

Series 6 Network Node N651 Data Sheet

Publication: 98-2109 Rev AA

**Landis
|Gyr⁺**

LANDIS+GYR CONFIDENTIAL INFORMATION

Limitation on Warranties and Liability

Information in this document is subject to change without notice. This manual or any part of it thereof may not be reproduced in any form unless permitted by contract or by written permission of Landis+Gyr.

In no event will Landis+Gyr be liable for any incidental, indirect, special, or consequential damages (including lost profits) arising out of or relating to this publication or the information contained in it, even if Landis+Gyr has been advised, knew, or should have known of the possibility of such damages.

© 2019 Landis+Gyr, Inc. All Rights Reserved Covered by both issued and pending patents.
For further patent information see: <https://www.landisgyr.com/about/patent-notices/>

Series 6 Network Node N651 Data Sheet			
Publication: 98-2109 Rev AA			
Revision History			
Modification Date	Revision	Description	Author
9/20/2019	AA	In Progress	Amit Mahajan
© 2019 Landis+Gyr All rights reserved.			

Contact Us:

Landis+Gyr technical support:

1-888-390-5733

solutionsupport.na@landisgyr.com

To provide feedback about this documentation, contact the Technical Documentation team at:

ustechnicaldocumentation@landisgyr.com.

Series 6 Network Node N651 Landis+Gyr⁺ Data Sheet

Introduction

Landis+Gyr's Series 6 Network Node (N651) is key to building a single, integrated IoT network for your utility future. This product is a fully functional, dual-band mPCIe Network Interface Card (NIC) for simple network and sensor-device integration. This technology is foundational to Landis+Gyr's industry-leading utility IoT networking solution, Gridstream® Connect. Further, the Series 6 Network Node (N651) provides the flexibility to grow the value of your IoT platform over time with proven Wi-SUN FAN interoperability as you integrate today's and future AMI or DA networking equipment and third-party IoT devices.



Figure 1. Series 6 Network Node N651

Table 1. Series 6 Network Node N651 Specification

	Element	Description
Radio Model	Series 6 Network Node N651	
Communication Protocol (PHY)	IEEE 802.15.4g, IEEE 802.15.4e, IPv6 (RPL & 6LoWPAN)	
MAC/PHY Features		
MAC	Simultaneous multi-band support Automatic selection of 'best' Band based on Link Quality Automatic selection of 'best' Modulation based on Link Quality	
PHY	Adaptive Power Control (ie. Short range output power back-off) Precision Output Power Management Clear Channel Assessment	
Hardware Capabilities		
Clock Speed	120 MHz	
RAM Memory	640 Kbytes	
FLASH Memory	2 MB + 4 MB External	
RF Modulation	IEEE 802.15.4 SUN FSK, O-QPSK & OFDM	
RF Bands	Sub-GHz & 2.4-GHz Simultaneous Operation	
RF Port	Single Dual-Band 50Ω U.FL Male Connector	
Sub-GHz Band Characteristics: North America		
Network Operating Mode	Series-5 Compatible	Greenfield
Frequency Range (Fc)	902.4 MHz – 927.6 MHz	904 MHz – 926.8 MHz
Channel Width	400 KHz	1200 KHz
Number of Channels	64	20
Multicast Modulation	2-FSK 50 kbps	OFDM Option 1 MCS0 (100 kbps)
Unicast Modulation Support	2-FSK: 50 – 200 kbps OFDM Option 3: MCS3 - MCS6	OFDM Option 1: MCS0 – MCS6
Data Rate Coverage	50 kbps – 600 kbps	100 kbps – 2400 kbps
Transmitter Output Power	50 mW – 1 W (peak)	10 mW – 427 mW (average)
Receiver Sensitivity (IEEE 802.15.4)	F2B50 = -108 dBm F2B150 = -100 dBm F2B200 = -99 dBm O3M3 = -107 dBm O3M4 = -105 dBm O3M5 = -102 dBm O3M6 = -97 dBm	O1M0 = -110 dBm O1M1 = -109 dBm O1M2 = -105 dBm O1M3 = -102 dBm O1M4 = -99 dBm O1M5 = -96 dBm O1M6 = -90 dBm
Sub-GHz Band Characteristics: Philippines		
Network Operating Mode	Series-5 Compatible	
Frequency Range (Fc)	915.2 – 917.6 MHz	

Table 1. Series 6 Network Node N651 Specification (Continued)

	Element	Description
Channel Width		400 KHz
Number of Channels		7
SUN Modulation Support		2-FSK: 50 – 200 kbps OFDM Option 3: MCS3 – MCS6
Output Power		50 mW – 1 W
Receiver Sensitivity (IEEE 802.15.4)		F2B50 = -108 dBm F2B100 = -103 (TBC) dBm F2B150 = -100 (TBC) dBm F2B200 = -99 (TBC) dBm O3M3 = -107 dBm O3M3 = -105 dBm O3M5 = -102 dBm O3M6 = -97 dBm
2.4 GHz Band Characteristics: International		
Network Operating Mode		Greenfield
Frequency Range (Fc)		2410.8 MHz to 2461.2 MHz
Channel Width		1200 KHz
Number of Channels		43
Multicast Modulation		OFDM Option 1 MCS0 (100 kbps)
Unicast Modulation Support		OFDM Option 1: MCS0 – MCS6
Data Rate Coverage		100 kbps – 2400 kbps
Transmitter Output Power		100 mW – 490 mW (average)
Receiver Sensitivity (IEEE 802.15.4)		O1M0 = -112 dBm O1M1 = -111 dBm O1M2 = -107 dBm O1M3 = -105 dBm O1M4 = -102 dBm O1M5 = -99 dBm O1M6 = -93 dBm

Series 6 Network Node N651 Outline

The PCB outline is shown below.

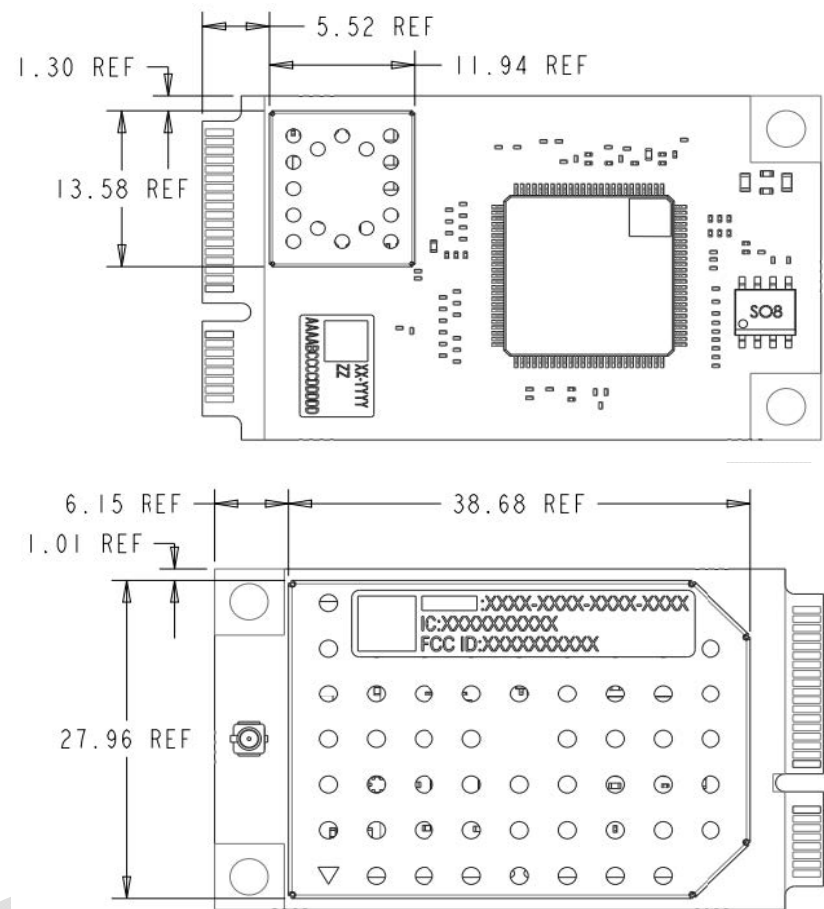


Figure 2. Board Outline 1

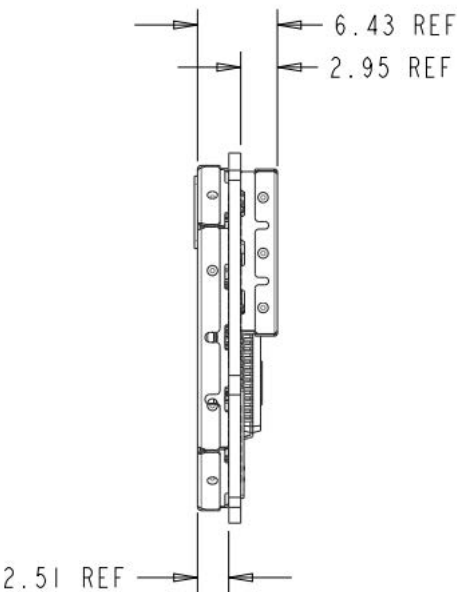


Figure 3. Board Outline 2

FCC, Industry Canada Compliance

FCC Class B

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult Landis+Gyr or an experienced radio technician for help.

U

WARNING: Changes or modifications to this device not expressly approved by Landis+Gyr could void the user's authority to operate the equipment.

RF Exposure

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 36cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites FCC/ISED d'exposition aux radiations définies pour un environnement non contrôlé.

Cet équipement doit être installé et utilisé à une distance minimale de 36cm entre le radia-teur et votre corps.

Cet émetteur ne doit pas être co-implantés ou exploités en conjonction avec une autre antenne ou émetteur.

Requirement for Modular Certification

N651 network node is approved for use with the antennas listed in the table below. Antenna types not included in the list below or a having higher gain than the maximum indicated for that type, are prohibited for use with this device.

Make	Model	Type	Termination	902 - 928 MHz Max. Gain	2400 - 2485 MHz Max. Gain	Antenna Impedance
Panorama Antennas	BS-IN2421	Dipole	Type- N	4.5 dBi	8 dBi	50 ohms
Skywave Antennas	13-1904-B	Dipole	u.fl	2 dBi	2 dBi	50 ohms

The Host manufacturer is responsible for providing a 50ohm coaxial cable with Type N termination (Antenna) and u.fl termination (N651 Network Node).

Information on Test Modes and Additional Testing Requirements

A diagnostic test mode is available to device integrators that allows control of the transmitter in order to execute FCC 15.247 compliance testing. This mode of operation provides a basic command interface over a dedicated serial port. Further information on how to enable this mode of operation and a description of the command interface is available to device integrators upon request and under NDA.

Additional Testing, Part 15 Subpart B Disclaimer

The end product with an embedded N651 Network Node may also need to pass the FCC Part 15 unintentional emission testing requirements and be properly authorized per FCC Part 15 Subpart B.

Industry Canada

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter (5294A-NG0R1S4) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list or having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Approved Antennas:

Panorama BS-IN2421, Dipole, 902 - 928 MHz, 2400 - 2485 MHz, and Max Gain of 4.5 dBi and 8 dBi.

Skywave 13-1904-B, Dipole, 902 - 928 MHz, 2400 - 2485 MHz, and Max Gain of 2 dBi (both bands)

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Host FCC Label Requirement

In the final installation, the following information must be visible:

- Contains FCC ID: **R7PNG0R1S4**
- Contains IC: **5294A-NG0R1S4**

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.