



TM2503A

10MHz and 1PPS Distribution Amplifier

Installation and Operation Manual v1.0



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TIME MACHINES

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1 Introduction

The TM2503A is a 3 channel distribution amplifier that can distribute 1PPS and 10MHz signals from other TimeMachines time server products. It is well matched to the TM2500C when the need to distribute the 10MHz signal to distant equipment is needed. It resides in the same form factor as the TM2500C and can be mounted in the same rack mount panels making for a clean installation.

The TM2503A contains filtering to turn the 3.3V TTL square wave 10MHz signal into a low distortion sine wave. 50Ohm inputs and outputs are standard. Clean sine waves travel much more reliably on coaxial cable across longer distances. The 1PPS signal is not filtered, but having 3 separate drivers allows a wider distribution of the 1PPS signal if required. The TM2503A has a selection switch that switches the signal path between the 1PPS and 10MHz modes. It is powered from a single 12V supply and provides isolated outputs.

Front panel indications for 10MHz Out of Range, 10MHz Good, 1PPS, and Power provide functional information with a quick glance. Input and output connections are made through standard BNC connectors located on the back of the device.

2 Installation

2.1 Physical Mounting

The TM2503A can be left as a stand-alone table top device or can be mounted in a rack using the TimeMachines 760-022-000 or 760-023-000 rack mount adapter plates. Rubber feet are included if the user wishes to place the device on a table top.

2.2 Power

The TM2503A runs on 12V DC power. The connector is a 5.5/2.5mm center positive connector. Other 12V sources can be used as well if more convenient. Input range is 7-18V DC.

2.3 Front Panel Indications and Controls

The front panel of the TM2503A has 4 indicator LEDs:

- **IN OOR** – Input Out of Range. This red LED indicator lights when in the 10MHz mode and the input signal is not in the prescribed functional range.
- **IN OK** – Input signal is OK. This green LED indicator lights when in the 10MHz mode and the input signal is in the acceptable range.
- **1PPS** – 1 Pulse Per Second detect. This yellow LED indicator functions as a indication that a 1PPS signal has been detected on the input.
- **POW** – Power LED. This green LED lights when input power is applied.
- **10MHz – 1PPS** Slide Switch. This switch is moved to set the signal processing mode of the device. Signal paths are altered by the switch and active circuitry is moved to support the desired type of signal.

3 Connection Diagram



3.1 Power

The 12V power supply included with the TM2503A is connected to the back panel power jack.

3.2 Input

The Input of the TM2503A is typically connected to either a 10MHz oscillator source, or a 1PPS signal.

3.3 Output 1, 2, and 3

The outputs of the TM2503A when in 10MHz mode, are transformer coupled isolated 50Ohm outputs. Typical connection is with a 50 Ohm coaxial cable between the TM2503A and other pieces of test equipment. The outputs of the TM2503A when in 1PPS mode are optically isolated.

4 Basic Theory of Operation

4.1 Input Section

The input signal, 10MHz or 1PPS enters through the BNC connector. The path of signal is then split based on the position of the slide switch. If the switch is in the 1PPS position, that path will be followed. The 10MHz position follows a different path with additional signal conditioning.

4.2 1PPS Path

The 1PPS path is significantly simpler than the 10MHz path as there is no filtering of the signal. It is treated as a logic signal through the device. Once the path is split at U8, the signal enters an optical isolation logic device, U17. The output of the opto-isolator then feeds three separate N and P channel Mosfet arrays, U19, U20, and U22, which are powered from an internally generated and isolated power supply created by U16 and T5. The outputs of these MOSFET arrays are then fed through the 1PPS path of Relays K1 and K2. From there, the signals go to the three separate output BNC connections. Some small crossover distortion can be seen at high measurement rates on the 1PPS outputs from the MOSFET drivers.

4.3 10MHz Path

The 10MHz path, post 1PPS/10MHz path selection switch U8, enters a 10MHz bandpass filter to convert the square wave to a sine wave. The output of the filter is transformer coupled through HY1 to an RMS detector that is used to update the display LEDs. In addition the filtered signal is passed to a set of three amplifiers, U2-U4, whose outputs are then passed through a 15MHz low pass filter stage. The outputs of the amplifiers and then passed through three transformers, T1-T3, and then to the three BNC outputs.

5 Specifications

5.1 Input

- Voltage Range 7-18V DC
- Frequency Range 10MHz +/- 1% / 1 Hz
- Input Signal Range, 10MHz 0 to +16dBm, 0.8 to 4Vpp, into 50Ohms
- Input Signal Range, 1PPS 2.2 Vpp to 5Vpp
- Input Impedance 50Ohm +/-5.5%
- Input Coupling Series LC (Open at DC)

5.2 Output

- Waveform Sine
- Level +13dBm +/- 1dBm
- Impedance 50Ohm +/-5%
- Isolation >13dB
- Coupling Transformer
- Harmonic Level >34 dBc
- Bandwidth +/- 2.8MHz (-3dB)
- 1PPS 3.3V TTL compatible

5.3 Miscellaneous

- Connection, Power 5.5/2.5mm center positive
- Connections, Signal BNC female, 1 In, 3 Out

(Specifications are subject to change without notice)