
PXI-6683

Specifications

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PXI-6683H Specifications

These specifications apply to the PXI-6683 Series the PXI-6683H unless otherwise noted.

Definitions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

Characteristics describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are **Characteristics** unless otherwise noted.

PXI-6683 Specification Conditions

Specifications are valid for the range 0 °C to 55 °C unless otherwise noted.

CLKOUT Characteristics

Output frequency ^[1]	10 MHz
Duty cycle distortion ^[2]	<1%, typical
Output impedance	50 Ω , nominal

Output coupling	AC
PXI_CLK10 to CLKOUT delay	8 ns, typical

Load	Square Wave
Open Load	5 V _{p-p} , typical
50 Ω Load	2.5 V _{p-p} , typical

Square wave rise/fall time (10 to 90%)	<1 ns, typical
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PFI<0..2>

Output Characteristics

Frequency range	DC to 50 MHz
Output impedance	50 Ω, nominal
Output coupling	DC
Output voltage levels	
Output high	1.2 V min, 1.6 V typical for 50 Ω load to ground 2.6 V min, 3.3 V typical for 1 MΩ load
Output low	0.1 V max, 0 V typical for 50 Ω load to ground

	0.1 V max, 0V typical for 1 M Ω load
Absolute maximum applied voltage ^[3]	0 to 4.4 V
Output-to-output skew, asynchronous PXI_Star to PFI routes ^[4]	<400 ps, typical
Output-to-output skew, other asynchronous routes	<1.5 ns, typical
Output-to-output skew, synchronous routes	<2 ns, typical
Synchronized trigger clock to out time, t_{co}	10 ns, max (relative to CLKOUT when configured to route PXI_CLK10)
Output current	± 48 mA, max
Square wave rise/fall time (10 to 90%) for 50 Ω load	<1 ns, typical

Input Characteristics

^[5]

Frequency range	DC to 50 MHz
Input impedance	1k Ω , nominal

Input coupling	DC
Nominal voltage level	0 to +3.3 V, +5V tolerant
Absolute maximum input voltage ^[6]	-0.5 V to +6.0 V
Input thresholds	
Voltage threshold high	+2.3 V max
Voltage threshold low	+0.8 V min
Asynchronous delay, t_{pd}	
PFI<0..2> to PXI_TRIG<0..7> output	17 to 20 ns, typical
PFI<0..2> to PXI_STAR<0..12> output ^[7]	12 ns, typical
Synchronized trigger input setup time, t_{setup}	25 ns, max (relative to CLKOUT when configured to route PXI_CLK10)
Synchronized trigger input hold time, t_{hold}	0 ns (relative to CLKOUT when configured to route PXI_CLK10)

IRIG-B Input Characteristics (PFI0)

IRIG-B AM compatibility	IRIG-B 12X (200-04 standard)
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Maximum Input voltage range	-5 V to +5 V
Decode Input voltage range	1.5 V to 10 V peak-peak mark (3:1 ration mark:space)
Input carrier frequency	1 kHz



Caution Do not connect an IRIG-B AM signal to PFI 0 when the input is configured for digital operation, as this can result in damage of the digital input circuitry.

IRIG-B DC compatibility	IRIG-B 00X (200-04 standard)
Input characteristics for IRIG-B DC	same as PFI digital input characteristics listed above

The following assumptions are made regarding the received IRIG-B signal. All conditions must be met for the PXI-6683 Series to be able to synchronize accurately:

- Seconds begin every minute at 0, increment to 59, and then roll over to 0.
- Minutes begin every hour at 0, increment to 59, and then roll over to 0.
- Hours begin every day at 0, increment to 23, and then roll over to 0.
- Days begin every year at 1. Days increment to 365 in non-leap years, or to 366 in leap years, and then roll-over to 1. Leap years must be supported. Valid values for year are 01 to 99, inclusive. Years are assumed to be in the XXI Century. For instance, year 09 represents 2009. If the year is not supplied (sent as 00), the OS system time is read and the year is derived from it.

To achieve proper synchronization of the NI PXI-6683 Series ensure that the IRIG-B source used conforms to the requirements listed above. Note that most IRIG-B sources conform to these requirements.

PXI Trigger Characteristics

Output-to-output skew ^[8]	<5 ns, typical
Asynchronous delay, t_{pd}	
PXI_Trig<0..7> to PFI<0..2>	13 to 23 ns, typical

Timestamping and Time-Synchronized Clock Generation

Time-synchronized clock period and duty cycle resolution	10 ns
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Note Clock signals generated on PFI, PXI_Star (PXI-6683 only), or PXI Trigger lines must have a period and duty cycle that is a multiple of 10 ns.

Minimum pulse width for timestamping	22 ns
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TCXO Characteristics

Frequency	10 MHz
Initial accuracy	±1 ppm
Temperature stability (0 to 55 °C)	±1 ppm
Tuning range	±17.5 ppm minimum

Aging per year	± 1 ppm
Duty cycle	45 to 55%

GPS Characteristics

DC voltage output for antenna	+5 V, $\pm 5\%$
Maximum output current	60 mA
Minimum current for antenna presence detection	4.7 mA typical, 7.9 mA max
Input impedance	50 Ω , nominal
GPS receiver type	50 channels, GPS L1 frequency (1575.42 MHz), C/A Code
Recommended signal strength at SMB connector	-130 dBm
Maximum RF power at input	+3 dBm
Accuracy	
PPS ^[9]	15 ns

Position ^{[10][11]}	2.5 m CEP, 3.5 m SEP
Velocity ^[12]	0.1 m/s
Maximum horizontal velocity	310 m/s
Maximum vertical velocity	50 m/s

Physical

Chassis requirement	One 3U CompactPCI or PXI slot (PXI the system timing slot for full functionality)	
Weight	186 g	
Front panel connectors	Six SMB male, 50 Ω; one standard RJ-45 Ethernet connector	
Front panel indicators	Two tricolor LEDs (green, red, and amber) for GPS and IEEE 1588 status, and two green/amber LEDs for Ethernet link status and speed	
Recommended maximum cable lengths		
PFI, DC to 1.5 MHz		200 m
CLKOUT to CLKIN ^[13]		200 m

Ethernet CAT5	100 m
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Power Requirements

Voltage (V)	Typical	Maximum
+3.3 V	740 mA	1.86 A
+5 V	335 mA	1.14 A
+12 V	54 mA	175 mA
-12 V	24 mA	35 mA

Synchronization Accuracy

Test [*]	Synchronization Performance
GPS [†]	±40 ns, <8 ns standard deviation
IEEE 1588 3 m Ethernet direct connection [‡]	±25 ns, <4 ns standard deviation
IEEE 1588 through a 1588 switch ^{‡,***}	±40 ns, <8 ns standard deviation
IEEE 1588 through a hub ^{‡,††}	±60 ns, <12 ns standard deviation
IEEE 1588 through a switch ^{‡,††}	±25 μs, <150 ns standard deviation
IRIG-B DC	±55 ns, <13 ns standard deviation
IRIG-B AM matching ^{***,†††}	±1.15 μs, <260 ns standard deviation
IRIG-B AM to source ^{†††}	±5 μs, <500 ns standard deviation
PPS	±40 ns, <8 ns standard deviation

^{*} All synchronization performance figures are based on empirical results and represent typical behavior. All figures are obtained recording the offset between PPS signals generated by two PXI-6683 Series boards, inside a closed PXI chassis, configured to synchronize to the particular time reference, at ambient room temperature. Synchronization was performed for 15 minutes before PPS offset recording began. All

test durations were at least 12 hours.

[†]For the GPS test, two PXI-6683 Series boards were independently synchronizing to GPS and configured to generate a PPS. the specification above represents typical empirical results. Please note that GPS satellites are only guaranteed to be within 100 ns of UTC. Therefore, the offset between any two devices synchronizing can be as high as 200 ns plus the offset of that device to GPS.

[‡]Sync interval of 1 second was used for IEEE 1588 tests, and all Ethernet connections were 1 Gbps unless otherwise specified.

^{**} Hirschmann MAR1040 Gb 1588 switch used

^{††}Netgear DS104 Hub used with 100 Mbps links

^{‡‡}Airlink 101 Gigabit over copper switch used. For this test, a moderate amount of non-1588 Ethernet traffic was present on the switch.

^{***} IRIG-B AM matching specification was obtained by setting two PXI-6683 Series boards to synchronize independently to the same IRIG-B AM source and generate a PPS. the offset between their PPS signals was then measured over a 12 hour period.

^{†††}IRIG-B performance depends on IRIG-B source stability and quality.

Environmental

Operating Environment

Ambient temperature range	0 to 55 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Maximum altitude	2,000 m (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.

Storage Environment

Ambient temperature range	-40 to 70 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)
Relative humidity range	5% to 95% noncondensing (Tested in accordance with IEC-60068-2-56.)

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



Note For UL and other safety certifications, refer to the product label or the Online Product Certification section.

Shock and Vibration

Operating Shock	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)
Random Vibration	
Operating	5 to 500 Hz, 0.3 grms
Nonoperating	5 to 500 Hz, 2.4 grms (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions

- ICES-001: Class A emissions



Note For the standards applied to assess the EMC of this product, refer to the Online Product Certification section.



Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the Minimize Our Environmental Impact web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

EU and UK Customers

-  **Waste Electrical and Electronic Equipment (WEEE)**—At the end of the product

life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit ni.com/environment/weee.

电子信息产品污染控制管理办法（中国RoHS）

-  **中国RoHS**— NI符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于NI中国RoHS合规性信息，请登录 ni.com/environment/rohs_china。 (For information about China RoHS compliance, go to ni.com/environment/rohs_china.)