Agilent U2781A USB Modular Instrument Chassis

User's Guide

Agilent Technologies

Notices

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	Direct current
	Caution, risk of danger.

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ICES/NMB-001	This ISM device complies with the Canadian ICES-001.

In This Guide...

This guide contains information of product, features, functions and information on how to install the Agilent U2781A USB modular instrument chassis.

1 Getting Acquainted

In this chapter you are introduced to an overview of the product features, applications and specifications.

2 Installation

In this chapter you prepare your system for both hardware and software installation. It describes on how to install the USB DAQ modules into the U2781A USB modular instrument chassis and other pre- installation software.

3 Features and Functions

In this chapter you are provided with information for better understanding on the features and functions of U2781A USB modular instrument chassis.

4 General Maintenance

In this chapter you are briefed on how to maintain the U2781A USB modular instruement chassis.

Contents

1 Getting Acquainted

This chapter gives an introduction and overview of the product features, applications and specifications.

Introduction

The U2781A USB modular instrument chassis is a 4U height chassis with six USB module slots. It is a portable chassis with high performance added value. It targets a wide range of applications in both industrial and scientific environments. It helps you lower your cost of test and accelerate your test system integration and development.

The Agilent U2781A is equipped with USB plug - and- play connectivity. The USB interface that is compliant with the TMC- 488.2 Standards works seamlessly with Agilent Measurement Manager software and can be controlled remotely via industry standard SCPI commands. In addition, the U2781A modular instrument chassis comes with Agilent IO Libraries Suite 14.2.

The U2781A modular instrument chassis comes with star trigger bus, which offers precise synchronization between USB modules and the external trigger signal. The star trigger bus is a dedicated trigger lines between the external trigger input and USB slots.

Features

The key features of the U2781A modular instrument chassis are as follows:

- Simultaneous Synchronization (SSI)
- Star trigger
- Internal and external 10 MHz reference clock
- Trigger in and trigger out signals
- SCPI commands
- IVI- COM driver compatibility
- USBTMC 488.2 compliant
- USB 2.0 high speed interface

Applications

The Agilent U2781A USB modular instrument chassis can be applied to nearly any industrial data acquisition, industrial automation and education environment. The primary advantage is its synchronzation capability between modules.

Checking the Contents

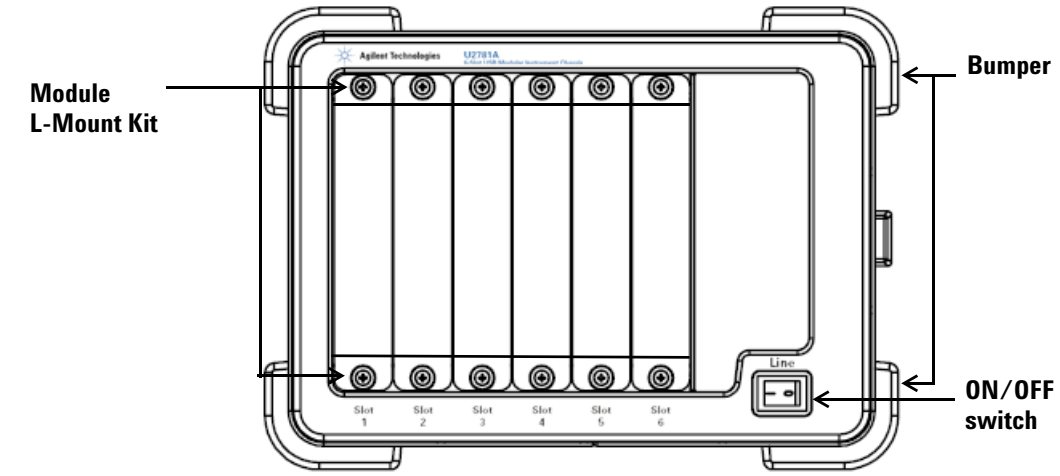
Inspect and verify the following items for the standard purchase of U2781A USB modular instrument chassis:

- Power cord
- USB extension cable
- Quick start guide
- Product Reference CD- ROM
- Agilent Automation- Ready CD
- Functional Test Certificate

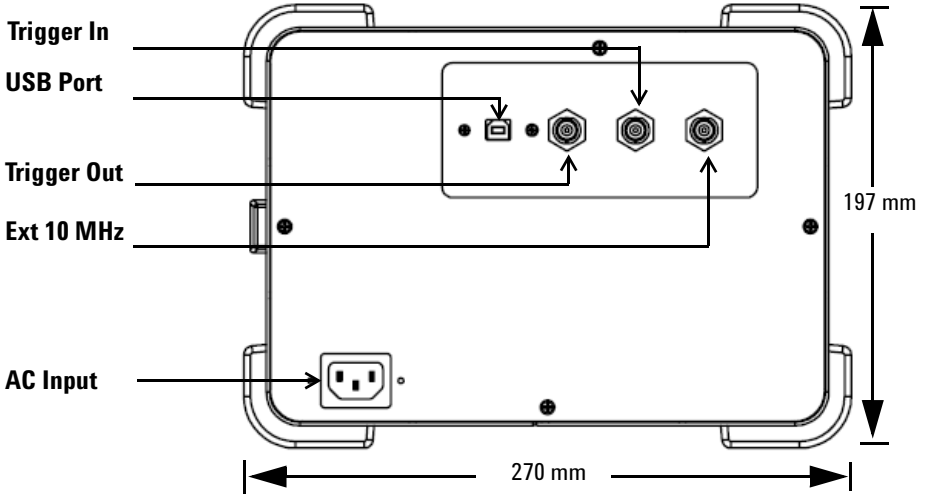
If there are missing items, contact the nearest Agilent Sales Office.

Product Outlook

Front View



Rear View



General Specifications

REMOTE INTERFACE

- USB 2.0 High speed
- USBTMC Class Device

POWER CONSUMPTION

- 400 VA maximum

OPERATING ENVIRONMENT

- Operating temperature from 0 °C to +55 °C
- Relative humidity at 15% to 85% RH (non-condensing)
- Altitude up to 4600 meters

STORAGE COMPLIANCE

- –20 °C to 70 °C

SAFETY COMPLIANCE

Certified with:

- IEC 61010-1:2001/EN 61010-1:2001 (2nd Edition)
- USA: UL61010-1: 2004
- Canada: CSA C22.2 No.61010-1:2004

EMC COMPLIANCE

- IEC/EN 61326-1 1998
- CISPR 11: 1990/EN55011:1991 , Group 1, Class A
- CANADA: ICES-001: 1998
- Australia/New Zealand: AS/NZS 2064.1

ACOUSTIC EMISSION

- Sound pressure level: 45.5 dB(A)
- Sound power level: 56.6 dB(A)

SHOCK & VIBRATION

- Tested to IEC/EN 60068-2

DIMENSION (WxDxH)

- 270.00 mm x 271.20 mm x 197.00 mm

WEIGHT

- 3.7 kg

WARRANTY

- One year

Electrical Specifications

Power Supply AC Input	
Input voltage range	100 to 240 VAC
Input frequency range	50 to 60 Hz
Input current rating	3.5 A/115 VAC; 1.7 A/230 VAC
Effiency	75%
Power Supply DC Output	
Output rated voltage	12 VDC
Max output rated current	16.7 A
Max output rated power	200 W
Over voltage protection	13.2 to 16.2 V

Internal 10 MHz Reference Clock	
Accuracy	25 ppm for operating range
Slot to slot skew	350 ps
External 10 MHz Reference Clock	
Auto detection level	Yes
Input frequency range	10 MHz
Input magnitude	100 mVpp to 5 Vpp (sine/square wave)
Input impedance	50 Ω ± 5 Ω
Damage level	10 Vrms
External Trigger In	
Compatibility	TTL
V_{IH} (Positive threshold voltage)	2.0 V
V_{IL} (Negative threshold voltage)	0.8 V
Hold time	8 ns pulse width
Input voltage range	0 to 5.0 V
Slot to slot skew	350 ps
External Trigger Out	
V_{OH}	2.9 V
V_{OL}	0.1 V
Output voltage range	0 to 3.3 V

Mechanical Specifications

Physical Layout	
Number of USB module slots	6
Dimension of each module slot	25.40 mm (W) x 174.54 mm (D) x 105.00 mm (H)
Dimension of chassis	270.00 mm (W) x 271.20 mm (D) x 197.00 mm (H)
Weight	3.7 kg
Power LED	ON/OFF type
USB Backplane	
Connector	55 pins Ernet male type C
Input signals	External 10 MHz clock in (BNC connector) External trigger in (BNC connector)
Output signal	Trigger out (BNC connector)
Cooling Fan	
Number of fans	2 (at the bottom of the chassis)
Fan speed	3300 rpm ±10%
Noise	37 dB(A)
Power (each fan)	2.52 W

2 Installation

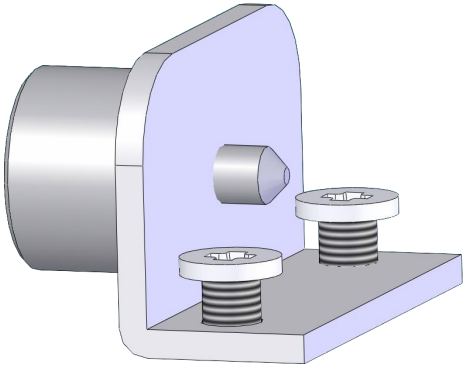
This chapter describes both the software and hardware installations of the Agilent U2781A USB modular instrument chassis. It covers the L-Mount kit installation, rackmount kit installation and the USB DAQ driver.

L-Mount Kit Installation

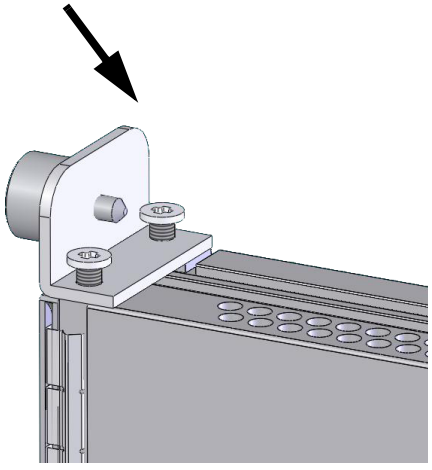
In order to slot in the USB module into the U2781A USB modular instrument chassis, you need to fix the L- Mount kit on both sides of the U2300A series DAQ.

NOTE The L-Mount kit is provided when you purchase the U2300A series USB DAQ.

Below are simple instructions to install the L- Mount kit onto the U2300A series DAQ. The instructions in page 21 shows how a USB module is slot into the U2781A modular chassis.



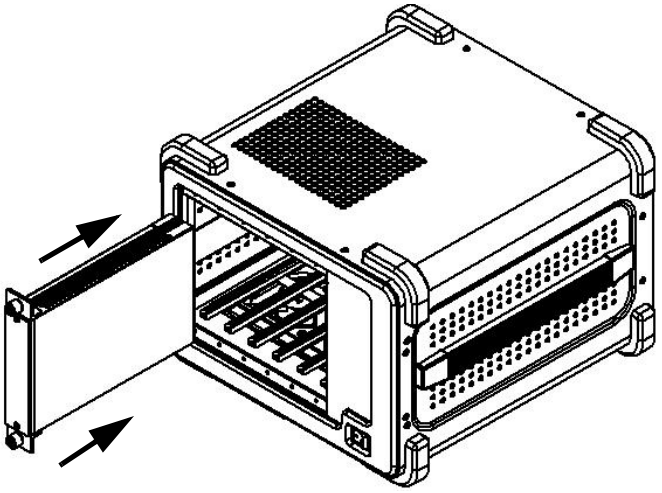
Step 1
Use both the L-Mount kit that are provided with the USB module.



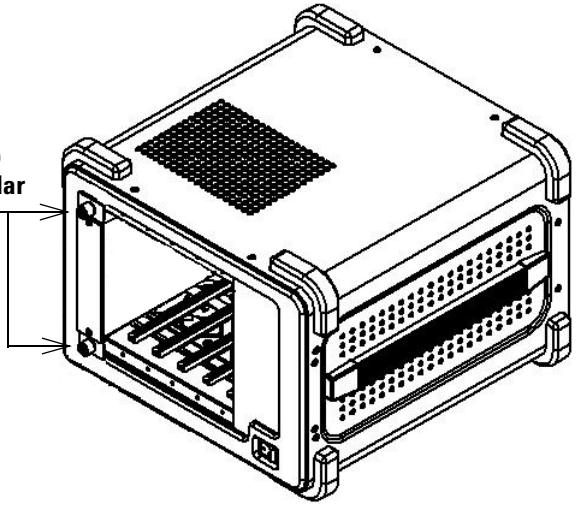
Step 2
By using a Philips head screwdriver, tighten the screws on both sides of the USB module.

Modular Chassis Installation

Figures below show the installation of the USB module into the U2781A modular instrument chassis. Follow the arrows shown below.



Step 1
Slot in the USB module into the modular chassis. Make sure that the 55-pin backplane connector is at the bottom.



Step 2
Secure both the thumb screws onto the modular chassis

System Requirements

Prior to installing the Agilent Measurement Manager software and the USB DAQ driver, make sure your PC meets the following minimum system requirements.

NOTE The software installation for U2781A USB modular instrument chassis is similar to U2300A series USB DAQ.

Hardware Requirements

Processor 500 MHz Pentium III or higher required
(1 GHz is recommended)

Operating system Windows 2000/XP

Browser Microsoft Internet Explorer 5.01 and above

Available RAM 256 MB above is recommended

Available disk space

225 MB required for installation
160 MB for Microsoft .NET Framework
65 MB for Agilent IO Libraries Suite
8118 KB for Agilent U2300A DAQ Driver
5125 KB for Agilent Measurement Manager Software

175 MB required for operation
110 MB for Microsoft .NET Framework
65 MB for Agilent IO Libraries Suite
8118 KB for Agilent U2300A DAQ Driver
5125 KB for Agilent Measurement Manager Software

Video Super VGA (800 x 600) 256 colors or more

Software Requirements

Software requirements Agilent IO Libraries Suite, T&M Toolkit and Microsoft .NET Framework version 1.0 and 2.0

The Agilent IO Libraries Suite version 14.2 and above is recommended. If possible, you should use the current version of the Agilent IO Libraries Suite. Alternatively, you can install the Agilent IO Libraries Suite with the required version directly from the *Agilent Automation-Ready CD*.

NOTE You are required to install the Agilent IO Libraries and DAQ Hardware Driver before installing the Agilent Measurement Manager Software. You are recommended to follow in sequence.

DAQ Driver Installation

NOTE

- You are required to install the DAQ driver at least once. If you have installed the DAQ driver when using the U2300A series USB DAQ, you do not need to install it again.
- The USB DAQ driver only compatible with Windows 2000 and Windows XP.
- Ensure that all devices are disconnected from PC before installing the driver.

Pre-installation of USB DAQ driver

- Verify that your PC meets the minimum hardware requirements as stated in Hardware Requirements.
- Disconnect and unplug all devices from your PC.
- Ensure that Agilent IO Libraries Suite is installed before proceeding.

Installing the USB DAQ driver

1 Unpack the U2781A USB modular instrument chassis.

2 Insert the *Product Reference CD-ROM* into the CD- ROM drive.

3 Installer will automatically execute the Agilent U2300 Series Installation Menu. Click **Hardware Driver** to begin the installation of USB DAQ driver.

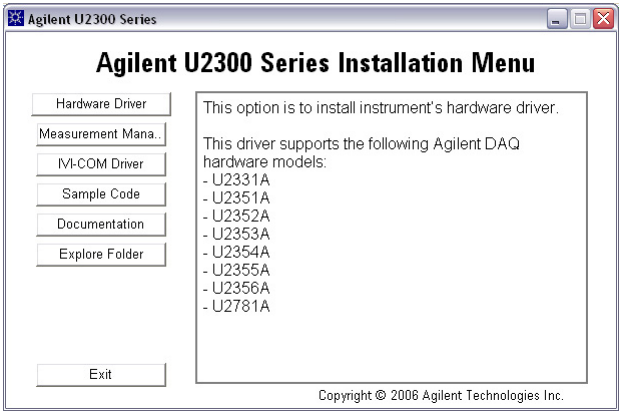


Figure 2-1

4 If it does not auto execute, go to **Start > Run** (on the Windows Start menu) and type `<drive>:\Driver\Hardware\setup_hw.exe`, where <drive> is your CD- ROM drive. Click **OK** to begin installation.

5 The Agilent USB DAQ Driver dialog box will appear as shown in figure 2- 2. Click **Next** to proceed.

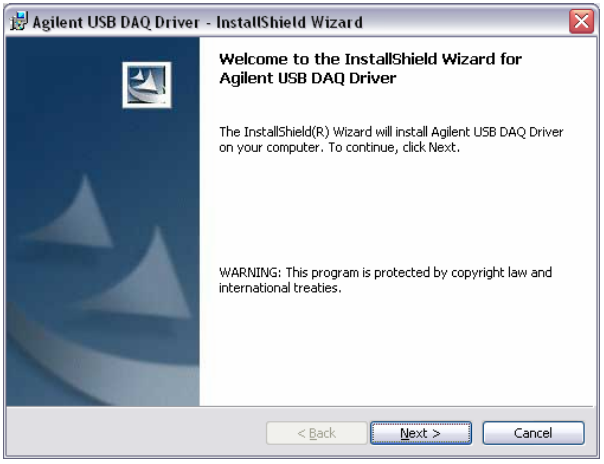


Figure 2-2

6 Click **Install** to begin installation.

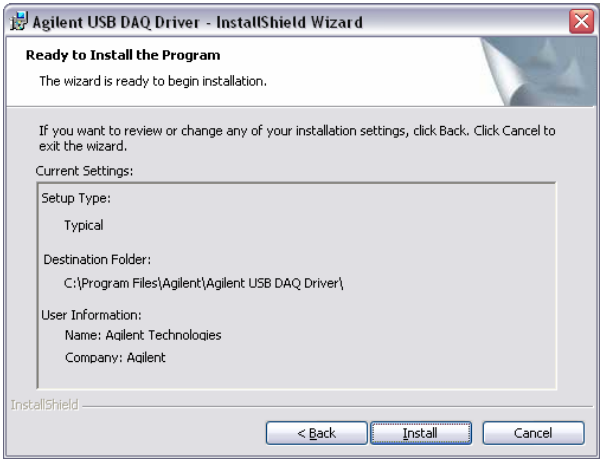


Figure 2-3

7 Click **Finish** when the installation is completed.

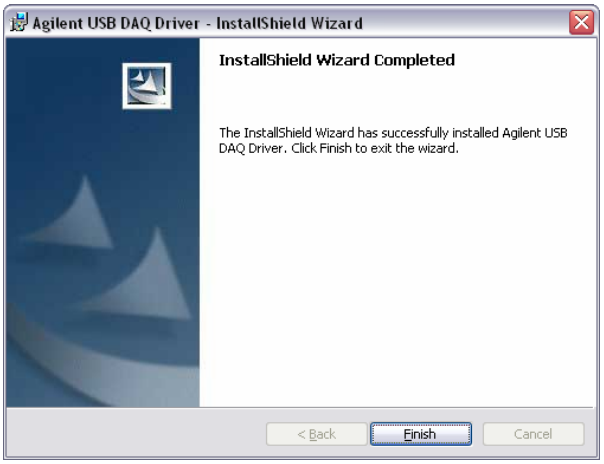


Figure 2-4

Hardware Verification

To verify that the hardware plugged in and installed is connected properly, run the Agilent Connection Expert to do the hardware verification

Agilent Connection Expert is one of the utility files in the Agilent IO Libraries. The Connection Expert configures connected instruments and enables communication. Connection Expert will automatically detect the USB instruments when connected. To begin, Click **Start > All Programs > Agilent IO Libraries Suite > Agilent Connection Expert**. The connected devices will be visible in this application.

Agilent Measurement Manager Software Installation

NOTE

- Verify that your PC meets the minimum requirements as stated in Hardware Requirements.
- You do not need to install the Agilent Measurement Manager software again if you have previously purchased and installed the U2300A series USB DAQ.

3
Features and Functions

This chapter describes the features and functions of the Agilent U2781A modular instrument chassis. This includes the operation of the USB backplane.

Introduction

The Agilent U2781A USB modular instrument chassis provides six USB modular slots and equipped with 200 W universal AC power supply and built- in over current protection circuit. A 10MHz system reference clock is supplied to each modules slots. There are two temperature sensors and a monitoring fan control circuit to monitor the internal temperature and speed of the fans. The fans are mainly used for heat dissipation.

The chassis also provides external 10MHz reference clock, external trigger in and trigger out functions via BNC connectors at the rear panel.

The key function for the chassis is to provide users with flexibility when using the U2781A modular instrument chassis. The modular chassis allocates housing for six USB modules with built- in power supply. The USB backplane provides a means to synchronize the modules.

The key features and functions of the Agilent U2781A USB modular instrument chassis are explained in this chapter.

USB Backplane

Figure 3- 1 illustrates the 55- pin assignment of the backplane connector pin.

11	GND	+12V	+12V	GND	USB_D+	USB_D-	GND
10	GND	+12V	+12V	+12V	GND	GND	GND
9	GND	+12V	+12V	+12V	GND	USB_VBUS	GND
8	GND	LBL0	BRSV	GND	TRIG0	LBR0	GND
7	GND	LBL1	GA0	TRIG7	GND	LBR1	GND
6	GND	LBL2	GA1	GND	TRIG1	LBR2	GND
5	GND	LBL3	GA2	TRIG6	GND	LBR3	GND
4	GND	LBL4	STAR TRIG	GND	TRIG2	LBR4	GND
3	GND	LBL5	GND	TRIG5	GND	LBR5	GND
2	GND	LBL6	CLK10M	GND	TRIG3	LBR6	GND
1	GND	LBL7	GND	TRIG4	GND	LBR7	GND
	Z	A	B	C	D	E	F

Figure3-1 55-pin backplane connector pin assignment

Table 3-1 Pin information of SSI connector

SSI timing signal	Functionality
+12V	+12 V power from backplane
GND	Ground
BRSV	Reserved pin
TRIG0~TRIG7	Trigger bus 0 ~ 7
STAR_TRIG	Star trigger
CLK10M	10MHz reference clock
USB_VBUS	USB bus power, +5 V
USB_D+, USB_D-	USB differential pair
LBL <0..7> and LBR <0..7>	Reserved pin
GA0, GA1, GA2	Geographical address pin

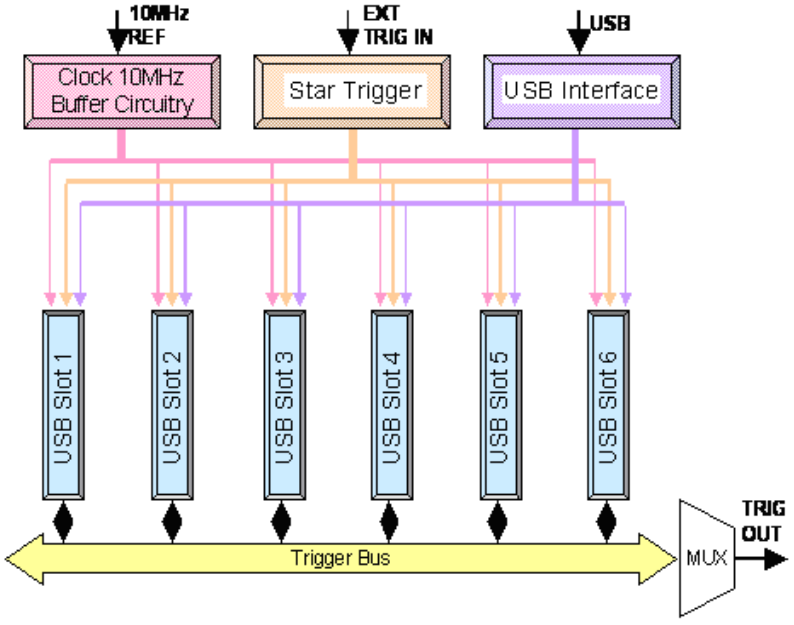


Figure3-2 USB backplane block diagram

Trigger Bus [0...7]

Trigger Bus [0...7] is an 8- bit digital bus connected from slot 1 to slot 6 to synchronize different USB modules. This trigger bus enables the USB modules of passing trigger signals to one another.

To have one of the modules to control the operation of the other modules, set the particular module as MASTER and the rest as SLAVE (refer to “Simultaneous Synchronization (SSI)” on page 39 for more details). The control signal is sent from the Master module to the SLAVE modules through this trigger bus. See Figure 3- 3 for the bus architecture.

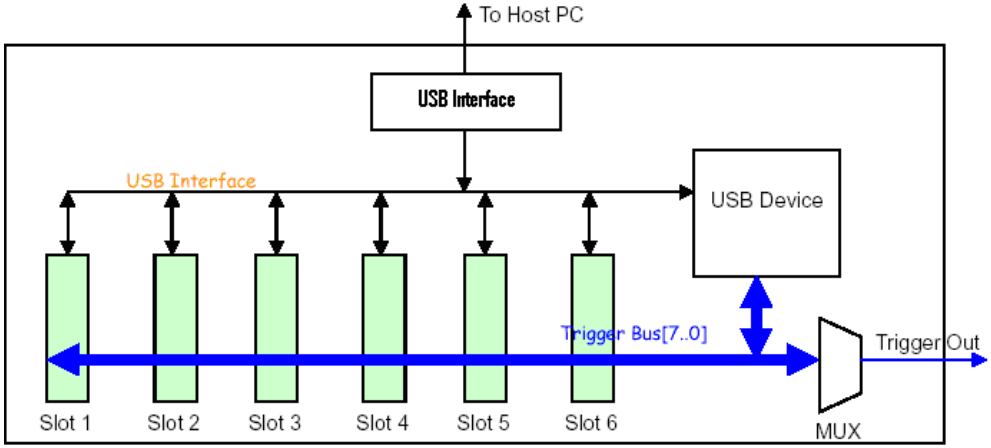


Figure3-3 Block diagram of Trigger Bus[0...7] and Trigger Out

In addition, the trigger bus can also be used to carry out the pre- configuration of the chassis and modules before any triggering activities. Refer to “Identifying Modules Location” on page 38 for more information,

Trigger Out

Trigger Out selects one of the trigger bus bit [0...7] for external trigger. The USB device in Figure 3- 3 controls the multiplexer switching for the trigger out selection.

The SCPI command below is used to set one of the trigger bus [0...7] as external trigger source:

TRIGger:OUT {0|1|2|3|4|5|6|7}

Trigger Out	Function
Bit-0	Time base
Bit-1	Reserved
Bit-2	Reserved
Bit-3	A/D trigger
Bit-4	Reserved
Bit-5	Reserved
Bit-6	Reserved
Bit-7	D/A trigger

External Trigger In (Star Trigger)

The star trigger bus offers a very high performance or precise synchronization between modules.The star trigger bus is a dedicated trigger line between the External Trigger Input and USB slots. This trigger signal is sent from external to each slot through a 1- to- 6 CLK buffer. The slot- to- slot skews are minimized to ensure that trigger signal reaches all six slots simultaneously. Refer Figure 3- 4 for the star trigger bus architecture.

To set star trigger as the module trigger source, the SCPI command below is sent to the modules:

OUTP:TRIG:SOUR STRG

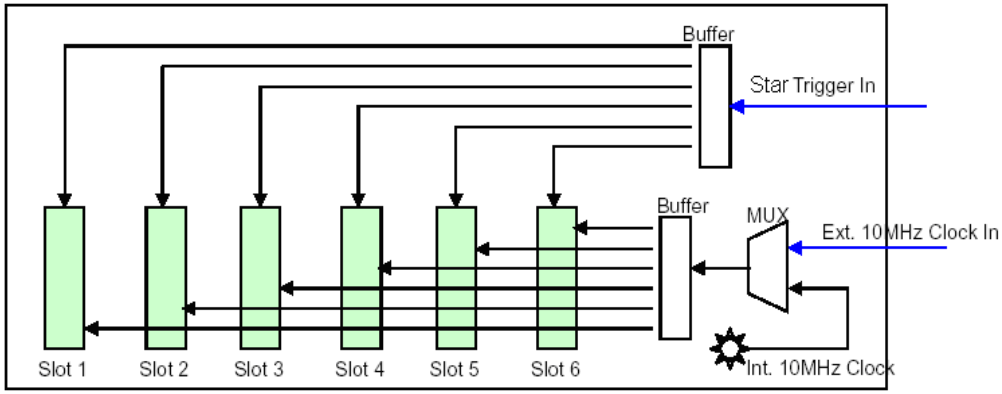


Figure3-4 Block diagram of the 10 Mhz Reference Clock and External Trigger In

System Reference Clock

The 10 MHz reference clock can come from two sources; internal backplane oscillator and external clock source.

The internal oscillator on the USB backplane supplies an independent 10 MHz system reference clock to each of the USB slot. This 10 MHz reference clock is driven through an independent buffer. Refer to Figure 3- 4 for the block diagram. Every clock trace is in equal distance to ensure that the slot to slot skew is at minimum. Users can use this common reference clock signal to synchronize multiple modules in a measurement or control system.

The default SCPI command of ***ACQuire:RSIGnal AUTO*** will scan thru and detect if there is any valid clock source from the external BNC connector. If non is found, then the internal 10 MHz clock source will be used.

The SCPI command below will direct the reference clock source to the internal 10 MHz:

ACQuire:RSIGnal INT

Chassis Temperature Monitoring

The chassis contains a temperature control circuitry. It has two thermistor sensors to sense the inner temperature of the chassis. The temperature control circuitry communicates with backplane USB device through an I^2C interface as illustrated in Figure 3- 5.

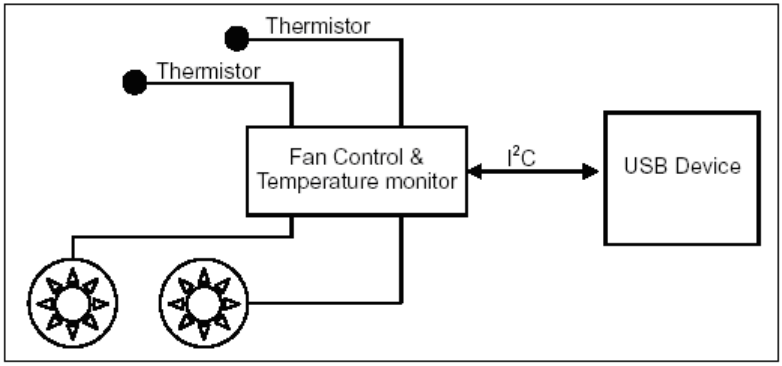


Figure3-5 Block diagram of temperature monitoring and fan control

The SCPI command below queries the temperature reading from the sensors in ^{o}C:

SYSTem:TEMPerature? {1|2}

Fan Speed Monitoring

The U2781A USB modular instrument chassis is also integrated with a fan speed control circuit. It is used to monitor the fan status and speed. The control circuit communicates with backplane USB device via I^2C interface. Refer to Figure 3- 5.

To query the fan status, send the SCPI command below:

SYSTem:FSTATus? {1|2}

To query the fan speed in rpm, send the SCPI command below:

SYSTem:FSPeed? {1|2}

Identifying Modules Location

Georgraphical Address

Each slot in the chassis is designed with a 3- bit address pin, which is designated as a location identity for USB modules. The address for all six slots are as below:

Slot	Address
1	001
2	010
3	011
4	100
5	101
6	110

The USB modules are able to read this 3- bit data and know which slot the module is plugged in. To read the geographical address of each module, the SCPI command below is used:

SYSTem:CDEScription?

Modules Identification

You may have more than one module or chassis connected to the same host PC. Figure 3- 6 illustrates an example of the connection.

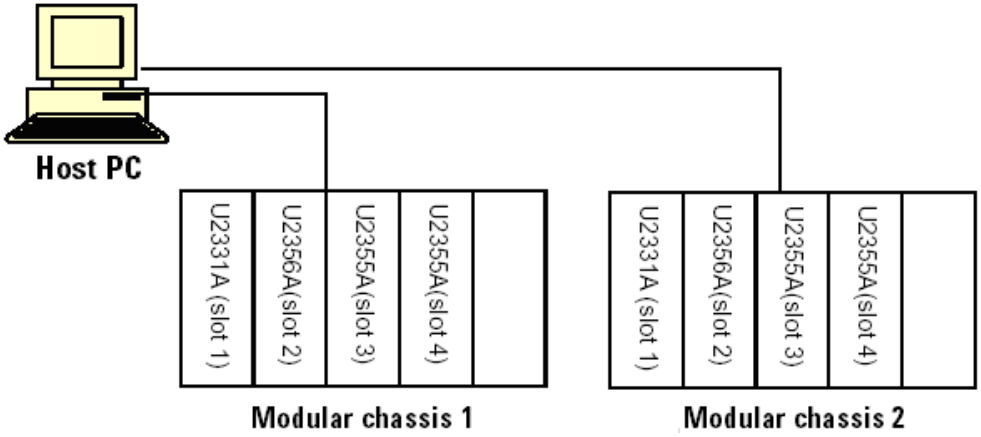


Figure3-6 Identifying modules location

In order to identify the location of the modules, a pre- configuration setting is needed before the synchronization or triggering event begins. Follow the steps below:

1 Send the following command to the modular chassis to trigger it. This command will be used to transmit the number to all USB modules via Trigger Bus [0...7]. You can choose from 1 to 255 for your chassis number.

SYSTem:IDentity {1|2|3...|255}

2 Send the following command to every module in the chassis to query each of the slot and chassis numbers.

SYST:CDES?

3 You may need to perform some sorting routine to determine which slot it is at and what is the assigned number of its host chassis. If a chassis has six modules in it, then there will be a total of 7 SCPI commands to send to chassis and modules.

4 During this identification operation, the trigger bus is used. Hence, any triggering activities on the backplane would be blocked.

5 Prior to any triggering activities, you must stop the configuration activity by sending the following command:

SYSTem:IDentity {0|OFF}

NOTE

- Do not execute the above mentioned steps when the USB modules are in the process of acquiring data.
- You do not need to perform the above pre-configuration if you are using the Agilent Measurement Manager software. You are only required to press the "Refresh" button.

Simultaneous Synchronization (SSI)

Simultaneous Synchronization (SSI) provides synchronization between the USB modules. Figure 3- 7 illustrates an example of SSI.

SSI allows you to set one of the modules as MASTER and others as SLAVE. MASTER module sends the SSI signal to the slave modules via the backplane trigger bus. SLAVE modules will then receive the signal and begin synchronization with MASTER module.

The SCPI command below is used to set the module as master:

CONF:SSI MAST

Send the SCPI command below to set the module as SLAVE:

CONF:SSI SLAV

NOTE

Only ONE master is assigned.

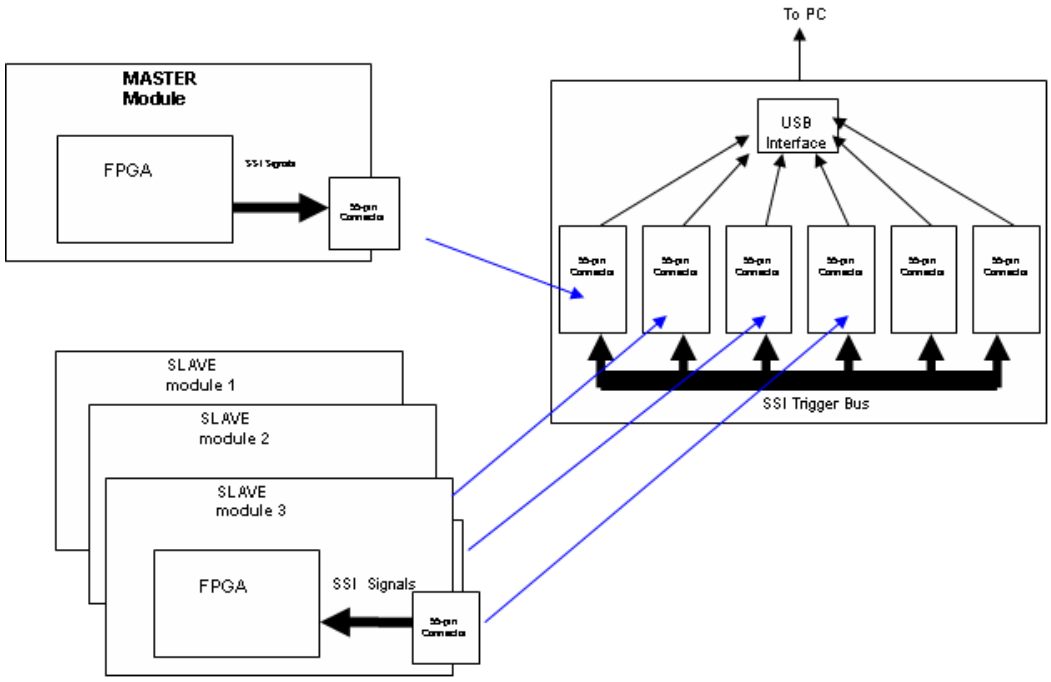


Figure3-7 Synchronization between modules in the chassis

4
General Maintenance

This chapter gives a brief desciption on how to maintain the U2781A USB modular instrument chassis.

NOTE Repair or service which are not covered in this manual should only be performed by qualified personnel.

To remove the dirt or moisture in the chassis panel, the cleaning steps are as follows:

1. Turn off the unit and remove the power cord and I/O cable.
2. Shake out any dirt that may have accumulated inside the chassis unit.
3. Wipe the case with a damp cloth and mild detergent- do not use abrasives or solvents. Wipe the contact in each terminal with a clean swab dipped in alcohol.

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Contact us

To obtain service, warranty or technical support assistance, contact us at the following phone numbers:

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