User Manual

Model 2816

Data Generator POD

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Tabor Electronics Ltd.

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FOR YOUR SAFETY

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

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 autotransformer, 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.

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Chapter 1
PORTRAYAL

What's in This Chapter

This chapter contains a general and functional description of the Model 2816 Data Generator Pod. It also describes the front and rear panel connectors and its operational modes.

Introduction

The Model 2816, as shown in Figure 1-1, is a bench-top, 2U, half 19" rack size, fully metal case 16 channel digital data convertor. The instrument is supplementary to the Model 257XA/857XA series. Connected to one of these models the instrument allows independent control of 16bit digital data.

The digital data is generated with the Model 257XA/857XA and is routed to the Model 2816 via a 68 pin High density SCSI-2 connector. The 16 bits are separated into 16 channels and each channel's High/Low level can be controlled separately.

The Model 2816 combined with the Model 257XA/857XA enable 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 257XA/857XA.

2816 Feature Highlights

- Sixteen voltage-level independent Channels
- Signals amplified up to 5 Vpp
- Up to 300 MHz signal bandwidth
- When combined with either 257XA/857XA :
    - Up to 4 M pattern memory depth
    - Pattern editing and sequencing

Conventions Used in this Manual

The following symbols may appear in this manual:

Note

A Note contains information relating to the use of this product

TIP

A Tip contains information relating to the performance of this product

Caution

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

Warning

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, The Model 2816

Functional Description

Detailed functional description of the features, operation and options available with the 2816 is given in the following paragraphs. The Data Generator Pod can be ordered only in combination with 257XA/857XA.

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 2816 has 17 SMB connectors on its front panel, 16 channel outputs, each labeled with the corresponding bit number, and one Sample Clock output. These connectors are described below.

Main Output – Channels 1 to 16

The main output connectors generate user defined data patterns. These data patterns are generated at data rates of up to 300 Mb/s. The output source impedance is 50 Ω. The Amplitude levels that are stated in this manual refer to a 1 MΩ termination. When the output is connected to a 50 Ω termination the amplitude is decreased by half.

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.

5 Vp-p is the maximum amplitude level this amplifier can produce however, only into high impedance loads.

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. Output level is 500 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 2816 has 1 indicator on its front panel. The POWER LED will light as soon as you press the switch to power up the 2816. An illuminated power light designates power is applied to the instrument and you should expect to have signal at its output connector(s).

Rear Panel Connectors

The 2816 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 DG2816 to its host instrument. Description of the interconnecting cables and their function is given hereinafter.

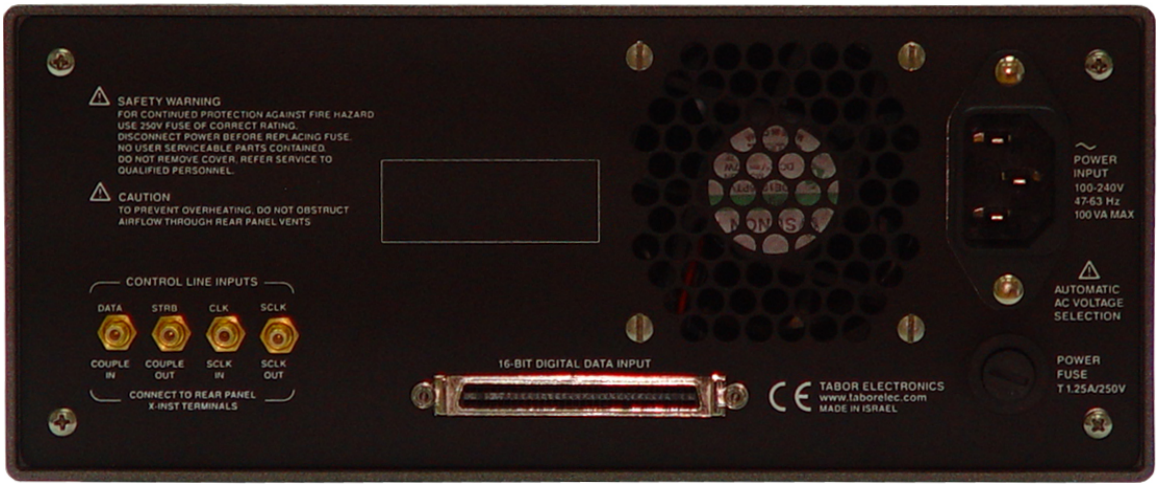

Figure 1-2, The 2816 Rear Panel

16-bit Digital Input

This 68 pin, high density SCSI-2 connector is connected to the 257XA/857XA rear panel using the supplied SCSI cable. The input to this connector is routed from channel 1 of the 257XA/857XA. The design and programming of the digital patterns is done either through the 257XA/857XA front panel or through the ArbConnection software. For a detailed explanation please refer to the 257XA/857XA user manual.

DATA

The DATA line is connected to the COUPLE IN connector on the rear panel of the 257XA/857XA. This connector accepts the control signals of the control line used 2816

STRB

The STRB line is connected to the COUPLE OUT connector on the rear panel of the 257XA/857XA. This connector accepts control signals used in the 2816.

CLK

The CLK line is connected to the SCLK IN connector on the rear panel of the 257XA/857XA. This connector accepts control signal used in the 2816.

SCLK

The SCLK line is connected to the SCLK OUT connector on the rear panel of the 257XA/857XA. This connector signal accepts the SCLK of the 257XA/857XA and outputs it on the front of the 2816

Line Receptacle and Fuse

Power is connected to the 2816 through the line receptacle. The pod accepts any voltage from 80 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 2816 is a passive device with no front panel controls. The instrument can be programmed only via the computer.

WARNING

There is no switch control to turn the 2816 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 2816.

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Chapter 2
CONFIGURING the INSTRUMENT

Installation Overview

This chapter contains information and instructions necessary to prepare the Model 2816 for operation. Details are provided for initial inspection, grounding safety requirements, repackaging instructions for storage or shipment, installation information and Ethernet address configuration.

Unpacking and Initial Inspection

Unpacking and handling of the device 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

The following 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 recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on power cables, connector jacks, or test fixtures. The American National Standard Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak or 60 VDC are present.

WARNING

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, installing or removing cards from the computer, or making internal changes such as changing the module address.

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.

When using test fixtures, keep the lid closed while power is applied to the device under test. Carefully read the Safety Precautions instructions that are supplied with your test fixtures.

Before performing any maintenance, disconnect the line cord and all test cables. Only qualified service personnel should perform maintenance.

Performance Checks

The instrument has been inspected for mechanical and electrical performance before shipment from the factory. It is free of physical defects and in perfect electrical order. Check the instrument for damage in transit and perform the electrical procedures outlined in the section entitled **Unpacking and Initial Inspection.**

Operating Environment

The 2816 is intended for operation on the bench or inside a rack of instruments. It is intended for indoor use only and should be operated in a clean, dry environment with an ambient temperature within the range of 0 °C to 50 °C.

WARNING

The 2816 must not be operated in explosive, dusty, or wet atmospheres. Avoid installation of the module close to strong magnetic fields.

The design of the 2816 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.

Installation (Overvoltage) Category I refers to signal level, which is applicable for equipment measuring terminals that are connected to source circuits in which measures are taken to limit transient voltages to an appropriately low level.

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 2816 may be operated from a wide range of mains voltage 90 to 264Vac. Voltage selection is automatic and does not require switch setting. The instrument operates over the power mains frequency range of 48 to 63Hz. Always verify that the operating power mains voltage is the same as that specified on the rear panel.

The 2816 should be operated from a power source with its neutral at 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.

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 BNC 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 2816 and your equipment.

WARNING

Input and output grounds are tied together and therefore, it is absolutely forbidden to connect the output ground to a different level than the input ground. Failure to adhere to this limitation may damage the 2816 and the surrounding equipment connected to its I/O connectors.

Long Term Storage or Repackaging for Shipment

If the instrument is to be stored for a long period of time or shipped to a service center, proceed as directed below. If repacking procedures are not clear to you or, if you have questions, contact your nearest Tabor Electronics Representative, or the Tabor Electronics 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 Electronics 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 RMA (Returned Materials Authorization) order as well as the date and method of shipment. ALWAYS OBTAIN AN RMA NUMBER FROM THE FACTORY BEFORE SHIPPING THE 2816 TO TABOR ELECTRONICS.

Preparation for Use

Preparation for use includes removing the instrument from the container box and connecting the cables to its input and output connectors.

Installation

If this instrument is intended to be installed in a rack, it must be installed in a way that clears air passage to its cooling fans. For inspection and normal bench operation, place the instrument on the bench in such a way that will clear any obstructions to its rear fan to ensure proper airflow.

CAUTION

Using the 2816 without proper airflow will result in damage to the instrument.

Connections

The Model 2816 is connected to the model 257XA/857XA using a 68 pin SCSI cable and 4 SMB cables supplied with the unit. The 16-bit digital OUT on the rear panel of the 257XA/857XA is connected to the 16-bit digital IN on the rear panel of the 2816.

The 4 SMB connectors on the rear panel of the 257XA/857XA, COUPLE IN, COUPLE OUT, SCLK IN and SCLK OUT are connected to the 4 SMB connectors DATA, STRB, CLK and SCLK on the rear panel of the 2816 respectively. Figure XX shows the connections.

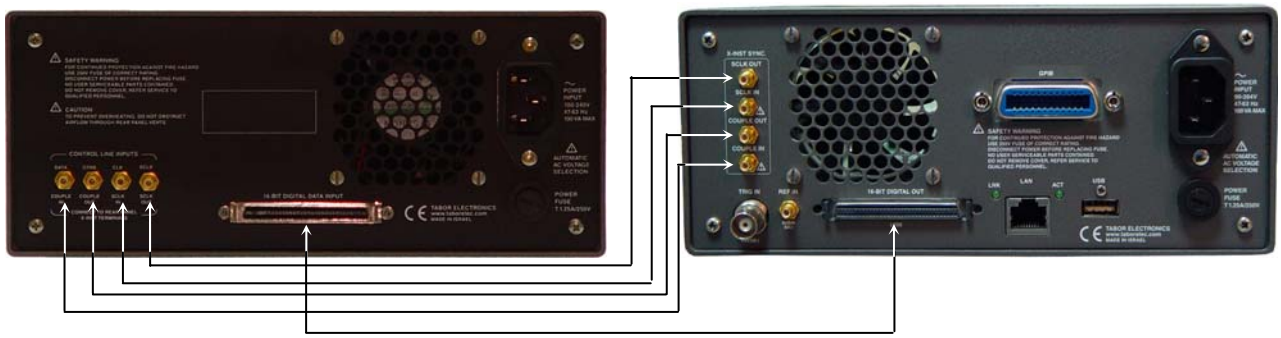

Figure 2-1, Connecting the 2816 to 257xA or 857x

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 Model 2816 Digital Data Convertor.

WARNING

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.

CAUTION

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 2816 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 2816 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 2816 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	LC684	LeCroy
Digital Multimeter	2000	Keithley
Pulse/Function Generator	PM8572	Tabor Electronics
Accessories	BNC to BNC cables	
	SMB to BNC cables	
	SMB to SMB cables	
	50Ω Feed through termination	
	Dual banana to BNC adapter	

Performance Check Procedures

Use the following procedures to check the Model 2816 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 the Chapter 2 for detailed installation instructions.

Connect rear panels of PM8572 and DG2816 as follows:

Use LVDS SCSI Cable HD68 pin to HD68 pin

SMB to SMB connectors and connect according to table 3-2

Table 3-2, Rear Panel Connection

PM8572	DG2816
COUPLE IN	DATA / COUPLE IN
COUPLE OUT	STRB / COUPLE OUT
SCLK IN	CLK / SCLK IN
SCLK OUT	SCLK / SCLK OUT

Amplitude Accuracy

Amplitude accuracy checks, tests the accuracy of the output amplifier. Each channel has its own set of amplifiers and therefore, the accuracy is tested on each channel separately.

Amplitude Accuracy

Equipment**:** Oscilloscope

Preparation:

1. Configure the oscilloscope as follows:
   Termination: 1MΩ
2. Connect DG2816 Channel outputs to the oscilloscope input
3. Configure the PM8572 as follows:
   SCLK: 1MHz
   Function: Arbitrary
   Digital patterns:
   Data Source Arbitrary Segment
   State On
4. Download wave:
   Length: 16 point
   Shape: Square
   Cycles: 8

Test Procedure

1. Perform amplitude Accuracy tests on 16 channels using Table 3-3

Table 3-3, Amplitude Accuracy

	DG2816 Amplitude Setting		Error Limits		Oscilloscope Reading		Pass	Fail
	HIGH LEVEL	LOW LEVEL	HIGH LEVEL	LOW LEVEL	HIGH LEVEL	LOW LEVEL		
CH 1	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 2	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 3	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 4	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 5	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 6	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 7	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 8	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 9	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 10	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 11	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 12	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 13	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 14	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 15	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				
CH 16	1.00V	-1.00V	1.00V±30mV	-1.00V±30mV				

Amplitude Accuracy

Equipment**:** Oscilloscope

Preparation:

1. Configure the oscilloscope as follows:
   Termination: 1MΩ
2. Connect DG2816 Channel outputs to the oscilloscope input
3. Configure the PM8572 as follows:
   SCLK: 1MHz
   Function: Arbitrary
   Digital patterns:
   Data Source Arbitrary Segment
   State On
4. Download wave:
   Length: 16 point
   Shape: Square
   Cycles: 8

Test Procedure

1. Perform amplitude Accuracy tests on 16 channels using Table 3-4

Table 3-4, Amplitude Accuracy

	Amplitude Setting		Error Limits		Oscilloscope Reading		Pass	Fail
	HIGH LEVEL	LOW LEVEL	HIGH LEVEL	LOW LEVEL	HIGH LEVEL	LOW LEVEL		
CH 1	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 2	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 3	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 4	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 5	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 6	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 7	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 8	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 9	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 10	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 11	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 12	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 13	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 14	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 15	3.00V	0.00V	3.00V±30mV	0.00V±30mV				
CH 16	3.00V	0.00V	3.00V±30mV	0.00V±30mV				

Square wave Characteristics

This tests the characteristics of the square waveform. It includes transition times and skew between channels. Each channel has its own set of amplifiers and attenuators and therefore, the characteristics are tested on each channel separately.

Square wave Checks

Equipment: Oscilloscope

Preparation:

1. Configure the Oscilloscope as follows:
   - Termination: 1MΩ
   - Setup: As required for the test
2. Connect DG2816 Channels output to the oscilloscope input
3. Configure the PM8572 as follows:
   - SCLK: 1MHz
   - Function: Arbitrary
   - Digital patterns:
   - Data Source: Arbitrary Segment
   - State: On
4. Download wave:
   - Length: 16 point
   - Shape: Square
   - Cycles: 8
5. Configure the DG2816 as follows:
   - High Level: 3V
   - Low Level: 0V

Test Procedure

1. Perform Squarewave Characteristics tests on 16 channels using Table 3-5

Table 3-5, Rise Time Characteristics

CH	Error Limits	Oscilloscope Reading Rise time	Pass	Fail
CH 1	<2.5ns			
CH 2	<2.5ns			
CH 3	<2.5ns			
CH 4	<2.5ns			
CH 5	<2.5ns			
CH 6	<2.5ns			
CH 7	<2.5ns			
CH 8	<2.5ns			
CH 9	<2.5ns			
CH 10	<2.5ns			
CH 11	<2.5ns			
CH 12	<2.5ns			
CH 13	<2.5ns			
CH 14	<2.5ns			
CH 15	<2.5ns			
CH 16	<2.5ns			

Skew Between Channels

Equipment: Oscilloscope

Preparation:

1. Configure the Oscilloscope as follows:
   - Termination: 1MΩ
   - Setup: As required for the test
2. Connect DG2816 Channels output to the oscilloscope input
3. Configure the PM8572 as follows:
   - SCLK: 1MHz
   - Function: Arbitrary
   - Digital patterns:
   - Data Source: Arbitrary Segment
   - State: On
4. Download wave:
   - Length: 16 point
   - Shape: Square
   - Cycles: 8
5. Configure the DG2816 all channels as follows:
   - High Level: 1V
   - Low Level: -1V

Test Procedure

1. Measure the skew between the channels to be less than 2ns. Make sure that the cables used are of the same length and type.

Test Results	Pass		Fail	

Flatness Characteristics

This tests the operation of the flatness characteristics while performing frequency changes. The Frequency Sample Clock is common to 16 channels and therefore the tests are performed on all the channels.

Flatness Checks 3.3Vpp

Equipment: Oscilloscope

Preparation:

1. Configure the Oscilloscope as follows:
   Termination: 1MΩ
2. Connect DG2816 Channels output to the oscilloscope input
3. Configure the PM8572 as follows:
   SCLK: As required for the test
   Function: Arbitrary
   Waveform: Square
   Length: 16 points
   Cycles: 8
4. Configure the DG2816 as follows:
   High Level: 3.30Vpp
   low Level: 0.00Vpp

Test Procedure

1. Perform the test using Tables 3-6.

Table 3-6, Flatness Characteristics

	SCLK	HIGH LEVEL Error limits	Oscilloscope Reading	Pass	Fail
CH 1	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 2	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 3	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 4	10 MS/s	3.30V±30mV			

	150 MS/s	3.30V±0.2V			
CH 5	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 6	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 7	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 8	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 9	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 10	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 11	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 12	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 13	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 14	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 15	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			
CH 16	10 MS/s	3.30V±30mV			
	150 MS/s	3.30V±0.2V			

Adjustment Procedures

Use the following procedures to adjust Model DG2816. 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 16 so make sure that the output cables are connected to the appropriate channel during the adjustments.

Power Supply Adjustment

Use this procedure to adjust the power supply so that the amplitude level on the main board is as show on table. This adjustment is a pre-requisite to the proceeding adjustments because it will affect the performance of the waves. This procedure also assures that the amplitude levels that are applied to the output amplifier do not exceed the required voltage.

Warning

You probably notice there are no references to parts numbers and test points in this adjustment. This information is given on a need-to-know basis because it is critical to the operation of the instrument and can be performed only by persons who were trained to do this adjustment. Removing the cover from the power supply by untrained persons is dangerous and could inflict injuries and death. Do not attempt to do this adjustment without proper training!

+5 V Supply

Equipment: DMM
Preparation:
1. Remove the power supply cover to reveal the adjustment resistors VR1 on top of the power supply.
2. Using the DMM test probes, connect the black probe to a ground point and the red probe to a +5 V on the main board.

Adjustment:
1. Adjust the power supply resistor for a DMM reading of +5 V ±1%

+3.3 V Supply

Equipment: DMM
Preparation:
1. Locate VR2 to adjust the +3.3 V.
2. Using the DMM test probes, connect the black probe to a ground point and the red probe to a +3.3 V on the main board.

Adjustment:
Adjust the power supply resistor for a DMM reading of +3.3 V ±1%

Symmetrical Adjustments

The symmetrical adjustments assure that the input signal on the differential amplifier is symmetrical around the 0V line. Use this procedure if you suspect that there is an oscillation or accuracy issue.

CH 1 – CH 16 SYM_CH1 to SYM_CH16 <RV1 to RV16>

Equipment: 1:10 Probe, Pulse Generator PM8571A

Preparation:

1. Configure the PM8571A as follows:
   - Waveform: Arbitrary
   - Wave shape: Square
   - Wave Length: 16 points
   - No. of Cycle: 8
   - SCLK: 1 MS/s
   - Data Source: Arbitrary Segment
   - Digital Pattern: State [ON]
2. Configure the oscilloscope as required for the test

Adjustment:

3. Put the probe edge on the transistors collector, use table 3-7 for reference.
4. Adjust the RV resistors as shown in table 1, for a symmetrical square wave around 0V line, the high level at +0.9V and the low level at -0.9V.

Table 3-7, Symmetrical Adjustments

Channel	Probe on Collector	Adjust +0.9V	Error Limits	Oscilloscope Reading	Pass	Fail
CH 1	Q3	RV1	+0.9V±30mV			
CH 2	Q4	RV2	+0.9V±30mV			
CH 3	Q7	RV3	+0.9V±30mV			
CH 4	Q8	RV4	+0.9V±30mV			
CH 5	Q11	RV5	+0.9V±30mV			
CH 6	Q12	RV6	+0.9V±30mV			
CH 7	Q15	RV7	+0.9V±30mV			
CH 8	Q16	RV8	+0.9V±30mV			
CH 9	Q19	RV9	+0.9V±30mV			
CH 10	Q20	RV10	+0.9V±30mV			
CH 11	Q23	RV11	+0.9V±30mV			
CH 12	Q24	RV12	+0.9V±30mV			
CH 13	Q27	RV13	+0.9V±30mV			
CH 14	Q28	RV14	+0.9V±30mV			
CH 15	Q31	RV15	+0.9V±30mV			
CH 16	Q32	RV16	+0.9V±30mV			

Amplitude Adjustments

The amplitude adjustments assure that the high and low levels are within the specified range. Use this procedure if you suspect that the amplitude accuracy is an issue.

CH 1 – CH 16

High / Low Level

Equipment: Pulse Generator PM8571A, Oscilloscope

Preparation:

1. Configure the PM8571A as follows:
   - Waveform: Arbitrary
   - Wave shape: Square
   - Wave Length: 16 points
   - No. of Cycle: 8
   - SCLK: 1 MS/s
   - Data Source: Arbitrary Segment
   - Digital Pattern: State [ON]
2. Configure the DG2816 as follows for all channels:
   - High Level: 2V
   - Low Level: -1V
3. Configure the oscilloscope as required for the test

Adjustment:

4. Use table 3-8 for adjustments

Table 3-8, Amplitude Adjustments

Channels	Adjust		Error Limits		Oscilloscope Reading		Pass	Fail
	High level	Low level	High level	Low level	High level	Low level		
CH 1 – CH 4	RV17	RV18	2.00V±30mV	-1.00V±30mV				
CH 5 – CH 8	RV19	RV20	2.00V±30mV	-1.00V±30mV				
CH 9 – CH 12	RV21	RV22	2.00V±30mV	-1.00V±30mV				
CH 13 – CH 16	RV23	RV24	2.00V±30mV	-1.00V±30mV				

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Appendix A

2816 SPECIFICATIONS

Rear Panel Control Line Inputs

Data

Connector	SMB
Impedance	50 Ω, 1 MΩ.
Input	COUPLE IN of 257XA/857XA

STRB

Connector	SMB
Impedance	50 Ω, 1 MΩ.
Input	COUPLE OUT of 257XA/857XA

CLK

Connector	SMB
Impedance	50 Ω, 1 MΩ.
Input	SCLK IN of 257XA/857XA

SCLK

Connector	SMB
Impedance	50 Ω, 1 MΩ.
Input	SCLK OUT of 257XA/857XA

Digital Data Input

Connector	Rear pane SCSI-2 type 68-pin VHDC
Pattern Width	16-bits, differential
Level	LVDS
Pattern Length	Programmed by 257XA/857XA

Data Output Characteristics

Channels	16
Connector	SMB
Impedance	50 Ω, ±1%
Skew	2 ns max
Data Rate	
DC to 100Mb/s	5 Vp-p
DC to 200Mb/s	3.3 Vp-p
DC to 300Mb/s	2 Vp-p
V_{OH}	-0.5 V to +3.5 V into 1 MΩ
V_{OL}	-1.5 V to +2.5 V into 1 MΩ
Resolution	0.02 V
Maximum Swing	5 Vp-p into 1 MΩ
Minimum Swing	1 Vp-p into 1 MΩ

Output Current	
Sink	>-20 mA per channel
Source	<+40 mA per channel
Rise/Fall time	
5Vp-p	<2.5 ns into 1 MΩ

Auxiliary Output	
Type:	Sample Clock
Connector	Front panel SMB
Sampling Rate	2.5 MHz to 250 MHz (typically 300 MHz)
Resolution	9 digits
Level	500 mVp-p into 50 Ω (double into high impedance)
Rise/Fall Time	<1 ns into 50 Ω
Impedance	50 Ω, ±1%

General

Voltage Ranges:	85 to 265 Vac, 47-63 Hz
Power Consumption:	40 W maximum
Maximum Current:	3 A
Operating Temperature:	0 ºC to +40 ºC
Storage Temperature:	–20 ºC to +60 ºC
Dimensions:	212 x 88 x 393 mm (W x H x D)
EMC Certification:	CE marked
Safety:	EN61010-1, 2nd revision
Weight:	Approximately 3Kg
Workmanship Std.	Conform to IPC-A-610D
Warranty:	3 years standard;

Environmental

Operating Temperature	0 °C - 40 °C, RH 80% (non-condensing)
Storage Temperature	-20 °C - 60 °C
Humidity:	Up to 80% (no condensation)