GIII-C

Installation Guide
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1 INTRODUCTION

1.1 INTRODUCTION

This installation guide is about the GIII-C and GIII-CM reader. The NEDAP GIII-C reader is intended for detection of 120kHz NEDAP tags and 125kHz based EM 400x tags. The GIII-C reader can operate stand-alone. See Figure 1. It is also possible to connect the GIII-C into a multidrop loop. However the master reader must be a SUPER GIS III. The GIII-CM is functionally equal to the GIII-C except that it has another housing, which has an integrated antenna.

![Figure 1](image)

The GIII-C is a simple, low-cost yet powerful RF-ID tag reading system. Standard a RS232 interface is available for host communication. Optionally a communication board can be placed to support other interfaces like RS422, Ethernet, Proﬁbus etc. See also chapter 3.3.2.

1.2 RF-ID PRINCIPLES

The principle of RF-ID (Radio Frequency IDentification) technology is based upon two harmonized circuits both at the same frequency. One circuit is a part of the tag and the other is a part of the reader. The tag is energized by the electromagnetic radio frequency (RF) wave that is transmitted by the reader. The RF signal is called carrier signal. The information stored in the tag is automatically transmitted back to the reader. By detecting the returned signal the information stored in the tag can be fully identiﬁed by the reader.

The maximum detection distance is affected by:
1. Dimensions of the antenna.
2. Dimensions of the tag.
3. Orientation of the tag compared to the antenna.
4. Electrical noise level in the vicinity of the antenna.
5. Amount and geometry of metal parts in the proximity of the antenna and or tag.

1.3 SAFETY PRECAUTIONS

The following safety precautions should be observed during normal use, service and repair.
- The GIII-C must be connected with safety ground.
- Disconnect the power supply before removing the top cover.
- The GIII-C may only be installed and serviced by qualiﬁed service personnel.
- To be sure of safety, do not modify or add anything to the GIII-C other than mentioned in this installation guide or indicated by NEDAP N.V.

Always switch off the power supply before adding or replacing additional boards.
2 MOUNTING

2.1 MOUNTING THE GIII-C

The GIII-C can be mounted on an industrial rail. Symmetric rails compliant with the EN 50022 (DIN 46277-3) standard and asymmetric rails compliant with the EN 50035 (DIN 46277-1) standard can be used.

GIII-C can also be mounted by using the chassis' mounting holes. See the figure below.

Figure 2: GIII-C dimensions
2.2 MOUNTING THE GIII-CM

The GIII-CM IP65 housing has an integrated antenna. Therefore its mounting position must be carefully chosen to assure correct reading. The housing has 4 mounting clips, which can be turned in all directions to suit every mounting position. See the figure below for the dimensions.

![Figure 3: GIII-CM dimensions](image-url)
3 CONNECTIONS

3.1 POWER SUPPLY

To perform all its functions, the GIII-C needs a 24VDC @ 400 mA power supply.

- **2 GND** power supply 0V. Should be connected to a protective earth connection.
- **4 24V** power supply +24VDC

The power supply has an auto resetting fuse protection. Completely disconnect the power supply upon overload to reset the fuse.

3.2 ANTENNA

3.2.1 ANTENNA CONNECTIONS

The HF+ and HF- antenna connections are available twice, to allow 2 antennas to be connected parallel.

- **14 HF+** Antenna cable
- **16 HF-** Antenna cable shield
- **18 HF+** Antenna cable
- **20 HF-** Antenna cable shield
- **22 UL** Unlock LED (max. 20mA)
- **24 GND** Ground for LED’s
- **26 NA** Lock LED (max. 20mA)
- **28 IND** Indication LED (max. 20mA)

Note: In case two antennas are connected the maximum reading range will drop considerably.
3.2.2 ANTENNA ADJUSTING

The principle of RF-ID (Radio Frequency IDentification) technology is based upon two harmonized circuits both at the same frequency. One circuit is a part of the tag and the other is a part of the reader. Therefore the maximum reading distance is achieved when the antenna is optimally adjusted. Follow the procedure below to adjust the antenna.

1. Make sure all connections are properly made.
2. Keep all tags away from the antenna.
3. Set J3 in position 1-2 (internal adjusting)
   Note that pin 1 of the jumper is marked with a white dot on the PCB.
   Set J5 in position 2-3 (don't use 1n5)
   Set J4 in position 2-3 (don't use 3n3)
4. Adjust C29, the large variable capacitor, until maximum illumination of IND LED. In case no maximum can be found:
   a) Set J5 to position 1-2 to add the 1n5 capacitor. Try to adjust again with C29.
   b) Reset J5 in previous position 2-3 and set J4 in position 1-2 to add the 3n3 capacitor. Try to adjust C29 again.
   c) Set both J5 and J4 in position 1-2 to add both capacitors. Adjust with C29.
5. Check correct detection of a NEDAP tag.

![Figure 6](image)

3.2.3 ANTENNA ADJUSTING AT LONG DISTANCE

When the distance between antenna and reader exceeds 5 meters the antenna has to be connected in combination with an adjustment box. The internal adjustment capacitors are shortened and the adjusting is done in the adjustment box.

The maximum cable length between reader and adjustment box is 50 meters. The maximum cable length between adjustment box and antenna is 5 meters.

Follow the procedure below to adjust the antenna by means of an adjustment box.

1. Make sure all connections are properly made.
2. Keep all tags away from the antenna.
3. Set J3 in position 2-3 (external adjusting)
   Note that pin 1 of the jumper is marked with a white dot on the PCB.
   Set J5 in position 2-3 (don't use 1n5)
   Set J4 in position 2-3 (don't use 3n3)
4. Adjust the large variable capacitor in the adjustment box, until maximum illumination of IND LED or maximum reading on field strength indicator.
5. Check correct detection of a NEDAP tag.

![Figure 7](image)

3.2.4 SINGLE COIL ANTENNA

The single coil antenna is an antenna that has a coil with only 1 winding. The adjustment procedure is similar to the adjustment procedure for antennas at long distances. Instead of an adjustment box an EW120 antenna transformer must be used.

Refer for more details to the EW120 installation guide.
3.2.5 **ANTENNA SYNCHRONISATION**

In general antenna synchronization is only necessary when the distance between antennas is less than 5 meters. This distance is depending upon the type of antenna used. For large antennas antenna synchronization may be required earlier.

![Diagram](image)

*Figure 8*

When antennas are not synchronized it can result in a decrease of the detection range. A maximum of 10 GIII-C readers can be synchronized with each other. It is also possible to synchronize antennas with a mixture of GIII-C and SUPER GIS III readers.

⚠️ *Note: when the IND LED is alternating in brightness synchronization is necessary.*

3.3 **COMMUNICATION**

3.3.1 **RS232 CONNECTIONS**

The GIII-C has an on-board RS-232 interface. This interface does not support any hardware handshake signals. Software handshaking may be supported depending upon the firmware used.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>RXD</td>
</tr>
<tr>
<td>25</td>
<td>GND</td>
</tr>
<tr>
<td>27</td>
<td>TXD</td>
</tr>
</tbody>
</table>

![Diagram](image)

*Figure 9*

⚠️ *Note: DIP-5 must be OFF to enable the on-board RS-232 interface.*
3.3.2 INSTALLING OPTIONAL COMMUNICATION BOARDS

Make sure to follow all safety precautions outlined in chapter 1.3 and disconnect the power supply when installing or replacing an optional communication board.

Various optional communication boards are available for the GIII-C. See appendix A for product numbers.

**Ethernet (TCP/IP) communication board**
Connects the GIII-C to an Ethernet network using the TCP/IP protocol. The network interface speed is 10 Mbit/s. See for detailed information about the Ethernet communication board its user's manual.

**Profibus communication board**
Requires G7AAU-DC2 firmware. Connects the GIII-C to a Profibus-DP network. See for detailed information about the Profibus communication board its user's manual.

**RS-422 communication board**
See for detailed information about the Profibus communication board its installation guide.

**Multidrop communication board**
Requires G7NAAU firmware.

Installation procedure:

1. Make sure power supply is disconnected.
2. Remove cover from the GIII-C.
3. Remove the front cover plate.
4. Place the communication board on the 14-pin header K2. Make sure it is firmly positioned and makes good contact with connector K2.
5. Set DIP-5 to ON to enable the communication board. This implicitly disables the on-board RS-232 interface.
6. Read the board's installation guide for additional installation notes (like specific grounding prescriptions, address settings, jumper settings etc.).
7. Replace the cover on the GIII-C.
8. Reconnect power supply and test the communication board.
3.4 DIGITAL I/O

3.4.1 RELAY/OPTOCOUPLE OUTPUT

The GIII-C has a relay output and an optocoupler output. These outputs are activated when the reader is powered up. The outputs are deactivated when a 'valid' tag is identified and automatically reactivated when no tag is identified anymore and the relay-hold-time has elapsed. Refer to the firmware's installation guide for details about how to setup the relay-hold-time.

![Diagram of GIII-C and relay output](image)

- **9 NC**: Relay contact normally closed
- **11 COM**: Relay contact common
- **13 NO**: Relay contact normally open
- **15 OPTO-**: Optocoupler contact (-)
- **17 OPTO+**: Optocoupler contact (+)

3.4.2 SENSOR INPUT

The sensor input (also called no-read input) is available to generate a no-read situation. At this input a sensor can be connected, which indicates that the tag is in a position where it should be identified. If this is not possible then there is a no-read situation. This situation can cause the reader to transmit an event (no-read event) or to activate an output (no-read output). The Nedap system does not include the sensor. The no-read function must be enabled in order to operate. Refer to the firmware's installation guide for more details.

![Diagram of sensor input](image)

- **1 GND**: Sensor power supply 0V
- **3 PNP**: Sensor contact for PNP type sensors
- **5 NPN**: Sensor contact for NPN type sensors
- **7 24V**: Sensor power supply +24VDC

3.4.3 OPEN COLLECTOR OUTPUT

The open-collector output (also called no-read output) can be used to indicate a no-read situation. This option must be enabled in order to operate. Refer to the firmware's installation guide for more details.

![Diagram of open collector output](image)
4 LED INDICATIONS

A number of LED’s on the GIII-C indicate the current status of the GIII-C. The LED’s can be seen without removing the reader’s top cover. The table below describes the function of each LED.

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
</table>
| POW | Power LED (green)  
Indicates that the power supply is present and switched on. |
| STS | Status LED (blue)  
Indicates that the processor is running. The LED continuously blinks like the system's heartbeat. |
| IB | Interface Board LED (yellow)  
The LED is on when the optional interface board is used.  
The LED is off when the on-board RS-232 interface is used.  
See also chapter 3.3.2 for details about using the optional communication board. |
| RX | Receive LED (red)  
Indicates that data is being received by the on-board RS-232 communication interface. |
| TX | Transmit LED (red)  
Indicates that data is being transmitted by the on-board RS-232 communication interface. |
| IN | Input status LED (yellow)  
This LED is on when the input sensor is active. See also chapter 3.4.2 for details about using the sensor input. |
| OUT | Output status LED (red)  
This LED is on when the relay/optocoupler output is active. See also chapter 3.4.1 for details about using the relay/optocoupler output. |
| ID | Identification LED (green)  
This green LED starts to blink fast when a 'valid' tag is identified.  
The LED stays off when no (valid) tag is identified. |
| UL | Unlock LED (green)  
The unlock LED is normally off and goes on when a 'valid' tag is identified. The LED is turned off when no tag is identified anymore and the relay-hold-time has elapsed.  
This LED can also be externally connected to, for example, a RefleXS 130 antenna. |
| IND | Indication LED (red)  
The LED burns brightly to indicate good antenna adjusting.  
The LED burns weakly or not to indicate bad antenna adjusting. See chapter 3.2.2 for details about adjusting the antenna.  
This LED can also be externally connected to, for example, a RefleXS 130 antenna. |

Table 1: LED indicators

A number of LED’s can be connected externally to the GIII-C to view the status of the GIII-C remotely. This is especially useful when the antenna is not placed nearby the reader. The table below describes the function of each LED that can be connected externally.

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
</table>
| UL | Unlock LED  
The unlock LED is normally off and goes on when a 'valid' tag is identified. The LED is turned off when no tag is identified anymore and the relay-hold-time has elapsed.  
In case of the GIII-CM this is already connected to the green LED on the housing. |
| NA | Lock LED  
Indicates system standby. This LED is normally on and starts blinking when a 'valid' tag is identified.  
In case of the GIII-CM this is already connected to the red LED on the housing. |
| IND | Indication LED  
The LED burns brightly to indicate good antenna adjusting.  
The LED burns weakly or not to indicate bad antenna adjusting. See chapter 3.2.2 for details about adjusting the antenna. |

Table 2: External LED indicators
5  DIP-SWITCH SETTINGS

The GIII-C has 5 DIP-switches. The function of each switch may vary depending on the firmware used. Only DIP-switch 5 is not firmware controlled. This DIP-switch has always the same function. The function of DIP-switch 5 is described below.

<table>
<thead>
<tr>
<th>Switch 5 Function</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option comm. board enabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS232 on-board enabled</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 14: GIII-C DIP-switches

5.1 DEFAULT STAND-ALONE DIP-SWITCH SETTINGS

The default stand-alone DIP-switch settings, as used by the G7AAU-DC2 firmware, are described below.

<table>
<thead>
<tr>
<th>Event buffer size</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 (only last event)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baudrate</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data format</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/EVEN/2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/NONE/1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 15: Stand-alone DIP-switches

5.2 DEFAULT MULTIDROP SLAVE DIP-SWITCH SETTINGS

The default multidrop slave DIP-switch settings, as used by the G7NAAU, firmware are described below.

<table>
<thead>
<tr>
<th>Multidrop slave address</th>
<th>ON</th>
<th>OFF</th>
<th>ON</th>
<th>OFF</th>
<th>ON</th>
<th>OFF</th>
<th>ON</th>
<th>OFF</th>
<th>ON</th>
<th>OFF</th>
<th>ON</th>
<th>OFF</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slave 1</td>
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<tr>
<td>Slave 2</td>
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<tr>
<td>Slave 3</td>
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<td>Slave 4</td>
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<tr>
<td>Slave 5</td>
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<td>Slave 6</td>
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<td>Slave 7</td>
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<td>Slave 8</td>
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<td>Slave 9</td>
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<td>Slave 10</td>
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<td>Slave 12</td>
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<td>Slave 13</td>
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<tr>
<td>Slave 14</td>
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<td>Slave 15</td>
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</tbody>
</table>

Figure 16: Multidrop slave DIP-switches

For the multidrop slave firmware the normal DIP-switch settings are patched in the EPROM.

<table>
<thead>
<tr>
<th>Description</th>
<th>Address</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event buffer size</td>
<td>$FE45</td>
<td>$FF: 1 event, $00: 800 events</td>
</tr>
<tr>
<td>Baudrate</td>
<td>$FE44</td>
<td>$FF: 9600 baud, $00: 2400 baud</td>
</tr>
</tbody>
</table>

Table 3: EPROM patches multidrop slave firmware
A  PART NUMBERS

READERS

GIII-C  part number: 9883320

GIII-CM IP65 with integrated antenna  part number: 9882952

SUPER GIS III  part number: 9841253

OPTIONS

Ethernet (TCP/IP) communication board  part number: 7817940

Profibus communication board  part number: 7817134

RS422 communication board  part number: 7811730

MD300 Multidrop communication board  part number: 7811721

AB320 adjustment box  part number: 9844368

EW120 antenna transformer for single coil antennas  part number: 9875395

FS110 field strength indicator  part number: 9848207

iTerminal for Windows
RF-ID reader communication toolkit  part number: 9880801
ANTENNAS

- Antenna 350x160x20 detection up to 50cm part number: 9818138
- Antenna 350x80x20 detection up to 40cm part number: 9843477
- Antenna 200x80x20 detection up to 30cm part number: 9807144

- Antenna round 19x45 detection up to 6cm part number: 9800239

- RefleXS 130 proximity antenna part number: 9866531

TAGS

- LR12 Ø12x5 read-only part number: 9874801
- LR12 Ø12x5 R/W 6 part number: 9872400
- LR12 Ø12x5 R/W 80 part number: 9872396

- LR22 Ø22x10 read-only part number: 9844147
- LR22 Ø22x10 R/W 6 part number: 9844155
- LR22 Ø22x10 R/W 80 part number: 9844163

- LR22HT Ø22x10 high temp. read-only part number: 9868259
- LR22HT Ø22x10 high temp. R/W 6 part number: 9868267
- LR22HT Ø22x10 high temp. R/W 80 part number: 9864288

- LR40 Ø40x10 read-only part number: 9872337
- LR40 Ø40x10 R/W 6 part number: 9872329
- LR40 Ø40x10 R/W 80 part number: 9872728

- LR40HT Ø40x10 high temp. read-only part number: 9882006
- LR40HT Ø40x10 high temp. R/W 6 part number: 9882022
- LR40HT Ø40x10 high temp. R/W 80 part number: 9882014

- LR85 Ø85x13 read-only part number: 9842292
- LR85 Ø85x13 R/W 6 part number: 9844082
- LR85 Ø85x13 R/W 80 part number: 9844104

- LCC 86x55x2.6 read-only part number: 9888624
- LCC 86x55x2.6 R/W 6 part number: 9888632
- LCC 86x55x2.6 R/W 80 part number: 9888640

- ISO card 86x55x0.76 read-only part number: 9879684

- Key fob read-only part number: 9864750
B  FIRMWARE VERSIONS

Depending upon the firmware the GIII can be used in various applications. The table below describes the available firmware versions. For more details about the firmware please consult the firmware's installation guide. Specialized or tailor-made firmware may be available on request.

<table>
<thead>
<tr>
<th>FIRMWARE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>G7AAU-DC2</td>
<td>Standard GIII stand-alone reader firmware with DC2/DC4 communication protocol.</td>
</tr>
<tr>
<td>G7AAU-DC2-CT</td>
<td>Same as G7AAU-DC2 with additional cross-table function.</td>
</tr>
<tr>
<td>G7AAU-CR</td>
<td>GIII stand-alone reader firmware with CR/LF communication protocol.</td>
</tr>
<tr>
<td>G7AAU-CR-CT</td>
<td>Same as G7AAU-CR with additional cross-table function.</td>
</tr>
<tr>
<td>G7AAU-S3964</td>
<td>GIII stand-alone reader firmware with S3964-R protocol.</td>
</tr>
<tr>
<td>G7AAU-S3964-CT</td>
<td>Same as G7AAU-S3964 with additional cross-table function.</td>
</tr>
<tr>
<td>G7NAAU</td>
<td>Standard GIII multidrop slave reader firmware.</td>
</tr>
<tr>
<td>G7NAAU-CT</td>
<td>Same as G7NAAU with additional cross-table function.</td>
</tr>
</tbody>
</table>

*Table 4: Firmware versions*