Beijer Electronics GT-5114 High Speed Counter Module User Manual

Contents

Beijer Electronics GT-5114 High Speed Counter Module

About This Manual

This manual contains information on the software and hardware features of the Beijer Electronics GT-5114 High Speed Counter Module. It provides in-depth specifications, guidance on installation, setup, and usage of the product.

Symbols Used in This Manual

This publication includes Warning, Caution, Note and Important icons where appropriate, to point out safety-related, or other important information. The corresponding symbols should be interpreted as follows:

WARNING
The Warning icon indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury, and major damage to the product.

CAUTION
The Caution icon indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, and moderate damage to the product.

NOTE
The Note icon alerts the reader to relevant facts and conditions.

IMPORTANT
The Important icon highlights important information

Safety

Before using this product, please read this manual and other relevant manuals carefully. Pay full attention to safety instructions!

In no event will Beijer Electronics be responsible or liable for damages resulting from the use of this product. The images, examples and diagrams in this manual are included for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Beijer Electronics cannot take responsibility or liability for actual use based on the examples and diagrams.

Product Certifications
The product has the following product certifications.

General Safety Requirements

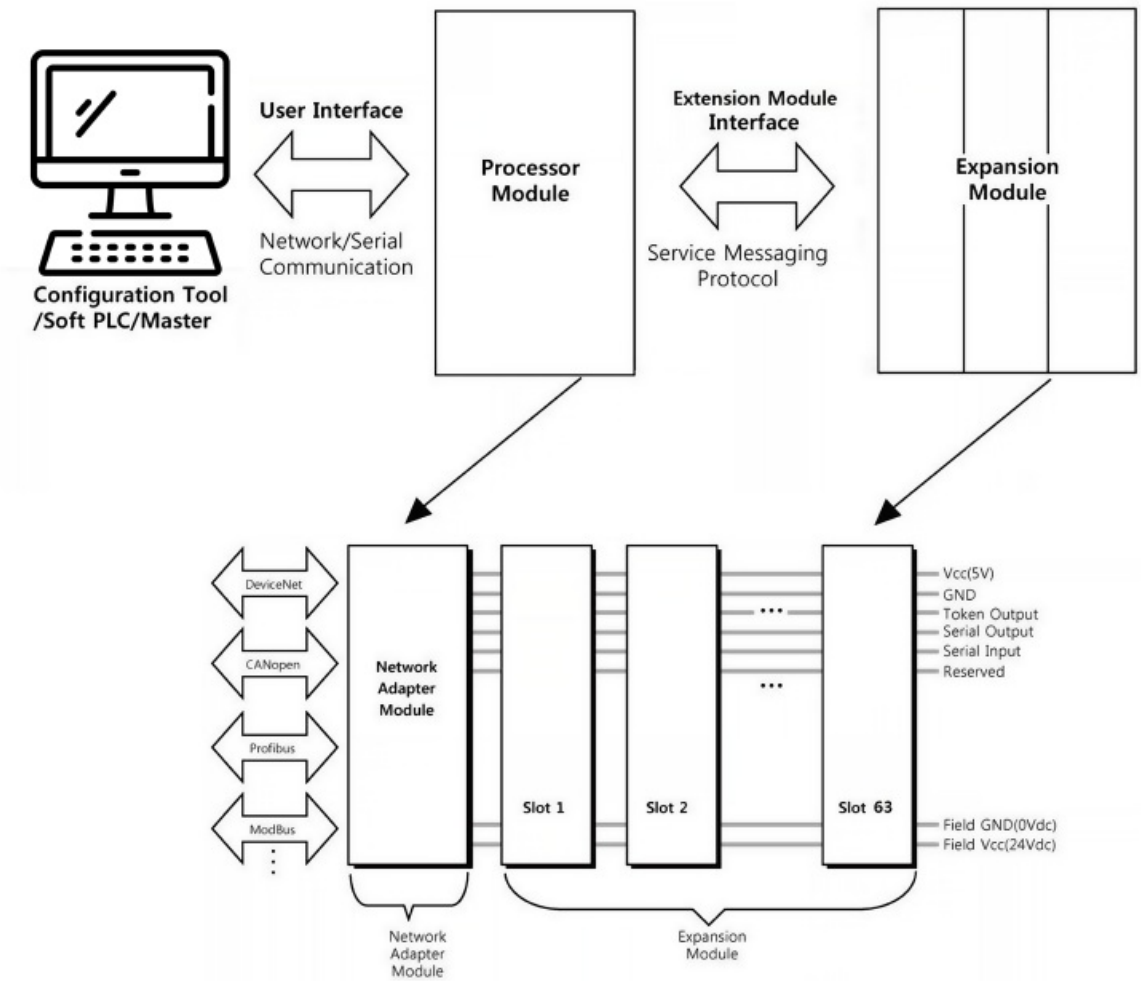
WARNING

- Do not assemble the products and wires with power connected to the system. Doing so cause an “arc flash”, which can result in unexpected dangerous events (burns, fire, flying objects, blast pressure, sound blast, heat).
- Do not touch terminal blocks or IO modules when the system is running. Doing so may cause electric shock, short circuit or malfunction of the device.
- Never let external metallic objects touch the product when the system is running. Doing so may cause electric shock, short circuit or malfunction of the device.
- Do not place the product near inflammable material. Doing so may cause a fire.
- All wiring work should be performed by an electrical engineer.
- When handling the modules, ensure that all persons, the workplace and the packing are well grounded. Avoid touching conductive components, the modules contain electronic components that may be destroyed by electrostatic discharge.

CAUTION

- Never use the product in environments with temperature over 60°C. Avoid placing the product in direct sunlight.
- Never use the product in environments with over 90% humidity.
- Always use the product in environments with pollution degree 1 or 2.
- Use standard cables for wiring.

About the G-series System

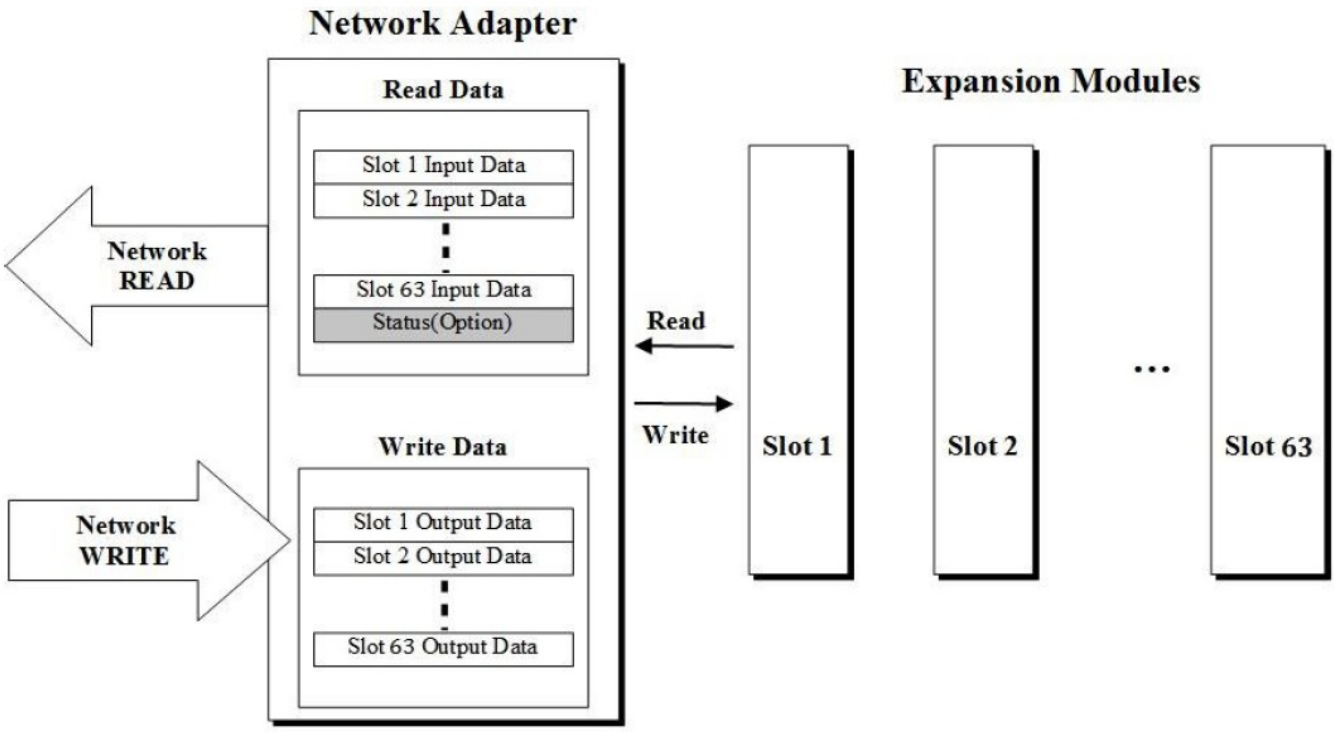


System overview

- Network Adapter Module – The network adapter module forms the link between the field bus and the field devices with the expansion modules. The connection to different field bus systems can be established by each of the corresponding network adapter module, e.g., for MODBUS TCP, Ethernet IP, EtherCAT, PROFINET, CC-Link IE Field, PROFIBUS, CANopen, DeviceNet, CC-Link, MODBUS/Serial etc.
- Expansion Module – Expansion module types: Digital IO, Analog IO, and Special modules.
- Messaging – The system uses two types of messaging: Service messaging and IO messaging.

IO Process Data Mapping

An expansion module has three types of data: IO data, configuration parameter, and memory register. The data exchange between the network adapter and the expansion modules is made via IO process image data by internal protocol.



Data flow between network adapter (63 slots) and expansion modules
The input and output image data depend on the slot position and the data type of the expansion slot. The ordering of input and output process image data is based on the expansion slot position. Calculations for this arrangement are included in the manuals for network adapter and programmable IO modules.
Valid parameter data depends on the modules in use. For example, analog modules have settings of either 0-20 mA or 4-20 mA, and temperature modules have settings such as PT100, PT200, and PT500. The documentation for each module provides a description of the parameter data.

Specifications

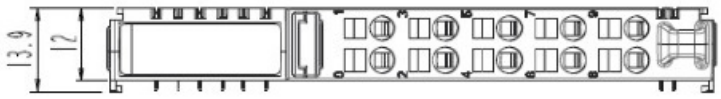
Environmental Specifications

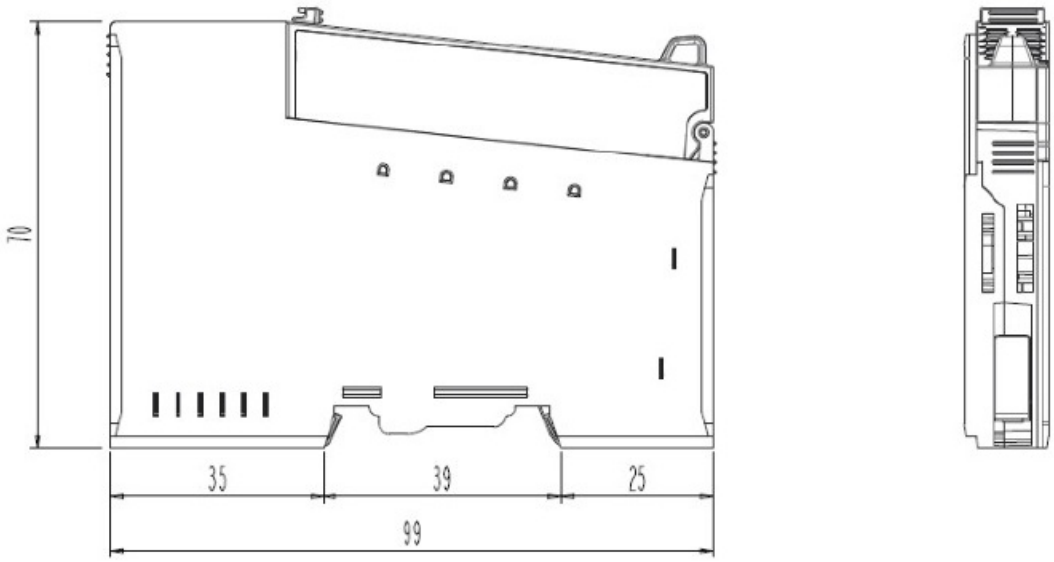
Operating temperature	-20°C – 60°C
UL temperature	-20°C – 60°C
Storage temperature	-40°C – 85°C
Relative humidity	5% – 90% non-condensing
Mounting	DIN rail
Shock operating	IEC 60068-2-27 (15G)
Vibration resistance	IEC 60068-2-6 (4 g)
Industrial emissions	EN 61000-6-4: 2019
Industrial immunity	EN 61000-6-2: 2019
Installation position	Vertical and horizontal
Product certifications	CE, FCC, UL, cUL

General Specifications

Power dissipation	Max. 70 mA @ 5 VDC
Isolation	I/O to logic: Photocoupler isolation
UL field power	Supply voltage: 24 VDC nominal, Class 2
Field power	Not used. Field power bypass to next expansion module
Wiring	IO cable max. 2.0 mm² (AWG 14)
Torque	0.8 Nm (7 lb-in)
Weight	60 g
Module size	12 mm x 99 mm x 70 mm

Dimensions





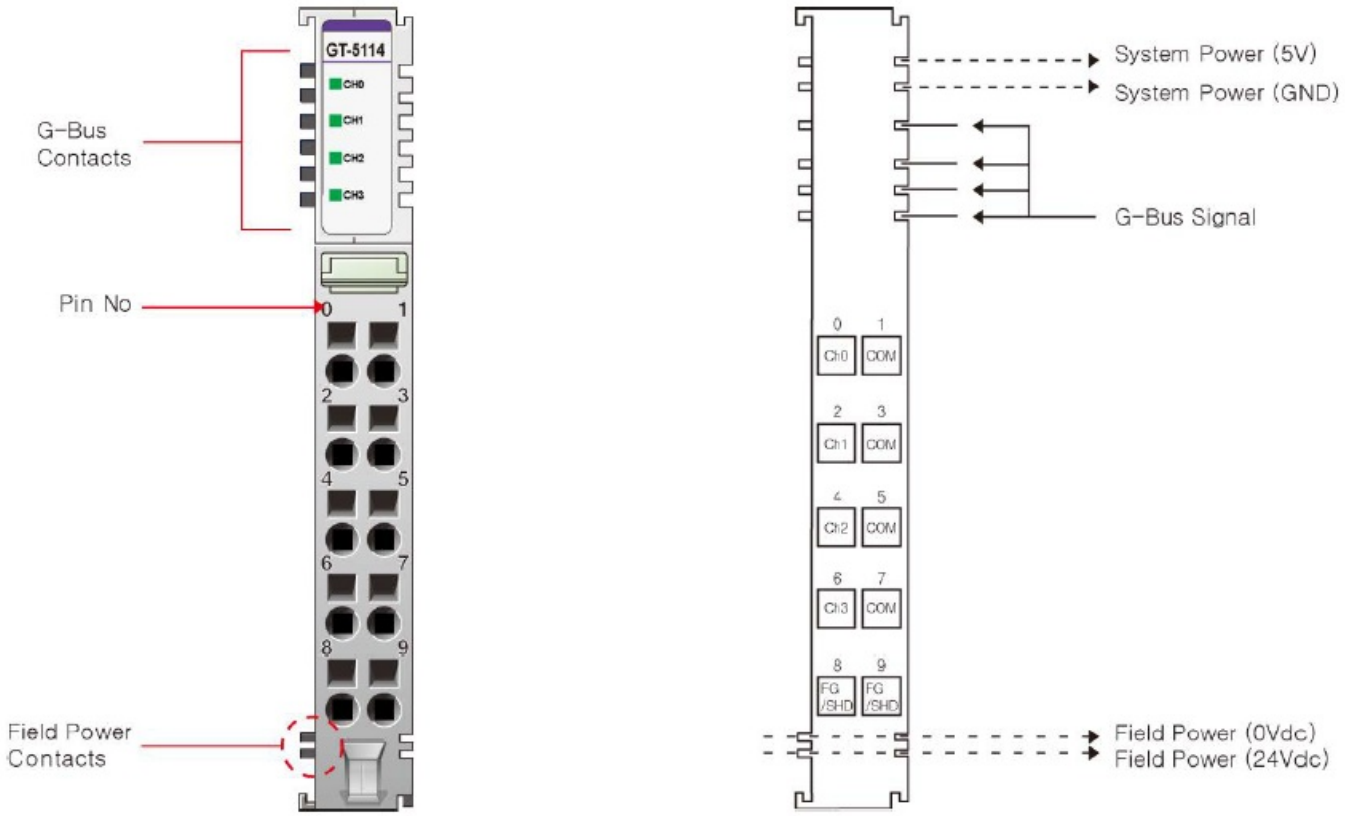
Module dimensions (mm)

Module dimensions (mm)

Input Specifications

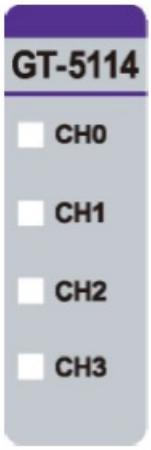
Number of channels	4 Channels. Encoder, High speed counter, Frequency measurement, Pulse width & Period measurement.
Indicators	4 green terminal input
Input voltage	24 VDC nominal (max. 28.8 VDC)
Input current	3 mA @ 24 VDC
Min on-stage voltage	≥16.5 VDC
Input frequency	0 – 100 kHz Count mode 0 – 750 kHz Encoder mode
Counting mode	1- Input mode: Up, Down, Frequency measurement, Pulse width, Period measurement. 2- Input mode: Encoder 4x, Encoder 2x, Up / Inhibit, Up / Reset, Down / Inhibit, Down / Reset, Up / Down, Clock / Direction.
Counter size	32 bit-wide/channel

Wiring Diagram



Pin no.	Signal description
0	Counter input Ch#0
1	COM0
2	Counter input Ch#1
3	COM1
4	Counter input Ch#2
5	COM2
6	Counter input Ch#3
7	COM3
8	Shield
9	Shield

LED Indicator



LED	LED function / description	LED color
1	Counter input Ch#0	Green
2	Counter input Ch#1	Green
3	Counter input Ch#2	Green
4	Counter input Ch#3	Green

LED channel status

Status	LED is	Indication
No signal	Off	Normal operation
On signal	Green	Normal operation

Mapping Data From the Image Table

Input image data – 16 byte

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Counter value Ch#0 LL							
1	Counter value Ch#0 LH							
2	Counter value Ch#0 HL							
3	Counter value Ch#0 HH							
4	Counter value Ch#1 LL							
5	Counter value Ch#1 LH							
6	Counter value Ch#1 HL							
7	Counter value Ch#1 HH							
8	Counter value Ch#2 LL							
9	Counter value Ch#2 LH							
10	Counter value Ch#2 HL							
11	Counter value Ch#2 HH							
12	Counter value Ch#3 LL							
13	Counter value Ch#3 LH							
14	Counter value Ch#3 HL							
15	Counter value Ch#3 HH							

Each Channel has 4-byte input.
Counter value represents counter, frequency (Hz), pulse width (0.1 us) or pulse period (0.1 us).

Output image data – 4 byte

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	CR 0	CS 0	—	—	Count mode Ch#0			
1	CR 1	CS 1	—	—	Count mode Ch#1			
0	CR 2	CS 2	—	—	Count mode Ch#2			
1	CR 3	CS 3	—	—	Count mode Ch#3			

CR 0 – 3 = Counter Reset for Ch#0 – 3.
CS 0 – 3 = Counter Stop (inhibit input) for Ch#0 – 3.
Count mode Ch#0 – 3 = Count mode for Ch#0 – 3 respectively. See chapter Count Mode Ch#0 – 3.

Count Mode Ch#0 – 3

Value	Count Mode	Description
B’ 0000 (0x0)	Up	Up counter. Counter input Ch#0 – 3 act as Up clock to Ch#0 – 3.
B’ 0001 (0x1)	Down	Down Counter. Counter input Ch#0 – 3 act as Down clock to Ch#0 – 3.

Value	Count Mode	Description
B’ 0010 (0x2)	–	–
B’ 0011 (0x3)	–	–
B’ 0100 (0x4)	Up clock & Inhibit	Up counter with inhibit. If Counter mode Ch#0 = 0x4, Counter mode Ch#1 is not used . • Counter input Ch#0 acts as Up clock input to Ch#0. • Counter input Ch#1 acts as Inhibit input to Ch#0. • If Counter mode Ch#2 = 0x4, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as Up clock input to Ch#2. • Counter input Ch#3 acts as Inhibit input to Ch#2.
B’ 0101 (0x5)	Up clock & Reset	Up counter with reset. If Counter mode Ch#0 = 0x5, Counter mode Ch#1 is not used . • Counter input Ch#0 acts as Up clock input to Ch#0. • Counter input Ch#1 acts as Reset input to Ch#0. • If Counter mode Ch#2 = 0x5, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as Up clock input to Ch#2. • Counter input Ch#3 acts as Reset input to Ch#2.
B’ 0110 (0x6)	Down clock & Inhibit	• Down counter with Inhibit. If Counter mode Ch#0 = 0x6, Counter mode Ch#1 is not used. • Counter input Ch#0 acts as Down clock input to Ch#0. • Counter input Ch#1 acts as Inhibit input to Ch#0. • If Counter mode Ch#2 = 0x6, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as Down clock input to Ch#2. • Counter input Ch#3 acts as Inhibit input to Ch#2.

Value	Count Mode	Description
B’ 0111 (0x7)	Down clock & Reset	Down counter with Reset. If Counter mode Ch#0 = 0x7, Counter mode Ch#1 is not used . • Counter input Ch#0 acts as Down clock input to Ch#0. • Counter input Ch#1 acts as Reset input to Ch#0. • If Counter mode Ch#2 = 0x7, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as Down clock input to Ch#2. • Counter input Ch#3 acts as Reset input to Ch#2.
B’ 1000 (0x8)	Up clock & Down clock	Up & Down counter. • If Counter mode Ch#0 = 0x8, Counter mode Ch#1 is not used. • Counter input Ch#0 acts as Up clock input to Ch#0. • Counter input Ch#1 acts as Down clock input to Ch#0. • If Counter mode Ch#2 = 0x8, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as Up clock input to Ch#2. • Counter input Ch#3 acts as Down clock input to Ch#2.
B’ 1001 (0x9)	Clock & Direction	• Up & Down with Direction. • If Counter mode Ch#0 = 0x9, Counter mode Ch#1 is not used. • Counter input Ch#0 acts as Clock input to Ch#0. • Counter input Ch#1 acts as Direction input to Ch#0. • If Counter mode Ch#2 = 0x9, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as Clock input to Ch#2. • Counter input Ch#3 acts as Direction input to Ch#2. • (Direction input : Low = Up Count, High = Down Count)

Value	Count Mode	Description

B’ 1010 (0xA)	Encoder 1x *	Encoder 1x. • If Counter mode Ch#0 = 0xA, Counter mode Ch#1 is not used. • Counter input Ch#0 acts as A Phase input to Ch#0. • Counter input Ch#1 acts as B Phase input to Ch#0. • If Counter mode Ch#2 = 0xA, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as A Phase input to Ch#2. • Counter input Ch#3 acts as B Phase input to Ch#2.
B’ 1011 (0xB)	Encoder 2x	Encoder 2x. • If Counter mode Ch#0 = 0xB, Counter mode Ch#1 is not used. • Counter input Ch#0 acts as A Phase input to Ch#0. • Counter input Ch#1 acts as B Phase input to Ch#0. • If Counter mode Ch#2 = 0xB, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as A Phase input to Ch#2. • Counter input Ch#3 acts as B Phase input to Ch#2.
B’ 1100 (0xC)	Encoder 4x	Encoder 4x. • If Counter mode Ch#0 = 0xA, Counter mode Ch#1 is not used. • Counter input Ch#0 acts as A Phase input to Ch#0. • Counter input Ch#1 acts as B Phase input to Ch#0. • If Counter mode Ch#2 = 0xA, Counter mode Ch#3 is not used. • Counter input Ch#2 acts as A Phase input to Ch#2. • Counter input Ch#3 acts as B Phase input to Ch#2.
B’ 1101 (0xD)	Frequency measurement, 1 s update **	• Simple frequency measurement, updated by 1s, Hz unit. • Aph Input acts as Frequency input. • Bph Input is not used. • Counter input Ch#0, Ch#2 act as Frequency input to Ch#0, Ch#2.
B’ 1110 (0xE)	Pulse width measurement ***	Simple pulse width measurement, 0.1 us unit. Pulse width (32 bit), if 1234, then Pulse high (on) width is 123 .4 us. *** Counter input Ch#0, Ch#2 act as Pulse input to Ch#0, Ch#2.

Value	Count Mode	Description
B’ 1111 (0xF)	Pulse width & period measurement ****	Simple pulse width & Period measurement, 0.1 us unit. • Available in case of Pulse input >= 200 Hz(<= 2.5 ms, pulse on width) • Pulse width (16 bit, low word) + Pulse period (16 bit, high word) **** • Counter input Ch#0, Ch#2.act as Pulse input to Ch#0, Ch#2.

Frequency range of the Encoder x1 mode is the same as the counting mode.
Frequency, B’1101(0xD) can’t be used with other channel’s Count mode = 0x0, 0x1, 0x4 – 0xA.
Pulse width, B’1110(0xE) measures Pulse input’s high (on) Pulse width (32 bit) in 0.1 us unit.
Pulse width and period, B’1111(0xF) measures Pulse input’s high (on) width (16 bit) and period (16 bit) in 0.1 us unit.

Parameter Data

Valid parameter length: 4 by

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved							
1	Reserved							
2	Reserved							
3	Reserved							

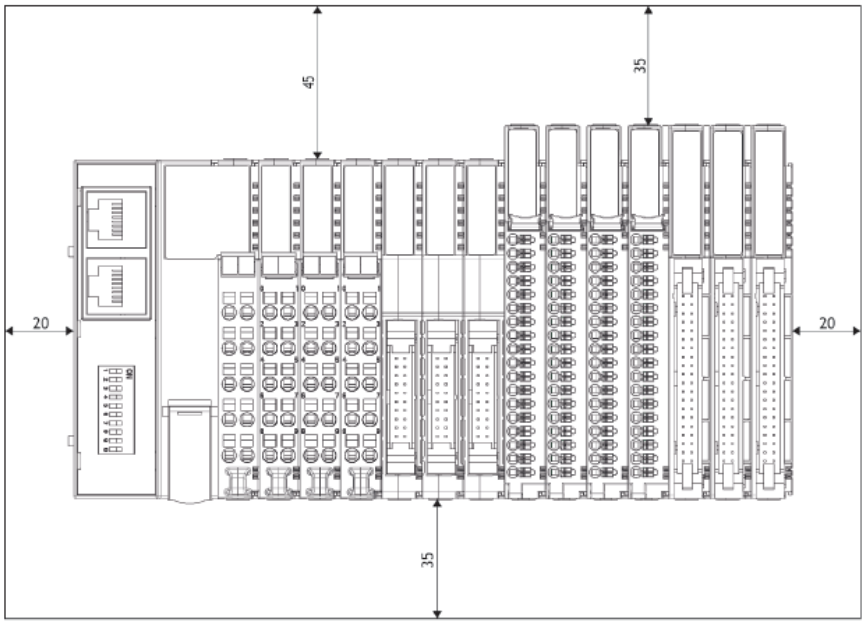
Hardware Setup

CAUTION

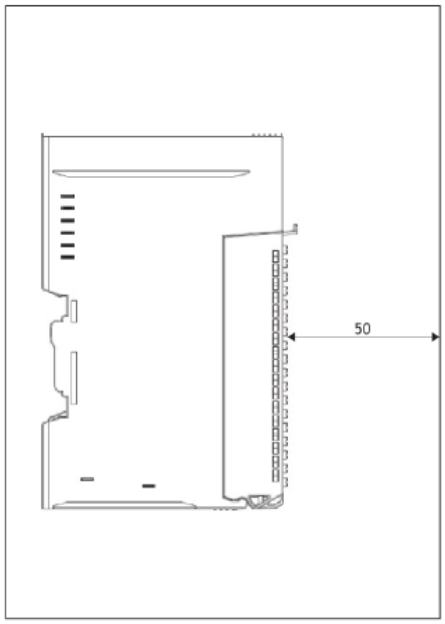
- Always read this chapter before installing the module!
- Hot surface! The surface of the housing can become hot during operation. If the device is used in high ambient temperatures, always let the device cool down before touching it.
- Working on energized devices can damage the equipment! Always turn off the power supply before working on the device.

Space Requirements
The following drawings show the space requirements when installing the G-series modules. The spacing creates space for ventilation, and prevents conducted electromagnetic interference from influencing the operation. Installation position is valid vertical and horizontal. The drawings are illustrative and may be out of proportion.

CAUTION
NOT following the space requirements may result in damaging the product.



Vertical and horizontal space requirements



Required distance to door

Mount Module to DIN Rail
The following chapters describe how to mount the module to the DIN rail.

CAUTION
The module must be fixed to the DIN rail with the locking levers.

Mount GL-9XXX or GT-XXXX Module
The following instructions apply to these module types:

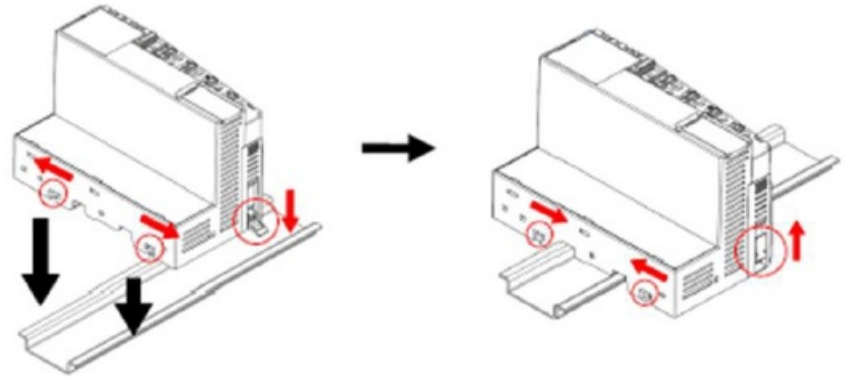
- GL-9XXX
- GT-1XXX
- GT-2XXX
- GT-3XXX
- GT-4XXX
- GT-5XXX
- GT-7XXX
- GN-9XXX modules have three locking levers, one at the bottom and two on the side. For mounting instructions, refer to Mount GN-9XXX Module.

Mount to DIN rail

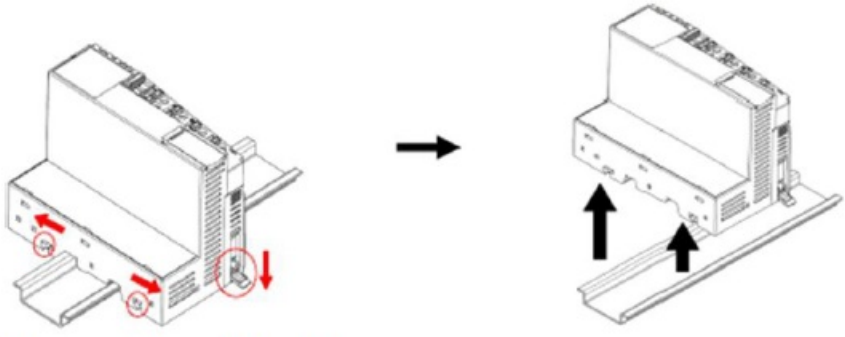
Dismount from DIN rail

Mount GN-9XXX Module

To mount or dismount a network adapter or programmable IO module with the product name GN-9XXX, for example GN-9251 or GN-9371, see the following instruction



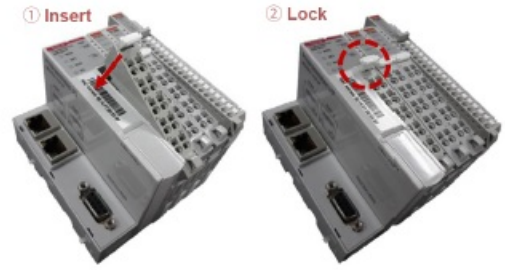
Mount to DIN rail



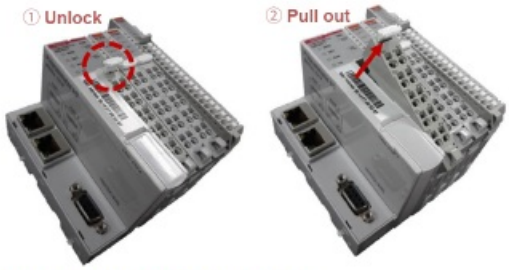
Dismount from DIN rail

Mount Removable Terminal Block

To mount or dismount a removable terminal block (RTB), see the instructions below.



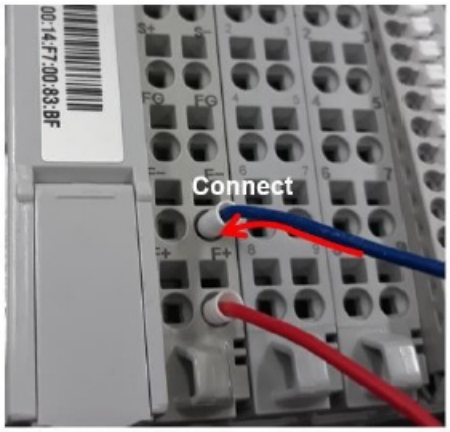
Mount a removable terminal block



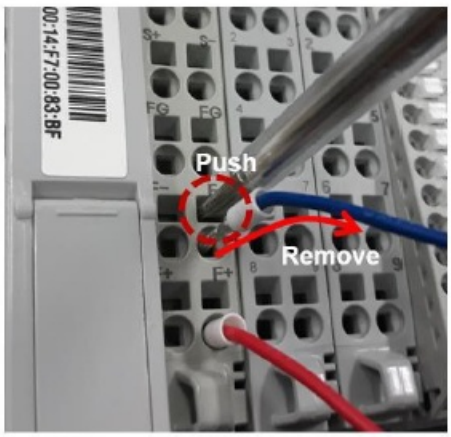
Dismount a removable terminal block

Connect Cables to Removable Terminal Block
To connect/disconnect cables to/from the removable terminal block (RTB), see the instructions below.

WARNING
Always use the recommended supply voltage and frequency to prevent damage to the equipment and ensure optimal performance.



Connect cable



Disconnect cable

Documents / Resources

	**Beijer Electronics GT-5114 High Speed Counter Module** [pdf] User Manual GT-5114 High Speed Counter Module, GT-5114, High Speed Counter Module, Speed Counter Module, Counter Module

References

- **User Manual**