Jitter Operating
Manual

HP 37717C
Communications
Performance Analyzer

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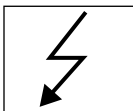
WARNING

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

Double-click here to define book introduction head

The Jitter Operating Manual explains the following :

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

"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 Communications Performance Analyzer irrespective of the option configuration.

"The HP 37717C PDH /DSn Operating Manual" describes the selection of PDH / DSn features and how to peform PDH / DSn tests with the HP 37717C Communications Performance Analyzer.

"The HP 37717C SDH / SONET Operating Manual "describes the selection of SDH / SONET features and how to peform SDH / SONET tests with the HP 37717C Communications Performance Analyzer.

"The HP 37717C ATM Operating Manual"describes the selection of ATM features and how to peform ATM tests with the HP 37717C Communications Performance Analyzer.

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Jitter Modules

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

HP 37717C 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 HiIT 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.

Option UHN [US9]

Option A1M [A1Q] (PDH & STM-1 Electrical Jitter Measurements)

Option A1M 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.

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 A1M module.

The following **Jitter measurements** are available at all PDH rates and STM-1 Electrical rate:

Jitter HiIT 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

Option A1M [A1Q]

Option A1N [A1R] (PDH & STM-1 Optical & Electrical Jitter Measurements)

Option A1N provides Jitter measurement at STM-1 Optical rate and 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) or the STM-1 Electrical signal to the STM-1E IN of the A1N module or the STM-1 Optical signal to STM-1 IN of the A1N module.

The following **Jitter measurements** are available at all PDH rates and STM-1 Optical rate:

Jitter HiIT 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.

Option A1N [A1R]

Option A1P [A1S] (PDH, STM-1 Electrical &Optical &STM-4 Optical Jitter Measurements)

Option A1P provides Jitter measurement at STM-1 Optical rate, STM-4 Optical rate and 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) or the STM-1 Electrical signal to the STM-1E IN of the A1P module or the STM-1/STM-4 Optical signal to STM-1/STM-4 IN of the A1P module.

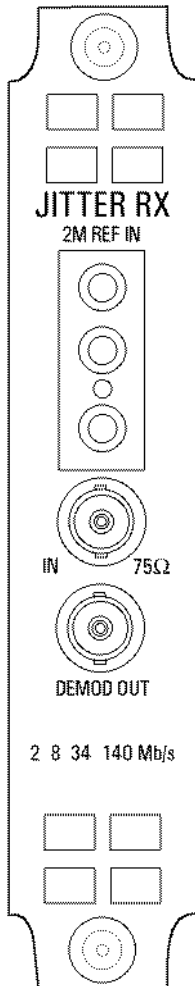The following **Jitter measurement**s are available at all PDH rates, STM-1 Optical rate and STM-4 Optical rate:

Jitter HiIT 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.

Option A1P [A1S]

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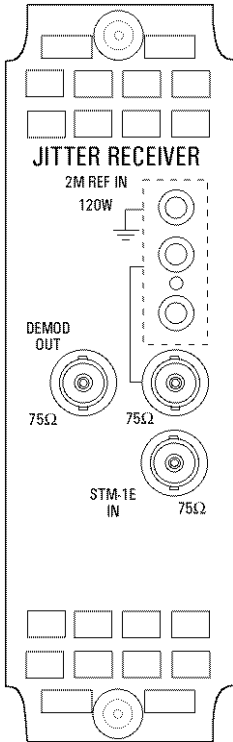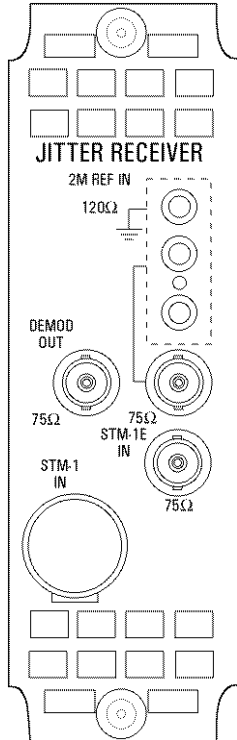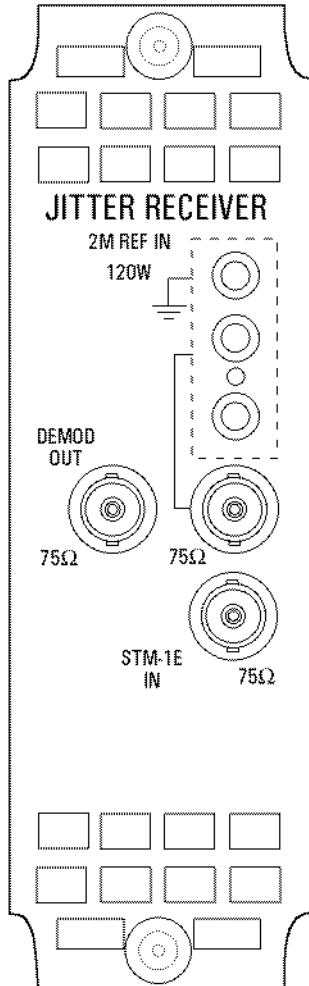
Jitter measurements are available at all PDH rates and STM-1 Electrical rate:
Jitter Hit Count
Jitter Hit Seconds
Jitter Hit Free Seconds
Peak Jitter (Positive and Negative)
Peak to Peak Jitter
Peak rms Jitter

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.

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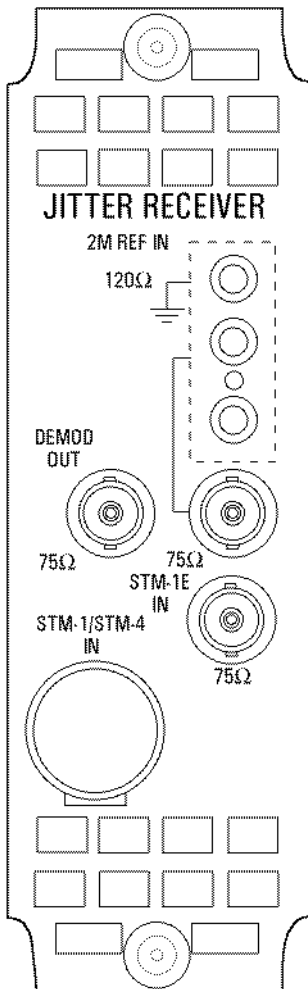
Jitter measurements are available at all PDH rates and STM-1:
Jitter Hit Count
Jitter Hit Seconds
Jitter Hit Free Seconds
Peak Jitter (Positive and Negative)
Peak to Peak Jitter
Peak rms Jitter

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.

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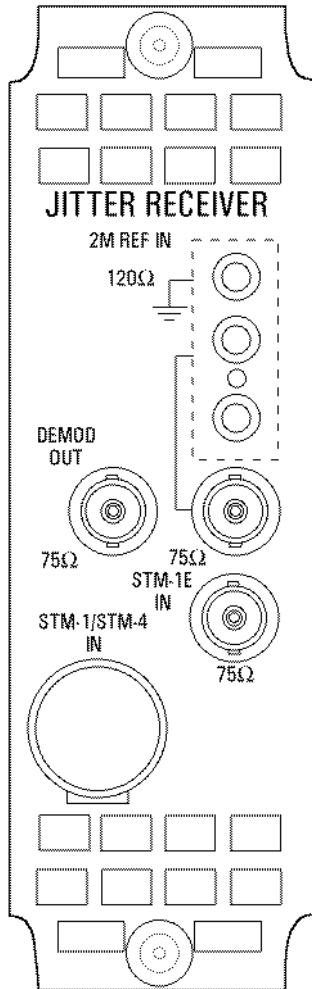
Jitter measurements are available at all PDH rates, STM-1 Optical and electrical rate and STM-4 Optical rate:
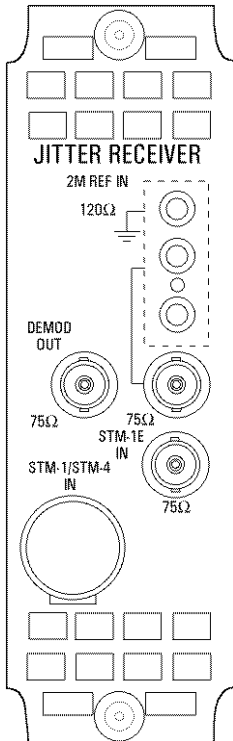Jitter Hit Count
Jitter Hit Seconds
Jitter Hit Free Seconds
Peak Jitter (Positive and Negative)
Peak to Peak Jitter
Peak rms Jitter

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.

Option A3N [A3P]

Option UHK Jitter Generation

Option UHK 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 as follows:

Spot frequency Jitter within the ITU-T mask.

 Swept frequency Jitter within the ITU-T mask.

 Automatic Jitter Tolerance testing of PDH and SDH networks covering high and low Q systems using fixed jitter tolerance masks. Peak to Peak Jitter and Modulating frequencies as per ITU-T G.823 (PDH) and ITU-T G.958 (SDH).

The Automatic Jitter Tolerance results are plotted in graphical form relative to the ITU-T mask.

The User can control:

 the number of frequency points at which Jitter is generated, up to 55

the Dwell time - time taken at each frequency point

the Delay time - time delay at each frequency point before jitter is generated

the Bit error threshold - determines the threshold for the Jitter Tolerance PASS/FAIL decision.

High or Low Q Factor selection (2 Mb/s and 8 Mb/s only)

the type of mask A or B (SDH only)

the Test Pattern
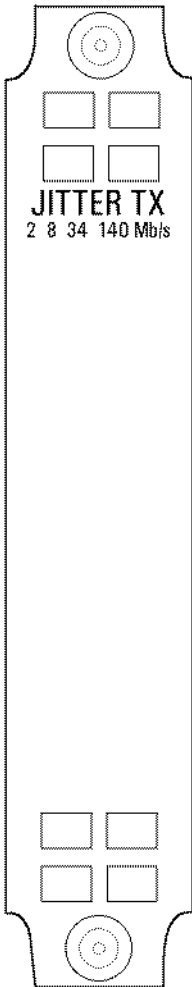
Option UHK

Option A3K [A3Q] Jitter & Wander Generation
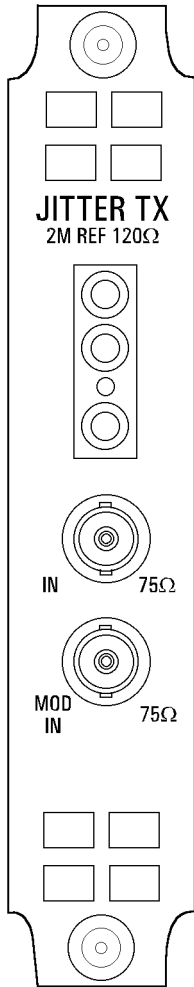
Option A3K provides Jitter Generation at all ETSI rates, 2 Mb/s, 8 Mb/s, 34 Mb/s, 140 Mb/s, STM-1 and STM-4 depending on which PDH and SDH options are fitted.

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.

Option A3K [A3Q]

Jitter Operating Features

Various Jitter features are available with Options UHK, UHN, A1M, A1N and A1P.

Jitter Generation Option UHK

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.

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

```
TRANSMITTER OUTPUT          [ PDH        ]
  MAIN   STRUCT'D  JITTER    TEST
SETTINGS SETTINGS           FUNCTION
 JITTER                     [ ON         ]
 SIGNAL FREQUENCY             140 Mb/s
 JITTER MASK                [ OFF        ]

 MODULATION FREQUENCY       [   1000 Hz ]
 RANGE                      [    1.0 UI ]
 AMPLITUDE                  [    1.00 UI ]




STATUS:
    OFF      SWEPT      SPOT                 MULTIPLE
                                             WINDOW
```
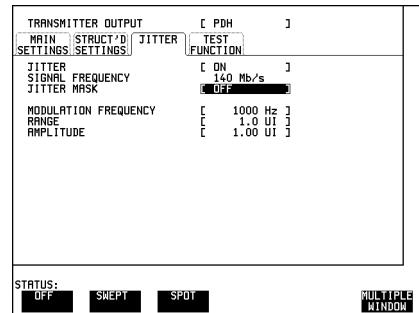
JITTER MASK [OFF] allows the user to set the jitter MODULATION FREQUENCY, jitter RANGE and jitter AMPLITUDE ..

When JITTER MASK [SWEPT] is selected the HP 37717C will "sweep" through the jitter mask adjusting amplitude according to the Jitter frequencyAt 2, 8, 34 and 140 Mb/s the masks are as defined in ITU-T G.823. At STM-1 and STM-4 the masks are as defined in ITU-T G.958.

```
TRANSMITTER OUTPUT          [ PDH        ]
  MAIN   STRUCT'D  JITTER    TEST
SETTINGS SETTINGS           FUNCTION
 JITTER                     [ ON         ]
 SIGNAL FREQUENCY             140 Mb/s
 JITTER MASK                [ SWEPT      ]

 SWEPT FREQUENCY              1000 Hz
 AMPLITUDE                    1.00 UI




STATUS:
    OFF      SWEPT      SPOT                 MULTIPLE
                                             WINDOW
```

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 contolled
by the HP 37717C according to the
frequency selected.

```
TRANSMITTER OUTPUT        [ PDH      ]
  MAIN   STRUCT'D  JITTER    TEST
SETTINGS SETTINGS        FUNCTION
JITTER                    [ ON       ]
SIGNAL FREQUENCY            140 Mb/s
JITTER MASK               [ SPOT       ]

SPOT FREQUENCY            [   1000 Hz ]
AMPLITUDE                     1.00 UI




STATUS:
   OFF      SWEPT      SPOT                MULTIPLE
                                          WINDOW
```

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.

```
TRANSMITTER OUTPUT        [ PDH      ]
  MAIN   STRUCT'D  JITTER    TEST
SETTINGS SETTINGS        FUNCTION
JITTER                    [ ON       ]
SIGNAL FREQUENCY            8 Mb/s
JITTER MASK               [ SPOT     ]
Q FACTOR                  [ HIGH Q     ]
SPOT FREQUENCY            [   1000 Hz ]
AMPLITUDE                     1.00 UI




STATUS:
  HIGH Q    LOW Q                         MULTIPLE
                                          WINDOW
```

Jitter Tolerance Option UHK

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 ITU-T
mask limit is reached. The jitter amplitude level below FAIL or the mask limit is the
Jitter Tolerance for that frequency.

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 (10 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 being reached and jitter being generated. This allows the network equipment to settle as jitter frequency is changed (0 to 99.9 seconds).

```
TRANSMITTER OUTPUT        [ PDH      ]
  MAIN   STRUCT'D  JITTER   TEST
SETTINGS SETTINGS          FUNCTION
JITTER                    [ TOLERANCE ]
SIGNAL FREQUENCY            140 Mb/s
PATTERN                   [ 2^15-1    ]
NUMBER OF POINTS          [      55   ]
DWELL TIME                [    20.0s  ]
DELAY TIME                [     5.0s  ]
ERROR THRESHOLD           [       0   ]
          PRESS RUN/STOP TO BEGIN.
          PRESS AGAIN TO ABORT

STATUS:
  OFF        ON       AUTO                MULTIPLE
                    TOLERNCE              WINDOW
```

ERROR THRESHOLD (0 to 1,000,000) If set to 0 any BIP or BIT error will signify a FAIL. If set between 1 - 1,000,0000 determines the BIT error threshold for the Jitter Tolerance PASS/FAIL decision.

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.

```
TRANSMITTER OUTPUT        [ SDH      ]
  SDH    STRUCT'D  JITTER   TEST   OVERHEAD
         PAYLOAD           FUNCTION SETUP
JITTER                    [ TOLERANCE ]
SIGNAL FREQUENCY            STM-1
SDH MASK                  [ TYPE A    ]
PATTERN                   [ 2^15-1    ]
NUMBER OF POINTS          [      55   ]
DWELL TIME                [    20.0s  ]
DELAY TIME                [     5.0s  ]
ERROR THRESHOLD           [       0   ]
          PRESS RUN/STOP TO BEGIN.
          PRESS AGAIN TO ABORT

STATUS:
 TYPE A    TYPE B                          MULTIPLE
                                           WINDOW
```
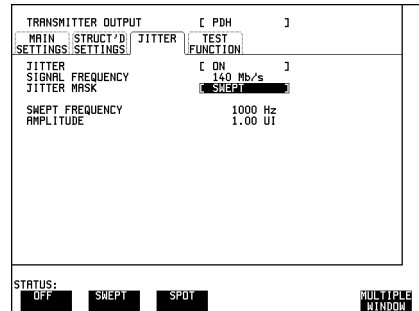
Jitter Generation Option A3K

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 made on the PDH or SDH **TRANSMIT** MAIN SETTINGS display as required.

```
TRANSMITTER OUTPUT        PDH
  MAIN  STRUCT'D JITTER  TEST
SETTINGS SETTINGS        FUNCTION
JITTER / WANDER          JITTER
JITTER                 [ ON        ]
SIGNAL FREQUENCY         34 Mb/s
MODULATION SOURCE      [ INTERNAL  ]
JITTER MASK            [ OFF       ]

CLOCK SYNC               INTERNAL

RANGE                  [    1.0 UI ]
MODULATION FREQUENCY   [   1000 Hz ]
AMPLITUDE              [   1.00 UI ]



STATUS:
   OFF       ON      AUTO                MULTIPLE
                   TOLERNCE              WINDOW
```

The jitter modulation can be obtained internally from the HP 37717C 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 37717C.

```
TRANSMITTER OUTPUT        PDH
  MAIN  STRUCT'D JITTER  TEST
SETTINGS SETTINGS        FUNCTION
JITTER / WANDER          JITTER
JITTER                 [ ON        ]
SIGNAL FREQUENCY         34 Mb/s
MODULATION SOURCE      [ EXTERNAL  ]
RANGE                  [   2 UI    ]

CLOCK SYNC               INTERNAL




STATUS:
  2 UI     10 UI                         MULTIPLE
                                         WINDOW
```

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.

```
TRANSMITTER OUTPUT        PDH
  MAIN  STRUCT'D JITTER  TEST
SETTINGS SETTINGS        FUNCTION
JITTER / WANDER          JITTER
JITTER                 [ ON        ]
SIGNAL FREQUENCY         34 Mb/s
MODULATION SOURCE      [ INTERNAL  ]
JITTER MASK            [ OFF       ]

CLOCK SYNC               INTERNAL

RANGE                  [    1.0 UI ]
MODULATION FREQUENCY   [   1000 Hz ]
AMPLITUDE              [   1.00 UI ]



STATUS:
  1.0 UI   10 UI                         MULTIPLE
                                         WINDOW
```

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

```
TRANSMITTER OUTPUT          PDH
  MAIN   STRUCT'D  JITTER    TEST
SETTINGS SETTINGS           FUNCTION
JITTER / WANDER             JITTER
JITTER                    [ ON        ]
SIGNAL FREQUENCY            34 Mb/s
MODULATION SOURCE         [ INTERNAL  ]
JITTER MASK               [ SWEPT     ]

CLOCK SYNC                  INTERNAL

SWEPT MASK                     G.823
SWEPT FREQUENCY              1000 Hz
AMPLITUDE                    1.00 UI




STATUS:
  OFF      SWEPT     SPOT                  MULTIPLE
                                          WINDOW
```

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 37717C according to the
frequency selected.

```
TRANSMITTER OUTPUT          PDH
  MAIN   STRUCT'D  JITTER    TEST
SETTINGS SETTINGS           FUNCTION
JITTER / WANDER             JITTER
JITTER                    [ ON        ]
SIGNAL FREQUENCY            34 Mb/s
MODULATION SOURCE         [ INTERNAL  ]
JITTER MASK               [ SPOT      ]

CLOCK SYNC                  INTERNAL


SPOT FREQUENCY            [   2222 Hz ]
AMPLITUDE                    1.00 UI




STATUS:
DECREASE INCREASE               END    MULTIPLE
 DIGIT    DIGIT                 EDIT   WINDOW
```

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

```
TRANSMITTER OUTPUT          PDH
  MAIN   STRUCT'D  JITTER    TEST
SETTINGS SETTINGS           FUNCTION
JITTER / WANDER             JITTER
JITTER                    [ ON        ]
SIGNAL FREQUENCY            8 Mb/s
MODULATION SOURCE         [ INTERNAL  ]
JITTER MASK               [ SPOT      ]
Q FACTOR                  [ HIGH Q    ]
CLOCK SYNC                  INTERNAL

SPOT FREQUENCY            [   1000 Hz ]
AMPLITUDE                    1.00 UI




STATUS:
 HIGH Q    LOW Q                        MULTIPLE
                                        WINDOW
```

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 Option A3K (A3Q)

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).

```
TRANSMITTER OUTPUT          [ SDH       ]
┌─────┬─────────┬───────┬────────┬────────┐
│ SDH │STRUCT'D │JITTER │ TEST   │OVERHEAD│
│     │ PAYLOAD │       │FUNCTION│ SETUP  │
└─────┴─────────┴───────┴────────┴────────┘
JITTER / WANDER            [ JITTER    ]
JITTER                     [ TOLERANCE ]
SIGNAL FREQUENCY              STM-1
SDH MASK                   [ TYPE A    ]
PATTERN                    [ 2^23-1    ]

NUMBER OF POINTS           [     55    ]
DWELL TIME                 [    1.0s   ]
DELAY TIME                 [    1.0s   ]
ERROR THRESHOLD            [     1     ]
                BER >=
        PRESS RUN/STOP TO BEGIN.
        PRESS AGAIN TO ABORT


STATUS:
┌────────┬────────┬────┬────┬────┬────────┐
│DECREASE│INCREASE│ ←  │ →  │END │MULTIPLE│
│ DIGIT  │ DIGIT  │    │    │EDIT│ WINDOW │
└────────┴────────┴────┴────┴────┴────────┘
```

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.

```
TRANSMITTER OUTPUT        [ SDH      ]
  SDH   STRUCT'D  JITTER   TEST   OVERHEAD
        PAYLOAD            FUNCTION SETUP
JITTER / WANDER           [ JITTER    ]
JITTER                    [ TOLERANCE ]
SIGNAL FREQUENCY            STM-1
SDH MASK                  [ TYPE A    ]
PATTERN                   [ 2^23-1    ]

NUMBER OF POINTS          [     55   ]
DWELL TIME                [    1.0s  ]
DELAY TIME                [    1.0s  ]
ERROR THRESHOLD           [    1000  ]
                    BER >=
            PRESS RUN/STOP TO BEGIN.
            PRESS AGAIN TO ABORT

STATUS:
  TYPE A    TYPE B                        MULTIPLE
                                          WINDOW
```

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 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.

```
TRANSMITTER OUTPUT        [ SDH      ]
  SDH   STRUCT'D  JITTER   TEST   OVERHEAD
        PAYLOAD            FUNCTION SETUP
JITTER / WANDER           [ JITTER     ]
JITTER                    [ TRANSFER FN ]
SIGNAL FREQUENCY            STM-1
MODE                        CALIB
NUMBER OF POINTS          [      55   ]
DELAY TIME                [     5.0s ]
INPUT MASK                [ G.958 A   ]
F1   100   F2   1000   A1  1.50 UI
F3  10000  F4 100000   A2  0.15 UI
PASS MASK                    G.958 A

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.

STATUS:
  OFF      ON     AUTO     TRANSFER       MULTIPLE
               TOLERNCE   FUNCTION        WINDOW
```
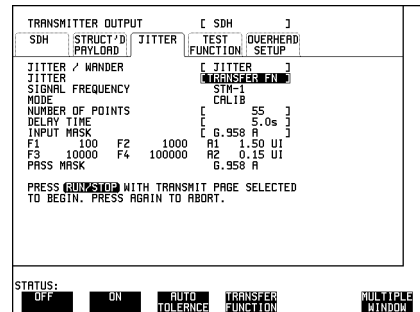
Wander Generation Option A3K

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.

```
TRANSMITTER OUTPUT          [ PDH        ]
  MAIN   STRUCT'D  JITTER   TEST
SETTINGS SETTINGS          FUNCTION
  SIGNAL                    [ 2 Mb/s     ]

  CLOCK SYNC  [ EXT. JIT.][ CLOCK ][ 75Ω ]
  TERMINATION              [ 75Ω UNBAL  ]
  LINE CODE                [ HDB3       ]
  FREQUENCY OFFSET         [ OFF        ]

  PAYLOAD TYPE             [ STRUCTURED ]

  TO SET TEST SIGNAL, FIRST SELECT THE
  'STRUCT'D SETTINGS' FOLDER ABOVE.




STATUS:                                MULTIPLE
  2MHz    2Mb/s                         WINDOW
  CLOCK   DATA
```
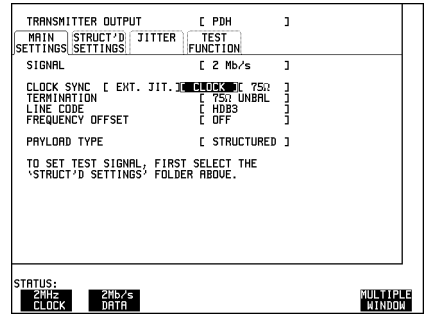
If CLOCK SYNC [INTERNAL] is selected on the **PDH** MAIN SETTINGS display, PDH Wander is disabled.

```
TRANSMITTER OUTPUT          [ PDH        ]
  MAIN   STRUCT'D  JITTER   TEST
SETTINGS SETTINGS          FUNCTION
  JITTER / WANDER          [ WANDER     ]
  WANDER                   [ OFF        ]








STATUS:                                MULTIPLE
  JITTER   WANDER                       WINDOW
```
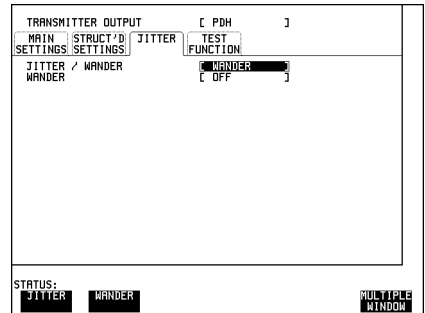
SDH Wander at STM-1 and STM-4 is enabled if CLOCK SYNC [EXT MTS] or [STM-1 RX] or [STM-4 RX] is selected on the **SDH** display.

If CLOCK SYNC [INTERNAL] is selected on the **SDH** display, SDH Wander is disabled.
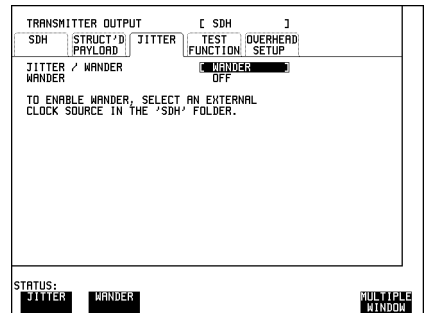
```
TRANSMITTER OUTPUT          [ SDH        ]
  SDH    STRUCT'D  JITTER   TEST   OVERHEAD
         PAYLOAD           FUNCTION SETUP
  JITTER / WANDER          [ WANDER     ]
  WANDER                     OFF

  TO ENABLE WANDER, SELECT AN EXTERNAL
  CLOCK SOURCE IN THE 'SDH' FOLDER.






STATUS:                                MULTIPLE
  JITTER   WANDER                       WINDOW
```

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 made on the PDH or SDH **TRANSMIT** MAIN SETTINGS display as required.

```
TRANSMITTER OUTPUT        [ PDH        ]
  MAIN  STRUCT'D JITTER    TEST
SETTINGS SETTINGS         FUNCTION
JITTER / WANDER           [ WANDER     ]
WANDER                    [ ON         ]
SIGNAL FREQUENCY            2 Mb/s
MODULATION SOURCE         [ INTERNAL   ]
WANDER MASK               [ OFF        ]

CLOCK SYNC                   EXT JITTER
CONNECT 2MHz SOURCE TO JITTER TX MODULE

MODULATION FREQUENCY      [ 125000 uHz]
AMPLITUDE                 [    1.0 UI ]



STATUS:
  OFF      ON                    MULTIPLE
                                  WINDOW
```

The wander modulation can be obtained internally from the HP 37717C 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 37717C.

```
TRANSMITTER OUTPUT        [ PDH        ]
  MAIN  STRUCT'D JITTER    TEST
SETTINGS SETTINGS         FUNCTION
JITTER / WANDER           [ WANDER     ]
WANDER                    [ ON         ]
SIGNAL FREQUENCY            2 Mb/s
MODULATION SOURCE         [ EXTERNAL   ]
RANGE                     [ 10 UI      ]

CLOCK SYNC                   EXT JITTER
CONNECT 2MHz SOURCE TO JITTER TX MODULE




STATUS:
  2 UI    10 UI                  MULTIPLE
                                  WINDOW
```

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.

```
TRANSMITTER OUTPUT        [ PDH        ]
  MAIN  STRUCT'D JITTER    TEST
SETTINGS SETTINGS         FUNCTION
JITTER / WANDER           [ WANDER     ]
WANDER                    [ ON         ]
SIGNAL FREQUENCY            2 Mb/s
MODULATION SOURCE         [ INTERNAL   ]
WANDER MASK               [ OFF        ]

CLOCK SYNC                   EXT JITTER
CONNECT 2MHz SOURCE TO JITTER TX MODULE

MODULATION FREQUENCY      [ 125000 uHz]
AMPLITUDE                 [    1.0 UI ]




STATUS:
  OFF     SPOT                   MULTIPLE
                                  WINDOW
```

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
37717C 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.

```
TRANSMITTER OUTPUT          [ PDH      ]
 MAIN  STRUCT'D  JITTER    TEST
SETTINGS SETTINGS         FUNCTION
JITTER / WANDER            [ WANDER    ]
WANDER                     [ ON        ]
SIGNAL FREQUENCY             2 Mb/s
MODULATION SOURCE          [ INTERNAL  ]
WANDER MASK                [ SPOT      ]

CLOCK SYNC                   EXT JITTER
CONNECT 2MHz SOURCE TO  JITTER TX MODULE

SPOT FREQUENCY             [ 125000 uHz]
AMPLITUDE                       1.0 UI




STATUS:
 OFF       SPOT                      MULTIPLE
                                     WINDOW
```

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.

```
RECEIVER INPUT              [ PDH      ]
 MAIN  STRUCT'D JITTER
SETTINGS SETTINGS
SIGNAL FREQUENCY             140 Mb/s

RECEIVER RANGE             [ 1.6  UI   ]
HIT THRESHOLD              [ 1.00 UI   ]
FILTER                     [ OFF       ]

    WANDER AVAILABLE AT 2MB/S ONLY




STATUS:
 OFF      LP      HP1     HP2    MORE   MULTIPLE
                                ....... WINDOW
```

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.

```
RECEIVER INPUT              [ PDH      ]
 MAIN   STRUCT'D  JITTER
SETTINGS SETTINGS
 SIGNAL FREQUENCY             140 Mb/s

 RECEIVER RANGE              [ 1.6  UI  ]
 HIT THRESHOLD               [ 1.00 UI  ]
 FILTER                      [ OFF      ]
 ADDITIONAL RMS FILTER       [ OFF      ]

         WANDER AVAILABLE AT 2MB/S ONLY




STATUS:
  LP+HP1    LP+HP2     12kHz              MORE    MULTIPLE
                        HP              ........   WINDOW
```

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 MAIN SETTINGS, 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.

```
RECEIVER INPUT              [ PDH      ]
 MAIN   STRUCT'D  JITTER
SETTINGS SETTINGS
 SIGNAL FREQUENCY             140 Mb/s

 RECEIVER RANGE              [ 1.6  UI  ]
 HIT THRESHOLD               [ 1.00 UI  ]
 FILTER                      [ 12kHz HP ]

         WANDER AVAILABLE AT 2MB/S ONLY




STATUS:
  LP+HP1    LP+HP2     12kHz              MORE    MULTIPLE
                        HP              ........   WINDOW
```

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

```
RECEIVER INPUT              [ PDH      ]
 MAIN   STRUCT'D  JITTER
SETTINGS SETTINGS
 SIGNAL FREQUENCY             2 Mb/s

 RECEIVER RANGE              [ 1.6  UI  ]
 HIT THRESHOLD               [ 1.00 UI  ]
 FILTER                      [ LP+HP2   ]

 WANDER REFERENCE            [ 75% UNBAL ]
 WANDER REF. FORMAT          [ HDB3 DATA ]




STATUS:
  HDB3     CLOCK                               MULTIPLE
  DATA                                          WINDOW
```

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 $\boxed{\text{RESULTS}}$ display. Short Term results are recalculated at user dedfined intervals during the measurement period. Cumulative results provide result at that time in the measurement period.

The Filter selection is also displayed.

```
RESULTS [ JITTER      ][ CUMULATIVE    ]
 HITS  ▐ AMPLI ▌
       ▐ TUDE  ▌

  +VE PEAK        0.01 UI
  -VE PEAK        0.01 UI
  PEAK-PEAK       0.01 UI
  FILTERS      LP+HP2
  ELAPSED TIME



STATUS:
                            ▐MULTIPLE▌
                            ▐ WINDOW ▌
```

Cumulative results of Jitter Hits are available on the $\boxed{\text{RESULTS}}$ display.

A Jitter Hit occurs when the measured jitter exceeds the Hit Threshold set on the $\boxed{\text{RECEIVE}}$ JITTER display.

```
RESULTS [ JITTER      ][ CUMULATIVE    ]
 ▐ HITS ▌ AMPLI
         TUDE

 HIT COUNT     4.295E+09
 HIT SEC               1
 FREE SEC              1

  ELAPSED TIME



STATUS:
                            ▐MULTIPLE▌
                            ▐ WINDOW ▌
```

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.

```
RESULTS [ WANDER      ][ WANDER        ]



  +VE PEAK              0.001 BITS
  -VE PEAK              0.001 BITS
  PEAK-PEAK            0.001 BITS
  PEAK-PEAK (15 MIN)    0.001 BITS
  PEAK-PEAK (24 HOURS)  0.001 BITS
  TIME-INTERVAL ERROR   0.001 BITS
  ELAPSED TIME



STATUS:
 ▐WANDER▌   BIT     BAR          ▐MULTIPLE▌
           SLIPS   GRAPH         ▐ WINDOW ▌
```

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.
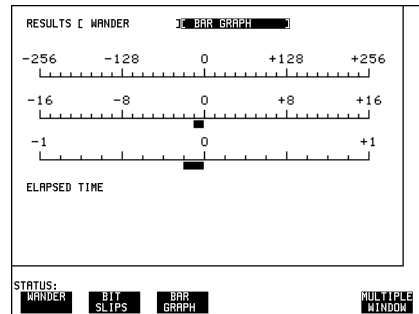
Jitter Transfer Option A3L [A3M], A3V [A3W], A3N [A3P]

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] 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 seconds to 30.0 seconds and determines the time the jitter is generated at each jitter frequency.

DWELL TIME is fixed at 5 seconds and 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.

```
TRANSMITTER OUTPUT          [ SDH        ]
  SDH   STRUCT'D  JITTER   TEST    OVERHEAD
        PAYLOAD           FUNCTION  SETUP

JITTER / WANDER            [ JITTER    ]
JITTER                     [ TRANSFER FN ]
SIGNAL FREQUENCY            STM-1
MODE                        CALIB
NUMBER OF POINTS          [      55   ]
DELAY TIME                [     5.0s  ]
INPUT MASK                [ G.958 A   ]
F1     100   F2    1000   A1   1.50 UI
F3   10000   F4  100000   A2   0.15 UI
PASS MASK                   G.958 A

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.



STATUS:
   OFF        ON      AUTO     TRANSFER           MULTIPLE
                    TOLERNCE  FUNCTION            WINDOW
```

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
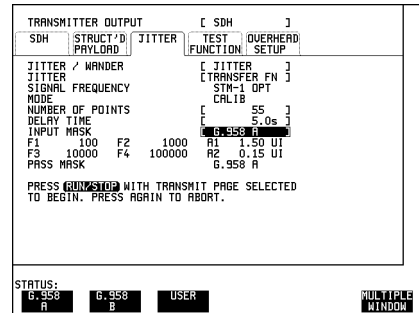mask can be selected as either TYPE A or
TYPE B as per ITU-T G.958.

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.

```
TRANSMITTER OUTPUT        [ SDH      ]
 SDH  | STRUCT'D | JITTER | TEST    | OVERHEAD
      | PAYLOAD  |        | FUNCTION| SETUP

JITTER / WANDER           [ JITTER     ]
JITTER                    [TRANSFER FN ]
SIGNAL FREQUENCY              STM-1 OPT
MODE                          CALIB
NUMBER OF POINTS          [       55  ]
DELAY TIME                [      5.0s  ]
INPUT MASK                [  G.958 A   ]
F1     100   F2    1000   A1   1.50 UI
F3   10000   F4  100000   A2   0.15 UI
PASS MASK                     G.958 A

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.



STATUS:
 G.958    G.958    USER                 MULTIPLE
   A        B                            WINDOW
```
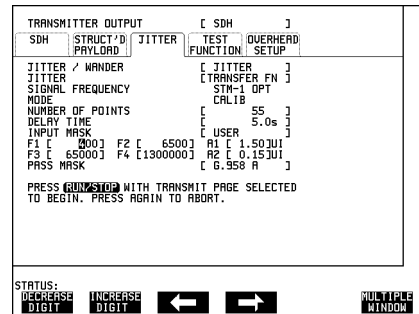
The type of mask available depends upon
the rate selected.
For conformity with ITU-T, G.958 is
available for SDH rates and G.823 is
available for PDH rates.

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.

```
TRANSMITTER OUTPUT        [ SDH      ]
 SDH  | STRUCT'D | JITTER | TEST    | OVERHEAD
      | PAYLOAD  |        | FUNCTION| SETUP

JITTER / WANDER           [ JITTER     ]
JITTER                    [TRANSFER FN ]
SIGNAL FREQUENCY              STM-1 OPT
MODE                          CALIB
NUMBER OF POINTS          [       55  ]
DELAY TIME                [      5.0s  ]
INPUT MASK                [  USER      ]
F1 [   200]  F2 [  6500]  A1 [ 1.50]UI
F3 [ 65000]  F4 [1300000] A2 [ 0.15]UI
PASS MASK                 [ G.958 A    ]

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.



STATUS:
DECREASE INCREASE   ←       →          MULTIPLE
 DIGIT    DIGIT                         WINDOW
```

NOTE

To achieve the required accuracy:

1. The HP 37717C must be connected back to back in order to perform a calibration
cycle before making a Jitter Transfer measurement.

2. The HP 37717C 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.

Jitter Transfer Calibration

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

```
TRANSMITTER OUTPUT        [ SDH      ]
 SDH  STRUCT'D JITTER  TEST  OVERHEAD
      PAYLOAD         FUNCTION SETUP

JITTER / WANDER          [ JITTER    ]
JITTER                   [TRANSFER FN ]
SIGNAL FREQUENCY          STM-1 OPT
MODE                      CALIB
NUMBER OF POINTS         [    55   ]
DELAY TIME              [      5.0s ]
INPUT MASK             [ USER      ]
F1 [   400] F2 [  6500] A1 [ 1.50]UI
F3 [ 65000] F4 [1300000] A2 [ 0.15]UI
PASS MASK               [ G.958 A   ]

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.

STATUS:
  OFF      ON      AUTO   TRANSFER        MULTIPLE
                TOLERNCE FUNCTION          WINDOW
```
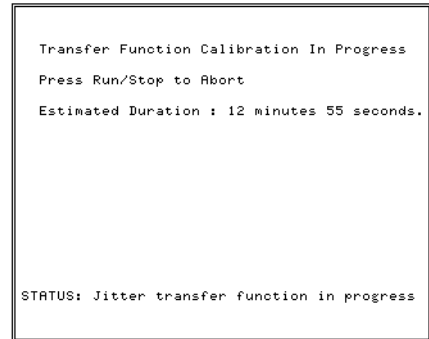
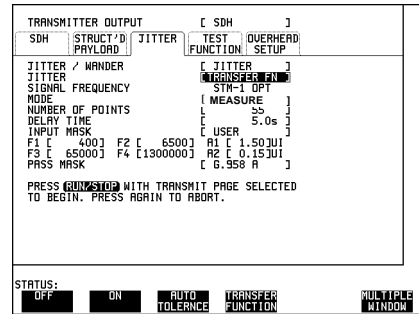The estimated time to complete the calibration will appear on the display.

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

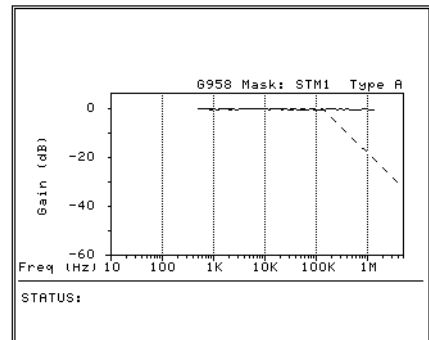The Jitter Transfer measurement must be started within 10 minutes of the completion of Calibration.

```
 Transfer Function Calibration In Progress

 Press Run/Stop to Abort

 Estimated Duration : 12 minutes 55 seconds.




 STATUS: Jitter transfer function in progress
```

Jitter Transfer Measurement

1. Connect the HP 37717C to the network equipment

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

3. Press [RUN/STOP]**.**

```
TRANSMITTER OUTPUT        [ SDH        ]
 SDH  STRUCT'D JITTER  TEST  OVERHEAD
       PAYLOAD        FUNCTION SETUP
JITTER / WANDER            [ JITTER    ]
JITTER                     [TRANSFER FN ]
SIGNAL FREQUENCY            STM-1 OPT
MODE                      [ MEASURE    ]
NUMBER OF POINTS          [       55   ]
DELAY TIME                [      5.0s  ]
INPUT MASK                [ USER       ]
F1 [    400]  F2 [   6500]  A1 [ 1.50]UI
F3 [  65000]  F4 [1300000]  A2 [ 0.15]UI
PASS MASK                 [ G.958 A    ]

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.



STATUS:
 OFF      ON      AUTO   TRANSFER           MULTIPLE
                TOLERNCE FUNCTION            WINDOW
```

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

```
                        G958 Mask: STM1  Type A

      0

  G
  a  -20
  i
  n
 (dB) -40


     -60
Freq (Hz) 10   100    1K   10K   100K   1M
STATUS:
```

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
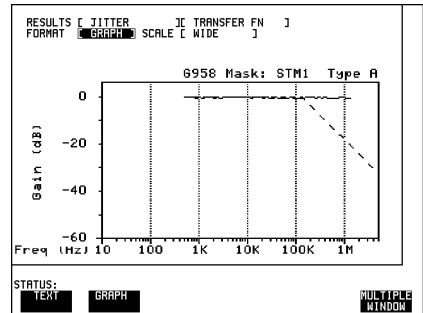result and the ITU-T pass mask.

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

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 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 Masinframe Operating Manual.*

Test Setup Procedure (Jitter Tolerance Test)

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

- UHK - 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 37717C Automatic jitter tolerance feature is used and the results plotted on the ITU-T mask.

PDH/SDH/ATM
TEST SET

PDH
IN

PDH
OUT

PDH MUX

34 Mb/s

LINE

TRIB

140 Mb/s

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.

PDH/SDH/ATM
TEST SET

PDH
IN

PDH
OUT

34 Mb/s

MUX

34 Mb/s

DEMUX

Unstructured PDH Jitter Tolerance Test

1. Connect the HP 37717C 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 reqirement of the network equipment.

```
TRANSMITTER OUTPUT          [ PDH      ]
 MAIN  STRUCT'D  JITTER   TEST
SETTINGS SETTINGS         FUNCTION

SIGNAL                    [ 34 Mb/s   ]
CLOCK SYNC                    INTERNAL
TERMINATION                  75Ω UNBAL
LINE CODE                    HDB3
FREQUENCY OFFSET          [ OFF       ]

PAYLOAD TYPE              [ FRAMED     ]
PATTERN                   [ 2^23-1 PRBS]
PRBS POLARITY           [ INV ]     CCITT




STATUS:
                                  MULTIPLE
                                  WINDOW
```

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

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

```
TRANSMITTER OUTPUT          [ PDH      ]
 MAIN  STRUCT'D  JITTER   TEST
SETTINGS SETTINGS         FUNCTION

JITTER                    [ TOLERANCE ]
SIGNAL FREQUENCY             34 Mb/s

PATTERN                   [ 2^23-1    ]

NUMBER OF POINTS          [     55    ]
DWELL TIME                [    1.0s   ]
DELAY TIME                [    1.0s   ]
ERROR THRESHOLD           [     0     ]
          PRESS RUN/STOP TO BEGIN.
          PRESS AGAIN TO ABORT




STATUS:
                                  MULTIPLE
                                  WINDOW
```

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

```
RECEIVER INPUT              [ PDH      ]
 MAIN  STRUCT'D  JITTER
SETTINGS SETTINGS

SIGNAL                    [ 140 Mb/s  ]

TERMINATION                  75Ω UNBAL
LINE CODE                    CMI
LEVEL                     [ TERMINATE ]

PAYLOAD TYPE              [ STRUCTURED ]

TO SET TEST SIGNAL, FIRST SELECT THE
'STRUCT'D SETTINGS' FOLDER ABOVE




STATUS:
                                  MULTIPLE
                                  WINDOW
```

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.

```
RECEIVER INPUT              [ PDH      ]
  MAIN  STRUCT'D JITTER
SETTINGS SETTINGS
TEST SIGNAL                 [ 34 Mb/s  ]
34M PAYLOAD                 [ FRAMED   ]
          34Mb
        [  2  ]

PATTERN                     [ 2^23-1 PRBS]
PRBS POLARITY               [ INV ]    CCITT




STATUS:
                                   MULTIPLE
                                   WINDOW
```
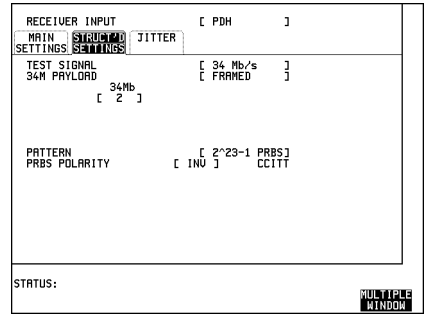
Run the Test (Jitter Tolerance)

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.
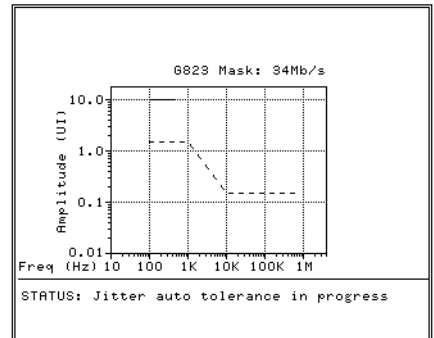

```
                    G823 Mask: 34Mb/s
        10.0
    Amplitude (UI)
         1.0
         0.1
        0.01
Freq (Hz) 10  100  1K  10K 100K 1M
STATUS: Jitter auto tolerance in progress
```

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.


```
RESULTS [ JITTER      ][ AUTO TOLER    ]
                    G823 Mask: 34Mb/s
        10.0
    Amplitude (UI)
         1.0
         0.1
        0.01
Freq (Hz) 10  100  1K  10K 100K 1M
STATUS:
 CUMUL   SHORT  AUTO               MULTIPLE
 ATIVE   TERM   TOLER              WINDOW
```
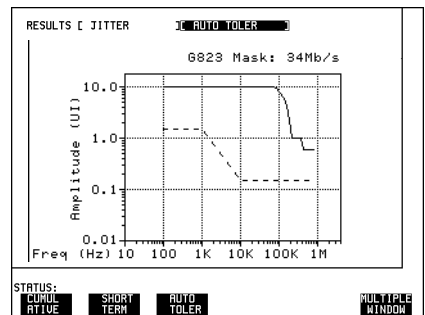
If Option 1CW, RS-232-C Remote control, or Option 1A8, HP-IB Remote Control, or Optioin A3B or Option A3D is fitted the Jitter Tolerance Mask results can be logged to an External printer (See *Connecting an HP 550C DeskJet Printer in the Mainframe Operating Manual*).

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

To log the results which make up the Jitter Auto Tolerance plot select the printer on the LOGGING display. 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 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 Masinframe Operating Manual.*

Wander and Slips Test Setup Procedure

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

- UHN or A1M or A1N or A1P 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 37717C 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 a printer for the 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.
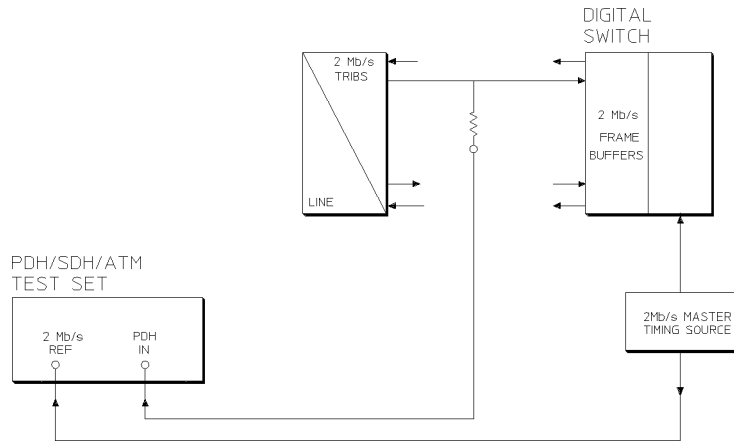
Wander and Slips Test

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

Selections of TERMINATION, LINE CODE and PAYLOAD TYPE should match those of the network equipment.

```
RECEIVER INPUT           [ PDH      ]
 MAIN  STRUCT'D JITTER
SETTINGS SETTINGS

SIGNAL                   [ 2 Mb/s   ]

TERMINATION              [ 75Ω UNBAL ]
LINE CODE                [ HDB3      ]
LEVEL                    [ MONITOR   ]
EQUALIZER     [ OFF ] GAIN [ 20 dB   ]
PAYLOAD TYPE             [ PCM30CRC  ]
PATTERN                  [LIVE TRAFFIC]




STATUS:
TERM-    MONITOR                    MULTIPLE
INATE                              WINDOW
```

2. Select the 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.

```
FUNCTION      [ LOGGING      ]
LOGGING SETUP          [ CONTROL   ]

LOGGING                [ ON        ]
LOGGING PERIOD         [ OFF       ]



LOG ERROR SECONDS      [ OFF       ]
LOG AT END OF TEST       ALL RESULTS

LOG ON DEMAND          [ RESULTS   ]




STATUS:
 OFF      ON                       MULTIPLE
                                   WINDOW
```
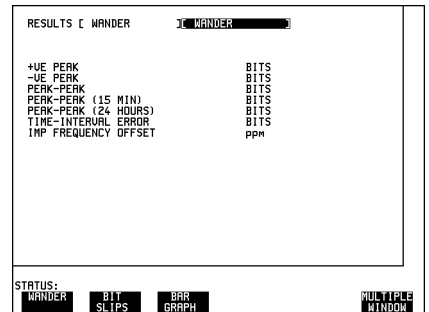
3. Set up the **RESULTS**
TIMING CONTROL display as shown
opposite.

```
RESULTS [TIMING CONTROL]

SHORT TERM PERIOD [1 SECOND          ]
TEST TIMING      [ MANUAL   ]

GRAPH STORAGE    [ 1 MIN RESOL'N     ]
                 [ INTERNAL          ]




STATUS:
  OFF     1 SEC    1 MIN   15 MIN   1 HR
        RESOL'N  RESOL'N  RESOL'N RESOL'N
```

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

Graphics can be stored to the instrument
store - INTERNAL or to DISK.
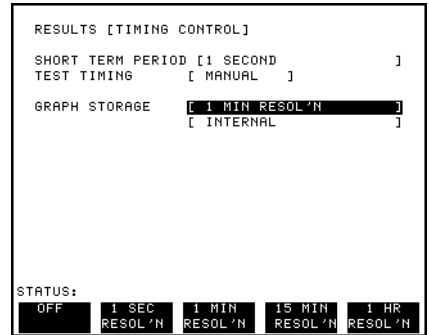
4. Select **RESULTS** **WANDER** .

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

```
RESULTS [ WANDER       ][ WANDER      ]

+VE PEAK                        BITS
-VE PEAK                        BITS
PEAK-PEAK                       BITS
PEAK-PEAK (15 MIN)              BITS
PEAK-PEAK (24 HOURS)            BITS
TIME-INTERVAL ERROR            BITS
IMP FREQUENCY OFFSET            PPM




STATUS:
 WANDER   BIT      BAR             MULTIPLE
          SLIPS    GRAPH            WINDOW
```

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 to the HP 37717C 2 Mb/s
REFERENCE input.

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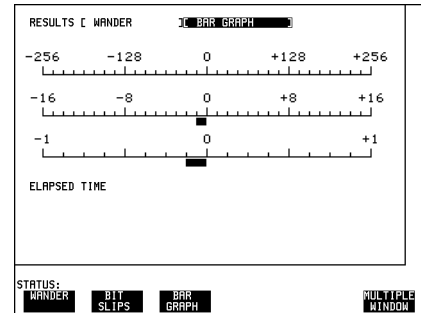REF" is displayed.

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 $\pm$ 1 UI,
$\pm$ 16 UI and $\pm$ 256 UI, are displayed.

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

```
RESULTS [ WANDER      ][ BAR GRAPH  ]

-256    -128      0     +128     +256
 |........|........|........|........|

-16      -8       0      +8       +16
 |........|........|........|........|
                       ■
-1                     0              +1
 |.............................|......|
                     ■

ELAPSED TIME




STATUS:
 WANDER    BIT      BAR                MULTIPLE
          SLIPS    GRAPH                WINDOW
```

• 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
  printer.

• Any alarms which occur during the test period will be logged on the printer.

• At the end of the test period a complete set of results are logged on the printer.

• A graphical record of the results during the test period can be viewed on the
  GRAPH display. If Remote Control option 1A8 (HP-IB) or 1CW (RS-232-C),
  or 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
  Masinframe Operating Manual*.

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

The total graphics store capacity is normally 20,000 events. 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 $\boxed{\textbf{RESULTS}}$ display.

Desynchroniser 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 moves with respect to the SDH frame.

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

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. The default settings are set by selecting OTHER **STORED SETTINGS** STORED SETTING NUMBER 0 and pressing **RECALL**

Desynchroniser Stress Test Setup Procedure

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

- UKK or UKJ - PDH module

- UHN or A1M or A1N or A1P or A3L or A3V or A3N - Jitter measurement module

- A1T - SDH module

- UH1 or UH2 or URU or USN or UKT - STM-1/4 Optical interface <

The HP 37717C 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 desynchroniser output is returned to the HP 37717C and a jitter measurement is performed on the demapped 2 Mb/s signal.
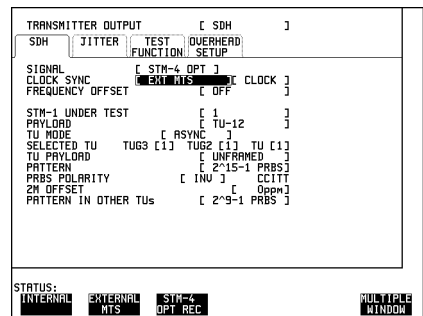
```
PDH/SDH/ATM
TEST SET
              OPTICAL
              OUT
PDH IN        ○
    ○
                    ▽
                   (╱╱)  ───  STM-4  ──── ┌──────────────┐
                                          │ DESYNCHRONISER │
                                          └──────────────┘
         △
              2Mb/s
```
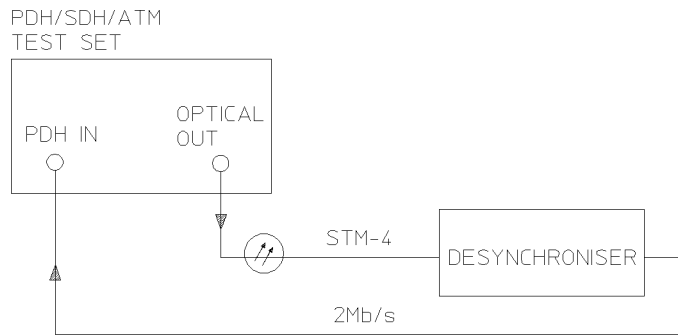
Desynchroniser Stress

1. Connect the HP 37717C to the network equipment and set up the **TRANSMIT** **SDH** display as shown opposite.
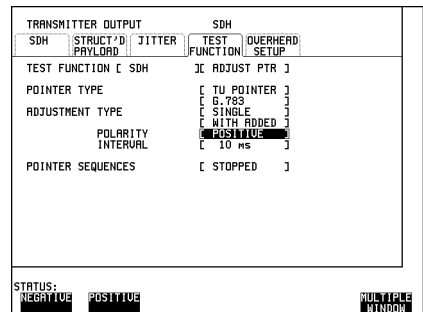
The CLOCK SYNC selection determines the synchronization source for the TRANSMIT clock. If **EXTERNAL MTS** is selected a 2 Mb/s reference must be connected to the 2M REF IN port. The format can be CLOCK or DATA.

```
TRANSMITTER OUTPUT       [ SDH        ]
  SDH   JITTER   TEST   OVERHEAD
                FUNCTION SETUP
SIGNAL              [ STM-4 OPT ]
CLOCK SYNC          [ EXT MTS      ][ CLOCK ]
FREQUENCY OFFSET    [ OFF        ]

STM-1 UNDER TEST    [ 1        ]
PAYLOAD             [ TU-12      ]
TU MODE             [ ASYNC   ]
SELECTED TU   TUG3 [1] TUG2 [1]  TU [1]
TU PAYLOAD          [ UNFRAMED   ]
PATTERN             [ 2^15-1 PRBS]
PRBS POLARITY       [ INV ]    CCITT
2M OFFSET           [   0ppm]
PATTERN IN OTHER TUs  [ 2^9-1 PRBS ]




STATUS:
INTERNAL  EXTERNAL  STM-4                MULTIPLE
          MTS       OPT REC              WINDOW
```

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 POINTER SEQUENCES **STARTED**.

```
TRANSMITTER OUTPUT       SDH
  SDH  STRUCT'D JITTER  TEST   OVERHEAD
       PAYLOAD          FUNCTION SETUP
TEST FUNCTION [ SDH    ][ ADJUST PTR ]

POINTER TYPE            [ TU POINTER ]
                        [ G.783      ]
ADJUSTMENT TYPE         [ SINGLE     ]
                        [ WITH ADDED ]
         POLARITY       [ POSITIVE   ]
         INTERVAL       [ 10 ms      ]
POINTER SEQUENCES       [ STOPPED    ]




STATUS:
NEGATIVE  POSITIVE                       MULTIPLE
                                         WINDOW
```

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

If Jitter filtering is required select from the
softkey menu.

```
RECEIVER INPUT              [ PDH      ]
 MAIN  STRUCT'D  JITTER
SETTINGS SETTINGS
SIGNAL FREQUENCY            2 Mb/s

RECEIVER RANGE             [ 16   UI   ]
HIT THRESHOLD              [  0.5 UI   ]
FILTER                     [ OFF       ]

WANDER REFERENCE           [ 75Ω UNBAL ]
WANDER REF. FORMAT         [ HDB3 DATA ]




STATUS:
  OFF      LP      HP1     HP2     MORE   MULTIPLE
                                  ......  WINDOW
```

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

```
RESULTS [TIMING CONTROL]

SHORT TERM PERIOD [1 SECOND          ]
TEST TIMING       [ MANUAL   ]

GRAPH STORAGE     [ OFF                ]
                  [ INTERNAL           ]







STATUS:
  OFF    1 SEC   1 MIN   15 MIN  1 HR
        RESOL'N RESOL'N RESOL'N RESOL'N
```

Start the Desynchroniser Stress Test

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

Jitter Hits can be viewed without affecting
the measurement.

```
RESULTS [ JITTER     ][ CUMULATIVE  ]
 HITS    AMPLI
         TUDE


+VE PEAK              UI
-VE PEAK              UI
PEAK-PEAK            UI
FILTERS          OFF
ELAPSED TIME




STATUS:
                                 MULTIPLE
                                  WINDOW
```

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 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 Masinframe Operating Manua*l.

### Test Setup Procedure (Jitter Tolerance Test)

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

- UHK - Jitter Generation

- UKJ or UKK - PDH Module

- US1 or A1T - SDH Module

- UH1, UH2, URU, USN or UKT - Optical Interface Module

This setup procedure is based on STM-4 optical test signal with jitter terminated in 75 Ω. The HP 37717C Automatic jitter tolerance feature is used and the results plotted on the ITU-T mask.
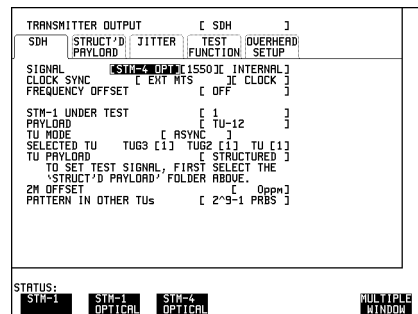
PDH/SDH/ATM TEST SET
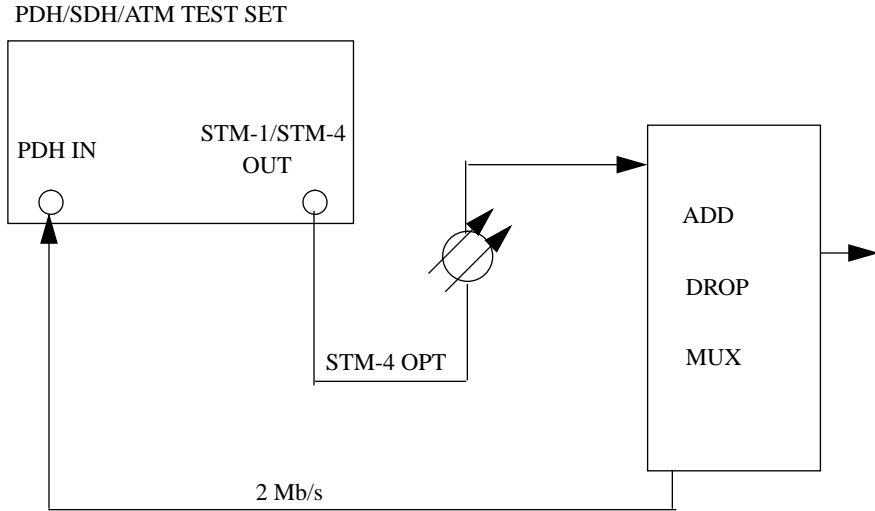
1. Connect the HP 37717C to the network equipment and set up the **TRANSMIT** **SDH** display as shown opposite.

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

```
TRANSMITTER OUTPUT        [ SDH      ]
  SDH   STRUCT'D JITTER    TEST  OVERHEAD
        PAYLOAD           FUNCTION SETUP
SIGNAL              [STM-4 OPT][1550][ INTERNAL ]
CLOCK SYNC          [ EXT MTS      ][ CLOCK ]
FREQUENCY OFFSET              [ OFF      ]

STM-1 UNDER TEST             [ 1        ]
PAYLOAD                      [ TU-12    ]
TU MODE            [ ASYNC  ]
SELECTED TU    TUG3 [1]  TUG2 [1]  TU [1]
TU PAYLOAD                 [ STRUCTURED ]
   TO SET TEST SIGNAL, FIRST SELECT THE
   'STRUCT'D PAYLOAD' FOLDER ABOVE.
2M OFFSET                   [    0ppm]
PATTERN IN OTHER TUs     [ 2^9-1 PRBS ]



STATUS:
  STM-1     STM-1     STM-4                    MULTIPLE
            OPTICAL   OPTICAL                  WINDOW
```

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

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

```
TRANSMITTER OUTPUT        [ SDH        ]
  SDH  |STRUCT'D| JITTER |  TEST  |OVERHEAD
       |PAYLOAD |        |FUNCTION| SETUP

JITTER                    [ TOLERANCE ]
SIGNAL FREQUENCY            STM-4 OPT
SDH MASK                  [ TYPE A    ]
PATTERN                   [ 2^23-1    ]

NUMBER OF POINTS          [    55     ]
DWELL TIME                [    1.0s   ]
DELAY TIME                [    1.0s   ]
ERROR THRESHOLD           [     0     ]
         PRESS RUN/STOP TO BEGIN.
         PRESS AGAIN TO ABORT



STATUS:
  TYPE A     TYPE B                    MULTIPLE
                                        WINDOW
```

53

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

```
RECEIVER INPUT          [ PDH      ]
 MAIN  STRUCT'D  JITTER
SETTINGS SETTINGS
SIGNAL                  [ 2 Mb/s   ]

TERMINATION             [ 75Ω UNBAL ]
LINE CODE               [ HDB3      ]
LEVEL                   [ TERMINATE ]

PAYLOAD TYPE            [ STRUCTURED ]

TO SET TEST SIGNAL, FIRST SELECT THE
'STRUCT'D SETTINGS' FOLDER ABOVE




STATUS:
                                    MULTIPLE
                                    WINDOW
```

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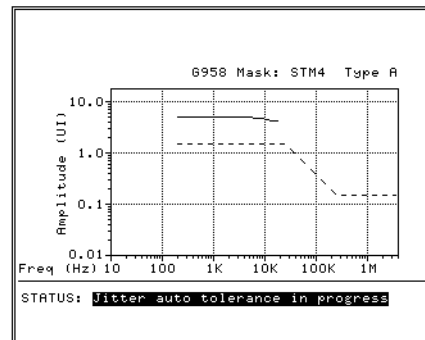
At the end of the test the results can be
viewed on the **RESULTS** display.

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 : Select
the required logging device on the
OTHER **LOGGING** display.. Select
LOGGING [ON]. Select **RESULTS**
JITTER **AUTO TOLER** and press
PRINT NOW.
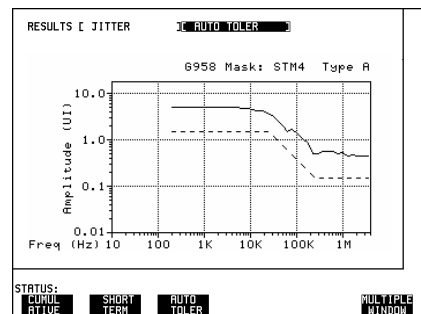
In Service SDH Jitter

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 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 Masinframe Operating Manua*l.

Test Setup Procedure (In Service SDH Jitter)

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

• UHK - Jitter Generation

• UKJ or UKK - PDH Module

• US1 or A1T - SDH Module

• UH1, UH2, URU, USN or UKT - 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 37717C "sweeps" through the jitter mask, adjusting the jitter amplitude according to the jitter frequency. The network equipment alarms are monitored particularly OOF and LOF.
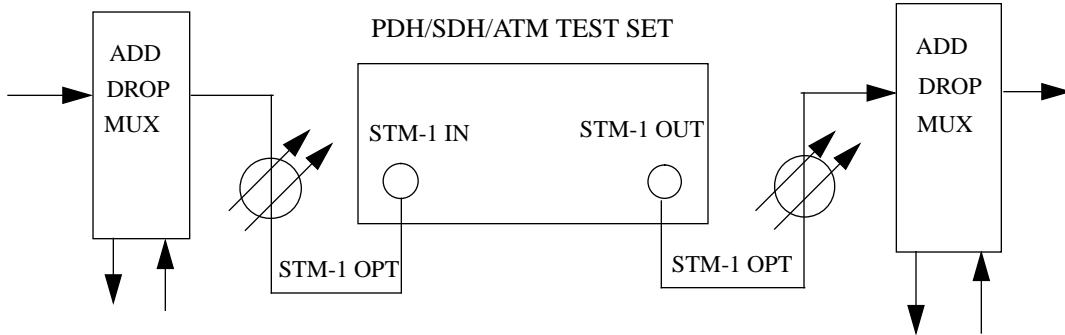
Select **RECEIVE** **SDH** and set up the display as shown opposite.

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

```
RECEIVER INPUT            [ SDH        ]
 SDH   STRUCT'D   TEST  OVERHEAD
       PAYLOAD  FUNCTION MONITOR
SIGNAL       [STM-1 OPT]


PAYLOAD                      [ 140 Mb/s  ]

PAYLOAD TYPE                 [ FRAMED     ]
PATTERN                      [LIVE TRAFFIC]




STATUS:
                                        MULTIPLE
                                         WINDOW
```

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

```
TRANSMITTER OUTPUT         [ SDH        ]
 SDH    JITTER    TEST  OVERHEAD
               FUNCTION SETUP
SIGNAL      [STM-1 OPT][1310][THRU MODE]
CLOCK SYNC       STM-1 OPT RX
PAYLOAD OVERWRITE          [ OFF      ]
SDH+POH CHANNEL OVERWRITE  [ OFF      ]

RX SIGNAL RE-TRANSMITTED UNCHANGED






STATUS:
                                        MULTIPLE
                                         WINDOW
```

Run the Test (In Service SDH Jitter)

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

When JITTER MASK [SWEPT] is
selected the HP 37717C 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.

```
TRANSMITTER OUTPUT        [ SDH      ]
  SDH   STRUCT'D  JITTER    TEST   OVERHEAD
        PAYLOAD           FUNCTION  SETUP

JITTER                    [ ON      ]
SIGNAL FREQUENCY            STM-1 OPT
JITTER MASK               [ SWEPT      ]
SDH MASK                  [ TYPE B      ]
SWEPT FREQUENCY             1000 Hz
AMPLITUDE                   1.00 UI




STATUS:
    OFF       SWEPT      SPOT                 MULTIPLE
                                              WINDOW
```

Tributary Mapping Jitter

Application

STM-4 with TU12 Payload. Frequency Offset TU12 by 1 or 2 ppm. Measure Jitter on received TU12.

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 (Tributary Mapping Jitter)

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

- UHK - Jitter Generation

- UKJ or UKK - PDH Module

- US1 or A1T - SDH Module

- UH1, UH2, URU, USN or UKT - 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.

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

The 2M OFFSET can be varied during the
test.

```
TRANSMITTER OUTPUT      [ SDH      ]
 SDH   STRUCT'D  JITTER   TEST   OVERHEAD
       PAYLOAD           FUNCTION  SETUP
SIGNAL      [STM-4 OPT][1550][ INTERNAL]
CLOCK SYNC      [ INTERNAL   ]
FREQUENCY OFFSET          [ OFF      ]

STM-1 UNDER TEST          [ 1       ]
PAYLOAD                   [ TU-12      ]
TU MODE              [ ASYNC  ]
SELECTED TU    TUG3 [2]  TUG2 [4]  TU [3]
TU PAYLOAD                [ PCM30CRC   ]
PATTERN                   [ 2^15-1 PRBS]
PRBS POLARITY        [ INV ]    CCITT
2M OFFSET                 [    0ppm]
PATTERN IN OTHER TUs      [ 2^9-1 PRBS ]




STATUS:
140 Mb/s   TU-3     TU-2     TU-12         MULTIPLE
                                           WINDOW
```

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

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

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

```
RECEIVER INPUT         [ PDH      ]
 MAIN     STRUCT'D  JITTER
SETTINGS  SETTINGS
SIGNAL                    [ 2 Mb/s   ]

TERMINATION               [ 75Ω UNBAL ]
LINE CODE                 [ HDB3      ]
LEVEL                     [ TERMINATE ]

PAYLOAD TYPE              [ PCM30CRC  ]
PATTERN                   [ 2^15-1 PRBS]
PRBS POLARITY        [ INV ]    CCITT




STATUS:
                                           MULTIPLE
                                           WINDOW
```

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

Any filter can be selected from the softkey
menu.

```
RECEIVER INPUT         [ PDH      ]
 MAIN     STRUCT'D  JITTER
SETTINGS  SETTINGS
SIGNAL FREQUENCY          2 Mb/s

RECEIVER RANGE            [ 1.6  UI   ]
HIT THRESHOLD             [ 0.05 UI   ]
FILTER                    [ HP1        ]

WANDER                    [ OFF      ]




STATUS:
 OFF       LP       HP1      HP2       MORE    MULTIPLE
                                       ......  WINDOW
```

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 37717C 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 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. 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 37717C to perform this test:

• A3K or UHK - Jitter Generation

• A3L or A3V or A3N - Jitter Measurement

• US1 or A1T - SDH Module

• UH1 or UH2 or URU or UKT or USN - Optical Interface

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 37717C. The HP 37717C 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 37717C must be connected back to back in order to perform a calibration cycle before making a Jitter Transfer measurement.

2. The HP 37717C 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.

Calibrate the HP 37717C

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

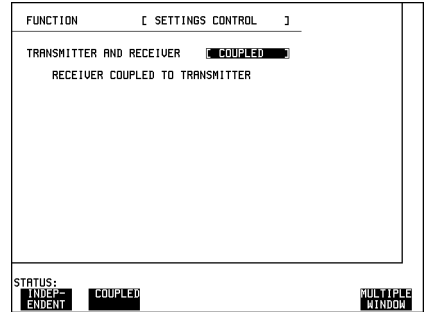If PDH Jitter Transfer is required connect PDH IN to PDH OUT.

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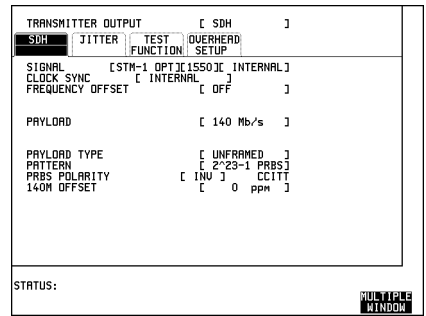
1. Set up the OTHER SETTINGS
CONTROL display as shown opposite.

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

```
FUNCTION          [ SETTINGS CONTROL   ]

TRANSMITTER AND RECEIVER   [ COUPLED   ]
     RECEIVER COUPLED TO TRANSMITTER




STATUS:
 INDEP-  COUPLED                              MULTIPLE
 ENDENT                                       WINDOW
```

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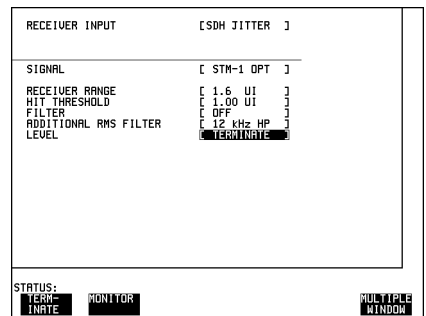set up the display as shown opposite.

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].

```
TRANSMITTER OUTPUT       [ SDH       ]
 SDH   JITTER   TEST   OVERHEAD
              FUNCTION  SETUP
SIGNAL      [STM-1 OPT][1550][ INTERNAL]
CLOCK SYNC      [ INTERNAL   ]
FREQUENCY OFFSET          [ OFF      ]

PAYLOAD                   [ 140 Mb/s  ]

PAYLOAD TYPE              [ UNFRAMED   ]
PATTERN                   [ 2^23-1 PRBS]
PRBS POLARITY      [ INV ]    CCITT
140M OFFSET               [   0  ppm  ]


STATUS:
                                             MULTIPLE
                                             WINDOW
```

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

For CALIBRATION, HP 37717C
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.

```
RECEIVER INPUT          [SDH JITTER ]


SIGNAL                 [ STM-1 OPT ]

RECEIVER RANGE         [ 1.6  UI   ]
HIT THRESHOLD          [ 1.00 UI   ]
FILTER                 [ OFF       ]
ADDITIONAL RMS FILTER  [ 12 kHz HP ]
LEVEL                  [ TERMINATE ]




STATUS:
 TERM-   MONITOR                             MULTIPLE
 INATE                                       WINDOW
```

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

4. 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.

```
TRANSMITTER OUTPUT            [ SDH        ]
 SDH    STRUCT'D  JITTER   TEST   OVERHEAD
        PAYLOAD           FUNCTION SETUP
JITTER / WANDER            [ JITTER    ]
JITTER                      TRANSFER FN
SIGNAL FREQUENCY            STM-1 OPT
MODE                        CALIB
NUMBER OF POINTS          [      55  ]
DELAY TIME                [     5.0s ]
INPUT MASK                [ USER     ]
F1 [    400] F2 [   6500] A1 [ 1.50]UI
F3 [  65000] F4 [1300000] A2 [ 0.15]UI
PASS MASK                 [ G.958 A  ]

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.




STATUS:
  OFF      ON      AUTO    TRANSFER        MULTIPLE
                 TOLERNCE  FUNCTION         WINDOW
```

DWELL TIME is fixed at 5 seconds and
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/amplitude is changed.

The NUMBER OF POINTS, DWELL TIME and DELAY TIME determine the time
the calibration and eventually the measurement will take to complete.

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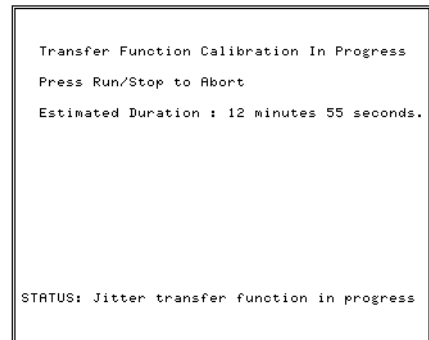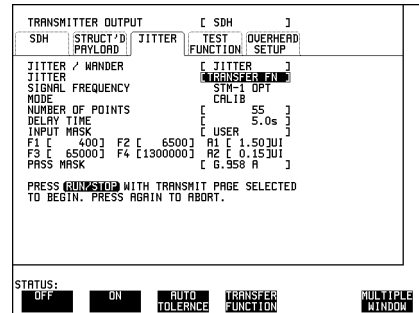regenerator being tested. The PASS MASK will adopt the same selection.

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

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

The estimated time to complete the
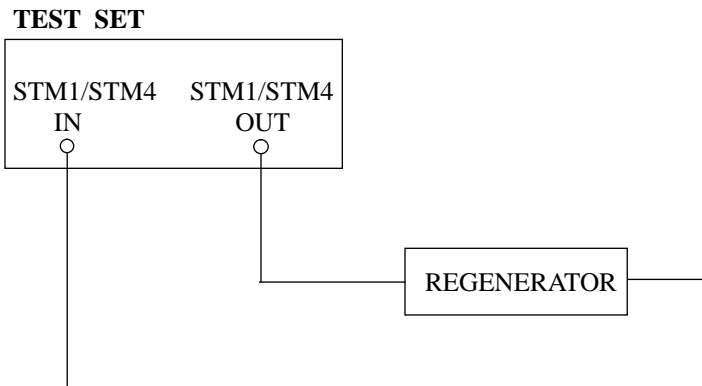calibration will appear on the display.

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.

```
Transfer Function Calibration In Progress

Press Run/Stop to Abort

Estimated Duration : 12 minutes 55 seconds.






STATUS: Jitter transfer function in progress
```

TEST SET

```
┌─────────────────────────────────┐
│  STM1/STM4    STM1/STM4          │
│     IN           OUT             │
│      ○            ○              │
└──────┼────────────┼─────────────┘
       │            │
       │            │      ┌──────────────┐
       │            └──────┤              │
       │                   │ REGENERATOR  ├───┐
       │            ┌──────┤              │   │
       │            │      └──────────────┘   │
       │            └───────────────────────  │
       └────────────────────────────────────────┘
```

Jitter Transfer Test

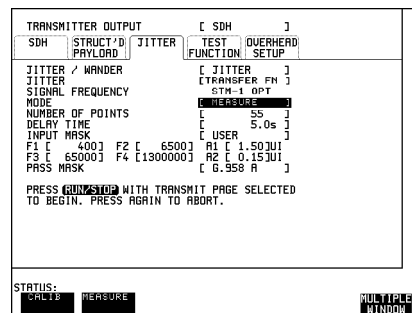**Automatic Jitter Transfer Measurement**

1. Remove the back to back connection and connect the HP 37717C 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, select MODE **MEASURE** 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.

```
TRANSMITTER OUTPUT        [ SDH      ]
┌────┬────────┬──────┬────────┬────────┐
│SDH │STRUCT'D│JITTER│  TEST  │OVERHEAD│
│    │PAYLOAD │      │FUNCTION│ SETUP  │
└────┴────────┴──────┴────────┴────────┘
JITTER / WANDER           [ JITTER    ]
JITTER                    [TRANSFER FN ]
SIGNAL FREQUENCY           STM-1 OPT
MODE                      [ MEASURE   ]
NUMBER OF POINTS          [      55   ]
DELAY TIME                [    5.0s   ]
INPUT MASK                [ USER      ]
F1 [    400] F2 [  6500] A1 [ 1.50]UI
F3 [  65000] F4 [1300000] A2 [ 0.15]UI
PASS MASK                 [ G.958 A   ]

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.



STATUS:
┌──────┬───────┐                  ┌────────┐
│CALIB │MEASURE│                  │MULTIPLE│
└──────┴───────┘                  │ WINDOW │
                                  └────────┘
```

NOTE

Changing the HP 37717C 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.

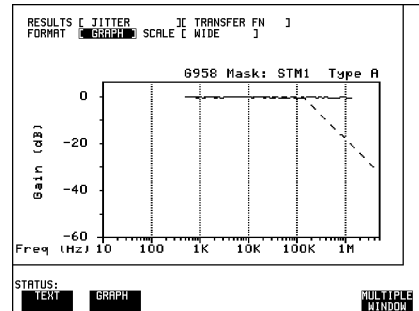The following information is displayed for each result:
Point Number
Jitter Frequency
Mask value
Result
Pass / Fail Indication.

```
RESULTS [ JITTER      ][ TRANSFER FN   ]
FORMAT  [ TEXT  ] PAGE   1

Point Frequency Mask(dB) Gain(dB) Result

  G958 Mask: STM1  Type A
Point Frequency Mask(dB) Gain(dB) Result
  1       500      0.10      0.03    PASS
  2       578      0.10      0.04    PASS
  3       669      0.10      0.01    PASS
  4       773      0.10      0.01    PASS
  5       895      0.10      0.00    PASS
  6      1035      0.10      0.03    PASS
  7      1197      0.10     -0.01    PASS
  8      1385      0.10      0.03    PASS
  9      1602      0.10      0.01    PASS
 10      1854      0.10      0.01    PASS
 11      2144      0.10     -0.01    PASS
 12      2480      0.10      0.01    PASS

STATUS:
    TEXT     GRAPH                        MULTIPLE
                                          WINDOW
```

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.

```
RESULTS [ JITTER     ][ TRANSFER FN   ]
FORMAT  [ GRAPH ] SCALE [ WIDE  ]

                       G958 Mask: STM1   Type A
         0
  Gain (dB)
       -20

       -40

       -60
  Freq (Hz) 10   100   1K   10K  100K  1M

STATUS:
    TEXT     GRAPH                        MULTIPLE
                                          WINDOW
```

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.

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** **TRANSFER FUNCTION** display or by using the USER mask capability of the HP 37717C.
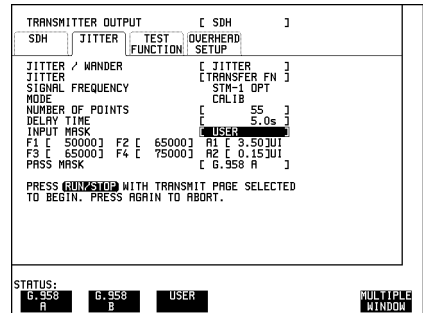
To use the USER mask capability select
TRANSMIT **SDH** JITTER and set up
the display as shown opposite.

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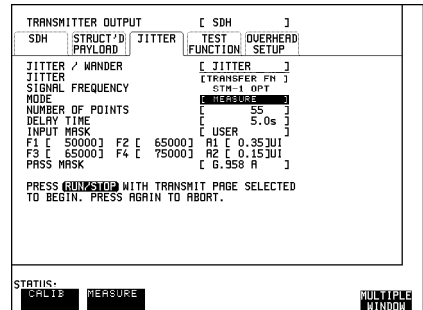amplitude values.

In this example the jitter transfer will be
measured at 55 points between 50 kHz and
75 kHz, at amplitudes of 0.35 UI, 50 kHz
to 65 kHz and 0.15 UI, 65 kHz to 75 kHz.

```
TRANSMITTER OUTPUT          [ SDH        ]
 SDH  | JITTER | TEST    | OVERHEAD
                FUNCTION | SETUP
JITTER / WANDER              [ JITTER    ]
JITTER                       [TRANSFER FN ]
SIGNAL FREQUENCY             STM-1 OPT
MODE                         CALIB
NUMBER OF POINTS             [    55    ]
DELAY TIME                   [    5.0s  ]
INPUT MASK                   [ USER     ]
F1 [ 50000] F2 [ 65000] A1 [ 3.50]UI
F3 [ 65000] F4 [ 75000] A2 [ 0.15]UI
PASS MASK                    [ G.958 A   ]

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.


STATUS:
 G.958   G.958    USER                 MULTIPLE
   A       B                           WINDOW
```

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

1. Connect the HP 37717C to the network
equipment.

2. Select **TRANSMIT** **SDH** JITTER,
select MODE **MEASURE** and press
RUN/STOP .

```
TRANSMITTER OUTPUT          [ SDH        ]
 SDH  | STRUCT'D | JITTER | TEST    | OVERHEAD
        PAYLOAD           | FUNCTION | SETUP
JITTER / WANDER              [ JITTER    ]
JITTER                       [TRANSFER FN ]
SIGNAL FREQUENCY             STM-1 OPT
MODE                         [ MEASURE   ]
NUMBER OF POINTS             [    55    ]
DELAY TIME                   [    5.0s  ]
INPUT MASK                   [ USER     ]
F1 [ 50000] F2 [ 65000] A1 [ 0.35]UI
F3 [ 65000] F4 [ 75000] A2 [ 0.15]UI
PASS MASK                    [ G.958 A   ]

PRESS RUN/STOP WITH TRANSMIT PAGE SELECTED
TO BEGIN. PRESS AGAIN TO ABORT.


STATUS:
 CALIB    MEASURE                      MULTIPLE
                                       WINDOW
```

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.

```
RESULTS [ JITTER     ][ TRANSFER FN   ]
FORMAT [ GRAPH ] SCALE [ NARROW   ]

                          G958 Mask: STM1  Type A
         +3.0

  Gain    +1.0
  (dB)
         -1.0

         -3.0
 Freq (Hz) 10   100   1K   10K  100K   1M

STATUS:
 WIDE    NARROW                       MULTIPLE
                                      WINDOW
```
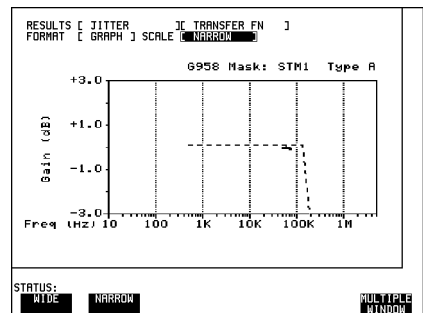
In Service ATM Jitter

Options required:

- Jitter Generation UHK

- PDH Module UKJ

- ATM Module UKN or UKZ

Application

Receiver set to Live Traffic, Jitter added in ATM THRU mode. Swept Mask used and network equipment checked for Alarms particularly OOF LOF.

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 Masinframe Operating Manua*l.

Test Setup Procedure (In Service SDH Jitter)

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

Select **RECEIVE** **ATM** PHYSICAL
LAYER and set up the display as shown
opposite.

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

```
RECEIVER INPUT          [ ATM      ]
PHYSICAL   ATM    JITTER
LAYER     LAYER
  SIGNAL                 [ 2 Mb/s   ]

  TERMINATION            [ 75Ω UNBAL ]
  LINE CODE              [ HDB3      ]
  LEVEL                  [ TERMINATE ]

  CRC-4 MULTIFRAME       [ OFF       ]

  SCRAMBLING             [ ON        ]




STATUS:
                                      MULTIPLE
                                       WINDOW
```

Select **TRANSMIT** **ATM** PHYSICAL
LAYER and set up the display as shown
opposite.

```
TRANSMITTER OUTPUT      [ ATM      ]
PHYSICAL   ATM    JITTER    TEST
LAYER     LAYER           FUNCTION
  SIGNAL     [2 Mb/s  ]    [THRU MODE]




  SCRAMBLING             [ ON        ]



STATUS:
INTERNAL    THRU                       MULTIPLE
            MODE                        WINDOW
```

Run the Test (In Service ATM Jitter)

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

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

Monitor the network alarms

```
TRANSMITTER OUTPUT      [ ATM      ]
PHYSICAL   ATM    JITTER    TEST
LAYER     LAYER           FUNCTION
  JITTER                 [ ON        ]
  SIGNAL FREQUENCY         2 Mb/s
  JITTER MASK              SWEPT
  Q FACTOR               [ HIGH Q    ]
  SWEPT FREQUENCY          1000 Hz
  AMPLITUDE                1.00 UI






STATUS:
  OFF       SWEPT     SPOT           MULTIPLE
                                      WINDOW
```

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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 / DSn Operating Manual - 37717-90222

Information about the PDH / DSn 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.

About This Edition

This is the1st edition of the
37717-90224 manual. It
documents the product as
of August 1996. Edition
dates are as follows:

1st Edition, 08/1996
2nd Edition 11/96

In This Book

This book provides information on HP 37717C
modules with Jitter 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