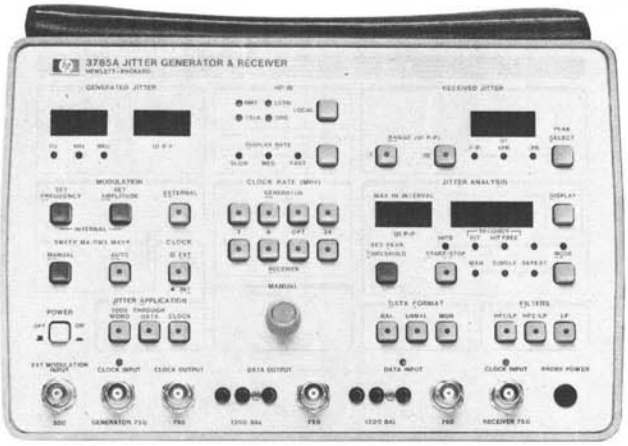
TELECOMMUNICATIONS TEST EQUIPMENT

Dedicated PCM/TDM Jitter Generator and Receiver

Models 3785A

- Jitter generation and measurement on data and clock
- Jitter specifications designed to CCITT Recommendation 0.171
- Transient-free sweeping of internal CCITT defined jitter tolerance masks
- Single portable unit for up to 4 internal bit rates
- Built-in measurement filters to CCITT Recommendations
- Comprehensive jitter analysis against real-time and jitter amplitude



3785A (2048, 8448, 34368 and, optionally, 25776 kHz) CEPT

DESIGNED FOR HP-IB SYSTEMS

The 3785A/B Jitter Generator and Receiver is a dedicated jitter measurement system for testing and evaluating the performance of CEPT or Bell digital transmission terminal and link equipment up to and including the third level (34368 kb/s or DS-3) in the digital hierarchy. The 3785A/B can be used in production testing, field installation and maintenance of the CEPT or Bell digital transmission system including PCM/TDM transmission over cable, radio, satellite, and fiber optic links. The principal application is thorough testing to current CCITT Recommendations at each level in the digital hierarchy.

In addition to providing a comprehensive measurement capability which includes in-service jitter measurements, the microprocessor-controlled Jitter Generator and Receiver is easy to use with ergonomic layout of switches and connectors on the front panel. The instrument is designed to interface fully with the HP-IB, allowing bus-controlled operation and automatic measurement sequencing.

The Jitter Generator may be used to phase modulate an internally provided crystal clock, an externally applied clock (at a nominal digital hierarchy bit rate) or an externally applied data stream. Sinusoidal modulation is provided by an internal synthesizer whose amplitude and frequency can be set manually or swept, transient-free, through a CCITT shaped jitter tolerance mask programmed into the instrument. Alternatively, external modulating signals can be applied. The amplitude of generated jitter in unit intervals (U.I.) pk-pk and the frequency of internal modulation are in accordance with CCITT Recommendation 0.171 and are displayed on the front panel.

The modulated clock output can be applied to an external pattern generator such as the 3780A, 3762A, 3781A or 3782B. For jitter transfer function measurements, the CCITT standard 1000 repetitive pattern is provided within the 3785A/B. In addition, for demultiplexer jitter transfer function, jitter can be applied to an externally applied data stream which has the necessary framing and justification digits.

Measurements

The Jitter Receiver offers six types of measurement:

- Absolute jitter amplitude in U.I. pk-pk
- Jitter peak, positive or negative
- Jitter hit count of the number of times received jitter exceeds a user-defined hit threshold in U.I. pk
- Jitter hit seconds count of the number of seconds in which one or more jitter hits occur
- Jitter hit-free seconds count of the number of seconds which are free of jitter hits
- Maximum absolute jitter amplitude in U.I. pk-pk is held during the jitter analysis gating period

Simultaneous measurement of all six parameters is possible with result display selection. In addition, the Receiver has a built-in interval timer and real-time clock to allow measurements of jitter distribution against time to be made.

The measurements can be made on clock or data inputs with or without internal filtering. Two high pass filters and one low pass filter as specified by CCITT are provided for each of the four bit rates. In addition, external filters can be connected between the demodulated jitter output and the measuring circuitry input. The demodulated jitter output can also be used to measure rms jitter amplitude on an external voltmeter or to display jitter spectrum on an external analyzer.

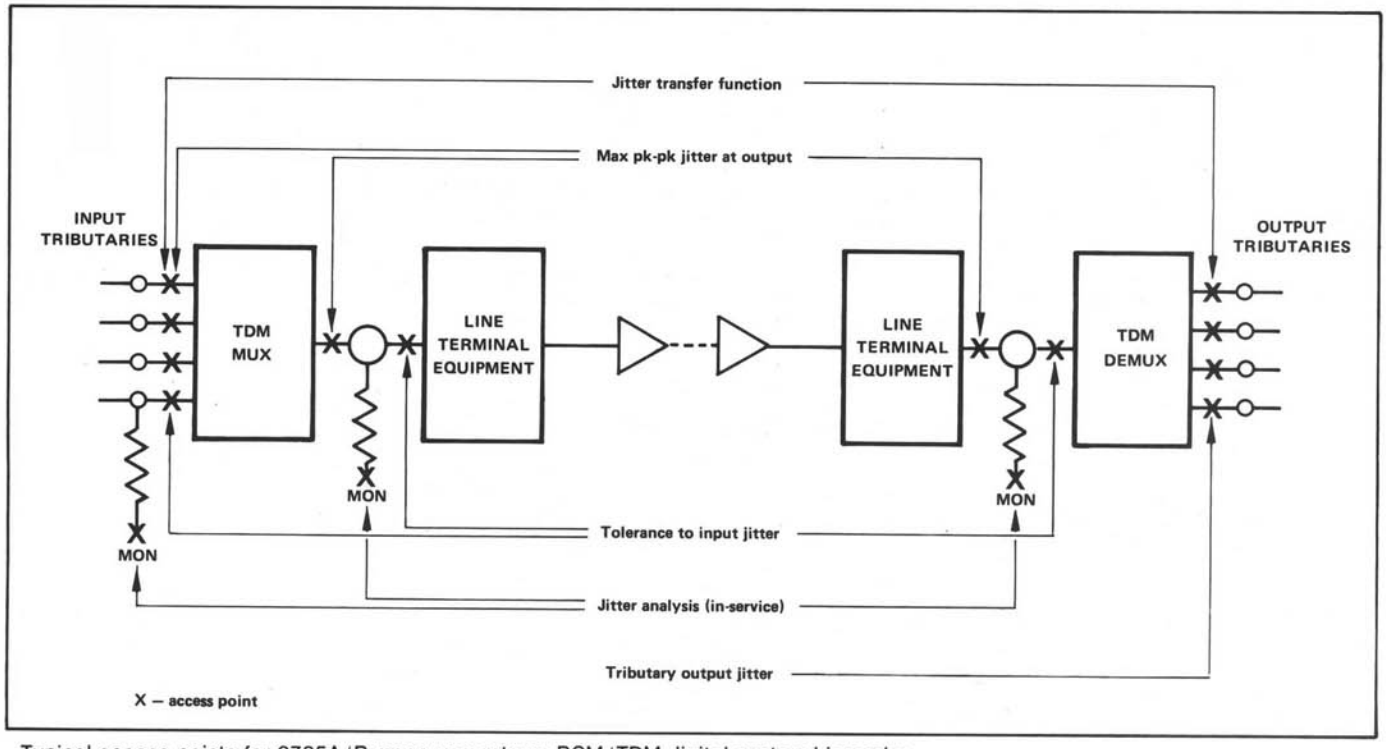
The clock reference for the jitter measurements can be internally derived from the applied data or clock via a narrow band phase-locked loop or externally derived from an applied reference.

The data input allows out-of-service or in-service measurements. The MON facility for in-service measurements has built-in additional gain to compensate for the flat loss at the protected monitor points.

HP-IB Operation

The capabilities of the 3785A/B can be enhanced by using the HP-IB to provide remote operation and automatic sequencing of results. The HP-IB facility offers several principal features:

- Remote control of front panel switches and pushbuttons using programming codes
- Control codes which are set to default values on power-on and can be user-defined with the controller
- The ability to transfer all desired switch positions and masks onto a tape memory and reloaded back onto the instrument at a later time
- Output of the result data to a printer (eg 5150A Thermal Printer) or storage memory



Typical access points for 3785A/B measurements on PCM/TDM digital system hierarchy

Specifications Summary

Jitter Generator

Data outputs

3785A: CCITT Rec G.703 interfaces for CEPT rates.

3785B: DSX-1, DSX-1C, DSX-2 and DSX-3 ternary outputs.

Internal clock: crystal controlled clocks at

3785A: 2.048, 8.448, and 34.368 MHz.

3785B: 1.544, 3.152, 6.312, and 44.736 MHz.

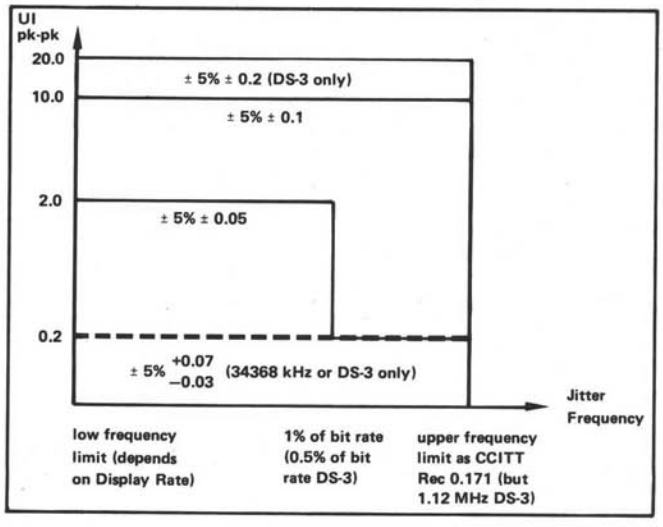
External clock: at internal rates ±10%.

Internal jitter modulation: conforms to CCITT Rec. 0.171 (lower frequency limit 1 Hz) (DS-3 only up to 1.12 MHz upper frequency).

External jitter modulation: conforms to CCITT Rec. 0.171 (lower frequency limit dc) (DS-3 only up to 1.12 MHz upper frequency).

Internal jitter tolerance masks: currently conforms to the appropriate CCITT G. series Recommendations.

Accuracy of jitter display:



Jitter Receiver

Data inputs: conforms to CCITT Rec. G.703.

3785A: for use at monitor points −30 dB (2.048 and 8.448 MHz) and −26 dB (34.368 MHz).

3785B: compatible with HI and XCON outputs for all internal bit rates, DS-1, DS-1C, DS-2 and DS-3. Additional monitor capability at each internal bit rate.

Clock input: at internal rates ±50 ppm or 2.0 to 34 MHz (3785A)/1.5 to 45 MHz (3785B) when also using Receiver External Reference Clock Input (rear panel).

Jitter amplitude measurement (pk-pk)

Ranges: 1, 10 (and 20, 3785B only).

Max. Jitter amplitude reduced at 6 dB/octave above a nominal corner frequency specified by CCITT Rec. 0.171.

Bandwidth: satisfies CCITT Rec. 0.171 (DS-3 upper frequency limit 1.12 MHz).

Accuracy: ±4% + additional intrinsic error.

Measurements: intrinsic jitter amplitude pk-pk, jitter amplitude +pk or −pk, jitter analysis. When used in conjunction with a pattern generator and error detector, jitter tolerance and jitter transfer function measurements can be made.

Options

3785A

001: fourth internal clock (25.776 MHz) in addition to the three standard clocks.

002: Siemens connectors on all front panel interfaces.

061: rack mounted.

062: rack mounted with front panel access to rear panel controls/connectors.

3785B

001: provides front panel data output and input connectors to enable direct application in the Canadian digital hierarchy.

061: rack mounted.

062: rack mounted with front panel access to rear panel controls/connectors.

Ordering Information

3785A Jitter Generator and Receiver (CEPT)

3785B Jitter Generator and Receiver (Bell)