WINDOW

HP 37717C PDH / DSn Features

**E1, E3 and E4 Transmit and Receive Interfaces for ATM Payloads.  
Option UKN (USE)**

Then select the type of result required.



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**NOTE**

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When DS3 frame errors are being measured, errors in either FAS or MFAS bits are included.

Information on the ATM features of this module is given in “The ATM Operating Manual”.

## Binary Interfaces. Option UH3 (US7)

To enable the **TRANSMIT** selection of NRZ binary interfaces, select , **PDH** , MAIN SETTINGS, INTERFACE, **BINARY**

The CLOCK SYNC for the transmitted signal may be selected as either the internal source or from an external binary (NRZ) input.

TRANSMITTER OUTPUT	[ PDH ]
MAIN   STRUCT'D   TEST	BINARY
SETTINGS   SETTINGS   FUNCTION	
SIGNAL	[ 2 Mb/s ]
INTERFACE	[ BINARY ]
CLOCK SYNC	[ INTERNAL ]
FREQUENCY OFFSET	[ OFF ]
PAYLOAD TYPE	[ UNFRAMED ]
PATTERN	[ 2 <sup>15</sup> -1 PRBS ]
PRBS POLARITY	[ INU ] CCITT

STATUS: **CODED** **BINARY** **MULTIPLE WINDOW**

The binary clock and data output thresholds and polarity are selectable. Thresholds may be ECL (75 Ω to ground) or TTL (75 Ω to -2V), polarity may be normal or inverted.

TRANSMITTER OUTPUT	[ PDH ]
MAIN   STRUCT'D   TEST	BINARY
SETTINGS   SETTINGS   FUNCTION	
SIGNAL	2 Mb/s
INTERFACE	BINARY
CLOCK SYNC	INTERNAL
THRESHOLDS: CLOCK OUT	[ ECL ]
DATA OUT	[ ECL ]
POLARITY: CLOCK OUT	[ NORMAL ]
DATA OUT	[ NORMAL ]

STATUS: **MULTIPLE WINDOW**

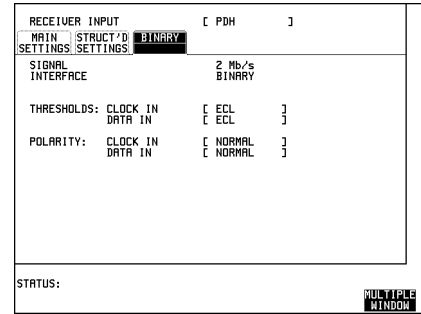
To enable the **RECEIVE** selection of binary interfaces, select , **PDH** , MAIN SETTINGS, INTERFACE, **BINARY**

RECEIVER INPUT	[ PDH ]
MAIN   STRUCT'D   TEST	BINARY
SETTINGS   SETTINGS   FUNCTION	
SIGNAL	[ 2 Mb/s ]
INTERFACE	[ BINARY ]
PAYLOAD TYPE	[ UNFRAMED ]
PATTERN	[ 2 <sup>15</sup> -1 PRBS ]
PRBS POLARITY	[ INU ] CCITT

STATUS: **CODED** **BINARY** **MULTIPLE WINDOW**

HP 37717C PDH / DS<sub>n</sub> Features  
**Binary Interfaces. Option UH3 (US7)**

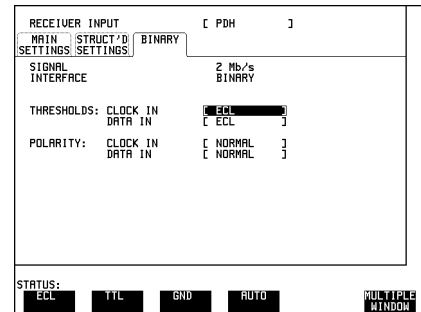
The binary clock and data input thresholds and polarity are selectable.



The DATA threshold selections are:  
 TTL (1.5V), ECL (-1.3V) and GND (0V)

The CLOCK thresholds are as for data plus AUTO (mean signal level).

The CLOCK and DATA polarity may be normal or inverted.



HP 37717C PDH / DSn Features  
**Binary Interfaces. Option UH3 (US7)**

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## 2

Alarm Monitoring	page 26
Analysis of N X 64 kb/s	page 29
BERT Testing	page 33
Cross Multiplexer Testing	page 38
FAS Monitoring	page 44
Frequency Measurement	page 48
Frequency Offset Tolerance	page 51
Multiplexer Testing	page 55
Round Trip Delay	page 60
M2100, M2110, M2120 Analysis	page 63
Monitoring DS3 with ATM Payloads	page 67

## Alarm Monitoring

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## Alarm Monitoring

**Options Required** Structured PDH UKJ (USA) or UKN (USE)

### Application

Problems in the network at all levels in the hierarchy can be detected by the occurrence of alarms in each tributary of structured PDH systems.

Using the HP 37717C in a *receive only* mode, each tributary can be scanned and the state of Frame Loss, Remote (RAI) and AIS alarms viewed on the **RESULTS** display.

### Default (Known State) Settings

It can be advisable to set the HP 37717C to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings*.

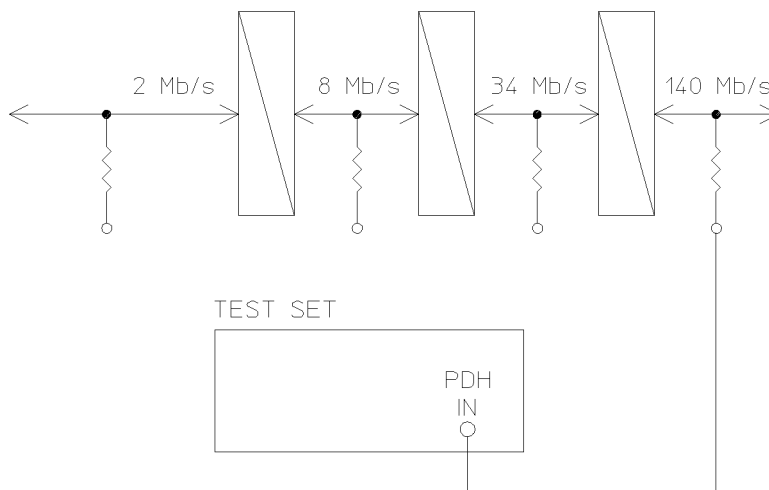
### Test Setup Procedure (Alarm Monitoring)

This setup procedure is based on Structured PDH 140 Mb/s line traffic interfaced at the line equipment 75  $\Omega$  protected Monitor point . If a protected Monitor Point is not available then an HP 15510A Protective Probe may be used at an unprotected Monitor point.

When 120  $\Omega$  Balanced alarm monitoring is desired at an unprotected Monitor point use an HP 15511A Protective Monitor Probe. The instrument is used in a *receive only* mode to monitor Frame Loss, AIS and Remote alarms.

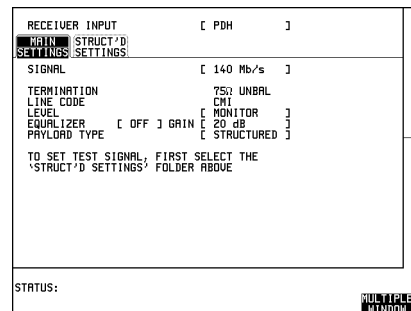


PDH / DS<sub>n</sub> Testing With The HP 37717C  
**Alarm Monitoring**



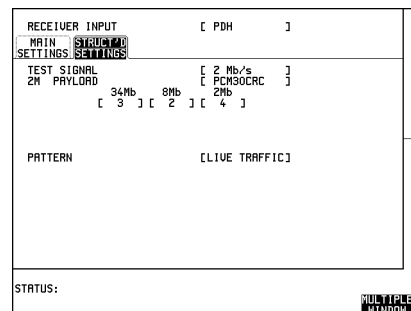
- 1 Connect the HP 37717C to the line terminal equipment protected Monitor point and set up the **RECEIVE** display **MAIN SETTINGS** as shown opposite.

The GAIN and EQUALIZER settings should be set to optimize the received signal.



- 2 Set up the **RECEIVE** display **STRUCTURED SETTINGS** as shown opposite.

2M PAYLOAD determines the Framing and selection which should match that of the network equipment.



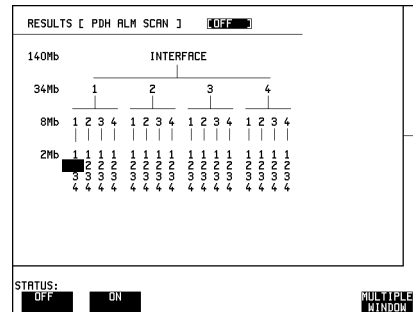
## PDH / DS<sub>n</sub> Testing With The HP 37717C Alarm Monitoring

### Start the Test (Alarm Monitoring)

1. Set up the **RESULTS** display as shown opposite and select **PDH ALM SCAN ON**.

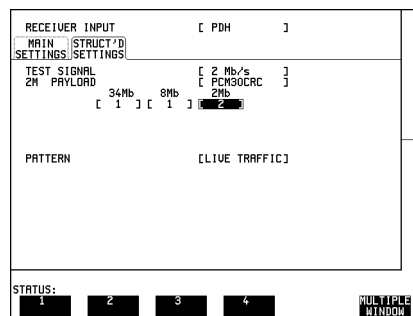
If any of the three alarms, Frame Loss, RAI or AIS has occurred the appropriate point in the hierarchy will be highlighted.

The test can be halted at any time by selecting **OFF** on the **RESULTS PDH ALM SCAN** display.

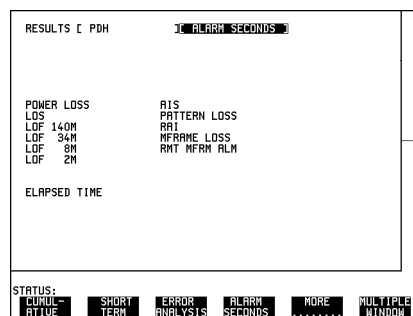


2. To determine which alarm has occurred set the PDH ALM SCAN **OFF** and then set the **RECEIVE STRUCTURED SETTINGS** display to the tributary highlighted as shown opposite and press **RUN/STOP**.

*Example 2Mb number 2 of 8Mb number 1 of 34 Mb number 1 is highlighted.*



3. Now view the Alarm Seconds results on the **RESULTS** display to determine which alarms have occurred.



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## Analysis of N X 64 kb/s

**Options Required** Structured PDH UKJ (USA) or UKN (USE)

### Application

Many customer premises receive subrate signals for example 128 Kb/s or 384 kb/s. The timeslots which make up these services may or may not be contiguous. Testing these services requires that the test set to be able to insert a pattern across the required timeslots.

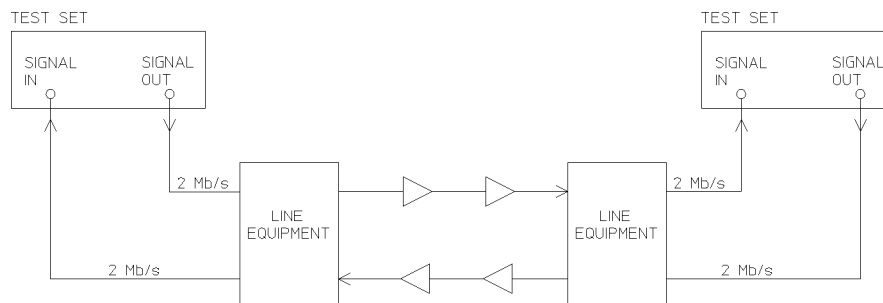
Testing N X 64 kb/s channels structured within a 2 Mb/s signal can be carried out on an End to End basis using two test sets.

### Default (Known State) Settings

It can be advisable to set the HP 37717C to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings in the Mainframe Operating Manual*.

### Test Setup Procedure (N X 64 kb/s Analysis)

This setup procedure is interfaced at 2 Mb/s, with a test signal of 6 X 64 kb/s non-contiguous timeslots. A PRBS test pattern is transmitted across the 6 timeslots. A BER measurement is performed on the received test pattern.

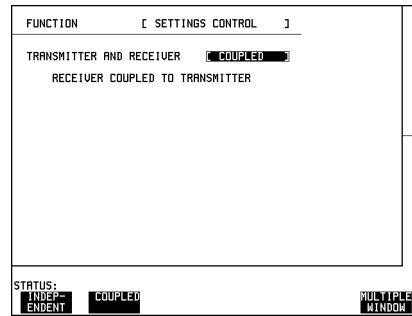


## PDH / DSn Testing With The HP 37717C Analysis of N X 64 kb/s

### HP 37717C #1

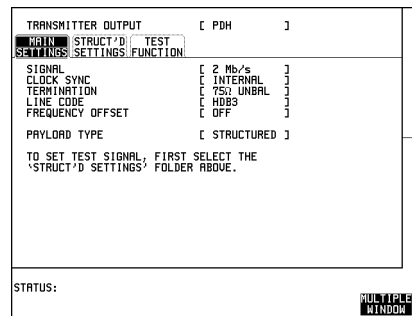
1. Set up the **OTHER SETTINGS CONTROL** display as shown opposite.

Any settings change made on the **TRANSMIT** or **RECEIVE** displays will automatically occur on the other.



2. Connect the HP 37717C to the line equipment and set up the **TRANSMIT MAIN SETTINGS** display as shown opposite.

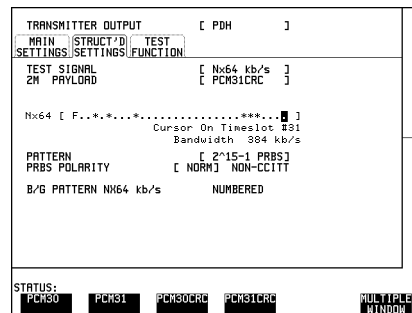
The settings of SIGNAL rate and LINE CODE must match those of the network equipment.



3. Set up the **TRANSMIT STRUCTURED SETTINGS** display as shown opposite.

In this example timeslots 3, 5, 9, 25, 26 and 27 are selected.

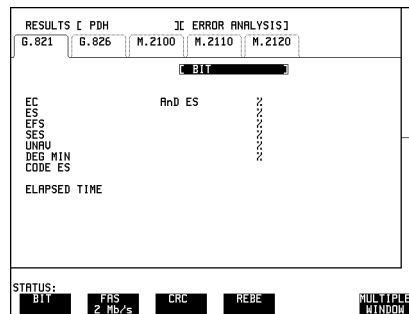
2M PAYLOAD selects the Framing which must match that of the network equipment.



PDH / DS<sub>n</sub> Testing With The HP 37717C  
**Analysis of N X 64 kb/s**

4. Set up the **RESULTS** display as shown opposite.

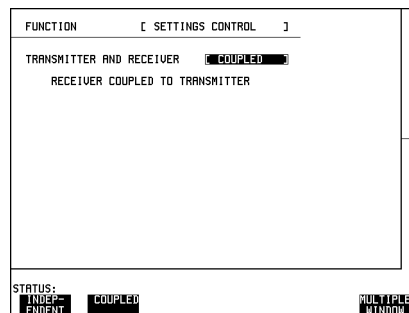
The RESULTS type may be changed during the measurement without interrupting the test.



**HP 37717C #2**

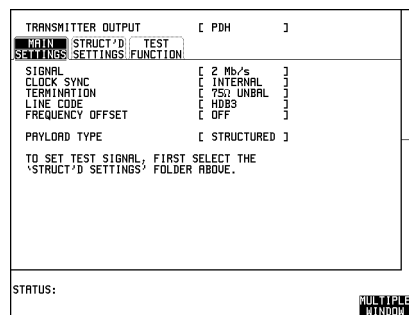
1. Set up the **OTHER SETTINGS CONTROL** display as shown opposite.

Any settings change made on the **TRANSMIT** or **RECEIVE** displays will automatically occur on the other.



2. Set up the **RECEIVE MAIN SETTINGS** display as shown opposite.

The settings of SIGNAL rate and LINE CODE must match those of the network equipment.





## BERT Testing

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## BERT Testing

**Options Required** Structured PDH UKJ (USA) or UKN (USE), or Unstructured PDH UKK (USB)

### Application

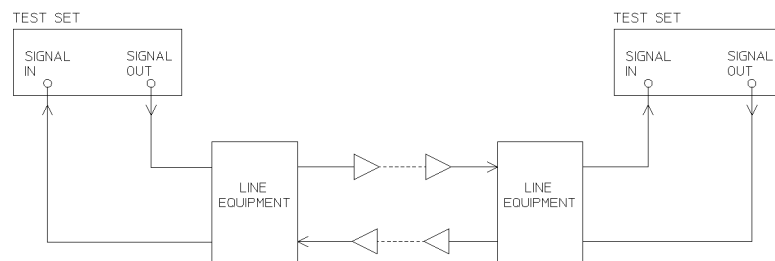
A transmission system must be specified for its overall error performance, measured over a period of time. Conformance to these specifications ensures that an installed system will meet the requirements of an Integrated Digital Network (IDN).

After troubleshooting, or during installation or commissioning, it is necessary to check that the transmission link meets this error performance.

This can be performed in two ways :

- End To End - Error performance measurements are made on an end-to-end basis testing the Go and Return paths separately but simultaneously. The measurements are often performed unattended and the results and other events, alarms for example, logged on a printer or disc and timed by a real time clock facility.

Two HP 37717C's are required for this measurement, one at each end of the link.

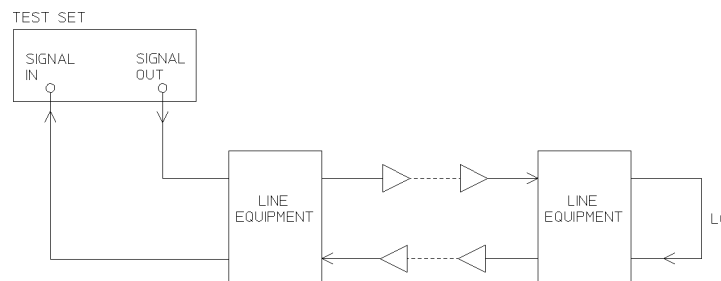


### End-to End Test

## PDH / DSn Testing With The HP 37717C

### BERT Testing

- Loopback - Error performance measurements are made via a loopback at the remote end of the system testing the combined Go and Return paths. The measurements are often performed unattended and the results and other events, alarms for example, logged on a printer or disc and timed by a real time clock.



### Loopback Test

#### Default (Known State) Settings

It can be advisable to set the HP 37717C to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings*.

#### Test Setup Procedure (BERT Testing)

This setup procedure is based on 140 Mb/s, CMI, PRBS test data terminated in  $75\Omega$ . A SINGLE test period of 24 HOURS is used and use of the a printer or disc for recording of results and alarms is included. A graphical record of the results can be viewed on the HP 37717C **GRAPH** display at the end of the test period.

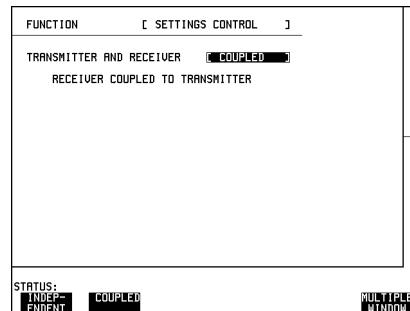


## PDH / DS<sub>n</sub> Testing With The HP 37717C

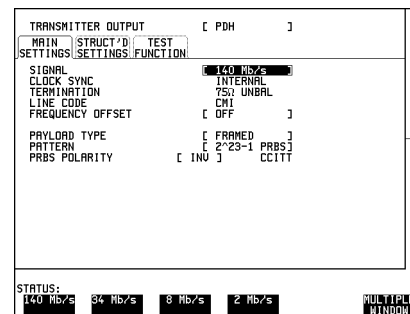
### BERT Testing

1. Set up the **OTHER SETTINGS CONTROL** display as shown opposite (on both HP 37717C's if end to end).

Any settings change made on the **TRANSMIT** or **RECEIVE** displays will automatically occur on the other.



2. Connect the HP 37717C to the line equipment and set up the **TRANSMIT** display as shown opposite (on both HP 37717C's if end to end).

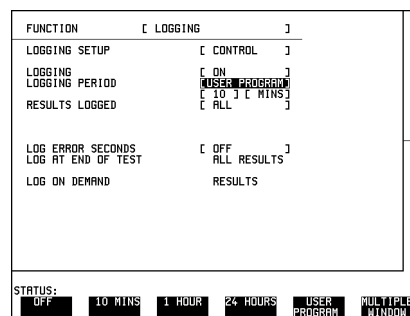


3. Select the **LOGGING** function as shown opposite (on both HP 37717C's if end to end).

A LOGGING PERIOD selection of [USER PROGRAM] [10 MIN] provides the following :

A complete set of period and a complete set of cumulative results logged on the printer or disc every 10 minutes.

A complete set of cumulative results logged on the printer or to disc at the end of the test period.



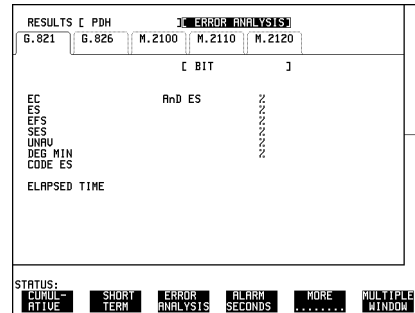
## PDH / DSn Testing With The HP 37717C

### BERT Testing

4. Set up the **RESULTS** display as shown opposite (on both HP 37717C's if end to end).

The RESULTS type can be changed during the test period without interrupting the test.

The RESULTS **TIMING CONTROL** STORAGE selection enables the graphics. To disable graphics select STORAGE [OFF].



### Start the Test (BERT Testing)

1. Press **RUN/STOP** (on both HP 37717C's if end to end).

The measurement results and alarms are available on the **RESULTS** display during the test period.

The graphical measurement results and alarms are stored in non volatile memory for viewing later on the **GRAPH** display.

The test can be halted at any time by pressing **RUN/STOP**.

### At the End of the Test (BERT Testing)

- The Date and Time the test started and the instrument setup are logged on the selected logging device.
- All results are logged on the selected logging device at 10 minute intervals.
- Any alarms which occur during the test period will be logged on a printer or disc.
- At the end of the test period a complete set of cumulative results are logged on the printer or disc.
- A graphical record of the results during the test period can be viewed on the **GRAPH** display. If Remote Control option A3B or A3D is fitted the graph results can be logged to an external printer, at a later date. See *Graphics* and *External HP 550C DeskJet Printer in the Mainframe Operating Manua*.
- Results and Alarm summaries can be viewed on the **GRAPH** display.

## PDH / DSn Testing With The HP 37717C

### BERT Testing

The total graphics store capacity is normally 20,000 events. If GRAPH STORAGE RESOLUTION [FULL] is selected on the **OTHER** **MISCELLANEOUS** display the capacity reduces to 10,000 events.

The resolution, determined by the selection made under STORAGE on the **RESULTS** **TIMING CONTROL** display, affects the ZOOM capability when viewing the bar graphs. If 1 SECOND is selected all resolutions are available under ZOOM. If 1 MIN is selected only 1 MIN/BAR, 15 MINS/BAR and 60 MINS/BAR are available. If 15 MINS is selected only 15 MINS/BAR and 60 MINS/BAR are available. If 1 HOUR is selected only 60 MINS/BAR is available.

Up to 10 sets of graphical results can be stored. If an attempt is made to store more than 10 sets of results, then a first in first out policy is operated and the oldest set of results will be lost. If graphics are enabled and a test is run which exceeds the remaining storage capacity, then some previously stored graphical results will be lost.

To prevent accidental overwriting of previously stored results the graphics capability should be disabled, when graphical results are not required, by selecting STORAGE [OFF] on the **RESULTS** **TIMING CONTROL** display.

## Cross Multiplexer Testing

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## Cross Multiplexer Testing

**Options Required** Structured PDH UKJ (USA) or UKN (USE)

### Application

For comprehensive testing of network equipment it is essential that the test equipment can multiplex/demultiplex the test signal.

The insertion of tributary signals into the PDH multiplexer, which are then multiplexed into the 140 Mb/s PDH structure should take place without introducing errors. The insertion and structuring process is tested by adding a test pattern to the tributary inserted at the tributary insert port. At the high rate side of the PDH multiplexer the tributary is destructured and a BER test performed.

By using a protected monitor point at the high rate side of the PDH multiplexer the mux/demux need not be taken out of service.

### Default (Known State) Settings

It is advisable to set the HP 37717C to a known state before setting up a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings in the Mainframe Operating Manua*.

### Cross Multiplexer Testing Test Setup Procedure

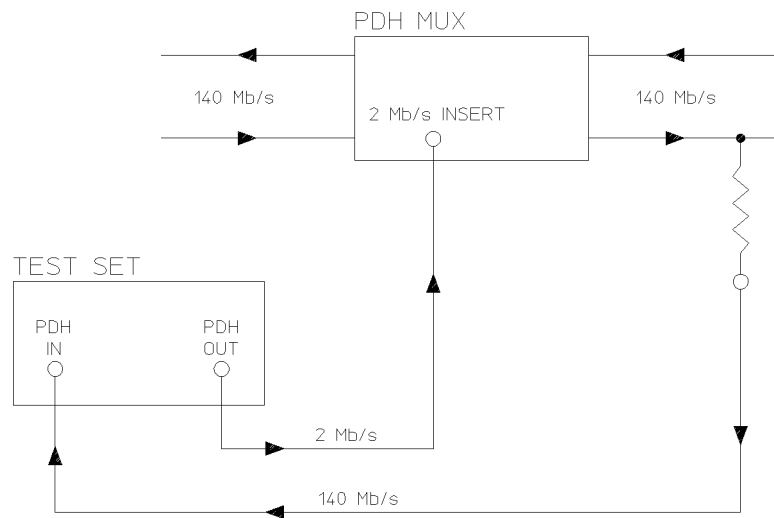
In this setup a 2 Mb/s Framed tributary, containing a test pattern, is inserted at the tributary insert port of the PDH multiplexer. The 140 Mb/s structured PDH signal is obtained from a protected monitor point. The 2 Mb/s tributary is destructured by the HP 37717C test set and an Error measurement is performed on the 2 Mb/s tributary test pattern.

A SINGLE test period of 24 HOURS is used and the printer is enabled to record results and alarms.

The HP 37717C PDH/SDH test set GRAPHICS function is enabled. The graphical results can be viewed on the **GRAPH** display.

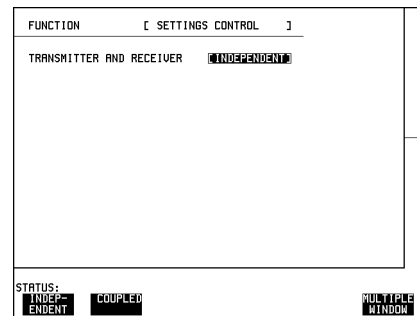
## PDH / DS<sub>n</sub> Testing With The HP 37717C

### Cross Multiplexer Testing



### Cross Multiplexer Testing

1. Connect the HP 37717C to the network equipment and set up the **OTHER** **SETTINGS CONTROL** display as shown opposite.



## PDH / DS<sub>n</sub> Testing With The HP 37717C

### Cross Multiplexer Testing

2. Set up the **TRANSMIT** display as shown opposite.

The PAYLOAD TYPE determines the Framing, which is selected from the softkey menu.

Selections of Framing and Code must match those of the network equipment.

TRANSMITTER OUTPUT [ PDH ]	
MAIN	STRUCT'D
SETTINGS	TEST
SETTINGS:SETTINGS:FUNCTION	
SIGNAL	[ 2 Mb/s ]
CLOCK SYNC	[ INTERNAL ]
TERMINATION	[ 75Ω UNBAL ]
LINE CODE	[ HDDB ]
FREQUENCY OFFSET	[ OFF ]
PAYLOAD TYPE	[ <b>PCMS1CRC</b> ]
PATTERN	[ 2 <sup>11</sup> -1 PRBS ]
PRBS POLARITY	[ NORM ] CCITT
STATUS:	
<b>PCMS1CRC</b>	STRUCT'D
	MORE
	MULTIPLE WINDOW

3. Set up the **RECEIVE** display **MAIN SETTINGS** as shown opposite.

The GAIN and EQUALIZER settings should be set to optimize the received signal.

RECEIVER INPUT [ PDH ]	
MAIN	STRUCT'D
SETTINGS	SETTINGS
SETTINGS:SETTINGS	
SIGNAL	[ 140 Mb/s ]
TERMINATION	[ 75Ω UNBAL ]
LINE CODE	[ CMI ]
LEVEL	[ OFF ] GAIN [ 20 dB ]
EQUALIZER	[ OFF ] GAIN [ 20 dB ]
PAYLOAD TYPE	[ STRUCTURED ]
TO SET TEST SIGNAL, FIRST SELECT THE 'STRUCT'D SETTINGS' FOLDER ABOVE	
STATUS:	
	MULTIPLE WINDOW

4. Set up the **RECEIVE** display **STRUCTURED SETTINGS** as shown opposite.

The required 2 Mb/s test signal is selected under 34Mb : 8Mb : 2Mb

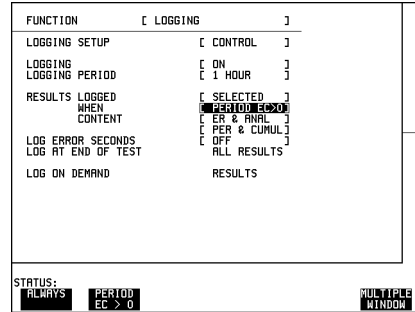
2M Payload determines the test signal framing and must match that of the network equipment.

RECEIVER INPUT [ PDH ]	
MAIN	STRUCT'D
SETTINGS	SETTINGS
SETTINGS:SETTINGS	
TEST SIGNAL	[ 2 Mb/s ]
2M PAYLOAD	[ <b>PCMS1CRC</b> ]
	[ 34Mb : 8Mb : 2Mb ]
	[ 2 ] [ 4 ]
PATTERN	[ 2 <sup>11</sup> -1 PRBS ]
PRBS POLARITY	[ NORM ] CCITT
STATUS:	
<b>1</b>	<b>2</b>
<b>3</b>	<b>4</b>
	MULTIPLE WINDOW

PDH / DS<sub>n</sub> Testing With The HP 37717C  
**Cross Multiplexer Testing**

5. Select the logging device and set up the **OTHER** display, **LOGGING** function, as shown opposite.

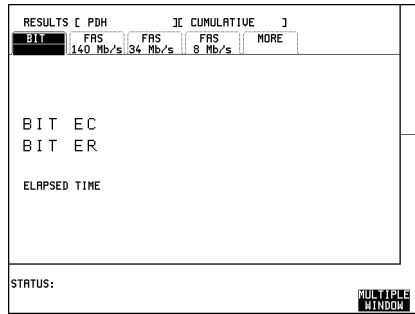
WHEN [PERIOD EC>0] ensures results are not logged on the selected logging device when a print period is error free.



**Continuity Check**

Before running the test carry out a continuity test to verify the measurement path.

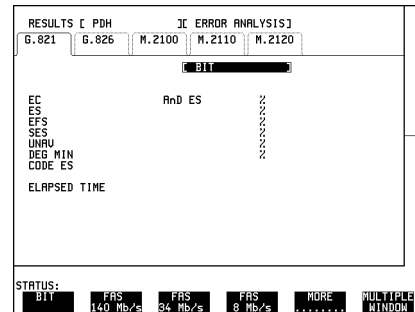
1. Set up the **RESULTS** display as shown opposite.
2. Press **RUN/STOP** to start a measurement.
3. Press error add **SINGLE** three times and check that the errors are recorded on the **RESULTS** display.
4. Press **RUN/STOP** to stop the measurement.



**Start the Cross Multiplexer Test**

1. Set up the **RESULTS** display as shown opposite.

G.821 Analysis results are displayed but any of the other results can be viewed without affecting the measurement.

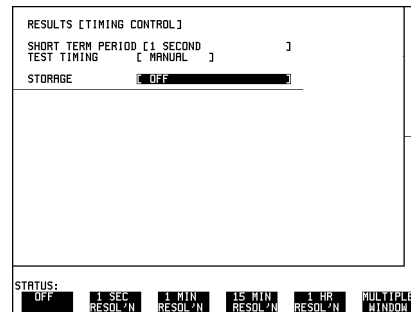


## PDH / DS<sub>n</sub> Testing With The HP 37717C

### Cross Multiplexer Testing

If you do not require stored graphics results select STORAGE [OFF] on the **RESULTS** **TIMING CONTROL** display.

2. Press **RUN/STOP** to start the measurement.



The following error results are available on the **RESULTS** display during the test period :

- 2 Mb/s - FAS, CRC, REBE and BIT
- 8, 34 and 140 Mb/s - FAS

The graphical measurement results and alarms are stored in non volatile memory for viewing later on the **GRAPH** display.

The test can be halted at any time by pressing **RUN/STOP**.

#### At the End of the Test (Cross Multiplexer Testing)

- The Date and Time the test started and the instrument set-up are logged on the logging device selected.
- Results are logged on the selected logging device at 1 hour intervals if the error count is greater than 0.
- Any alarms which occur during the test period will be logged on the selected logging device.
- At the end of the test period a complete set of cumulative results are logged on the selected logging device.
- A graphical record of the results during the test period can be viewed on the **GRAPH** display. If Remote Control option A3B or A3D is fitted the graph results can be logged to an external printer, at a later date. See *Graphics and External HP 550C DeskJet Printer in the Mainframe Operating Manua*.
- Results and Alarm summaries can be viewed on the **GRAPH** display.



## PDH / DSn Testing With The HP 37717C

### Cross Multiplexer Testing

The total graphics store capacity is normally 20,000 events. If GRAPH STORAGE RESOLUTION [FULL] is selected on the **OTHER** **MISCELLANEOUS** display the capacity reduces to 10,000 events.

The resolution, determined by the selection made under STORAGE on the **RESULTS** **TIMING CONTROL** display, affects the ZOOM capability when viewing the bar graphs. If 1 SECOND is selected all resolutions are available under ZOOM. If 1 MIN is selected only 1 MIN/BAR, 15 MINS/BAR and 60 MINS/BAR are available. If 15 MINS is selected only 15 MINS/BAR and 60 MINS/BAR are available. If 1 HOUR is selected only 60 MINS/BAR is available.

Up to 10 sets of graphical results can be stored. If an attempt is made to store more than 10 sets of results, then a first in first out policy is operated and the oldest set of results will be lost. If graphics are enabled and a test is run which exceeds the remaining storage capacity, then some previously stored graphical results will be lost.

To prevent accidental overwriting of previously stored results the graphics capability should be disabled, when graphical results are not required, by selecting STORAGE [OFF] on the **RESULTS** **TIMING CONTROL** display.

PDH / DS<sub>n</sub> Testing With The HP 37717C  
**FAS Monitoring**

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## **FAS Monitoring**

**Options Required** Structured PDH **UKJ (USA)** or **UKN (USE)**, or Unstructured PDH **UKK (USB)**

Alternatively for PDH / DS<sub>n</sub> with ATM payloads Option **UKZ**.

---

### **NOTE**

Option UKK (USB) - Unstructured PDH allows FAS Monitoring to be carried out at 2, 8, 34 and 140 Mb/s.

Option UKZ - allows FAS Monitoring to be carried out at DS<sub>1</sub> and DS<sub>3</sub> (Incorrect F and M framing sequence) rates as well as at 2 and 34 Mb/s ETSI rates.

### **Application**

Degradation in error performance can be detected by the occurrence of Frame Alignment Signal (FAS) errors in PDH /DS<sub>n</sub> systems.

Using the HP 37717C in a *receive only* mode, FAS errors can be measured and viewed on the **RESULTS** display. In addition, the results can be logged on the selected logging device for examination later.

### **Default (Known State) Settings**

It can be advisable to set the HP 37717C to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings*.

### **Test Setup Procedure (FAS Monitoring)**

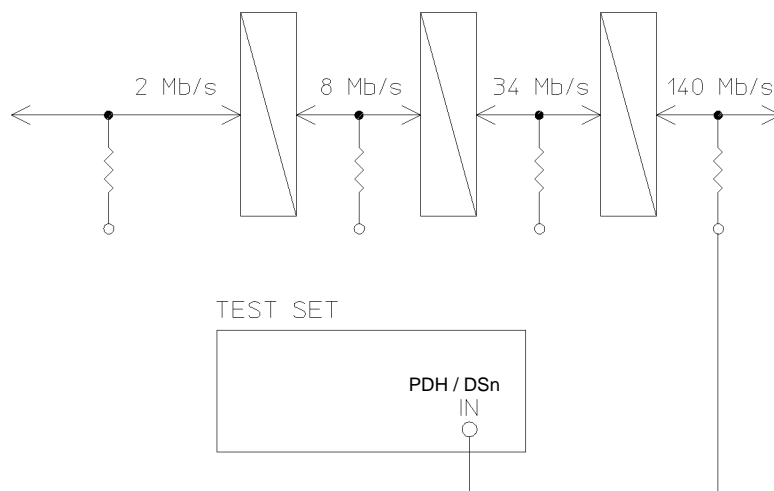
This setup procedure is based on Structured PDH 140 Mb/s line traffic interfaced at the line equipment protected Monitor point . If a protected Monitor Point is not available then an HP 15510A Protective Probe may be used at an unprotected Monitor point.

The instrument is used in a *receive only* mode to measure FAS Errors. A Timed Start test period is used which allows the measurement to be started at a time when the user would not normally be available.

All Error Ratio and Analysis results are logged on the selected logging device at 2 hour intervals and at the end of the test period. Occurrences of error seconds and

**PDH / DS<sub>n</sub> Testing With The HP 37717C**  
**FAS Monitoring**

alarms are logged on the selected logging device in real time.

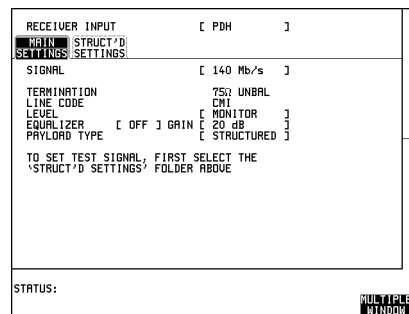


**FAS Monitoring**

1. Connect the HP 37717C to the line terminal equipment protected Monitor point and set up the **RECEIVE** display **MAIN SETTINGS** as shown opposite.

When Balanced FAS monitoring is desired at an unprotected Monitor point use an HP 15511A Protective Monitor Probe.

The GAIN and EQUALIZER settings should be set to optimize the received signal.



## PDH / DS<sub>n</sub> Testing With The HP 37717C FAS Monitoring

2. Set up the **RECEIVE** display **STRUCTURED SETTINGS** as shown opposite.

2M PAYLOAD Framing selection should match that of the network equipment.

RECEIVER INPUT	[ PDH ]
MAIN SETTINGS	<b>STRUCTURED SETTINGS</b>
TEST SIGNAL	[ 2 Mb/s ]
2M PAYLOAD	[ PCS0CRC ]
	34Mb 8Mb 2Mb
	[ 2 ] [ 3 ] [ 4 ]
PATTERN	[ LIVE TRAFFIC ]
STATUS:	
	<b>MULTIPLE WINDOW</b>

3. Set up the **OTHER LOGGING** display as shown opposite.

FUNCTION	[ LOGGING ]
LOGGING SETUP	[ CONTROL ]
LOGGING PERIOD	[ 1 HOUR ]
RESULTS LOGGED WHEN	[ SELECTED ]
CONTENT	<b>PERIOD EC &gt; 0</b>
LOG ERROR SECONDS	[ PER & CUMUL ]
LOG AT END OF TEST	[ OFF ]
LOG ON DEMAND	RESULTS
STATUS:	
<b>ALWAYS</b>	PERIOD EC > 0
	<b>MULTIPLE WINDOW</b>

### Start the Test (FAS Monitoring)

Set up the **RESULTS** display as shown opposite.

The test period will begin at the START time selected on the **RESULTS** display.

RESULTS [ PDH ]	[ CUMULATIVE ]
<b>FAS</b>	FAS MORE
140 Mb/s	34 Mb/s 8 Mb/s 2 Mb/s
FAS 140M EC	
FAS 140M ER	
ELAPSED TIME	
STATUS:	
	<b>MULTIPLE WINDOW</b>

The following error types can be monitored :

140 Mb/s - FAS (Short Term, Cumulative and G.821 Analysis) 4 Mb/s- FAS

## PDH / DSn Testing With The HP 37717C

### **FAS Monitoring**

(Short Term, Cumulative and G.821 Analysis)

8 Mb/s - FAS (Short Term, Cumulative and G.821 Analysis)

2 Mb/s - FAS, CRC and REBE (Short Term, Cumulative and G.821 Analysis)

- Any occurrence of Alarms or Error Seconds during the test period are logged on the selected logging device.
- Cumulative and Period versions of Error Results and Analysis Results are logged on the selected logging device at 1 hour intervals.
- The test can be halted at any time by pressing **RUN/STOP**.

### **At the End of the Test**

Cumulative and Period versions of Error Results and Analysis Results are logged on the selected logging device.

---

## Frequency Measurement

**Options Required** Structured PDH **UKJ (USA)** or **UKN (USE)**, or Unstructured PDH **UKK (USB)**

Alternatively for PDH / DS<sub>n</sub> with ATM payloads Option **UKZ**.

### Application

The clock frequency and the amount of offset from the ITU standard rate can be measured to give an indication of probability of errors. The measurement can be made in out of service or monitor mode and is generally of short duration.

### Default (Known State) Settings

It can be advisable to set the HP 37717C to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings*.

### Test Setup Procedure (Frequency Measurement)

If measuring frequency at PDH rates one of the following options is required.

- UKJ (USA), UKN (USE), UKK (USB) or UKL - Modules with PDH capability.
- UKZ - Module with PDH / DS<sub>n</sub> capability

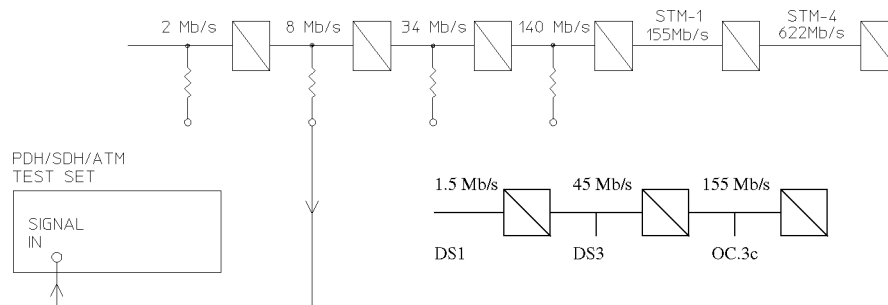
If measuring frequency at SDH rates the following options must be fitted :

- US1 (US5) or A1T (A1U) - SDH Module (STM-1 electrical)
- UH1 or UH2 or URU (STM-1 or STM-4 optical)

If measuring on live traffic the measurement is interfaced at the line terminal equipment Monitor point.

The HP 37717C is used in a *receive only* mode to measure the PDH / DS<sub>n</sub> frequency. The PDH / DS<sub>n</sub> frequency is measured and compared with the internal ITU standard frequency selected

## PDH / DS<sub>n</sub> Testing With The HP 37717C Frequency Measurement



**Figure 1**

### Frequency Measurement

1. Select **SIGNAL** [8 Mb/s] on the **RECEIVE** display.

For frequency measurement **PATTERN**; **TERMINATION** and **CODE** are not relevant.

RECEIVER INPUT	[ PDH ]
SIGNAL	[ 8 Mb/s ]
LEVEL	[ MONITOR ]
TEST MODE	[ OUT OF SRUC ]
CODE	[ HDB3 ]
PATTERN	[ 2 <sup>15</sup> -1 ]
TERMINATION	75Ω UNBAL

STATUS: 140 Mb/s 34 Mb/s 8 Mb/s 2 Mb/s 704 kb/s MULTIPLE WINDOW

2. Select **RESULTS** **PDH** **FREQUENCY**.

RESULTS [ PDH ]	[ FREQUENCY ]
1 SEC	16 SEC
FREQUENCY	Hz
OFFSET	Hz
	ppm

STATUS: MULTIPLE WINDOW SHORT TERM ERROR ANALYSIS ALARM SECONDS FREQUENCY MULTIPLE WINDOW

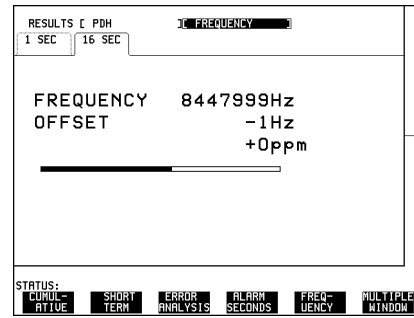
## PDH / DS<sub>n</sub> Testing With The HP 37717C Frequency Measurement

### Run the Test (Frequency Measurement)

Connect the PDH / DS<sub>n</sub> IN port to the line terminal equipment monitor point.

The measured frequency and amount of offset from the internal standard is displayed.

If the PDH / DS<sub>n</sub> frequency is different from the selected BIT RATE the error message **Unable to recover clock** appears on the display. A **FREQ** reading is displayed but this should be ignored.



### At the End of the Test (Frequency Measurement)

Disconnect the HP 37717C from the line terminal equipment.



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## Frequency Offset Tolerance

### Application

The capability of the network equipment to reliably recover the clock is tested by varying the clock rate of the generated data and checking for the occurrence of transmission errors.

The measurement can be made via a loopback or in a cross-multiplexer configuration, and is generally of short duration.

The ITU G.703 Recommendation for Clock Tolerance is :

- DS1 1.544 Mb/s  $\pm$  32 ppm
- E1 2.048 Mb/s  $\pm$  50 ppm
- E2 8.448 Mb/s  $\pm$  30 ppm
- E3 34.368 Mb/s  $\pm$  20 ppm
- DS3 44.736 Mb/s  $\pm$  20 ppm
- E4 139.264 Mb/s  $\pm$  15 ppm

In SDH systems if the master timing reference is lost a standby reference within 20 ppm can be used for a limited time :

- STM-1 155.520 Mb/s  $\pm$  20 ppm
- STM-4 622.080 Mb/s  $\pm$  20 ppm.

### Default (Known State) Settings

It can be advisable to set the HP 37717C to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings in the Mainframe Operating Manual*.

### Test Setup Procedure (Frequency Offset Tolerance)

If checking frequency offset tolerance at PDH /DS<sub>n</sub> rates one of the following options is required.

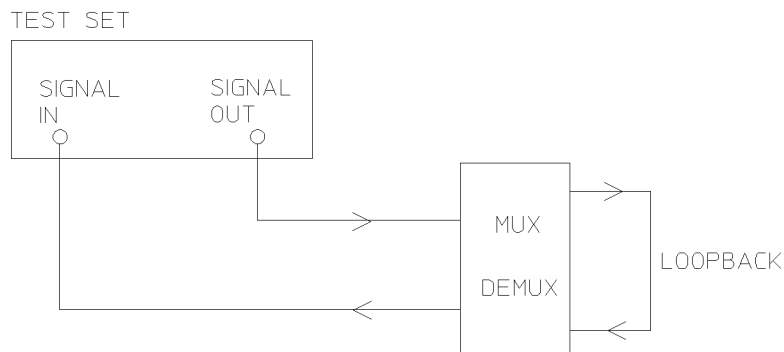
- UKJ (USA) UKN (USE), or UKK (USB) - Modules with PDH capability
- UKZ - Module with PDH / DS<sub>n</sub> capability.

PDH / DS<sub>n</sub> Testing With The HP 37717C  
**Frequency Offset Tolerance**

If checking frequency offset tolerance at SDH rates one of the following options must be fitted :

- US1 (US5) or A1T (A1U) - SDH Module (STM-1 electrical)
- UH1 or UH2 or URU (STM-1 or STM-4 optical)

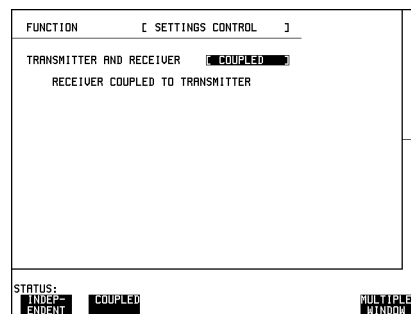
This setup procedure tests the clock recovery capability of the line terminal equipment at 34 Mb/s using a PRBS pattern connected to the 75Ω interface. The frequency of the generated data is offset and the data is looped back and monitored for errors.



**Figure 2** Frequency Offset Tolerance Test

1. Set up the **OTHER SETTINGS CONTROL** display as shown below.

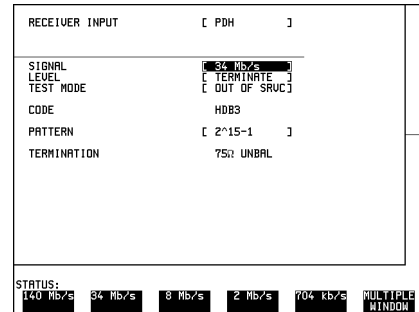
Any settings change made on the **TRANSMIT** or **RECEIVE** displays will automatically occur on the other.



## PDH / DS<sub>n</sub> Testing With The HP 37717C Frequency Offset Tolerance

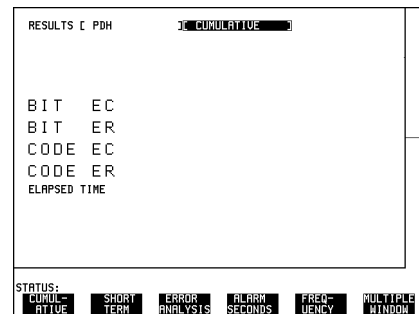
2. Set up the **RECEIVE** display as shown opposite.

Select the PATTERN required from the menu.



3. Set up the **RESULTS** display as shown opposite.

Any of the other results can be selected without affecting the measurement.



### Continuity Check

Before running the test carry out a continuity test to verify the measurement path.

1. Connect a loopback at the desired point on the line terminal or cross-multiplexer equipment.
2. Press **RUN/STOP** to start a measurement.
3. Press error add **SINGLE** three times and check that the errors are recorded on the **RESULTS** display.
4. Press **RUN/STOP** to stop the measurement.

## PDH / DS<sub>n</sub> Testing With The HP 37717C Frequency Offset Tolerance

### Run the Test (Frequency Offset Tolerance)

1. Connect the HP 37717C to the 75Ω interface of the multiplexer and set up the **TRANSMIT** display as shown opposite.

2. Press **RUN/STOP** to start the measurement.

TRANSMITTER OUTPUT	[ PDH ]
PDH	[ STRUCT'D ]
TEST	[ SETTINGS ]
FUNCTION	[ ]
SIGNAL	[ 34 Mb/s ]
CLOCK SYNC	[ INTERNAL ]
FREQUENCY OFFSET	[ OFF ]
CODE	[ HDB3 ]
PATTERN	[ 2 <sup>15</sup> -1 ]
TERMINATION	[ 75Ω UNBAL ]
STATUS:	
[ OFF ]	[ +20 ppm ]
[ -20 ppm ]	[ USER OFFSET ]
[ ]	[ MULTIPLE WINDOW ]

3. Select TX CLOCK OFFSET [+20ppm] and check that the Error Count and Error Ratio results are unchanged.

4. Select TX CLOCK OFFSET [-20ppm] and check that the Error Count and Error Ratio results are unchanged.

### NOTE

The OFFSET values used above conform to ITU, G.703 Recommendation. If different values are required selection of [USER OFFSET] allows offsets of up to 100 ppm to be used.

### At the End of the Test

1. Halt the test by pressing **RUN/STOP**, and disconnect the HP 37717C.

2. Remove the loopback from the line terminal or cross-multiplexer equipment.

## Multiplexer Testing

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## Multiplexer Testing

### Application

PDH multiplexers combine four lower rate signals into a higher rate signal for transmission or further multiplexing. It is important that each multiplexer port operates error free and no "crosstalk" occurs between ports.

Multiplexing of the tributaries can be verified by performing a BER test at each of the four ports. However a more rigorous test involves loading all four ports to simulate live traffic conditions. This verifies the individual ports and detects any crosstalk problems between the ports.

### Default (Known State) Settings

It is advisable to set the HP 37717C to a known state before setting up a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings*.

### Multiplexer Test Setup Procedure

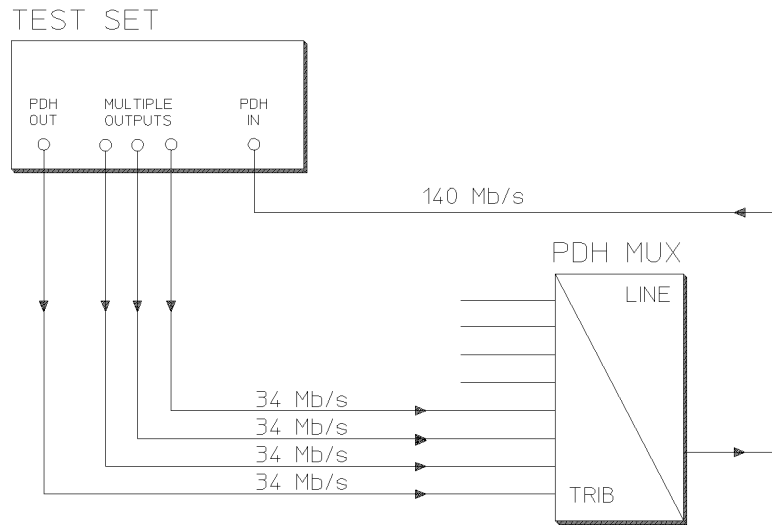
The following Options must be fitted to the HP 37717C to perform this test :

- UHC (US6) - Multiple Outputs
- UKJ (USA) or UKK (USB) - PDH Module

In this setup the PDH OUT signal and the three additional data outputs, from the Multiple Outputs option, load the 34 Mb/s input ports of the multiplexer. The HP 37717C (Structured PDH Option UKJ (USA)) destructures the 140 Mb/s signal and a BER test is performed on each of the 34 Mb/s signals in turn.

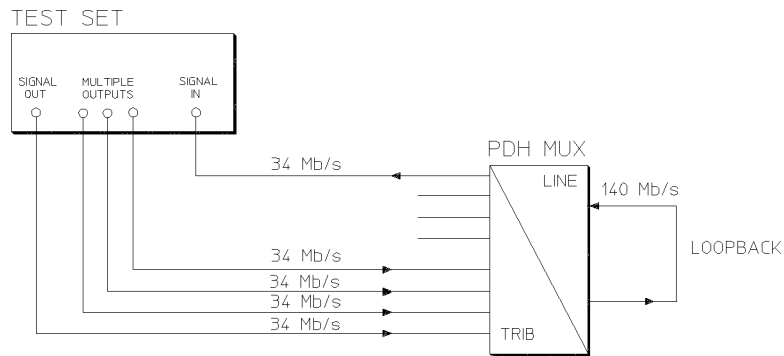
A SINGLE test period of 15 Minutes is used and the selected logging device is enabled to record results and alarms.

PDH / DS<sub>n</sub> Testing With The HP 37717C  
**Multiplexer Testing**



**Figure 3**      **Structured PDH Multiplexer Test**

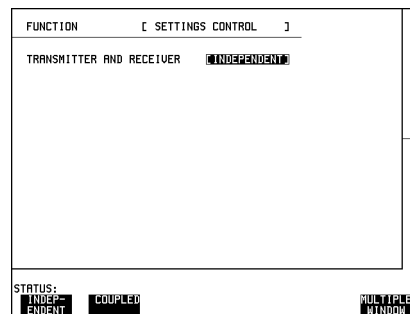
**NOTE**      This test can be performed using the Unstructured PDH Option UKK (USB) but the equipment configuration is slightly different as shown below.



**Figure 4**      **Unstructured PDH Multiplexer Test**

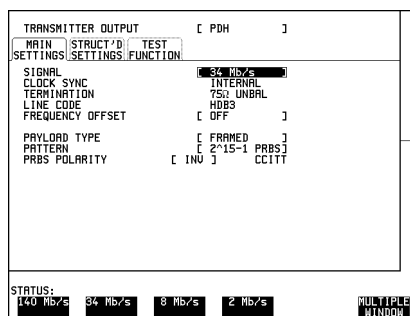
## PDH / DS<sub>n</sub> Testing With The HP 37717C Multiplexer Testing

1. Connect the HP 37717C to the network equipment and set up the **OTHER** **SETTINGS CONTROL** display as shown opposite.



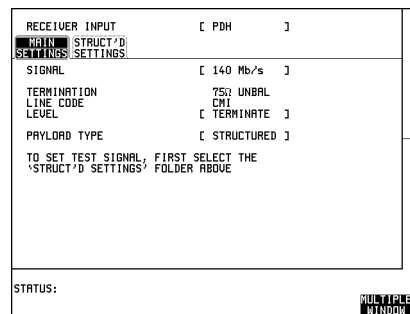
2. Set up the **TRANSMIT** **MAIN SETTINGS** as shown opposite.

PAYLOAD TYPE, PATTERN and PRBS POLARITY selections should meet the requirements of the network equipment.



3. Set up the **RECEIVE** display MAIN SETTINGS as shown below.

PAYLOAD TYPE [STRUCTURED] ensures the 140 Mb/s signal is destructured into the four 34 Mb/s test signals



## PDH / DS<sub>n</sub> Testing With The HP 37717C Multiplexer Testing

4. Set up the **RECEIVE** display **STRUCTURED SETTINGS** as shown opposite.

The required 34 Mb/s test signal is selected under 34Mb.

RECEIVER INPUT	[ PDH ]
MAIN SETTINGS	<b>STRUCTURED SETTINGS</b>
TEST SIGNAL	[ 34 Mb/s ]
34M PAYLOAD	[ FRAMED ]
	34Mb [ 3 ]
PATTERN	[ 2 <sup>15</sup> -1 PRBS ]
PRBS POLARITY	[ INU ] CCITT
STATUS:	
<b>MULTIPLE WINDOW</b>	

5. Select the logging output required with the **OTHER** display, **LOGGING** function, LOGGING SETUP **DEVICE CONTROL** and set up the display as shown opposite.

FUNCTION	[ LOGGING ]
LOGGING SETUP	[ CONTROL ]
LOGGING PERIOD	<b>ON</b>
	[ OFF ]
LOG ERROR SECONDS	[ OFF ]
LOG AT END OF TEST	ALL RESULTS
LOG ON DEMAND	RESULTS
STATUS:	
OFF <b>ON</b>	
<b>MULTIPLE WINDOW</b>	

### Start the Multiplexer Test

1. Set up the **RESULTS** display as shown opposite.

2. Press **RUN/STOP** to start the measurement.

3. Repeat the test for the other three 34 Mb/s signals, selectable on the **RECEIVE STRUCTURED SETTINGS** display.

G.821 ANALYSIS is selected but any of the other results can be selected from the softkey menu without affecting the measurement.

- The measurement results and alarms are available on the **RESULTS** display

RESULTS [ PDH ]	[ ERROR ANALYSIS ]
<b>G.821</b> G.826 M.2100 M.2110 M.2120	
	[ BIT ]
EC	And ES
ES	
EFS	
SES	
UNRU	
DEG MIN	
CODE ES	
ELAPSED TIME	
STATUS:	
<b>MULTIPLE WINDOW</b>	



## PDH / DSn Testing With The HP 37717C

### **Multiplexer Testing**

during the test period.

- The test can be halted at any time by pressing **RUN/STOP**.

#### **At the End of the Multiplexer Test**

- The Date and Time the test started and the instrument setup are logged on the selected logging device.
- All results are logged on the selected logging device at the end of the test.
- Any alarms which occur during the test period will be logged on the selected logging device.

## Round Trip Delay

---

## Round Trip Delay

### Application

In certain applications the time taken for a signal to pass through the network can be very important for example Voice Traffic where excessive delay can make speech difficult to understand. The Round Trip delay feature of the HP 37717C allows easurement of the delay at any interface or test signal rate.

### Default (Known State) Settings

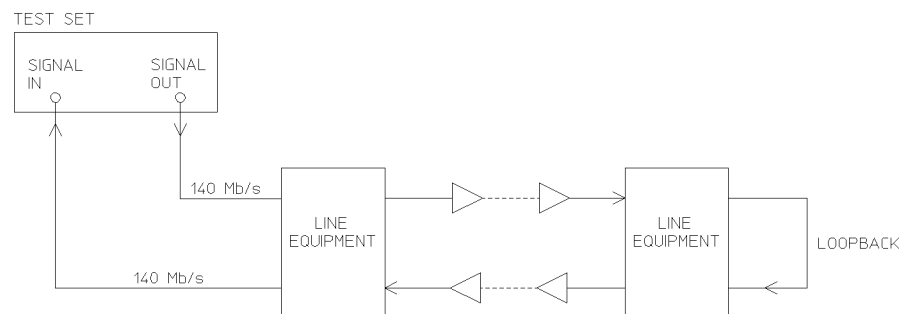
It can be advisable to set the HP 37717C to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings in the Mainframe Operating Manual*.

### Test Setup Procedure (Round Trip Delay)

The following Option must be fitted to the HP 37717C to perform this test :

- UKJ (USA) - Structured PDH Module

This setup is interfaced at 140 Mb/s with a test signal of 64 kb/s. A test pattern is transmitted in the 64 kb/s slot and a timer is set running. A loopback is applied to the network equipment to return the test signal. The received pattern stops the timer and the Round Trip Delay is calculated.



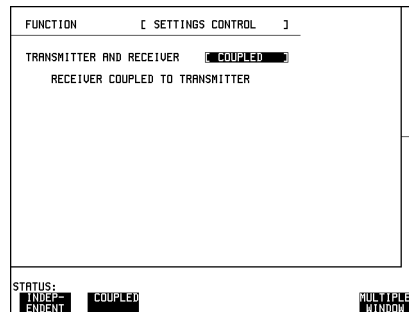
### Round Trip Delay

## PDH / DS<sub>n</sub> Testing With The HP 37717C

### Round Trip Delay

1. Connect the HP 37717C to the network equipment as shown and set up the **OTHER SETTINGS CONTROL** display as shown opposite.

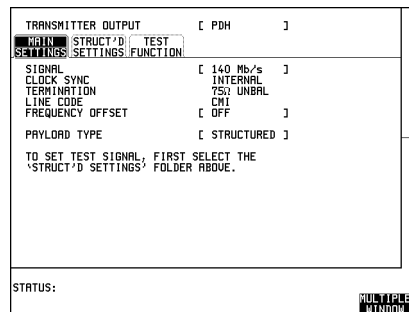
Any settings change made on the **TRANSMIT** or **RECEIVE** displays will automatically occur on the other.



2. Set up the **TRANSMIT MAIN SETTINGS** display as shown opposite.

The SIGNAL rate and LINE CODE settings must match those of the network equipment.

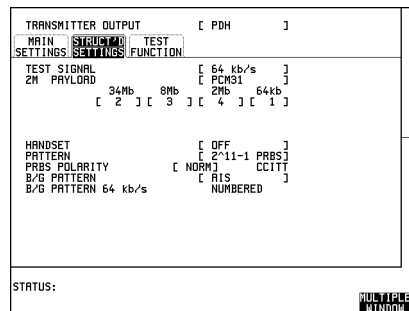
Ensure that the **TRANSMIT TEST FUNCTION** display is set for bit errors.



3. Set up the **TRANSMIT STRUCTURED SETTINGS** display as shown opposite.

The 2M PAYLOAD selection determines the Framing which should match that of the network equipment.

The test 64 kb/s slot is selected under 34Mb ; 8Mb ; 2Mb ; 64kb.



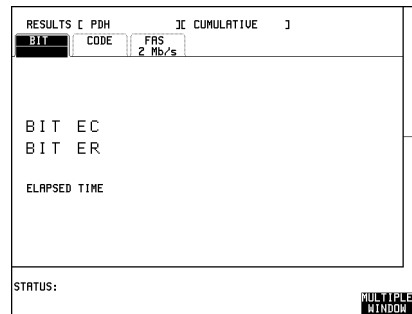
### Continuity Check

Before running the test carry out a continuity test to verify the measurement path.

## PDH / DS<sub>n</sub> Testing With The HP 37717C

### Round Trip Delay

1. Connect a loopback at the desired point on the line terminal equipment and set up the **RESULTS** display as shown opposite.
2. Press **RUN/STOP** to start a measurement.
3. Press error add **SINGLE** three times and check that the errors are recorded on the **RESULTS** display.
4. Press **RUN/STOP** to stop the measurement.

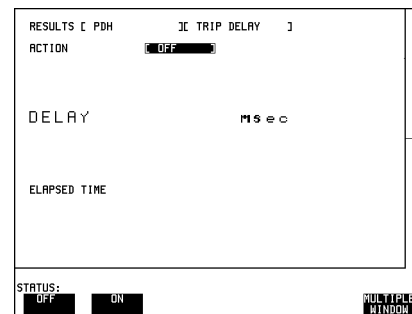


#### Start the Test (Round Trip Delay)

1. Set up the **RESULTS** display as shown opposite.

Select ACTION **ON** to start the test.

The Round Trip Delay result is displayed in milliseconds.



The delay measurement range is up to 2 seconds. The Resolution varies according to the received rate :

- 2 Mb/s - 1 $\mu$ s
- 8, 34, 140 Mb/s - 10 $\mu$ s
- STM-1 - 0.5 ms

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## **M2100, M2110, M2120 Analysis**

### **Application**

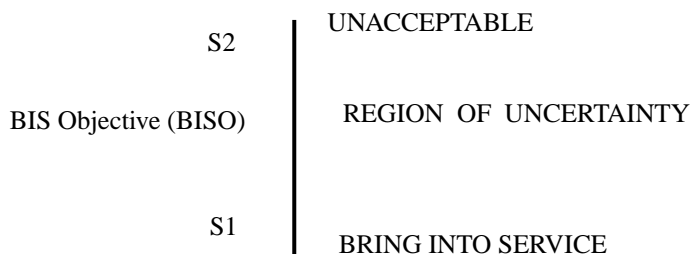
Previously ITU-T G.821 was the only international recommendation available to measure the quality of a communications link. ITU-T G.821 was originally an "Out of Service" measurement and analysis for commissioning a link and troubleshooting during severe disruption. The commissioning test was a one month "Out of Service" test based on errored and severely errored seconds. A one month test with the subsequent loss of revenue is clearly unacceptable.

Due to demand ITU-T G.821 also evolved into proprietary methods for "In Service" testing based on FAS and code errors. Demand for high quality leased lines meant an "In Service" performance standard, closer to real conditions and allowing comparisons between providers, was required.

The ITU-T M.2100 series was specifically defined to provide a clear indication of link quality, for service providers using long term performance analysis. "Bringing into Service" and "repair criteria" analysis were also included.

M.2100 analysis is based on frame errors and provides Error Seconds (anomaly), Severely Errored Seconds (defect) and Unavailability results for receive and transmit directions. Transmit results are only available for 2 Mb/s signals with CRC framing. "Out of Service" testing is only available for the receive direction. M.2110 is an "Out of Service" measurement for "bringing into service" testing of paths. A 15 minute BER test (G.821) is performed and if this is error free a 24 hour M.2110 test is performed. If the 24 hour M.2110 test displays PASS (S1 limit not reached) the path can be returned to service. If FAIL is displayed (S2 limit reached or exceeded) the 15 minute BER test should be repeated, If If m-d;- (UNCERTAIN) is displayed (result between the S1 and S2 limits) run the 7 day BIS test.

The PASS FAIL and UNCERTAIN parameters are determined by the S1 and S2 limits which are user selectable.



PDH / DS<sub>n</sub> Testing With The HP 37717C  
**M2100, M2110, M2120 Analysis**

**Default (Known State) Settings**

It can be advisable to set the HP 37717C to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. For a list of Default Settings and the procedure for accessing them see *Stored Settings in the Mainframe Operating Manual*.

**Test Setup Procedure M2110 Analysis**

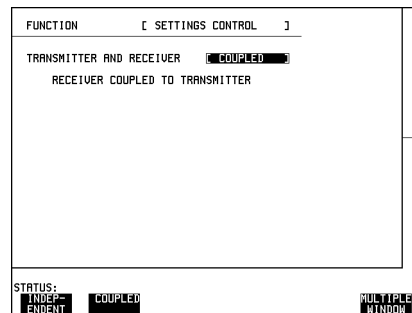
The following Option must be fitted to the HP 37717C to perform this test:

- UKJ - Structured PDH Module

This setup procedure is interfaced at 140 Mb/s, with a test signal of 2 Mb/s with PCM30CRC framing.

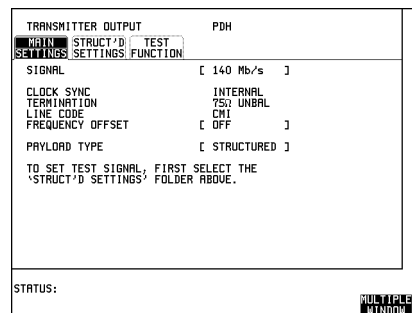
1. Set up the **OTHER SETTINGS CONTROL** display as shown opposite.

Any settings change made on the **TRANSMIT** or **RECEIVE** displays will automatically occur on the other.



2. Connect the HP 37717C to the line equipment and set up the **TRANSMIT MAIN SETTINGS** display as shown opposite.

The settings of SIGNAL rate and LINE CODE must match those of the network equipment.



## PDH / DS<sub>n</sub> Testing With The HP 37717C M2100, M2110, M2120 Analysis

3. Set up the **TRANSMIT** display  
**STRUCTURED SETTINGS** as shown  
opposite.

2M PAYLOAD selects the Framing which  
must match that of the network equipment.

TRANSMITTER OUTPUT		PDH
MAIN	STRUCTURED	TEST
SETTINGS	SETTINGS	FUNCTION
TEST SIGNAL	[ 2 Mb/s ]	
2M PAYLOAD	[ PCM30CRC ]	
	[ 34Mb ]	[ 8Mb ]
	[ 1 ]	[ 1 ]
	[ 1 ]	[ 1 ]
PATTERN	[ 2 <sup>15</sup> -1 PRBS ]	
PRBS POLARITY	[ INU ]	
B/G PATTERN	[ AIS ]	
STATUS:		
MULTIPLE WINDOW		

4. Set up the **RESULTS** display as shown  
opposite.

RESULTS [TIMING CONTROL]	
SHORT TERM PERIOD	[ 1 SECOND ]
TEST TIMING	[ SINGLE ] [ 1 HOUR ]
GRAPH STORAGE	[ OFF ]
	[ INTERNAL ]
STATUS:	
OFF	[ 1 SEC RESOL'N ]
	[ 1 MIN RESOL'N ]
	[ 15 MIN RESOL'N ]
	[ 1 HR RESOL'N ]
MULTIPLE WINDOW	

5. Press **RUN/STOP** to start the  
measurement.

At the end of the test period check that the  
G.821 results are error free.

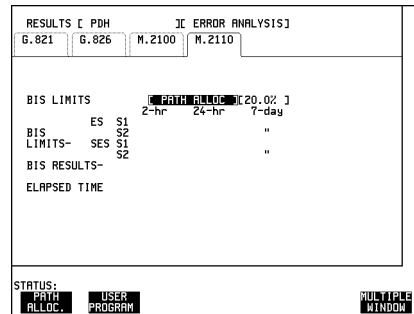
RESULTS [ PDH ]		[ ERROR ANALYSIS ]	
G.821	G.826	M.2100	M.2110
BIT			
EC	RnD	ES	Z
ES			Z
EFS			Z
SES			Z
UNRU			Z
DEG MIN			Z
CODE ES			Z
ELAPSED TIME			
STATUS:			
MULTIPLE WINDOW			

## PDH / DS<sub>n</sub> Testing With The HP 37717C M2100, M2110, M2120 Analysis

6. Set up the **RESULTS** display as shown opposite

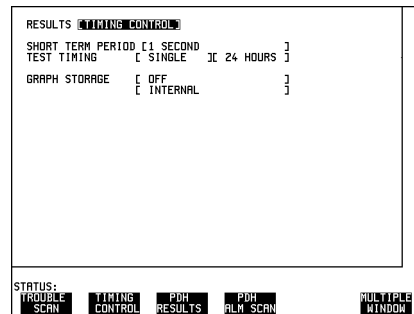
Select the Path Allocation value required in the range 0.5% to 40%.

The Path Allocation value determines the S1 and S2 limits and these will change on the display as the Path Allocation value is changed.



7. Set up the **RESULTS** display as shown opposite.

Press **RUN/STOP** to start the measurement.



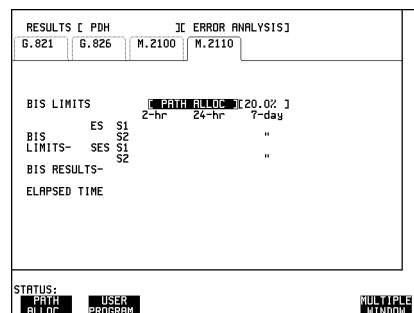
8. View the M.2110 results.

BIS Results of PASS, FAIL and m-d;- (uncertain) are possible.

If PASS is displayed (S1 limit not reached) the path may be returned to service immediately.

If FAIL is displayed (S2 limit reached or exceeded) repeat the BER (G.821) test.

If m-d;- is displayed (result between the S1 and S2 limits) run the 7 day BIS test.





PDH / DS<sub>n</sub> Testing With The HP 37717C  
**Monitoring DS3 with ATM Payloads**

## Monitoring DS3 with ATM Payloads

**Option Required** DS1, DS3, E1 and E3 Transmit and Receive Interfaces for ATM Payloads. **Option UKZ**

Connect the HP 37717C RECEIVE DS3 IN to the network monitor point, select the **RECEIVE** display and DS3 rate.

RECEIVER INPUT	ATM
PHYSICAL LAYER	ATM LAYER
SIGNAL	DS3
TERMINATION LINE CODE LEVEL	75Ω UNBAL B32S [ TERMINATE ]
CONVERGENCE SUB-LAYER	[ DIRECT ]
CELL SCRAMBLING	[ ON ]
STATUS:	
DS3	34 Mb/s
2 Mb/s	DS1
MULTIPLE WINDOW	

Select the convergence layer, Direct or PLCP.

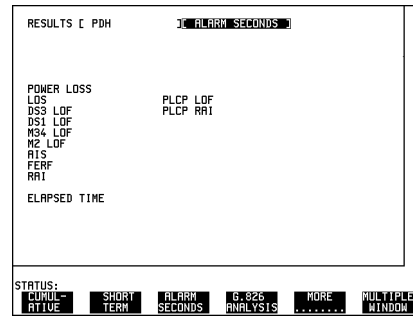
RECEIVER INPUT	ATM
PHYSICAL LAYER	ATM LAYER
SIGNAL	[ DS3 ]
TERMINATION LINE CODE LEVEL	75Ω UNBAL B32S [ TERMINATE ]
CONVERGENCE SUB-LAYER	[ PLCP ]
CELL SCRAMBLING	[ ON ]
STATUS:	
DIRECT	PLCP
MULTIPLE WINDOW	

Select **RESULTS PDH** for the physical and convergence layer results.

RESULTS [ PDH ]	[ CUMULATIVE ]
FEBE	PLCP BIP
PLCP FEBE	PLCP TRAILER
MORE	
PLCP TRAILER-MISMATCHES	
ELAPSED TIME	
STATUS:	
MULTIPLE WINDOW	

## PDH / DS<sub>n</sub> Testing With The HP 37717C Monitoring DS<sub>3</sub> with ATM Payloads

Select **RESULTS** **PDH** ALARM  
SECONDS to display the physical and  
convergence layer alarms.



Information on cell level testing is given in “The ATM Operating Manual”.

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# Index

---

## Symbols

.Selecting display values in, 17

## A

AIS alarm indicator  
  PDH / DS<sub>n</sub>, 28  
AIS-L Alarm Indicator  
  SONET, 29  
AIS-P Alarm Indicator  
  SONET, 29  
AIS-V Alarm Indicator  
  SONET, 29  
Alarm Indicator  
  Errors, 27  
  Pattern Loss, 27  
  Signal Loss, 27  
Alarm Indicators, 27  
  SDH, 28  
  SONET, 29  
Alarm Indicators PDH / DS<sub>n</sub>, 28  
Alarm Scan, 107  
Alarm Seconds  
  ATM, 145  
  PDH, 144  
  SDH, 145  
Analysis Control  
  Selection, 90  
Analysis Display Mode, 90  
ATM Alarm Seconds, 145  
ATM Alarms  
  Loss of Cell Sync, 29  
  Selected Cell Not Received, 29  
  VC Alarm, 29  
  VP Alarm, 29  
ATM layer selections with pop-up menus,  
  22  
ATM Physical Layer Results  
  G.826 C Bit Parity, 138  
  G.826 CRC 4, 141  
  G.826 CRC 6, 140  
  G.826 EM BIP, 136  
  G.826 FEBE, 137, 139  
  G.826 REBE, 142  
ATM Results  
  Cumulative, 112  
  Short Term, 109  
Auto Setup key, 26  
Autosetup, 62

## B

Bar Graph Logging, 101  
Basic Error Measurement, 34  
Beep On Received Error, 90  
Binary entry with pop-up menu, 19

## C

Cancel key, 26  
Clock Loss Alarm Indicator  
  SDH, 28  
  SONET, 29  
Connecting a Centronix Printer, 61  
Copy Configuration from Disk to Instru-  
  ment Store, 83  
Copy Configuration from Instrument Store  
  to Disk, 83  
Copy Graphics from Instrument Store to  
  Disk, 84  
Coupling, 87  
Create a Directory, 86  
Cumulative Results  
  ATM, 112  
  PDH, 111  
  PLCP Convergence Layer, 112  
  SDH, 111  
Cursor  
  Introduction to, 17  
  Moving, 17

## D

Datacomm port loopback for Self Test, 93  
Date and time entry with pop-up menu, 18  
Date and Time Setting, 88  
Default Settings, 63, 73  
Delete a Directory, 85  
Delete a File, 84  
Directory Structure, 75  
Disc Drive  
  Logging Results, 54  
  Printing From, 55  
  Printing Logging Results, 86  
Disk Drive, 75–86  
  Copy Configuration from Disk, 83  
  Copy Configuration to Disk, 83  
  Copy Graphics to Disk, 84  
  Create a Directory, 86  
  Delete a Directory, 85  
  Delete a File, 84

Directory Management, 77  
Directory Structure, 75  
Disk Portability, 75  
File Management, 77  
Format, 76  
Label, 76  
Print Logging Results from Windows,  
  86  
Recall Configurations from Disk, 82  
Recall Graphics Results from Disk, 82  
Rename a File, 85  
Save Configuration to Disk, 80  
Save Data Logging to Disk, 81  
Save Graphics Results to Disk, 80  
Display on a monitor, 25  
Displaying list of, 12  
DS<sub>n</sub> Alarm Indicators, 28

## E

Error Add  
  Enabling, 35  
Error Event Logging, 50  
Errors Alarm Indicator, 27  
External Printer  
  Connecting, 60, 61

## F

File and Directory Management, 77  
Floppy Disk, 75  
Format a Disk, 76  
Frame Loss Alarm Indicator  
  PDH / DS<sub>n</sub>, 28  
Frequency Measurement, 147  
Fuse rating, 7

## G

G.821 Analysis  
  Bit, 115  
  CRC, 117  
  Frame (FAS), 116  
  REBE, 118  
G.826 Analysis  
  140 Mb/s Framed, 122  
  2 Mb/s CRC4 Framed, 119  
  2 Mb/s Framed Not CRC4, 120  
  2 Mb/s Unframed, 120  
  34 Mb/s Framed, 121  
  8 Mb/s Framed, 121

---

## Index

---

- 8, 34 and 140 Mb/s Unframed, 123
- C Bit Parity (DS3 with ATM Payload), 138
- CRC 4 (2 Mb/s with ATM Payload), 141
- CRC 6 (DS1 with ATM Payload), 140
- EM BIP (34 Mb/s with ATM Payload), 136
- FEBE (34 Mb/s with ATM Payload), 137
- FEBE (DS3 with ATM Payload), 139
- MS B2 BIP, 127
- Path B3 BIP, 129
- Path FEBE, 130
- Path IEC, 131
- REBE (2 Mb/s with ATM Payload), 142
- RS B1 BIP, 126
- TU Path BIP 2 Mb/s, 133
- TU Path BIP 34 Mb/s, 132
- TU Path FEBE 2 Mb/s, 135
- TU Path FEBE 34 Mb/s, 134
- Graph key, 12
- Graphic displays as a selection aid, 21
- Graphics, 41–48
  - Bar Graph Logging, 102
  - Logging Bar Graphs, 101
  - Obtaining Results, 42
  - Printing Displays, 48
  - Recall Results, 44
  - Viewing Alarm Summary, 46
  - Viewing Bar Graphs, 44
  - Viewing Error Summary, 46
  - Viewing Stored ResultsStatus, 47
- H**
- Hexadecimal entry with pop-up menu, 18
- History Keys, 27
- HP-IB Printer
  - Results Logging, 52
- I**
- Indicators
  - Front Panel, 27
- Installing Upgrade Modules, 7
- Instrument Fuse, 7
- Integer entry with pop-up menu, 18
- Internal Printer, 56
  - Alignment of Paper, 59
  - Cleaning the Print Head, 59
- Operation Indication, 56
- Selecting, 51
- J**
- Jitter Auto Tolerance Logging, 103
- Jitter mask selection with pop-up menu, 22
- Jitter Results, 143
- K**
- Keyboard Lock, 89
- Keys
  - Auto Setup, 26
  - Cancel, 26
  - Graph, 12
  - Local, 26
  - Other, 12
  - Paper Feed, 26
  - Print Now, 26
  - Receive, 12
  - Reset History, 27
  - Results, 12
  - Run / Stop, 26
  - Set, 26
  - Show History, 27
  - Transmit, 12
- L**
- Label a Disk, 76
- Local key, 26
- Logging
  - Overhead Capture, 50
  - Overhead Snapshot, 50
  - Results Snapshot, 50
- Logging At End of Measurement, 101
- Logging Bar Graphs, 102
- Logging Devices, 96
- Logging During Measurement, 100
- Logging Header, 96
- Logging Messages, ??– 103
- Logging on Demand, 50
- Logging Results, 49–55
  - At end of Measurement, 101
  - Bar Graphs, 101
  - Disc Drive, 52, 54
  - During Measurement, 97
  - Error & Alarm Summaries, 102
  - Error Event, 50
  - Graphics Text, 102
- HP-IB Printer, 52
- Internal Printer, 51
- Jitter Autotolerance, 103
- Logging Header, 96
- Parallel Port Printer, 52
- RS-232-C Printer, 52
- Test Period, 49
- Loss of Cell Sync Alarm Indicator
  - ATM, 29
- Loss Of Pointer Alarm Indicator
  - SDH, 28
  - SONET, 29
- M**
- M.2100 Frame Analysis, 123
- M.2110 BIS Analysis, 125
- M.2120 Circuit Maintenance, 125
- M/Fame Loss Alarm Indicator
  - PDH /DSn, 28
- Measurement Data
  - Storing, 40
- Measurement Demo
  - Recall Default Settings, 34
- Menus, pop-up, obtaining, 18
- Miscellaneous, 89, 90
- Monitor,connecting, 25
- MS AIS Alarm Indicator
  - SDH, 28
- MS FERF Alarm Indicator
  - SDH, 28
- Multiple windows
  - Moving between, 14
  - Selecting the undisplayed window, 15
- Multiple/single window selection, 13
- O**
- Option Summary, 5
- Options fitted, 12
- Ordering Upgrade Modules, 7
- Other key, 12
- Overhead Capture Logging, 50
- Overhead Snapshot Logging, 50
- P**
- Paper Feed key, 26
- Parallel Port Printer
  - Selecting, 52
- Parallel Printer

---

# Index

---

- Connecting, 61
- Path AIS Alarm Indicator
  - SDH, 28
- Path FERF Alarm Indicator
  - SDH, 28
- Pattern Loss Alarm Indicator, 27
  - SDH, 28
- PDH / DS<sub>n</sub> Alarms
  - AIS, 28
  - Frame Loss, 28
  - M/Frame Loss, 28
  - Remote Alarm, 28
  - Remote M/Frame Alarm, 28
- PDH Alarm Indicators, 28
- PDH Alarm Seconds, 144
- PDH Results
  - Cumulative, 111
  - Error Analysis, 115–125
  - Short Term, 108
- PDH Tests, Option UKK (75W Unbal Back to Back), 150, 151
- Pictorial displays as a selection aid, 21
- PLCP Convergence Layer Results
  - Cumulative, 112
  - Short Term, 109
- Pointer Adjust Indicator
  - SDH, 28
  - SONET, 29
- Pop-up menu as alternative to soft keys, 20
- Pop-up menus
  - Modifying displays with, 18
- Portability of Disks, 75
- Power Requirements, 7
- Print Now key, 26
- Printer
  - External HP-IB selecting, 52
  - External RS-232-C selecting, 52
  - Internal Selecting, 51
  - Parallel Connecting, 61
  - Parallel Port selecting, 52
  - RS-232-C Connecting, 60
- Printer Paper
  - Replacing (Internal Printer), 57
- Printing
  - Screen display dump, 52
  - Printing from Disc, 55
  - Printing Logging Results from Disc, 86
- R**
- RDI-L Alarm Indicator
  - SONET, 29
- RDI-P Alarm Indicator
  - SONET, 29
- RDI-V Alarm Indicator
  - SONET, 29
- Recall, 73
- Recall Configurations from Disk to Instrument, 82
- Recall Graphics Results from Disk to Instrument, 82
- Recall Settings, 73
- Receive key, 12
- Receive/Transmit settings coupled, 87
- Received Error
  - Beep on, 90
- Remote Alarm Indicator
  - PDH / DS<sub>n</sub>, 28
- Remote M/Frame Alarm Indicator
  - PDH / DS<sub>n</sub>, 28
- Rename a File, 85
- Reset History key, 27
- Results Definitions
  - Alarm Scan, 107
  - ATM Alarm Seconds, 145
  - Cumulative ATM, 112
  - Cumulative PDH, 111
  - Cumulative SDH, 111
  - Cumulative, PLCP Convergence Layer, 112
  - Frequency Measurement, 147
  - G.821 Bit Analysis, 115
  - G.821 CRC Analysis, 117
  - G.821 Frame Analysis, 116
  - G.821 REBE Analysis, 118
  - G.826 ATM EM BIP, 136
  - G.826 ATM FEBE, 137, 138, 139, 140, 141, 142
  - G.826 MS B2 BIP Analysis, 127
  - G.826 MS FEBE Analysis, 128
  - G.826 Path B3 BIP Analysis, 129
  - G.826 Path FEBE, 130
  - G.826 Path IEC, 131
  - G.826 PDH Analysis, 119
  - G.826 RS B1 BIP Analysis, 126
  - G.826 TU Path BIP 2 Mb/s, 133
  - G.826 TU Path BIP 34 Mb/s, 132
- G.826 TU Path FEBE 2 Mb/s, 135
- G.826 TU Path FEBE 34 Mb/s, 134
- Jitter, 143
- M.2100 Analysis, 123
- M.2110 Analysis, 125
- M.2120 Analysis, 125
- PDH Alarm Seconds, 144
- SDH Alarm Seconds, 145
- Short Term ATM, 109
- Short Term PDH, 108
- Short Term SDH, 108
- Short Term, PLCP Convergence Layer, 109
- Trouble Scan, 106
- Wander, 143
- Results key, 12
- Results Logging, 49–55
  - Disc Drive, 54
  - HP-IB Printer, 52
  - RS-232-C Printer, 52
- Results snapshot Logging, 50
- RS-232-C Printer
  - Connecting, 60
  - Logging Results, 52
- RS-449 Loopback, 93
- Run / Stop Key, 26
- S**
- Save Current Instrument Configuration to Disk, 80
- Save Data Logging to Disk, 81
- Save Graphics Results to Disk, 80
- Save Settings, 73
- Screen dump, 52
- SDH Alarm Indicators, 28
- SDH Alarm Seconds, 145
- SDH Alarms
  - Clock Loss, 28
  - Loss Of Pointer, 28
  - MS AIS, 28
  - MS FERF, 28
  - Path AIS, 28
  - Path FERF, 28
  - Pattern Loss, 28
  - Pointer Adjust, 28
  - TU Path AIS, 28
  - TU Path FERF, 28
- SDH Error Analysis, 126–135

---

## Index

---

- SDH payload mapping with pictorial display, 21
  - SDH Results
    - Cumulative, 111
    - G.826 MS B2 BIP, 127
    - G.826 MS FEBE, 128
    - G.826 Path B3 BIP, 129
    - G.826 Path FEBE, 130
    - G.826 Path IEC, 131
    - G.826 RS B1 BIP, 126
    - G.826 TU Path BIP 2 Mb/s, 133
    - G.826 TU Path BIP 34 Mb/s, 132
    - G.826 TU Path FEBE 2 Mb/s, 135
    - G.826 TU Path FEBE 34 Mb/s, 134
    - Short Term, 108
  - Selectable display values, 17
  - Selected Cell Not Received Alarm Indicator
    - ATM, 29
  - Self Test, 91
    - Datcomm port loopback, 93
  - Set key, 26
  - Settings Control, 87
  - Short Term Results
    - ATM, 109
    - PDH, 108
    - PLCP Convergence Layer, 109
    - SDH, 108
  - Show History key, 27
  - Signal loss
    - Suspending test on, 87
  - Signal Loss Alarm Indicator, 27
  - Single/multiple window selection, 13
  - Soft key alternative, pop-up menu, 20
  - SONET Alarm Indicators, 29
  - SONET Alarms
    - AIS-L, 29
    - AIS-P, 29
    - AIS-V, 29
    - Clock Loss, 29
    - Loss Of Pointer, 29
    - Pointer Adjust, 29
    - RDI-L, 29
    - RDI-P, 29
    - RDI-V, 29
  - Status Indicators, 27
  - Stored Settings, 63, 87
    - Recall, 73
    - Save, 73
    - Title, 73
  - Stored Text Results Logging, 103
  - Storing Measurement Data, 40, 41
  - Suspending test on signal loss, 87
- T**
- Test Period Logging, 49
  - Test timing selection, 37
  - Text entry with pop-up menu, 18
  - Text Results Logging, 103
  - Time and Date Setting, 88
  - Timing of test
    - Selection, 37
  - Title Settings, 73
  - Trace data entry with pop-up menu, 18
  - Transmit key, 12
  - Transmit/Receive settings coupled, 87
  - Trouble Scan, 106
  - TU Path AIS Alarm Indicator
    - ADH, 28
  - TU Path FERF Alarm Indicator
    - SDH, 28
- U**
- Upgrade Modules, 7
    - Ordering, 7
- V**
- VC Alarm Indicator
    - ATM, 29
  - VP Alarm Indicator
    - ATM, 29
- W**
- Wander Results, 143

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## **Learning Products Map**

All of the learning products which apply to the HP 37717C Communications Performance Analyzer are shown below:

### **The HP 37717C Mainframe Operating Manual- 37717-90221**

General operating information irrespective of option.

### **The HP 37717C PDH / DS<sub>n</sub> Operating Manual - 37717-90222**

Information about the PDH / DS<sub>n</sub> modules, how to select the features available and measurement examples.

### **The HP 37717C SDH / SONET Operating Manual - 37717-90223**

Information about the SDH / SONET modules, how to select the features available and measurement examples. This book also contains a table of ANSI / ETSI equivalent terms.

### **The HP 37717C Jitter Operating Manual - 37717-90224**

Information about the Jitter modules, how to select the features available and measurement examples.

### **The HP 37717C ATM Operating Manual - 37717-90225**

Information about the ATM modules, how to select the features available and measurement examples. This book also contains tutorial information on some ATM measurements, Information on pre-stored sequences and a glossary of ATM terms.

### **Remote Control Manual - 37717-90227:**

Provides remote control information for instruments fitted with the RS232 and HP-IB remote control option modules.

### **Calibration Manual - 37717-90228:**

Provides specifications and methods of testing that the instrument meets its specifications.



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### **In This Book**

This book provides information on HP 37717C modules with PDH / DS<sub>n</sub> capability. It also provides applications associated with these modules. The individual applications contain techniques which may be of value for purposes other than those shown.