
User Manual

Model WXD1

1.15Gb/s 14-Channels Digital Signal Amplifier/POD

Publication No. 130630

Ver. 1.2

Tabor Electronics Ltd.

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PUBLICATION DATE: July 15, 2015

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Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNINGS** and **CAUTION** notices.



CAUTION
RISK OF ELECTRICAL SHOCK
DO NOT OPEN



This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.



If this instrument is to be powered from the AC line (mains) through an auto-transformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.



Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.



Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid “live” circuit points.

Before operating this instrument:

1. Ensure the proper fuse is in place for the power source to operate.
2. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until, performance is checked by qualified personnel.

DECLARATION OF CONFORMITY

We: Tabor Electronics Ltd.
9 Hatasia Street, Tel Hanan
ISRAEL 36888

declare, that the 1.15Gb/s 14-Channels Digital Signal Amplifier/POD

Model WXD1

complies with the requirements of the Electro Magnetic Compatibility 2004/108/EC, class A and the Low Voltage Directive 73/23/EEC amended by 93/68/EEC, according to testing performed at HERMON LABORATORIES. Compliance was demonstrated to the following specifications as listed in the official Journal of the European Communities:

Safety:

IEC/EN 61010-1 2nd Edition: 2001+ C1, C2

EMC:

IEC 61326-1:2006	Class A Radiated and Conducted Emission
EN 61000-4-2	ESD
EN 61000-4-3	Radiated Immunity
EN 61000-4-4	Burst/fast transients
EN 61000-4-5	Surge
EN 61000-4-6	Conducted Immunity
EN 61000-4-8	Power frequency magnetic field
EN 61000-4-11	Voltage dips and fluctuations
EN 55011	Radiated and conducted Emissions

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Chapter 1

PORTRAYAL

What's in This Chapter

This chapter contains a general and functional description of the Model WXD1 Digital Signal Amplifier. It also describes the front and rear panel connectors and its operational modes.



NOTE

The WXD1 is supplementary ONLY to the Tabor WX Series models having option D (Digital outputs) installed. The use of model WX2182B-D in this manual is done for reasons of convenience only.

Introduction

The Model WXD1, as shown in Figure 1-1, is a bench-top, 2U, quarter 19" rack size, fully metal case 14 channels digital signal amplifier. The instrument is supplementary to the Tabor WX Series models having option D (Digital outputs) installed. Connected to one of these models the instrument allows independent control of 14 bit digital data.

The digital data is generated with the WX2182B-D and is routed to the WXD1 via a 68 pin High density VRDPC connector. The 14 bits are separated into 14 channels and each channel's High/Low level can be controlled separately.

The WXD1 combined with the WX2182B-D enables the generation and editing of complex digital patterns. These patterns are created and edited using the ArbConnection software utility which is used for controlling the WX2182B-D or any other tool using the unit's IVI driver, let it be visual studio, Labview, CVI or NATLAB based.

WXD1 Feature Highlights

- 14 Digital Data Channels
- Data Rate of 10Mb/s to 1.15Gb/s
- Signals amplified up to 4Vp-p
- Dedicated pattern memory of up to 16MWord
- Programmable amplitude and offset control
- <100ps Initial skew between bits
- ± 2.5 ns skew control and 5ps resolution
- Up to 4Vp-p into 50 Ω , double into open circuit
- Transition Times:
 - <0.5ns: <2Vp-p;
 - <1ns: 2Vp-p to 4Vp-p
- Auxiliary clock output
- Remote calibration without removing case covers
- Compatible ONLY with Tabor WX Series models having option D (Digital outputs) installed

Conventions Used in this Manual

The following symbols may appear in this manual:



A Note contains information relating to the use of this product



A Tip contains information relating to the performance of this product



A Caution contains information that should be followed to avoid personal damage to the instrument or the equipment connected to it.



A Warning alerts you to a potential hazard. Failure to adhere to the statement in a WARNING message could result in personal injury.



Figure 1-1, Model WXD1

Functional Description

Detailed functional description of the features, operation and options available with the WXD1 is given in the following paragraphs. The Digital Signal Amplifier/POD can be ordered only in combination with WX2182B-D.

Specifications

Instrument specifications are listed in Appendix A. These specifications are the performance standards or limits against which the instrument is tested. Specifications apply under the following conditions: output terminated into matching impedance, after 30 minutes of warm up time, and within a temperature range of 10 °C to 40 °C. Specifications outside of the temperature range are degraded by 0.1% per °C.

Front Panel Connectors

The WXD1 has 15 SMB connectors on its front panel, 14 channel outputs, each labeled with the corresponding bit number, and one Sample Clock output. These connectors are described below.

Main Output – Channels 1 to 14

The main output connectors generate user defined data patterns. These data patterns are generated at data rates of up to 1.15 Gb/s. The output source impedance is 50Ω. 4 V_{p-p} is the maximum amplitude level this amplifier can produce in a 50Ω load; however, double the amplitude can be achieved into high impedance loads.

**Tip**

Knowing your source impedance is very important because the output gain accuracy is calibrated to specific source impedance and therefore, any unmatched load impedance may have an affect on output level accuracy.

**WARNING**

Applying the output signal on inductive or capacitive loads may damage the outputs.

SCLK OUT

This SMB connector outputs the programmed sample clock frequency divided by two and is presented in a DDR (Double Data Rate) manner. Output level is 400 mVp-p, terminated into 50Ω. This output generates sample clock waveforms continuously. You may also use this output to synchronize other components in your system to one master clock.

Front Panel Indicators

The WXD1 has 1 indicator on its front panel. The POWER LED will light as soon as you press the switch to power up the WX2182B-D. An illuminated power light designates power is applied to the instrument and you should expect to have a signal at its output connector(s), as soon as data is downloaded to the WX2182B-D.

Rear Panel Connectors

The WXD1 has a number of connectors on its rear panel. These connectors are described below. Figure 1-2 shows the rear panel plugs, connectors and other parts and Figure 1-3 shows how to connect the WXD1 to its host instrument. Description of the interconnecting cables and their function is given hereinafter.



Figure 1-2, The WXD1 Rear Panel

14-bit Digital Input

This 68 pin, high density VRDPC connector is connected to the WX2182B-D rear panel using the supplied VPSTP cable. The input to this connector is routed from either channel 1 or channel 2 of the WX2182B-D. The design and programming of the digital patterns is done either through the WX2182B-D front panel, through the ArbConnection software or its driver. For a detailed explanation please refer to the WX2182B user manual.

Line Receptacle and Fuse

Power is connected to the WXD1 through the line receptacle. The pod accepts any voltage from 85 to 265 Vac and there is no need to select the voltage range between different countries. Instructions how to connect the line cord and how to replace the line fuse is given in Chapter 2. If a fuse blows, make sure you replace it with the same type and rating to avoid possible damage to the product from unsuitable fuse value.

Operating Instructions

The WXD1 is a passive device with no front panel controls. The instrument can be programmed only via the WX2182B-D.



WARNING

There is no physical switch control to turn the WXD1 channels on and off and therefore, the device is active immediately after you power it up. Always make sure your load is protected from inadvertent power up conditions before you turn on your WXD1.

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Chapter 2

Installation

Installation Overview

This chapter contains information and instructions necessary to prepare the WXD1 for operation. Details are provided for initial inspection, grounding requirements, repackaging instructions for storage or shipment and installation information.

Unpacking and Initial Inspection

Unpacking and handling of the amplifier requires normal precautions and procedures applicable to handling of sensitive electronic equipment. The contents of all shipping containers should be checked for included accessories and certified against the packing slip to determine that the shipment is complete.

Safety Precautions

Extreme safety precautions should be observed before using this product. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.



CAUTION

This product is intended for use by qualified persons who are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.



CAUTION

For maximum safety, do not touch the product, test cables, or any other instrument parts while power is applied to the circuit under test. ALWAYS remove power from the entire test system before connecting cables or jumpers. Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always keep your hands dry while handling the instrument.

**WARNING**

Always keep the lid closed when power is applied to the device under test conditions. Carefully read the Safety Precautions instructions that are supplied with your test fixtures. Any adjustment, maintenance and repair of an opened, powered-on instrument must be performed by authorized service personnel.

Operating Environment

The W XD1 is intended for indoor use and should be operated in a clean, dry environment with an ambient temperature within the range of 0 °C to 40 °C.

**WARNING**

The W XD1 must not be operated in explosive, dusty, or wet atmospheres. Avoid installation of the module close to strong magnetic fields.

The design of the W XD1 has been verified to conform to EN 61010-1 2nd addition safety standard per the following limits:
Installation (Overvoltage) Category I (Measuring terminals)
Pollution Degree 2.

Pollution Degree 2 refers to an operating environment where normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation must be expected.

Power Requirements

The WXD1 may be operated from a wide range of mains voltage from 85 to 265 Vac. Voltage selection is automatic and does not require switch setting. The instrument operates over the power mains frequency range of 50 to 60Hz. Always verify that the operating power mains voltage is the same as that specified on the rear panel. The instruments power consumption is 70VA max.

The WXD1 should be operated from a power source with neutral or near ground (earth potential). The instrument is not intended for operation from two phases of a multi-phase ac system or across the legs of a single-phase, three-wire ac power system. Crest factor (ratio of peak voltage to rms.) should be typically within the range of 1.3 to 1.6 at 10% of the nominal rms. mains voltage.



WARNING

Do not connect the line cord to the WXD1 before you verify the correct power line setting. Failure to switch the instrument to match the operating line voltage will damage the instrument and may void the warranty.

Grounding Requirements

To ensure the safety of operating personnel, the U.S. O.S.H.A. (Occupational Safety and Health) requirement and good engineering practice mandate that the instrument panel and enclosure be “earth” grounded. Although SMB housings are isolated from the front panel, the metal part is connected to earth ground.



WARNING

Do not attempt to float the output from ground, as it may damage the Model WXD1 and your equipment.

Calibration

The recommended calibration interval is two years. Calibration should be performed by qualified personnel only.

Abnormal Conditions

Operate the WXD1 only as intended by the manufacturer. If you suspect the product has been impaired, remove the power cord and secure against any unintended operation. The WXD1 protection is likely to be impaired if, for example, the instrument fails to perform the intended operation or shows visible damage.



WARNING

Any use of the WXD1 in a manner not specified by the manufacturer may impair the protection provided by the instrument

Long Term Storage or Repackaging For Shipment

If the instrument is to be stored for a long period of time or shipped immediately, proceed as directed below. If you have any questions, contact your local Tabor representative or the Tabor Customer Service Department.

1. Repack the instrument using the wrappings, packing material and accessories originally shipped with the unit. If the original container is not available, purchase replacement materials.
2. Be sure the carton is well sealed with strong tape or metal straps.
3. Mark the carton with the model and serial number. If it is to be shipped, show sending and return address on two sides of the box.



NOTE

If the instrument is to be shipped to Tabor for calibration or repair, attach a tag to the instrument identifying the owner. Note the problem, symptoms, and service or repair desired. Record the model and serial number of the instrument. Show the returned authorization order number (RMA) as well as the date and method of shipment. ALWAYS OBTAIN A RETURN AUTHORIZATION NUMBER FROM THE FACTORY BEFORE SHIPPING THE INSTRUMENT TO TABOR.

Preparation for Use

Preparation for use includes removing the instrument from the box, the bag and installing the WXD1 either on the bench or in a 19" rack. Chapter 3 of the WX2182B manual contains operating instructions. Make sure you read and understand the instructions in Chapter 2 of the WX2182B manual before turning on the device.

Bench Installation

The WXD1 dissipates large amount of power. No special cooling is required. However, the instrument should not be operated where the ambient temperature exceeds 40 °C, when the relative humidity exceeds 80% or condensation appears anywhere on the instrument. Avoid operating the instrument close to strong magnetic fields, which may be found near high power equipment such as motors, pumps, solenoids, or high power cables. Always leave 4 cm (about 1.5 inches) of ventilation space on all sides of the instrument.

Rack Mounting

The WXD1 can be rack mounted inside a standard 19" rack. It can be mounted using one of two configurations: 1) single, or 2) side-by-side. Tabor offers rack-mounting ears for both options. Consult the factory for the appropriate part number.

Using the single rack mounting option, the WXD1 is supplied with a blank panel that covers the empty side. The case can be mounted either on the left or the right of the rack with the blank panel covering the empty space.

Side-by-side option is available only with the WX2182B-D. In this case, the two boxes are latched in the middle and side ears connect the assembly to the rack. Figure 2-1 shows how the WXD1 can be mounted next to the WX2182B-D.

Use care when rack mounting to locate the instrument away from sources of excessive heat or magnetic fields. Always leave 4 cm (1.5 inches) of ventilation space on top and bottom sides of the power amplifier.

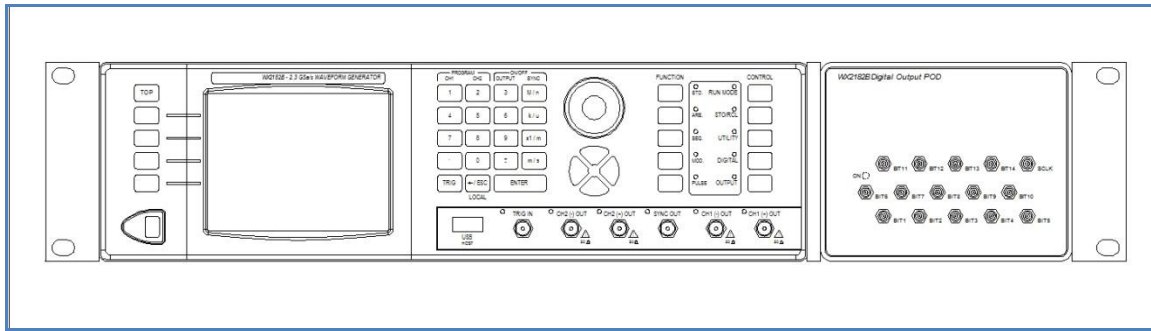


Figure 2-1, Rack Mount Configuration of WX2182B-D and POD

Configuring the Digital POD

As was mentioned in chapter 1 of this manual, each channel is fitted with its own digital pattern output connector and thus can be connected jointly or separately to the WX2182B-D. Figure 2-1 shows the WX2182B-D attached to the digital POD and mounting ears to fit in a 19" rack mount cabinet. Two PODs and an instrument will not fit in a rack mount width and therefore, they must be configured as shown in Figure 2-2. While separate assemblies can be configured by anybody with minimal mechanical experience, rack mounting requires a bit more skills and therefore it is recommended that rack mounted instruments be ordered as such from the factory.

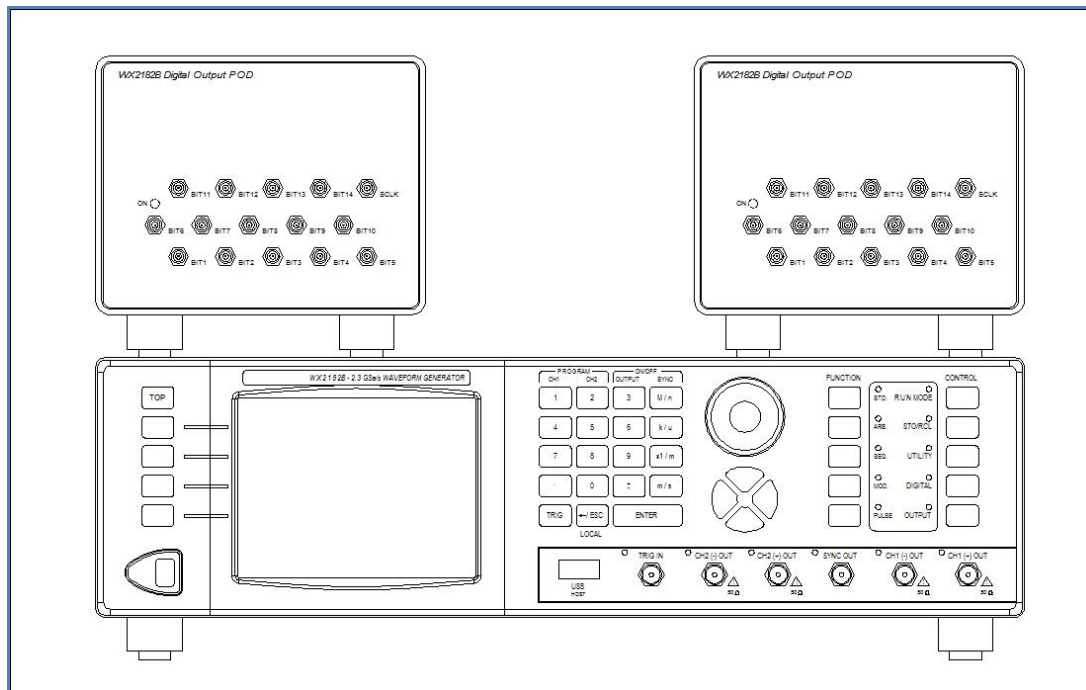


Figure 2-2, Bench Configuration of WX2182B-D and Two PODs

Connecting the Digital POD

There are two cables that connect to the digital POD: power and data. Power is connected to the POD using a standard three-prong AC cable that connects to any mains power outlet. The data cable, although standard, is length sensitive and therefore, either order it from Tabor Electronics or from one of its representatives or you may also order directly from the factory; the type is SAMTEC VPSTP-24-000-01. Figure 2-3 shows a picture of the cable and pin assignment is given in Chapter 3 of the WX2182B manual.



Figure 2-3, Digital POD Data Cable Example

Special care must be taken when connecting the cable to the instrument to avoid reversal of the pins and thereby damaging the cable detents and pins. Note that there is an arrow on one side of the connector, with correct assembly this arrow will be facing up to the top side of the WX2182B-D and down to bottom side of the WXD1.

Operating the Digital POD

As a first step before powering up the digital POD, take another look at the connections to make sure the cables are correctly mounted and secured on both sides. Then you'll probably notice there is no power switch on the digital POD; this is because a control line from the WX2182B-D turns the power to the POD on automatically when the power to the WX2182B-D is switched on. Power is on when the Power LED on the POD's front panel illuminates.

Further information how to control data patterns out of the POD's terminals is available in the WX2182B manual.

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Chapter 3

MAINTENANCE, PERFORMANCE CHECKS and ADJUSTMENTS

What's in This Chapter

This chapter provides maintenance and service information, performance tests, and the procedures necessary to adjust and troubleshoot the WXD1 Digital Signal Amplifier.



The procedures described in this section are for use only by qualified service personnel. Many of the steps covered in this section may expose the individual to potentially lethal voltages that could result in personal injury or death if normal safety precautions are not observed.



ALWAYS PERFORM DISASSEMBLY, REPAIR AND CLEANING AT A STATIC SAFE WORKSTATION.

Disassembly Instructions

If it is necessary to troubleshoot the instrument or replace a component, use the following procedure to remove the side panels:

1. Using a Phillips head screwdriver, remove the screws from the top and bottom covers.
2. Carefully lift the top cover from its back end and slide the cover to the rear to clear the front panel spring latch. Do the same for the bottom. After removing the covers from the instrument, access the component side for calibration and checks, and the solder side when replacing components.
3. When replacing the top and bottom covers, reverse the above procedure.

Special Handling of Static Sensitive Devices

CMOS devices are designed to operate at very high impedance levels for low power consumption. As a result, any normal static charge that builds up on your person or clothing may be sufficient to destroy these devices if they are not handled properly. When handling such devices, use the precautions described below to avoid damaging them:

1. CMOS IC's should be transported and handled only in containers specially designed to prevent static build-up. Typically, these parts are received in static-protected containers of plastic or foam. Keep these devices in their original containers until ready for installation.
2. Ground yourself with a suitable wrist strap. Remove the devices from the protective containers only at a properly grounded workstation.
3. Remove a device by grasping the body; do not touch the pins.
4. Any printed circuit board into which the device is to be inserted must also be grounded to the bench or table.
5. Use only anti-static type solder sucker.
6. Use only grounded soldering irons.

Once the device is installed on the PC board, the device is adequately protected and normal handling may resume.

Cleaning

The Model WXD1 should be cleaned as often as operating conditions require. To clean the instrument, use the following procedure:

1. Thoroughly clean the inside and outside of the instrument.
2. When cleaning inaccessible areas, remove dust with low-pressure compressed air or a vacuum cleaner.
3. Use alcohol applied with a cleaning brush to remove accumulation of dirt or grease from connector contacts and component terminals.
4. Clean the exterior of the instrument and the front panel with a mild detergent mixed with water, applying the solution with a soft, lint-free cloth.

Repair and Replacement

Repair and replacement of electrical and mechanical parts must be accomplished with great care. Printed circuit boards can become warped, cracked or burnt from excessive heat or mechanical stress. The following repair techniques are suggested to avoid inadvertent destruction or degradation of parts and assemblies:

1. Use a 60/40 solder and temperature-controlled 35 - 40 watt pencil-type soldering iron on the circuit board. The tip of the iron should be clean and properly tinned for best heat transfer to the solder joint. A higher wattage soldering iron may separate the circuit from the base material.
2. Keep the soldering iron in contact with the PC board for a minimum time to avoid damage to the components or printed conductors.
3. To de-solder components, use a commercial "solder sucker" or a solder-removing SOLDER - WICK, size 3.
4. Always replace a component with an exact duplicate as specified in the parts list.

Performance Checks

The performance of the WXD1 should be checked to verify proper operation of the instrument and should normally be used:

1. As a part of the incoming inspection of the instrument specifications;
2. As part of the troubleshooting procedure;
3. After any repair or adjustment before returning the instrument to regular service.

Environmental Conditions

Tests should be performed under laboratory conditions having an ambient temperature of 25 °C, ± 5 °C and at relative humidity of less than 80%. If the instrument has been subjected to conditions outside these ranges, allow at least one additional hour for the instrument to stabilize before beginning the adjustment procedure.

Warm-up Period

Most instruments are subject to small amount of drifts when first turned on. To ensure accuracy, turn on the power to the Model W XD1 and allow it to warm-up for at least 10 minutes before beginning the performance test procedure.

Recommended Test Equipment

Recommended test equipment for troubleshooting, calibration and performance checking is listed below. Test instruments other than those listed may be used only if their specifications equal or exceed the required characteristics.

Table 3-1, Recommended Test Equipment

Equipment	Model No.	Manufacturer
Oscilloscope	DSA90604A	Agilent
Digital Multimeter	3458A	Agilent
Frequency Counter	53132A	Agilent
Spectrum Analyzer	N9010A	Agilent
Function Generator	33250A	Agilent
Signal Generator	N5181A	Agilent
Power Meter	N1913A	Agilent
Power Sensor	E9304A	Agilent

Performance Check Procedures

Use the following procedures to check the W XD1 against the specifications. A complete set of specifications is listed in Appendix A. The following paragraphs show how to set up the instrument for the test, what the specifications for the tested function are, and what acceptable limits for the test are. If the instrument fails to perform within the specified limits, the instrument must be calibrated or tested to find the source of the problem.

Connections

Refer to Chapter 2 of this manual for detailed installation instructions.



NOTE

Special care must be taken when connecting the data cable to the instrument to avoid reversal of the pins and thereby damaging the cable detents and pins. Note there is an arrow on one side of the connector, with correct assembly this arrow will be facing down to the bottom side of the WX2182B-D.

WXD1 Digital Output Characteristics

This tests the operation of the WXD1 outputs. There are 14 digital outputs for each channel and these are programmed as a waveform data in the WX2182B-D. The digital outputs can be skewed in reference to one another in increments of 5 ps and can be programmed with variable high and low level.

The function of the WXD1 outputs is tested in this section. Perform the following tests if you suspect that the WXD1 outputs do not perform as expected.

WXD1 Digital Outputs and Level Checks

Equipment: Oscilloscope

Preparation:

1. Configure the oscilloscope follows:
Setup: As required for the test
2. Connect WXD1 outputs to the oscilloscope inputs.
3. Configure the WX2182B-D as follows:
Function Mode: Arbitrary
Digital Waveforms: Square, 192 points, 1 cycle
WX2182B-D Output: ON
WXD1 CH(1-14) Output: ON

Test Procedure

1. Check the WXD1 outputs and levels using Tables 3-2 and 3-3.

Table 3-2, Channel 1 Digital Port Outputs and Level Tests

	Amplitude Setting		Error Limits	Scope Reading		Amplitude Setting		Error Limits	Scope Reading		Pass	Fail
	Low	High		Low	High	Low	High		Low	High		
CH1	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH2	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH3	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH4	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH5	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH6	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH7	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH8	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH9	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH10	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH11	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH12	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH13	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH14	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				

Table 3-3, Channel 2 Digital Port Output and Level Tests

	Amplitude Setting		Error Limits	Scope Reading		Amplitude Setting		Error Limits	Scope Reading		Pass	Fail
	Low	High		Low	High	Low	High		Low	High		
CH1	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH2	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH3	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH4	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH5	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH6	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH7	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH8	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH9	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH10	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH11	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH12	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH13	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				
CH14	-2 V	2 V	±0.2 V			-1 V	1 V	±0.15 V				

WxD1 Digital Outputs Delay Checks

Equipment: Oscilloscope

Preparation:

1. Configure the oscilloscope as required by the test.
2. Connect WxD1 CH1 outputs to the oscilloscope input – channel 1.
3. Connect the WxD1 channel as required by the test to the oscilloscope – channel 2.
4. Configure the WX2182B-D as follows:

Function Mode:	Arbitrary
Digital Waveforms:	Square, 192 points, 1 cycle
WX2182B-D Output:	ON
WxD1 CH(1-14) Output:	ON
Bits Low Level:	-1V
Bits High Level:	1V

Test Procedure

1. Check the channels delay using Tables 3-4 and 3-5. The delay is referenced to the WX2182B-D CH1 output.

Table 3-4, Channel 1 Digital Port Outputs Delay Tests

	Delay Setting	Error Limits	Scope Reading	Delay Setting	Error Limits	Scope Reading	Delay Setting	Error Limits	Scope Reading	Pass	Fail
CH1	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH2	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH3	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH4	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH5	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH6	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH7	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH8	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH9	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH10	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH11	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH12	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH13	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH14	0 n	±20 p		-2 n	±220 p		2 n	±220 p			

Table 3-5, Channel 2 Digital Port Outputs Delay Tests

	Delay Setting	Error Limits	Scope Reading	Delay Setting	Error Limits	Scope Reading	Delay Setting	Error Limits	Scope Reading	Pass	Fail
CH1	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH2	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH3	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH4	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH5	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH6	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH7	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH8	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH9	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH10	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH11	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH12	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH13	0 n	±20 p		-2 n	±220 p		2 n	±220 p			
CH14	0 n	±20 p		-2 n	±220 p		2 n	±220 p			

Adjustment Procedures

Use the following procedures to adjust WXD1. The following paragraphs show how to set up the instrument for adjustment and what the acceptable adjustment limits are.

There are separate adjustments for Channel 1 to Channel 14 so make sure that the output cables are connected to the appropriate channel and that the WXD1 is connected properly to the WX2182B-D during the adjustments.

Channels 1-14 Amplitude and Offset Adjustments

The amplitude and offset adjustments assure that the DC offsets and amplitudes of the WXD1 are within the specified range. Use this procedure if you suspect that the offset accuracy is an issue.

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Amplitude Adjustments

Preparation:

1. Configure the DMM as follows:
 - Function: ACV
 - Range: 10 V
2. Connect the WXD1 Channel 1 output to the DMM input.
3. Configure the WX2182B-D as follows:
 - Function Mode: Arbitrary
 - Digital Waveforms: Square, 10,240 points, 1 cycle
 - SCLK: 10.24 MS/s
 - WX2182B-D Output: ON
 - WXD1 CH(1-14) Output: ON
 - Bits Low / High Level: -1V / 1V

Adjustment

1. Adjust RVampl for DMM reading of 2 V, ± 20 mV.
2. Return step 1 for each channel as per the table below

	RVampl
CH1	RV14
CH2	RV15
CH3	RV22
CH4	RV24
CH5	RV29
CH6	RV10
CH7	RV13
CH8	RV18
CH9	RV20
CH10	RV28
CH11	RV10
CH12	RV13
CH13	RV14
CH14	RV15

Setup 108

Offset Adjustments

Equipment: DMM

Preparation:

1. Configure the DMM as follows:
Function: DCV
Range: 100 mV
2. Connect the WxD1 channel 1 output to the DMM input.
3. Configure the WX2182B-D as follows:
Function Mode: Arbitrary
Digital Waveforms: Square, 192 points, 1 cycle
SCLK: 192 MS/s
WX2182B-D Output: ON
WxD1 CH(1-14) Output: ON
Bits Low / High Level: -1V / 1V

Adjustment:

1. Adjust RVoffs for DMM reading of 0 mV, ± 20 mV.
2. Return step 1 for each channel as per the table below

	RVoffs
CH1	RV16
CH2	RV17
CH3	RV23
CH4	RV25
CH5	RV27
CH6	RV11
CH7	RV12
CH8	RV19
CH9	RV21
CH10	RV26
CH11	RV11
CH12	RV12
CH13	RV16
CH14	RV17

Digital Port 1 Delay Adjustments

The delay adjustments assure that the delay between the WxD1's outputs will be minimal as possible. Use this procedure if you suspect that the delay accuracy is an issue.

The delay adjustments are stored internally in the WX2182B-D per digital channel port, which is output on a rear panel connector. The following procedures pertain to digital channel 1 and therefore, make sure that your connections are made to the digital channel port 1, in order to maintain the proper calibration data.

Setup 79

Step 1 - Setting Delay Adjustments Setup

Preparation:

1. Configure the WX2182B-D as follows:

Function:	Arbitrary
Digital Waveforms:	Square, 400 points, 1% duty cycle
SCLK:	1 GHz
CH1 Digital Output:	ON
Bit<1-14>:	ON

Setup 80 - 92

Step 2 - Delay Adjustments

Equipment: Oscilloscope

Preparation:

1. Connect WxD1 CH1 output to Oscilloscope CH1 inputs.
2. Connect WxD1 CH2 output to Oscilloscope CH2 inputs.

Adjustment:

1. Adjust CAL:SETUP80 for a delay reading of 0 sec \pm 100 psec.
2. For (i=1; i<13; i++) repeat step 1 with CH(2+i) and adjust CAL:SETUP(80+i).

Digital Port 2 Delay Adjustments

The delay adjustments assure that the delay between the WXD1's outputs will be minimal as possible. Use this procedure if you suspect that the delay accuracy is an issue.

The delay adjustments are stored internally in the WX2182B-D per digital channel port, which is output on a rear panel connector. The following procedures pertain to digital channel 2 and therefore, make sure that your connections are made to the digital channel port 2, in order to maintain the proper calibration data.

Setup 93

Step 1 - Setting Delay Adjustments Setup

Preparation:

1. Configure the WX2182B-D as follows:

Function:	Arbitrary
Digital Waveforms:	Square, 400 points, 1% duty cycle
SCLK:	1 GHz
CH1 Digital Output:	ON
Bit<1-14>:	ON

Setup 94 - 106

Step 2 - Delay Adjustments

Equipment: Oscilloscope

Preparation:

1. Connect WXD1 CH1 output to Oscilloscope CH1 inputs.
2. Connect WXD1 CH2 output to Oscilloscope CH2 inputs.

Adjustment:

1. Adjust CAL:SETUP94 for a delay reading of 0 sec \pm 100 psec.
2. For (i=1; i<13; i++) repeat step 1 with CH(2+i) and adjust CAL:SETUP(94+i).

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Appendix A

SPECIFICATIONS

Electrical Specifications

Digital Waveforms

Characteristics	Description
General	Digital data are created on a remote computer and downloaded to the arbitrary waveform memory through one of the available remote interfaces. The data rate is calculated from its programmed sample clock value and the number of data points that were used for creating the data waveform
Data length	192 to 8,000,000 points (192 to 16,000,000 with option WXxx8x-232), in multiples of 16 points
Number of patterns	1 to 48,000
Dynamic pattern control	Software command or rear panel segment control input (D-sub, 8 bit lines)
Pattern jump timing	Coherent or asynchronous, selectable
Data resolution	32 bits form WX Series / 14 bits available per POD
Data creation utilities	Data Editor creates patterns.

Digital outputs

Characteristics	Description
Connector type	SMB
Number of Digital outputs	14
Type of output	Single-ended
Impedance	50 Ω , typical
Max. Data Rate	SCLK/2
Level control	Specified into 50 Ω , levels double into high impedance
Voltage window	-2.0V to 2.0 V (0.2Vp-p to 4Vp-p)
Low level	-1.5 V to 2 V
High level	-2 V to 1.5 V
Resolution	100 mV
Accuracy	± 0.1 V \pm 5% of setting
Initial Skew between bits	<100 ps, typical
Variable delay control	Skew Control Between bits
Range	-2.5ns to +2.5ns
Resolution	5 ps
Accuracy	\pm (10% of setting +20 ps)
Rise/fall time (typ.)	
<2Vp-p	0.5 ns
<4Vp-p	1.0 ns
Sample Clock Output	
Connector type	SMB
Type of output	NECL

Mechanical, Environmental and Maintenance Specifications

Peripheral devices

Characteristics	Description
Digital Pattern Input	
Connector	High speed I/O receptacle, 68-pin VRDPC
Output Level	LVDS
Impedance	100Ω

Power supply

Characteristics	Description
Source voltage & frequency	
Rating range	100 VAC to 240 VAC
Frequency range	50 Hz to 60 Hz
Power consumption	70 VA

Mechanical

Characteristics	Description
Dimensions	
With feet	112 x 102 x 415mm (W x H x D)
Without feet	112 x 88 x 415mm (W x H x D)
Weight	
Without package	1.5 kg
Shipping weight	2 kg

Environmental

Characteristics	Description
Operating temperature	0°C to 40°C
Storage temperature	-40°C to 70°C
Humidity	80% RH, non condensing

Maintenance

Characteristics	Description
General	Periodical recalibration is required to maintain accuracy of output characteristics
Recalibration Period	2 years