Electrolux

G L O B A L T E C H N O L O G Y C E N T E R

User Manual

NIU USER MANUAL

GTC DEPARTMENT:	**Advanced Electronics**
PROJECT:	**Connectivity Platform for NA Solution**
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1.0 HISTORY

Version	Date	Author	Note
0.1c	15/05/2014	GTC	This is the initial release of this document.

2.0 INTRODUCTION

2.1 Purpose

The NIU received modular approval from the FCC. A requirement for modular approval is that the end product into which the NIU is installed has FCC mandated statements in the marking label and user manual. This document contains the specific notes that the FCC requires to be added to the end product user manual.

2.2 Scope

This document provides the information that should be incorporated into the target Electrolux connected appliance user manual and appliance label.

2.3 Acronyms

AP	Access Point – a device that connects wireless devices to a wired LAN
HAN	Home Area Network
JTAG	Joint Test Action Group - (JTAG, or "IEEE Standard 1149.1") A standard
LAN	Local Area Network
NIU	Network Interface Unit
OTA	Over-The-Air – wireless method of communication
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembly – the PCB with parts mounted on it.
UI	User Interface
WiFi	802.11 Wireless Local Area Network
WPS	WiFi Protected Setup

2.4 Reference Documents

FCC Title 47 Part 15	Radio Frequency Devices
IEEE 802 Part 11	Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, IEEE Computer Society, LAN/MAN Standards Committee. 2007.

2.4.1 Electrolux Documents

HwDesign_NIU_ REL02_xx.doc -- NIU Specification document

3.0 BACKGROUND

The WiFi NIU is the electronic component that will be added to household appliances and utilize the WiFi protocol to integrate them into a Home Area Network (HAN) for Energy Management and various user interface functions.

The WiFi NIU was developed as a module to interface an appliance with an Electrolux standard serial bus to a WiFi AP and eventually to an internet cloud. The NIU is certified as a module so that it requires no specific testing when installed in an appliance. It is certified at the module level with the FCC and with UL.

There are two different hardware versions of the NIU – one that has only a MACS interface and another that has only a DAAS interface. The NIU software for each implementation will be customized to properly interface with each appliance group for which the hardware is installed.

MACS Version – Model number 543 0042 01

DAAS Version – Model number 543 0042 02

Figure 1 below shows an NIU WiFi module with a prototype enclosure. The enclosure is designed with four snaps for easy installation into an appliance without requiring any tools. There is a tab on the top surface that provides a secondary locking mechanism to retain the connector.

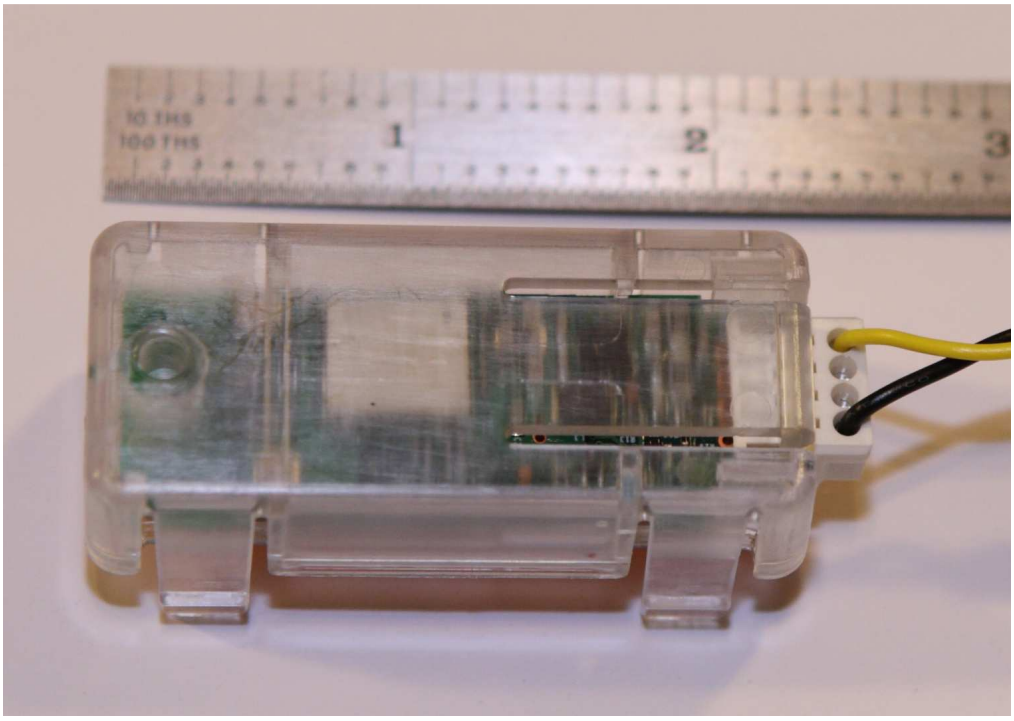

Figure 1 NIU Module

4.0 HW INTERFACE

4.1 MACS Specific Details

4.1.1 MACS Appliance Interface

The MACS pcba incorporates a MACS interface which has an inverting transfer function and does not provide electrical isolation. The circuitry matches the standard GTC implementation. The MACS interface utilizes the current standard MACS pinout as shown below:

Pin	Function
1	GND
2	COMM
3	+Vin
4	+12V

The following keying has been chosen for the MACS connector. Mating connectors are available from at least Stocko (MFMP 7238-004-061-960-000-00-G) and Lumberg (3517-04-K01).

4.1.2 MACS Input Power

The MACS pcba power comes from either of two input pins -- pins 3 or 4 could supply power to the pcba. These pins are configured so that power could be supplied by either pin (i.e. they are diode or'd).

4.2 DAAS Specific Details

4.2.1 DAAS Appliance Interface

The DAAS pcba incorporates a DAAS interface which has a non-inverting transfer function and does not provide electrical isolation. The circuitry matches the standard GTC implementation. The DAAS interface utilizes the current standard DAAS pinout as shown below:

Pin	Function
1	GND
2	+Vin
3	NIU_RX
4	NIU_TX

The following keying has been chosen for the DAAS connector. Mating connectors are available from at least Stocko (MFMP 7238-004-074-960-000-00-G) and Lumberg (3517-04-K18).

4.3 Power Requirements

The pcba runs correctly when supplied with input voltage ranging from 4.5Vdc to 15Vdc. With 5Vdc applied to the NIU input, the average current draw is approximately 220 mA (1.1W) with peaks of approximately 400 mA (2.0W). The principle element behind the power consumption is the WiFi radio transmitter. When the transmitter is driven at 100% duty cycle, the power consumption is approximately 1.65W. When the transmitter is turned off, the power consumption is approximately 0.35W. Therefore, the power required depends largely upon the software implementation with respect to the permitted transmitter duty cycle.

5.0 APPROVALS

FCC CFR47 Part 15 sub-part C “Intentional Radiators”.

(FCC) Modular Transmitter Approvals – KDB 996369

Single-modular transmitter – independent of a host: Compliance to all 8 requirements of 15.212 rules is demonstrated in a standalone, open configuration.

The NIU modules have been certified to the following standards.

5.1 USA (Federal Communications Commission, FCC)

The NIU modules have been tested to comply with FCC CFR47 Part 15 sub-part C “Intentional Radiators”. The devices meet the requirements for modular transmitter approval as detailed in FCC public notice DA 00-1407 Released: June 26, 2000. The modular transmitter approval eliminates the need to re-perform costly “Intentional Radiator” testing when submitting an appliance for certification.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

5.1.1 FCC Labeling Requirements

The modular transmitter must be equipped with either a permanent affixed label or must be capable of electronically displaying its FCC identification number. The NIU FCC ID is 2ABHC-5430042. Additionally, the following statement is supposed to be present on the label:

“This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) This device must accept any interference received, including interference that may cause undesired operation.”

Because the NIU is so small that it is not practicable to place the above statement on it, the information required shall be placed in a prominent location in the appliance user manual supplied to the user. However, the FCC identifier must be displayed on the NIU module.

If the FCC identification number is not visible when the module is installed inside the appliance, then the appliance must also display a label referring to the enclosed module. This exterior label can use wording such as the following**:**

Contains Transmitter Module FCC ID: 2ABHC-5430042 -or- Contains FCC ID: 2ABHC-5430042 This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

5.1.2 Information to be included in the appliance user manual

Because the following statement did not fit on the NIU module label, alternatively it could be implemented in the appliance user manual (as follows).

“This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) This device must accept any interference received, including interference that may cause undesired operation.”

The host appliance user manual must also contain clear instructions on how end users can find and/or access the module and the FCC ID.

“The user’s manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.”

5.1.3 RF Exposure

All transmitters regulated by the FCC must comply with RF exposure requirements. OET Bulletin 65 “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields” provides assistance in determining whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to Radio Frequency (RF) fields adopted by the Federal Communications Commission (FCC). The bulletin offers guidelines and suggestions for evaluating compliance.

If appropriate, compliance with exposure guidelines for mobile and unlicensed devices can be accomplished by the use of warning labels and by providing end users with information concerning minimum separation distances from transmitting structures and proper installation of antennas.

The following statement must be included as a CAUTION statement in manuals and OEM products to alert end users of FCC RF Exposure compliance:

To satisfy FCC RF Exposure requirements for mobile and base station transmission devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

5.2 Canada (Industry Canada, IC)

The NIU modules have been certified for use in Canada under Industry Canada (IC) Radio Standards Specifications (RSS) RSS-210 and RSS-Gen.

From section 3.2 RSS-Gen, Issue 3, December 2010, Modular Approval for Category I Equipment or Category II Equipment:

“Modular approval permits the installation of the same module in a host device or multiple host devices without the need to recertify the device. Equipment certification for a modular device may be sought for either Category I equipment or Category II equipment. Transmitters designed as modules for the installation in a host device may obtain equipment certification as a modular device provided that the applicable RSS is met and the following conditions in this section are met.”

In RSS-Gen section 7.1.2 Transmitter Antenna, it has been mentioned that the user manuals for transmitters shall display the following notice in a conspicuous location:

Notice: 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.

Avis: Sous la réglementation d'Industrie Canada, ce transmetteur radio ne peut fonctionner qu’en utilisant seulement une antenne d'un type et d’un maximum (ou moins) de gain approuvé pour l'émetteur par Industrie Canada. Pour réduire des potentielles interférences radio pour les autres utilisateurs, le type d'antenne et son gain doivent être choisis de sorte que la puissance isotrope rayonnée équivalente (PIRE) ne dépasse pas ce qui est nécessaire pour une communication réussie.

5.2.1 IC Labeling Requirements

From section 3.2.1 RSS-Gen, Issue 3, December 2010, Labeling Requirements for the Host Device:

The host device shall be properly labeled to identify the modules within the host device. The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words “Contains transmitter module”, or the word “Contains”, or similar wording expressing the same meaning.

From section 5.2, RSS-Gen, Issue 3, December 2010, Equipment Certification Numbers and Labels:

Every unit of Category I radio apparatus certified for marketing and use in Canada shall bear a permanent label on which is indelibly displayed the model number and Industry Canada certification number of the equipment model (transmitter, receiver, or inseparable combination thereof). Each model shall be identified by a unique combination of a model number and a certification number, which are assigned as described below in this section.

The label shall be securely affixed to a permanently attached part of the device, in a location where it is visible or easily accessible to the user, and shall not be readily detachable. The label shall be sufficiently durable to remain fully legible and intact on the device in all normal conditions of use throughout the device’s expected lifetime. These requirements may be met either by a separate label or nameplate permanently attached to the device or by permanently imprinting or impressing the label directly onto the device.

The label text shall be legible without the aid of magnification, but is not required to be larger than 8-point font size. If the device is too small to meet this condition, the label information may be included in the user manual upon agreement with Industry Canada.

The model number is assigned by the applicant and shall be unique to each model of radio apparatus under that applicant's responsibility. The model number shall be displayed on the label preceded by the text: "Model:", so it appears as follows:

Model: model number assigned by applicant

Label:

Contains IC: 12012A-5430042

Notice: This device complies with Industry Canada licence-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.

Avis: Cet appareil est conforme avec Industrie Canada RSS standard exempts de licence (s). Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne peut pas provoquer 'interférences et (2) cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

For more information, see: Industry Canada http://www.ic.gc.ca/.

5.2.2 RF Exposure

All transmitters regulated by IC must comply with RF exposure limits as set forth in RSS-102, Issue 4, section 4, "Exposure Limits". Furthermore RSS-102, Issue 4, Section 2 "Certification Requirements", provides assistance in determining the specific requirements for compliance. If appropriate, compliance with exposure guidelines for mobile and unlicensed devices can be accomplished by the use of warning labels and by providing users with information concerning minimum separation distances from transmitting structures and proper installation of antennas.

The following statement must be included as a CAUTION statement in manuals and OEM products to alert users of IC RF Exposure compliance:

Notice: To satisfy IC RF Exposure requirements for mobile and base station transmission devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Avis: Pour répondre à la IC d'exposition pour les besoins de base et mobiles dispositifs de transmission de la station, sur une distance de séparation de 20 cm ou plus doit être maintenue entre l'antenne de cet appareil et les personnes en cours de fonctionnement. Pour assurer le respect, l'exploitation de plus près à cette distance n'est pas recommandée. L'antenne (s) utilize pour cet émetteur ne doit pas être co-localisés ou fonctionner conjointement avec une autre antenne ou transmetteur.