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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. In other documentation, to reduce potential confusion, the only change to product numbers and names has been in the company name prefix: where a product number/name was HP XXXX the current name/number is now Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

Jitter Operating Manual

HP 37717B Communications Performance Analyzer

HP Part No. 37717-90275

First edition **07/97**

Printed in U.K.

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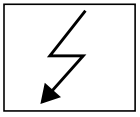

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Hewlett-Packard Limited
Communications Measurements Division
South Queensferry
West Lothian, Scotland EH30 9TG

Serial Numbers

This manual applies directly to instruments with serial numbers GB00000101 and above.

HP Part Number 37717-90275

Printed in U.K. July1997

HP 37717B Communications Performance Analyzer

About This Manual

This Jitter Operating manual explains the following:

- How to use the Jitter features provided with the Jitter options
- How to make Jitter measurements

The Mainframe Operating manual (37717-90271) 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 37717B irrespective of the option configuration.

The PDH Operating Manual (37717-90212) describes in detail how to perform PDH tests with the HP 37717B PDH/SDH test set.

The SDH Operating Manual (37717-90273) describes in detail how to perform SDH tests with the HP 37717B PDH/SDH test set.

he ATM Operating (37717-90215) describes in detail how to perform ATM tests with the HP 37717B PDH/SDH test set.

1 HP 37717B Jitter Operating Features

2 Jitter Testing with the HP 37717B

1 HP 37717B Jitter Operating Features

Introduction to Jitter

Errors will occur in a digital signal if jitter at the input of Network Equipment exceeds a threshold value. It is important to check that the maximum input jitter, that can be tolerated by that equipment, meets the ITU-T standards for maximum tolerable input jitter.

Excessive jitter not only causes errors, alarms and loss of synchronization but directly affects quality of service within the network.

During the transition from a PDH network to mixed PDH/SDH networks, tight control of jitter levels is essential, especially as new sources of jitter emerge, caused by the mapping process and network synchronization problems resulting in pointer movements. The pointer movements cause tributary jitter at the PDH output ports of the network element.

Cascading SDH regenerators on long distance links makes a build up of jitter unavoidable. It is vital to keep the jitter accumulation at the line side of the network element to a minimum as the SDH line rate is increasingly being used for synchronization purposes within SDH networks. Excessive line jitter may cause timing problems between network elements resulting in errors and pointer movements.

ATM network elements such as switches, routers, multiplexers and cross connects are also susceptible to jitter and it is therefore important to minimize jitter in ATM networks.

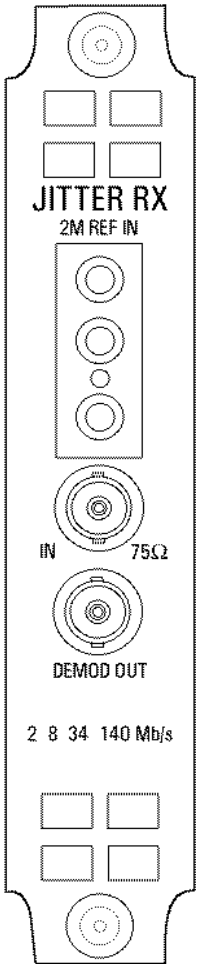
Wander is an extremely slow variation in the timing of the pulse stream. Excessive amounts of wander in a network will cause timing problems resulting in pointer movements. Wander measurements are made at 2 Mb/s, using an external 2 Mb/s MTS (ITU-T G.811) as a reference. Estimated frame and bit slips are also indicative of wander effects.

The HP 37717B provides comprehensive Jitter testing at all PDH and SDH rates from 2 Mb/s to 622.08 Mb/s (STM-4).

HP 37717B Jitter Measurement

Four Jitter measurement options are available according to your testing needs.

Option UHN [US9] PDH Jitter Measurement



Option UHN provides Jitter measurement at PDH rates of 2 Mb/s, 8 Mb/s, 34 Mb/s and 140 Mb/s.

To measure jitter connect the PDH signal to the PDH IN port of the PDH module (Options UKK, UKJ and UKN).

The following **Jitter measurements** are available at all PDH rates:

Jitter Hit Count

Jitter Hit Seconds

Jitter Hit Free Seconds

Peak Jitter (Positive and Negative)

Peak to Peak Jitter

The following **Wander measurements** are only available at 2.048 Mb/s:

Peak Wander (Positive and Negative)

Peak to Peak Wander

Estimated Bit Slips

Estimated Frame Slips

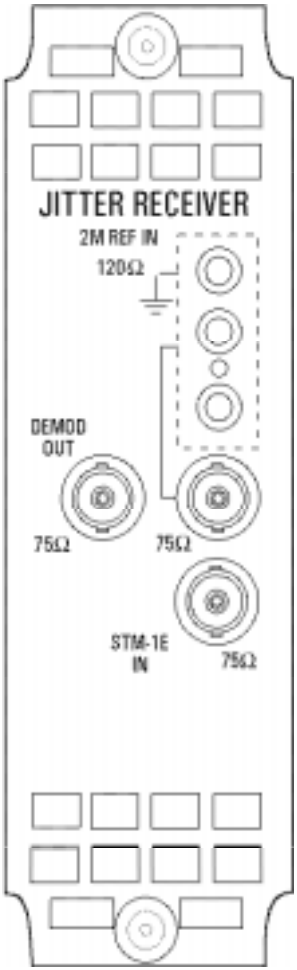
A graphical display of Wander is also provided.

DEMOD OUT connector provides a Demodulated Jitter output.

Figure 1-1 **Option UHN [US9]**

Option A3L [A3M] PDH & STM-1 Electrical Jitter Measurements

Option A3L provides Jitter measurement at STM-1 Electrical rate and PDH rates of 2 Mb/s, 8 Mb/s, 34 Mb/s and 140 Mb/s. Compliance to ITU-T O.171 and testing to ITU-T G.825/G.958 is provided.



To measure jitter connect the PDH signal to the PDH IN port of the PDH module (Options UKK, UKJ and UKN) or the STM-1 Electrical signal to the STM-1E IN of the A3L module.

Jitter measurements are available at all PDH rates and STM-1 Electrical rate:
Jitter Hit Count
Jitter Hit Seconds
Jitter Hit Free Seconds
Peak Jitter (Positive and Negative)
Peak to Peak Jitter
Peak rms Jitter

Automatic Jitter Transfer with narrowband selective filtering, in conjunction with Option UHK or A3K, Jitter Generation.

The user can control the number of frequency points at which Jitter is generated, up to 55.
Fixed input masks, ITU-T G.823 for PDH and ITU-T G.958 for SDH, are provided. A user defined mask is also available.
Jitter Transfer results are displayed in tabular form and in Graphical form. The ITU-T pass mask is also displayed on the graph.

Wander measurements are only available at 2.048 Mb/s:

Peak Wander (Positive and Negative)

Peak to Peak Wander

Estimated Bit Slips

Estimated Frame Slips

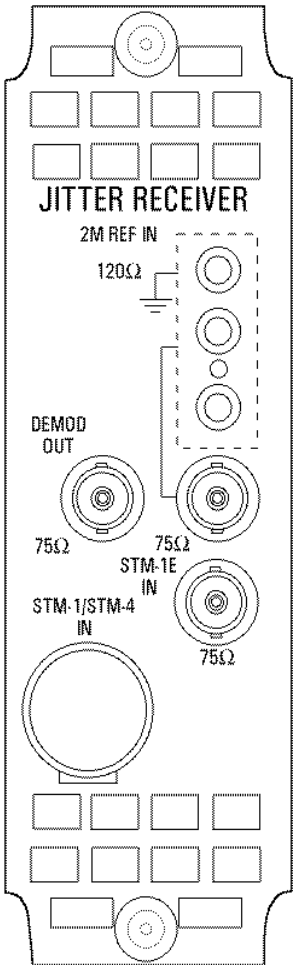
Implied Frequency Offset

A graphical display of Wander is also provided.

DEMOD OUT connector provides a Demodulated Jitter output.

Figure 1-2 **Option A3L [A3M]**

Option A3V [A3W] PDH & STM-1 Optical & Electrical Jitter Measurements



Option A3V provides Jitter measurement at STM-1 Optical and electrical rate and PDH rates of 2 Mb/s, 8 Mb/s, 34 Mb/s and 140 Mb/s. Compliance to ITU-T O.171 and testing to ITU-T G.825/G.958 is provided.

To measure jitter connect the PDH signal to the PDH IN port of the PDH module (Options UKK, UKJ and UKN) or the STM-1 Electrical signal to the STM-1E IN of the A3V module or the STM-1 Optical signal to STM-1/STM-4 IN of the A3V module.

Jitter measurements are available at all PDH rates and STM-1:
Jitter Hit Count
Jitter Hit Seconds
Jitter Hit Free Seconds
Peak Jitter (Positive and Negative)
Peak to Peak Jitter
Peak rms Jitter

Automatic Jitter Transfer with narrowband selective filtering, in conjunction with Option A3K or UHK, Jitter Generation.

The user can control the number of frequency points at which Jitter is generated, up to 55.
Fixed input masks, ITU-T G.823 for PDH and ITU-T G.958 for SDH, are provided. A user defined mask is also available.
Jitter Transfer results are displayed in tabular form and in Graphical form. The ITU-T pass mask is also displayed on the graph.

Wander measurements are only available at 2.048 Mb/s:

Peak Wander (Positive and Negative)

Peak to Peak Wander

Estimated Bit Slips

Estimated Frame Slips

Implied Frequency Offset

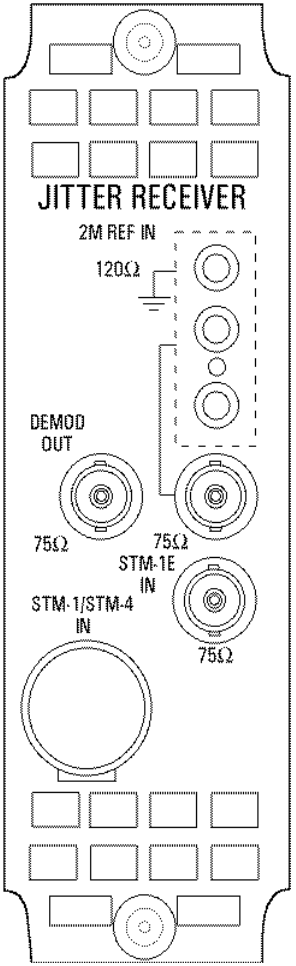
A graphical display of Wander is also provided.

DEMOD OUT connector provides a Demodulated Jitter output.

Figure 1-3 **Option A3V [A3W]**

Option A3N [A3P] PDH, STM-1 Electrical & Optical & STM-4 Optical Jitter Measurements

Option A3N provides Jitter measurement at STM-1 Optical and electrical rate, STM-4 Optical rate and PDH rates of 2 Mb/s, 8 Mb/s, 34 Mb/s and 140 Mb/s. Compliance to ITU-T O.171 and testing to ITU-T G.825/G.958 is provided.



To measure jitter connect the PDH signal to the PDH IN port of the PDH module (Options UKK, UKJ and UKN) or the STM-1 Electrical signal to the STM-1E IN of the A3N module or the STM-1/STM-4 Optical signal to STM-1/STM-4 IN of the A3N module.

Jitter measurements are available at all PDH rates, STM-1 Optical and electrical rate and STM-4 Optical rate:
Jitter Hit Count
Jitter Hit Seconds
Jitter Hit Free Seconds
Peak Jitter (Positive and Negative)
Peak to Peak Jitter
Peak rms Jitter

Automatic Jitter Transfer with narrowband selective filtering, in conjunction with Option A3K or UHK, Jitter Generation.

The user can control the number of frequency points at which Jitter is generated, up to 55.
Fixed input masks, ITU-T G.823 for PDH and ITU-T G.958 for SDH, are provided. A user defined mask is also available.
Jitter Transfer results are displayed in tabular form and in Graphical form. The ITU-T pass mask is also displayed on the graph.

Wander measurements are only available at 2.048 Mb/s:

Peak Wander (Positive and Negative)

Peak to Peak Wander

Estimated Bit Slips

Estimated Frame Slips

Implied Frequency Offset

A graphical display of Wander is also provided.

DEMOD OUT connector provides a Demodulated Jitter output.

Figure 1-4 **Option A3N [A3P]**

Option A3K [A3Q] Jitter & Wander Generator

Option A3K provides Jitter Generation at all ETSI rates, 2 Mb/s, 8 Mb/s, 34 Mb/s, 140 Mb/s, STM-1 and STM-4 depending on which PDH and SDH options are fitted.

Allows the generation of **User Definable Jitter** including **Automatic Jitter Tolerance** as detailed for Option UHK.

The **jitter modulation** can be sourced internally or from an External source. The external modulation is connected to the MOD IN port.

Allows testing to **ITU-T G.825**.

Full **ITU-T O.171** generation capability from 10 µHz to 5 MHz

Provides stimulus for **Jitter Transfer measurements**.
Peak to Peak Jitter and Modulating frequencies as per ITU-T G.823 (PDH) and ITU-T G.958 (SDH).

Provides **Wander Generation at** 2 Mb/s, STM-1 and STM-4 depending on which PDH and SDH options are fitted. An external clock must be connected to the 2M REF input.

The **2M REF input** can be used as an external clock for 2.048 Mb/s PDH transmission.

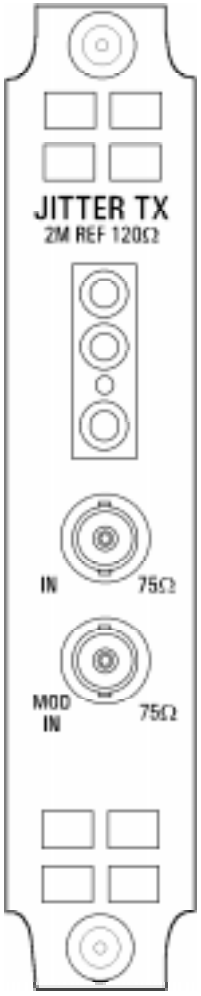
The **wander modulation** can be sourced internally or from an external source. The external modulation is connected to the MOD IN port.

Allows the generation of **User Definable Wander** as follows:

Spot frequency Wander within the ITU-T mask.

Figure 1-5 **Option A3K [A3Q]**

Option 140 [141] Extended Jitter Generator



Option 140 provides Jitter Generation at all ETSI rates, 2 Mb/s, 8 Mb/s, 34 Mb/s, 140 Mb/s, STM-1 and STM-4 depending on which PDH and SDH options are fitted.

Allows the generation of **User Definable Jitter** including **Automatic Jitter Tolerance** as detailed for Option UHK.

The **jitter modulation** can be sourced internally or from an External source. The external modulation is connected to the MOD IN port.

Allows testing to **ITU-T G.825**.

Full **ITU-T O.171** generation capability from 10 µHz to 5 MHz

Provides stimulus for **Jitter Transfer measurements**.

Peak to Peak Jitter and Modulating frequencies as per ITU-T G.823 (PDH) and ITU-T G.958 (SDH).

The **2M REF input** can be used as an external clock for 2.048 Mb/s PDH transmission.

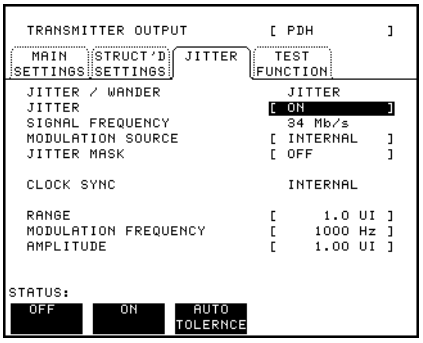
Figure 1-6 **Option 140 [141]**

HP 37717B Jitter Features

Jitter Generation

The SIGNAL FREQUENCY selection is made on the PDH or SDH **TRANSMIT** display as required. PDH - 2, 8, 34 or 140 Mb/s. SDH - STM-1, STM-1 OPT or STM-4 OPT.

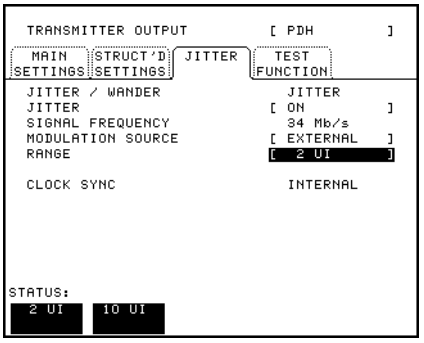
CLOCK SYNC,PAYLOAD and PATTERN selections are also made on the PDH or SDH **TRANSMIT** display as required.



The jitter modulation can be obtained internally from the HP 37717B jitter module or from an external MODULATION SOURCE.

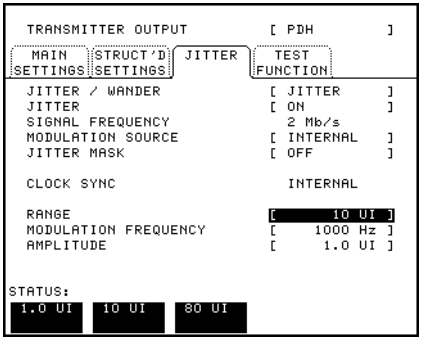
When EXTERNAL is selected up to 10 UI of jitter modulation can be applied to the MOD IN port.

When INTERNAL is selected the jitter modulation is obtained from the HP 37717B.



JITTER MASK [OFF] allows the user to set the jitter RANGE, MODULATION FREQUENCY and AMPLITUDE.

If SIGNAL FREQUENCY 2Mb/s is selected on the PDH display then up to 80 UI of jitter can be generated. If 8, 34 or 140 Mb/s is selected the maximum jitter is 10 UI. If STM-1 is selected the maximum jitter is 50 UI. If STM-4 is selected the maximum jitter is 200 UI.

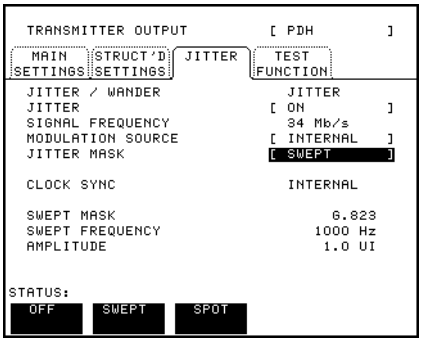


The MODULATION FREQUENCY can be selected in the range 0.1 Hz to 5 MHz depending upon the Signal Frequency selected.

When JITTER MASK [SWEPT] is selected the HP 37717B will "sweep" through the jitter mask adjusting amplitude according to the Jitter frequency.

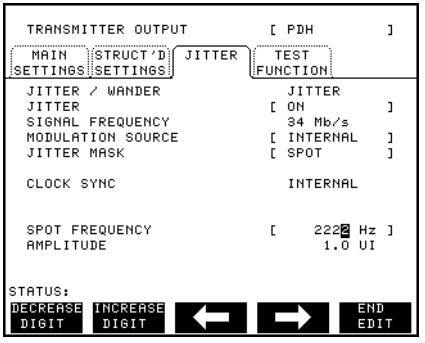
The Current SWEPT FREQUENCY and AMPLITUDE are displayed.

To stop the "sweep" select OFF or SPOT.



If when using the SWEPT MASK capability a problem occurs around a certain frequency which requires closer examination simply stop the sweep at that point by selecting SPOT. The Spot frequency can be user controlled to more closely examine the problem.

When JITTER MASK [SPOT] is selected the user can select the jitter frequency. The jitter amplitude is adjusted and controlled by the HP 37717B according to the frequency selected.

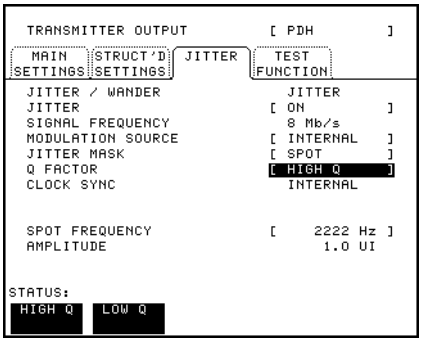


When 2 Mb/s or 8 Mb/s is selected a Q FACTOR selection is provided.

Q FACTOR selections should match the network equipment regenerator Q Factor.

LOW Q systems have good Jitter Tolerance and the mask corner points are modified to compensate.

HIGH Q systems have poorer Jitter Tolerance but a narrower Jitter Transfer function and the mask corner points are modified to compensate.



Jitter Tolerance

When Jitter Tolerance is selected jitter is generated at a range of frequencies within the ITU-T mask and errors are measured. If no errors occur (PASS) the jitter amplitude at that frequency point is increased until errors occur (FAIL) or the maximum jitter amplitude is reached. The highest jitter amplitude level at which PASS occurs is plotted on the display as the Jitter Tolerance for that frequency.

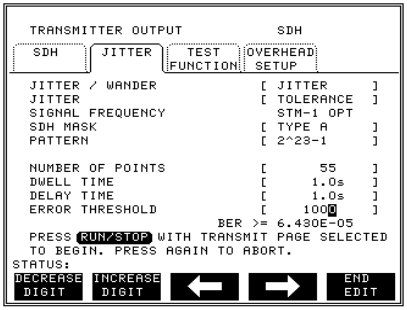
The transmitter and receiver can be set to different rates to allow testing across multiplexers e.g. Transmitter set to STM-1 with embedded 34 Mb/s and Receiver set to 34 Mb/s.

The Jitter Tolerance mask is displayed with the ITU-T G.823 (PDH) or ITU-T G. 958 (SDH) mask on the **RESULTS** display.

NUMBER of POINTS determines the number of jitter frequencies at which jitter is transmitted (3 to 55).

DWELL TIME determines the time the jitter is generated at each jitter frequency (1 second to 99.9 seconds).

DELAY TIME determines the time delay between the jitter frequency/amplitude being applied and the test being performed. This allows the network equipment to settle as jitter frequency is changed (0 to 99.9 seconds).



ERROR THRESHOLD: If set to ANY ERRORS any BIP or BIT error will signify a FAIL.

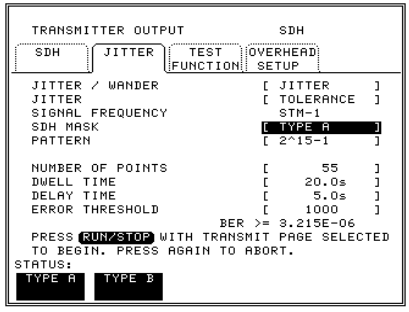
If set to BIT ERRORS the value set (between 1 - 1,000,0000) determines the BIT error threshold for the Jitter Tolerance PASS/FAIL decision.

BER >= provides a bit error ratio calculated from the bit error threshold selection and the dwell time selection for the rate selected.

If SDH Jitter is selected the type of SDH mask can be selected as either TYPE A or TYPE B as per ITU-T G.958.

Type A masks have good Jitter tolerance and the mask corner points are modified to compensate

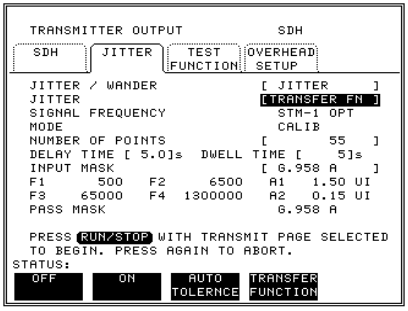
Type B masks have poorer Jitter Tolerance but a narrower Jitter Transfer function and the mask corner points are modified to compensate.



Automatic Jitter Transfer

Automatic Jitter transfer measurements are a receiver function and are explained under Jitter Measurement. To perform Jitter Transfer measurements a Jitter Generation module UHK or A3K[A3Q] or 140 [141] and a Jitter measurement module, Option A3L [A3M] PDH and STM-1 Electrical or Option A3V [A3W] PDH & STM-1 Electrical and Optical or Option A3N [A3P] PDH, STM-1 Electrical & Optical and STM-4 Optical, are required.

When Jitter Transfer Function is selected jitter is generated at a range of frequencies within the ITU-T mask and the received Jitter is measured by Option A3L, A3V or A3N. Both transmitter and receiver must be configured to the same rate.

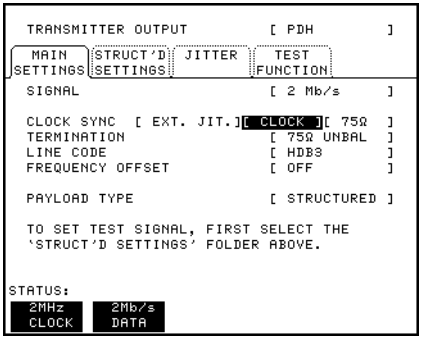


Wander Generation

Wander generation is possible at 2.048 Mb/s, 155.52 Mb/s (STM-1) and 622.08 Mb/s (STM-4).

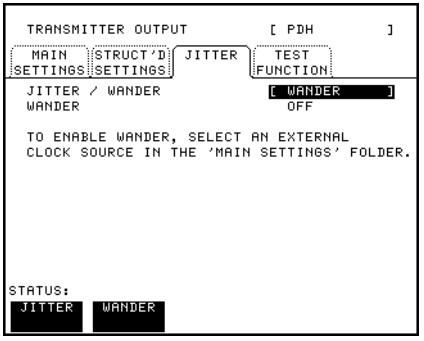
PDH 2 Mb/s requires a 2.048 MHz MTS clock to be connected to the 2M REF port on the Tx Jitter Module (Option A3K).

CLOCK SYNC [EXT. JIT] and SIGNAL [2 Mb/s] must be selected on the **PDH** **MAIN SETTINGS** display.



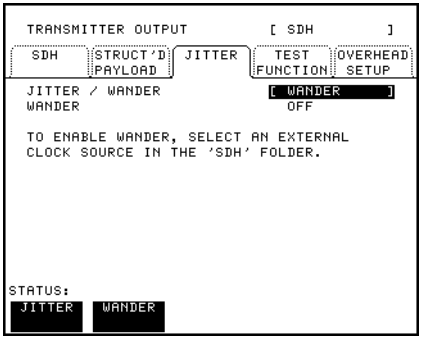
The EXT. JIT. clock format can be 2 MHz data or clock, 75Ω unbalanced or 120Ω balanced.

If CLOCK SYNC [INTERNAL] is selected on the **PDH** **MAIN SETTINGS** display, PDH Wander is disabled.



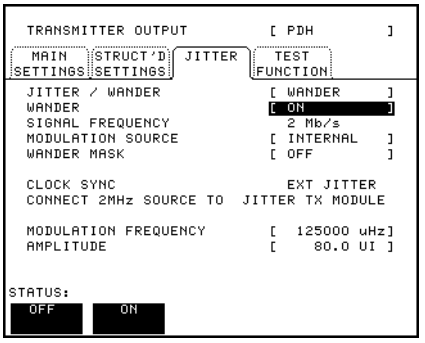
SDH Wander at STM-1 and STM-4 is enabled if CLOCK SYNC [EXT MTS] or [STM-1 RX] or [STM-4 RX] is selected on the **SDH** display.

If CLOCK SYNC [INTERNAL] is selected on the **SDH** display, SDH Wander is disabled.



The SIGNAL FREQUENCY selection is made on the PDH or SDH **TRANSMIT** display as required. PDH - 2 Mb/s. SDH - STM-1, STM-1 OPT or STM-4 OPT.

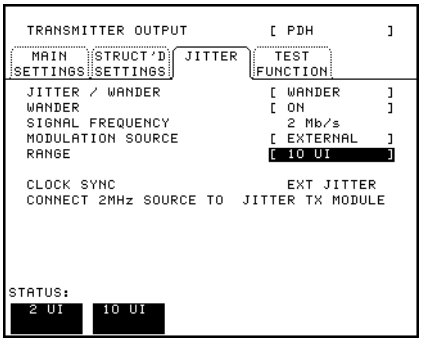
CLOCK SYNC, PAYLOAD and PATTERN selections are also made on the PDH or SDH **TRANSMIT** display as required.



The wander modulation can be obtained internally from the HP 37717B jitter module or from an external MODULATION SOURCE.

When EXTERNAL is selected up to 10 UI of wander modulation can be applied to the External Modulation port.

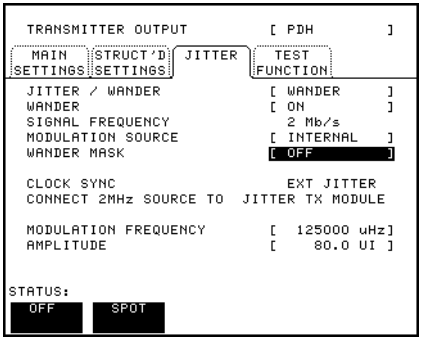
When INTERNAL is selected the wander modulation is obtained from the HP 37717B.



WANDER MASK [OFF] allows the user to set the wander MODULATION FREQUENCY and wander AMPLITUDE.

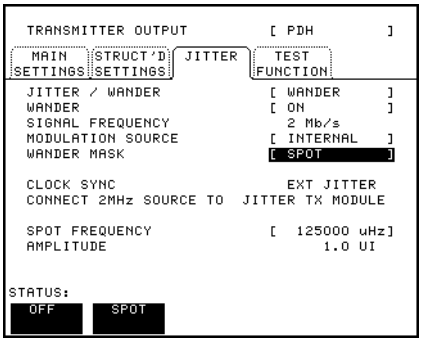
If SIGNAL FREQUENCY 2Mb/s is selected on the PDH display then up to 80 UI of wander can be generated. If STM-1 is selected the maximum wander is 3600 UI. If STM-4 is selected the maximum wander is 14400 UI.

The MODULATION FREQUENCY is set in µHz in the range 0.000010 Hz to 0.125000 Hz.



When WANDER MASK [SPOT] is selected the user can select the wander frequency in µHz. The wander amplitude is adjusted and controlled by the HP 37717B according to the frequency selected.

At 2 Mb/s the mask is as defined in ITU-T G.823. At STM-1 and STM-4 the mask is as defined in ITU-T G.958.

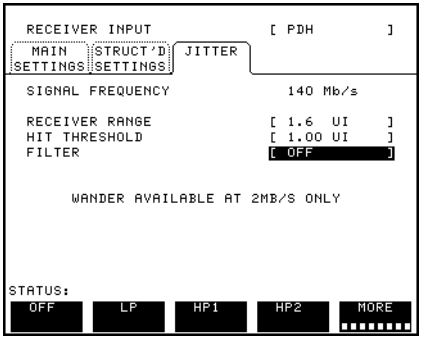


Jitter Measurement

The RECEIVER RANGE selection on the **RECEIVE** display determines the measurement range of the jitter receiver.

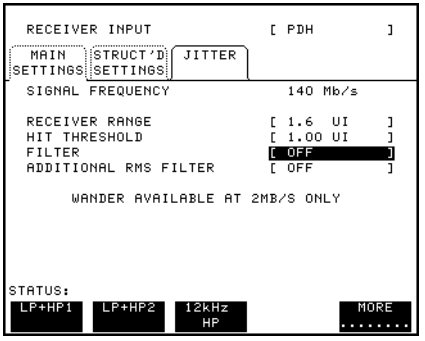
The HIT THRESHOLD selection sets the jitter level above which a jitter HIT is recorded.

The FILTER selection allows the use of Low Pass and High Pass filters in the jitter measurement LP, HP1, HP2, LP+HP1, LP+HP2.



If Option A3L, A3V or A3N are fitted an additional selection 12 kHz HP is provided.

FILTER allows the selection of Low Pass and High Pass filters in the pk_pk and RMS jitter measurement LP, HP1, HP2, LP+HP1, LP+HP2, 12 kHz HP.

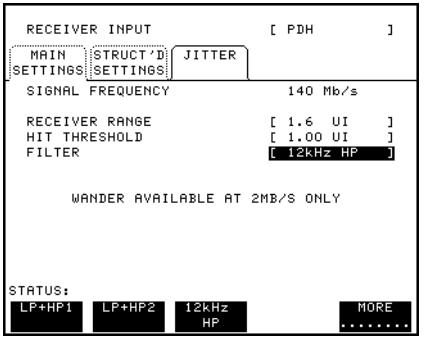


It is possible that different filters will be required for Peak_Peak and RMS measurements and the ADDITIONAL RMS FILTER field allows the selection of 12 kHz HP for RMS measurement only.

If 12 kHz HP is selected under FILTER the ADDITIONAL RMS FILTER field is removed from the display.

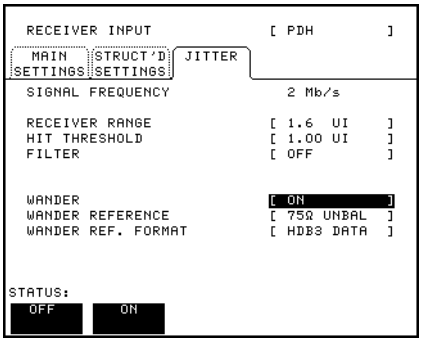
CALIBRATION of Jitter Transfer should always be performed with LEVEL [TERMINATE] selected.

If the Jitter Transfer measurement is to be made at a network equipment monitor point select MONITOR after the CALIBRATION is completed before making the jitter transfer measurement.



If 2 Mb/s Signal Frequency is selected Wander measurements are available by selecting WANDER [ON]. Wander measurements are made relative to a 2 MH/z reference Clock/Data signal connected to the 2 MH/z REF IN port.

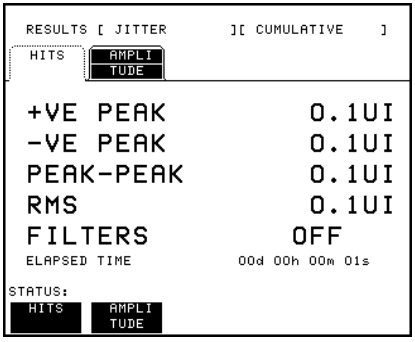
WANDER REFERENCE selection should match the network equipment PDH interface, 75 Ω unbalanced or 120 Ω balanced. WANDER REF FORMAT should match the source of the reference, DATA or CLOCK.



Short Term or Cumulative results of Jitter amplitude are available on the **RESULTS** display. Short Term results are recalculated at user defined intervals during the measurement period. Cumulative results provide result at that time in the measurement period.

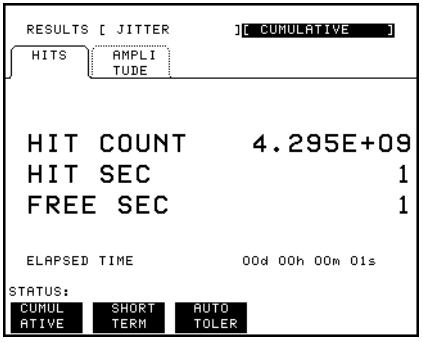
RMS and TRANSFER FUNCTION are only available when Option A3L or A3V or A3N is fitted.

The Filter selection is also displayed.



Cumulative results of Jitter Hits are available on the **RESULTS** display.

A Jitter Hit occurs when the measured jitter exceeds the Hit Threshold set on the **RECEIVE** display.

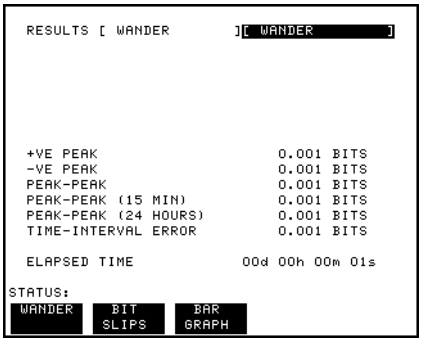


If 2 Mb/s Wander measurements are selected Wander results of Wander, Bit Slips and Bar Graph are available.

Bit Slips results of Estimated Bit Slips and Estimated Frame Slips are provided.

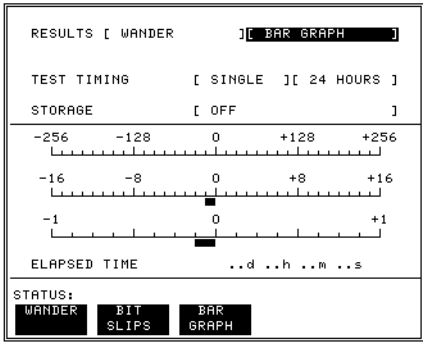
Estimated Bit Slips signify slippage from the start of the measurement, Resolution 1 UI.

An Estimated Frame Slip corresponds to 256 Bit Slips.



If BAR GRAPH is selected the cumulative Wander measurements are displayed in graphical form.

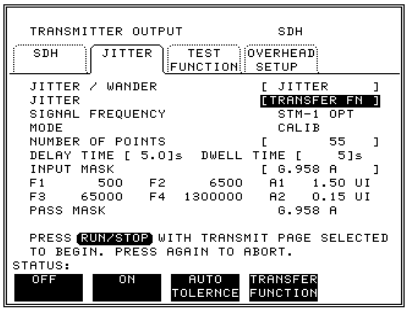
The Bar Graphs are additive - in the example shown the Wander is -1.125 Bits.



Jitter Transfer (Options A3L [A3M], A3V [A3W], A3N [A3P])

To perform an automatic Jitter Transfer test the transmitter and receiver must be set to the same rate, STM-4, STM-1, 140 Mb/s, 34 Mb/s, 8 Mb/s or 2 Mb/s. The Jitter Generator, Option UHK or A3K [A3Q] or 140 [141] provides the stimulus for the Jitter Transfer measurement. Narrow band filtering is used in the Jitter receiver, Option A3L [A3M] or A3V [A3W] or A3N [A3P]. This allows selection and measurement of the relevant jitter components in order to provide accurate and repeatable results.
The Jitter transfer results are displayed in tabular and graphical form.
The graphical results are plotted as Gain V Frequency.
The Pass Mask, specified in the relevant ITU-T standard, is also displayed on the graph.

NOTE There is no ITU-T Pass Mask for 140 Mb/s



NUMBER of POINTS determines the number of jitter frequencies at which jitter is transmitted (1 to 55).

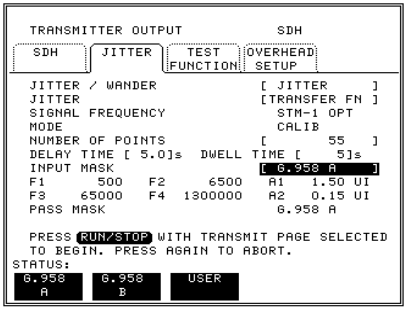
DELAY TIME is selectable in the range 5.0 seconds to 30.0 seconds and determines the time the jitter is generated at each jitter frequency.

DWELL TIME is selectable in the range 5.0 seconds to 30.0 seconds and determines the time delay between the jitter frequency/amplitude being applied and the test being performed. The greater the DWELL time the more accutate the measurement due to increased averaging. This is of particular benifit when measuring in a critical area with only a few POINTS selected.

When 2 Mb/s or 8 Mb/s is selected a Q FACTOR selection is provided for the input mask. Q FACTOR selections should match the network equipment regenerator Q Factor.

LOW Q systems have good Jitter Tolerance and the mask corner points are modified to compensate.

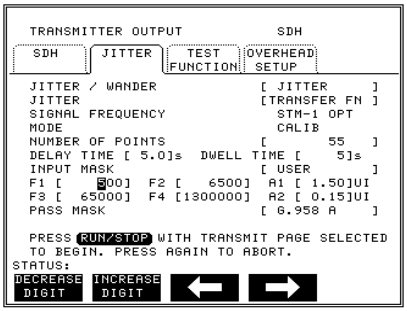
HIGH Q systems have poorer Jitter Tolerance but a narrower Jitter Transfer function and the mask corner points are modified to compensate.



If SDH Jitter is selected the type of SDH mask can be selected as either TYPE A or TYPE B as per ITU-T G.958.
Type A masks have good Jitter tolerance and the mask corner points are modified to compensate

Type B masks have poorer Jitter Tolerance but a narrower Jitter Transfer function and the mask corner points are modified to compensate.

The type of mask available depends upon the rate selected.
For conformity with ITU-T, G.958 is available for SDH rates and G.823 is available for PDH rates.
When G.823 or G.958 is selected the mask frequencies and amplitudes are displayed for information only.
If USER is selected the mask jitter frequencies, F1 F2 F3 and F4, and jitter amplitudes, A1 A2 can be set to user defined values.



NOTE

To achieve the required accuracy:
1.The HP 37717B must be connected back to back in order to perform a calibration cycle before making a Jitter Transfer measurement.
2. The HP 37717B must have been switched on for 1 hour before starting a calibration cycle.
3. The climatic conditions must remain stable from switch-on to end of measurement.
4. The Jitter Transfer measurement must be started within 10 minutes of completion of the Calibration.
5. If maximum Delay time, maximum Dwell time and maximum number of Points is selected the accuracy specification cannot be guaranteed as the time from start of calibration to end of measurement (test period) will be approximately two hours. It is recommended that the maximum test period does not exceed 90 minutes.
Test Period = Delay Time + Dwell Time + 5 Seconds X Number of Points X 2 (Calibration + Measurement).

Jitter Transfer Calibration

Before making Automatic Jitter transfer measurements the HP 37717B must be calibrated to remove any uncertainties. The calibration is carried out by connecting the HP 37717B back to back.

- If PDH Jitter Transfer is required connect PDH IN to PDH OUT.
- If STM-1 Electrical Jitter Transfer is required connect STM-1E OUT of the SDH Module to STM-1E IN of the Jitter Measurement module Option A3L [A3M] or A3V [A3W] or A3N [A3P].

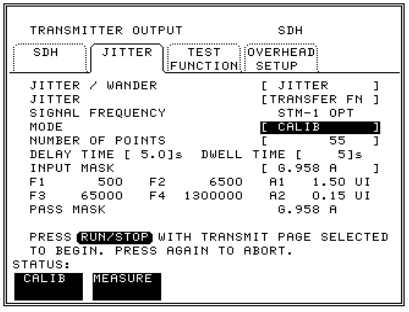
- If STM-1 or STM-4 Optical Jitter Transfer is required connect STM-1/STM-4 OUT of the Optical module to STM-1/STM-4 IN of the Jitter Measurement module Option A3V [A3W] or A3N [A3P].
- If **1550 nm** STM-1/4 SDH Jitter Transfer is required a 10 dB attennuator must be connected between STM-1/4 OUT of the Optical module and STM-1/STM-4 IN of the Jitter Measurement module Option A3V [A3W] or A3N [A3P].
- The CALIBRATION should always be carried out with LEVEL [TERMINATE] selected on the RECEIVE JITTER display.
  If the measurement is to be made at a network equipment monitor point select MONITOR after the CALIBRATION is completed before making the jitter transfer measurement.

To start the Calibration:

1. Select MODE [CALIB] on the TRANSMIT JITTER display.

2. Press RUN/STOP.

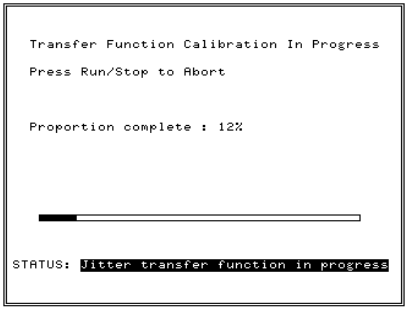
The Jitter Transfer display is replaced by an information display for the duration of the Calibration.



A bar graph showing the progress of the calibration will appear on the display.

When the Calibration is complete the display will revert to the TRANSMIT JITTER display.

The Jitter Transfer measurement must be started within 10 minutes of the completion of Calibration.

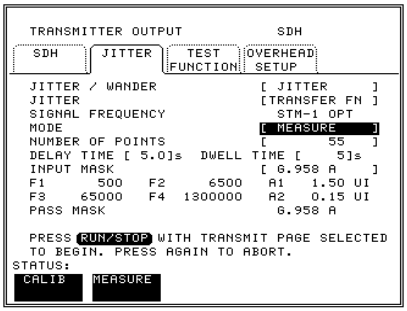


Jitter Transfer measurement

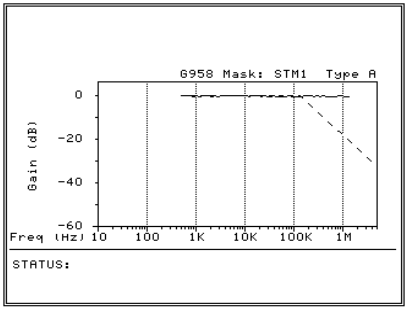
1. Connect the HP 37717B to the network equipment

2. Select MODE [MEASURE] on the **TRANSMIT** **JITTER** display.

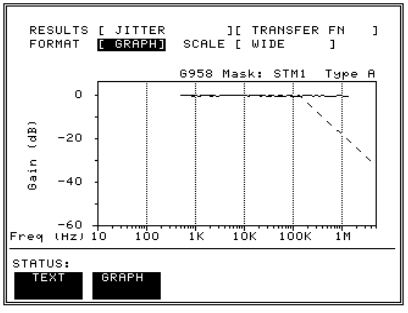
3. Press **RUN/STOP**.



The Jitter Transfer results are plotted in Graph form and the graph's progress can be monitored on the **TRANSMIT** display.



At the end of the measurement the Graph or Text results can be viewed on the **RESULTS** **JITTER** display.

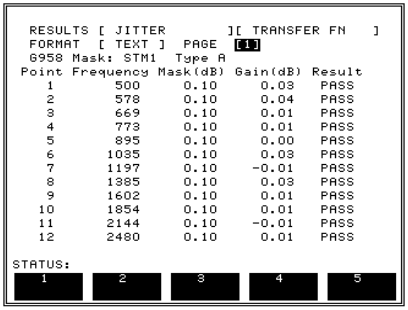


SCALE [WIDE] provides a vertical axis range of +5 dB to -60 dB and is recommended for viewing the high frequency portion of the graph as this allows a clearer view of the difference between the actual result and the ITU-T pass mask.

SCALE [NARROW] provides a vertical axis range of +3 dB to -3 dB and is recommended for viewing the low frequency portion of the graph as this allows a clearer view of the difference between the actual result and the ITU-T pass mask.

The graph on the **TRANSMIT** display is cleared when **TRANSMIT** is pressed but the **RESULTS** display remains available until the next Jitter Transfer measurement is made.

The Jitter Transfer results can also be viewed in TEXT form on the **RESULTS** display.



The following information is displayed for each result:
Point Number
Jitter Frequency
Mask value
Result
Pass /Fail Indication.

If applicable, results 13 to 55 can be viewed on pages 2 through 5.

2 Jitter Testing with the HP 37717B

Multiplexer Jitter Tolerance

Application

It is important that network equipment can operate correctly in the presence of certain amounts of jitter. ITU-T has specified tolerance masks of jitter amplitude against jitter frequency which all network equipment must be able to withstand and provide error free operation.

Jitter is applied at the ITU-T specified jitter frequencies and the amplitude increased beyond the ITU-T mask limits until errors occur or the maximum possible jitter amplitude is reached. The resulting amplitude levels are plotted relative to the mask to determine the network elements jitter tolerance.

Default (Known State) Settings

It can be advisable to set the HP 37717B to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. The default settings are set by selecting OTHER STORED SETTINGS STORED SETTING NUMBER 0 and pressing RECALL.

Test Setup Procedure (Jitter Tolerance Test)

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

- A3K [A3Q] or 140 [141] - Jitter Generation
- UKJ or UKK - PDH Module

This setup procedure is based on 34 Mb/s CMI, PRBS test data with jitter terminated in 75 Ω. The HP 37717B Automatic jitter tolerance feature is used and the results plotted on the ITU-T mask.

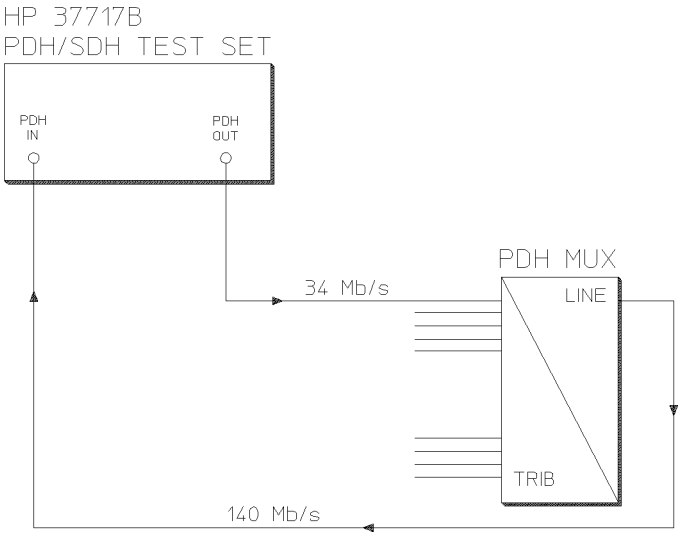


Figure 2-1 **Structured PDH Jitter Tolerance Test**

This test can be performed using the Unstructured PDH Option UKK but the network equipment must be looped back at the higher rate.

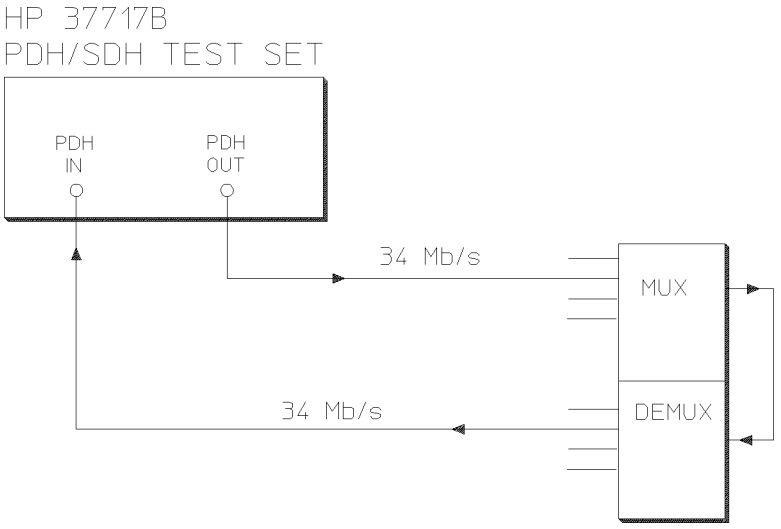
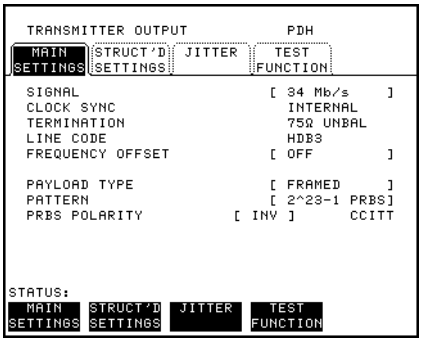


Figure 2-2 **Unstructured PDH Jitter Tolerance Test**

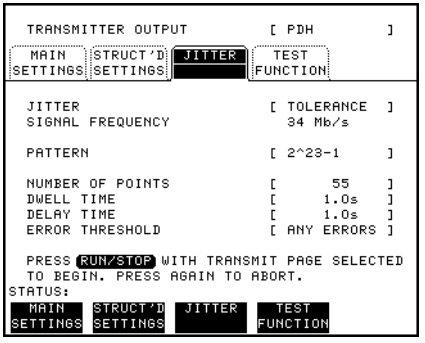
1. Connect the HP 37717B to the network equipment, and set up the **TRANSMIT** display **MAIN SETTINGS** as shown opposite.

PAYLOAD TYPE, PATTERN and PRBS POLARITY selections should match the requirement of the network equipment.

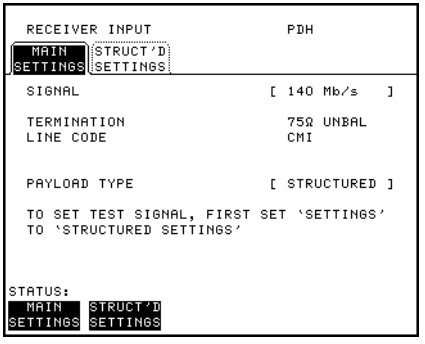


2. Select **TRANSMIT** **JITTER** and set up the display as shown opposite.

The Jitter Tolerance example shown will take approximately 10 minutes to complete.

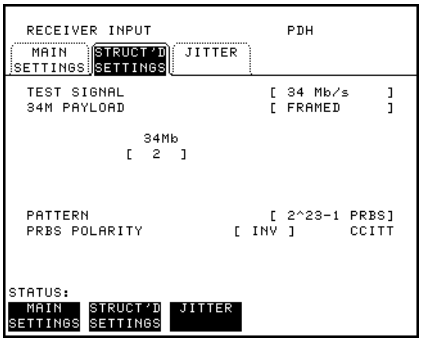


3. Set up the **RECEIVE** display **MAIN SETTINGS** as shown opposite.



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

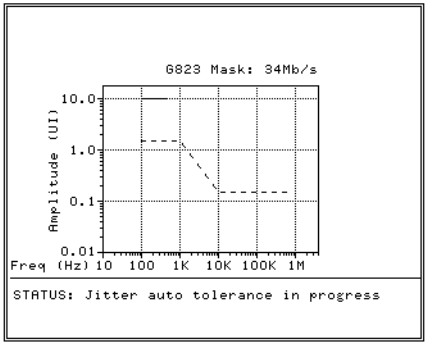
34M PAYLOAD selection should match the PAYLOAD TYPE selection on the TRANSMIT **MAIN SETTINGS** display.



Run the Test (Jitter Tolerance)

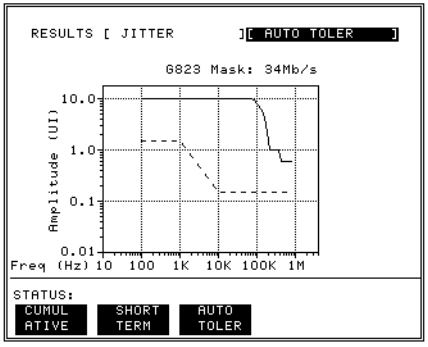
Press RUN/STOP to start the measurement.

The measurement takes approximately ten minutes to complete and its progress can be monitored on the TRANSMIT display.



At the end of the test the results can be viewed on the RESULTS display.

The results on the TRANSMIT display are cleared when TRANSMIT is pressed but the RESULTS display remains available until the next Jitter Tolerance measurement is made.



If Option A3B or Option A3D, Remote control, is fitted the Jitter Tolerance Mask results can be logged to an External printer (See *Connecting an HP 550C DeskJet Printer in the Mainframe Operating Manual*).

To Log the Auto Tolerance plot and the results which make up the Jitter Auto Tolerance plot:

Select the required logging device on the OTHER LOGGING display.
Select LOGGING [ON].
Select RESULTS JITTER AUTO TOLER and press PRINT NOW.

Wander and Slips

Application

The ITU-T specify the frequency limits within which network equipment clocks should operate. However when network equipment from different manufacturers is connected together errors in transmission may occur due to timing differences.

To avoid this problem Master Timing sources are typically used as a reference timing source for all network equipment. The timing reference is distributed throughout the network as a 2 Mb/s signal.

Problems may arise due to wrongly configured equipment running on internal clocks or at the junction of different operators network equipment.

Because the timing sources may operate at slightly different frequencies and exhibit long term frequency drift then phase difference (Wander) may occur, between the incoming data and the network equipment. This causes "Bit Slips" in the network equipment buffers and results in frames being repeated or deleted thus reducing the efficiency of data transfer.

Default (Known State) Settings

It is advisable to set the HP 37717B to a known state before setting up a measurement. This clears all previous settings and provides a clearly defined instrument state. The default settings are set by selecting **OTHER** **STORED SETTINGS** STORED SETTING NUMBER 0 and pressing **RECALL**.

Wander and Slips Test Setup Procedure

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

- UHN or A3L or A3V or A3N - PDH Jitter receiver + Wander and Estimated Slips
- UKJ or UKK - PDH Module

This measurement is made on live traffic and is interfaced at the line terminal equipment monitor point. The HP 37717B is used in a *receive only* mode to measure the Wander and Estimated Bit Slips.

A SINGLE test period of 24 HOURS is used and use of the internal printer for recording of results and alarms is included. A graphical record of the results can be viewed on the HP 37717B **GRAPH** display at the end of the test period.

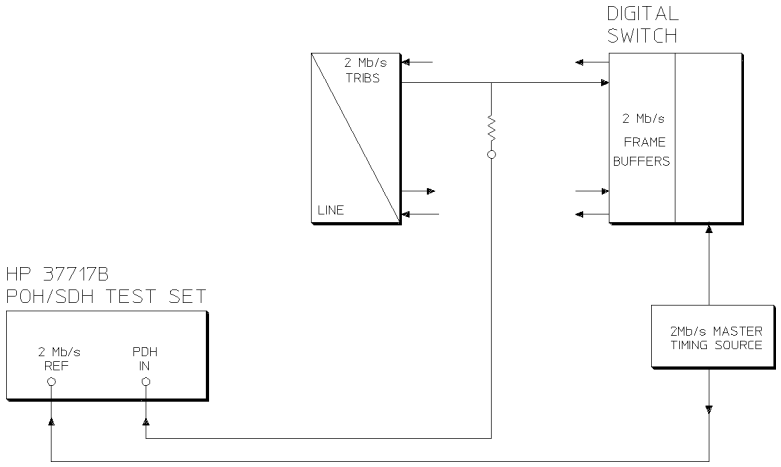
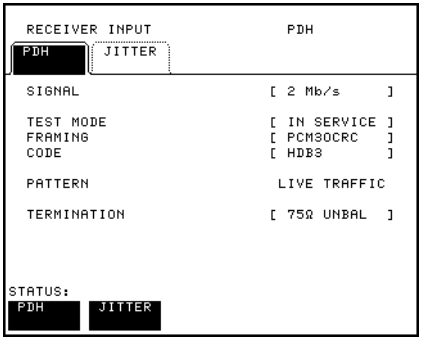


Figure 2-3 **Wander and Slips Test**

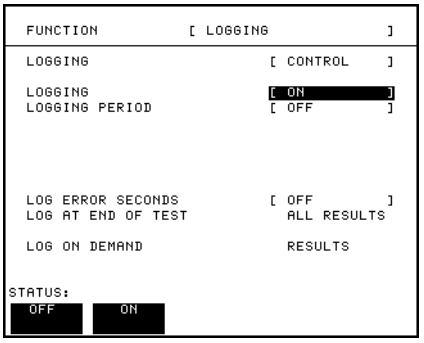
1. Select **RECEIVE** and set up the display as shown opposite.

Selections of FRAMING, CODE and TERMINATION should match those of the network equipment.



2. Select INTERNAL printer and set up the OTHER LOGGING display as shown opposite.

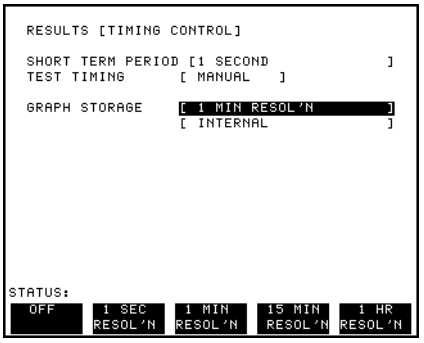
LOGGING PERIOD and LOG ERROR SECONDS selections can be modified according to the users requirements.



3. Set up the RESULTS display as shown opposite.

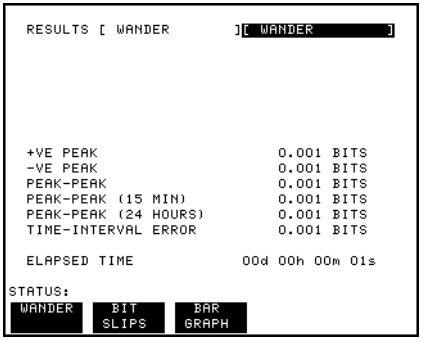
The STORAGE selection enables the graphics. To disable graphics select STORAGE [OFF].

Graphics can be stored to the instrument store - INTERNAL or to DISK.



4. Select RESULTS WANDER.

WANDER is selected but BIT SLIPS or BAR GRAPH may be selected without affecting the measurement.



Run the Test (Wander and Slips)

1. Press **SIGNAL IN** until the Monitor indicator, above the key, is lit.

2. Connect the PDH IN port to the line terminal equipment monitor point.

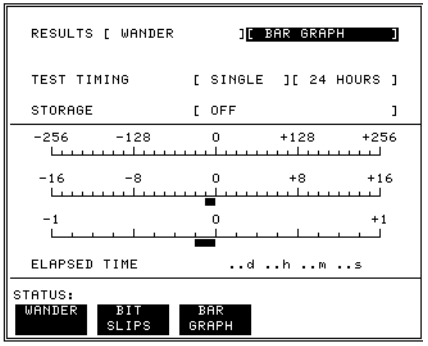
3. Connect the network master timing source (MTS clock) to the Receive Jitter module 2 Mb/s REFERENCE input.

If no reference signal is connected to the HP 37717B then the status message *"NO REF"* is displayed.

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

If **BAR GRAPH** is selected the current wander measurements are displayed in graphical form. Three positive and negative sliding bar graphs, of ± 1 UI, ± 16 UI and ± 256 UI, are displayed.

The Bar Graph displays are additive - in this example -1.125 UI.



- The measurement results and alarms are available on the **RESULTS** display during the test period.
- The test can be halted at any time by pressing **RUN/STOP**.

At the End of the Test (Wander and Slips)

- The Date and Time the test started and the instrument setup are logged on the internal printer.
- Any alarms which occur during the test period will be logged on the internal printer.
- At the end of the test period a complete set of results are logged on the internal printer.
- 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 External HP 550C DeskJet Printer.*

- Results and Alarm summaries can be viewed on the **GRAPH** display.

The total graphics store capacity is normally 20,000 events. An event is the occurrence of an error or an alarm. The resolution, determined by the selection made under STORAGE on the **RESULTS** 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** display.

Desynchronizer Stress

Application

At the boundary of the SDH network the 2 Mb/s or 140 Mb/s payload is demapped from the SDH signal. Pointer adjustments in the SDH signal may cause high levels of tributary jitter in the output payload. Excessive amounts of tributary jitter will result in errors.

The desynchronizing phase lock loop of the network element should minimize the level of tributary jitter in the payload but correct operation under stress conditions must be verified.

The desynchronizing phase lock loop can be stressed by adding pointer movement sequences (defined in ITU-T standard G.783) to the SDH signal such that the test VC-4 or TU moves with respect to the SDH frame.

A jitter measurement is made to verify that the Desynchronizer output jitter is within the required specification.

Default (Known State) Settings

It is advisable to set the HP 37717B to a known state before setting up a measurement. This clears all previous settings and provides a clearly defined instrument state. The default settings are set by selecting **OTHER** **STORED SETTINGS** STORED SETTING NUMBER 0 and pressing **RECALL**.

Desynchronizer Stress Test Setup Procedure

The following options must be fitted to the HP 37717B to perform this test:

- UKK or UKJ - PDH module
- UHN or A3L or A3V or A3N - Jitter measurement module
- A3R - SDH module
- UH1 or 130 or 131 - STM-1/4 Optical interface

The HP 37717B PDH/SDH test set transmits an STM-4 optical signal carrying 2 Mb/s payload. Pointer movement sequences are added in a controlled manner.

The Desynchronizer output is returned to the HP 37717B and a jitter measurement is performed on the demapped 2 Mb/s signal.

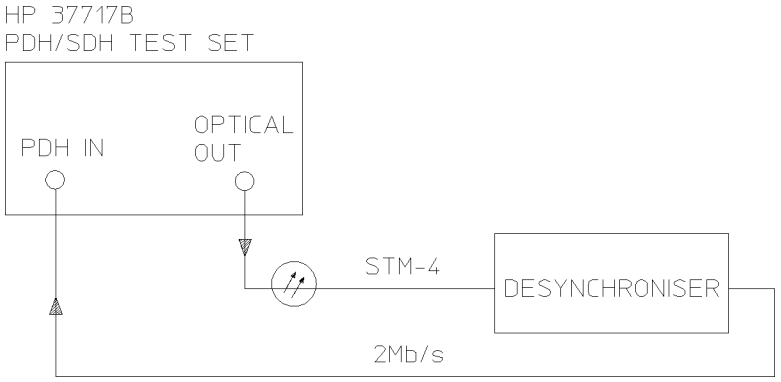
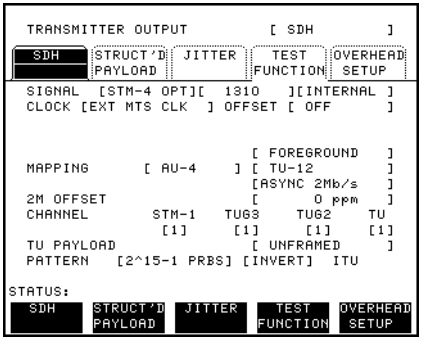


Figure 2-4 **Desynchronizer Stress Test**

1. Connect the HP 37717B to the network equipment and set up the **TRANSMIT** **SDH** display as shown opposite.

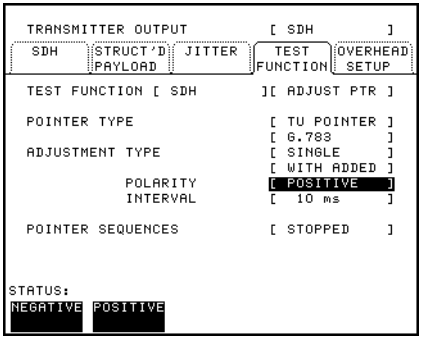
The CLOCK SYNC selection determines the synchronization source for the TRANSMIT clock. If **EXTERNAL MTS** is selected a 2 Mb/s reference must be connected to the 2M REF IN port. The format can be CLOCK or DATA.



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

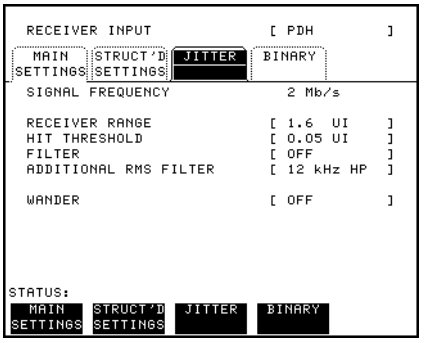
Pointer adjustments are made every 10 ms with an extra ADDED adjustment as defined in ITU-T standard G.783.

Pointer sequences are started by selecting **STARTED**.

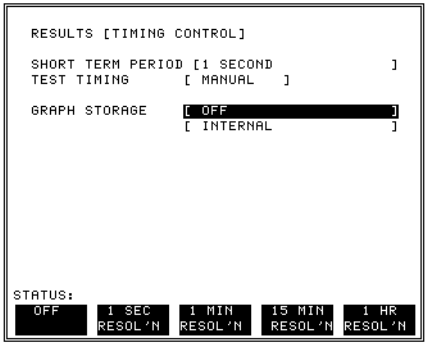


3. Set up the **RECEIVE** **JITTER** display as shown opposite.

If Jitter filtering is required select from the softkey menu.



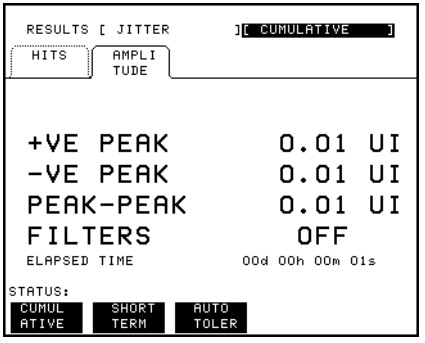
4. Set up the **RESULTS** display as shown opposite.



Start the Desynchronizer Stress Test

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

Jitter Hits can be viewed without affecting the measurement.



SDH Jitter Tolerance

Application

It is important that network equipment can operate correctly in the presence of certain amounts of jitter. ITU-T has specified tolerance masks of jitter amplitude against jitter frequency which all network equipment must be able to withstand and provide error free operation.

Jitter is applied at the ITU-T specified jitter frequencies and the amplitude increased until errors occur or the mask limit is reached. These amplitude levels are plotted on the mask to determine the network elements jitter tolerance.

Default (Known State) Settings

It can be advisable to set the HP 37717B to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. The default settings are set by selecting **OTHER** **STORED SETTINGS** STORED SETTING NUMBER 0 and pressing **RECALL**.

Test Setup Procedure (Jitter Tolerance Test)

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

- A3K [A3Q] or 140 [141] - Jitter Generation
- UKJ or UKK - PDH Module
- A3R - SDH Module
- UH1 or 130 or 131 - Optical Interface Module

This setup procedure is based on STM-4 optical test signal with jitter terminated in 75 Ω. The HP 37717B Automatic jitter tolerance feature is used and the results plotted on the ITU-T mask.

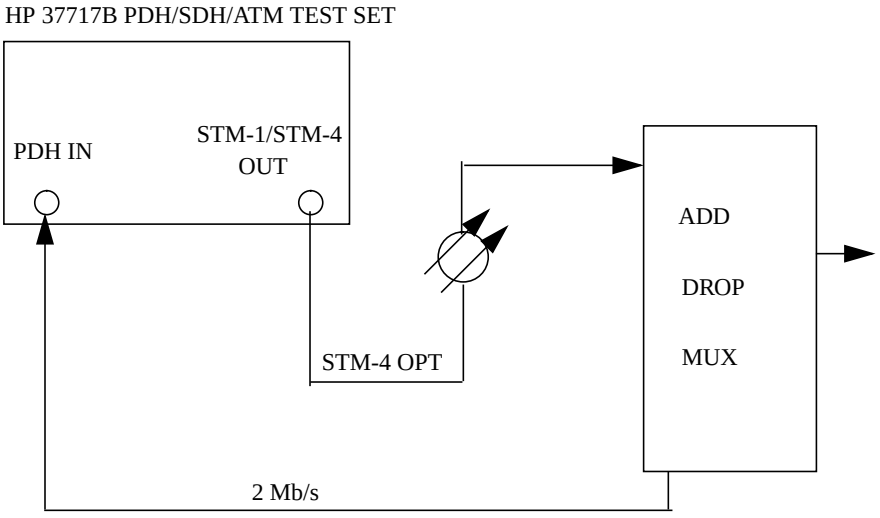
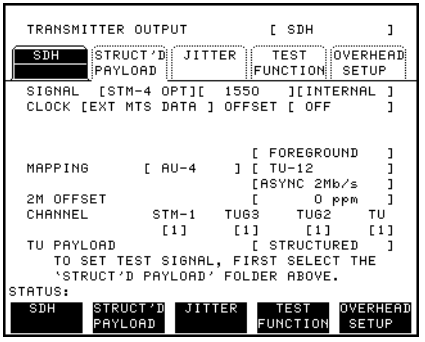


Figure 2-5 **SDH Jitter Tolerance Test**

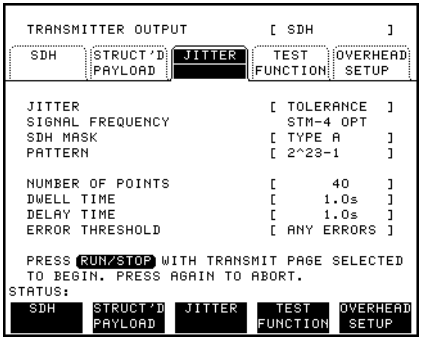
1. Connect the HP 37717B to the network equipment and set up the **TRANSMIT** **SDH** display as shown opposite.

CLOCK SYNC, STM-1 UNDER TEST and PAYLOAD selections can be modified according to the users requirements.

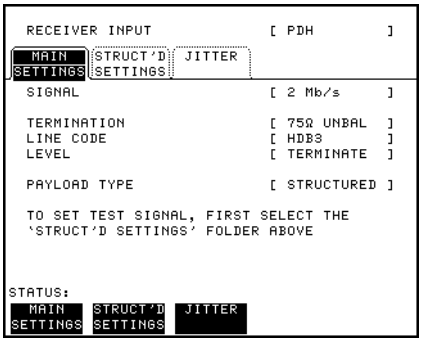


Select **TRANSMIT** **JITTER** and set up the display as shown opposite.

This Auto Tolerance example will take approximately nine minutes to complete.



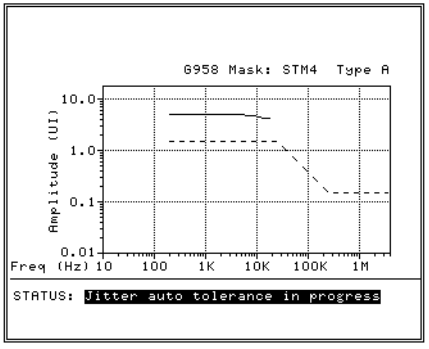
Set up the RECEIVE MAIN SETTINGS display as shown opposite.



Run the Test (SDH Jitter Tolerance)

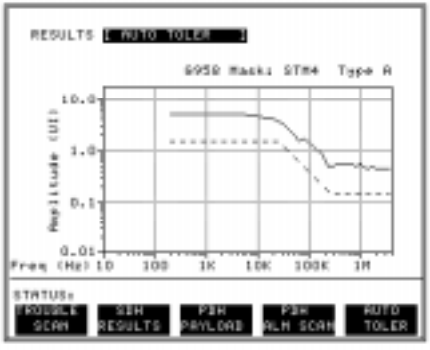
Press RUN/STOP to start the measurement.

The measurement takes approximately nine minutes to complete and its progress can be monitored on the TRANSMIT display.



At the end of the test the results can be viewed on the RESULTS display.

The results on the TRANSMIT display are cleared when TRANSMIT is pressed but the RESULTS display remains available until the next Jitter Tolerance measurement is made.



To Log the Auto Tolerance plot and the results which make up the plot: Select the required logging device on the OTHER LOGGING display. Select LOGGING [ON]. Select RESULTS JITTER AUTO TOLER and press PRINT NOW.

In Service SDH Jitter

Application

It can be useful at the installation or field trial stage of SDH rings or linear networks to verify the networks tolerance to jitter under simulated Live Traffic conditions and monitor its effects on the network equipment i.e Alarms particularly OOF and LOF.

Default (Known State) Settings

It can be advisable to set the HP 37717B to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. The default settings are set by selecting **OTHER** **STORED SETTINGS** STORED SETTING NUMBER 0 and pressing **RECALL**.

Test Setup Procedure (In Service SDH Jitter)

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

- A3K [A3Q] or 140 [141] - Jitter Generation
- UKJ or UKK - PDH Module
- A3R - SDH Module
- UH1 or 130 or 131 - Optical Interface Module

In this set up the received SDH signal has Jitter added and is retransmitted via SDH THRU mode. The Swept Mask feature is used and the HP 37717B "sweeps" through the jitter mask, adjusting the jitter amplitude according to the jitter frequency. The network equipment alarms are monitored particularly OOF and LOF.

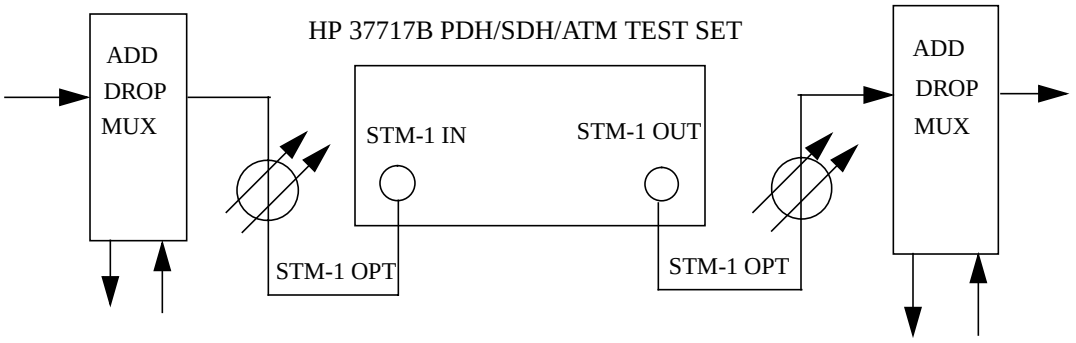
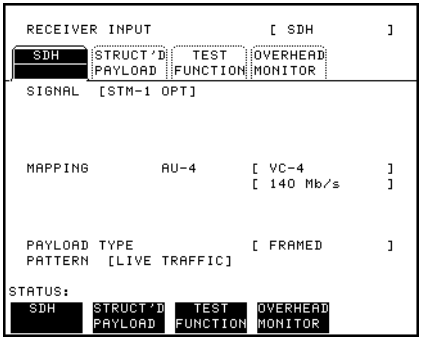


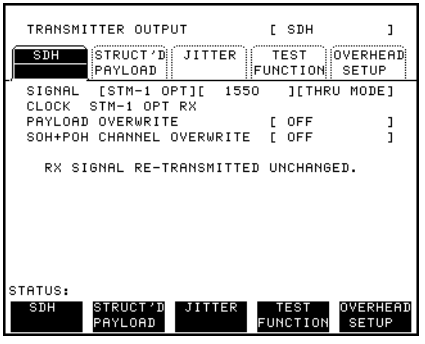
Figure 2-6 **In Service SDH Jitter Test**

Select **RECEIVE** **SDH** and set up the display as shown opposite.

PAYLOAD and PAYLOAD TYPE selections can be modified according to the users requirements.



Select **TRANSMIT** **SDH** and set up the display as shown opposite.

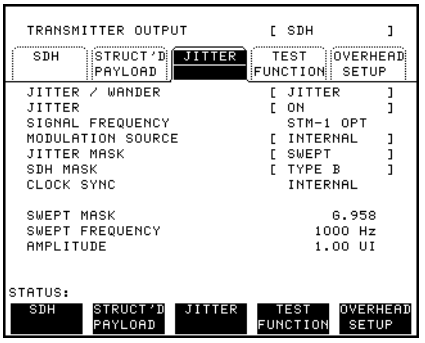


Run the Test (In Service SDH Jitter)

Select **TRANSMIT** **JITTER** and set up the display as shown opposite.

When JITTER MASK [SWEPT] is selected the HP 37717B will "sweep" through the jitter mask adjusting amplitude according to the Jitter frequency.

Monitor the network alarms, particularly Out Of Frame and Loss Of Frame.



Tributary Mapping Jitter

Application

Tributary Mapping jitter occurs during the mapping and demapping process inside SDH network equipment as the PDH signal is mapped into its Virtual Container.

The method used for mapping an asynchronous 2 Mb/s into a VC-12 provides a number of opportunities to justify the 2 Mb/s data. The justification process allows for variations between the 2.048 Mb/s clock and the clock timing the synchronous network. This process however introduces jitter into the tributary signal when it is demapped from the VC-12.

Tributary Mapping jitter has four basic characteristics:

1 It is low in amplitude (ITU-T G.783 specifications listed below).

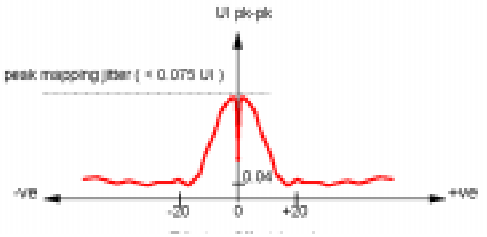
Table 1-1 **ITU-T G.783 Mapping Jitter Specifications**

Payload	Offset (ppm)	Measurement Bandwidth	Maximum Jitter (UI pk-pk)
2 Mb/s	± 50	18 - 100 kHz	0.08
34 Mb/s	± 20	10 - 800 kHz	0.08
139 Mb/s	± 15	10 - 3500 kHz	0.08

2 It is relatively high frequency (and can therefore be suppressed by the SDH NE's de-synchronizer).

3 It varies in amplitude as the PDH tributary frequency is offset relative to the VC-n. This is due to changes in the mappings "bit-stuff justification" ratio to compensate for such offsets.

4 The peak mapping jitter occurs at a small offset from 0 ppm (PDH tributary relative to VC-n).



Default (Known State) Settings

It can be advisable to set the HP 37717B to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. The default settings are set by selecting **OTHER** **STORED SETTINGS** STORED SETTING NUMBER 0 and pressing **RECALL**.

Test Setup Procedure (Tributary Mapping Jitter)

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

- UHN or A3L or A3V or A3N - Jitter Receiver
- UKJ or UKK - PDH Module
- A3R - SDH Module
- UH1 or 130 or 131 - Optical Interface Module

In this set up Frequency Offset is added to a TU12 tributary within an STM-4 SDH signal. A Jitter measurement is performed on the received TU12 tributary.

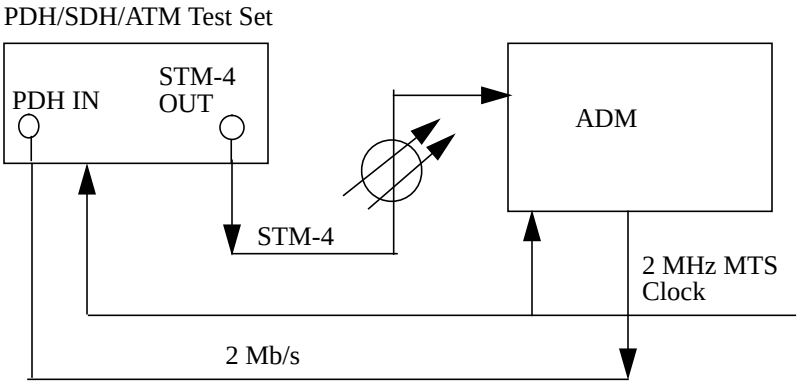
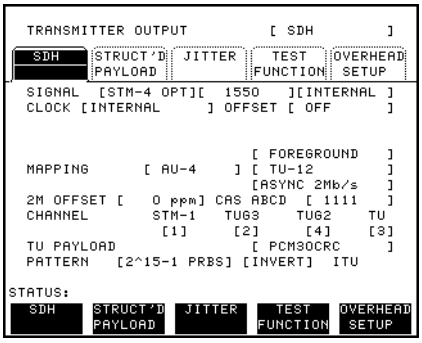


Figure 2-7 **Tributary Mapping Jitter Test**

Select **TRANSMIT** **SDH** and set up the display as shown opposite.

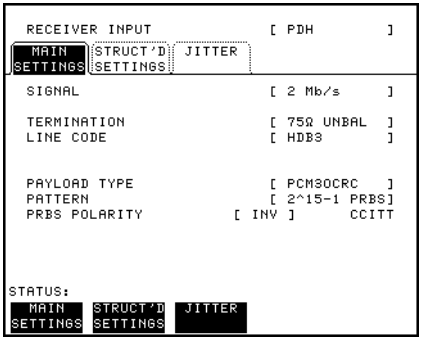
The 2M OFFSET can be varied during the test.



Select **RECEIVE** **PDH** and set up the display as shown opposite.

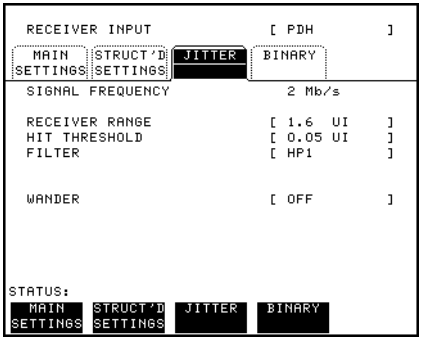
TERMINATION and LINE CODE selections should match that of the network equipment.

STM-1 UNDER TEST, TU PAYLOAD, PATTERN, PRBS POLARITY and PATTERN IN OTHER TU'S selections can be modified according to the users requirements.



Select **RECEIVE** **JITTER** and set up the display as shown opposite.

Any filter can be selected from the softkey menu.



Run the Test (Tributary Mapping Jitter)

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

The Jitter Amplitude and Jitter Hits results can be viewed on the **RESULTS** display.

Selective Jitter Transfer Measurement

The problem with many SDH jitter analyzers is the fact that their receivers are wideband receivers and are not able to measure within a sufficiently narrow bandwidth. The reason is that these instruments are designed to measure peak to peak jitter in the transmission network for troubleshooting purposes and are not designed to make selective jitter measurements. The jitter analyzer just measures the peak-peak value of the incoming jitter over a wide frequency range. The problem occurs when testing the jitter transfer of real network equipment i.e. SDH regenerators.
The regenerator produces intrinsic jitter and this disturbs the measurement as the jitter receiver cannot determine whether it is measuring the jitter produced by the jitter analyzers transmitter or the intrinsic jitter which is generated, at a different frequency, by the regenerator. The problem is greatest at the higher jitter modulating frequencies when the amount of jitter generated, as per ITU-T G.958, is much smaller. The measurement is corrupted by the higher amplitude intrinsic jitter generated by the regenerator at lower frequencies and incorrectly measured by the analyzer.
The accurate method for measuring jitter transfer requires a selective measurement. The HP 37717B uses narrow band filtering in the jitter receiver which allows selection and measurement of the relevant jitter components. This provides the capability to measure jitter selectively and provide accurate and repeatable results. Jitter Transfer is performed to ITU-T G.823/G.958 with Graphical and Tabular results. The input jitter can conform to ITU-T G.823/G.958 or be user defined.

Default (Known State) Settings

It can be advisable to set the HP 37717B to a known state prior to setting up to make a measurement. This clears all previous settings and provides a clearly defined instrument state. The default settings are set by selecting OTHER STORED SETTINGS STORED SETTING NUMBER 0 and pressing RECALL.

Test Setup Procedure (Jitter Transfer Test)

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

- A3K [A3Q] or 140 [141] - Jitter Generation
- A3L or A3V or A3N - Jitter Measurement
- A3R - SDH Module
- UH1 or 130 or 131 - Optical Interface

Jitter Testing

This setup procedure is based on 155.52 Mb/s (STM-1), 140 Mb/s payload, PRBS test data with jitter. The jitter generation and jitter measurement are provided by the HP 37717B. The HP 37717B is calibrated in a back to back mode, to remove any inaccuracies before the automatic Jitter Transfer measurement is made.

NOTE

To achieve the required accuracy:
1.The HP 37717B must be connected back to back in order to perform a calibration cycle before making a Jitter Transfer measurement.
2. The HP 37717B must have been switched on for 1 hour before starting a calibration cycle.
3. The climatic conditions must remain stable from switch-on to end of measurement.
4. The Jitter Transfer measurement must be started within 10 minutes of completion of the Calibration.
5. If maximum Delay time, maximum Dwell time and maximum number of Points is selected the accuracy specification cannot be guaranteed as the time from start of calibration to end of measurement (test period) will be approximately two hours. It is recommended that the maximum test period does not exceed 90 minutes. Test Period = Delay Time + Dwell Time + 5 Seconds X Number of Points X 2 (Calibration + Measurement).

Calibrate the HP 37717B

Before making Automatic Jitter transfer measurements the HP 37717B must be calibrated to remove any uncertainties. The calibration is carried out by connecting the HP 37717B back to back.

For this test connect STM-1/STM-4 OUT of the Optical module to STM-1/STM-4 IN of the Jitter Measurement module Option A3V [A3W] or A3N [A3P].

NOTE

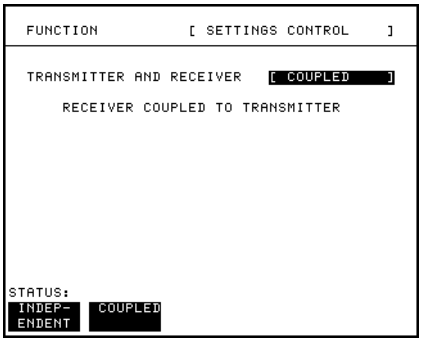
If **1550 nm** STM-1/4 SDH Jitter Transfer is required a 10 dB attennuator must be connected between STM-1/4 OUT of the Optical module and STM-1/STM-4 IN of the Jitter Measurement module Option A3V [A3W] or A3N [A3P].

If PDH Jitter Transfer is required connect PDH IN to PDH OUT.

If STM-1 Electrical Jitter Transfer is required connect STM-1E OUT of the SDH Module to STM-1E IN of the Jitter Measurement module Option A3L [A3M] or A3V [A3W] or A3N [A3P].

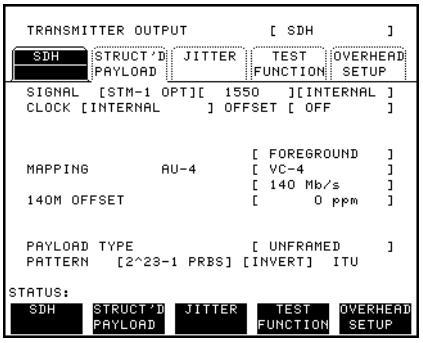
1. Set up the OTHER SETTINGS CONTROL display as shown opposite.

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



2. Select **TRANSMIT** **SDH** **SDH** and set up the display as shown opposite.

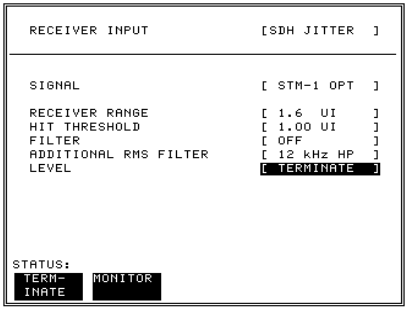
If **1550 nm** STM-1/4 SDH Jitter Transfer is required a 10 dB attennuator must be connected between STM-1/4 OUT of the Optical module and STM-1/STM-4 IN of the Jitter Measurement module Option A3V [A3W] or A3N [A3P].



34. Setup the **RECEIVE** **SDH JITTER** display as shown opposite.

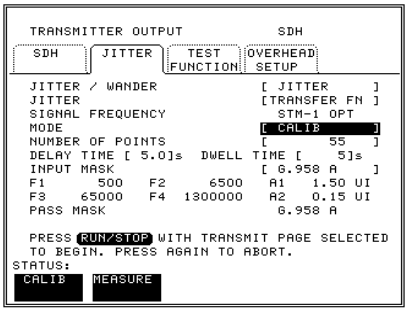
For CALIBRATION, HP 37717B connected back to back, select LEVEL [TERMINATE].

If the measurement is to be made at a network equipment monitor point select MONITOR after the CALIBRATION is completed before making the jitter transfer measurement.



The RECEIVER RANGE, HIT THRESHOLD, FILTER and ADDITIONAL RMS FILTER selections not valid for Jitter Transfer measurements.

5. Select MODE [CALIB] on the **TRANSMIT** **JITTER** display.



Select the NUMBER OF POINTS at which jitter transfer measurements are to be made.

Select the DELAY TIME in the range 5.0 to 30.0 seconds. This determines the time the jitter is generated at each jitter frequency.

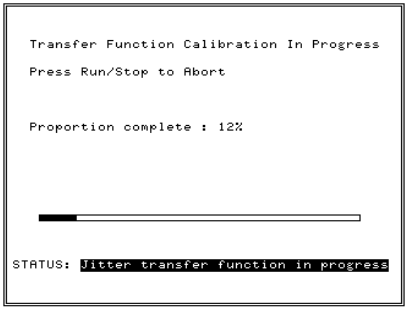
DWELL TIME is selectable in the range 5.0 seconds to 30.0 seconds and determines the time delay between the jitter frequency/amplitude being applied and the test being performed. The greater the DWELL time the more accutate the measurement due to increased averaging. This is of particular benifit when measuring in a critical area with only a few POINTS selected.

Select the INPUT MASK as G.958A or G.958B to correspond to the type of regenerator being tested. The PASS MASK will adopt the same selection.

6. Press **RUN/STOP** to start the calibration.

The Jitter Transfer display is replaced by an information display for the duration of the Calibration.

A bar graph showing the progress of the calibration will appear on the display.



When the Calibration is complete the display will revert to the **TRANSMIT** **JITTER** display.

The Jitter Transfer measurement must be started within 10 minutes of the completion of Calibration.

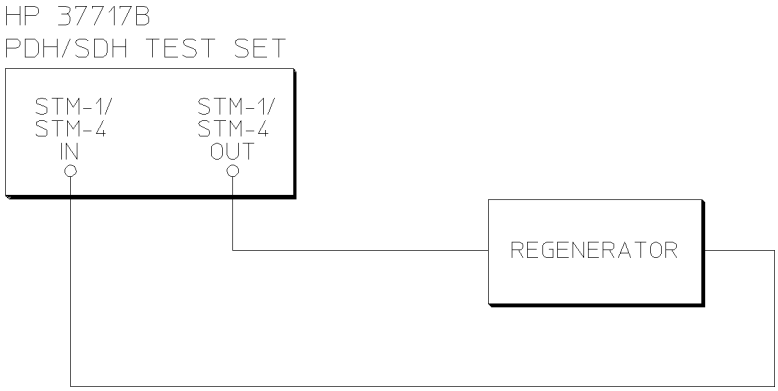


Figure 2-8 **Jitter Transfer Test**

Automatic Jitter Transfer Measurement

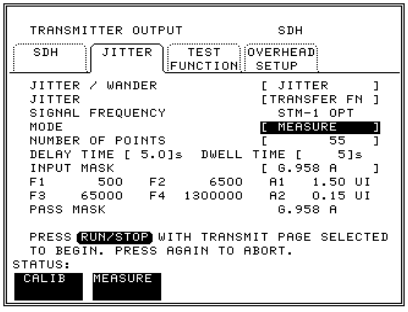
1. Remove the back to back connection and connect the HP 37717B to the network equipment as shown above.

NOTE

If the measurement is to be made at a network equipment monitor point select LEVEL [MONITOR] on the RECEIVE SDH JITTER display before making the jitter transfer measurement.

2. Select TRANSMIT SDH JITTER and press RUN/STOP to start the measurement.

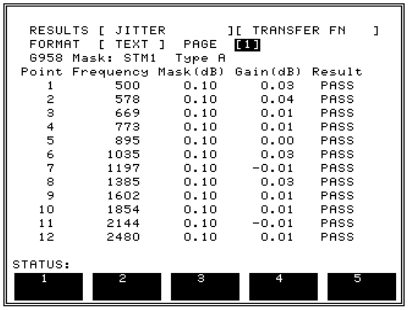
The Jitter Transfer results are plotted in Graph form and the graph's progress can be monitored on the TRANSMIT display.



NOTE

Changing the HP 37717B configuration or any Jitter Transfer parameter will invalidate the CALIBRATION. If this occurs the CALIBRATION must be repeated before a Jitter Transfer measurement is made.

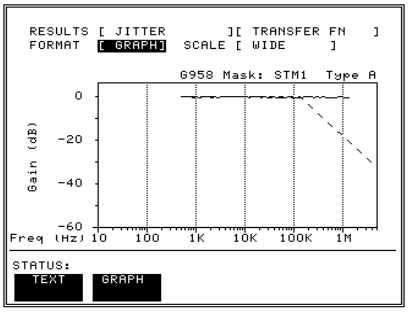
3. The Jitter Transfer results can also be viewed in TEXT form on the **RESULTS** display.



The following information is displayed for each result:
Point Number
Jitter Frequency
Mask value
Result
Pass /Fail Indication.

Results 13 to 55 can be viewed on pages 2 through 5.

4. At the end of the measurement the Graph results and the ITU-T pass mask can be viewed on the **RESULTS** **JITTER** display.



SCALE [WIDE] provides a vertical axis range of +5 dB to -60 dB and is recommended for viewing the high frequency portion of the graph as this allows a clearer view of the difference between the actual result and the ITU-T pass mask.

SCALE [NARROW] provides a vertical axis range of +3 dB to -3 dB and is recommended for viewing the low frequency portion of the graph as this allows a clearer view of the difference between the actual result and the ITU-T pass mask.

The graph on the **TRANSMIT** display is cleared when **TRANSMIT** is pressed but the **RESULTS** display remains available.

To Log the jitter transfer plot and the results which make up the Jitter transfer plot:

Select the required logging device on the **OTHER** **LOGGING** display.
Select LOGGING [ON].
Select **RESULTS** **JITTER** **TRANSFER FUNCTION** and press **PRINT NOW**.

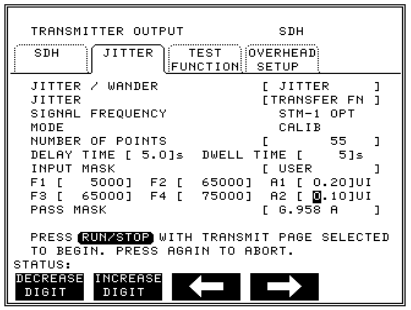
If the jitter transfer measurement is close to or exceeding the ITU-T pass mask in a particular area it may be desirable to Zoom in on the area of interest.

This is possible by viewing the TEXT results on the **RESULTS** **JITTER** **TRANS FN** display or by using the USER mask capability of the HP 37717B.

3. To use the USER mask capability select TRANSMIT SDH JITTER and set up the display as shown opposite.

The user can enter F1, F2, F3, and F4 jitter frequency points and A1 and A2 jitter amplitude values.

In this example the jitter transfer will be measured at 55 points between 50 kHz and 75 kHz, at amplitudes of 0.20 UI, 50 kHz to 65 kHz and 0.10 UI, 65 kHz to 75 kHz.

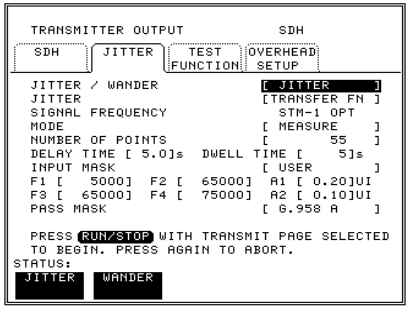


NOTE

Before the measurement can be made the HP 37717B must be connected back to back and a calibration performed. Press RUN/STOP to start the Calibration.

1. Connect the HP 37717B to the network equipment

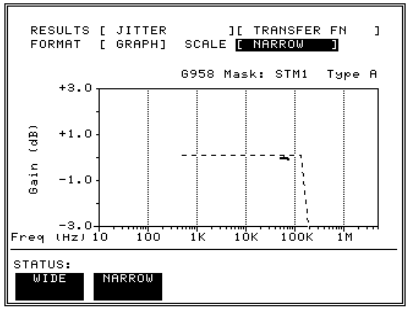
2. Select TRANSMIT SDH JITTER and press RUN/STOP.



The TEXT and GRAPH results can be viewed on the RESULTS JITTER display.

SCALE [NARROW] provides a vertical axis range of +3 dB to -3 dB and is recommended for viewing the low frequency portion of the graph as this allows a clearer view of the difference between the actual result and the ITU-T pass mask.

The TEXT results can also be viewed.



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Learning Products Map

Other learning products which apply to this instrument are listed below:

Mainframe Operating Manual 37717-90271

PDH Operating Manual 37717-90212

SDH Operating Manual 37717-90273

ATM Operating Manual 37717-90215

Calibration Manual 37717-90268

Remote Control Manual 37717-90269

About This Edition

This is the firstr edition of the 37717- 90275 manual. It documents the product as of **07/97**. Edition dates are as follows:

1st Edition **07/97**

In This Book

This book contains operating information relating to Jitter operation and measurement using the HP 37717B.

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