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# MP1777A
# 10 GHz Jitter Analyzer
# Operation Manual
# Vol. 1

**Seventh Edition**

Read this manual before using the equipment.
Keep this manual with the equipment.

APR.
2005

## ANRITSU CORPORATION

Document No.: M-W1497AE-7.0

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# Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.
Some or all of the symbols may not be used on this equipment. In addition, when drawings are included in this manual, labels on the equipment may not be shown on them.

## Safety Symbols Used in Manual

**DANGER** ⚠ This indicates a very dangerous procedure that could result in death or serious injury if not performed properly.

**WARNING** ⚠ This indicates a hazardous procedure that could result in death or serious injury if not performed properly.

**CAUTION** ⚠ This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

## Safety Symbols Used on Equipment and/or in Manual

The following safety symbols are used inside or on the equipment near operation locations, and/or in manual to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.



This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

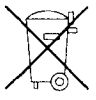


This indicates warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.





These indicate that the marked part should be recycled.

MP1777A
10 GHz Jitter Analyzer
Operation Manual Vol. 1

10 September 1998 (First Edition)
20 September 2002 (Seventh Edition)

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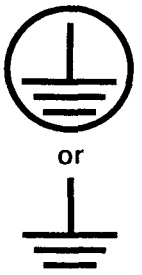
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# For Safety

## WARNING ⚠



1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.




2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

**Repair**

WARNING ⚠

3. This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

**Falling Over**

4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.



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# For Safety

## WARNING ⚠

**Battery Fluid**

5. DO NOT short the battery terminals and never attempt to disassemble it or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak.

   This fluid is poisonous.

   DO NOT touch it, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

**LCD**

6. This instrument uses a Liquid Crystal Display (LCD); DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.

   This liquid is very caustic and poisonous.

   DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.



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# For Safety

## CAUTION ⚠

**Changing Fuse**



1. Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. ALWAYS use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.

   T___A indicates a time-lag fuse.

   There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

**Cleaning**

2. Keep the power supply and cooling fan free of dust.
   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.




3. Use two or more people to lift and move this equipment, or use a trolley. There is a risk of back injury, if this equipment is lifted by one person.

**Changing memory back-up battery**

4. This equipment uses a lithium battery to back-up the memory. This battery must be replaced by a service engineer when it has reached the end of its useful life; contact the Anritsu sales section or your nearest representative.

   ***NOTE:*** The battery used in this equipment has a maximum useful life of 7 years. It should be changed before this period has elapsed.

5. The main unit of the MP1777A uses lithium batteries. When disposing of the batteries, make sure to conform with the local regulation.



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# Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory of Metrology and the Communications Research Laboratory, and was found to meet the published specifications.

# Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault, provided that this warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding, earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

# Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Corporation or its representatives at the address in this manual.



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## Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.
Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.
When you dispose of export-controlled items, the products/manuals are needed to be broken/shredded so as not to be unlawfully used for military purpose.

## Trademark and Registered Trademark

Quick Basic is a registered trademark of Microsoft Corporation.



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# CE Conformity marking

Anritsu affixes the CE Conformity Marking on the following product (s) in accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC and LVD directive of the European Union (EU).

## CE Marking



## 1. Product Model

Model: MP1777A 10 GHz Jitter Analyzer

and

Software: MP1777A Jitter Performance Test Software

## 2. Applied Directive

EMC: Council Directive 89/336/EEC

LVD: Council Directive 73/23/EEC



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## 3. Applied Standards

EMC: Emission: EN61326: 1997/A1: 1998 (Class A)
Immunity: EN61326: 1997/A1: 1998 (Annex A)

| | Performance Criteria* |
|---|---|
| IEC61000-4-2 (ESD) | B |
| IEC61000-4-3 (EMF) | A |
| IEC61000-4-4 (Burst) | B |
| IEC61000-4-5 (Surge) | B |
| IEC61000-4-6 (CRF) | A |
| IEC61000-4-8 (RPFMF) | A |
| IEC61000-4-11 (V dip/short) | B |

*: Performance Criteria

A: During testing normal performance within the specification limits.

B: During testing, temporary degradation, or loss of function or which is self-recovering.

Harmonic current emissions:
EN61000-3-2: 1995/A2: 1998 (Class A equipment)

LVD: EN61010-1: 1993/A2: 1995 (Installation Category II, Pollution Degree 2)



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# C-tick Conformity marking

Anritsu affixes the C-tick marking on the following product(s) in accordance with the regulation to indicate that they conform with the EMC framework of Australia New Zealand.

## C-tick marking




## 1. Product Model

Model: MP1777A 10 GHz Jitter Analyzer

and

Software: MP1777A Jitter Performance Test Software

## 2. Applied Standards

EMC: Emission:

AS/NZS 2064.1/2 (ISM, Group 1, Class A equipment)



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# Power Line Fuse Protection

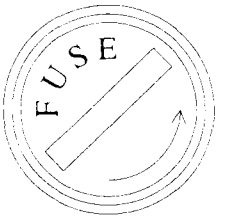
For safety, Anritsu products have either one or two fuses in the AC power lines as requested by the customer when ordering.

Single fuse: A fuse is inserted in one of the AC power lines.

Double fuse: A fuse is inserted in each of the AC power lines.

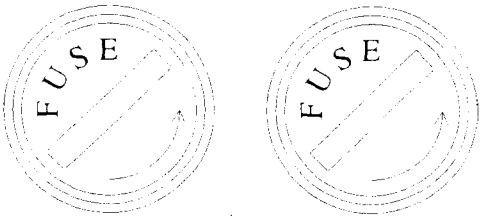
Example 1: An example of the single fuse is shown below:

**Fuse Holder**




Example 2: An example of the double fuse is shown below:

**Fuse Holders**






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# Composition of the MP1777A Operation Manual

The operation manual for the MP1777A 10 GHz Jitter Analyzer is composed of the two volumes shown below. Use the volume that suits the intended application of the product.

| | | |
|---|---|---|
| MP1777A Operation Manual | VOL. 1 | Operation manual for the main unit |
| | VOL. 2 | Operation manual for remote control |

**Operation manual for the main unit:** This manual provides an outline of the MP1777A and its specifications, and describes its panel, performance and operation.

**Operation manual for remote control:** This manual describes remote control and provides program examples.



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# Section 1 Outline


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# 1.1 Product Description

The MP1777A 10 GHz Jitter Analyzer provides functions to generate jitter and perform measurement necessary to evaluate the quality of digital transmission circuit.

Moreover, the combination of the 10/12.5/15 G PPG, 10/12.5/15 G ED, and MS4630A/B Network Analyzer enables the basic jitter measurement listed below with an external PC (personal computer) to function as a controller.

### Basic jitter measurement

(1) Jitter tolerance measurement
(2) Jitter transfer measurement
(3) Jitter generation measurement (rms measurement, With HP+LP)
(4) Output jitter measurement (peak to peak measurement, With HP1+LP, HP2+LP)



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# 1.2 Specification

## 1.2.1 Standard

| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 1 | Jitter Clock Output | | | |
| 1.1 | Frequency | 2,488.32 MHz, 4,976.64 MHz, 9,953.28 MHz | | |
| 1.2 | Termination/Level | 50 Ω/+5 dBm ± 3 dB | | |
| 1.3 | Connector | APC 3.5 (Clock Output) | | |
| 2 | Jitter Clock Input | | | |
| 2.1 | Frequency | 2,488.32 MHz ±50 ppm, 4,976.64 MHz ±30 ppm, 9,953.28 MHz ±20 ppm | | |
| 2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{p}$<br>0.15 V to 1.3 $V_{p}$ (with Option 19) | | |
| 2.3 | Connector | APC 3.5 (Clock Input) | | |
| 3 | Ext. Ref. Clock Input | | | |
| 3.1 | Frequency | 155.52 MHz ±50 ppm | | |
| 3.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{p}$ | | |
| 3.3 | Connector | SMA (Clock Input) | | |
| 4 | DCS Input | | | |
| 4.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI B8ZS) or 1.544 MHz ±50 ppm (CLOCK) | | |
| 4.2 | Level | Unbalance: | 1.544 MHz, | |
| | | | 2.048 MHz (CLOCK): | 1.125 $V_{p}$ ±34 % G.703 |
| | | | 2.048 Mbit/s (HDB3): | 2.37 $V_{p}$ ±10 % G.703 |
| | | Balance: | 1.544 Mbit/s, 2.048 Mbit/s: | |
| | | | 3.0 $V_{p}$ ±24 % ANSI T1.102-1987 | |
| 4.3 | Connector | Unbalance: | 75 Ω/BNC | |
| | | Balance: | 100 Ω/Weco 310 Compatible | (1.544 Mbit/s) |
| | | | 120 Ω/3-Pole CF | (2.048 Mbit/s) |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 5 | Ext. Mod. Input | | | |
| 5.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/9,953.28 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/4,976.64 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,488.32 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 5.2 | Sensitivity | (0.5 UI Range) | | |
| | | 0.5 $UI_{PP}$ ±15 %/0.5 $V_{PP}$ | (at 9,953.28 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (at 4,976.64 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/2 $V_{PP}$ | (at 2,488.32 Mbit/s) | |
| | | (3,200 UI, 1,600 UI, 800 UI, 80 UI, 40 UI, 20 UI Range) | | |
| | | 3,200 Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (9,953.28 Mbit/s only) |
| | | 1,600 Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,976.64 Mbit/s only) |
| | | 800 Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,488.32 Mbit/s only) |
| | | 80 Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (9,953.28 Mbit/s only) |
| | | 40 Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,976.64 Mbit/s only) |
| | | 20 Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,488.32 Mbit/s only) |
| 5.3 | Termination | 50 Ω | | |
| 5.4 | Connector | BNC (Ext. Mod. Input) | | |
| 6 | Demod. Output | | | |
| 6.1 | Frequency range | 100 Hz to 80 MHz | | |
| 6.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range), 1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) | | |
| 6.3 | Termination | 50 Ω | | |
| 6.4 | Connector | BNC (Demod. Output) | | |
| 7 | 10M STD Input | | | |
| 7.1 | Frequency range | 10 MHz ±50 ppm | | |
| 7.2 | Level | 0 to +10 dBm | | |
| 7.3 | Termination | 50 Ω | | |
| 7.4 | Connector | BNC | | |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8 | | |
| 8.1 | [Clock mode] | |
| | CLOCK | Internal, External, Lock 2 MHz (BNC), Lock 2 MHz (UBNC), Lock 2 Mbit/s (BNC), Lock 2 Mbit/s (UBNC), Lock 1.5 MHz (UBNC), Lock 1.5 Mbit/s (BNC), Lock 10 M |
| 8.1.1 | Internal | Reference signal synchronous with the internal reference signal |
| | Accuracy | ±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |
| 8.1.2 | External | Reference signal synchronous with the incoming signal from the Ext. Ref. Clock Input |
| 8.1.2.1 | Frequency | 155.52 MHz ±50 ppm |
| 8.1.2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 Vp-p |
| 8.1.2.3 | Connector | SMA |
| 8.1.3 | DCS Input | Reference signal synchronous with the incoming signal from the DCS Input |
| 8.1.3.1 | Frequency, Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) |
| 8.1.3.2 | Level | Unbalance: 1.544 MHz,<br>2.048 MHz (CLOCK): 1.125 Vp-p ±34 % G.703<br>2.048 Mbit/s (HDB3): 2.37 Vp-p ±10 % G.703<br>Balance: 1.544 Mbit/s, 2.048 Mbit/s:<br>3.0 Vp-p ±24 % ANSI T1.102-1987 |
| 8.1.3.3 | Connector | Unbalance: 75 Ω BNC<br>Balance: 100 Ω Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |
| 8.1.4 | 10M STD Input | Reference signal synchronous with the incoming signal from the 10M STD Input |
| 8.1.4.1 | Frequency range | 10 MHz ±50 ppm |
| 8.1.4.2 | Level | 0 to +10 dBm |
| 8.1.4.3 | Termination | 50 Ω |
| 8.1.4.4 | Connector | BNC |
| 8.2 | [Variable frequency] | |
| 8.2.1 | Frequency range | ±50 ppm |
| 8.2.2 | Step | 0.1 ppm |
| 8.2.3 | Accuracy | ±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |



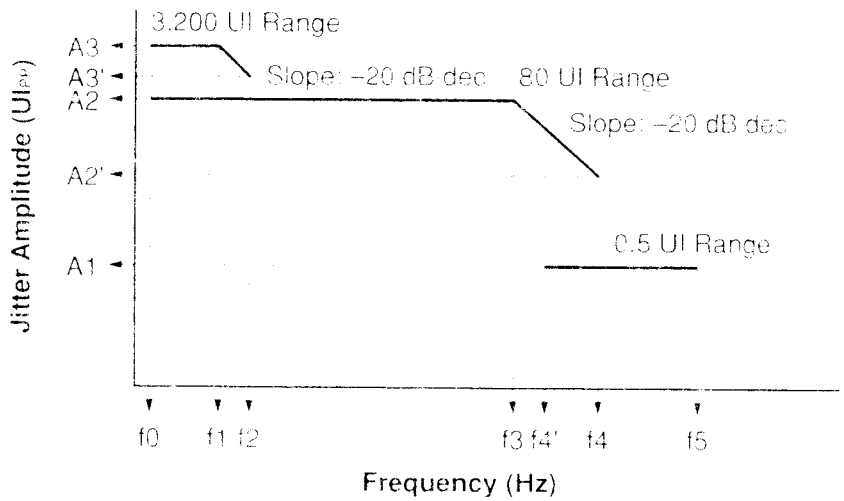
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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.3 | **[Jitter generation]** | | | |
| 8.3.1 | Bit Rate | 2,488.32 Mbit/s, 4,976.64 Mbit/s, 9,953.28 Mbit/s | | |
| 8.4 | Jitter modulating signal | | | |
| 8.4.1 | Ext. Mod. Input | Connector for external modulating signal input | | |
| 8.4.1.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/9,953.28 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/4,976.64 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,488.32 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 8.4.1.2 | Waveform | Sine wave | | |
| 8.4.1.3 | Sensitivity | 3,200 UI Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (9,953.28 Mbit/s only) |
| | | 1,600 UI Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,976.64 Mbit/s only) |
| | | 800 UI Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,488.32 Mbit/s only) |
| | | 80 UI Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (9,953.28 Mbit/s only) |
| | | 40 UI Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,976.64 Mbit/s only) |
| | | 20 UI Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,488.32 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.5 $V_{PP}$ | (at 9,953.28 Mbit/s) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (at 4,976.64 Mbit/s) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/2 $V_{PP}$ | (at 2,488.32 Mbit/s) |
| 8.4.1.4 | Termination | 50 Ω | | |
| 8.4.1.5 | Connector | BNC (Ext. Mod. Input) | | |
| 8.4.1.6 | Equalizer Amp | Selection of Equalizer Amp. to suit the jitter tolerance mask enabled (9,953.28 Mbit/s only) | | |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.5 | Jitter modulation | | | |
| 8.5.1 | Range | 3,200 UI Range: | Up to 3,200 $UI_{pp}$ | (9,953.28 Mbit/s only) |
| | | 1,600 UI Range: | Up to 1,600 $UI_{pp}$ | (4,976.64 Mbit/s only) |
| | | 800 UI Range: | Up to 800 $UI_{pp}$ | (2,488.32 Mbit/s only) |
| | | 80 UI Range: | Up to 80 $UI_{pp}$ | (9,953.28 Mbit/s only) |
| | | 40 UI Range: | Up to 40 $UI_{pp}$ | (4,976.64 Mbit/s only) |
| | | 20 UI Range: | Up to 20 $UI_{pp}$ | (2,488.32 Mbit/s only) |
| | | 0.5 UI Range: | Up to 0.5 $UI_{pp}$ | |
| 8.5.2 | Amount of modulation | **[Bit Rate: at 9,953.28 Mbit/s]** | | |




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 9,953.28 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

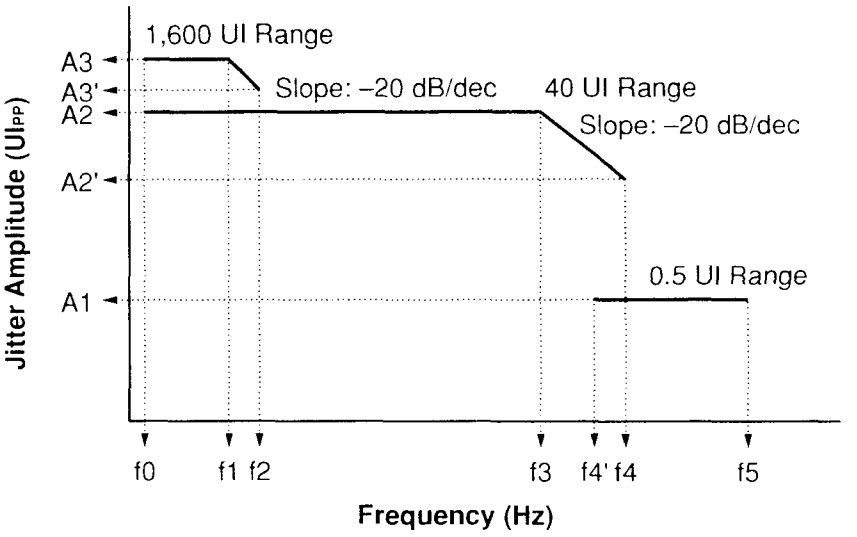
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 80 MHz | 0.5 $UI_{pp}$ | 4 $UI_{pp}$ | 80 $UI_{pp}$ | 100 $UI_{pp}$ | 3,200 $UI_{pp}$ |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 4,976.64 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 4,976.64 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

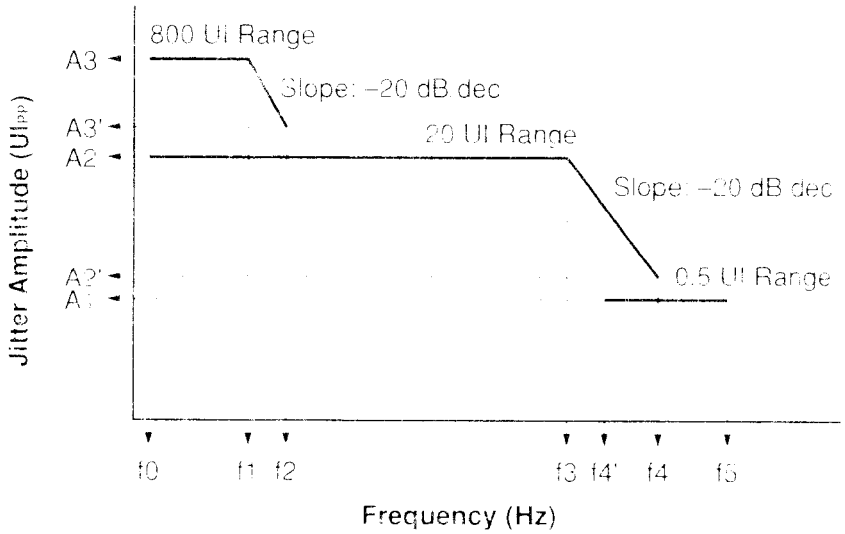
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 40 MHz | 0.5 UIPP | 2 UIPP | 40 UIPP | 50 UIPP | 1,600 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 2,488.32 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 2,488.32 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 20 MHz | 0.5 UIpp | 1 UIpp | 20 UIpp | 25 UIpp | 800 UIpp |

8.5.3 Accuracy

| | | |
|---|---|---|
| 3,200 UI Range: | ±5 % ±10 UIpp at 10 Hz | at 9,953.28 Mbit/s |
| 1,600 UI Range: | ±5 % ±8 UIpp at 10 Hz | at 4,976.64 Mbit/s |
| 800 UI Range: | ±5 % ±5 UIpp at 10 Hz | at 2,488.32 Mbit/s |
| 80 UI Range: | ±5 % ±0.8 UIpp at 100 kHz | at 9,953.28 Mbit/s |
| 40 UI Range: | ±5 % ±0.6 UIpp at 100 kHz | at 4,976.64 Mbit/s |
| 20 UI Range: | ±5 % ±0.3 UIpp at 100 kHz | at 2,488.32 Mbit/s |
| 0.5 UI Range: | ±5 % ±0.1 UIpp at 100 kHz | at 9,953.28 Mbit/s |
| | ±5 % ±0.08 UIpp at 100 kHz | at 4,976.64 Mbit/s |
| | ±5 % ±0.05 UIpp at 100 kHz | at 2,488.32 Mbit/s |

**Frequency error (100 kHz set as the reference)**

| | |
|---|---|
| 10 Hz to 20 Hz: | ±5 % |
| 20 Hz to 300 kHz: | ±2 % |
| 300 kHz to 1 MHz: | ±5 % |
| 1 MHz to 3 MHz: | ±5 % |
| 3 MHz to 10 MHz: | ±10 % |
| 10 MHz to 80 MHz: | ±15 % |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.6 | **[Jitter measurement]**<br>Jitter signal input | |
| 8.6.1 | Frequency | 2,488.32 MHz ±50 ppm, 4,976.64 MHz ±30 ppm, 9,953.28 MHz ±20 ppm |
| 8.7 | Jitter demodulating signal | |
| 8.7.1 | Demod. Output | Output of signal demodulated from the incoming signal |
| 8.7.1.1 | Frequency range | 100 Hz to 80 MHz |
| 8.7.1.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range)<br>1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) |
| 8.7.1.3 | Termination | 50 Ω |
| 8.7.1.4 | Connector | BNC |
| 8.8 | Jitter measurement | |
| 8.8.1 | Unit | $UI_{PP}$, UI+p, UI–p, UIrms |
| 8.8.2 | Measurement range | 1 UI Range (0.000 to 1.010 $UI_{PP}$/Step 0.001 $UI_{PP}$)<br>(0.000 to 0.357 UIrms/Step 0.001 UIrms)<br>4 UI Range (0.00 to 4.04 $UI_{PP}$/Step 0.01 $UI_{PP}$)<br>(0.00 to 1.43 UIrms/Step 0.01 UIrms) |
| 8.8.3 | Measurement mode | Single, Repeat, Manual |
| 8.8.4 | Measurement interval | 1 to 99 (second) (1-second step)<br>1 to 99 (minute) (1-minute step)<br>1 to 99 (hour) (1-hour step) |
| 8.8.5 | Measurement display | Current, Last |
| 8.8.6 | Filter | LP, HP1+LP, HP1'+LP, HP2+LP, HP+LP, HP'+LP |

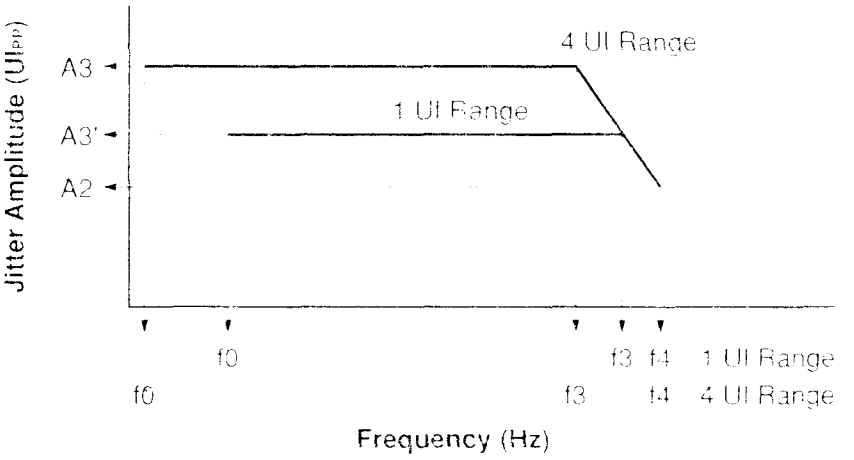
| Bit Rate (bit/s) | HP1 (Hz) | HP1'* (Hz) | HP2 (Hz) | HP' (Hz) | HP (Hz) | LP (Hz) |
|---|---|---|---|---|---|---|
| 2,488.32 M | 5 k | – | 1 M | – | 12 k | 20 M |
| 4,976.64 M | 8 k | – | 2 M | – | 12 k | 40 M |
| 9,953.28 M | 10 k | 20 k | 4 M | 50 k | 12 k | 80 M |

* The HP1'+LP filter can be used at Revision 3 of main body farm-ware or the later.



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.7 | Measuring range | |




| Bit Rate (bit s) | Range | f0 | f3 | f4 | A2 | A3' | A3 |
|---|---|---|---|---|---|---|---|
| 2,488.32 M | 1 UI | 100 Hz | 10 MHz | 20 MHz | 0.5 UIpp | 1 UIpp | |
| | 4 UI | 100 Hz | 2.5 MHz | 20 MHz | 0.5 UIpp | | 4 UIpp |
| 4,976.64 M | 1 UI | 100 Hz | 20 MHz | 40 MHz | 0.5 UIpp | 1 UIpp | |
| | 4 UI | 100 Hz | 5 MHz | 40 MHz | 0.5 UIpp | | 4 UIpp |
| 9,953.28 M | 1 UI | 100 Hz | 40 MHz | 80 MHz | 0.5 UIpp | 1 UIpp | |
| | 4 UI | 100 Hz | 10 MHz | 80 MHz | 0.5 UIpp | | 4 UIpp |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.8 | Accuracy | |

**[UIPP, UI+p, UI–p]**

1 UI Range: ±5 % ±W UIPP/at 100 kHz

4 UI Range: ±5 % ±W UIPP/at 100 kHz

**[UIrms]**

1 UI Range: ±5 % ±Y UIrms/at 100 kHz

4 UI Range: ±5 % ±Y UIrms/at 100 kHz

| Bit Rate (bit/s) | W *1 | | Y *2 | |
|---|---|---|---|---|
| | 1 UI Range | 4 UI Range | 1 UI Range | 4 UI Range |
| 2,488.32 M | 0.05 UIPP | 0.22 UIPP | 0.008 UIrms | 0.08 UIrms |
| 4,976.64 M | 0.07 UIPP | 0.24 UIPP | 0.009 UIrms | 0.09 UIrms |
| 9,953.28 M | 0.09 UIPP | 0.26 UIPP | 0.010 UIrms | 0.10 UIrms |

***NOTE* *1:**

With HP1+LP

***NOTE* *2:**

With HP+LP

**Frequency error (100 kHz set as the reference)**

100 Hz to 300 kHz: ±2 %

300 kHz to 1 MHz: ±3 %

1 MHz to 3 MHz: ±5 %

3 MHz to 10 MHz: ±10 %

10 MHz to 80 MHz: ±15 %

| | | |
|---|---|---|
| 8.9 | LED display | Unlock, Alarm, Remote |
| 8.9.1 | Unlock | Lights up when the Rx section switches into the unlock status. |
| 8.9.2 | Alarm | Lights up when the Tx section switches into the abnormal status (such as unlock). |
| 8.9.3 | Remote | Lights up when the mode switches into the remote status by the external controller. |
| 8.10 | External interface | |
| 8.10.1 | GPIB | All the control except for cancellation of remote status enabled from the external controller |
| 8.11 | Other | |
| 8.11.1 | Dimensions | 221.5 High, 426 Wide, 451 Deep (mm) |
| 8.11.2 | Weight | 23 kg (Max.) |
| 8.11.3 | Power source | 85 to 132 Vac or 170 to 250 Vac 47.5 to 63 Hz |
| 8.11.4 | Temperature | 10 to 40 °C, –20 to 60 °C (When stored) |



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## 1.2.2 Option 01

| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 1 | Jitter Clock Output | | | |
| 1.1 | Frequency | 2,494.16 MHz, 4,988.32 MHz, 9,976.64 MHz | | |
| 1.2 | Termination/Level | 50 Ω +5 dBm ±3 dB | | |
| 1.3 | Connector | APC 3.5 (Clock Output) | | |
| 2 | Jitter Clock Input | | | |
| 2.1 | Frequency | 2,494.16 MHz ±50 ppm, 4,988.32 MHz ±30 ppm, 9,976.64 MHz ±20 ppm | | |
| 2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 Vp<br>0.15 V to 1.3 Vp (with Option 19) | | |
| 2.3 | Connector | APC 3.5 (Clock Input) | | |
| 3 | Ext. Ref. Clock Input | | | |
| 3.1 | Frequency | 155.885 MHz | | |
| 3.2 | Termination/Level | 50 Ω/0.7 V to 1.3 Vp | | |
| 3.3 | Connector | SMA (Clock Input) | | |
| 4 | DCS Input | | | |
| 4.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) | | |
| 4.2 | Level | Unbalance: | 1.544 MHz, | |
| | | | 2.048 MHz (CLOCK): | 1.125 Vp ±24 % G.703 |
| | | | 2.048 Mbit/s (HDB3): | 2.37 Vp ±10 % G.703 |
| | | Balance: | 1.544 Mbit/s, 2.048 Mbit/s: | |
| | | | 3.0 Vp ±24 % ANSI T1.102-1987 | |
| 4.3 | Connector | Unbalance: | 75 Ω BNC | |
| | | Balance: | 100 Ω/Weco 310 Compatible | (1.544 Mbit/s) |
| | | | 120 Ω/3-Pole CF | (2.048 Mbit/s) |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 5 | Ext. Mod. Input | | | |
| 5.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/9,976.64 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/4,988.32 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,494.16 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 5.2 | Sensitivity | (0.5 UI Range) | | |
| | | 0.5 $UI_{PP}$ ±15 %/0.5 $V_{PP}$ | (at 9,976.64 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (at 4,988.32 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/2 $V_{PP}$ | (at 2,499.16 Mbit/s) | |
| | | (3,200 UI, 1,600 UI, 800 UI, 80 UI, 40 UI, 20 UI Range) | | |
| | | 3,200 Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (9,976.64 Mbit/s only) |
| | | 1,600 Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,988.32 Mbit/s only) |
| | | 800 Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,494.16 Mbit/s only) |
| | | 80 Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (9,976.64 Mbit/s only) |
| | | 40 Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,988.32 Mbit/s only) |
| | | 20 Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,499.16 Mbit/s only) |
| 5.3 | Termination | 50 Ω | | |
| 5.4 | Connector | BNC (Ext. Mod. Input) | | |
| 6 | Demod. Output | | | |
| 6.1 | Frequency range | 100 Hz to 80 MHz | | |
| 6.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range), 1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) | | |
| 6.3 | Termination | 50 Ω | | |
| 6.4 | Connector | BNC (Demod. Output) | | |
| 7 | 10M STD Input | | | |
| 7.1 | Frequency range | 10 MHz ±50 ppm | | |
| 7.2 | Level | 0 to +10 dBm | | |
| 7.3 | Termination | 50 Ω | | |
| 7.4 | Connector | BNC | | |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8 | | |
| 8.1 | [Clock mode] | |
| | CLOCK | Internal, External, Lock 2 MHz (B), Lock 2 MHz (UB), Lock 2 Mbit/s (B), Lock 1.5 Mbit/s (UB), Lock 1.5 MHz (UB), Lock 1.5 Mbit/s (B), Lock 10 M |
| 8.1.1 | Internal<br>Accuracy | Reference signal synchronous with the internal reference signal<br>±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |
| 8.1.2 | External | Reference signal synchronous with the incoming signal from the Ext. Ref. Clock Input |
| 8.1.2.1 | Frequency | 155.885 MHz ±50 ppm |
| 8.1.2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 Vp-p |
| 8.1.2.3 | Connector | SMA |
| 8.1.3 | DCS Input | Reference signal synchronous with the incoming signal from the DCS Input |
| 8.1.3.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) |
| 8.1.3.2 | Level | Unbalance: 1.544 MHz, 2.048 MHz (CLOCK):<br>1.125 Vp-p ±34 % G.703<br>2.048 Mbit/s (HDB3): 2.37 Vp-p ±10 % G.703<br>Balance: 1.544 Mbit/s, 2.048 Mbit/s:<br>3.0 Vp-p ±24 % ANSI T1.102-1987 |
| 8.1.3.3 | Connector | Unbalance: 75 Ω/BNC<br>Balance: 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CI (2.048 Mbit/s) |
| 8.1.4 | 10M STD Input | Reference signal synchronous with the incoming signal from the 10M STD Input |
| 8.1.4.1 | Frequency range | 10 MHz ±50 ppm |
| 8.1.4.2 | Level | 0 to +10 dBm |
| 8.1.4.3 | Termination | 50 Ω |
| 8.1.4.4 | Connector | BNC |
| 8.2 | [Variable frequency] | |
| 8.2.1 | Frequency range | ±50 ppm |
| 8.2.2 | Step | 0.1 ppm |
| 8.2.3 | Accuracy | ±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |



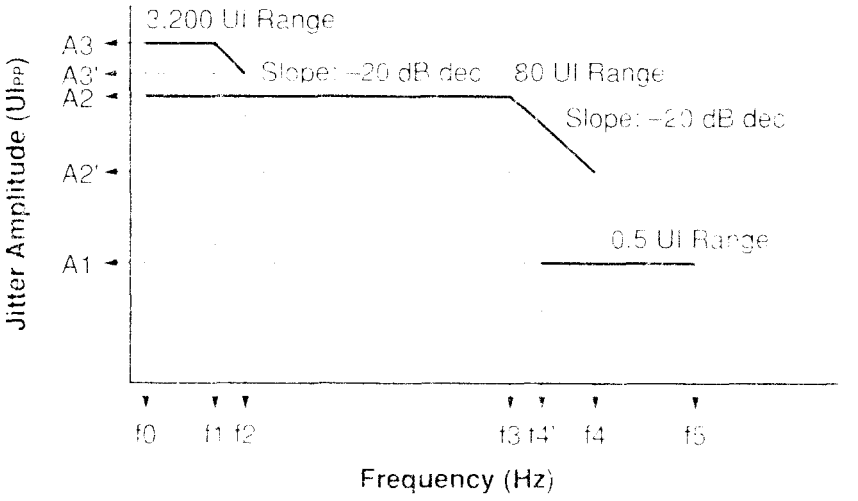
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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.3 | **[Jitter generation]** | | | |
| 8.3.1 | Bit Rate | 2,494.16 Mbit/s, 4,988.32 Mbit/s, 9,976.64 Mbit/s | | |
| 8.4 | Jitter modulating signal | | | |
| 8.4.1 | Ext. Mod. Input | Connector for external modulating signal input | | |
| 8.4.1.1 | Frequency range | 100 kHz to 80 MHz | (0.5 UI Range/9,976.64 Mbit/s) | |
| | | 100 kHz to 40 MHz | (0.5 UI Range/4,988.32 Mbit/s) | |
| | | 100 kHz to 20 MHz | (0.5 UI Range/2,494.16 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 8.4.1.2 | Waveform | Sine wave | | |
| 8.4.1.3 | Sensitivity | 3,200 UI Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (9,976.64 Mbit/s only) |
| | | 1,600 UI Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,988.32 Mbit/s only) |
| | | 800 UI Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,494.16 Mbit/s only) |
| | | 80 UI Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (9,976.64 Mbit/s only) |
| | | 40 UI Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,988.32 Mbit/s only) |
| | | 20 UI Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,494.16 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.5 $V_{PP}$ | (9,976.64 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (4,988.32 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/2 $V_{PP}$ | (2,494.16 Mbit/s only) |
| 8.4.1.4 | Termination | 50 Ω | | |
| 8.4.1.5 | Connector | BNC (Ext. Mod. Input) | | |
| 8.4.1.6 | Equalizer Amp | Selection of Equalizer Amp. to suit the jitter tolerance mask enabled (9,976.64 Mbit/s only) | | |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.5 | Jitter modulation | | | |
| 8.5.1 | Range | 3,200 UI Range: | Up to 3,200 UIpp | (9,976.64 Mbit/s only) |
| | | 1,600 UI Range: | Up to 1,600 UIpp | (4,988.32 Mbit/s only) |
| | | 800 UI Range: | Up to 800 UIpp | (2,494.16 Mbit/s only) |
| | | 80 UI Range: | Up to 80 UIpp | (9,976.64 Mbit/s only) |
| | | 40 UI Range: | Up to 40 UIpp | (4,988.32 Mbit/s only) |
| | | 20 UI Range: | Up to 20 UIpp | (2,494.16 Mbit/s only) |
| | | 0.5 UI Range: | Up to 0.5 UIpp | |
| 8.5.2 | Amount of modulation | [Bit Rate: at 9,976.64 Mbit/s] | | |




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 9,976,64 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 10 MHz |

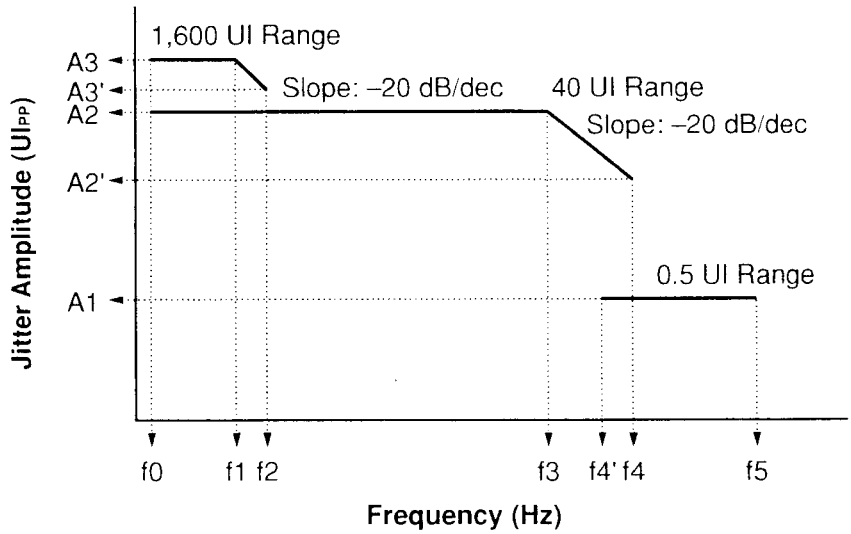
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 80 MHz | 0.5 UIpp | 4 UIpp | 80 UIpp | 160 UIpp | 3,200 UIpp |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 4,988.32 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 4,988.32 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

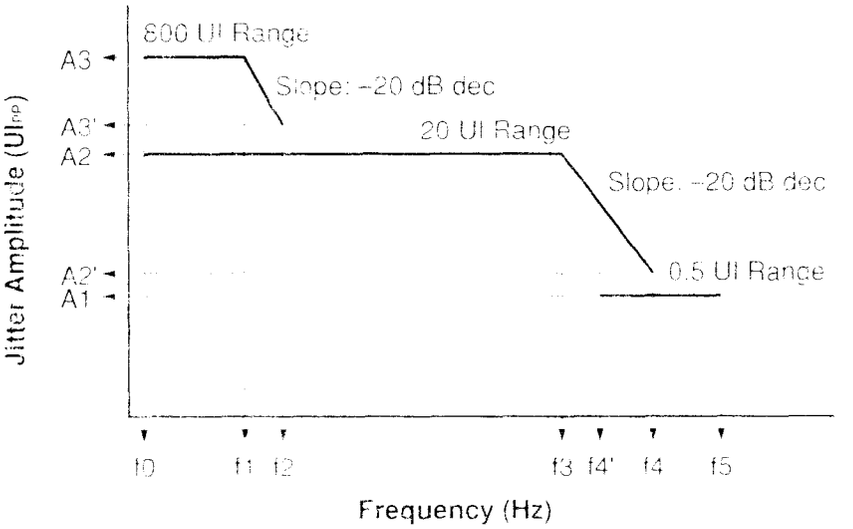
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 40 MHz | 0.5 UIPP | 2 UIPP | 40 UIPP | 50 UIPP | 1,600 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 2,494.16 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 2,494.16 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 2[illegible] MHz | 0.5 UIpp | 1 UIpp | 20 UIpp | 25 UIpp | 800 UIpp |

8.5.3 Accuracy

| | | |
|---|---|---|
| 3,200 UI Range: | ±5 % ±10 UIpp (at 10 Hz | (at 9,976.64 Mbit/s) |
| 1,600 UI Range: | ±5 % ± 8 UIpp (at 10 Hz | (at 4,988.32 Mbit/s) |
| 800 UI Range: | ±5 % ± 5 UIpp (at 10 Hz | (at 2,494.16 Mbit/s) |
| 80 UI Range: | ±5 % ±0.8 UIpp (at 100 kHz | (at 9,976.64 Mbit/s) |
| 40 UI Range: | ±5 % ±0.6 UIpp (at 100 kHz | (at 4,988.32 Mbit/s) |
| 20 UI Range: | ±5 % ±0.3 UIpp (at 100 kHz | (at 2,494.16 Mbit/s) |
| 0.5 UI Range: | ±5 % ±0.1 UIpp (at 100 kHz | (at 9,976.64 Mbit/s) |
| | ±5 % ±0.08 UIpp (at 100 kHz | (at 4,988.32 Mbit/s) |
| | ±5 % ±0.05 UIpp (at 100 kHz | (at 2,494.16 Mbit/s) |

**Frequency error (100 kHz set as the reference)**

| | |
|---|---|
| 10 Hz to 20 Hz: | ±5 % |
| 20 Hz to 300 kHz: | ±2 % |
| 300 kHz to 1 MHz: | ±3 % |
| 1 MHz to 3 MHz: | ±5 % |
| 3 MHz to 10 MHz: | ±10 % |
| 10 MHz to 80 MHz: | ±15 % |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.6 | **[Jitter measurement]**<br>Jitter signal input | |
| 8.6.1 | Frequency | 2,494.16 MHz ±50 ppm, 4,988.32 MHz ±30 ppm, 9,976.64 MHz ±20 ppm |
| 8.7 | Jitter demodulating signal | |
| 8.7.1 | Demod. Output | Output of signal demodulated from the incoming signal |
| 8.7.1.1 | Frequency range | 100 Hz to 80 MHz |
| 8.7.1.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range)<br>1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) |
| 8.7.1.3 | Termination | 50 Ω |
| 8.7.1.4 | Connector | BNC |
| 8.8 | Jitter measurement | |
| 8.8.1 | Unit | $UI_{PP}$, UI+p, UI–p, UIrms |
| 8.8.2 | Measurement range | 1 UI Range (0.000 to 1.010 $UI_{PP}$/Step 0.001 $UI_{PP}$)<br>(0.000 to 0.357 UIrms/Step 0.001 UIrms)<br>4 UI Range (0.00 to 4.04 $UI_{PP}$/Step 0.01 $UI_{PP}$)<br>(0.00 to 1.43 UIrms/Step 0.01 UIrms) |
| 8.8.3 | Measurement mode | Single, Repeat, Manual |
| 8.8.4 | Measurement interval | 1 to 99 (second) (1-second step)<br>1 to 99 (minute) (1-minute step)<br>1 to 99 (hour) (1-hour step) |
| 8.8.5 | Measurement display | Current, Last |
| 8.8.6 | Filter | LP, HP1+LP, HP1'+LP, HP2+LP, HP+LP, HP'+LP |

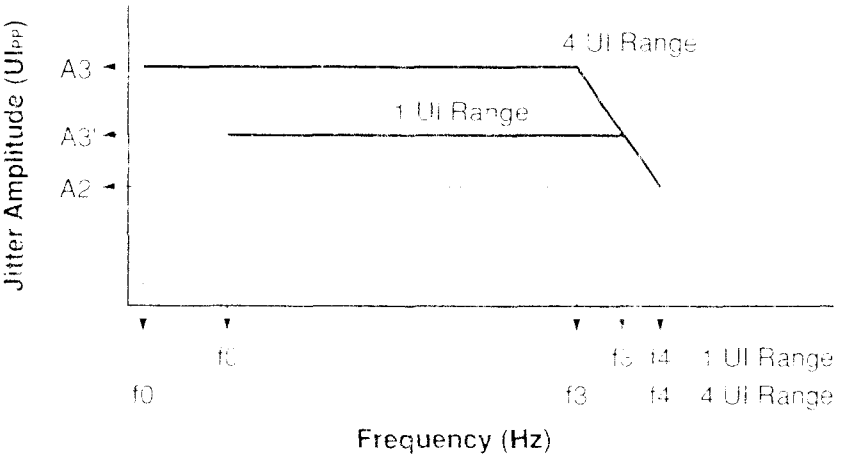
| Bit Rate (bit/s) | HP1 (Hz) | HP1'* (Hz) | HP2 (Hz) | HP' (Hz) | HP (Hz) | LP (Hz) |
|---|---|---|---|---|---|---|
| 2,494.16 M | 5 k | – | 1 M | – | 12 k | 20 M |
| 4,988.32 M | 8 k | – | 2 M | – | 12 k | 40 M |
| 9,976.64 M | 10 k | 20 k | 4 M | 50 k | 12 k | 80 M |

* The HP1'+LP filter can be used at Revision 3 of main body farm-ware or the later.



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.7 | Measuring range | |




| Bit Rate (bit/s) | Range | f0 | f3 | f4 | A2 | A3' | A3 |
|---|---|---|---|---|---|---|---|
| 2,494.16 M | 1 UI | 100 Hz | 10 MHz | 20 MHz | 0.5 UIpp | 1 UIpp | |
| | 4 UI | 100 Hz | 2.5 MHz | 20 MHz | 0.5 UIpp | | 4 UIpp |
| 4,988.32 M | 1 UI | 100 Hz | 20 MHz | 40 MHz | 0.5 UIpp | 1 UIpp | |
| | 4 UI | 100 Hz | 5 MHz | 40 MHz | 0.5 UIpp | | 4 UIpp |
| 9,976.64 M | 1 UI | 100 Hz | 40 MHz | 80 MHz | 0.5 UIpp | 1 UIpp | |
| | 4 UI | 100 Hz | 10 MHz | 80 MHz | 0.5 UIpp | | 4 UIpp |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.8 | Accuracy | **[UIpp, UI+p, UI–p]**<br>1 UI Range: ±5 % ±W UIpp/at 100 kHz<br>4 UI Range: ±5 % ±W UIpp/at 100 kHz<br><br>**[UIrms]**<br>1 UI Range: ±5 % ±Y UIrms/at 100 kHz<br>4 UI Range: ±5 % ±Y UIrms/at 100 kHz |

| Bit Rate (bit/s) | W*1 | | Y*2 | |
|---|---|---|---|---|
| | 1 UI Range | 4 UI Range | 1 UI Range | 4 UI Range |
| 2,494.16 M | 0.05 UIpp | 0.22 UIpp | 0.008 UIrms | 0.08 UIrms |
| 4,988.32 M | 0.07 UIpp | 0.24 UIpp | 0.009 UIrms | 0.09 UIrms |
| 9,976.64 M | 0.09 UIpp | 0.26 UIpp | 0.010 UIrms | 0.10 UIrms |

***NOTE *1:***

With HP1+LP

***NOTE *2:***

With HP+LP

**Frequency error (100 kHz set as the reference)**

100 Hz to 300 kHz: ±2 %
300 kHz to 1 MHz: ±3 %
1 MHz to 3 MHz: ±5 %
3 MHz to 10 MHz: ±10 %
10 MHz to 80 MHz: ±15 %

| | | |
|---|---|---|
| 8.9 | LED display | Unlock, Alarm, Remote |
| 8.9.1 | Unlock | Lights up when the Rx section switches into the unlock status. |
| 8.9.2 | Alarm | Lights up when the Tx section switches into the abnormal status (such as unlock). |
| 8.9.3 | Remote | Lights up when the mode switches into the remote status by the external controller. |
| 8.10 | External interface | |
| 8.10.1 | GPIB | All the control except for cancellation of remote status enabled from the external controller |
| 8.11 | Other | |
| 8.11.1 | Dimensions | 221.5 High, 426 Wide, 451 Deep (mm) |
| 8.11.2 | Weight | 23 kg (Max.) |
| 8.11.3 | Power source | 85 to 132 Vac or 170 to 250 Vac 47.5 to 63 Hz |
| 8.11.4 | Temperature | 10 to 40 °C, –20 to 60 °C (When stored) |



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## 1.2.3 Option 02

| Section | Specification Item | Specification Value | |
|---|---|---|---|
| 1 | Jitter Clock Output | | |
| 1.1 | Frequency | 2,666.057 MHz, 5,332.114 MHz, 10,664.228 MHz | |
| 1.2 | Termination/Level | 50 Ω/+5 dBm ±3 dB | |
| 1.3 | Connector | APC 3.5 (Clock Output) | |
| 2 | Jitter Clock Input | | |
| 2.1 | Frequency | 2,666.057 MHz ±50 ppm, 5,332.114 MHz ±30 ppm,<br>10,664.228 MHz ±20 ppm | |
| 2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{pp}$<br>0.15 V to 1.3 $V_{pp}$ (with Option 10) | |
| 2.3 | Connector | APC 3.5 (Clock Input) | |
| 3 | Ext. Ref. Clock Input | | |
| 3.1 | Frequency | 166.62857 MHz | |
| 3.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{pp}$ | |
| 3.3 | Connector | SMA (Clock Input) | |
| 4 | DCS Input | | |
| 4.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI B8ZS) or 1.544 MHz ±50 ppm (CLOCK) | |
| 4.2 | Level | Unbalance: | 1.544 MHz, 2.048 MHz (CLOCK):<br>1.425 $V_{pp}$ ±3 dB G.703<br>2.048 Mbit/s (HDB3): 2.37 $V_{pp}$ ±10 % G.703 |
| | | Balance: | 1.544 Mbit/s, 2.048 Mbit/s:<br>3.0 $V_{pp}$ ±24 % ANSI T1.102-1987 |
| 4.3 | Connector | Unbalance: | 75 Ω/BNC |
| | | Balance: | 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CP (2.048 Mbit/s) |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 5 | Ext. Mod. Input | | | |
| 5.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/10,664.228 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/5,332.114 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,666.057 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 5.2 | Sensitivity | (0.5 UI Range) | | |
| | | 0.5 $UI_{PP}$ ±15 %/0.5 $V_{PP}$ | (at 10,664.228 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (at 5,332.114 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/2 $V_{PP}$ | (at 2,666.057 Mbit/s) | |
| | | (3,200 UI, 1,600 UI, 800 UI, 80 UI, 40 UI, 20 UI Range) | | |
| | | 3,200 Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,664.228 Mbit/s only) |
| | | 1,600 Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,332.114 Mbit/s only) |
| | | 800 Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,666.057 Mbit/s only) |
| | | 80 Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,664.228 Mbit/s only) |
| | | 40 Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,332.114 Mbit/s only) |
| | | 20 Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,666.057 Mbit/s only) |
| 5.3 | Termination | 50 Ω | | |
| 5.4 | Connector | BNC (Ext. Mod. Input) | | |
| 6 | Demod. Output | | | |
| 6.1 | Frequency range | 100 Hz to 80 MHz | | |
| 6.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range), 1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) | | |
| 6.3 | Termination | 50 Ω | | |
| 6.4 | Tangential line | BNC (Demod. Output) | | |
| 7 | 10M STD Input | | | |
| 7.1 | Frequency range | 10 MHz ±50 ppm | | |
| 7.2 | Level | 0 to +10 dBm | | |
| 7.3 | Termination | 50 Ω | | |
| 7.4 | Connector | BNC | | |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8 | | |
| 8.1 | **[Clock mode]** | |
| | CLOCK | Internal, External, Lock 2 MHz (BNC), Lock 2 MHz (UBNC), Lock 2 Mbit/s (BNC), Lock 2 Mbit/s (UBNC), Lock 1.5 MHz (UBNC), Lock 1.5 Mbit/s (BNC), Lock 10 M |
| 8.1.1 | Internal<br>Accuracy | Reference signal synchronous with the internal reference signal<br>±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |
| 8.1.2 | External | Reference signal synchronous with the incoming signal from the Ext. Ref. Clock Input |
| 8.1.2.1 | Frequency | 166.62857 MHz ±50 ppm |
| 8.1.2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 Vp-p |
| 8.1.2.3 | Connector | SMA |
| 8.1.3 | DCS Input | Reference signal synchronous with the incoming signal from the DCS Input |
| 8.1.3.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) |
| 8.1.3.2 | Level | Unbalance: 1.544 MHz, 2.048 MHz (CLOCK):<br>1.125 V p-p ±34 % G.703<br>2.048 Mbit/s (HDB3): 2.37 V p-p ±10 % G.703<br>Balance: 1.544 Mbit/s, 2.048 Mbit/s:<br>3.0 V p-p ±24 % ANSI T1.102-1987 |
| 8.1.3.3 | Connector | Unbalance: 75 Ω/BNC<br>Balance: 100 Ω/Western 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CP (2.048 Mbit/s) |
| 8.1.4 | 10M STD Input | Reference signal synchronous with the incoming signal from the 10M STD Input |
| 8.1.4.1 | Frequency range | 10 MHz ±50 ppm |
| 8.1.4.2 | Level | 0 to +10 dBm |
| 8.1.4.3 | Termination | 50 Ω |
| 8.1.4.4 | Connector | BNC |
| 8.2 | **[Variable frequency]** | |
| 8.2.1 | Frequency range | ±50 ppm |
| 8.2.2 | Step | 0.1 ppm |
| 8.2.3 | Accuracy | ±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |



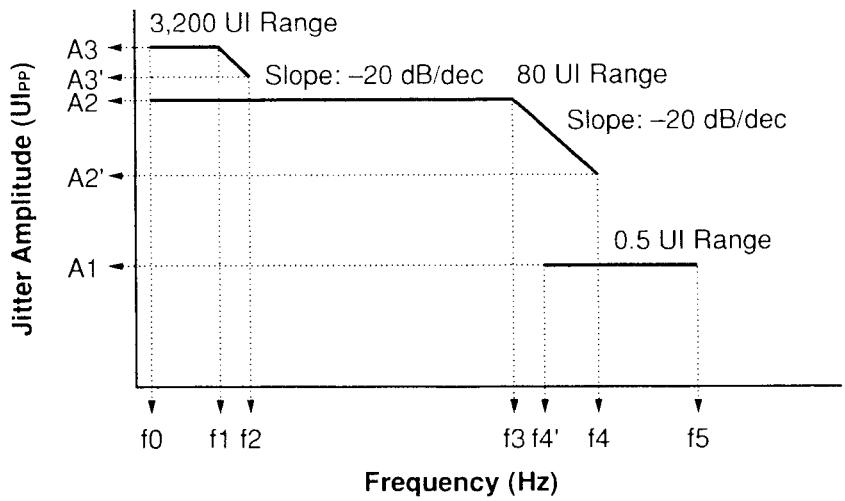
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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.3 | **[Jitter generation]** | | | |
| 8.3.1 | Bit Rate | 2,666.057 Mbit/s, 5,332.114 Mbit/s, 10,664.228 Mbit/s | | |
| 8.4 | Jitter modulating signal | | | |
| 8.4.1 | Ext. Mod. Input | Connector for external modulating signal input | | |
| 8.4.1.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/10,664.228 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/5,332.114 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,666.057 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 8.4.1.2 | Waveform | Sine wave | | |
| 8.4.1.3 | Sensitivity | 3,200 UI Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,664.228 Mbit/s only) |
| | | 1,600 UI Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,332.114 Mbit/s only) |
| | | 800 UI Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,666.057 Mbit/s only) |
| | | 80 UI Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,664.228 Mbit/s only) |
| | | 40 UI Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,332.114 Mbit/s only) |
| | | 20 UI Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,666.057 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.5 $V_{PP}$ | (10,664.228 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,332.114 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/2 $V_{PP}$ | (2,666.057 Mbit/s only) |
| 8.4.1.4 | Termination | 50 Ω | | |
| 8.4.1.5 | Connector | BNC (Ext. Mod. Input) | | |
| 8.4.1.6 | Equalizer Amp | Selection of Equalizer Amp. to suit the jitter tolerance mask enabled (10,664.228 Mbit/s only) | | |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.5 | Jitter modulation | | | |
| 8.5.1 | Range | 3,200 UI Range: | Up to 3,200 $UI_{PP}$ | (10,664.228 Mbit/s only) |
| | | 1,600 UI Range: | Up to 1,600 $UI_{PP}$ | (5,332.114 Mbit/s only) |
| | | 800 UI Range: | Up to 800 $UI_{PP}$ | (2,666.057 Mbit/s only) |
| | | 80 UI Range: | Up to 80 $UI_{PP}$ | (10,664.228 Mbit/s only) |
| | | 40 UI Range: | Up to 40 $UI_{PP}$ | (5,332.114 Mbit/s only) |
| | | 20 UI Range: | Up to 20 $UI_{PP}$ | (2,666.057 Mbit/s only) |
| | | 0.5 UI Range: | Up to 0.5 $UI_{PP}$ | |
| 8.5.2 | Amount of modulation | **[Bit Rate: at 10,664.228 Mbit/s]** | | |




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 10,664.228 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

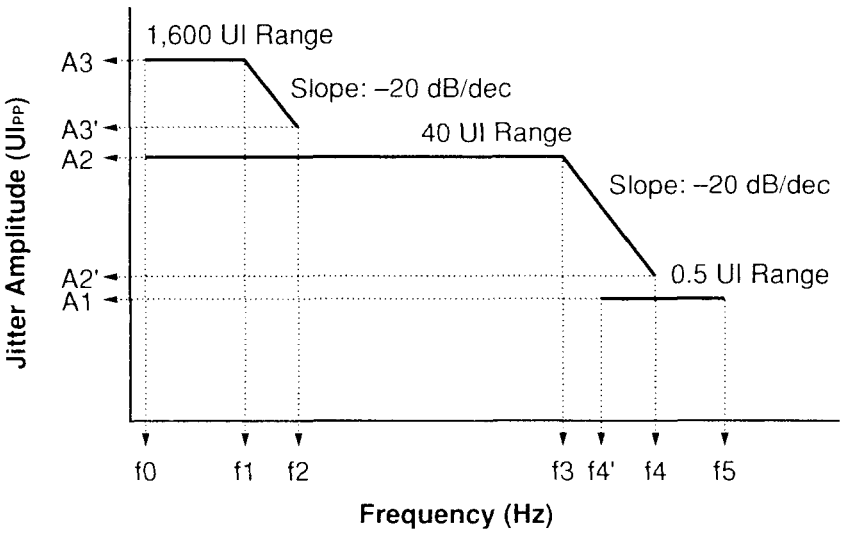
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 80 MHz | 0.5 $UI_{PP}$ | 4 $UI_{PP}$ | 80 $UI_{PP}$ | 100 $UI_{PP}$ | 3,200 $UI_{PP}$ |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 5,332.114 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 5,332.114 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

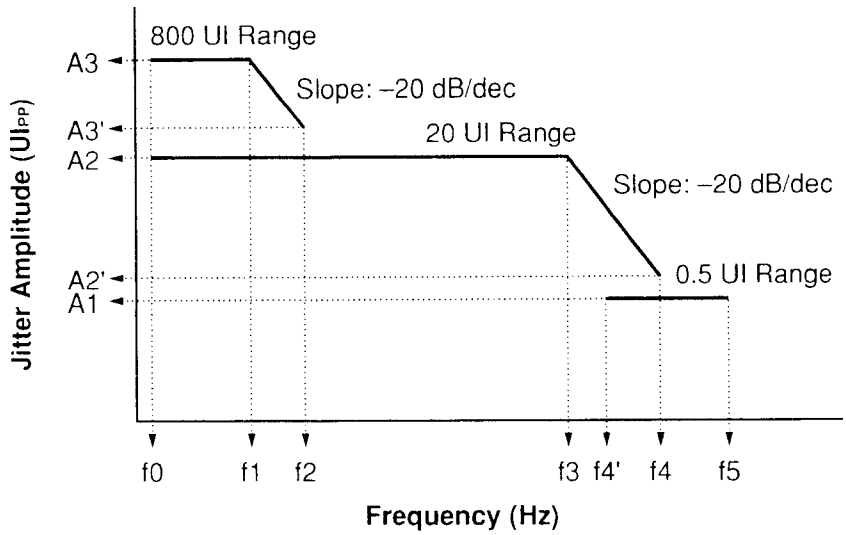
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 40 MHz | 0.5 UIPP | 2 UIPP | 40 UIPP | 50 UIPP | 1.600 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|

**[Bit Rate: at 2,666.057 Mbit/s]**




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 2,666.057 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 20 MHz | 0.5 UIPP | 1 UIPP | 20 UIPP | 25 UIPP | 800 UIPP |

8.5.3 Accuracy

| | | |
|---|---|---|
| 3,200 UI Range: | ±5 % ±10 UIPP/at 10 Hz | (at 10,664.228 Mbit/s) |
| 1,600 UI Range: | ±5 % ± 8 UIPP/at 10 Hz | (at 5,332.114 Mbit/s) |
| 800 UI Range: | ±5 % ± 5 UIPP/at 10 Hz | (at 2,666.057 Mbit/s) |
| 80 UI Range: | ±5 % ±0.8 UIPP/at 100 kHz | (at 10,664.228 Mbit/s) |
| 40 UI Range: | ±5 % ±0.6 UIPP/at 100 kHz | (at 5,332.114 Mbit/s) |
| 20 UI Range: | ±5 % ±0.3 UIPP/at 100 kHz | (at 2,666.057 Mbit/s) |
| 0.5 UI Range: | ±5 % ±0.1 UIPP/at 100 kHz | (at 10,664.228 Mbit/s) |
| | ±5 % ±0.08 UIPP/at 100 kHz | (at 5,332.114 Mbit/s) |
| | ±5 % ±0.05 UIPP/at 100 kHz | (at 2,666.057 Mbit/s) |

**Frequency error (100 kHz set as the reference)**

| | |
|---|---|
| 10 Hz to 20 Hz: | ±5 % |
| 20 Hz to 300 kHz: | ±2 % |
| 300 kHz to 1 MHz: | ±3 % |
| 1 MHz to 3 MHz: | ±5 % |
| 3 MHz to 10 MHz: | ±10 % |
| 10 MHz to 80 MHz: | ±15 % |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.6 | **[Jitter measurement]** Jitter signal input | |
| 8.6.1 | Frequency | 2,666.057 MHz ±50 ppm, 5,332.114 MHz ±30 ppm, 10,664.228 MHz ±20 ppm |
| 8.7 | Jitter demodulating signal | |
| 8.7.1 | Demod. Output | Output of signal demodulated from the incoming signal |
| 8.7.1.1 | Frequency range | 100 Hz to 80 MHz |
| 8.7.1.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range)<br>1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) |
| 8.7.1.3 | Termination | 50 Ω |
| 8.7.1.4 | Connector | BNC |
| 8.8 | Jitter measurement | |
| 8.8.1 | Unit | $UI_{PP}$, UI+p, UI–p, UIrms |
| 8.8.2 | Measurement range | 1 UI Range (0.000 to 1.010 $UI_{PP}$/Step 0.001 $UI_{PP}$)<br>(0.000 to 0.357 UIrms/Step 0.001 UIrms)<br>4 UI Range (0.00 to 4.04 $UI_{PP}$/Step 0.01 $UI_{PP}$)<br>(0.00 to 1.43 UIrms/Step 0.01 UIrms) |
| 8.8.3 | Measurement mode | Single, Repeat, Manual |
| 8.8.4 | Measurement interval | 1 to 99 (second) (1-second step)<br>1 to 99 (minute) (1-minute step)<br>1 to 99 (hour) (1-hour step) |
| 8.8.5 | Measurement display | Current, Last |
| 8.8.6 | Filter | LP, HP1+LP, HP1'+LP, HP2+LP, HP+LP, HP'+LP |

| Bit Rate (bit/s) | HP1 (Hz) | HP1'* (Hz) | HP2 (Hz) | HP' (Hz) | HP (Hz) | LP (Hz) |
|---|---|---|---|---|---|---|
| 2,666.057 M | 5 k | – | 1 M | – | 12 k | 20 M |
| 5,332.114 M | 8 k | – | 2 M | – | 12 k | 40 M |
| 10,664.228 M | 10 k | 20 k | 4 M | 50 k | 12 k | 80 M |

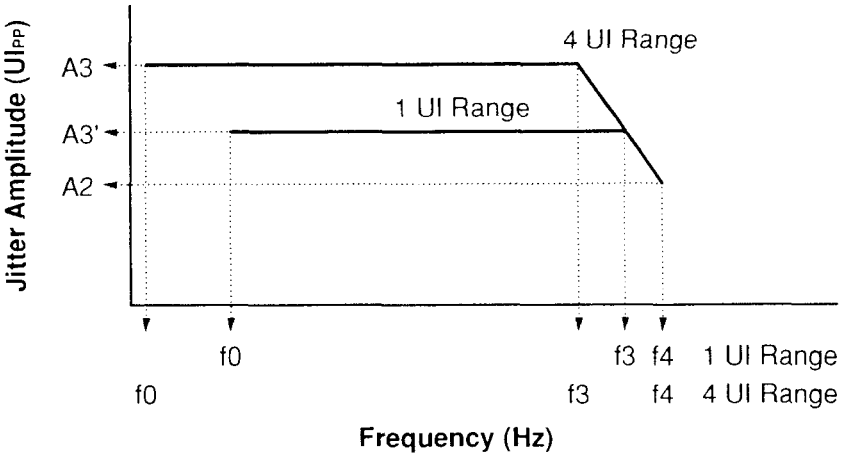
* The HP1'+LP filter can be used at Revision 3 of main body farm-ware or the later.



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| Section | Specification Item | Specification Value |
|---|---|---|

8.8.7 Measuring range




| Bit Rate (bit/s) | Range | f0 | f3 | f4 | A2 | A3' | A3 |
|---|---|---|---|---|---|---|---|
| 2,666.057 M | 1 UI | 100 Hz | 10 MHz | 20 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 2.5 MHz | 20 MHz | 0.5 UIPP | – | 4 UIPP |
| 5,332.114 M | 1 UI | 100 Hz | 20 MHz | 40 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 5 MHz | 40 MHz | 0.5 UIPP | – | 4 UIPP |
| 10,664.228 M | 1 UI | 100 Hz | 40 MHz | 80 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 10 MHz | 80 MHz | 0.5 UIPP | – | 4 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.8 | Accuracy | **[UIpp, UI+p, UI–p]**<br>1 UI Range: ±5 % ±W UIpp/at 100 kHz<br>4 UI Range: ±5 % ±W UIpp/at 100 kHz<br><br>**[UIrms]**<br>1 UI Range: ±5 % ±Y UIrms/at 100 kHz<br>4 UI Range: ±5 % ±Y UIrms/at 100 kHz |

| Bit Rate (bit/s) | W*1 | | Y*2 | |
|---|---|---|---|---|
| | 1 UI Range | 4 UI Range | 1 UI Range | 4 UI Range |
| 2,666.057 M | 0.05 UIpp | 0.22 UIpp | 0.008 UIrms | 0.08 UIrms |
| 5,332.114 M | 0.07 UIpp | 0.24 UIpp | 0.009 UIrms | 0.09 UIrms |
| 10,664.228 M | 0.09 UIpp | 0.26 UIpp | 0.010 UIrms | 0.10 UIrms |

***NOTE *1:***

With HP1+LP

***NOTE *2:***

With HP+LP

**Frequency error (100 kHz set as the reference)**

100 Hz to 300 kHz: ±2 %
300 kHz to 1 MHz: ±3 %
1 MHz to 3 MHz: ±5 %
3 MHz to 10 MHz: ±10 %
10 MHz to 80 MHz: ±15 %

| | | |
|---|---|---|
| 8.9 | LED display | Unlock, Alarm, Remote |
| 8.9.1 | Unlock | Lights up when the Rx section switches into the unlock status. |
| 8.9.2 | Alram | Lights up when the Tx section switches into the abnormal status (such as unlock). |
| 8.9.3 | Remote | Lights up when the mode switches into the remote status by the external controller. |
| 8.10 | External interface | |
| 8.10.1 | GPIB | All the control except for cancellation of remote status enabled from the external controller |
| 8.11 | Other | |
| 8.11.1 | Dimensions | 221.5 High, 426 Wide, 451 Deep (mm) |
| 8.11.2 | Weight | 23 kg (Max.) |
| 8.11.3 | Power source | 85 to 132 Vac or 170 to 250 Vac 47.5 to 63 Hz |
| 8.11.4 | Temperature | 10 to 40 °C, –20 to 60 °C (When stored) |



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## 1.2.4 Option 04

| Section | Specification Item | Specification Value | |
|---|---|---|---|
| 1 | Jitter Clock Output | | |
| 1.1 | Frequency | 3,062.3629 MHz, 6,124.7259 MHz, 12,249.4517 MHz | |
| 1.2 | Termination/Level | 50 Ω/+5 dBm ±3 dB | |
| 1.3 | Connector | APC 3.5 (Clock Output) | |
| 2 | Jitter Clock Input | | |
| 2.1 | Frequency | 3,062.3629 MHz ±50 ppm, 6,124.7259 MHz ±30 ppm,<br>12,249.4517 MHz ±20 ppm | |
| 2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$<br>0.15 V to 1.3 $V_{PP}$ (with Option 10) | |
| 2.3 | Connector | APC 3.5 (Clock Input) | |
| 3 | Ext. Ref. Clock Input | | |
| 3.1 | Frequency | 191.39768 MHz | |
| 3.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$ | |
| 3.3 | Connector | SMA (Clock Input) | |
| 4 | DCS Input | | |
| 4.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) | |
| 4.2 | Level | Unbalance: | 1.544 MHz, 2.048 MHz (CLOCK);<br>1.125 $V_{0P}$ ±34 % G.703<br>2.048 Mbit/s (HDB3); 2.37 $V_{0P}$ ±10 % G.703 |
| | | Balance: | 1.544 Mbit/s, 2.048 Mbit/s;<br>3.0 $V_{0P}$ ±24 % ANSI T1 102-1987 |
| 4.3 | Connector | Unbalance: | 75 Ω/BNC |
| | | Balance: | 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 5 | Ext. Mod. Input | | | |
| 5.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/12,249.4517 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/6,124.7259 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/3,062.3629 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 5.2 | Sensitivity | (0.5 UI Range) | | |
| | | 0.5 $UI_{PP}$ ±15 %/0.375 $V_{PP}$ | (at 12,249.4517 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/0.75 $V_{PP}$ | (at 6,124.7259 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/1.5 $V_{PP}$ | (at 3,062.3629 Mbit/s) | |
| | | (3,200 UI, 1,600 UI, 800 UI, 80 UI, 40 UI, 20 UI Range) | | |
| | | 3,200 Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (12,249.4517 Mbit/s only) |
| | | 1,600 Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (6,124.7259 Mbit/s only) |
| | | 800 Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (3,062.3629 Mbit/s only) |
| | | 80 Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (12,249.4517 Mbit/s only) |
| | | 40 Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (6,124.7259 Mbit/s only) |
| | | 20 Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (3,062.3629 Mbit/s only) |
| 5.3 | Termination | 50 Ω | | |
| 5.4 | Connector | BNC (Ext. Mod. Input) | | |
| 6 | Demod. Output | | | |
| 6.1 | Frequency range | 100 Hz to 80 MHz | | |
| 6.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range), 1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) | | |
| 6.3 | Termination | 50 Ω | | |
| 6.4 | Tangential line | BNC (Demod. Output) | | |
| 7 | 10M STD Input | | | |
| 7.1 | Frequency range | 10 MHz ±50 ppm | | |
| 7.2 | Level | 0 to +10 dBm | | |
| 7.3 | Termination | 50 Ω | | |
| 7.4 | Connector | BNC | | |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8 | | |
| 8.1 | **[Clock mode]** | |
| | CLOCK | Internal, External, Lock 2 MHz (B), Lock 2 MHz (UB), Lock 2 Mbit/s (B), Lock 2 Mbit/s (UB), Lock 1.5 MHz (UB), Lock 1.5 Mbit/s (B), Lock 10 M |
| 8.1.1 | Internal<br>Accuracy | Reference signal synchronous with the internal reference signal<br>±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |
| 8.1.2 | External | Reference signal synchronous with the incoming signal from the Ext. Ref. Clock Input |
| 8.1.2.1 | Frequency | 191.39768 MHz ±50 ppm |
| 8.1.2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$ |
| 8.1.2.3 | Connector | SMA |
| 8.1.3 | DCS Input | Reference signal synchronous with the incoming signal from the DCS Input |
| 8.1.3.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) |
| 8.1.3.2 | Level | Unbalance: 1.544 MHz, 2.048 MHz (CLOCK); 1.125 $V_{0P}$ ±34 % G.703<br>2.048 Mbit/s (HDB3); 2.37 $V_{0P}$ ±10 % G.703<br>Balance: 1.544 Mbit/s, 2.048 Mbit/s; 3.0 $V_{0P}$ ±24 % ANSI T1 102-1987 |
| 8.1.3.3 | Connector | Unbalance: 75 Ω/BNC<br>Balance: 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |
| 8.1.4 | 10M STD Input | Reference signal synchronous with the incoming signal from the 10M STD Input |
| 8.1.4.1 | Frequency range | 10 MHz ±50 ppm |
| 8.1.4.2 | Level | 0 to +10 dBm |
| 8.1.4.3 | Termination | 50 Ω |
| 8.1.4.4 | Connector | BNC |
| 8.2 | **[Variable frequency]** | |
| 8.2.1 | Frequency range | ±50 ppm |
| 8.2.2 | Step | 0.1 ppm |
| 8.2.3 | Accuracy | ±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |



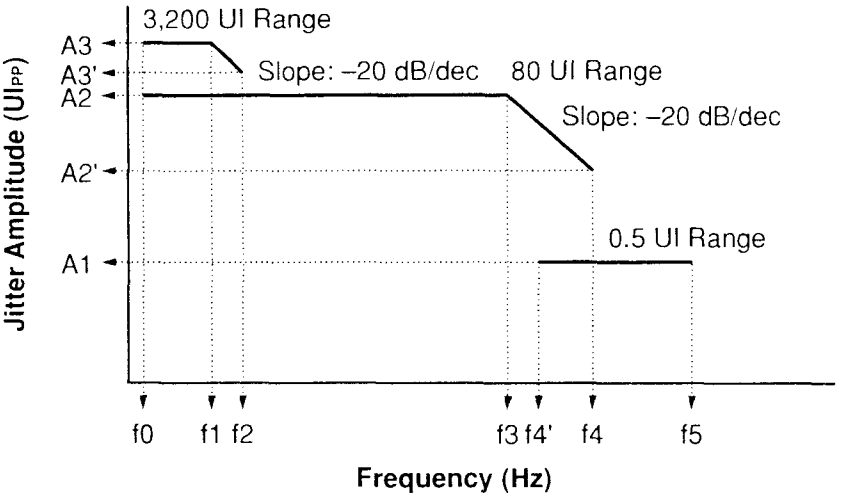
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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.3 | **[Jitter generation]** | | | |
| 8.3.1 | Bit Rate | 3,062.3629 Mbit/s, 6,124.7259 Mbit/s, 12,249.4517 Mbit/s | | |
| 8.4 | Jitter modulating signal | | | |
| 8.4.1 | Ext. Mod. Input | Connector for external modulating signal input | | |
| 8.4.1.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/12,249.4517 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/6,124.7259 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/3,062.3629 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 8.4.1.2 | Waveform | Sine wave | | |
| 8.4.1.3 | Sensitivity | 3,200 UI Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (12,249.4517 Mbit/s only) |
| | | 1,600 UI Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (6,124.7259 Mbit/s only) |
| | | 800 UI Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (3,062.3629 Mbit/s only) |
| | | 80 UI Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (12,249.4517 Mbit/s only) |
| | | 40 UI Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (6,124.7259 Mbit/s only) |
| | | 20 UI Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (3,062.3629 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.375 $V_{PP}$ | (12,249.4517 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.75 $V_{PP}$ | (6,124.7259 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/1.5 $V_{PP}$ | (3,062.3629 Mbit/s only) |
| 8.4.1.4 | Termination | 50 Ω | | |
| 8.4.1.5 | Connector | BNC (Ext. Mod. Input) | | |
| 8.4.1.6 | Equalizer Amp | Selection of Equalizer Amp. to suit the jitter tolerance mask enabled (12,249.4517 Mbit/s only) | | |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.5 | Jitter modulation | | | |
| 8.5.1 | Range | 3,200 UI Range: | Up to 3,200 $UI_{PP}$ | (12,249.4517 Mbit/s only) |
| | | 1,600 UI Range: | Up to 1,600 $UI_{PP}$ | (6,124.7259 Mbit/s only) |
| | | 800 UI Range: | Up to 800 $UI_{PP}$ | (3,062.3629 Mbit/s only) |
| | | 80 UI Range: | Up to 80 $UI_{PP}$ | (12,249.4517 Mbit/s only) |
| | | 40 UI Range: | Up to 40 $UI_{PP}$ | (6,124.7259 Mbit/s only) |
| | | 20 UI Range: | Up to 20 $UI_{PP}$ | (3,062.3629 Mbit/s only) |
| | | 0.5 UI Range: | Up to 0.5 $UI_{PP}$ | |
| 8.5.2 | Amount of modulation | **[Bit Rate: at 12,249.4517 Mbit/s]** | | |




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 12,249.4517 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

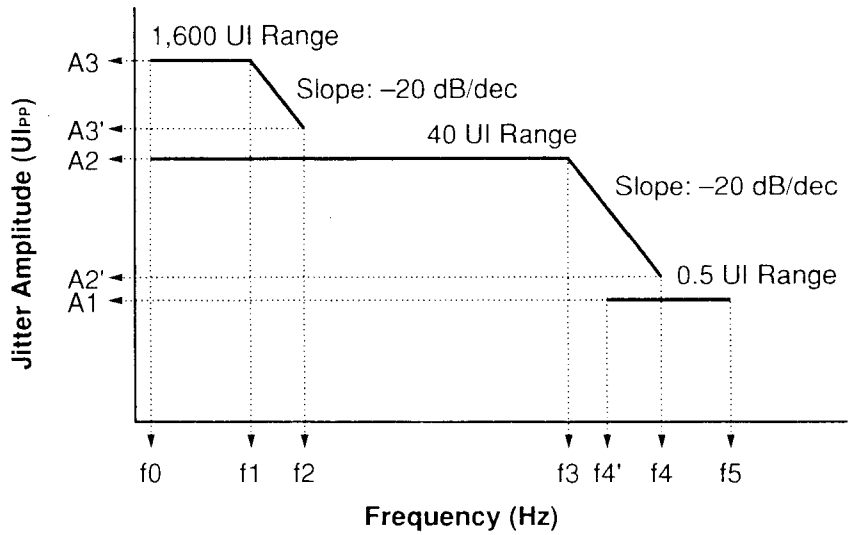
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 80 MHz | 0.5 $UI_{PP}$ | 4 $UI_{PP}$ | 80 $UI_{PP}$ | 100 $UI_{PP}$ | 3,200 $UI_{PP}$ |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 6,124.7259 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 6,124.7259 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

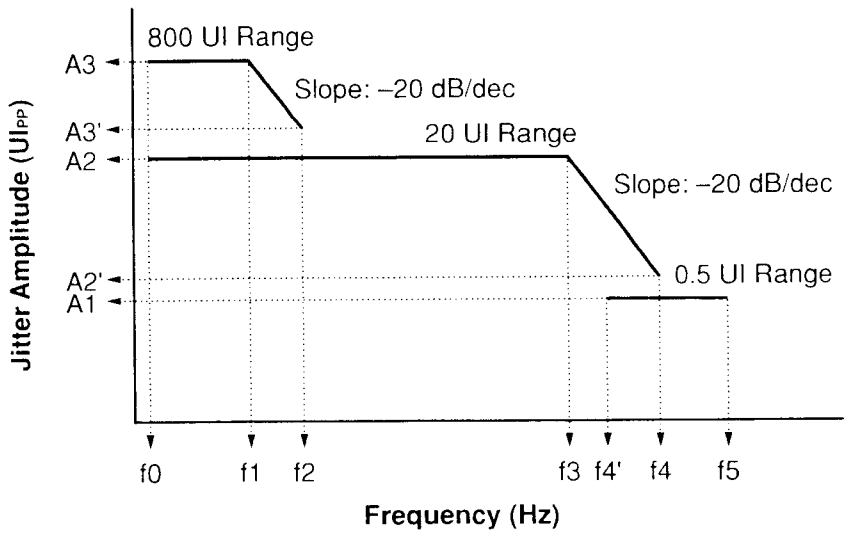
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 40 MHz | 0.5 UIPP | 2 UIPP | 40 UIPP | 50 UIPP | 1,600 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|

**[Bit Rate: at 3,062.3629 Mbit/s]**




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 3,062.3629 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 20 MHz | 0.5 UIPP | 1 UIPP | 20 UIPP | 25 UIPP | 800 UIPP |

8.5.3 Accuracy

| | | |
|---|---|---|
| 3,200 UI Range: | ±5 % ±10 UIPP/at 10 Hz | (at 12,249.4517 Mbit/s) |
| 1,600 UI Range: | ±5 % ± 8 UIPP/at 10 Hz | (at 6,124.7259 Mbit/s) |
| 800 UI Range: | ±5 % ± 5 UIPP/at 10 Hz | (at 3,062.3629 Mbit/s) |
| 80 UI Range: | ±5 % ±0.8 UIPP/at 100 kHz | (at 12,249.4517 Mbit/s) |
| 40 UI Range: | ±5 % ±0.6 UIPP/at 100 kHz | (at 6,124.7259 Mbit/s) |
| 20 UI Range: | ±5 % ±0.3 UIPP/at 100 kHz | (at 3,062.3629 Mbit/s) |
| 0.5 UI Range: | ±5 % ±0.1 UIPP/at 100 kHz | (at 12,249.4517 Mbit/s) |
| | ±5 % ±0.08 UIPP/at 100 kHz | (at 6,124.7259 Mbit/s) |
| | ±5 % ±0.05 UIPP/at 100 kHz | (at 3,062.3629 Mbit/s) |

**Frequency error (100 kHz set as the reference)**

| | |
|---|---|
| 10 Hz to 20 Hz: | ±5 % |
| 20 Hz to 300 kHz: | ±2 % |
| 300 kHz to 1 MHz: | ±3 % |
| 1 MHz to 3 MHz: | ±5 % |
| 3 MHz to 10 MHz: | ±10 % |
| 10 MHz to 80 MHz: | ±15 % |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.6 | **[Jitter measurement]** | |
| | Jitter signal input | |
| 8.6.1 | Frequency | 3,062.3629 MHz ±50 ppm, 6,124.7259 MHz ±30 ppm, 12,249.4517 MHz ±20 ppm |
| 8.7 | Jitter demodulating signal | |
| 8.7.1 | Demod. Output | Output of signal demodulated from the incoming signal |
| 8.7.1.1 | Frequency range | 100 Hz to 80 MHz |
| 8.7.1.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range)<br>1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) |
| 8.7.1.3 | Termination | 50 Ω |
| 8.7.1.4 | Connector | BNC |
| 8.8 | Jitter measurement | |
| 8.8.1 | Unit | $UI_{PP}$, UI+p, UI–p, UIrms |
| 8.8.2 | Measurement range | 1 UI Range (0.000 to 1.010 $UI_{PP}$/Step 0.001 $UI_{PP}$)<br>(0.000 to 0.357 UIrms/Step 0.001 UIrms)<br>4 UI Range (0.00 to 4.04 $UI_{PP}$/Step 0.01 $UI_{PP}$)<br>(0.00 to 1.43 UIrms/Step 0.01 UIrms) |
| 8.8.3 | Measurement mode | Single, Repeat, Manual |
| 8.8.4 | Measurement interval | 1 to 99 (second) (1-second step)<br>1 to 99 (minute) (1-minute step)<br>1 to 99 (hour) (1-hour step) |
| 8.8.5 | Measurement display | Current, Last |
| 8.8.6 | Filter | LP, HP1+LP, HP1'+LP, HP2+LP, HP+LP, HP'+LP |

| Bit Rate (bit/s) | HP1 (Hz) | HP1'* (Hz) | HP2 (Hz) | HP' (Hz) | HP (Hz) | LP (Hz) |
|---|---|---|---|---|---|---|
| 3,062.3629 M | 5 k | – | 1 M | – | 12 k | 20 M |
| 6,124.7259 M | 8 k | – | 2 M | – | 12 k | 40 M |
| 12,249.4517 M | 10 k | 20 k | 4 M | 50 k | 12 k | 80 M |

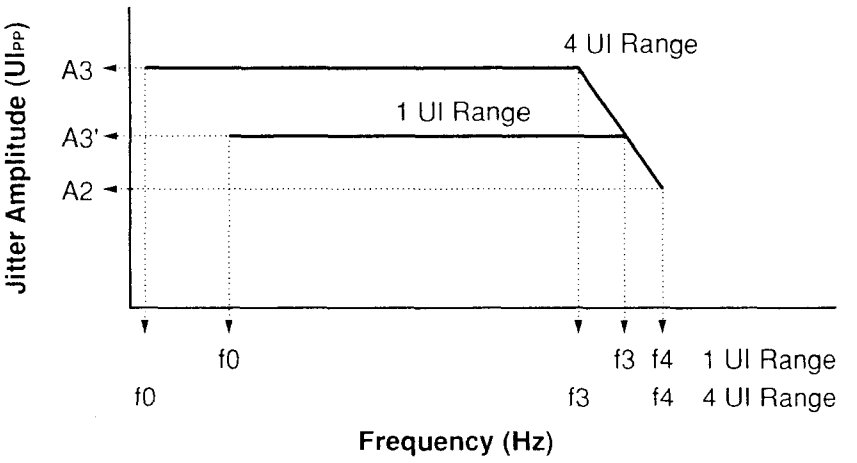
* The HP1'+LP filter can be used at Revision 3 of main body farm-ware or the later.



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| Section | Specification Item | Specification Value |
|---|---|---|

8.8.7 Measuring range




| Bit Rate (bit/s) | Range | f0 | f3 | f4 | A2 | A3' | A3 |
|---|---|---|---|---|---|---|---|
| 3,062.3629 M | 1 UI | 100 Hz | 10 MHz | 20 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 2.5 MHz | 20 MHz | 0.5 UIPP | – | 4 UIPP |
| 6,124.7259 M | 1 UI | 100 Hz | 20 MHz | 40 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 5 MHz | 40 MHz | 0.5 UIPP | – | 4 UIPP |
| 12,249.4517 M | 1 UI | 100 Hz | 40 MHz | 80 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 10 MHz | 80 MHz | 0.5 UIPP | – | 4 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.8 | Accuracy | **[UIPP, UI+p, UI–p]**<br>1 UI Range: ±5 % ±W UIPP/at 100 kHz<br>4 UI Range: ±5 % ±W UIPP/at 100 kHz<br><br>**[UIrms]**<br>1 UI Range: ±5 % ±Y UIrms/at 100 kHz<br>4 UI Range: ±5 % ±Y UIrms/at 100 kHz |

| Bit Rate (bit/s) | W*1 | | Y*2 | |
|---|---|---|---|---|
| | 1 UI Range | 4 UI Range | 1 UI Range | 4 UI Range |
| 3,062.3629 M | 0.05 UIPP | 0.22 UIPP | 0.008 UIrms | 0.08 UIrms |
| 6,124.7259 M | 0.07 UIPP | 0.24 UIPP | 0.009 UIrms | 0.09 UIrms |
| 12,249.4517 M | 0.09 UIPP | 0.26 UIPP | 0.010 UIrms | 0.10 UIrms |

***NOTE *1:***

With HP1+LP

***NOTE *2:***

With HP+LP

**Frequency error (100 kHz set as the reference)**

100 Hz to 300 kHz: ±2 %
300 kHz to 1 MHz: ±3 %
1 MHz to 3 MHz: ±5 %
3 MHz to 10 MHz: ±10 %
10 MHz to 80 MHz: ±15 %

| | | |
|---|---|---|
| 8.9 | LED display | Unlock, Alarm, Remote |
| 8.9.1 | Unlock | Lights up when the Rx section switches into the unlock status. |
| 8.9.2 | Alram | Lights up when the Tx section switches into the abnormal status (such as unlock). |
| 8.9.3 | Remote | Lights up when the mode switches into the remote status by the external controller. |
| 8.10 | External interface | |
| 8.10.1 | GPIB | All the control except for cancellation of remote status enabled from the external controller |
| 8.11 | Other | |
| 8.11.1 | Dimensions | 221.5 High, 426 Wide, 451 Deep (mm) |
| 8.11.2 | Weight | 23 kg (Max.) |
| 8.11.3 | Power source | 85 to 132 Vac or 170 to 250 Vac 47.5 to 63 Hz |
| 8.11.4 | Temperature | 10 to 40 °C, –20 to 60 °C (When stored) |



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## 1.2.5 Option 05

| Section | Specification Item | Specification Value | |
|---|---|---|---|
| 1 | Jitter Clock Output | | |
| 1.1 | Frequency | 3,069 MHz, 6,138 MHz, 12,276 MHz | |
| 1.2 | Termination/Level | 50 Ω/+5 dBm ±3 dB | |
| 1.3 | Connector | APC 3.5 (Clock Output) | |
| 2 | Jitter Clock Input | | |
| 2.1 | Frequency | 3,069 MHz ±50 ppm, 6,138 MHz ±30 ppm,<br>12,276 MHz ±20 ppm | |
| 2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$<br>0.15 V to 1.3 $V_{PP}$ (with Option 10) | |
| 2.3 | Connector | APC 3.5 (Clock Input) | |
| 3 | Ext. Ref. Clock Input | | |
| 3.1 | Frequency | 191.8125 MHz | |
| 3.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$ | |
| 3.3 | Connector | SMA (Clock Input) | |
| 4 | DCS Input | | |
| 4.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) | |
| 4.2 | Level | Unbalance: | 1.544 MHz, 2.048 MHz (CLOCK);<br>1.125 $V_{0P}$ ±34 % G.703<br>2.048 Mbit/s (HDB3); 2.37 $V_{0P}$ ±10 % G.703 |
| | | Balance: | 1.544 Mbit/s, 2.048 Mbit/s;<br>3.0 $V_{0P}$ ±24 % ANSI T1 102-1987 |
| 4.3 | Connector | Unbalance: | 75 Ω/BNC |
| | | Balance: | 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 5 | Ext. Mod. Input | | | |
| 5.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/12,276 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/6,138 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/3,069 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 5.2 | Sensitivity | (0.5 UI Range) | | |
| | | 0.5 $UI_{PP}$ ±15 %/0.375 $V_{PP}$ | (at 12,276 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/0.75 $V_{PP}$ | (at 6,138 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/1.5 $V_{PP}$ | (at 3,069 Mbit/s) | |
| | | (3,200 UI, 1,600 UI, 800 UI, 80 UI, 40 UI, 20 UI Range) | | |
| | | 3,200 Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (12,276 Mbit/s only) |
| | | 1,600 Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (6,138 Mbit/s only) |
| | | 800 Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (3,069 Mbit/s only) |
| | | 80 Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (12,276 Mbit/s only) |
| | | 40 Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (6,138 Mbit/s only) |
| | | 20 Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (3,069 Mbit/s only) |
| 5.3 | Termination | 50 Ω | | |
| 5.4 | Connector | BNC (Ext. Mod. Input) | | |
| 6 | Demod. Output | | | |
| 6.1 | Frequency range | 100 Hz to 80 MHz | | |
| 6.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range), 1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) | | |
| 6.3 | Termination | 50 Ω | | |
| 6.4 | Tangential line | BNC (Demod. Output) | | |
| 7 | 10M STD Input | | | |
| 7.1 | Frequency range | 10 MHz ±50 ppm | | |
| 7.2 | Level | 0 to +10 dBm | | |
| 7.3 | Termination | 50 Ω | | |
| 7.4 | Connector | BNC | | |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8 | | |
| 8.1 | **[Clock mode]** | |
| | CLOCK | Internal, External, Lock 2 MHz (B), Lock 2 MHz (UB), Lock 2 Mbit/s (B), Lock 2 Mbit/s (UB), Lock 1.5 MHz (UB), Lock 1.5 Mbit/s (B), Lock 10 M |
| 8.1.1 | Internal<br>Accuracy | Reference signal synchronous with the internal reference signal<br>±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |
| 8.1.2 | External | Reference signal synchronous with the incoming signal from the Ext. Ref. Clock Input |
| 8.1.2.1 | Frequency | 191.8125 MHz ±50 ppm |
| 8.1.2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$ |
| 8.1.2.3 | Connector | SMA |
| 8.1.3 | DCS Input | Reference signal synchronous with the incoming signal from the DCS Input |
| 8.1.3.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) |
| 8.1.3.2 | Level | Unbalance: 1.544 MHz, 2.048 MHz (CLOCK); 1.125 $V_{0P}$ ±34 % G.703<br>2.048 Mbit/s (HDB3); 2.37 $V_{0P}$ ±10 % G.703<br>Balance: 1.544 Mbit/s, 2.048 Mbit/s; 3.0 $V_{0P}$ ±24 % ANSI T1 102-1987 |
| 8.1.3.3 | Connector | Unbalance: 75 Ω/BNC<br>Balance: 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |
| 8.1.4 | 10M STD Input | Reference signal synchronous with the incoming signal from the 10M STD Input |
| 8.1.4.1 | Frequency range | 10 MHz ±50 ppm |
| 8.1.4.2 | Level | 0 to +10 dBm |
| 8.1.4.3 | Termination | 50 Ω |
| 8.1.4.4 | Connector | BNC |
| 8.2 | **[Variable frequency]** | |
| 8.2.1 | Frequency range | ±50 ppm |
| 8.2.2 | Step | 0.1 ppm |
| 8.2.3 | Accuracy | ±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |



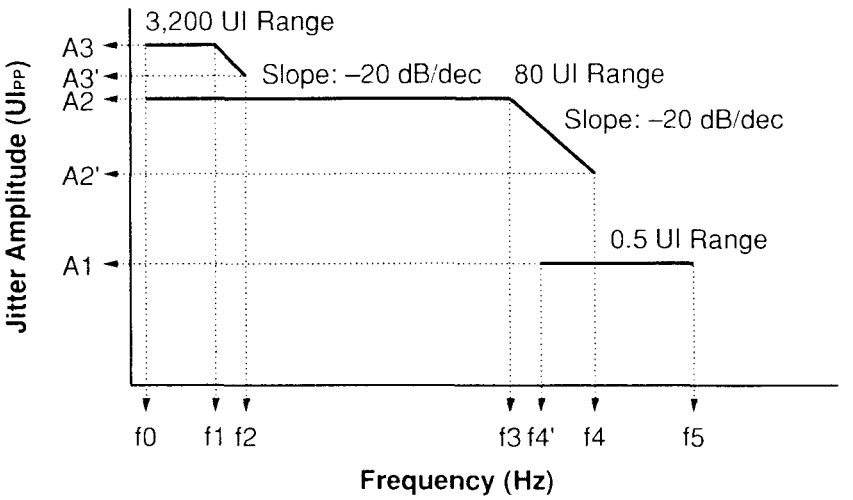
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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.3 | **[Jitter generation]** | | | |
| 8.3.1 | Bit Rate | 3,069 Mbit/s, 6,138 Mbit/s, 12,276 Mbit/s | | |
| 8.4 | Jitter modulating signal | | | |
| 8.4.1 | Ext. Mod. Input | Connector for external modulating signal input | | |
| 8.4.1.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/12,276 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/6,138 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/3,069 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 8.4.1.2 | Waveform | Sine wave | | |
| 8.4.1.3 | Sensitivity | 3,200 UI Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (12,276 Mbit/s only) |
| | | 1,600 UI Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (6,138 Mbit/s only) |
| | | 800 UI Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (3,069 Mbit/s only) |
| | | 80 UI Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (12,276 Mbit/s only) |
| | | 40 UI Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (6,138 Mbit/s only) |
| | | 20 UI Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (3,069 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.375 $V_{PP}$ | (12,276 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.75 $V_{PP}$ | (6,138 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/1.5 $V_{PP}$ | (3,069 Mbit/s only) |
| 8.4.1.4 | Termination | 50 Ω | | |
| 8.4.1.5 | Connector | BNC (Ext. Mod. Input) | | |
| 8.4.1.6 | Equalizer Amp | Selection of Equalizer Amp. to suit the jitter tolerance mask enabled (12,276 Mbit/s only) | | |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.5 | Jitter modulation | | | |
| 8.5.1 | Range | 3,200 UI Range: | Up to 3,200 $UI_{PP}$ | (12,276 Mbit/s only) |
| | | 1,600 UI Range: | Up to 1,600 $UI_{PP}$ | (6,138 Mbit/s only) |
| | | 800 UI Range: | Up to 800 $UI_{PP}$ | (3,069 Mbit/s only) |
| | | 80 UI Range: | Up to 80 $UI_{PP}$ | (12,276 Mbit/s only) |
| | | 40 UI Range: | Up to 40 $UI_{PP}$ | (6,138 Mbit/s only) |
| | | 20 UI Range: | Up to 20 $UI_{PP}$ | (3,069 Mbit/s only) |
| | | 0.5 UI Range: | Up to 0.5 $UI_{PP}$ | |
| 8.5.2 | Amount of modulation | **[Bit Rate: at 12,276 Mbit/s]** | | |




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 12.276 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

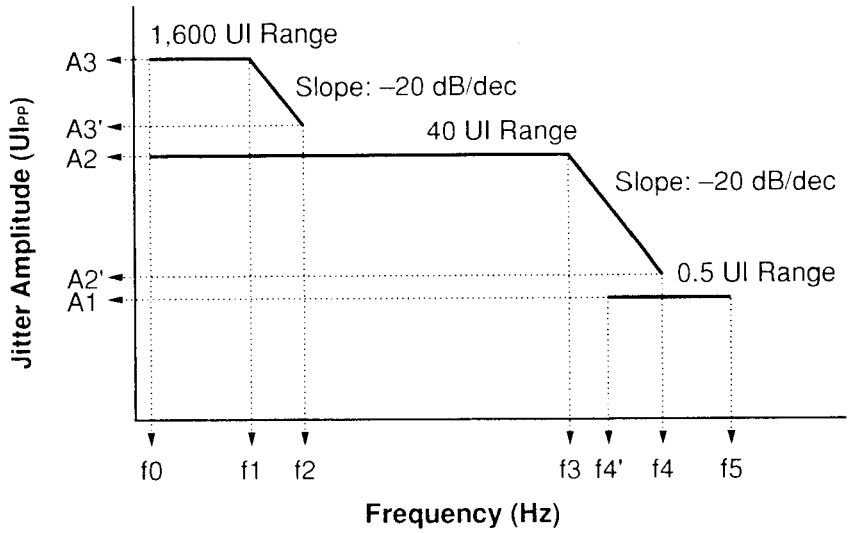
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 80 MHz | 0.5 $UI_{PP}$ | 4 $UI_{PP}$ | 80 $UI_{PP}$ | 100 $UI_{PP}$ | 3,200 $UI_{PP}$ |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 6,138 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 6,138 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

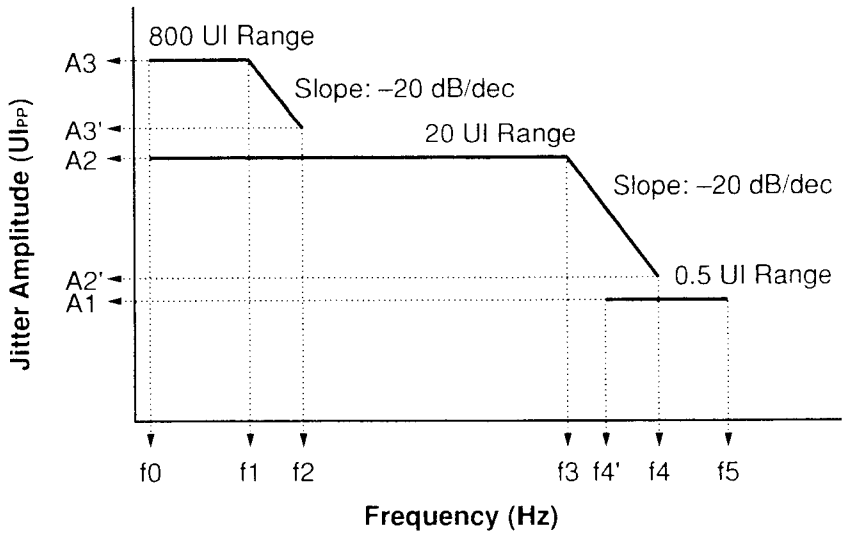
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 40 MHz | 0.5 UIPP | 2 UIPP | 40 UIPP | 50 UIPP | 1,600 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|

**[Bit Rate: at 3,069 Mbit/s]**




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 3,069 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 20 MHz | 0.5 UIPP | 1 UIPP | 20 UIPP | 25 UIPP | 800 UIPP |

8.5.3 Accuracy

| | | |
|---|---|---|
| 3,200 UI Range: | ±5 % ±10 UIPP/at 10 Hz | (at 12,276 Mbit/s) |
| 1,600 UI Range: | ±5 % ± 8 UIPP/at 10 Hz | (at 6,138 Mbit/s) |
| 800 UI Range: | ±5 % ± 5 UIPP/at 10 Hz | (at 3,069 Mbit/s) |
| 80 UI Range: | ±5 % ±0.8 UIPP/at 100 kHz | (at 12,276 Mbit/s) |
| 40 UI Range: | ±5 % ±0.6 UIPP/at 100 kHz | (at 6,138 Mbit/s) |
| 20 UI Range: | ±5 % ±0.3 UIPP/at 100 kHz | (at 3,069 Mbit/s) |
| 0.5 UI Range: | ±5 % ±0.1 UIPP/at 100 kHz | (at 12,276 Mbit/s) |
| | ±5 % ±0.08 UIPP/at 100 kHz | (at 6,138 Mbit/s) |
| | ±5 % ±0.05 UIPP/at 100 kHz | (at 3,069 Mbit/s) |

**Frequency error (100 kHz set as the reference)**

| | |
|---|---|
| 10 Hz to 20 Hz: | ±5 % |
| 20 Hz to 300 kHz: | ±2 % |
| 300 kHz to 1 MHz: | ±3 % |
| 1 MHz to 3 MHz: | ±5 % |
| 3 MHz to 10 MHz: | ±10 % |
| 10 MHz to 80 MHz: | ±15 % |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.6 | **[Jitter measurement]** Jitter signal input | |
| 8.6.1 | Frequency | 3,069 MHz ±50 ppm, 6,138 MHz ±30 ppm, 12,276 MHz ±20 ppm |
| 8.7 | Jitter demodulating signal | |
| 8.7.1 | Demod. Output | Output of signal demodulated from the incoming signal |
| 8.7.1.1 | Frequency range | 100 Hz to 80 MHz |
| 8.7.1.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range)<br>1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) |
| 8.7.1.3 | Termination | 50 Ω |
| 8.7.1.4 | Connector | BNC |
| 8.8 | Jitter measurement | |
| 8.8.1 | Unit | $UI_{PP}$, UI+p, UI–p, UIrms |
| 8.8.2 | Measurement range | 1 UI Range (0.000 to 1.010 $UI_{PP}$/Step 0.001 $UI_{PP}$)<br>(0.000 to 0.357 UIrms/Step 0.001 UIrms)<br>4 UI Range (0.00 to 4.04 $UI_{PP}$/Step 0.01 $UI_{PP}$)<br>(0.00 to 1.43 UIrms/Step 0.01 UIrms) |
| 8.8.3 | Measurement mode | Single, Repeat, Manual |
| 8.8.4 | Measurement interval | 1 to 99 (second) (1-second step)<br>1 to 99 (minute) (1-minute step)<br>1 to 99 (hour) (1-hour step) |
| 8.8.5 | Measurement display | Current, Last |
| 8.8.6 | Filter | LP, HP1+LP, HP1'+LP, HP2+LP, HP+LP, HP'+LP |

| Bit Rate (bit/s) | HP1 (Hz) | HP1'* (Hz) | HP2 (Hz) | HP' (Hz) | HP (Hz) | LP (Hz) |
|---|---|---|---|---|---|---|
| 3,069 M | 5 k | – | 1 M | – | 12 k | 20 M |
| 6,138 M | 8 k | – | 2 M | – | 12 k | 40 M |
| 12,276 M | 10 k | 20 k | 4 M | 50 k | 12 k | 80 M |

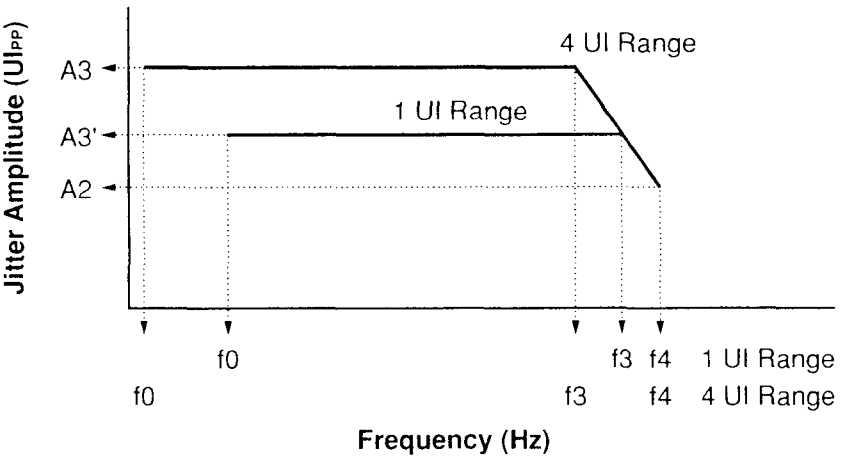
* The HP1'+LP filter can be used at Revision 3 of main body farm-ware or the later.



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| Section | Specification Item | Specification Value |
|---|---|---|

8.8.7 Measuring range




| Bit Rate (bit/s) | Range | f0 | f3 | f4 | A2 | A3' | A3 |
|---|---|---|---|---|---|---|---|
| 3,069 M | 1 UI | 100 Hz | 10 MHz | 20 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 2.5 MHz | 20 MHz | 0.5 UIPP | – | 4 UIPP |
| 6,138 M | 1 UI | 100 Hz | 20 MHz | 40 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 5 MHz | 40 MHz | 0.5 UIPP | – | 4 UIPP |
| 12,276 M | 1 UI | 100 Hz | 40 MHz | 80 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 10 MHz | 80 MHz | 0.5 UIPP | – | 4 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.8 | Accuracy | **[UIpp, UI+p, UI–p]**<br>1 UI Range: ±5 % ±W UIpp/at 100 kHz<br>4 UI Range: ±5 % ±W UIpp/at 100 kHz<br><br>**[UIrms]**<br>1 UI Range: ±5 % ±Y UIrms/at 100 kHz<br>4 UI Range: ±5 % ±Y UIrms/at 100 kHz |

| Bit Rate (bit/s) | W*1 | | Y*2 | |
|---|---|---|---|---|
| | 1 UI Range | 4 UI Range | 1 UI Range | 4 UI Range |
| 3,069 M | 0.05 UIpp | 0.22 UIpp | 0.008 UIrms | 0.08 UIrms |
| 6,138 M | 0.07 UIpp | 0.24 UIpp | 0.009 UIrms | 0.09 UIrms |
| 12,276 M | 0.09 UIpp | 0.26 UIpp | 0.010 UIrms | 0.10 UIrms |

***NOTE** *1:*

With HP1+LP

***NOTE** *2:*

With HP+LP

**Frequency error (100 kHz set as the reference)**

100 Hz to 300 kHz: ±2 %
300 kHz to 1 MHz: ±3 %
1 MHz to 3 MHz: ±5 %
3 MHz to 10 MHz: ±10 %
10 MHz to 80 MHz: ±15 %

| | | |
|---|---|---|
| 8.9 | LED display | Unlock, Alarm, Remote |
| 8.9.1 | Unlock | Lights up when the Rx section switches into the unlock status. |
| 8.9.2 | Alram | Lights up when the Tx section switches into the abnormal status (such as unlock). |
| 8.9.3 | Remote | Lights up when the mode switches into the remote status by the external controller. |
| 8.10 | External interface | |
| 8.10.1 | GPIB | All the control except for cancellation of remote status enabled from the external controller |
| 8.11 | Other | |
| 8.11.1 | Dimensions | 221.5 High, 426 Wide, 451 Deep (mm) |
| 8.11.2 | Weight | 23 kg (Max.) |
| 8.11.3 | Power source | 85 to 132 Vac or 170 to 250 Vac 47.5 to 63 Hz |
| 8.11.4 | Temperature | 10 to 40 °C, –20 to 60 °C (When stored) |



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## 1.2.6 Option 06

| Section | Specification Item | Specification Value |
|---|---|---|
| 1 | Jitter Clock Output | |
| 1.1 | Frequency | 2,677.3063 MHz, 5,354.6127 MHz, 10,709.2253 MHz |
| 1.2 | Termination/Level | 50 Ω/+5 dBm ±3 dB |
| 1.3 | Connector | APC 3.5 (Clock Output) |
| 2 | Jitter Clock Input | |
| 2.1 | Frequency | 2,677.3063 MHz ±50 ppm, 5,354.6127 MHz ±30 ppm,<br>10,709.2253 MHz ±20 ppm |
| 2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$<br>0.15 V to 1.3 $V_{PP}$ (with Option 10) |
| 2.3 | Connector | APC 3.5 (Clock Input) |
| 3 | Ext. Ref. Clock Input | |
| 3.1 | Frequency | 167.3316 MHz |
| 3.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$ |
| 3.3 | Connector | SMA (Clock Input) |
| 4 | DCS Input | |
| 4.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) |
| 4.2 | Level | Unbalance: 1.544 MHz, 2.048 MHz (CLOCK);<br>1.125 $V_{0P}$ ±34 % G.703<br>2.048 Mbit/s (HDB3); 2.37 $V_{0P}$ ±10 % G.703<br>Balance: 1.544 Mbit/s, 2.048 Mbit/s;<br>3.0 $V_{0P}$ ±24 % ANSI T1 102-1987 |
| 4.3 | Connector | Unbalance: 75 Ω/BNC<br>Balance: 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 5 | Ext. Mod. Input | | | |
| 5.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/10,709.2253 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/5,354.6127 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,677.3063 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 5.2 | Sensitivity | (0.5 UI Range) | | |
| | | 0.5 $UI_{PP}$ ±15 %/0.375 $V_{PP}$ | (at 10,709.2253 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/0.75 $V_{PP}$ | (at 5,354.6127 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/1.5 $V_{PP}$ | (at 2,677.3063 Mbit/s) | |
| | | (3,200 UI, 1,600 UI, 800 UI, 80 UI, 40 UI, 20 UI Range) | | |
| | | 3,200 Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,709.2253 Mbit/s only) |
| | | 1,600 Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,354.6127 Mbit/s only) |
| | | 800 Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,677.3063 Mbit/s only) |
| | | 80 Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,709.2253 Mbit/s only) |
| | | 40 Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,355.6127 Mbit/s only) |
| | | 20 Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,677.3063 Mbit/s only) |
| 5.3 | Termination | 50 Ω | | |
| 5.4 | Connector | BNC (Ext. Mod. Input) | | |
| 6 | Demod. Output | | | |
| 6.1 | Frequency range | 100 Hz to 80 MHz | | |
| 6.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range), 1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) | | |
| 6.3 | Termination | 50 Ω | | |
| 6.4 | Tangential line | BNC (Demod. Output) | | |
| 7 | 10M STD Input | | | |
| 7.1 | Frequency range | 10 MHz ±50 ppm | | |
| 7.2 | Level | 0 to +10 dBm | | |
| 7.3 | Termination | 50 Ω | | |
| 7.4 | Connector | BNC | | |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8 | | |
| 8.1 | **[Clock mode]** | |
| | CLOCK | Internal, External, Lock 2 MHz (B), Lock 2 MHz (UB), Lock 2 Mbit/s (B), Lock 2 Mbit/s (UB), Lock 1.5 MHz (UB), Lock 1.5 Mbit/s (B), Lock 10 M |
| 8.1.1 | Internal<br>Accuracy | Reference signal synchronous with the internal reference signal<br>±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |
| 8.1.2 | External | Reference signal synchronous with the incoming signal from the Ext. Ref. Clock Input |
| 8.1.2.1 | Frequency | 167.3316 MHz ±50 ppm |
| 8.1.2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$ |
| 8.1.2.3 | Connector | SMA |
| 8.1.3 | DCS Input | Reference signal synchronous with the incoming signal from the DCS Input |
| 8.1.3.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) |
| 8.1.3.2 | Level | Unbalance: 1.544 MHz, 2.048 MHz (CLOCK); 1.125 $V_{OP}$ ±34 % G.703<br>2.048 Mbit/s (HDB3); 2.37 $V_{OP}$ ±10 % G.703<br>Balance: 1.544 Mbit/s, 2.048 Mbit/s; 3.0 $V_{OP}$ ±24 % ANSI T1 102-1987 |
| 8.1.3.3 | Connector | Unbalance: 75 Ω/BNC<br>Balance: 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |
| 8.1.4 | 10M STD Input | Reference signal synchronous with the incoming signal from the 10M STD Input |
| 8.1.4.1 | Frequency range | 10 MHz ±50 ppm |
| 8.1.4.2 | Level | 0 to +10 dBm |
| 8.1.4.3 | Termination | 50 Ω |
| 8.1.4.4 | Connector | BNC |
| 8.2 | **[Variable frequency]** | |
| 8.2.1 | Frequency range | ±50 ppm |
| 8.2.2 | Step | 0.1 ppm |
| 8.2.3 | Accuracy | ±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |



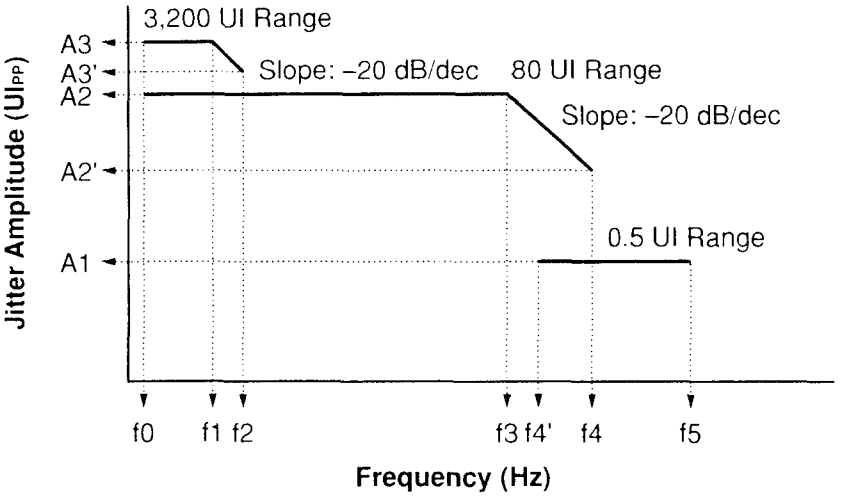
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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.3 | **[Jitter generation]** | | | |
| 8.3.1 | Bit Rate | 2,677.3063 Mbit/s, 5,354.6127 Mbit/s, 10,709.2253 Mbit/s | | |
| 8.4 | Jitter modulating signal | | | |
| 8.4.1 | Ext. Mod. Input | Connector for external modulating signal input | | |
| 8.4.1.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/10,709.2253 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/5,354.6127 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,677.3063 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 8.4.1.2 | Waveform | Sine wave | | |
| 8.4.1.3 | Sensitivity | 3,200 UI Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,709.2253 Mbit/s only) |
| | | 1,600 UI Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,354.6127 Mbit/s only) |
| | | 800 UI Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,677.3063 Mbit/s only) |
| | | 80 UI Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,709.2253 Mbit/s only) |
| | | 40 UI Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,354.6127 Mbit/s only) |
| | | 20 UI Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,677.3063 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.375 $V_{PP}$ | (10,709.2253 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.75 $V_{PP}$ | (5,354.6127 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/1.5 $V_{PP}$ | (2,677.3063 Mbit/s only) |
| 8.4.1.4 | Termination | 50 Ω | | |
| 8.4.1.5 | Connector | BNC (Ext. Mod. Input) | | |
| 8.4.1.6 | Equalizer Amp | Selection of Equalizer Amp. to suit the jitter tolerance mask enabled (10,709.2253 Mbit/s only) | | |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.5 | Jitter modulation | | | |
| 8.5.1 | Range | 3,200 UI Range: | Up to 3,200 $UI_{PP}$ | (10,709.2253 Mbit/s only) |
| | | 1,600 UI Range: | Up to 1,600 $UI_{PP}$ | (5,354.6127 Mbit/s only) |
| | | 800 UI Range: | Up to 800 $UI_{PP}$ | (2,677.3063 Mbit/s only) |
| | | 80 UI Range: | Up to 80 $UI_{PP}$ | (10,709.2253 Mbit/s only) |
| | | 40 UI Range: | Up to 40 $UI_{PP}$ | (5,354.6127 Mbit/s only) |
| | | 20 UI Range: | Up to 20 $UI_{PP}$ | (2,677.3063 Mbit/s only) |
| | | 0.5 UI Range: | Up to 0.5 $UI_{PP}$ | |
| 8.5.2 | Amount of modulation | **[Bit Rate: at 10,709.2253 Mbit/s]** | | |




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 10,709.2253 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

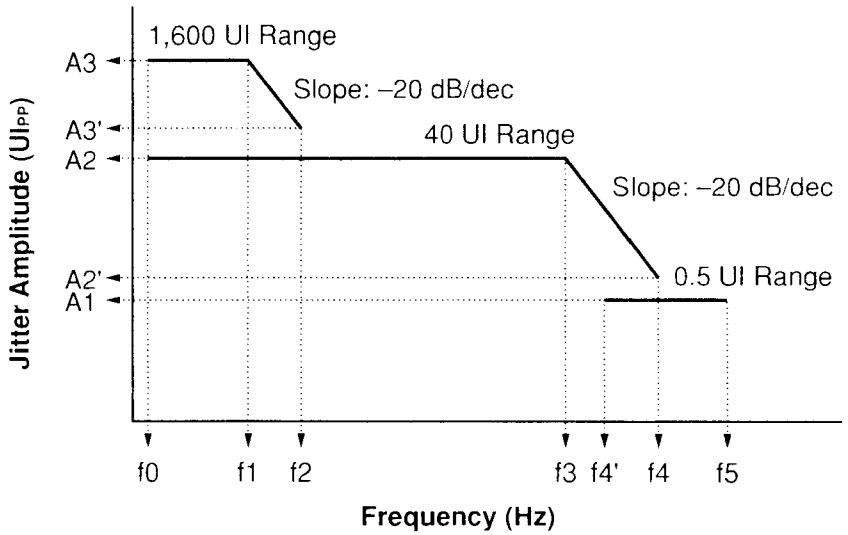
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 80 MHz | 0.5 $UI_{PP}$ | 4 $UI_{PP}$ | 80 $UI_{PP}$ | 100 $UI_{PP}$ | 3,200 $UI_{PP}$ |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 5,354.6127 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 5,354.6127 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

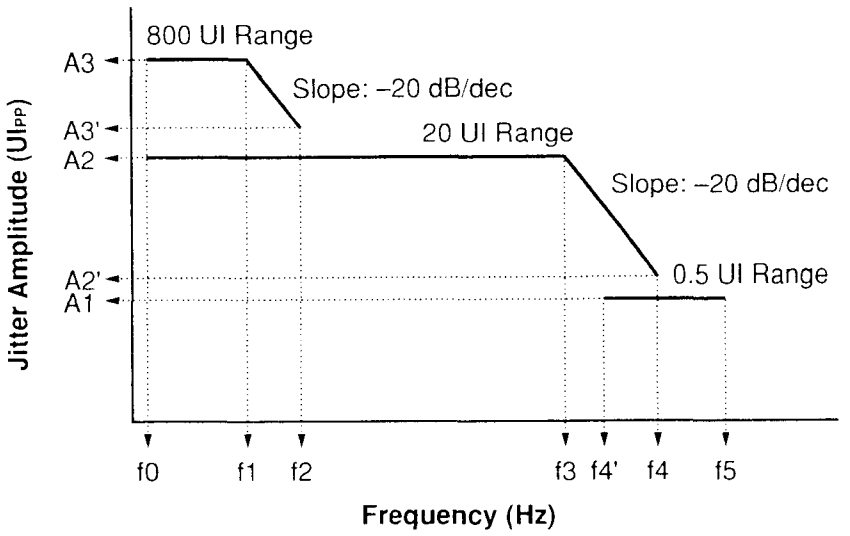
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 40 MHz | 0.5 $UI_{PP}$ | 2 $UI_{PP}$ | 40 $UI_{PP}$ | 50 $UI_{PP}$ | 1,600 $UI_{PP}$ |



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| Section | Specification Item | Specification Value |
|---|---|---|

**[Bit Rate: at 2,677.3063 Mbit/s]**




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 2,677.3063 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 20 MHz | 0.5 UIPP | 1 UIPP | 20 UIPP | 25 UIPP | 800 UIPP |

8.5.3 Accuracy

| | | |
|---|---|---|
| 3,200 UI Range: | ±5 % ±10 UIPP/at 10 Hz | (at 10,709.2253 Mbit/s) |
| 1,600 UI Range: | ±5 % ± 8 UIPP/at 10 Hz | (at 5,354.6127 Mbit/s) |
| 800 UI Range: | ±5 % ± 5 UIPP/at 10 Hz | (at 2,677.3063 Mbit/s) |
| 80 UI Range: | ±5 % ±0.8 UIPP/at 100 kHz | (at 10,709.2253 Mbit/s) |
| 40 UI Range: | ±5 % ±0.6 UIPP/at 100 kHz | (at 5,354.6127 Mbit/s) |
| 20 UI Range: | ±5 % ±0.3 UIPP/at 100 kHz | (at 2,677.3063 Mbit/s) |
| 0.5 UI Range: | ±5 % ±0.1 UIPP/at 100 kHz | (at 10,709.2253 Mbit/s) |
| | ±5 % ±0.08 UIPP/at 100 kHz | (at 5,354.6127 Mbit/s) |
| | ±5 % ±0.05 UIPP/at 100 kHz | (at 2,677.3063 Mbit/s) |

**Frequency error (100 kHz set as the reference)**

| | |
|---|---|
| 10 Hz to 20 Hz: | ±5 % |
| 20 Hz to 300 kHz: | ±2 % |
| 300 kHz to 1 MHz: | ±3 % |
| 1 MHz to 3 MHz: | ±5 % |
| 3 MHz to 10 MHz: | ±10 % |
| 10 MHz to 80 MHz: | ±15 % |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.6 | **[Jitter measurement]** Jitter signal input | |
| 8.6.1 | Frequency | 2,677.3063 MHz ±50 ppm, 5,354.6127 MHz ±30 ppm, 10,709.2253 MHz ±20 ppm |
| 8.7 | Jitter demodulating signal | |
| 8.7.1 | Demod. Output | Output of signal demodulated from the incoming signal |
| 8.7.1.1 | Frequency range | 100 Hz to 80 MHz |
| 8.7.1.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range)<br>1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) |
| 8.7.1.3 | Termination | 50 Ω |
| 8.7.1.4 | Connector | BNC |
| 8.8 | Jitter measurement | |
| 8.8.1 | Unit | $UI_{PP}$, UI+p, UI–p, UIrms |
| 8.8.2 | Measurement range | 1 UI Range (0.000 to 1.010 $UI_{PP}$/Step 0.001 $UI_{PP}$)<br>(0.000 to 0.357 UIrms/Step 0.001 UIrms)<br>4 UI Range (0.00 to 4.04 $UI_{PP}$/Step 0.01 $UI_{PP}$)<br>(0.00 to 1.43 UIrms/Step 0.01 UIrms) |
| 8.8.3 | Measurement mode | Single, Repeat, Manual |
| 8.8.4 | Measurement interval | 1 to 99 (second) (1-second step)<br>1 to 99 (minute) (1-minute step)<br>1 to 99 (hour) (1-hour step) |
| 8.8.5 | Measurement display | Current, Last |
| 8.8.6 | Filter | LP, HP1+LP, HP1'+LP, HP2+LP, HP+LP, HP'+LP |

| Bit Rate (bit/s) | HP1 (Hz) | HP1'* (Hz) | HP2 (Hz) | HP' (Hz) | HP (Hz) | LP (Hz) |
|---|---|---|---|---|---|---|
| 2,677.3063 M | 5 k | – | 1 M | – | 12 k | 20 M |
| 5,354.6127 M | 8 k | – | 2 M | – | 12 k | 40 M |
| 10,709.2253 M | 10 k | 20 k | 4 M | 50 k | 12 k | 80 M |

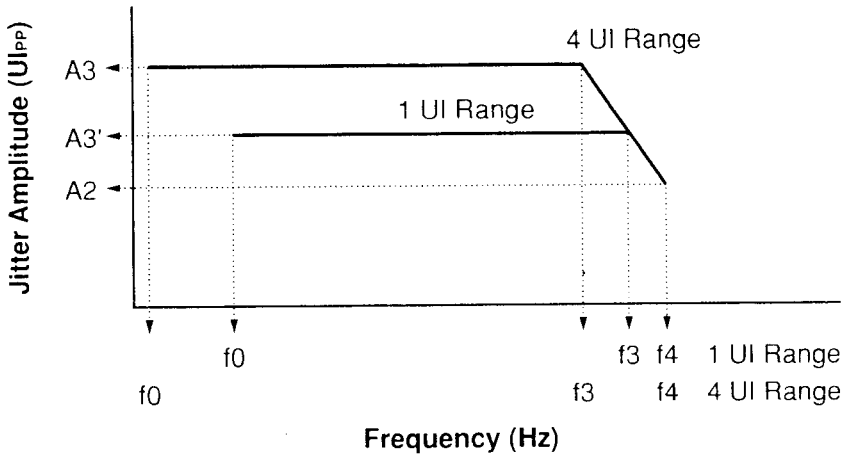
* The HP1'+LP filter can be used at Revision 3 of main body farm-ware or the later.



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| Section | Specification Item | Specification Value |
|---|---|---|

8.8.7 Measuring range




| Bit Rate (bit/s) | Range | f0 | f3 | f4 | A2 | A3' | A3 |
|---|---|---|---|---|---|---|---|
| 2,677.3063 M | 1 UI | 100 Hz | 10 MHz | 20 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 2.5 MHz | 20 MHz | 0.5 UIPP | – | 4 UIPP |
| 5,354.6127 M | 1 UI | 100 Hz | 20 MHz | 40 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 5 MHz | 40 MHz | 0.5 UIPP | – | 4 UIPP |
| 10,709.2253 M | 1 UI | 100 Hz | 40 MHz | 80 MHz | 0.5 UIPP | 1 UIPP | – |
| | 4 UI | 100 Hz | 10 MHz | 80 MHz | 0.5 UIPP | – | 4 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.8 | Accuracy | **[UIpp, UI+p, UI–p]**<br>1 UI Range: ±5 % ±W UIpp/at 100 kHz<br>4 UI Range: ±5 % ±W UIpp/at 100 kHz<br><br>**[UIrms]**<br>1 UI Range: ±5 % ±Y UIrms/at 100 kHz<br>4 UI Range: ±5 % ±Y UIrms/at 100 kHz |

| Bit Rate (bit/s) | W*1 | | Y*2 | |
|---|---|---|---|---|
| | 1 UI Range | 4 UI Range | 1 UI Range | 4 UI Range |
| 2,677.3063 M | 0.05 UIpp | 0.22 UIpp | 0.008 UIrms | 0.08 UIrms |
| 5,354.6127 M | 0.07 UIpp | 0.24 UIpp | 0.009 UIrms | 0.09 UIrms |
| 10,709.2253 M | 0.09 UIpp | 0.26 UIpp | 0.010 UIrms | 0.10 UIrms |

***NOTE *1:***

With HP1+LP

***NOTE *2:***

With HP+LP

**Frequency error (100 kHz set as the reference)**

100 Hz to 300 kHz: ±2 %
300 kHz to 1 MHz: ±3 %
1 MHz to 3 MHz: ±5 %
3 MHz to 10 MHz: ±10 %
10 MHz to 80 MHz: ±15 %

| | | |
|---|---|---|
| 8.9 | LED display | Unlock, Alarm, Remote |
| 8.9.1 | Unlock | Lights up when the Rx section switches into the unlock status. |
| 8.9.2 | Alram | Lights up when the Tx section switches into the abnormal status (such as unlock). |
| 8.9.3 | Remote | Lights up when the mode switches into the remote status by the external controller. |
| 8.10 | External interface | |
| 8.10.1 | GPIB | All the control except for cancellation of remote status enabled from the external controller |
| 8.11 | Other | |
| 8.11.1 | Dimensions | 221.5 High, 426 Wide, 451 Deep (mm) |
| 8.11.2 | Mass | 23 kg (Max.) |
| 8.11.3 | Power source | 85 to 132 Vac or 170 to 250 Vac 47.5 to 63 Hz |
| 8.11.4 | Temperature | 10 to 40 °C, –20 to 60 °C (When stored) |



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## 1.2.7 Option 07

| Section | Specification Item | Specification Value | |
|---|---|---|---|
| 1 | Jitter Clock Output | | |
| 1.1 | Frequency | 2,578.125 MHz, 5,156.25 MHz, 10,312.5 MHz | |
| 1.2 | Termination/Level | 50 Ω/+5 dBm ±3 dB | |
| 1.3 | Connector | APC 3.5 (Clock Output) | |
| 2 | Jitter Clock Input | | |
| 2.1 | Frequency | 2,578.125 MHz ±50 ppm, 5,156.25 MHz ±30 ppm,<br>10,312.5 MHz ±20 ppm | |
| 2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$<br>0.15 V to 1.3 $V_{PP}$ (with Option 10) | |
| 2.3 | Connector | APC 3.5 (Clock Input) | |
| 3 | Ext. Ref. Clock Input | | |
| 3.1 | Frequency | 161.13281 MHz | |
| 3.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$ | |
| 3.3 | Connector | SMA (Clock Input) | |
| 4 | DCS Input | | |
| 4.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) | |
| 4.2 | Level | Unbalance: | 1.544 MHz, 2.048 MHz (CLOCK);<br>1.125 $V_{0P}$ ±34 % G.703<br>2.048 Mbit/s (HDB3); 2.37 $V_{0P}$ ±10 % G.703 |
| | | Balance: | 1.544 Mbit/s, 2.048 Mbit/s;<br>3.0 $V_{0P}$ ±24 % ANSI T1 102-1987 |
| 4.3 | Connector | Unbalance: | 75 Ω/BNC |
| | | Balance: | 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 5 | Ext. Mod. Input | | | |
| 5.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/10,312.5 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/5,156.25 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,578.125 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 5.2 | Sensitivity | (0.5 UI Range) | | |
| | | 0.5 $UI_{PP}$ ±15 %/0.375 $V_{PP}$ | (at 10,312.5 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/0.75 $V_{PP}$ | (at 5,156.25 Mbit/s) | |
| | | 0.5 $UI_{PP}$ ±15 %/1.5 $V_{PP}$ | (at 2,578.125 Mbit/s) | |
| | | (3,200 UI, 1,600 UI, 800 UI, 80 UI, 40 UI, 20 UI Range) | | |
| | | 3,200 Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,312.5 Mbit/s only) |
| | | 1,600 Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,156.25 Mbit/s only) |
| | | 800 Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,578.125 Mbit/s only) |
| | | 80 Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,312.5 Mbit/s only) |
| | | 40 Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,156.25 Mbit/s only) |
| | | 20 Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,578.125 Mbit/s only) |
| 5.3 | Termination | 50 Ω | | |
| 5.4 | Connector | BNC (Ext. Mod. Input) | | |
| 6 | Demod. Output | | | |
| 6.1 | Frequency range | 100 Hz to 80 MHz | | |
| 6.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range), 1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) | | |
| 6.3 | Termination | 50 Ω | | |
| 6.4 | Tangential line | BNC (Demod. Output) | | |
| 7 | 10M STD Input | | | |
| 7.1 | Frequency range | 10 MHz ±50 ppm | | |
| 7.2 | Level | 0 to +10 dBm | | |
| 7.3 | Termination | 50 Ω | | |
| 7.4 | Connector | BNC | | |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8 | | |
| 8.1 | **[Clock mode]** | |
| | CLOCK | Internal, External, Lock 2 MHz (B), Lock 2 MHz (UB), Lock 2 Mbit/s (B), Lock 2 Mbit/s (UB), Lock 1.5 MHz (UB), Lock 1.5 Mbit/s (B), Lock 10 M |
| 8.1.1 | Internal<br>Accuracy | Reference signal synchronous with the internal reference signal<br>±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |
| 8.1.2 | External | Reference signal synchronous with the incoming signal from the Ext. Ref. Clock Input |
| 8.1.2.1 | Frequency | 161.13281 MHz ±50 ppm |
| 8.1.2.2 | Termination/Level | 50 Ω/0.7 V to 1.3 $V_{PP}$ |
| 8.1.2.3 | Connector | SMA |
| 8.1.3 | DCS Input | Reference signal synchronous with the incoming signal from the DCS Input |
| 8.1.3.1 | Frequency/Interface | 2.048 Mbit/s ±50 ppm (HDB3) or 2.048 MHz ±50 ppm (CLOCK)<br>1.544 Mbit/s ±50 ppm (AMI/B8ZS) or 1.544 MHz ±50 ppm (CLOCK) |
| 8.1.3.2 | Level | Unbalance: 1.544 MHz, 2.048 MHz (CLOCK);<br>1.125 $V_{0P}$ ±34 % G.703<br>2.048 Mbit/s (HDB3); 2.37 $V_{0P}$ ±10 % G.703<br>Balance: 1.544 Mbit/s, 2.048 Mbit/s;<br>3.0 $V_{0P}$ ±24 % ANSI T1 102-1987 |
| 8.1.3.3 | Connector | Unbalance: 75 Ω/BNC<br>Balance: 100 Ω/Weco 310 Compatible (1.544 Mbit/s)<br>120 Ω/3-Pole CF (2.048 Mbit/s) |
| 8.1.4 | 10M STD Input | Reference signal synchronous with the incoming signal from the 10M STD Input |
| 8.1.4.1 | Frequency range | 10 MHz ±50 ppm |
| 8.1.4.2 | Level | 0 to +10 dBm |
| 8.1.4.3 | Termination | 50 Ω |
| 8.1.4.4 | Connector | BNC |
| 8.2 | **[Variable frequency]** | |
| 8.2.1 | Frequency range | ±50 ppm |
| 8.2.2 | Step | 0.1 ppm |
| 8.2.3 | Accuracy | ±0.1 ppm (at 23 ±5 °C following calibration performed 60 minutes after the power is turned ON) |



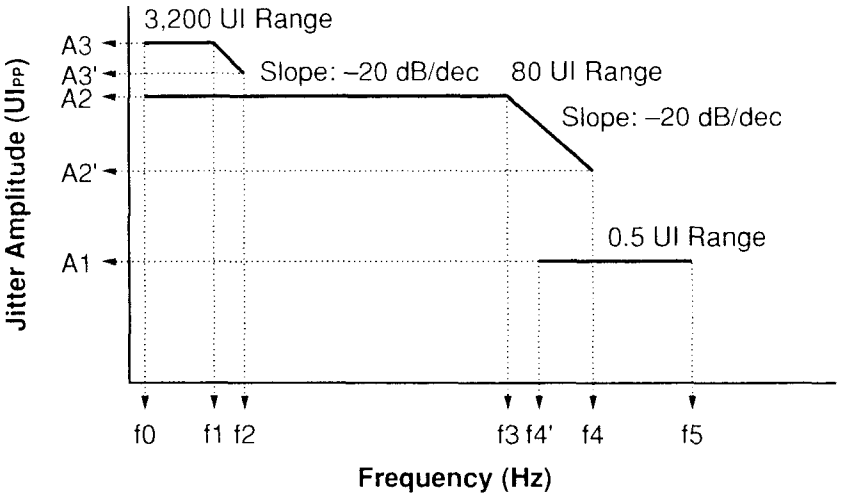
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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.3 | **[Jitter generation]** | | | |
| 8.3.1 | Bit Rate | 2,578.125 Mbit/s, 5,156.25 Mbit/s, 10,312.5 Mbit/s | | |
| 8.4 | Jitter modulating signal | | | |
| 8.4.1 | Ext. Mod. Input | Connector for external modulating signal input | | |
| 8.4.1.1 | Frequency range | 100 kHz to 80 MHz | (at 0.5 UI Range/10,312.5 Mbit/s) | |
| | | 100 kHz to 40 MHz | (at 0.5 UI Range/5,156.25 Mbit/s) | |
| | | 100 kHz to 20 MHz | (at 0.5 UI Range/2,578.125 Mbit/s) | |
| | | 10 Hz to 2 MHz | (80 UI, 40 UI, 20 UI Range) | |
| | | 10 Hz to 480 Hz | (3,200 UI, 1,600 UI, 800 UI Range) | |
| 8.4.1.2 | Waveform | Sine wave | | |
| 8.4.1.3 | Sensitivity | 3,200 UI Range: | 3,200 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,312.5 Mbit/s only) |
| | | 1,600 UI Range: | 1,600 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,156.25 Mbit/s only) |
| | | 800 UI Range: | 800 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,578.125 Mbit/s only) |
| | | 80 UI Range: | 80 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (10,312.5 Mbit/s only) |
| | | 40 UI Range: | 40 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (5,156.25 Mbit/s only) |
| | | 20 UI Range: | 20 $UI_{PP}$ ±15 %/1 $V_{PP}$ | (2,578.125 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.375 $V_{PP}$ | (10,312.5 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/0.75 $V_{PP}$ | (5,156.25 Mbit/s only) |
| | | 0.5 UI Range: | 0.5 $UI_{PP}$ ±15 %/1.5 $V_{PP}$ | (2,578.125 Mbit/s only) |
| 8.4.1.4 | Termination | 50 Ω | | |
| 8.4.1.5 | Connector | BNC (Ext. Mod. Input) | | |
| 8.4.1.6 | Equalizer Amp | Selection of Equalizer Amp. to suit the jitter tolerance mask enabled (10,312.5 Mbit/s only) | | |



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| Section | Specification Item | Specification Value | | |
|---|---|---|---|---|
| 8.5 | Jitter modulation | | | |
| 8.5.1 | Range | 3,200 UI Range: | Up to 3,200 $UI_{PP}$ | (10,312.5 Mbit/s only) |
| | | 1,600 UI Range: | Up to 1,600 $UI_{PP}$ | (5,156.25 Mbit/s only) |
| | | 800 UI Range: | Up to 800 $UI_{PP}$ | (2,578.125 Mbit/s only) |
| | | 80 UI Range: | Up to 80 $UI_{PP}$ | (10,312.5 Mbit/s only) |
| | | 40 UI Range: | Up to 40 $UI_{PP}$ | (5,156.25 Mbit/s only) |
| | | 20 UI Range: | Up to 20 $UI_{PP}$ | (2,578.125 Mbit/s only) |
| | | 0.5 UI Range: | Up to 0.5 $UI_{PP}$ | |
| 8.5.2 | Amount of modulation | **[Bit Rate: at 10,312.5 Mbit/s]** | | |




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 10,312.5 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

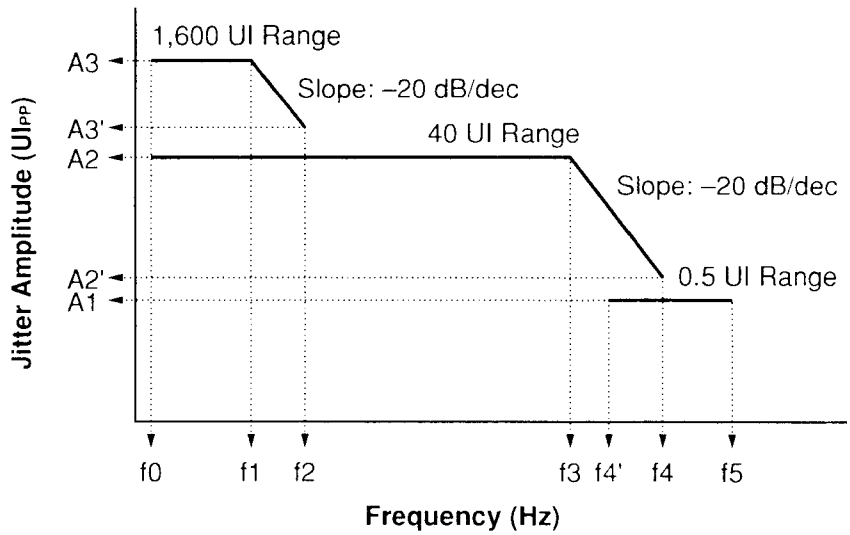
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 80 MHz | 0.5 $UI_{PP}$ | 4 $UI_{PP}$ | 80 $UI_{PP}$ | 100 $UI_{PP}$ | 3,200 $UI_{PP}$ |



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| Section | Specification Item | Specification Value |
|---|---|---|

[Bit Rate: at 5,156.25 Mbit/s]




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 5,156.25 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

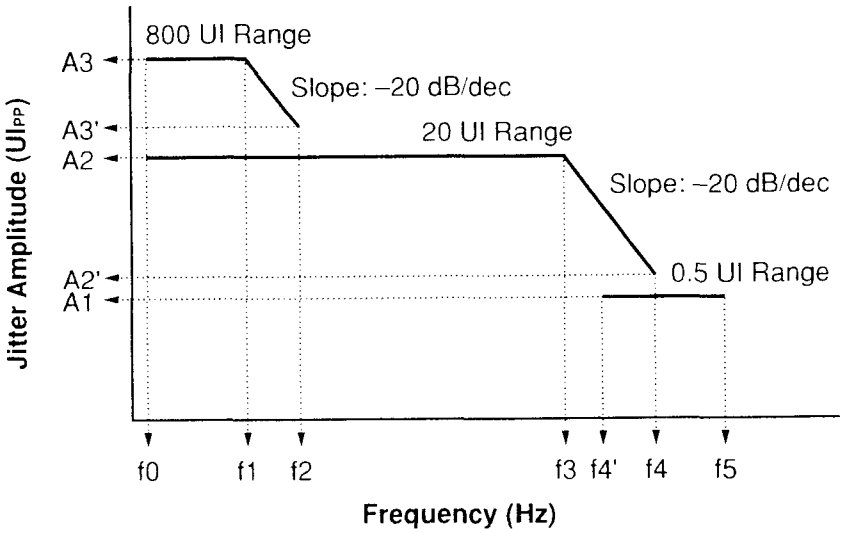
| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 40 MHz | 0.5 UIPP | 2 UIPP | 40 UIPP | 50 UIPP | 1,600 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|

**[Bit Rate: at 2,578.125 Mbit/s]**




| Bit Rate (bit/s) | f0 | f1 | f2 | f3 | f4 | f4' |
|---|---|---|---|---|---|---|
| 2,578.125 M | 10 Hz | 15 Hz | 480 Hz | 100 kHz | 2 MHz | 100 kHz |

| f5 | A1 | A2' | A2 | A3' | A3 |
|---|---|---|---|---|---|
| 20 MHz | 0.5 UIPP | 1 UIPP | 20 UIPP | 25 UIPP | 800 UIPP |

8.5.3 Accuracy

| | | |
|---|---|---|
| 3,200 UI Range: | ±5 % ±10 UIPP/at 10 Hz | (at 10,312.5 Mbit/s) |
| 1,600 UI Range: | ±5 % ± 8 UIPP/at 10 Hz | (at 5,156.25 Mbit/s) |
| 800 UI Range: | ±5 % ± 5 UIPP/at 10 Hz | (at 2,578.125 Mbit/s) |
| 80 UI Range: | ±5 % ±0.8 UIPP/at 100 kHz | (at 10,312.5 Mbit/s) |
| 40 UI Range: | ±5 % ±0.6 UIPP/at 100 kHz | (at 5,156.25 Mbit/s) |
| 20 UI Range: | ±5 % ±0.3 UIPP/at 100 kHz | (at 2,578.125 Mbit/s) |
| 0.5 UI Range: | ±5 % ±0.1 UIPP/at 100 kHz | (at 10,312.5 Mbit/s) |
| | ±5 % ±0.08 UIPP/at 100 kHz | (at 5,156.25 Mbit/s) |
| | ±5 % ±0.05 UIPP/at 100 kHz | (at 2,578.125 Mbit/s) |

**Frequency error (100 kHz set as the reference)**

| | |
|---|---|
| 10 Hz to 20 Hz: | ±5 % |
| 20 Hz to 300 kHz: | ±2 % |
| 300 kHz to 1 MHz: | ±3 % |
| 1 MHz to 3 MHz: | ±5 % |
| 3 MHz to 10 MHz: | ±10 % |
| 10 MHz to 80 MHz: | ±15 % |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.6 | **[Jitter measurement]** Jitter signal input | |
| 8.6.1 | Frequency | 2,578.125 MHz ±50 ppm, 5,156.25 MHz ±30 ppm, 10,312.5 MHz ±20 ppm |
| 8.7 | Jitter demodulating signal | |
| 8.7.1 | Demod. Output | Output of signal demodulated from the incoming signal |
| 8.7.1.1 | Frequency range | 100 Hz to 80 MHz |
| 8.7.1.2 | Sensitivity | 1 $V_{PP}$ ±15 %/1 $UI_{PP}$ (1 UI Range)<br>1 $V_{PP}$ ±15 %/4 $UI_{PP}$ (4 UI Range) |
| 8.7.1.3 | Termination | 50 Ω |
| 8.7.1.4 | Connector | BNC |
| 8.8 | Jitter measurement | |
| 8.8.1 | Unit | $UI_{PP}$, UI+p, UI–p, UIrms |
| 8.8.2 | Measurement range | 1 UI Range (0.000 to 1.010 $UI_{PP}$/Step 0.001 $UI_{PP}$)<br>(0.000 to 0.357 UIrms/Step 0.001 UIrms)<br>4 UI Range (0.00 to 4.04 $UI_{PP}$/Step 0.01 $UI_{PP}$)<br>(0.00 to 1.43 UIrms/Step 0.01 UIrms) |
| 8.8.3 | Measurement mode | Single, Repeat, Manual |
| 8.8.4 | Measurement interval | 1 to 99 (second) (1-second step)<br>1 to 99 (minute) (1-minute step)<br>1 to 99 (hour) (1-hour step) |
| 8.8.5 | Measurement display | Current, Last |
| 8.8.6 | Filter | LP, HP1+LP, HP1'+LP, HP2+LP, HP+LP, HP'+LP, HP3+LP*2<br>(*2 Only for Option 07) |

| Bit Rate (bit/s) | HP1 (Hz) | HP1'*1 (Hz) | HP2 (Hz) | HP3*2 (Hz) | HP' (Hz) | HP (Hz) | LP (Hz) |
|---|---|---|---|---|---|---|---|
| 2,578.125 M | 5 k | — | 1 M | 6.186 M | — | 12 k | 20 M |
| 5,156.25 M | 8 k | — | 2 M | 6.186 M | — | 12 k | 40 M |
| 10,312.5 M | 10 k | 20 k | 4 M | 6.186 M | 50 k | 12 k | 80 M |

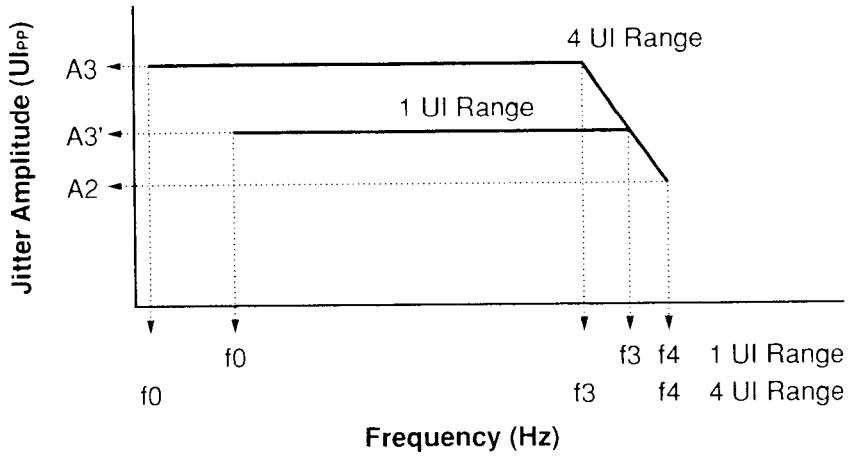
*1 The HP1'+LP filter can be used at Revision 3 of main body farm-ware or the later.



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| Section | Specification Item | Specification Value |
|---|---|---|

8.8.7 Measuring range




| Bit Rate (bit/s) | Range | f0 | f3 | f4 | A2 | A3' | A3 |
|---|---|---|---|---|---|---|---|
| 2,578.125 M | 1 UI | 100 Hz | 10 MHz | 20 MHz | 0.5 UIPP | 1 UIPP | — |
| | 4 UI | 100 Hz | 2.5 MHz | 20 MHz | 0.5 UIPP | — | 4 UIPP |
| 5,156.25 M | 1 UI | 100 Hz | 20 MHz | 40 MHz | 0.5 UIPP | 1 UIPP | — |
| | 4 UI | 100 Hz | 5 MHz | 40 MHz | 0.5 UIPP | — | 4 UIPP |
| 10.312.5 M | 1 UI | 100 Hz | 40 MHz | 80 MHz | 0.5 UIPP | 1 UIPP | — |
| | 4 UI | 100 Hz | 10 MHz | 80 MHz | 0.5 UIPP | — | 4 UIPP |



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| Section | Specification Item | Specification Value |
|---|---|---|
| 8.8.8 | Accuracy | **[UIPP, UI+p, UI–p]**<br>1 UI Range: ±5 % ±W UIPP/at 100 kHz<br>4 UI Range: ±5 % ±W UIPP/at 100 kHz<br><br>**[UIrms]**<br>1 UI Range: ±5 % ±Y UIrms/at 100 kHz<br>4 UI Range: ±5 % ±Y UIrms/at 100 kHz |

| Bit Rate (bit/s) | W*1 | | Y*2 | |
|---|---|---|---|---|
| | 1 UI Range | 4 UI Range | 1 UI Range | 4 UI Range |
| 2,578.125 M | 0.05 UIPP | 0.22 UIPP | 0.008 UIrms | 0.08 UIrms |
| 5,156.25 M | 0.07 UIPP | 0.24 UIPP | 0.009 UIrms | 0.09 UIrms |
| 10.312.5 M | 0.09 UIPP | 0.26 UIPP | 0.010 UIrms | 0.10 UIrms |

***NOTE *1:***

With HP1+LP

***NOTE *2:***

With HP+LP

**Frequency error (100 kHz set as the reference)**

100 Hz to 300 kHz: ±2 %
300 kHz to 1 MHz: ±3 %
1 MHz to 3 MHz: ±5 %
3 MHz to 10 MHz: ±10 %
10 MHz to 80 MHz: ±15 %

| | | |
|---|---|---|
| 8.9 | LED display | Unlock, Alarm, Remote |
| 8.9.1 | Unlock | Lights up when the Rx section switches into the unlock status. |
| 8.9.2 | Alram | Lights up when the Tx section switches into the abnormal status (such as unlock). |
| 8.9.3 | Remote | Lights up when the mode switches into the remote status by the external controller. |
| 8.10 | External interface | |
| 8.10.1 | GPIB | All the control except for cancellation of remote status enabled from the external controller |
| 8.11 | Other | |
| 8.11.1 | Dimensions | 221.5 High, 426 Wide, 451 Deep (mm) |
| 8.11.2 | Mass | 23 kg (Max.) |
| 8.11.3 | Power source | 85 to 132 Vac or 170 to 250 Vac 47.5 to 63 Hz |
| 8.11.4 | Temperature | 10 to 40 °C, –20 to 60 °C (When stored) |



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# Section 2 Description of Panel

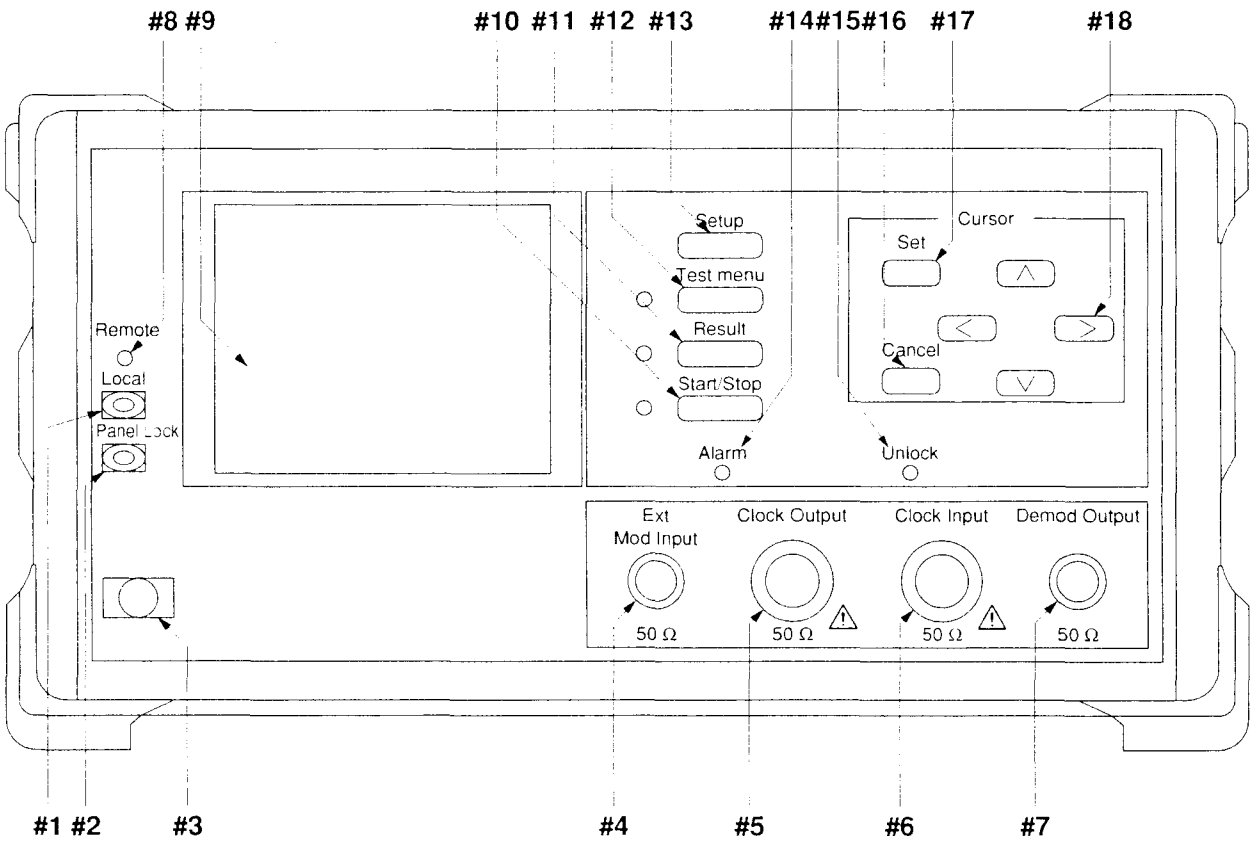

2.1 Description of Main Unit Panel ..... 2-2
2.1.1 Front Panel ..... 2-2
2.1.2 Back Panel ..... 2-4




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# 2.1 Description of Main Unit Panel

## 2.1.1 Front Panel




**Description of the Front Panel**

| No. | Label | Description |
|---|---|---|
| #1 | Local | Switches this device into the local control status (state where the panel key is effective) by an effective key when the remote lamp is lit. This does not operate when the remote lamp is unlit. |
| #2 | Panel Lock | Switches keys other than the panel lock and local keys between the status of input enabled and the status of input disabled. When the LED is ON, input of keys other than panel lock and local keys is disabled. |
| #3 | Power switch | A switch to turn the AC power source ON and OFF. |
| #4 | Ext. Mod. Input | Inputs external modulating signal to the BNC connector. |
| #5 | Clock Out | Connector for clock output.<br>Level: +4 dBm ±3 dB<br>Connector: APC 3.5/50 Ω |



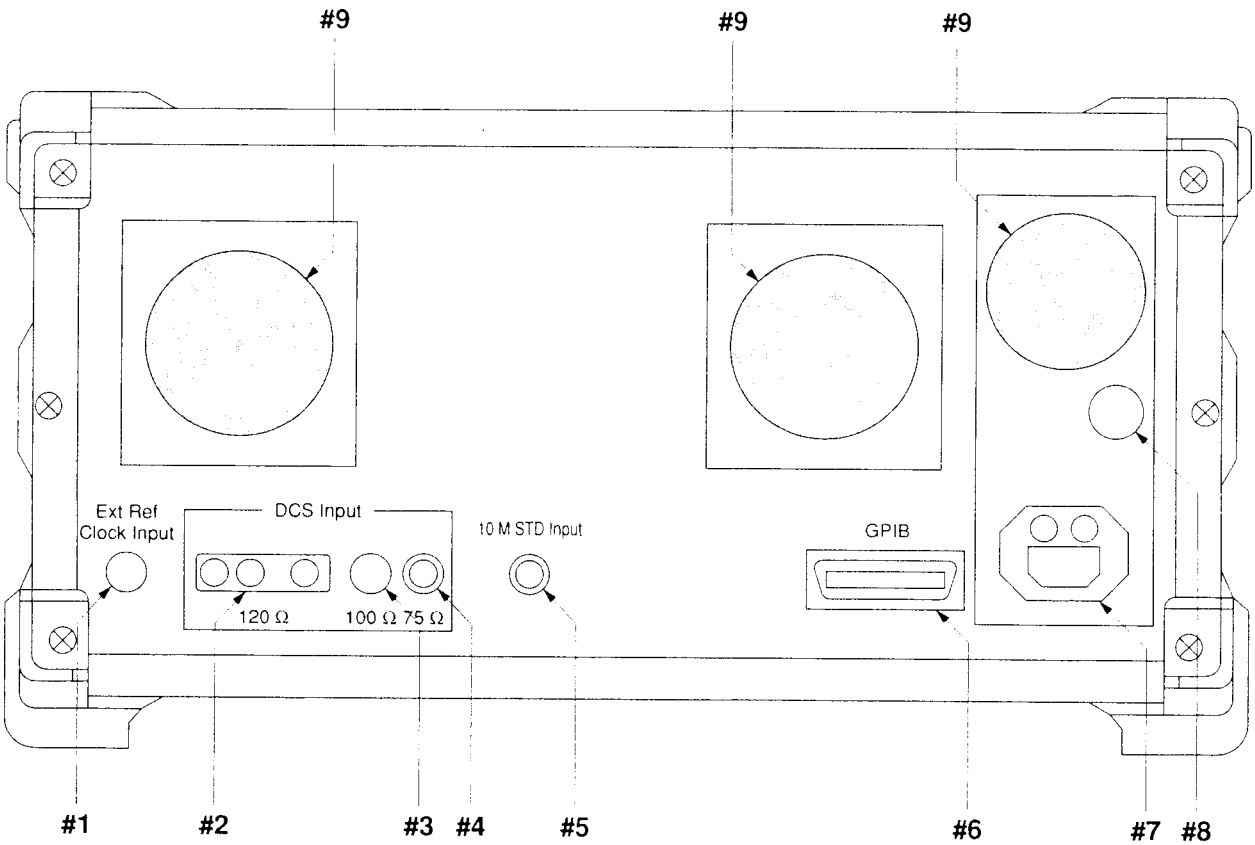
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| No. | Label | Description |
|---|---|---|
| #6 | Clock Input | Connector for clock input<br>Level: 0.7 to 1.3 $V_{PP}$<br>0.15 V to 1.3 $V_{PP}$ (with Option 10)<br>Connector: APC 3.5/50 Ω |
| #7 | Demod. Out | Connector to output the demodulation signal. |
| #8 | Remote | Lights up when this device is in the remote status (status controlled by GPIB) |
| #9 | (Display screen) | A screen to display the measurement items, setup items and measured results. |
| #10 | Start/Stop | Starts and stops measurement. |
| #11 | Result | Displays the Result screen. Closes the Result screen when it is already displayed. Does not operate when the window is open.<br>Does not operate either when the Result window alone is displayed.<br>Indicates "Result Screen Currently being Displayed" when the LED is ON. |
| #12 | Test Menu | Displays the Test Menu screen.<br>Closes the Test Menu screen when it is already displayed.<br>Does not operate when the window is open.<br>Does not operate either when the Test Menu window alone is displayed.<br>Indicates "Test Menu Screen Currently being Displayed" when the LED is ON. |
| #13 | Setup | Displays the Setup screen. Closes the Setup screen when it is already displayed. Does not operate when the window is open.<br>Does not operate either when the Setup window alone is displayed.<br>Indicates "Setup Screen Currently Displayed" when the LED is ON. |
| #14 | Alarm | The lamp lights up when the jitter transmission module is in the state of Unlock. |
| #15 | Unlock | The Unlock lamp lights up when the jitter reception module is in the state of Unlock. |
| #16 | Cancel | Selected at the time of data setting to close the window.<br>The data being set in the window become invalid (setting before opening of the window will be maintained).<br>Does not operate when the window is closed. |
| #17 | Set | Selected at the time of data setting to open the window.<br>Sets the item on the black and white reversed cursor when the window is already open. |
| #18 | <∧∨> | Moves the cursor and window cursor on the screen.<br>Increases or decreases the numerical value by using the ∧ and ∨ in the window of numerical value input.<br>These keys operate continuously by holding them down. |



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## 2.1.2 Back Panel




Description of the Back Panel



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| No. | Label | Description |
|---|---|---|
| #1 | Ext Ref Clock Input | Connector for external reference signal input. |
| #2 | DCS Input 120 Ω | Connector for synchronization with the external signal. Input clock that conforms to ITU-T.G.703-10 or HDB3 data. |
| #3 | DCS Input 100 Ω | Connector for synchronization with the external clock.<br>Input HDB3, AMI, or B8ZS data that conforms to ANSI T1. |
| #4 | DCS Input 75 Ω | Connector for synchronization with the external clock.<br>Input clock that conforms to ITU-T.G.703-10 or HDB3 data. |
| #5 | 10M STD Input | Connector to input 10 MHz signal from the external equipment at the time of Clock = Lock 10 M. |
| #6 | GPIB | A GPIB interface connector. |
| #7 | [Tangential line for AC power source] | A tangential line for AC power source. Make sure to use the power source cord that comes with the device. |
| #8 | [Frame grounding terminal] | A frame grounding terminal.<br>Make sure to connect it to the ground potential before the power is supplied to use a bipolar power receptacle. |
| #9 | Cooling fan | A fan for cooling purpose. Do not block this face. |



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# Section 3 Basic Operations


3.1 Screen Structure ..... 3-2
3.2 Segmented Display of Screen ..... 3-3
3.3 Selection of Screen ..... 3-4
3.4 Setting of Measurement Conditions ..... 3-5
3.4.1 Basic Operation of Setting ..... 3-5
3.4.2 Setting by Item ..... 3-6
3.4.3 Setting by Numerical Value ..... 3-7
3.4.4 Setting by Character ..... 3-8
3.5 Starting/Stopping Measurement ..... 3-10




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# 3.1 Screen Structure

The MP1777A screen is configured as follows.

| Main screen name | Secondary screen name | Detail of screen contents |
|---|---|---|
| Setup | Interface | Performs setting for the interface, clock source, equalizer and other. |
| | Memory | Performs setting for the memory and other. |
| | System | Performs setting for the buzzer, clock, GPIB and other. |
| Test menu | Manual Jitter | Performs setting for Tx, Rx, frequency offset and other. |
| Result | Jitter | Performs setting for the style of display data, mode of measured result display and other. |



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# 3.2 Segmented Display of Screen

The MP1777A enables the Main screen shown below to be displayed at the same time.

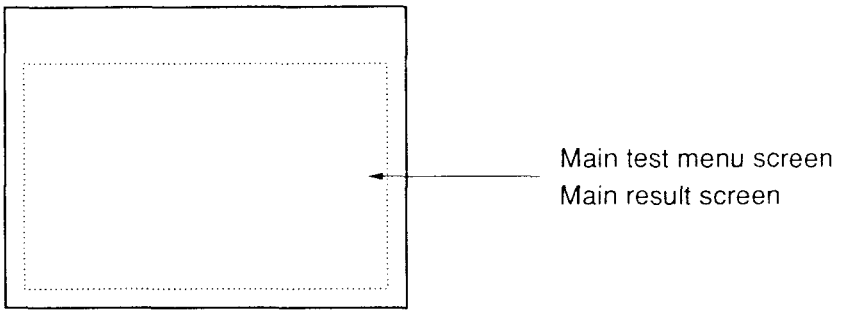
(1) Main test menu screen

(2) Main result screen

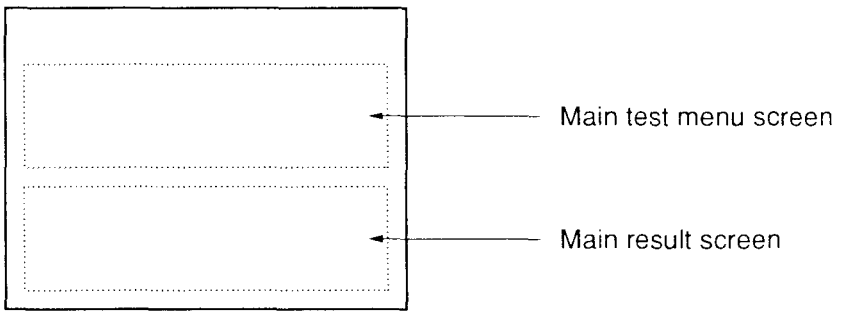
The combination of these screens is shown on segmented display. The Main setup screen cannot be displayed together with other screens.

Switch the screen layout from (1) to (2).

### (1) Single segment display




### (2) Display segmented into two






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# 3.3 Selection of Screen

This section provides explanations of the method of selection of the MP1777A screen.

### (1) Selection of the Main screen

The Main screen can be selected by using the setup, test menu or result key.

| Key name | Description |
|---|---|
| Setup | Pressing this key once causes the screen to move to the Main setup screen. Pressing this key again causes the screen to return to the screen shown before the move. |
| Test menu | Pressing this key once causes the LED located to the left of the key to light up. Pressing the key again causes the same LED to light off.<br>• When LED is lit: Shows that the Main test menu screen is displayed.<br>• When LED is unlit: Shows that the Main test menu screen is no displayed. |
| Result | Pressing this key once causes the LED located to the left of the key to light up. Pressing the key again causes the same LED to light off.<br>• When LED is lit: Shows that the Main result screen is displayed.<br>• When LED is unlit: Shows that the Main result screen is no displayed. |

***NOTE:***

When the LED located to the left of the test menu key and the result key are lit at the same time, it signifies that the Main screens for these are displayed at the same time. (Segmented display)

### (2) Selection of the secondary screen

Move the cursor to the area for switching to the secondary screen (located to the right of the main screen name) on each screen and press the Set key. As the window for item selection is displayed, select a secondary screen of your choice from the window. Pressing the Set key again causes the window for item selection to close and the specified secondary screen to be displayed.



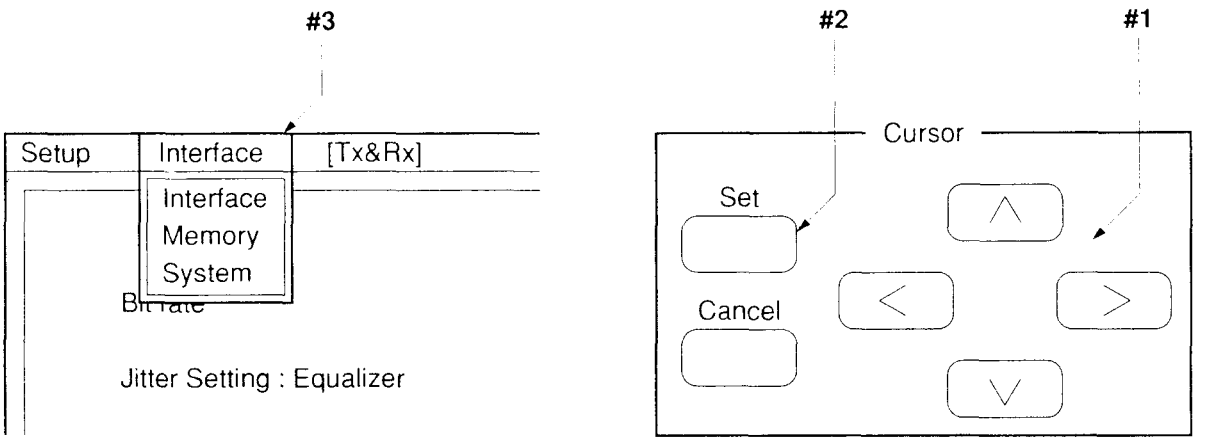
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# 3.4 Setting of Measurement Conditions

## 3.4.1 Basic Operation of Setting

Basically follow procedures set out below in order to modify items for the MP1777A.

(1) Press the cursor key (#1) and move the cursor onto the item you wish to modify.
(2) Press the Set (#2) key.
(3) As the window for item modification opens, set the target item in accordance with the explanations given in 3.4.2. (#3)
(4) When the window for item modification closes, the modified details are set.




***NOTE:***

Pressing the Cancel key causes the setting to return to the original setting if you wish to cancel setting operations. Windows for some of the items you wish to modify may not open.



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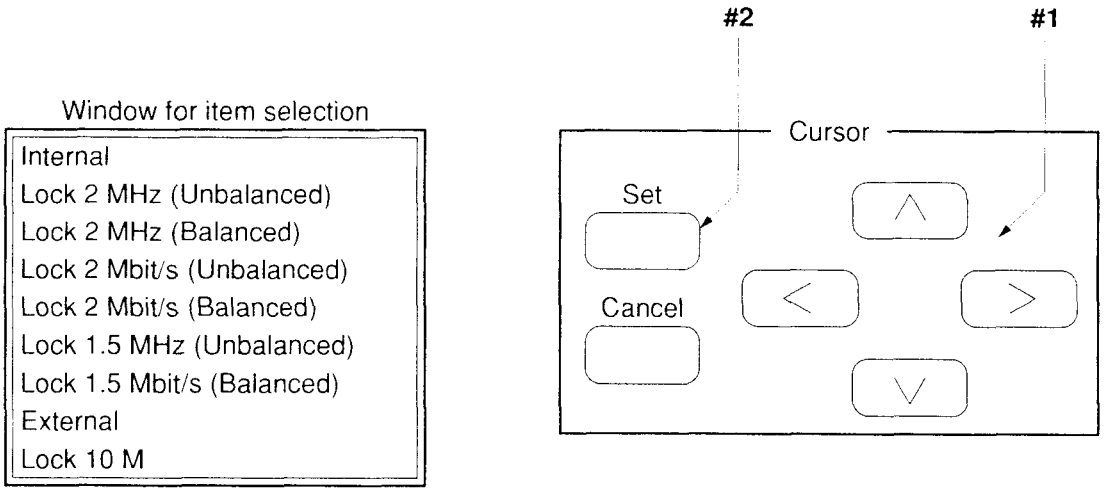
## 3.4.2 Setting by Item

To perform setting by item selection, the window for item selection opens.
This section provides operation procedures in the window for item selection.

(1) Press the cursor key (#1) and move the cursor onto the item of your choice.
(2) Press the Set (#2) key.
(3) The window for item selection automatically closes.

***NOTE:***

A window for Yes or No selection for confirmation purposes may open for certain items selected. In this case, check the item selected and press the Set key pointed to Yes to set the item or the same key pointed to No to cancel the item. The cancel key can also be used to cancel the item setting.





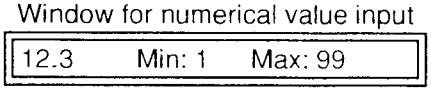

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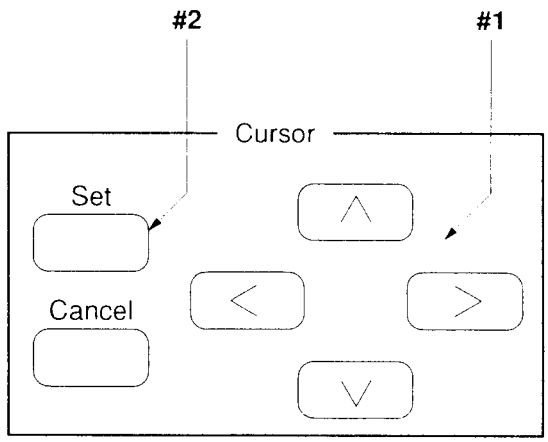
## 3.4.3 Setting by Numerical Value

To perform setting by numerical value input, the window for numerical value input opens.
This section provides operation procedures in the window for numerical value input.

(1) Press the cursor key (← or → of #1) and move the cursor onto the digit of your choice.
(2) Press the cursor key (↑ or ↓ of #1) and modify the value.
(3) Repeat operations, (1) and (2), until the value in the window reaches the numerical value intended.
(4) Press the Set (#2) key.
(5) The window for numerical value input automatically closes.

Window for numerical value input



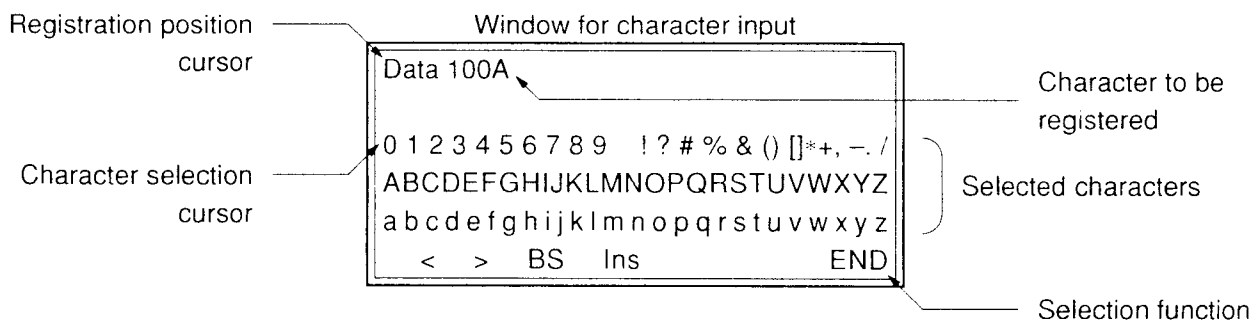


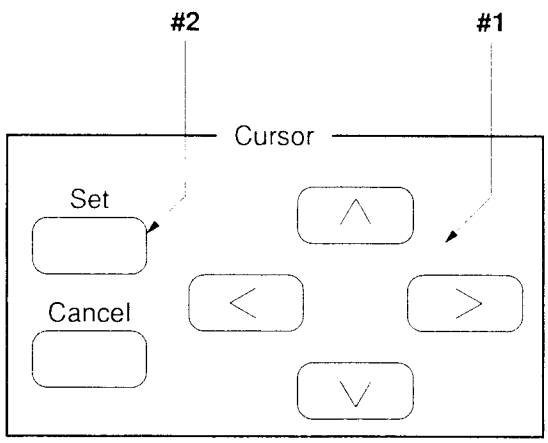

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## 3.4.4 Setting by Character

To perform setting by character input, the window for character input opens. This section provides operation procedures in the window for character input.

(1) Press the cursor key (#1) and move the character selection cursor onto < or >.
(2) Press the Set (#2) key and move the registration position cursor.
(3) Press the cursor key (#1) and move the character selection cursor onto the character of your choice
(4) Press the Set (#2) key and input characters.
(5) Repeat operations, (3) and (4), until the character string to be registered becomes the character string intended.
(6) When the input of the character string is completed, press the cursor key (#1) and move the character selection cursor onto END.
(7) Press the Set key.
(8) The window for character input automatically closes.






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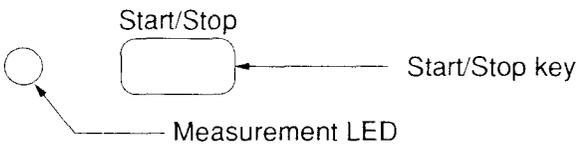
| Function character for selection | Operations |
|---|---|
| < | Moves the registration position cursor to the top left.<br>Moves the same cursor to the left edge when it is located at the left edge of the registration character area. |
| > | Moves the registration position cursor to the right.<br>Moves the same cursor to the left edge when it is located at the right edge of the registration character area. |
| BS | Deletes a character located to the left of the registration position cursor and moves the character string that comes from after the registration position cursor by one character worth to the left.<br>Does not operate when the registration position cursor is located at the left edge of the registration character area. |
| Ins | Moves the character string located from after the registration position cursor to the right by one character worth and insert a blank space equivalent to a character at the position of the registration position cursor.<br>The registration character string comprises up to fifteen characters and any excess character will be deleted. |
| END | Sets the character string to be registered and closes the character string window. |



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# 3.5 Starting/Stopping Measurement

Basically, use the Start/Stop key to start/stop the measurement on the MP1777A. The Start/Stop LED indicates the measurement status: When the LED is ON, it indicates that the MP1777A is measuring. When the LED is OFF, you can click the Start/Stop key to start the measurement. When the LED is ON, you can click the Start/Stop key to stop the measurement.




***Notes:***

1. Measurement starts in the following cases in addition to the case when clicking the Start/Stop key at LED-OFF.
   - With repeat measurement set, a new round of measurement has started.
   - Setting conditions related to measurement are modified during measurement.
2. Measurement stops in the following cases in addition to the case when clicking the Start/Stop key at LED-ON.
   - With a measurement cycle set, the measurement cycle set comes to an end after the measurement starts. (In the case of repeat measurement, the next round of measurement starts immediately after the previous round of measurement ends.)
   - Setting conditions related to measurement are modified during measurement. (The next round of measurement starts immediately after the previous round of measurement ends.)



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# Section 4 Description of Each Screen


4.1 Main Setup Screen ..... 4-2
4.1.1 Secondary Interface Screen ..... 4-2
4.1.2 Secondary Memory Screen ..... 4-5
4.1.3 Secondary System Screen ..... 4-6
4.2 Main Test Menu Screen ..... 4-7
4.2.1 Secondary Manual Screen ..... 4-7
4.3 Main Result Screen ..... 4-8
4.3.1 Secondary Jitter Screen ..... 4-8



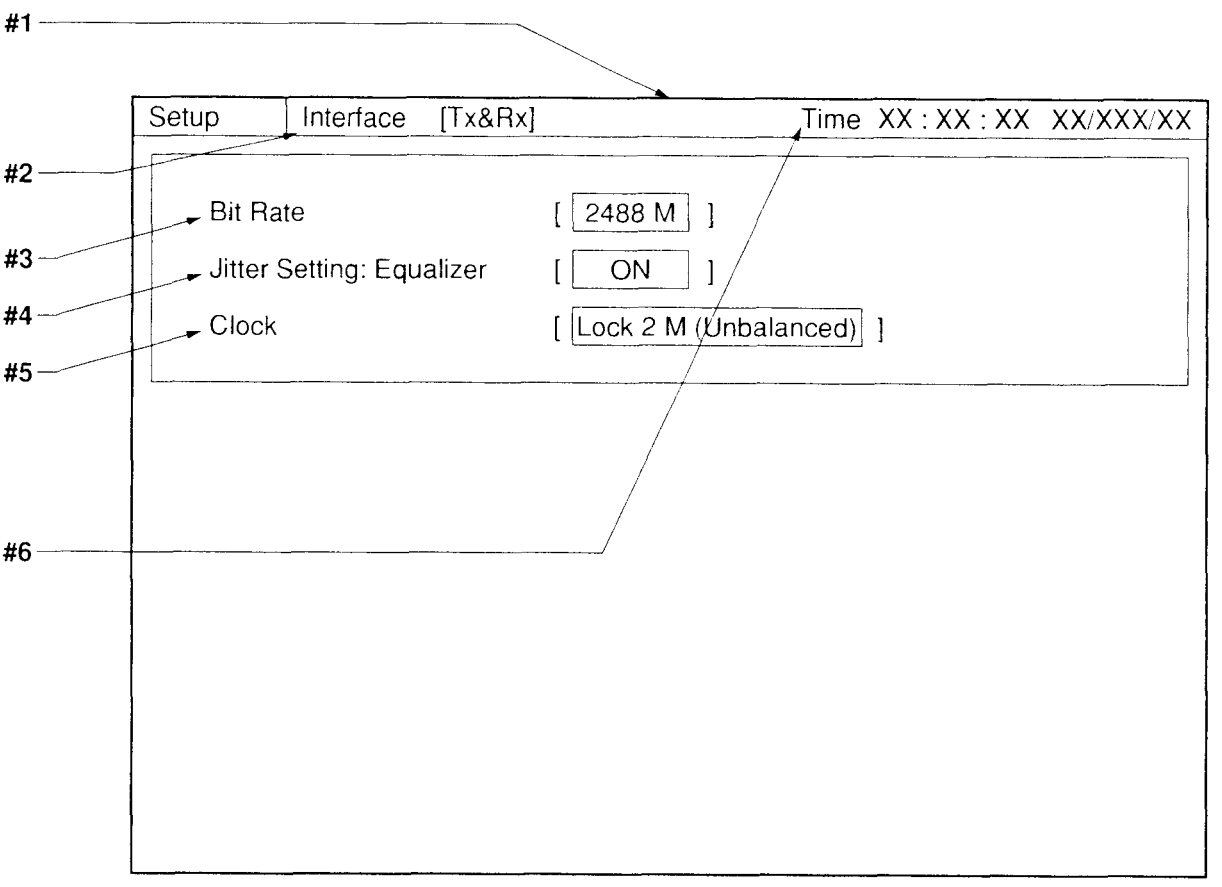

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# 4.1 Main Setup Screen

## 4.1.1 Secondary Interface Screen

### (1) Interface (Tx&Rx)

A screen to establish default setting of measurement. When modifications are added to the screen in the process of measurement, the measurement starts again. A method is available to establish setting separately for transmission and reception as Tx/Rx.





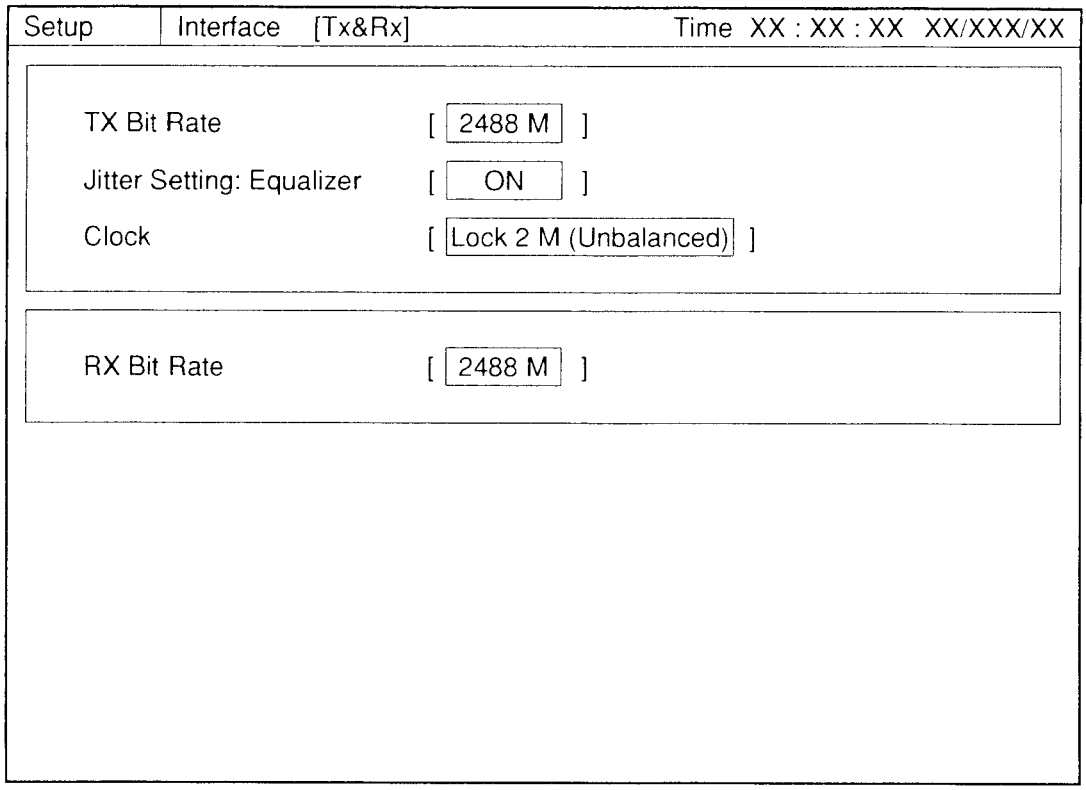

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| No. | Display | Description |
|---|---|---|
| #1 | [Secondary screen selection] | Selects a secondary screen of the Main setup screen. A secondary screen must be selected at this position also with other screens. |
| #2 | | Enables selection of the setting method.<br>Tx&Rx: Enables the same setting for transmission and reception. The value set for Rx will be set as the bit rate when the mode is switched from Tx/Rx to Tx&Rx.<br>Tx/Rx: Enables setting separately for transmission and reception. |
| #3 | Bit Rate | Clock Sets the Tx and Rx bit rate.<br>When Option is not mounted, the following bit rate can be set.<br>2,488 Mbit/s, 4,977 Mbit/s, 9,953 Mbit/s<br>When Option 01 is mounted, the following bit rate can be set.<br>2,494 Mbit/s, 4,988 Mbit/s, 9,977 Mbit/s<br>When Option 02 is mounted, the following bit rate can be set.<br>2,666 Mbit/s, 5,332 Mbit/s, 10,664 Mbit/s<br>When Option 04 is mounted, the following bit rate can be set.<br>3,062 Mbit/s, 6,125 Mbit/s, 12,249 Mbit/s<br>When Option 05 is mounted, the following bit rate can be set.<br>3,069 Mbit/s, 6,138 Mbit/s, 12,276 Mbit/s<br>When Option 06 is mounted, the following bit rate can be set.<br>2,677 Mbit/s, 5,355 Mbit/s, 10,709 Mbit/s<br>When Option 07 is mounted, the following bit rate can be set.<br>2,578 Mbit/s, 5,156 Mbit/s, 10,313 Mbit/s |
| #4 | Jitter Setting: Equalizer | Sets the equalizer ON and OFF.<br>(Enabled only when 9,953 Mbit/s, 9,977 Mbit/s, 10,664 Mbit/s, 12,249 Mbit/s, 12,276, 10,709 Mbit/s and 10,313 Mbit/s are selected.)<br>ON: The Ext. Mod. Input sensitivity changes linked to the tolerance mask.<br>OFF: The Ext. Mod. Input sensitivity becomes fixed. |
| #5 | Clock | Sets the clock source.<br>Internal: Internal self-oscillation.<br>Lock 2 MHz (Balanced): Clock synchronous with the 2 MHz signal input from the external DCS Input (120 Ω)<br>Lock 2 MHz (Unbalanced): Clock synchronous with the 2 MHz signal input from the external DCS Input (75 Ω)<br>Lock 2 Mbit/s (Balanced): Clock synchronous with the 2 Mbit/s signal input from the external DCS Input (120 Ω)<br>Lock 2 Mbit/s (Unbalanced): Clock synchronous with the 2 Mbit/s signal input from the external DCS Input (75 Ω)<br>Lock 1.5 Mbit/s (Balanced): Clock synchronous with the 1.5 Mbit/s signal input from the external DCS Input (100 Ω)<br>Lock 1.5 MHz (Unbalanced): Clock synchronous with the 1.5 MHz signal input from the external DCS Input (75 Ω)<br>External: Clock synchronous with the signal input from the Ext. Ref. Clock Input.<br>Lock 10 M: Clock synchronous with the 10 MHz signal input from the 10'M STD Input |
| #6 | Time | Displays the current date and time. |



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## (2) Interface (Tx/Rx)



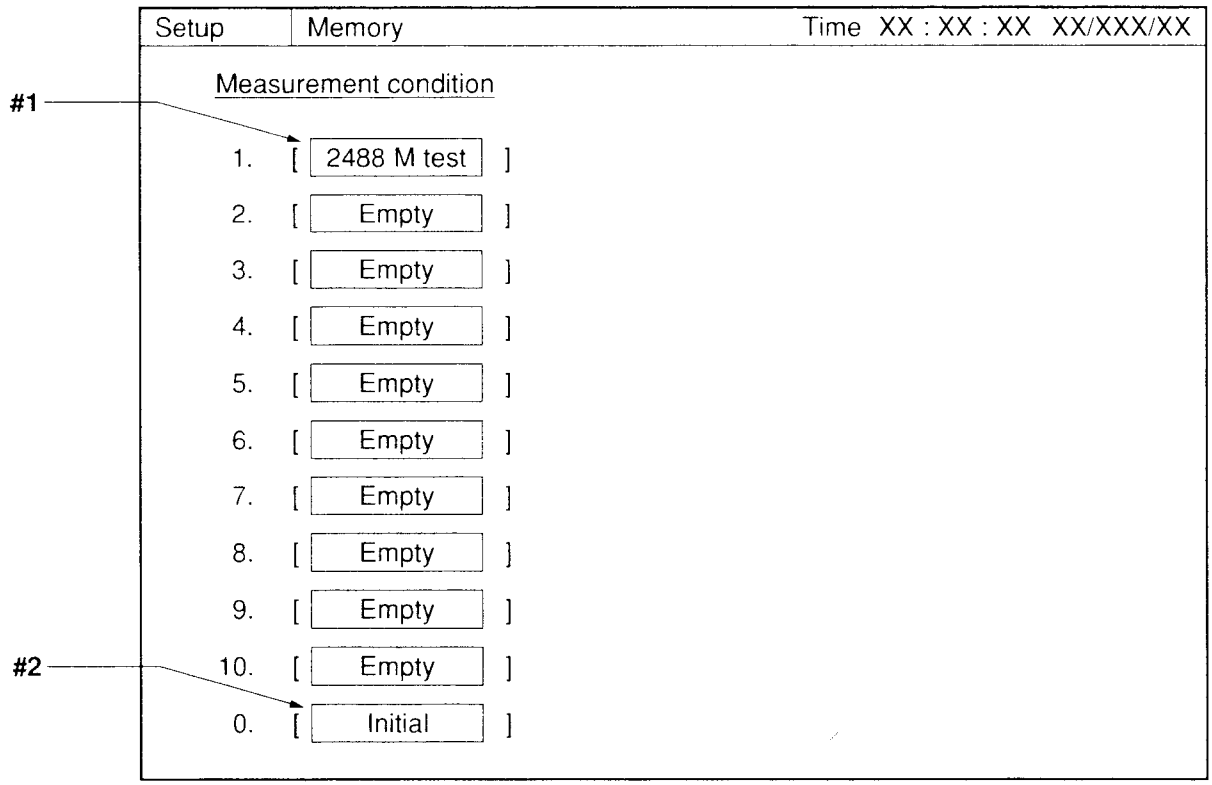

Setting for transmission is performed in the upper half of the screen, while setting for reception is performed in the bottom half of the screen. The details of the display are the same as those for Tx&Rx.



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## 4.1.2 Secondary Memory Screen

The MP1777A can internally store setting conditions. This screen is used to store and read setting conditions. Memory can be maintained even when the power is turned OFF.



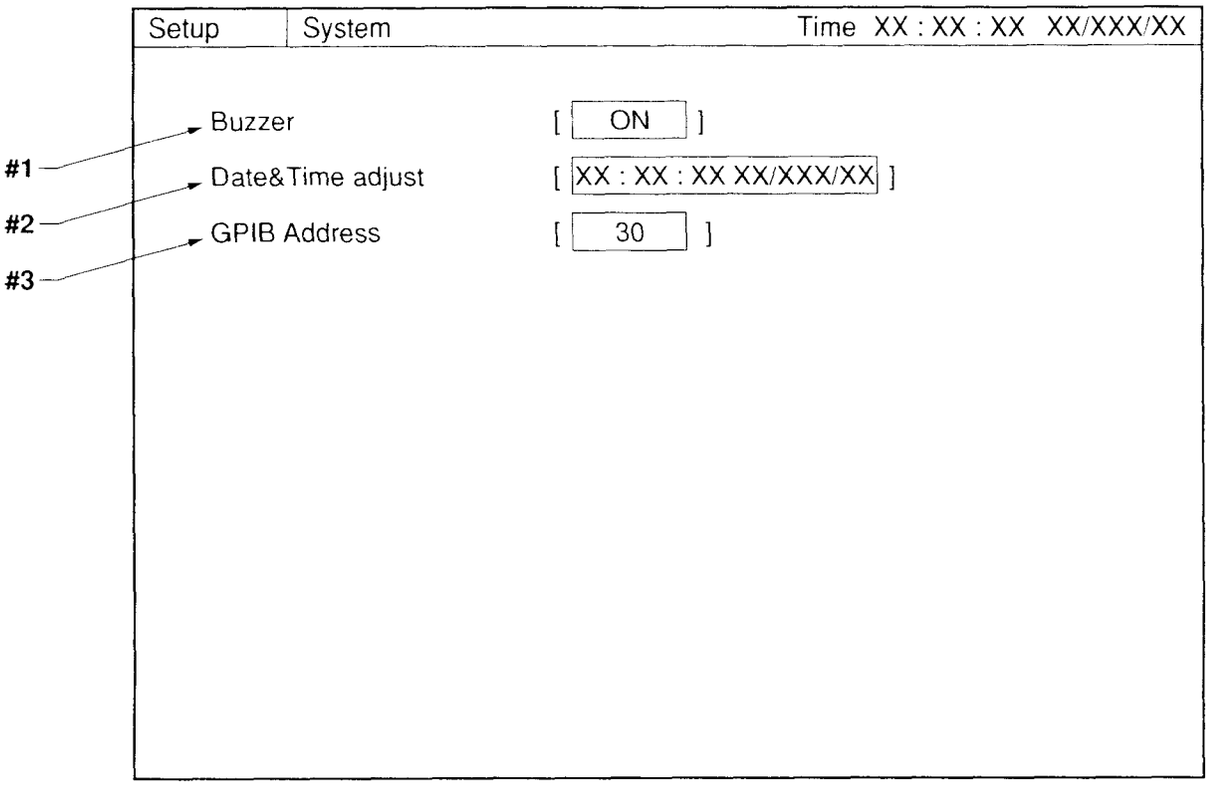

| No. | Display | Description |
|---|---|---|
| #1 | Measurement Condition 1-10 | Memory to store measurement conditions. Registration of up to ten measurement conditions enabled.<br>Pressing the Set key causes the window for item selection to open. Here, saving, overwriting, reading and deleting data, and changing names are enabled.<br>To save data or change names, the window for character input further opens to enable input of names.<br>When memory is empty, the name "Empty" is displayed. |
| #2 | Measurement Condition 0 | A special memory storing default values. Used to return measurement conditions to initial values. This memory cannot be used for operations other than reading. |



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## 4.1.3 Secondary System Screen

A screen used to perform basic MP1777A setting. This screen is also used to establish setting for GPIB.



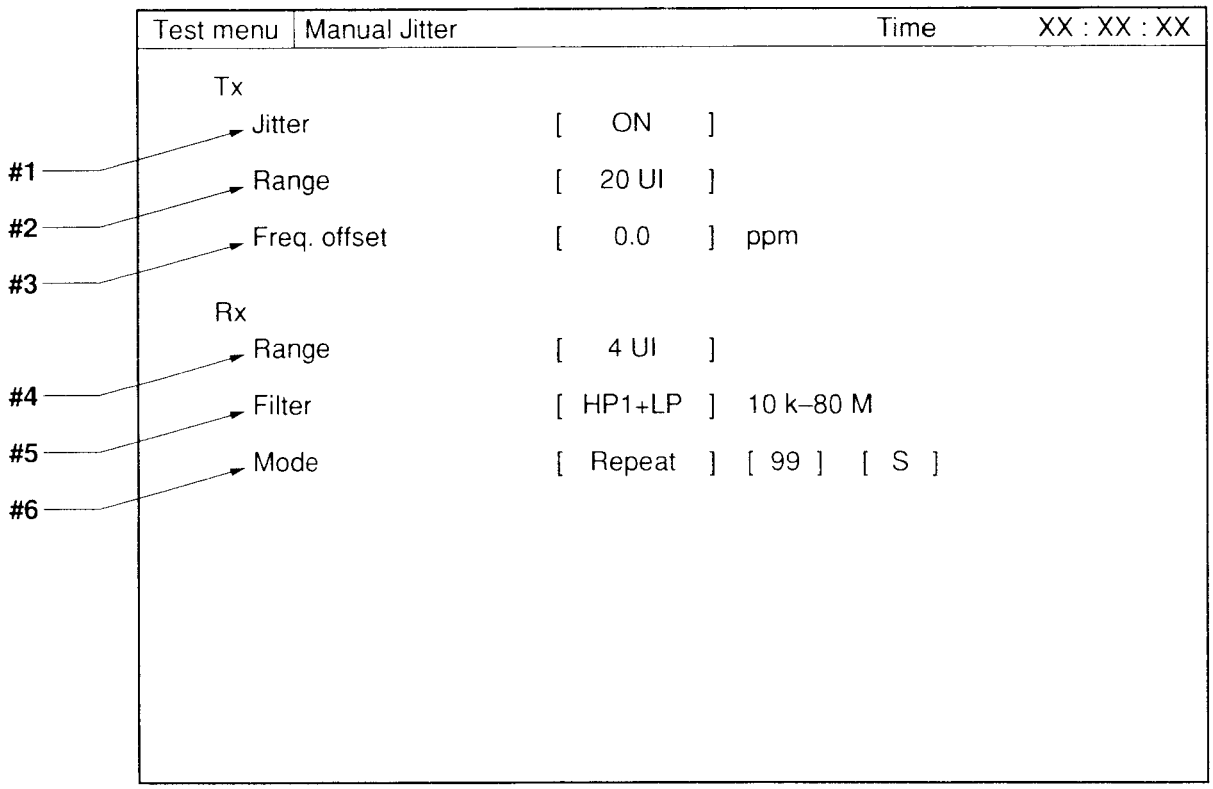

| No. | Display | Description |
|---|---|---|
| #1 | Buzzer | Enables selection of whether or not to blow buzzer when alarm or unlock is generated or the setting is wrong. |
| #2 | Date&Time adjust | Sets the clock built in the MP1777A. Pressing the Set key causes the window for numerical value input to open to enable setting of the time. |
| #3 | GPIB Address | Enables setting of the primary address of GPIB within the range between 0 and 30. |



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# 4.2 Main Test Menu Screen

## 4.2.1 Secondary Manual Screen




| No. | Display | Description |
|---|---|---|
| #1 | Tx Jitter | Sets jitter generation ON and OFF.<br>ON: Enables addition of the jitter.<br>OFF: Disables addition of the jitter. |
| #2 | Tx Range | Switches the jitter generation range. |
| #3 | Freq.offset | Sets the frequency offset. |
| #4 | Rx Range | Switches the range for reception jitter measurement. |
| #5 | Filter | Enables selection of filter for reception jitter measurement. |
| #6 | Mode | Enables selection of measurement mode.<br>Single: Performs single measurement.<br>Repeat: Automatically starts the next round of measurement after completion of a round of measurement.<br>Manual: Continues measurement until the Start/Stop key is pressed once measurement starts.<br>Sets the measuring time for measurement performed in the single or repeat mode. |



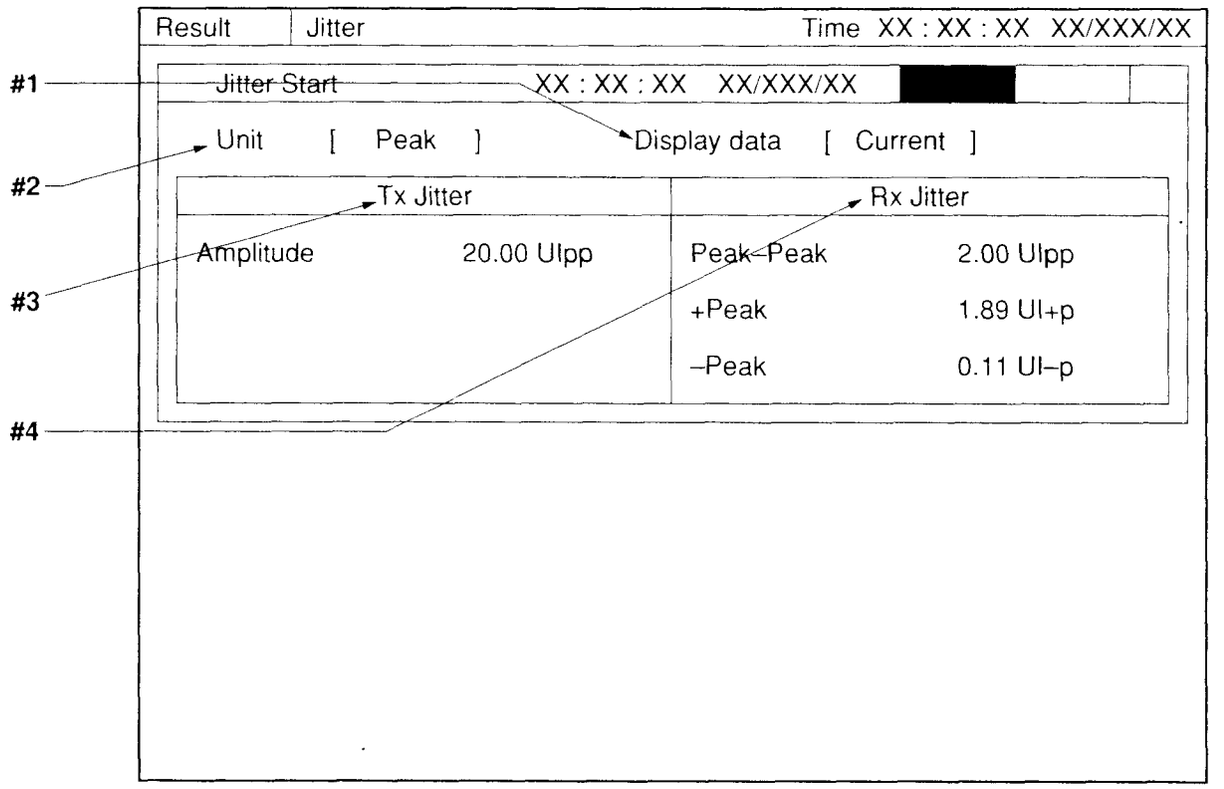
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# 4.3 Main Result Screen

## 4.3.1 Secondary Jitter Screen

A screen to display the measured results of jitter.

### (1) At peak





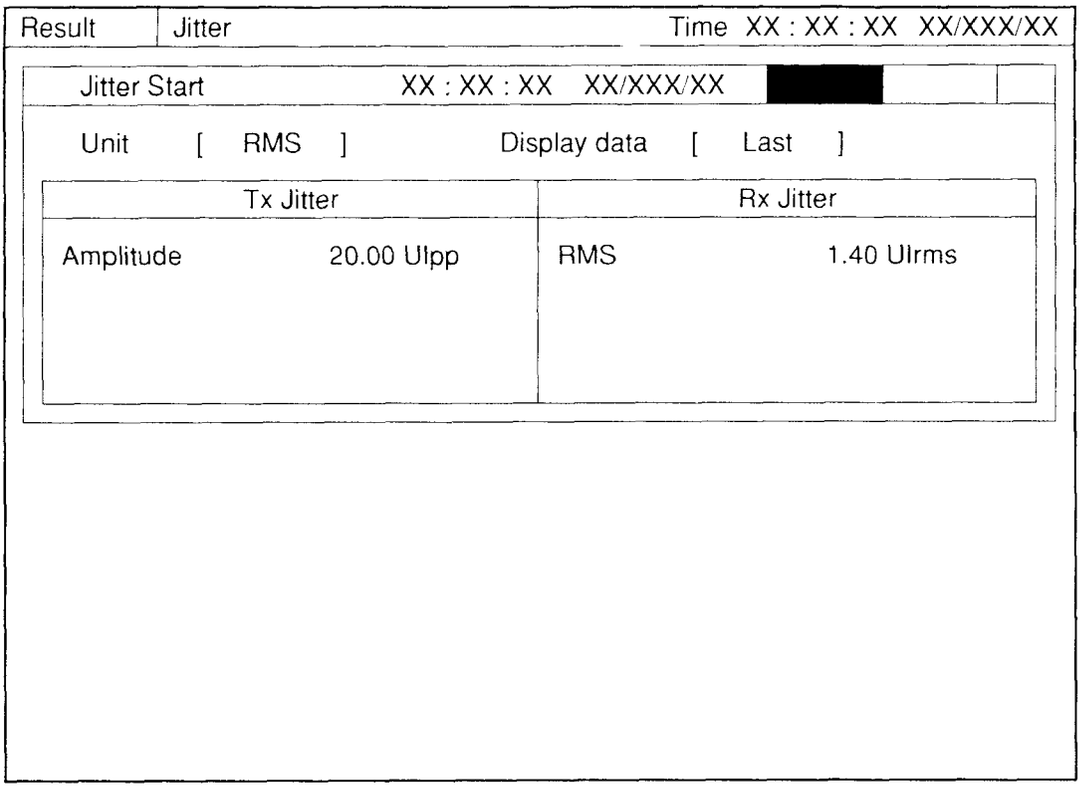

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| No. | Display | Description |
|---|---|---|
| #1 | Display data | Enables selection of the method for measured result display.<br>Current: Displays the results from the measurement start to the present.<br>Last: Displays the results at the completion of measurement. |
| #2 | Unit | Enables selection of the style of data to be displayed.<br>Peak: Displays the peak to peak measured results of the jitter.<br>RMS: Displays the measured results of effective jitter value. |
| #3 | Tx Jitter | Displays the monitor value of transmission jitter amplitude. |
| #4 | Rx Jitter | Peak–Peak displays the peak value of the measured values of the reception jitter in $UI_{PP}$.<br>+Peak: Displays the +peak value of measured values of the reception jitter in UI+p.<br>–Peak: Displays the –peak value of measured values of the reception jitter in UI–p.<br>RMS displays the effective value of measured values of the reception jitter in UIrms. |



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## (2) RMS






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# Section 5 Example of Operations


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5.2 Generation of Jitter ..... 5-3
5.2.1 Operation procedures ..... 5-3
5.3 Jitter Measurement ..... 5-5
5.3.1 Operation procedures ..... 5-5




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# 5.1 Block Diagram of Jitter Generation Module

The MP1777A can and add jitter that conform to ITU-T 0.172 Draft to the signal (clock) of the bit rate (clock) coverd by each option 01, 02, 04, 05, 06 or 07.

Figure 5-1 shows a block diagram of the jitter modulation module of the MP1777A. As the MP1777A does not incorporate a modulating signal generator, the modulating signal must be input from an external signal generator.

***NOTE:***

All the jitter measurement can be automatically performed from an external Personal Computer by combining the MS4630B Network Analyzer and the MX177701A Jitter Performance Test Software.

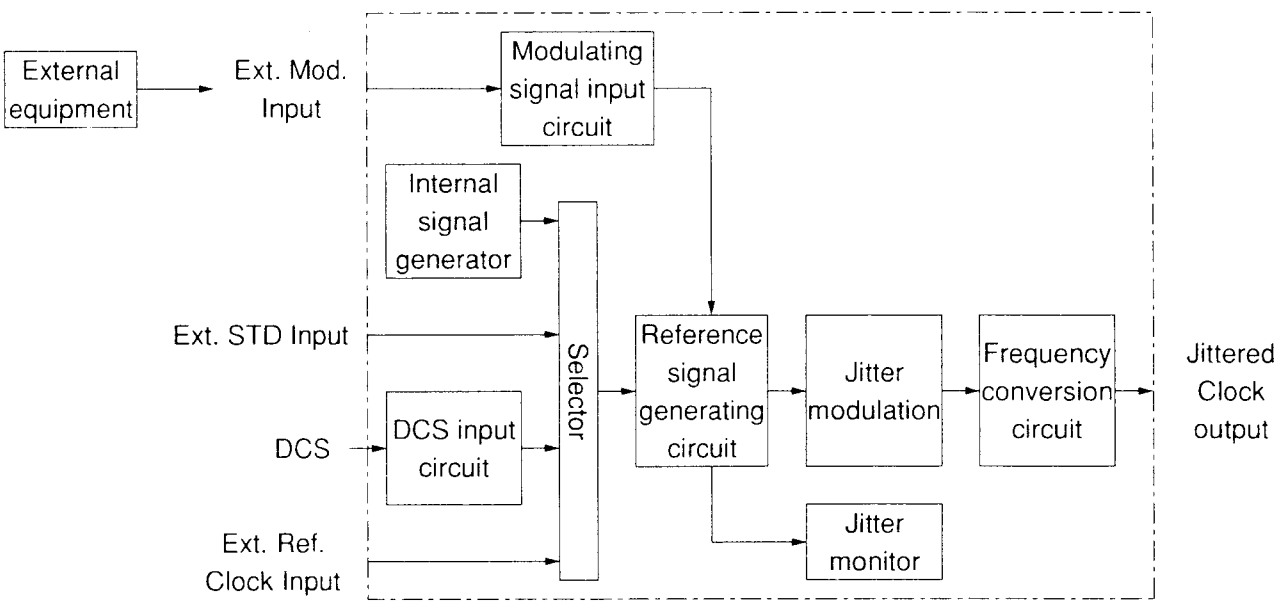



**Fig. 5-1 Block Diagram for MP1777A Jitter Generation Module**



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# 5.2 Generation of Jitter

## 5.2.1 Operation procedures

Procedures for jitter generation using external modulating signal source
Example: Bit Rate = 9,953 MHz, Modulation frequency = 100 kHz, Jitter amplitude = 1 $UI_{PP}$

(1) Connect an external modulating signal generator to Ext. Mod. Input of the MP1777A (See Fig. 5-2).
(Do not input signal exceeding 2 $V_{PP}$.)

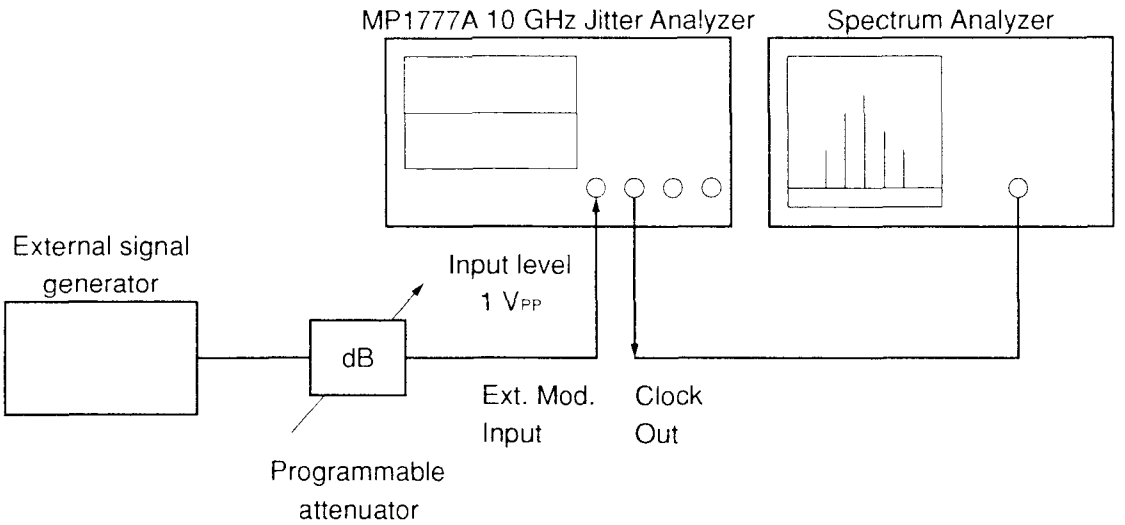



**Fig. 5-2 Jitter Generation Configuration**

(2) Select Bit Rate = 9,953 M on the secondary screen of the setup menu interface of the MP1777A.
Also, set Jitter Setting/Equalizer = OFF.
(The equalizer is used for automatic measurement of jitter transfer. Normally, select the equalizer setting of OFF.)

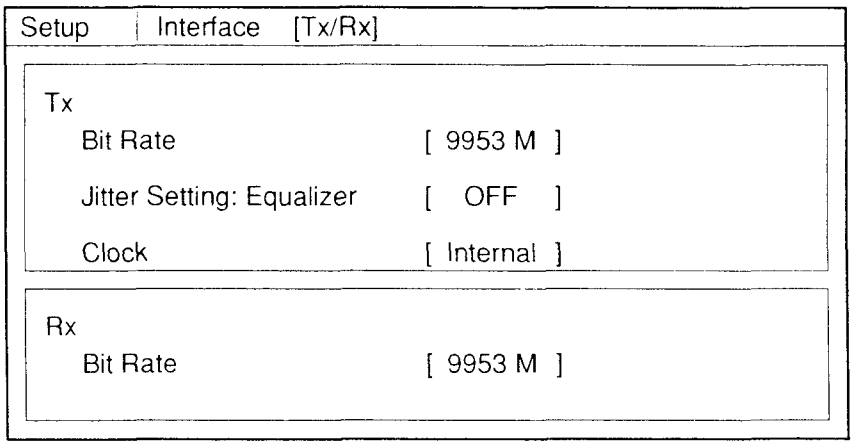



**Fig. 5-3 Setup Screen**



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(3) Set Tx Jitter = ON on the Test menu/manual jitter screen.
Also set Tx Range = 80 UI.

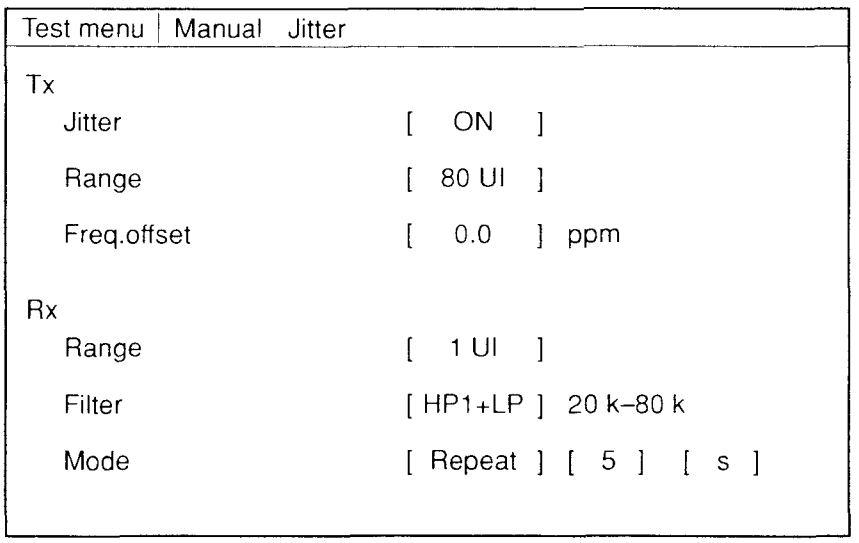



**Fig. 5-4 Test Menu Screen (Manual)**

(4) A clock with 1 UI jitter can be generated by setting the output level of the external modulating signal so that the TX monitor value on the Result screen becomes 1 UI.

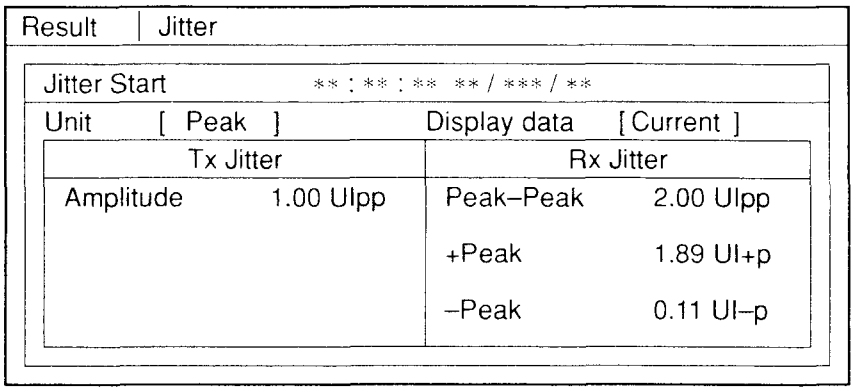



**Fig. 5-5 Result Screen (Manual)**

***NOTE:***

Refer to the Section 8 "Supplementary Data" for the amount of jitter enabled to be generated on each bit range and range.



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# 5.3 Jitter Measurement

The MP1777A 10 GHz Jitter Analyzer enables measurement of jitter of up to 80 MHz bandwidth, which conforms to ITU-T 0.172 Draft.

## 5.3.1 Operation procedures

***Example:***

Measurement of output jitter of bit rate = 9.953 M

(1) Connect the signal (clock) to be measured to the MP1777A 10 GHz Jitter Analyzer.

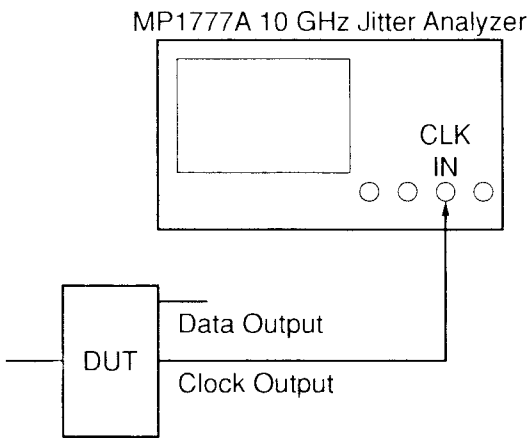



**Fig. 5-6 Connection Diagram for Jitter Measurement**

(2) Set Rx Bit Rate = 9.953 M on the Setup screen.

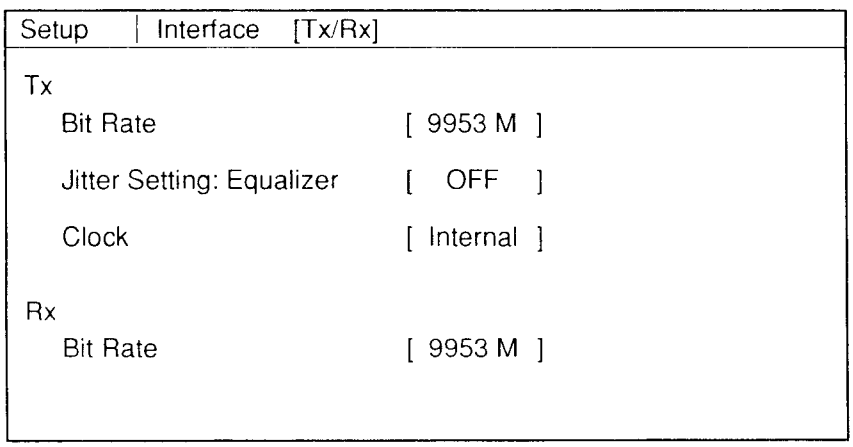



**Fig. 5-7 Setup Screen**



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(3) Set Rx Range = 4 UI and Filter = HP1+LP on the Test menu screen.
Also set Mode = Single and 60 second

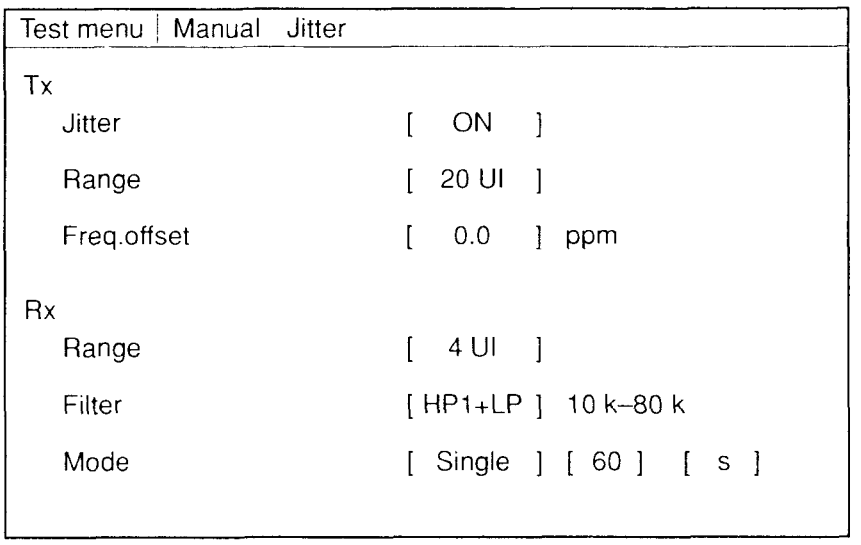



**Fig. 5-8 Test Menu Screen (Manual)**

(4) Pressing the Start/Stop button to start measurement causes the results to be displayed on the Result screen.

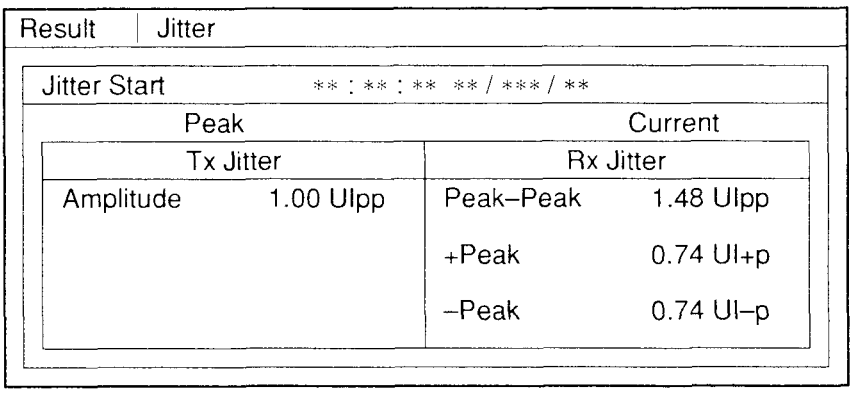



**Fig. 5-9 Result Screen (Manual)**



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# Section 6 Performance Tests

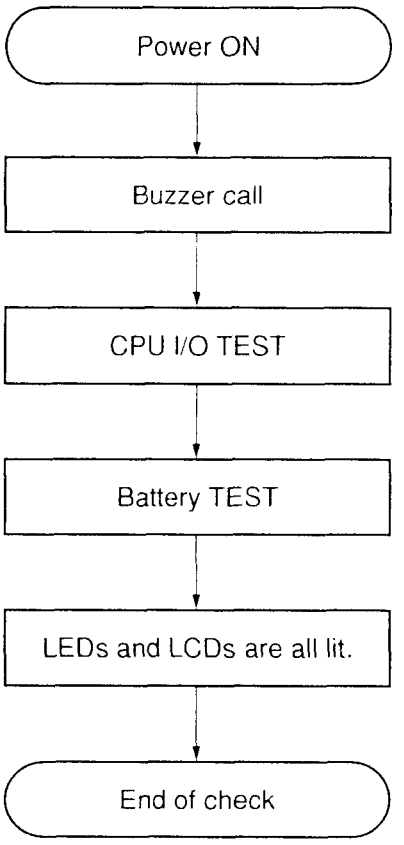

6.1 Checking CPU and Peripheral Devices ..... 6-2
6.2 Checking Clock Output Level ..... 6-3
6.3 Checking External Modulation Input Sensitivity ..... 6-4
6.4 Checking Jitter Measurement Accuracy ..... 6-5
6.5 Checking Demod. Output Sensitivity ..... 6-7




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# 6.1 Checking CPU and Peripheral Devices

The MP1777A checks the CPU and the peripheral devices in the following sequence when the power is turned on.






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# 6.2 Checking Clock Output Level

Check the output level in the following sequence.

(1) Connect the MP1777A 10 GHz Jitter Analyzer and the Spectrum Analyzer as shown in Fig. 6-1.
(2) Set the Bit Rate to 9953M on the "Setup: Interface" screen.
(3) Set the Tx Jitter = OFF on the "Test menu: Manual" screen.
(4) Adjust the Spectrum Analyzer sensor frequency to 9953.28 MHz.
(5) Check that the output level satisfies +5 dBm ±3 dB.
(6) Change the Bit Rate on the "Setup: Interface" screen, and repeat 1 to 5.

***NOTE:***

Refer to Table 6-1 to set the Bit Rate and the Spectrum Analyzer sensor frequency on the Setup menu.

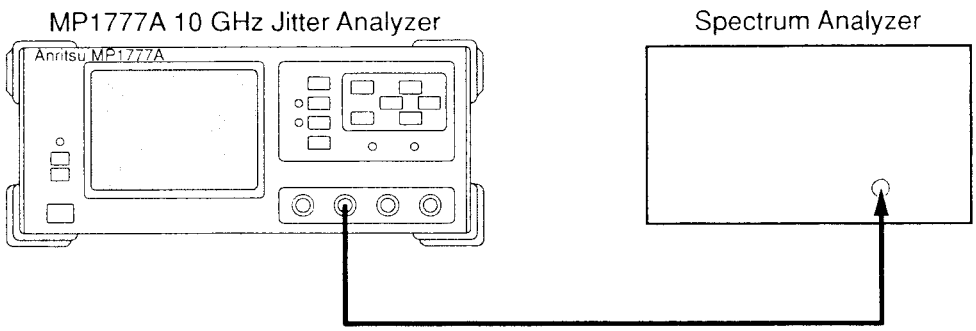



**Fig. 6-1 Clock Output Level Performance Test**

**Table 6-1 Nominal Frequency for Each Bit Rate**

| | Bit Rate | Nominal frequency |
|---|---|---|
| Standard | 2488 M | 2488.32 MHz |
| | 4977 M | 4976.64 MHz |
| | 9953 M | 9953.28 MHz |
| Option 01 | 2494 M | 2494.16 MHz |
| | 4988 M | 4988.32 MHz |
| | 9976 M | 9976.64 MHz |
| Option 02 | 2666 M | 2666.0571 MHz |
| | 5332 M | 5332.1142 MHz |
| | 10664 M | 10664.2284 MHz |
| Option 04 | 3062 M | 3062.3629 MHz |
| | 6125 M | 6124.7259 MHz |
| | 12249 M | 12249.4517 MHz |
| Option 05 | 3069 M | 3069.0 MHz |
| | 6138 M | 6138.0 MHz |
| | 12276 M | 12276.0 MHz |
| Option 06 | 2677 M | 2677.3063 MHz |
| | 5355 M | 5354.6127 MHz |
| | 10709 M | 10709.2253 MHz |
| Option 07 | 2578 M | 2578.125 MHz |
| | 5156 M | 5156.25 MHz |
| | 10313 M | 10312.5 MHz |



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# 6.3 Checking External Modulation Input Sensitivity

Check the external modulation input sensitivity in the following sequence.

(1) Connect the MP1777A 10 GHz Jitter Analyzer and the Signal Generator as shown in Fig. 6-2.
(2) Set the Bit Rate to 9953M on the "Setup: Interface" screen.
(3) Set the Tx Jitter = ON and the Range = 0.5 UI on the "Test menu: Manual Jitter" screen.
(4) From the Signal Generator, enter the sine wave signals with frequency 100 kHz and level 0.5 $V_{PP}$ to Ext. Mod. Input of the MP1777A.
(5) Check that the Tx monitor on the "Result/Jitter" screen satisfies the standard in Table 6-2.
(6) Check the other Bit Rates and Ranges by referring to Table 6-2 , as in the same manner.

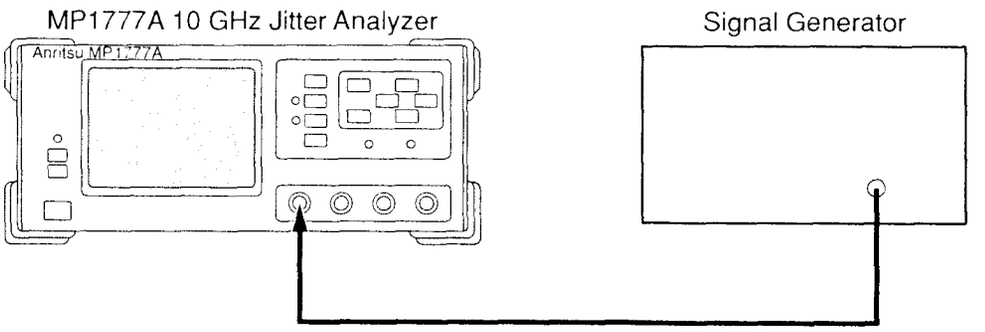



**Fig. 6-2 External Modulation Input Sensitivity Performance Test**

**Table 6-2 External Modulation Input Sensitivity Threshold Values**

| Bit Rate | Range | Minimum value ($UI_{PP}$) | Maximum value ($UI_{PP}$) | Standard |
|---|---|---|---|---|
| 2488 M | 0.5 UI | 0.425 | 0.575 | 0.5 $UI_{PP}$ ± 15 %/2 $V_{PP}$, 100 kHz |
| 2494 M | 20 UI | 17 | 23 | 20 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 100 kHz |
| 2666 M | 800 UI | 680 | 920 | 800 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 10 Hz |
| 4977 M | 0.5 UI | 0.425 | 0.575 | 0.5 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 100 kHz |
| 4988 M | 40 UI | 34 | 46 | 40 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 100 kHz |
| 5332 M | 1600 UI | 1360 | 1840 | 1600 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 10 Hz |
| 9953 M | 0.5 UI | 0.425 | 0.575 | 0.5 $UI_{PP}$ ± 15 %/0.5 $V_{PP}$, 100 kHz |
| 9976 M | 80 UI | 68 | 92 | 80 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 100 kHz |
| 10664 M | 3200 UI | 2720 | 3680 | 3200 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 10 Hz |
| 3062 M<br>3069 M<br>2677 M<br>2578 M | 0.5 UI | 0.425 | 0.575 | 0.5 $UI_{PP}$ ± 15 %/1.5 $V_{PP}$, 100 kHz |
| | 20 UI | 17 | 23 | 20 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 100 kHz |
| | 800 UI | 680 | 920 | 800 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 10 Hz |
| 6125 M<br>6138 M<br>5355 M<br>5156 M | 0.5 UI | 0.425 | 0.575 | 0.5 $UI_{PP}$ ± 15 %/0.75 $V_{PP}$, 100 kHz |
| | 40 UI | 34 | 46 | 40 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 100 kHz |
| | 1600 UI | 1360 | 1840 | 1600 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 10 Hz |
| 12249 M<br>12276 M<br>10709 M<br>10313 M | 0.5 UI | 0.425 | 0.575 | 0.5 $UI_{PP}$ ± 15 %/0.375$V_{PP}$, 100 kHz |
| | 80 UI | 68 | 92 | 80 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 100 kHz |
| | 3200 UI | 2720 | 3680 | 3200 $UI_{PP}$ ± 15 %/1 $V_{PP}$, 10 Hz |



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# 6.4 Checking Jitter Measurement Accuracy

Check the Jitter measurement accuracy in the following sequence.

(1) Connect the MP1777A 10 GHz Jitter Analyzer and the Signal Generator as shown in Fig. 6-3.
(2) Set the Bit Rate to 9953M on the "Setup: Interface" screen.
(3) Set the TX Jitter = ON and the Freq. Offset = 0.0 ppm on the "Test menu: Manual Jitter" screen.
(4) Set the Range = 0.5 UI on the "Test menu: Manual Jitter" screen.
(5) Enter the sign wave signals of 100 kHz frequency from the external signal generator. Adjust the amplitude of the Signal Generator so that the Tx monitor on the "Result/Jitter" screen is set to 0.5 $UI_{PP}$.
(6) Set the Rx Range = 1 UI and the Filter = HP1 + LP on the "Test menu: Manual Jitter" screen.
(7) Check that the value of the Rx Jitter Peak–Peak on the "Result: Jitter" screen satisfies the standard in Table 6-3-1.
(8) Set the Rx Range = 1 UI and the Filter = HP + LP on the "Test menu: Manual Jitter" screen.
(9) Check that the value of the Rx Jitter rms on the "Result: Jitter" screen satisfies the standard in Table 6-3-2.
(10) Change the Bit Rate on the "Setup: Interface" screen, and repeat 1 to 9 to check the accuracy.

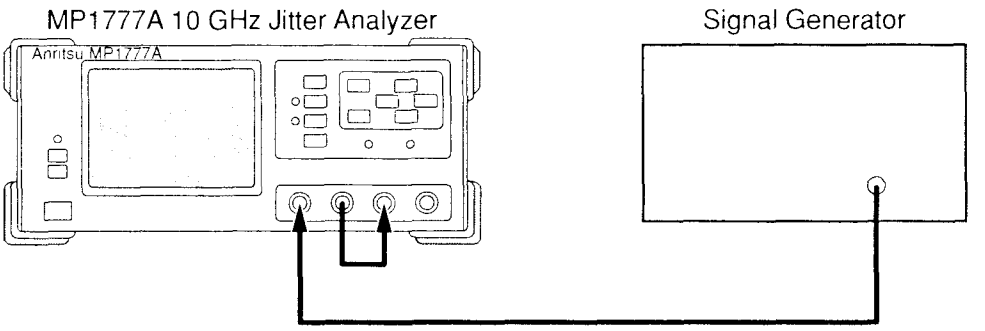



**Fig. 6-3 Jitter Measurement Accuracy Performance Test**



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Table 6-3-1 Jitter Measurement Accuracy Threshold Values ($UI_{PP}$)

| Bit Rate | Range | Minimum value ($UI_{PP}$) | Maximum value ($UI_{PP}$) | Standard ($UI_{PP}$) |
|---|---|---|---|---|
| 2488 M<br>2494 M<br>2666 M<br>3062 M<br>3069 M<br>2677 M<br>2578 M | 1 UI | 0.425 | 0.575 | −5 % ± 0.05 $UI_{PP}$<br>(with HP1 + LP) |
| | 4 UI | 0.26 | 0.74 | −5 % ± 0.22 $UI_{PP}$<br>(with HP1 + LP) |
| 4977 M<br>4988 M<br>5332 M<br>6125 M<br>6138 M<br>5355 M<br>5156 M | 1 UI | 0.423 | 0.577 | −5 % ± 0.07 $UI_{PP}$<br>(with HP1 + LP) |
| | 4 UI | 0.24 | 0.76 | −5 % ± 0.24 $UI_{PP}$<br>(with HP1 + LP) |
| 9953 M<br>9976 M<br>10664 M<br>12249 M<br>12276 M<br>10709 M<br>10313 M | 1 UI | 0.421 | 0.579 | −5 % ± 0.09 $UI_{PP}$<br>(with HP1 + LP) |
| | 4 UI | 0.22 | 0.78 | −5 % ± 0.26 $UI_{PP}$<br>(with HP1 + LP) |

Table 6-3-2 Jitter Measurement Accuracy Threshold Values (UIrms)

| Bit Rate | Range | Minimum value (UIrms) | Maximum value (UIrms) | Standard (UIrms) |
|---|---|---|---|---|
| 2488 M<br>2494 M<br>2666 M<br>3062 M<br>3069 M<br>2677 M<br>2578 M | 1 UI | 0.163 | 0.191 | −5 % ± 0.008 UIrms<br>(with HP + LP) |
| | 4 UI | 0.10 | 0.26 | −5 % ± 0.08 UIrms<br>(with HP + LP) |
| 4977 M<br>4988 M<br>5332 M<br>6125 M<br>6138 M<br>5355 M<br>5156 M | 1 UI | 0.162 | 0.192 | −5 % ± 0.009 UIrms<br>(with HP + LP) |
| | 4 UI | 0.09 | 0.27 | −5 % ± 0.09 UIrms<br>(with HP + LP) |
| 9953 M<br>9976 M<br>10664 M<br>12249 M<br>12276 M<br>10709 M<br>10313 M | 1 UI | 0.161 | 0.193 | −5 % ± 0.01 UIrms<br>(with HP + LP) |
| | 4 UI | 0.08 | 0.28 | −5 % ± 0.1 UIrms<br>(with HP + LP) |



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# 6.5 Checking Demod. Output Sensitivity

Check the Demod. Output sensitivity in the following sequence.

(1) Connect the MP1777A 10 GHz Jitter Analyzer, the Signal Generator and the Oscilloscope as shown in Fig. 6-4.
(2) Set the Bit Rate to 9953M on the "Setup: Interface" screen.
(3) Set the Tx Jitter = ON and the Range = 80 UI on the "Test menu: Manual Jitter" screen.
(4) Set the Rx Range = 1 UI and the Filter = HP1 + LP on the "Test menu: Manual Jitter" screen.
(5) Enter the sine wave signals of 100 kHz frequency from the external signal generator. Adjust the amplitude of the Signal Generator so that the Rx monitor on the "Result/Jitter " screen is set to 1.000 $UI_{PP}$.
(6) Check the Demod. Output using the Oscilloscope. Check that the value satisfies the standard in Table 6-4.
(7) Change the Bit Rate on the "Setup: Interface" screen, and repeat 1 to 6 to check the sensitivity.

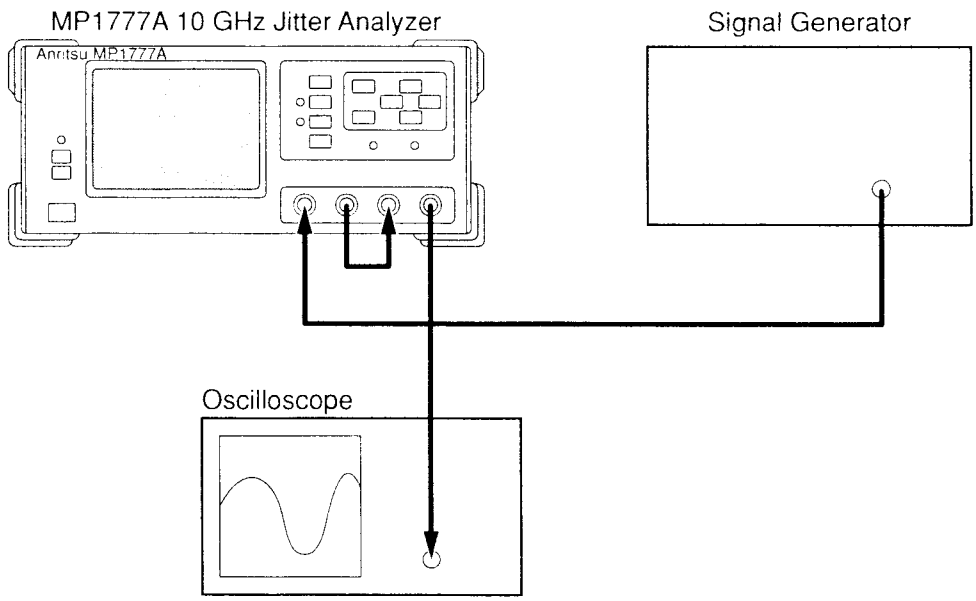



**Fig. 6-4 "Demod. Output" Output Sensitivity Performance Test**



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Table 6-4 "Demod. Output" Output Sensitivity Performance Test Threshold Values

| Bit Rate | Range | Minimum value ($V_{PP}$) | Maximum value ($V_{PP}$) | Standard |
|---|---|---|---|---|
| 2488 M<br>2494 M<br>2666 M<br>3062 M<br>3069 M<br>2677 M<br>2578 M | 1 UI | 0.85 | 1.15 | 1 $V_{PP}$ ± 15%/1 $UI_{PP}$ |
| | 4 UI | 0.85 | 1.15 | 1 $V_{PP}$ ± 15%/4 $UI_{PP}$ |
| 4977 M<br>4988 M<br>5332 M<br>6125 M<br>6138 M<br>5355 M<br>5156 M | 1 UI | 0.85 | 1.15 | 1 $V_{PP}$ ± 15%/1 $UI_{PP}$ |
| | 4 UI | 0.85 | 1.15 | 1 $V_{PP}$ ± 15%/4 $UI_{PP}$ |
| 9953 M<br>9976 M<br>10664 M<br>12249 M<br>12276 M<br>10709 M<br>10313 M | 1 UI | 0.85 | 1.15 | 1 $V_{PP}$ ± 15%/1 $UI_{PP}$ |
| | 4 UI | 0.85 | 1.15 | 1 $V_{PP}$ ± 15%/4 $UI_{PP}$ |



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# Section 7 Storage and Transportation


7.1 Daily Maintenance ..... 7-2
7.2 Storage ..... 7-2
7.2.1 Precaution on storage ..... 7-2
7.2.2 Recommended Storage Conditions ..... 7-2
7.3 Transportation ..... 7-2




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# 7.1 Daily Maintenance

Table 7-1 shows the procedure and time for daily maintenance.

**Table 7-1 Daily Maintenance**

| Item | Time | Procedure |
|---|---|---|
| Stained outer surfaces | • Before long-time storage<br>• After using in a dusty place | Wipe using cloth moistened with diluted neutral detergent. |
| Adhered dust and dirt | • When a foreign matter is involved<br>• When dust is involved | Clean using an electric cleaner. When cleaning a fan, do not vacuum the air too hard. |
| Loosened screws | • Whenever a loosenedscrew is found | Tighten it using a suitable tool. |

# 7.2 Storage

## 7.2.1 Precaution on storage

Be sure to observe the following points when storing for a long time.

(1) Wipe off dust and dirt adhered on the analyzer before storage.
(2) Avoid storing the analyzer in a place where the temperature may rise higher than +60 or lower below –20 degrees centigrade or a place where humidity may rise higher than 75 % or lower below 20 %.
(3) Avoid storing the analyzer for a long period of time in a place subject to direct sunlight or a dusty place.
(4) Avoid storing the analyzer in a place possibly exposed to dew condensation, active gas or acid.

## 7.2.2 Recommended Storage Conditions

When storing the analyzer for a long time, the storage place must meet the conditions in 7.2.1. In addition, the following storage conditions are also recommended:

- Temperature: 5 to 30 °C
- Humidity: 40 % to 75 %
- Daily fluctuation of temperature and humidity is small.

# 7.3 Transportation

Observe the following points when transporting the analyzer.

(1) Attach a protective cover to the front of the MP1777A.
(2) To protect the analyzer from moisture, shocks and vibration, put it in a vinyl bag, and then put it in a corrugated cardboard box filled with cushioning material.
(3) During the transportation, place the analyzer in an environment which meets the conditions in 7.2.1.



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# Section 8 Supplementary Data

8.1 Jitter Amplitude Limit ..... 8-2



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# 8.1 Jitter Amplitude Limit

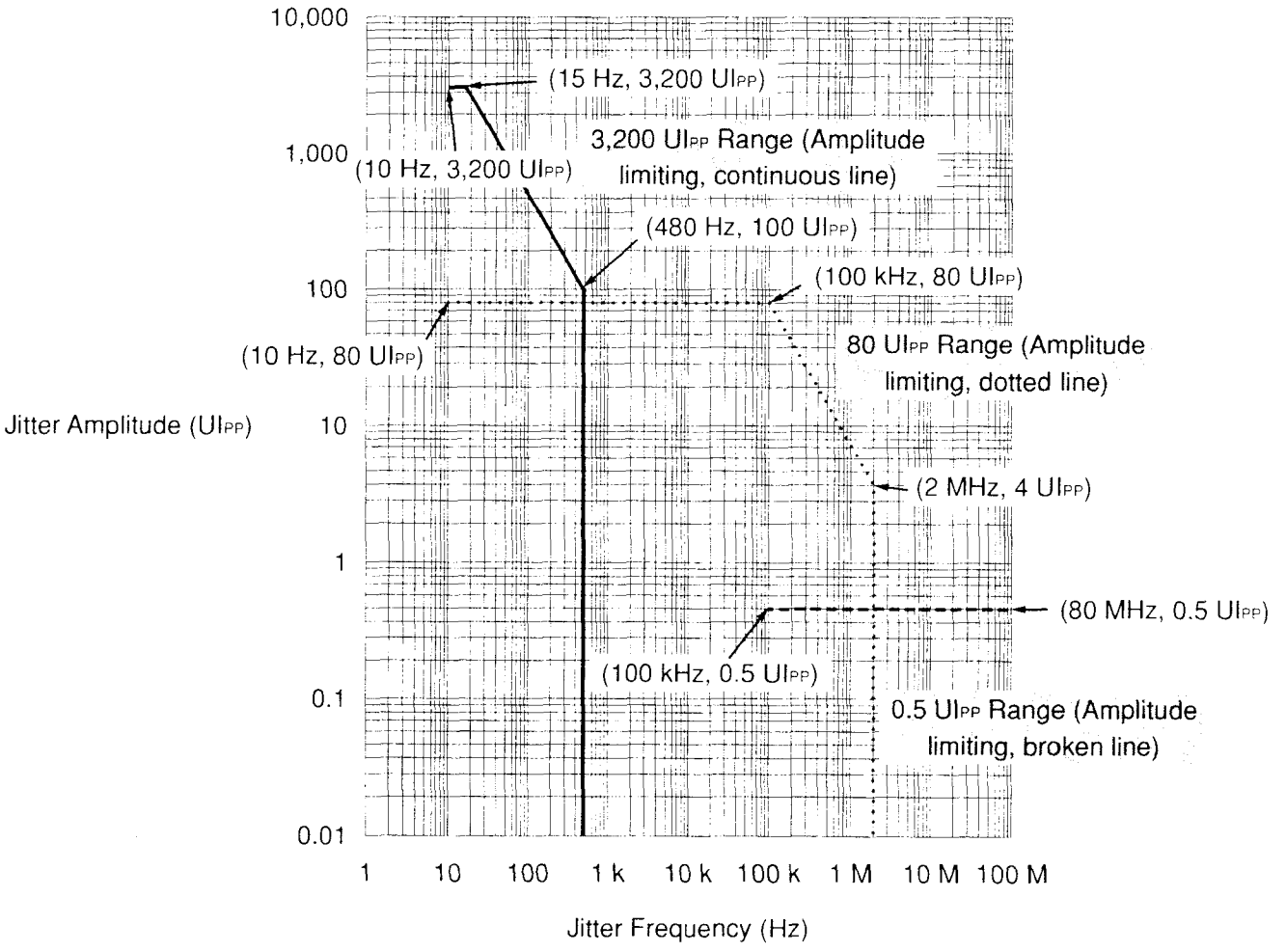



**Fig. 8-1 MP1777A 10 Gbit/s Jitter Amplitude Limiting**



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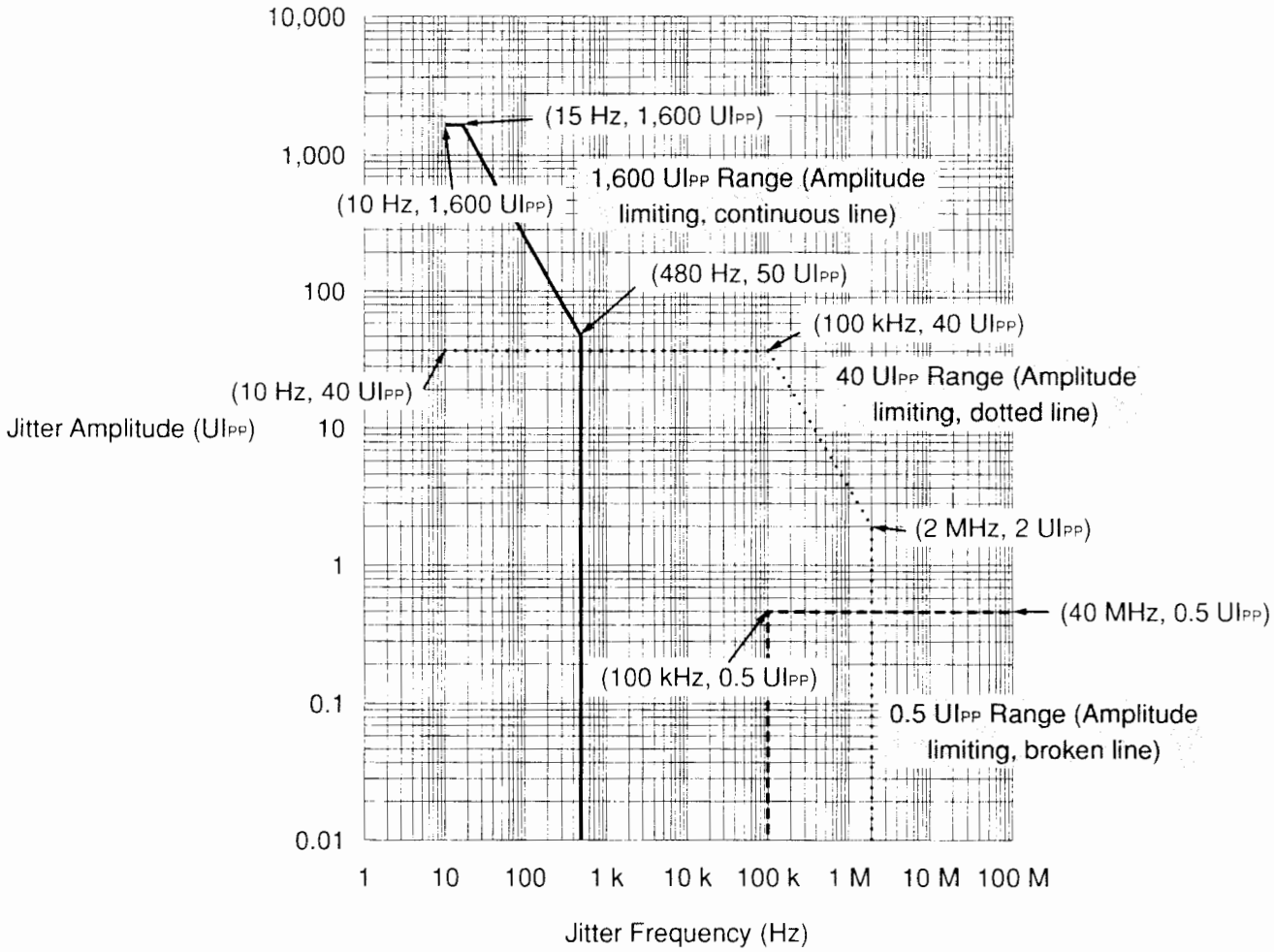



**Fig. 8-2 MP1777A 5 Gbit/s Jitter Amplitude Limiting**



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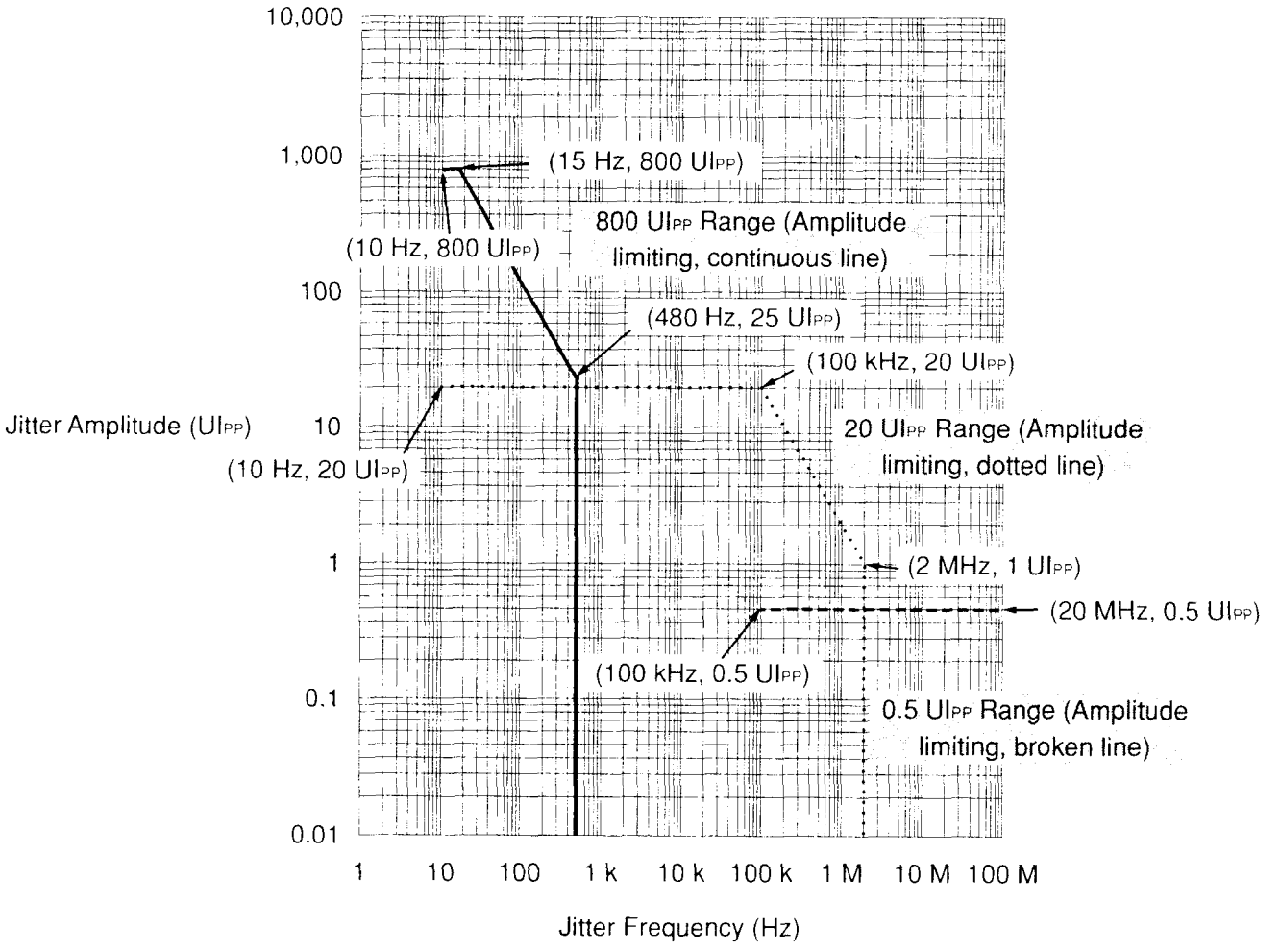



**Fig. 8-3 MP1777A 2.5 Gbit/s Jitter Amplitude Limiting**



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# Appendix A
# Performance Test Results Entry Table

Test site _____ Report No. _____

_____ Date _____

_____ Person in charge of the test _____

Analyzer name: MP1777A 10 GHz Jitter Analyzer

Manufacturing No. _____ Ambient temperature _____ ßC

Power supply frequency _____ Hz Relative temperature _____ %

Remarks:

_____

_____

_____

_____

_____

MP1777A 10 GHz Jitter Analyzer No. _____ Date _____

| Test name [Clock output level] | Minimum specification value | Result | Maximum specification value | Measurement uncertainty |
|---|---|---|---|---|
| 2488 M | +2 dBm | | +8 dBm | |
| 2494 M | +2 dBm | | +8 dBm | |
| 2666 M | +2 dBm | | +8 dBm | |
| 3062 M | +2 dBm | | +8 dBm | |
| 3069 M | +2 dBm | | +8 dBm | |
| 2677 M | +2 dBm | | +8 dBm | |
| 2578 M | +2 dBm | | +8 dBm | |
| 4977 M | +2 dBm | | +8 dBm | |
| 4988 M | +2 dBm | | +8 dBm | |
| 5332 M | +2 dBm | | +8 dBm | −0.4 dB |
| 6125 M | +2 dBm | | +8 dBm | |
| 6138 M | +2 dBm | | +8 dBm | |
| 5355 M | +2 dBm | | +8 dBm | |
| 5156 M | +2 dBm | | +8 dBm | |
| 9953 M | +2 dBm | | +8 dBm | |
| 9976 M | +2 dBm | | +8 dBm | |
| 10664 M | +2 dBm | | +8 dBm | |
| 12249 M | +2 dBm | | +8 dBm | |
| 12276 M | +2 dBm | | +8 dBm | |
| 10709 M | +2 dBm | | +8 dBm | |
| 10313 M | +2 dBm | | +8 dBm | |



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## Appendix A Performance Test Results Entry Table

| Test mane [External modulation input sensitivity] | Minimum specification value | Result | Maximum specification value | Measurement uncertainy |
|---|---|---|---|---|
| 2488 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 2488 M / 20 UI | 17 $UI_{PP}$ | | 23 $UI_{PP}$ | |
| 2488 M / 800 UI | 680 $UI_{PP}$ | | 920 $UI_{PP}$ | |
| 2494 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 2494 M / 20 UI | 17 $UI_{PP}$ | | 23 $UI_{PP}$ | |
| 2494 M / 800 UI | 680 $UI_{PP}$ | | 920 $UI_{PP}$ | |
| 2666 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 2666 M / 20 UI | 17 $UI_{PP}$ | | 23 $UI_{PP}$ | |
| 2666 M / 800 UI | 680 $UI_{PP}$ | | 920 $UI_{PP}$ | |
| 3062 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 3062 M / 20 UI | 17 $UI_{PP}$ | | 23 $UI_{PP}$ | |
| 3062 M / 800 UI | 680 $UI_{PP}$ | | 920 $UI_{PP}$ | |
| 3069 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 3069 M / 20 UI | 17 $UI_{PP}$ | | 23 $UI_{PP}$ | |
| 3069 M / 800 UI | 680 $UI_{PP}$ | | 920 $UI_{PP}$ | |
| 2677 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 2677 M / 20 UI | 17 $UI_{PP}$ | | 23 $UI_{PP}$ | |
| 2677 M / 800 UI | 680 $UI_{PP}$ | | 920 $UI_{PP}$ | |
| 2578 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 2578 M / 20 UI | 17 $UI_{PP}$ | | 23 $UI_{PP}$ | |
| 2578 M / 800 UI | 680 $UI_{PP}$ | | 920 $UI_{PP}$ | |
| 4977 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 4977 M / 40 UI | 34 $UI_{PP}$ | | 46 $UI_{PP}$ | |
| 4977 M / 1600 UI | 1360 $UI_{PP}$ | | 1840 $UI_{PP}$ | |
| 4988 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 4988 M / 40 UI | 34 $UI_{PP}$ | | 46 $UI_{PP}$ | |
| 4988 M / 1600 UI | 1360 $UI_{PP}$ | | 1840 $UI_{PP}$ | |
| 5332 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 5332 M / 40 UI | 34 $UI_{PP}$ | | 46 $UI_{PP}$ | |
| 5332 M / 1600 UI | 1360 $UI_{PP}$ | | 1840 $UI_{PP}$ | |
| 6125 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 6125 M / 40 UI | 34 $UI_{PP}$ | | 46 $UI_{PP}$ | |
| 6125 M / 1600 UI | 1360 $UI_{PP}$ | | 1840 $UI_{PP}$ | |
| 6138 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 6138 M / 40 UI | 34 $UI_{PP}$ | | 46 $UI_{PP}$ | |
| 6138 M / 1600 UI | 1360 $UI_{PP}$ | | 1840 $UI_{PP}$ | |
| 5355 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 5355 M / 40 UI | 34 $UI_{PP}$ | | 46 $UI_{PP}$ | |
| 5355 M / 1600 UI | 1360 $UI_{PP}$ | | 1840 $UI_{PP}$ | |
| 5156 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 5156 M / 40 UI | 34 $UI_{PP}$ | | 46 $UI_{PP}$ | |
| 5156 M / 1600 UI | 1360 $UI_{PP}$ | | 1840 $UI_{PP}$ | |
| 9953 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 9953 M / 80 UI | 68 $UI_{PP}$ | | 92 $UI_{PP}$ | |
| 9953 M / 3200 UI | 2720 $UI_{PP}$ | | 3680 $UI_{PP}$ | |



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| Test mane [External modulation input sensitivity] | Minimum specification value | Result | Maximum specification value | Measurement uncertainy |
|---|---|---|---|---|
| 9976 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 9976 M / 80 UI | 68 $UI_{PP}$ | | 92 $UI_{PP}$ | |
| 9976 M / 3200 UI | 2720 $UI_{PP}$ | | 3680 $UI_{PP}$ | |
| 10644 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 10664 M / 80 UI | 68 $UI_{PP}$ | | 92 $UI_{PP}$ | |
| 10664 M / 3200 UI | 2720 $UI_{PP}$ | | 3680 $UI_{PP}$ | |
| 12249 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 12249 M / 80 UI | 68 $UI_{PP}$ | | 92 $UI_{PP}$ | |
| 12249 M / 3200 UI | 2720 $UI_{PP}$ | | 3680 $UI_{PP}$ | |
| 12276 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 12276 M / 80 UI | 68 $UI_{PP}$ | | 92 $UI_{PP}$ | |
| 12276 M / 3200 UI | 2720 $UI_{PP}$ | | 3680 $UI_{PP}$ | |
| 10709 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 10709 M / 80 UI | 68 $UI_{PP}$ | | 92 $UI_{PP}$ | |
| 10709 M / 3200 UI | 2720 $UI_{PP}$ | | 3680 $UI_{PP}$ | |
| 10313 M / 0.5 UI | 0.425 $UI_{PP}$ | | 0.575 $UI_{PP}$ | |
| 10313 M / 80 UI | 68 $UI_{PP}$ | | 92 $UI_{PP}$ | |
| 10313 M / 3200 UI | 2720 $UI_{PP}$ | | 3680 $UI_{PP}$ | |



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## Appendix A Performance Test Results Entry Table

| Test mane [Jitter measure-ment accuracy](UIpp) | Minimum specification value | Result | Maximum specification value | Measurement uncertainy |
|---|---|---|---|---|
| 2488 M / 1 UI | 0.425 UIPP | | 0.575 UIPP | |
| 2488 M / 4 UI | 0.26 UIPP | | 0.74 UIPP | |
| 2494 M / 1 UI | 0.425 UIPP | | 0.575 UIPP | |
| 2494 M / 4 UI | 0.26 UIPP | | 0.74 UIPP | |
| 2666 M / 1 UI | 0.425 UIPP | | 0.575 UIPP | |
| 2666 M / 4 UI | 0.26 UIPP | | 0.74 UIPP | |
| 3062 M / 1 UI | 0.425 UIPP | | 0.575 UIPP | |
| 3062 M / 4 UI | 0.26 UIPP | | 0.74 UIPP | |
| 3069 M / 1 UI | 0.425 UIPP | | 0.575 UIPP | |
| 3069 M / 4 UI | 0.26 UIPP | | 0.74 UIPP | |
| 2677 M / 1 UI | 0.425 UIPP | | 0.575 UIPP | |
| 2677 M / 4 UI | 0.26 UIPP | | 0.74 UIPP | |
| 2578 M / 1 UI | 0.425 UIPP | | 0.575 UIPP | |
| 2578 M / 4 UI | 0.26 UIPP | | 0.74 UIPP | |
| 4977 M / 1 UI | 0.423 UIPP | | 0.577 UIPP | |
| 4977 M / 4 UI | 0.24 UIPP | | 0.76 UIPP | |
| 4988 M / 1 UI | 0.423 UIPP | | 0.577 UIPP | |
| 4988 M / 4 UI | 0.24 UIPP | | 0.76 UIPP | |
| 5332 M / 1 UI | 0.423 UIPP | | 0.577 UIPP | |
| 5332 M / 4 UI | 0.24 UIPP | | 0.76 UIPP | |
| 6125 M / 1 UI | 0.423 UIPP | | 0.577 UIPP | |
| 6125 M / 4 UI | 0.24 UIPP | | 0.76 UIPP | |
| 6138 M / 1 UI | 0.423 UIPP | | 0.577 UIPP | |
| 6138 M / 4 UI | 0.24 UIPP | | 0.76 UIPP | |
| 5355 M / 1 UI | 0.423 UIPP | | 0.577 UIPP | |
| 5355 M / 4 UI | 0.24 UIPP | | 0.76 UIPP | |
| 5156 M / 1 UI | 0.423 UIPP | | 0.577 UIPP | |
| 5156 M / 4 UI | 0.24 UIPP | | 0.76 UIPP | |
| 9953 M / 1 UI | 0.421 UIPP | | 0.579 UIPP | |
| 9953 M / 4 UI | 0.22 UIPP | | 0.78 UIPP | |
| 9976 M / 1 UI | 0.421 UIPP | | 0.579 UIPP | |
| 9976 M / 4 UI | 0.22 UIPP | | 0.78 UIPP | |
| 10664 M / 1 UI | 0.421 UIPP | | 0.579 UIPP | |
| 10664 M / 4 UI | 0.22 UIPP | | 0.78 UIPP | |
| 12249 M / 1 UI | 0.421 UIPP | | 0.579 UIPP | |
| 12249 M / 4 UI | 0.22 UIPP | | 0.78 UIPP | |
| 12276 M / 1 UI | 0.421 UIPP | | 0.579 UIPP | |
| 12276 M / 4 UI | 0.22 UIPP | | 0.78 UIPP | |
| 10709 M / 1 UI | 0.421 UIPP | | 0.579 UIPP | |
| 10709 M / 4 UI | 0.22 UIPP | | 0.78 UIPP | |
| 10313 M / 1 UI | 0.421 UIPP | | 0.579 UIPP | |
| 10313 M / 4 UI | 0.22 UIPP | | 0.78 UIPP | |



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| Test mane [Jitter measure-ment accuracy](UIrms) | Minimum specification value | Result | Maximum specification value | Measurement uncertainy |
|---|---|---|---|---|
| 2488 M / 1 UI | 0.163 UIrms | | 0.191 UIrms | |
| 2488 M / 4 UI | 0.10 UIrms | | 0.26 UIrms | |
| 2494 M / 1 UI | 0.163 UIrms | | 0.191 UIrms | |
| 2494 M / 4 UI | 0.10 UIrms | | 0.26 UIrms | |
| 2666 M / 1 UI | 0.163 UIrms | | 0.191 UIrms | |
| 2666 M / 4 UI | 0.10 UIrms | | 0.26 UIrms | |
| 3062 M / 1 UI | 0.163 UIrms | | 0.191 UIrms | |
| 3062 M / 4 UI | 0.10 UIrms | | 0.26 UIrms | |
| 3069 M / 1 UI | 0.163 UIrms | | 0.191 UIrms | |
| 3069 M / 4 UI | 0.10 UIrms | | 0.26 UIrms | |
| 2677 M / 1 UI | 0.163 UIrms | | 0.191 UIrms | |
| 2677 M / 4 UI | 0.10 UIrms | | 0.26 UIrms | |
| 2578 M / 1 UI | 0.163 UIrms | | 0.191 UIrms | |
| 2578 M / 4 UI | 0.10 UIrms | | 0.26 UIrms | |
| 4977 M / 1 UI | 0.162 UIrms | | 0.192 UIrms | |
| 4977 M / 4 UI | 0.09 UIrms | | 0.27 UIrms | |
| 4988 M / 1 UI | 0.162 UIrms | | 0.192 UIrms | |
| 4988 M / 4 UI | 0.09 UIrms | | 0.27 UIrms | |
| 5332 M / 1 UI | 0.162 UIrms | | 0.192 UIrms | |
| 5332 M / 4 UI | 0.09 UIrms | | 0.27 UIrms | |
| 6125 M / 1 UI | 0.162 UIrms | | 0.192 UIrms | |
| 6125 M / 4 UI | 0.09 UIrms | | 0.27 UIrms | |
| 6138 M / 1 UI | 0.162 UIrms | | 0.192 UIrms | |
| 6138 M / 4 UI | 0.09 UIrms | | 0.27 UIrms | |
| 5355 M / 1 UI | 0.162 UIrms | | 0.192 UIrms | |
| 5355 M / 4 UI | 0.09 UIrms | | 0.27 UIrms | |
| 5156 M / 1 UI | 0.162 UIrms | | 0.192 UIrms | |
| 5156 M / 4 UI | 0.09 UIrms | | 0.27 UIrms | |
| 9953 M / 1 UI | 0.161 UIrms | | 0.193 UIrms | |
| 9953 M / 4 UI | 0.08 UIrms | | 0.28 UIrms | |
| 9976 M /1 UI | 0.161 UIrms | | 0.193 UIrms | |
| 9976 M / 4 UI | 0.08 UIrms | | 0.28 UIrms | |
| 10664 M / 1 UI | 0.161 UIrms | | 0.193 UIrms | |
| 10664 M / 4 UI | 0.08 UIrms | | 0.28 UIrms | |
| 12249 M / 1 UI | 0.161 UIrms | | 0.193 UIrms | |
| 12249 M / 4 UI | 0.08 UIrms | | 0.28 UIrms | |
| 12276 M / 1 UI | 0.161 UIrms | | 0.193 UIrms | |
| 12276 M / 4 UI | 0.08 UIrms | | 0.28 UIrms | |
| 10709 M / 1 UI | 0.161 UIrms | | 0.193 UIrms | |
| 10709 M / 4 UI | 0.08 UIrms | | 0.28 UIrms | |
| 10313 M / 1 UI | 0.161 UIrms | | 0.193 UIrms | |
| 10313 M / 4 UI | 0.08 UIrms | | 0.28 UIrms | |



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## Appendix A Performance Test Results Entry Table

| Test mane [Demod. Out] Output sensitivity | Minimum specification value | Result | Maximum specification value | Measurement uncertainy |
|---|---|---|---|---|
| 2488 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2488 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2494 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2494 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2666 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2666 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 3062 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 3062 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 3069 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 3069 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2677 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2677 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2578 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 2578 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 4977 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 4977 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 4988 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 4988 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 5332 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 5332 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 6125 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 6125 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 6138 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | ±1.1% |
| 6138 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 5355 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 5355 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 5156 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 5156 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 9953 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 9953 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 9977 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 9977 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 10664 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 10664 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 12249 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 12249 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 12276 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 12276 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 10709 M / 1 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
| 10709 M / 4 UI | 0.85 $V_{PP}$ | | 1.15 $V_{PP}$ | |
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**Anritsu Corporation**
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TEL: +81-46-223-1111

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TEL: +55-4779-5522
FAX: +55-4779-5510

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**ANRITSU ELETRÔNICA LTDA.**
Praca Amadeu Amaral, 27-1 Andar
CEP 01327-010 - Sao Paulo - SP, Sao Paulo, Brazil
TEL: +55-11-3283-2511
FAX: +55-11-2886940

**ANRITSU ELETRÔNICA LTDA.**
Rua Voluntarios da Patria, 45 13 Andar Sala 1308,
CEP 222-000 - Rio de Janeiro - RJ, Brazil
TEL: +55-21-2527-6922
FAX: +55-21-2537-1456

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700 Silver Seven Road, Suite 120, Kanata,
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TEL: +1-613-591-2003
FAX: +1-613-591-1006

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300-1055 W Hastings St., Suite 38
Vancouver, BC V6E 2E9, Canada
Toll free: +1-877-267-4878
TEL: +1-604-682-5933
FAX: +1-604-682-5934

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2810 Matheson Blvd. E, 2nd Fl.,
Mississauga, ON L4W 4X7, Canada
Toll free: +1-877-267-4878
TEL: +1-905-890-7799
FAX: +1-905-625-5864

**ANRITSU ELECTRONICS LTD.**
**(MONTREAL OFFICE)**
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TEL: +1-514-695-9797
FAX: +1-514-697-0186

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FAX: +57-1-269-0191

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FAX: +593-2-255-396

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Local 315 San Salvador, El Salvador
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FAX: +503-243-3925

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TEL: +502-360-5135
FAX: +502-360-5217

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TEL: +52-5-5437313
FAX: +52-5-5437317

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**DATALAB S.R.L.**
Avda. Artigas No 1645 Edificio "DataLab"
Asuncion, Paraguay
TEL: +595-21-20-9126
FAX: +595-21-20-9127

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**ELETELSE S.A.**
AV Canaval Moreyra 748, San Isidro,
Lima 27, Peru
TEL: +51-1-224-2514
FAX: +51-1-224-8148

## • U.S.A.

**ANRITSU COMPANY**
1155 East Collins Blvd., Richardson, TX 75081, U.S.A.
Toll Free: +1-800-ANRITSU (267-4878)
TEL: +1-972-644-1777
FAX: +1-972-644-3416

**ANRITSU COMPANY**
490 Jarvis Drive, Morgan Hill, CA 95037, U.S.A.
Toll Free: +1-800-ANRITSU (267-4878)
TEL: +1-408-778-2000
FAX: +1-408-778-3180

**ANRITSU COMPANY**
10 New Maple Ave., Unit 305,
P.O. Box 836, Pine Brook, NJ 07058-0836
U.S.A.
Toll Free: +1-800-ANRITSU (267-4878)
TEL: +1-973-227-8999
FAX: +1-973-575-0092

**ANRITSU COMPANY**
**SALES AND SERVICE, FL OFFICE**
312 W. First Street, Suite 300, Sanford,
FL 32771, U.S.A.
Toll Free: 1-800-ANRITSU (267-4878)
TEL: +1-407-321-5130
FAX: +1-407-330-2018

**ANRITSU COMPANY**
**SALES AND SERVICE, GA OFFICE**
4625 Alexander Drive, Alpharetta,
GA 30022, U.S.A.
Toll Free: 1-800-ANRITSU (267-4878)
TEL: +1-678-566-0454
FAX: +1-678-566-1776

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Colonia 1900, Esc. 603, Montevideo,
Uruguay
TEL: +598-2-430522
FAX: +598-2-418594

## • Venezuela

**RADIOCOMUNICACIONES CRUZ, C.A.**
Calle La Colina Quinta. Elison, Frente al teatro Alberto Mateo Caracas 1050,
Venezuela
TEL: +58-2-793-2322
FAX: +58-2-793-3429




## • Austria

**WIEN-SCHALL GmbH**
Krichbaumgasse 25, A-1120 Vienna,
Austria
TEL: +43-1-81155140
FAX: +43-1-81155180

## • Belgium

**ANRITSU GmbH**
Grafenberger Allee 54-56, 40237
Düsseldorf, Germany
Local phone: 0800-90001 (toll free)



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h.e. Strelbishte, str. Kotlenski Prohod,
bl. 96/6/14, BG-1408 Sofia, Bulgaria
TEL: +359-2-958-1245
FAX: +359-2-958-1698

## • Croatia

**ELSINCO REPRESENTATION OFFICE ZAGREB**
Savska 66 HR-10000 Zagreb, Croatia
TEL: +385-1-6312-477
FAX: +385-1-6312-488

## • Czech Republic

**ELSINCO PRAHA SPOL S.R.O.**
Novodvorská 994, CZ-142 21 Praha,
4-Branik, Czech Republic
TEL: +420-2-4149-0147
FAX: +420-2-4447-2169

**ELSINCO PRAHA SPOL S.R.O.**
**(BRNO BRANCH OFFICE)**
Strmá 19, CZ-616 00 Brno, Czech Republic
TEL: +420-5-4142-7211
FAX: +420-5-4142-7219

## • Denmark

**ANRITSU AB DANMARK**
Korskildelund 6 DK-2670 Greve, Denmark
TEL: +45 36915035
FAX: +45 43909371

## • Finland

**ANRITSU AB**
**(FINLAND BRANCH OFFICE)**
Teknobulevardi 3-5, FI-01530 Vantaa, Finland
TEL: +358-9-435-522-0
FAX: +358-9-435-522-50

## • France

**ANRITSU S.A.**
9 Avenue du Québec, ZA Courtabœuf 1
91951 LES ULIS CEDEX, France
TEL: +33 1 60 92 15 50
FAX: +33 1 64 46 10 65

**ANRITSU S.A.**
**(TOULOUSE OFFICE)**
Bureau de Toulouse Région Centre Sud Ouest, France
TEL: +33-5-62070484
FAX: +33-5-62070668

**ANRITSU S.A.**
**(TOULON OFFICE)**
Bureau de Toulon Région Centre Sud Est, France
TEL: +33-4-94040264
FAX: +33-4-94040265

**ANRITSU S.A.**
**(RENNES OFFICE)**
Bureau de Rennes Région Ouest, France
TEL: +33-2-99521214
FAX: +33-2-99521224

## • Germany

**ANRITSU GmbH**
Grafenberger Allee 54-56, 40237
Düsseldorf, Germany
TEL: +49-211-96855-0
FAX: +49-211-96855-55

## • Greece

**KOSTAS KARAYANNIS SA**
58 Kapodistriou str, GR-142 35 Nea Ionia,
Athens, Greece
TEL: +30-1-680-0460-4
FAX: +30-1-685-3522

## • Hungary

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Pannónia utca 8. IV/I., H-1136 Budapest, Hungary
TEL: +36-1-339-0000
FAX: +36-1-339-4444

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**PEMA LTD.**
Dromiskin, Dundalk, Co. Louth, Ireland
TEL: +353-42-72899
FAX: +353-42-72376

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Via Elio Vittorini 129, 00144 Roma, Italy
TEL: +39-06-509-9711
FAX: +39-06-502-2425

**ANRITSU S.P.A.**
Via Paracelso 4, CD Colleoni, Agrate
Brianza, 20041 Milano, Italy
TEL: +39-039-657021
FAX: +39-039-6056396

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**BLOMKVIST AS**
Pb 188, 1371 ASKER, Norway
TEL: + 47 66901190
FAX: + 47 66901212

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**ELSINCO POLSKA SP. Z.O.O**
ul Gdanska 50, 01-691 Warszawa, Poland
TEL: +48-22-39-832-4042 (Sat Link)
FAX: +48-22-832-2238

## • Portugal

**OMNITECNICA S.A.**
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Amadora, Portugal
TEL: +351-21-472-12-00
FAX: +351-21-472-12-70 (Sales)

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**ELSINCO SLOVENSKO S.R.O**
Kudlákova 4, SK-844 15 Bratislava,
Slovakia
TEL: +421 7 6428 41 65
FAX: +421 7 6428 44 54

**ELSINCO SLOVENSKO S.R.O**
**(KOŠICE BRANCH OFFICE)**
Floriánska 16, SK-043 13 Kosice, Slovakia
TEL: +421 95 62 26 729
FAX: +421 95 62 26 729
CONTACT: Mr. Igor Domorak,
Branch Office Manager

## • Slovenia

**ELSINCO D.O.O.**
Dalmatinova 2, SI-1000 Ljublijana,
Slovenia
TEL: +386-61-133-62-77
FAX: +386-61-317-397

## • Sweden

**ANRITSU AB**
Borgarfjordsgatan 13A, S-164 40 KISTA,
Sweden
TEL: +46-8-534-70700
FAX: +46-8-534-70730

## • United Kingdom

**ANRITSU LTD.**
200 Capability Green, Luton, Bedfordshire,
LU1 3LU, U.K.
TEL: (Sales) + 44 1582-433280
(Service) +44 1582-433285
(Other enquiries) +44 1582-433200
FAX: +44 1582-731303

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TEL: +61-3-9558-8177
FAX: +61-3-9558-8255

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**BASMATECH**
P. O. Box 5701, Manama, Bahrain
TEL: +973-273729
FAX: +973-725404

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**ANRITSU COMPANY LTD.**
Suite 923, 9/F., Chinachem Golden Plaza
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Chao-Yang District, Beijing 100004
P.R. China
TEL: +86-10-6590-9230
FAX: +86-10-6590-9235

**ANRITSU COMPANY LTD.**
**(SHANGHAI OFFICE)**
Room 1807-1810, Tower A CITY CENTER of Shanghai
No. 100 ZunYi Road 200051 P.R.China
TEL: +86-021-6237-0898
FAX: +86-021-6237-0899

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**(GUANGZHOU REPRESENTATIVE OFFICE)**
Room 3008-9, Dongshan Plaza, 69 Xian Lie Zong Road Central, Guangzhou 510095, P.R. China
TEL: +86-20-8732 2231/2
FAX: +86-20-8732 2230

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26E New Times Square, No. 42, Wenwu Road, Xinhua Street, Chengdu 610017
P.R. China
TEL: +86-28-8651 0011/22/33
FAX: +86-28-8651 0055

**ANRITSU COMPANY LTD.**
**(XI'AN REPRESENTATIVE OFFICE)**
No.1102, ZhiCheng Building, No.2
Gao Xin I Road, High-Tech, Development Zone, Xi'an 710075, P.R. China
TEL: +86-29-8377 406/9
FAX: +86-29-8377 410

**ANRITSU COMPANY LTD.**
**(SHENZHEN REPRESENTATIVE OFFICE)**
Room 1505, Building A
World Trade Plaza, Fuhong Road
Shenzhen 518033, P.R. China
TEL: +86-755-8366 2847/2851/2852
FAX: +86-755-8366 2849

**ANRITSU COMPANY LTD.**
**(CHONG QING REPRESENTATIVE OFFICE)**
Rm.6-2, D Building, Kejifazhan Plaza
No.210, Keyuan 1st Road, Gaoxin District
Shiqiaopu, Chongqing 400010
P.R. China
TEL: +86-23-8909-9918
FAX: +86-23-8909-9928

**ANRITSU ELECTRONICS (SHANGHAI) CO., LTD. (SERVICE CENTER)**
2F, Room B, 52 Section Factory Building
No. 516 Fu Te North Road
Waigaoqiao Free Trade Zone
Pudong, Shanghai 200131, P.R. China
TEL: +86-21-5868-0226/7/8
FAX: +86-21-5868-0588

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**(SHENYANG REPRESENTATIVE OFFICE)**
2-185, City Plaza, No. 206, Nanjing North Street, He Ping District, Shenyang 110001
P.R. China
TEL: +86-24-2334 1178/89
FAX: +86-24-2334 2838

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A1803, ZhongShang Plaza
No. 9, Zhongnan Road
Wuchang, Wuhan 430071, P.R. China
TEL: +86-27-8771 3355
FAX: +86-27-8732 2773

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No.14-10, Block A, Xinruididai, No.25,
Keyuan 1st Street, High-Tech Zone,
Chongqing, 400039, P.R. China
TEL: +86-23-8909-9918
FAX: +86-23-6383-0238

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Room 2103, East Lilian Mansion,
No.29 Hubu Street, Nanjing, 210002,
P.R.China
TEL: +86-25-8689-5887
FAX: +86-25-4529132

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FAX: +357-2-765177

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TEL: +20-2-3368095
FAX: +20-2-3385799

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Graha Astri Aniela Angun, Jl. Tanah Abang III/15, Jakarta 10160, Indonesia
TEL: +62-21-352-4828
FAX: +62-21-352-4831

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TEL: +972-36-478563
FAX: +972-36-478334

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8F HyunJuk Building, 832-41 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080
Korea
TEL: +82-2-553-6603
FAX: +82-2-553-6604

**ANRITSU CORPORATION, LTD.**
Room 1503, Dong-A Venture Tower 538-8
BongMyung-Dong, Yusong-Gu
Daejeon, 305-301
Korea
TEL: +82-42- 828-7783
FAX: +82-2-42-828-7785

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TEL: +965-431-0615
FAX: +965-431-4085

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3rd Floor Bangnan O'Connor, 13 Jalan 223, 46100 Petaling Jaya,
Selangor Darul Ehsan, Malaysia
TEL: +60-3-753-8400
FAX: +60-30-757-7871

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TEL: +212-2-302444
FAX: +212-2-449311

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Bhotebahal Kathmandu, Nepal
TEL: +977-1-224-706
FAX: +977-1-227-956

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**NILSEN TECHNOLOGIES (AUCKLAND OFFICE)**
P. O. Box 9613, New market Unit 4,
Ambury Court, 1 Porters Ave, Eden Terrace Auckland, New Zealand
TEL: +64-9-309-2464
FAX: +64-9-309-2968

**NILSEN TECHNOLOGIES (WELLINGTON OFFICE)**
35 Ulric Street, Plimmerton Wellington,
New Zealand
TEL: +64-4-233-9116
FAX: +64-4-233-8366

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TEL: +968-793741
FAX: +968-796158



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FAX: +92-42-7221456

**SUPERIOR ELECTRONICS ASSOCIATED**
B-98 Block H, North Nasimabad, Karachi-33, Pakistan
TEL: +92-21-613655

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TEL: +632-816-2646, 893-8998
FAX: +632-815-0986

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**CARIBBEAN DATA SYSTEM**
636, San Patricio Ave. San Juan, PR00920-4507, Puerto Rico
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FAX: +1-787-774-6973

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P. O. Box 2481, Doha Qatar
TEL: +974-4-424347
FAX: +974-4-324777

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TEL: +966-2-6610006
FAX: +966-2-6610558

**ELECTRONIC EQUIPMENT MARKETING CO.**
P. O. Box 3750, Riyadh, 11481, Saudi Arabia
TEL: +966-3-887-0218
FAX: +966-3-887-0268

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**ANRITSU PTE. LTD.**
10, Hoe Chiang Road #07-01/02, Keppel Towers, Singapore 089315
TEL: +65-6282-2400
FAX: +65-6282-2533

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**ETECSA (PTY) LTD.**
12 Surrey Square Office Park, 330 Surrey Avenue, Ferndale, 2194 Randburg, South Africa (P. O. Box 4231 Randburg, 2125 South Africa)
TEL: +27-11-787-7200
FAX: +27-11-787-0446

## • Sri Lanka

**INFOTECHS LIMITED**
441, Alwitigala Mawatha, Colombo, Sri Lanka
TEL: +94-1-598237
FAX: +94-1-598112

## • Taiwan

**ANRITSU COMPANY, INC. (TAIPEI OFFICE)**
7F, No. 316, Sec. 1, NeiHu Rd., Taipei 114, Taiwan
TEL: +886-2-8751-1816
FAX: +886-2-8751-1817

**ANRITSU COMPANY, INC. (HSINCHU OFFICE)**
No. 21, Lane 23, Guandung Road, Hsinchu 300, Taiwan
TEL: +886-3-563-6601, 6602, 6603
FAX: +886-3-564-5819

**ANRITSU COMPANY, INC.**
7F-3, No.32, Lane 185, Sec. 2, Chung Hua E. Rd., Tainan 701, Taiwan
TEL: +886-6-290-7735
TEL: +886-6-290-3260

## • Thailand

**JASMINE TELECOM SYSTEMS CO., LTD.**
200 Moo 4, 9th Floor, Chaengwatana Road, Tambon Pakkret, Amphoe Pakkret, Nonthaburi 11120, Thailand
TEL: +66-2-502-3240, 3000
FAX: +66-2-962-2521

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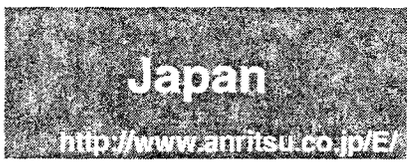
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FAX: +971-2-6458907

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TEL: +84-48.264.728
FAX: +84-49.344.111

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P.O. Box CH 857 Chisipite Harare, Zimbabwe
TEL: +263-4-494928
FAX: +263-4-494927




## • Japan

**ANRITSU CORPORATION**
1800 Onna, Atsugi-shi, Kanagawa, 243-8555, Japan
TEL: +81-46-223-1111
FAX: +81-46-296-1264



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