

Magelis XBTGC HMI Controller Hardware Guide

12/2016

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This manual describes how to use the Magelis XBT GC devices.

Validity Note

This document has been updated for the release of SoMachine V4.2.

The technical characteristics of the devices described in this document also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page www.schneider-electric.com .
2	In the Search box type the reference of a product or the name of a product range. <ul style="list-style-type: none">• Do not include blank spaces in the reference or product range.• To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the Product Datasheets search results and click on the reference that interests you. If you entered the name of a product range, go to the Product Ranges search results and click on the product range that interests you.
4	If more than one reference appears in the Products search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click Download XXX product datasheet .


The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

Related Documents

Title of Documentation	Reference Number
Instruction Sheet XBT GC (multi-lingual document)	3501639200
Modicon TM2 Digital I/O Modules Hardware Guide	EIO0000000028 (ENG) EIO0000000029 (FRE) EIO0000000030 (GER) EIO0000000031 (SPA) EIO0000000032 (ITA) EIO0000000033 (CS)
Modicon TM2 Analog I/O Modules Hardware Guide	EIO0000000034 (ENG) EIO0000000035 (FRE) EIO0000000036 (GER) EIO0000000037 (SPA) EIO0000000038 (ITA) EIO0000000039 (CS)

You can download these technical publications and other technical information from our website at <http://www.schneider-electric.com/ww/en/download>

Product Related Information

 **DANGER**

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

DANGER

POTENTIAL FOR EXPLOSION

- Only use this equipment in non-hazardous locations, or in locations that comply with Class I, Division 2, Groups A, B, C and D.
- Do not substitute components which would impair compliance to Class I Division 2.
- Do not connect or disconnect equipment unless power has been removed or the location is known to be non-hazardous.

Failure to follow these instructions will result in death or serious injury.

WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.¹
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

¹ For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Chapter 1

Overview

Introduction

This chapter describes peripheral devices that can be connected to XBT GC Series units along with the name and functions of each part.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Do not use this equipment as the only means of control for critical system functions such as motor start/stop or power disconnect.
- Do not use this equipment as the only notification device for critical alarms, such as device overheating or overcurrent.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
1.1	System Design	12
1.2	Accessories	18
1.3	Part Names and Functions	25

Section 1.1

System Design

Introduction

The following section illustrates the standard range of items that can be connected to XBT GC1000/2000 Series units.

What Is in This Section?

This section contains the following topics:

Topic	Page
Overview of the Product Range	13
XBT GC1000 Series: System Architecture	14
XBT GC2000 Series: System Architecture	16

Overview of the Product Range

XBT GC Series References

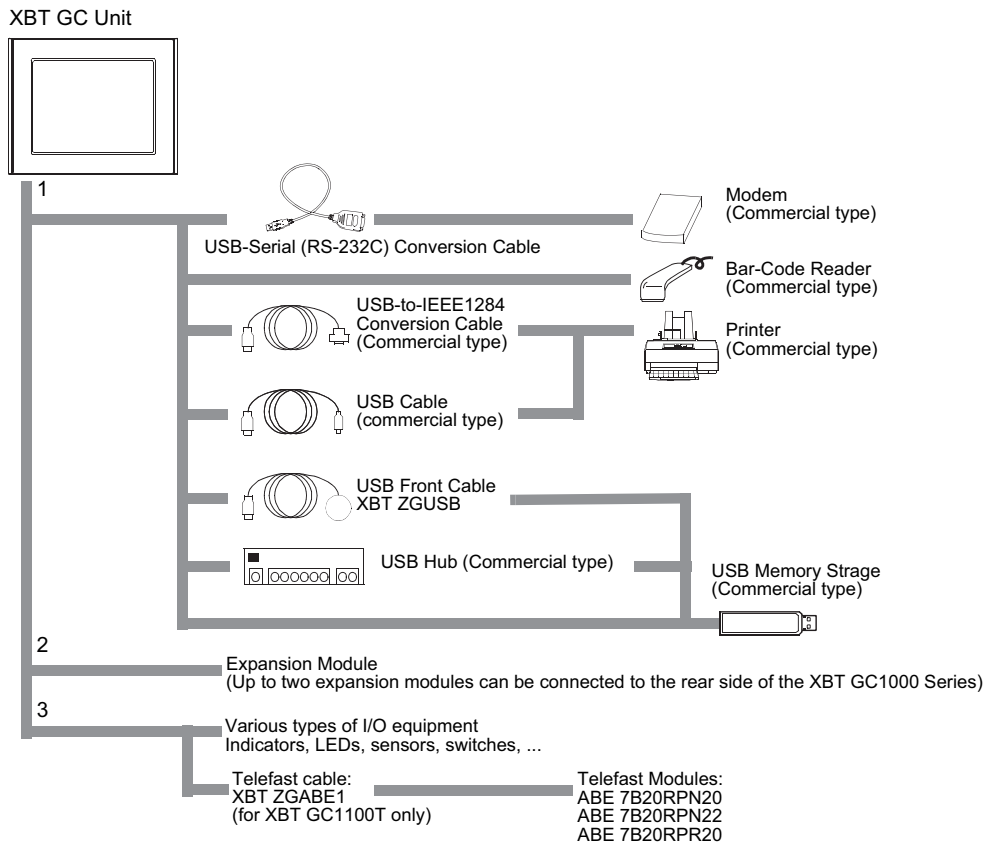
Series	Screen type	Output type	Reference
XBT GC1000 Series	3.8 in Monochrome Amber/Red LCD	Sink	XBT GC1100U
		Source	XBT GC1100T
XBT GC2000 Series	5.7 in Monochrome LCD	Sink	XBT GC2120U
		Source	XBT GC2120T
	5.7 in STN color LCD	Sink	XBT GC2230U
		Source	XBT GC2230T
	5.7 in TFT color LCD	Sink	XBT GC2330U
		Source	XBT GC2330T

XBT GC1000 Series: System Architecture

Introduction

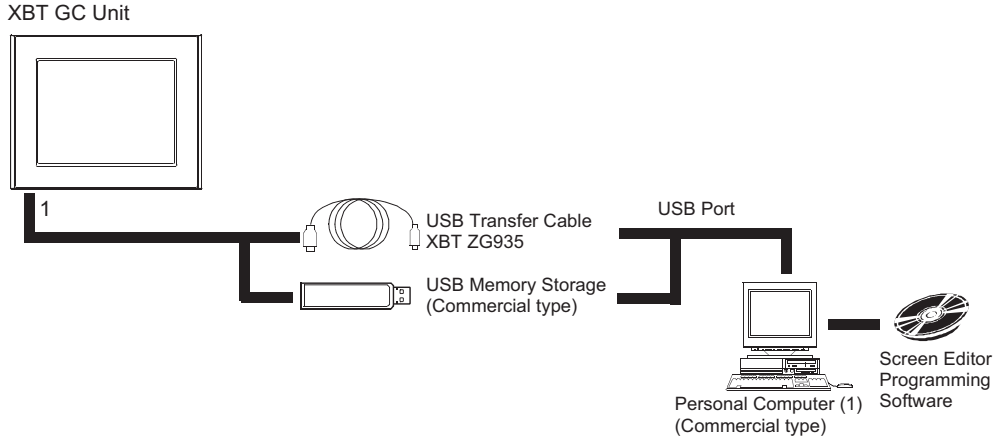
The following diagrams illustrate the standard range of items that can be connected to XBT GC1000 Series units.

RUN Mode Peripherals



N°	XBT GC Interfaces
1	USB Host Interface
2	Expansion Module Interface (See <i>I/O Expansion Modules</i> , page 21)
3	DIO Interface

EDIT Mode Peripherals



(1) Certain types and models of PCs cannot be used, refer to programming software online help.

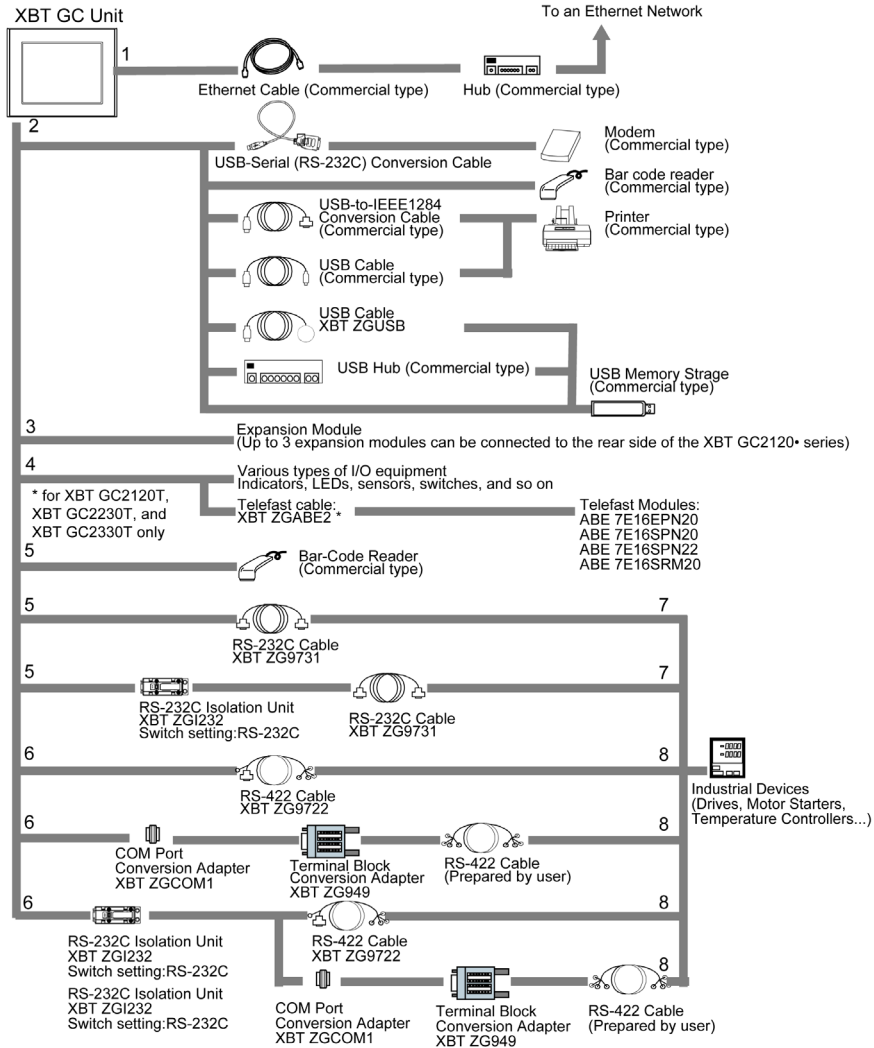
N°	XBT GC Interfaces
1	USB Host Interface

XBT GC2000 Series: System Architecture

Introduction

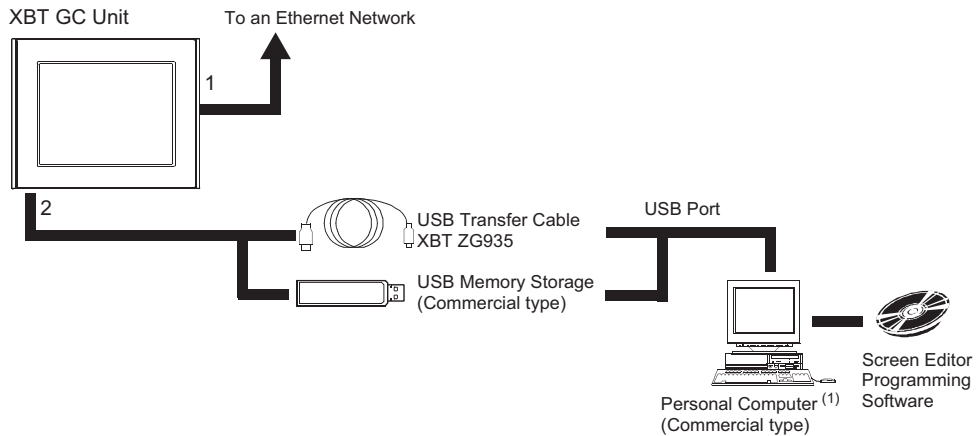
The following diagrams illustrate the standard range of items that can be connected to XBT GC2000 Series units.

RUN Mode Peripherals



N°	XBT GC Interfaces
1	Ethernet Interface (10BASE-T/100BASE-TX) Not available with XBT GC2120• units.
2	USB Host Interface
3	Expansion Module Interface (See <i>I/O Expansion Modules, page 21</i>)
4	DIO Interface
5	Serial Interface (COM1) (RS232C mode)
6	Serial Interface (COM1) (RS422 mode)
Temperature Controller (etc.) Interfaces	
7	RS232C Port
8	RS422 Port

EDIT Mode Peripherals



(1) Certain types and models of PCs cannot be used. Refer to programming software online help.

N°	XBT GC Interfaces
1	Ethernet Interface (10BASE-T/100BASE-TX) Not available with XBT GC2120• units.
2	USB Host Interface

Section 1.2

Accessories

Introduction

The following section describes accessories that can be connected to XBT GC Series units.

What Is in This Section?

This section contains the following topics:

Topic	Page
Accessories	19
I/O Expansion Modules	21

Accessories

USB Host Interface

Product Name	Reference	Description
USB Transfer Cable	XBT ZG935	Downloads project data created with the Screen Editor via the XBT GC unit's USB I/F.
USB Front Cable	XBT ZGUSB	Extension cable attaching USB port to front panel.

Serial Interface Item

Product Name	Reference	Description
RS-232C Cable	XBT ZG9731	Interface cable for communication between a temperature controller/various boards and the XBT GC2000 series via RS-232C.
RS-422 Cable	XBT ZG9722	Interface cable for communication between a temperature controller/various boards and the XBT GC2000 series via RS-422.
RS232C Isolation Unit	XBT ZGI232	Unit for providing isolated connection between a temperature controller/various boards and the XBT GC2000 series. RS-232C and RS-422 are switchable.
COM Port Conversion Adapter	XBT ZGCOM1	Connects optional RS-422 communication items to XBT GC2000 series unit's COM1 port.
Terminal Block Conversion Adapter	XBT ZG949	Connects output from a serial interface with an RS-422 terminal block.

Communication Module

Product Name	Reference	Description
CANopen Master Module	XBT ZGCCAN	Communication on CANopen network.

Telefast Cable

Product Name	Reference	XBT GC Reference	Description
Telefast Cable	XBT ZGABE1	XBT GC1100T	2m Interface to connect to ABE 7B20RPN20, ABE 7B20RPN22 and ABE 7B20RPR20 Telefast modules
	XBT ZGABE2	XBT GC2120T, XBT GC2230T, XBT GC2330T	2m Interface to connect to ABE 7E16EPN20, ABE 7E16SPN20, ABE 7E16SPN22 and ABE 7E16SRM20 Telefast modules

Option Items

Product Name	Reference	Series	Description
Screen Protection Sheet	XBT ZG60	XBT GC1000	Disposable, dirt-resistant sheet for the XBT GC unit's screen.(5 sheets/set)
	XBT ZG62	XBT GC2000	

Maintenance Items

Product Name	Reference	Series	Description
Installation Fastener	XBT ZGFIX	XBT GC1000 XBT GC2000	Used to install the XBT GC into a solid panel.
Installation Gasket	XBT ZG51	XBT GC1000	Provides dust and moisture resistance when XBT GC is installed into a solid panel.
	XBT ZG52	XBT GC2000	
DIO Connector	XBT ZGDIO1	XBT GC1000	Attached to the DIO interface. Connects an external I/O device. (5 connectors/set)
	XBT ZGDIO2	XBT GC2000	
DIO Cable	XBT ZGABE1	XBT GC1000	Used to connect the DIO Interface to Telefast modules (1 HE10 connector, 26 pins).
	XBT ZGABE2	XBT GC2000	Used to connect the DIO Interface to Telefast modules (2 HE10 connectors, 20 pins).
USB Cable Clamp	XBT ZGCLP2	XBT GC1000	USB Cable clamp used to prevent disconnection.
	XBT ZGCLP4	XBT GC2000	
DC Power Supply Connector for Medium-sized Units	XBT ZGPWS1	XBT GC1000 XBT GC2000	Used to attach power supply to medium-sized units.
Expansion Module Securing Hook	XBT ZGCHOK	XBT GC2000	Used to secure 3 expansion modules to the XBT GC2000 series.

I/O Expansion Modules

I/O Expansion Modules

I/O Expansion Module for XBT GC1000/2000 Series:

I/O Type	Description	Connector	Reference	Thickness in mm (in)	Thickness Type
Digital	8 DC Input	Removable / Screw type	TM2 DDI8DT	23.5 (0.925)	B
	16 DC Input		TM2 DDI16DT		
	16 DC Input	HE10	TM2 DDI16DK		
	32 DC Input		TM2 DDI32DK	29.7 (1.17)	C
	8 Relay Output	Removable / Screw type	TM2 DRA8RT	23.5 (0.925)	B
	16 Relay Output		TM2 DRA16RT		
	4 DC Input 4 Relay Output		TM2 DMM8DRT		
	16 DC Input 8 Relay Output		TM2 DMM24DRF	39.1 (1.54)	D
	8 Transistor Source Output 0.35 A		TM2 DDO8TT	23.5 (0.925)	B
	16 Transistor Source Output 0.35 A	HE10	TM2 DDO16TK	17.6 (0.69)	A
	32 Transistor Source Output 0.35 A		TM2 DDO32TK	29.7 (1.17)	C
	8 AC Input 120 V	Removable / Screw type	TM2 DAI8DT	23.5 (0.925)	B
	8 Transistor Sink Output 0.3 A		TM2 DDO8UT		
	16 Transistor Sink Output 0.1 A	HE10	TM2 DDO16UK	17.6 (0.69)	A
	32 Transistor Sink Output 0.1 A		TM2 DDO32UK	29.7 (1.17)	C

I/O Type	Description	Connector	Reference	Thickness in mm (in)	Thickness Type
Analog	2 Analog Input 0...10 V / 4...20 mA	Removable / Screw type	TM2 AMI2HT	23.5 (0.925)	B
	1 Analog Output 0...10 V / 4...20 mA		TM2 AMO1HT		
	2 Analog Input 0...10 V / 4...20 mA, 1 Analog Output 0...10 V / 4...20 mA		TM2 AMM3HT		
	2 Analog Input Thermo / PT100, 1 Analog Output 0...10 V / 4...20 mA		TM2 ALM3LT		
	2 Analog Input Thermo		TM2 AMI2LT		
	2 Analog Input 0...10 V / 4...20 mA / PT/Ni100 / PT/Ni1000		TM2 AMI4LT		
	8 Analog Input 0...10 V / 4...20 mA		TM2 AMI8HT		
	8 Analog Input PTC/NTC		TM2 ARI8HT		
	2 Analog Output +/- 0...10 V		TM2 AVO2HT		
	2 Analog Input 0...10 V / 4...20 mA, 2 Analog Output 0...10 V / 4...20 mA		TM2 AMM6HT		
	8 Analog Input PT100/1000		TM2 ARI8LT		
	8 Analog Input PT100/1000		RJ11		

Allowed Combination Principle

To maintain vibration and shock resistance, the total width of the expansion modules must be less than 60 mm (2.36 in), unless using the hook XBT ZGCHOK for 23.5 mm (0.925 in) and 17.6 mm (0.69 in) modules.

<i>NOTICE</i>
<p>EQUIPMENT DISCONNECTION</p> <ul style="list-style-type: none"> Ensure that the total width of the expansion modules does not exceed 60 mm (2.36 in) without using the XBT ZGCHOK security hook. Ensure that the XBT ZGCHOK security hook is properly mounted if the width of the modules exceeds 60 mm (2.36 in). With the XBT ZGCHOK security hook properly mounted, ensure that the total width of the expansion modules does not exceed 70.5 mm (2.77 in). <p>Failure to follow these instructions can result in equipment damage.</p>

The following tables describe the possible allowed combinations of modules, using the thickness type designation found in the table above.

XBT GC1000 Allowed Combination

Combination of 2 expansion modules:

Type	Type	Total Thickness in mm (<i>in</i>)	Combination
A	A	35.2 (1.38)	Allowed
A	B	41.1 (1.62)	
B	B	47.0 (1.85)	
A	C	47.3 (1.86)	
B	C	53.2 (2.09)	
A	D	56.7 (2.23)	
C	C	59.4 (2.34)	
B	D	62.6 (2.46)	Not Allowed
C	D	68.8 (2.71)	
D	D	78.2 (3.08)	

XBT GC2000 Allowed Combination

Combination of 2 expansion modules:

Type	Type	Total Thickness in mm (<i>in</i>)	Combination
A	A	35.2 (1.38)	Allowed
A	B	41.1 (1.62)	
B	B	47.0 (1.85)	
A	C	47.3 (1.86)	
B	C	53.2 (2.09)	
A	D	56.7 (2.23)	
C	C	59.4 (2.34)	
B	D	62.6 (2.46)	Not Allowed
C	D	68.8 (2.71)	
D	D	78.2 (3.08)	

Combination of 3 expansion modules:

Type	Type	Type	Total Thickness in mm (<i>in</i>)	Combination
A	A	A	52.8 (2.08)	Allowed with hook
A	A	B	58.7 (2.31)	
A	B	B	64.6 (2.54)	
B	B	B	70.5 (2.77)	
ALL OTHERS COMBINATIONS				Not Allowed

Section 1.3

Part Names and Functions

Introduction

The following section describes part functions of XBT GC Series units.

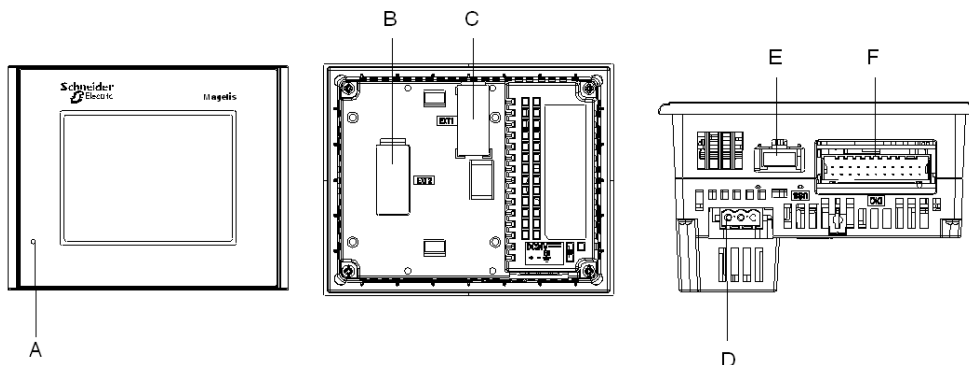
What Is in This Section?

This section contains the following topics:

Topic	Page
XBT GC1000 Series: Parts Description	26
XBT GC2000 Series: Parts Description	28

XBT GC1000 Series: Parts Description

Description



Label	Part name	Description
A	Status LED	Indicates the status of: <ul style="list-style-type: none"> the XBT GC (e.g. power input, firmware RUN status or backlight condition) the logic program execution See table below.
B	AUX Unit Interface / Expansion Unit (EXT2)	Interface where additional units such as communication devices can be connected.
C	Expansion Module Interface (EXT1)	Interface to mount the Expansion Module.
D	Power Plug Connector	Used to connect external 24 VDC power supply to terminal.
E	USB Host Interface (USB)	Conforms to USB1.1. (TYPE-A connector) Power Supply Voltage: 5 VDC 5% Output Current: 500 mA (at maximum) Connects a data transfer cable or USB-compatible printer. The maximum communication distance is 5 m (16.4 ft).
F	DIO Interface (DIO)	Interface to mount external I/O equipment using the DIO connector.

Status LED :

Color	Indicator	Operation Mode (Drawing)	Logic execution mode (when logic is enabled)
Green	ON	OFFLINE	-
		In operation	RUN
	Flashing	In operation	STOP
Red	ON	When power is turned on.	
	Flashing	In operation	Functionality severely impaired
Orange	ON	Backlight burnout ⁽¹⁾	
	Flashing	During software startup	

⁽¹⁾ The machine control system design should take into account the possibility of the backlight no longer functioning and thereby impairing or inhibiting the machine operator in the ability to correctly control the machine or process using the HMI terminal.

WARNING

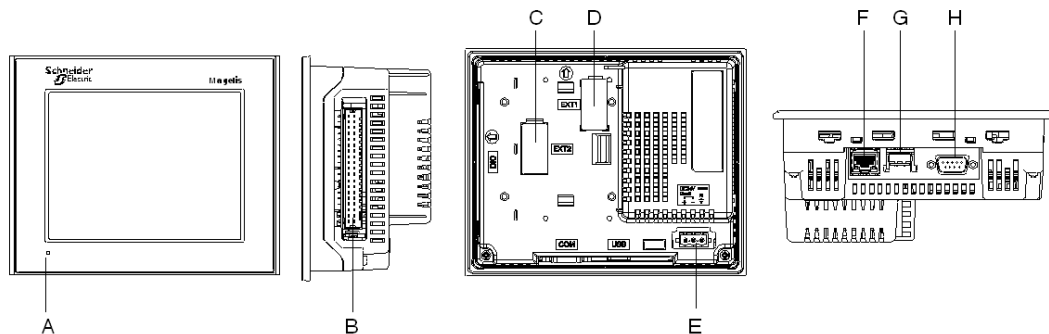
UNINTENDED EQUIPMENT OPERATION

- Do not use this equipment as the only means of control for critical system functions such as motor start/stop or power disconnect.
- Do not use this equipment as the only notification device for critical alarms, such as device overheating or overcurrent.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

XBT GC2000 Series: Parts Description

Description




Label	Part name	Description
A	Status LED	Indicates the status of: <ul style="list-style-type: none"> the XBT GC (e.g. power input, firmware RUN status or backlight condition) the logic program execution See table below.
B	DIO Interface (DIO)	Interface to mount external I/O equipment using the DIO connector.
C	AUX Unit Interface / Expansion Unit (EXT2)	Interface where additional units such as communication devices can be connected.
D	Expansion Module Interface (EXT1)	Interface to mount the Expansion Module.
E	Power Plug Connector	Used to connect external 24 VDC power supply to terminal.
F	Ethernet Interface (10BASE-T/100BASE-TX) Not available with XBT GC2120+ units	Ethernet transmission interface (10BASE-T/100BASE-TX). An RJ-45 type modular jack connector (8-pole) is used. The LED turns on or off to indicate the current status. See table below.
G	USB Host Interface (USB)	Conforms to USB1.1. (TYPE-A conn.) Power Supply Voltage: 5 VDC 5% Output Current: 500 mA (at maximum) Connects a data transfer cable or USB-compatible printer. The maximum communication distance is 5 m (16.4 ft).
H	Serial Interface (COM1)	RS232C/RS422/RS485 serial interface. SUB-D 9-pin plug type connector. Communication method is switched via software.

Status LED :

Color	Indicator	Operation Mode (Drawing)	Logic execution mode (when logic is enabled)
Green	ON	OFFLINE	-
		In operation	RUN
	Flashing	In operation	STOP
Red	ON	When power is turned on.	
	Flashing	In operation	Functionality severely impaired
Orange	ON	Backlight burnout ⁽¹⁾	
	Flashing	During software startup	

⁽¹⁾ The machine control system design should take into account the possibility of the backlight no longer functioning and thereby impairing or inhibiting the machine operator in the ability to correctly control the machine or process using the HMI terminal.

 WARNING
UNINTENDED EQUIPMENT OPERATION
<ul style="list-style-type: none"> • Do not use this equipment as the only means of control for critical system functions such as motor start/stop or power disconnect. • Do not use this equipment as the only notification device for critical alarms, such as device overheating or overcurrent.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Ethernet LED :

LED	Status	Description
Green	ON	Data transmission available
	OFF	No connection or subsequent loss of transmission
Yellow	ON	Data transmission is occurring
	OFF	No data transmission

Chapter 2

Specifications

Introduction

This chapter describes the general, functional and interface specifications of the XBT GC as well as its part names and dimensions.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
2.1	XBT GC1000 Series Specifications	32
2.2	XBT GC2000 Series Specifications	51

Section 2.1

XBT GC1000 Series Specifications

Introduction

This section describes the specifications of the XBT GC1000 Series units.

What Is in This Section?

This section contains the following topics:

Topic	Page
General Specifications	33
Performance Specifications	35
Interface Specifications	37
Wiring to the DIO Connector	45
XBT GC1000 Series Dimensions	48

General Specifications

Electrical Specifications

Characteristics		Specifications
Power Supply	Input Voltage	24 VDC
	Rated Voltage	19.2...28.8 VDC
	Allowable Voltage Drop	10 ms (max.)
	Power Consumption	18 W (max.)
	In-Rush Current	30 A (max.)
Voltage endurance between power terminal and frame ground (FG)		1000 VAC 20 mA for 1 minute
Insulation resistance between power terminal and FG		500 VDC 10 M Ω (min.)

Environmental Specifications

Characteristics		Specifications
Physical	Ambient Temperature	0...50 °C (32...122 °F) ⁽¹⁾
	Storage Temperature	-20...60 °C (-4...140 °F)
	Ambient Humidity	10...90% RH (Wet bulb temperature: 39 °C max. (102.2 °F) - no condensation)
	Storage Humidity	10...90% RH (Wet bulb temperature: 39 °C max. (102.2 °F) - no condensation)
	Dust	0.1mg/m ³ and below (non-conductive levels)
	Pollution Degree	For use in Pollution Degree 2 environment
	Atmosphere	Free of corrosive gases
	Air Pressure Vibration Resistance (operating altitude)	800...1114 hPa (2000 m (6,562 ft) max.)
Mechanical	Vibration Resistance	EC61131-2 compliant 5 to 9 Hz single-amplitude 3.5 mm (0.14 in) 9 to 150 Hz constant-accelerated velocity 9.8 m/s ² X, Y, Z directions for 10 cycle (100 minutes)
	Mechanical Shock Resistance	IEC61131-2 compliant (147 m/s ² X, Y, Z directions for 3 repetitions)

Characteristics		Specifications
Electrical	Electromagnetic interference (EMI) immunity (via EMI simulator)	Voltage: 1000 V P-P Pulse Duration: 1 μ s Rise Time: 1 ns
	Electrostatic Discharge Immunity	6 kV (complies with EN 61000-4-2 Level 3)

(1) Extended use in environments where ambient temperature is 40°C (104 °F) or higher may degrade the display quality and result in decreased contrast.

Structural Specifications

Installation	Specifications
Grounding	Grounding resistance of 100 Ω 2 mm ² (14 AWG), thicker wire or your country's applicable standard. (Same for FG and SG terminals)
Structure	Rating: IP65 NEMA #250 TYPE 4X/13 (Front surface at panel embedding) Feature size: All-in-one Installation configuration: Panel embedding
Cooling Method	Natural air circulation
Weight Approx.	1.0 kg (2.2 lb) max. (unit only)
External Dimensions	W130.0 mm (5.12 in) X H104.0 mm (4.09 in) X D76.5 mm (3.01 in)
Panel Cut Dimensions	W118.5 mm (4.67 in) X H92.5 mm (3.64 in) ⁽¹⁾ Panel thickness: 1.6...5.0 mm (0.06...0.20 in)

(1) All tolerances are +1/-0 mm and R in angle are below R3.

Performance Specifications

Performance Specifications

Characteristics		Specifications
Backup memory (Alarm, retain variables...) ⁽¹⁾		SRAM 512 K byte
Interface	DIO	Interface to external I/O equipment Input/Output points: 12-point inputs, 6-point outputs Connector: 22 pins
	AUX Interface / Expansion unit	Interface for external additional unit only (such as communication equipment) (external)
	USB Host Interface	Conforms to USB1.1. (TYPE-A conn.) x 1 Power Supply Voltage: 5 VDC 5% Output Current: 500 mA (max.) Communication Distance: 5 m max. (16.4 ft)
	Expansion Module Interface	Interface for Expansion Modules (Up to two Expansion Modules can be connected)
Clock Accuracy ⁽²⁾		65 seconds / month (at room temperature)
Maximum Application HMI + Control		16 MB FLASH EPROM

⁽¹⁾ It is user active capacity.

⁽²⁾ The XBT GC internal clock may add or lose seconds over time. At normal operating temperatures and conditions, with the XBT GC operating from its lithium battery, the accuracy is within 65 seconds per month. Variations in operating conditions and battery life can cause this tolerance to vary from -380 to +90 seconds per month. For systems where this degree of variation will be insufficient, be sure to monitor any potential loss of accuracy and make adjustments when required.

NOTE:

- When the message "RAAA051 Low battery" is displayed, supply power to the display unit and fully charge the battery. The battery charges within 24 hours to a level which allows backup operation. Completing a full charge requires about 96 hours (4 days).
- Lithium battery life:
 - 10 years when the ambient temperature of the battery is 40°C (104°F) or less,
 - 4.1 years when the ambient temperature of the battery is 50°C (122°F) or less,
 - 1.5 years when the ambient temperature of the battery is 60°C (140°F) or less.

When used for backup:

- approximately 100 days, with a fully charged battery,
- approximately 6 days, with a half-charged battery.

Display Specifications

Characteristics		Specifications
Display Type		Monochrome Amber/ Red LCD
Resolution		W320 x H240 pixels
Dot pitch		W0.24 mm (0.01 in) x H0.24 mm (0.01 in)
Effective Display Area		W78.8 mm (3.10 in) x H59.6 mm (2.35 in)
Color/Shade level		Black and White (8 Shades)
Backlight		Amber/ Red LED Note: Not user replaceable. When replacement is required, contact your local distributor.
Brightness control		8 levels of adjustment available via touch panel
Contrast Adjustment		8 levels of adjustment available via touch panel
Display Service Life		MTBF value: 50,000 hrs. (TYP) Note: Backlight display service life is not included.
Backlight Service Life		50,000 hrs. or more (at 25°C (77°F) and continuous operation - period until backlight brightness decreases to 50%)
Language Fonts		Japanese: 6962 (JIS Standards 1 & 2) (including 607 non-kanji characters) ANK: 158 (Korean fonts, Simplified Chinese and Taiwanese traditional Chinese fonts are downloadable).
Text composition	Character Sizes	Standard font: 8x8, 8x16, 16x16 and 32x32 dot fonts Stroke font: 6 to 127dot fonts
	Font Sizes	Standard font: Width can be expanded up to 8 times Height can be expanded up to 8 times ⁽¹⁾
Text	8 x 8 dots	40 Char. x 30 rows
	8 x 16 dots	40 Char. x 15 rows
	16 x 16 dots	20 Char. x 15 rows
	32 x 32 dots	10 Char. x 7 rows

⁽¹⁾ Font sizes other than those above can be set up by software.

Touch Panel Specifications

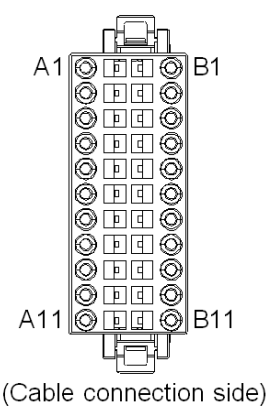
Characteristics	Specifications
Type	Resistive Film (analog)
Resolution	1024 x 1024
Service Life	1,000,000 times or more

Interface Specifications

DIO Interface (Connector)

Important: When preparing the cable to connect the wiring, check the pin numbers inscribed on the DIO Connector.

Connector XBT ZGDIO1 :

Pin Arrangement	Pin N°	Signal Name	Pin N°	Signal Name
 <p>(Cable connection side)</p>	A1	IN1	B1	IN0 (CT0)
	A2	IN3	B2	IN2 (CT1)
	A3	IN5	B3	IN4 (CT2)
	A4	IN7	B4	IN6 (CT3)
	A5	IN9	B5	IN8
	A6	IN11	B6	IN10
	A7	NC	B7	COM
	A8	0V	B8	+24V
	A9	OUT1 (PLS1, PWM1)	B9	OUT0 (PLS0, PWM0)
	A10	OUT3 (PLS3, PWM3)	B10	OUT2 (PLS2, PWM2)
	A11	OUT5	B11	OUT4

NOTE: Parenthesized signal names () indicate when Pulse Output (PLS•), PWM Output (PWM•), or Counter Input (CT•) are used.

Input Specifications

Characteristics	Specifications
Rated Voltage	24 VDC
Maximum Allowable Voltage	28.8 VDC
Input Method	Sink/Source Input
Rated Current	6.5 mA (24 VDC) (IN0, IN2, IN4, IN6) 5 mA (24 VDC) (Other input)
Input Resistance	Approx. 3.7 K Ω (IN0, IN2, IN4, IN6) Approx. 4.7 K Ω (Other input)
Input Derating	See <i>Input Derating</i> , page 39
Input Points	12
Common Lines	1

Characteristics		Specifications
Common Design		12 points/1 common line
Operation Range	ON Voltage	19 VDC or more
	OFF Voltage	5 VDC or less
Input Delay Time ⁽¹⁾	OFF to ON	0.5 to 20 ms ⁽²⁾
	ON to OFF	0.5 to 20 ms ⁽²⁾
Input Signal Display		No LED indicators
Status Display		None
Isolation Method		Photocoupler Isolation
External Connection		22-pin connector (used with Output section)
External Power Supply		24 VDC

⁽¹⁾ In the case of IN0, IN2, IN4 and IN6, the input delay time generates a 5 µs-delay. For example, in the case of a 0.5 ms-cycle sampling:

$$5 \mu\text{s (ON to OFF)} + 0.5 \text{ ms (sampling cycle)} + 5 \mu\text{s (OFF to ON)} = 0.51 \text{ ms}$$

A minimum 0.51 ms-restriction is imposed on the input pulse width.

In the case of IN1, IN3, IN5 and from IN7 to IN11, the input delay time generates a 0.5 ms-delay. For example, in the case of a 0.5 ms-cycle sampling:

$$0.5 \text{ ms (ON to OFF)} + 0.5 \text{ ms (sampling cycle)} + 0.5 \text{ ms (OFF to ON)} = 1.5 \text{ ms.}$$

A minimum 1.5 ms-restriction is imposed on the input-pulse width.

⁽²⁾ Digital filter can be set at intervals of 0.5 ms.

Input Derating

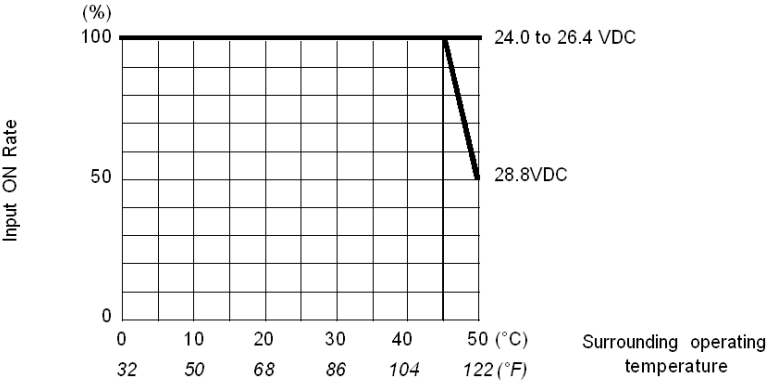
⚠ WARNING

OVERVOLTAGE AND OVERHEATING CAN CAUSE UNINTENDED OPERATION

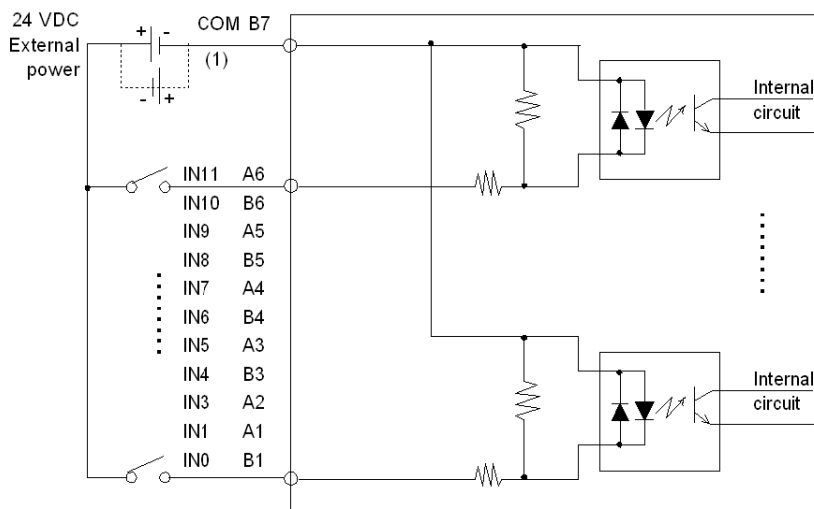
Do not exceed the XBT GC input voltage rating, the rated input ON voltage, or the number of input points.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Refer to the following drawing and perform Input Derating within the XBT GC unit's rated range.



Input Circuit



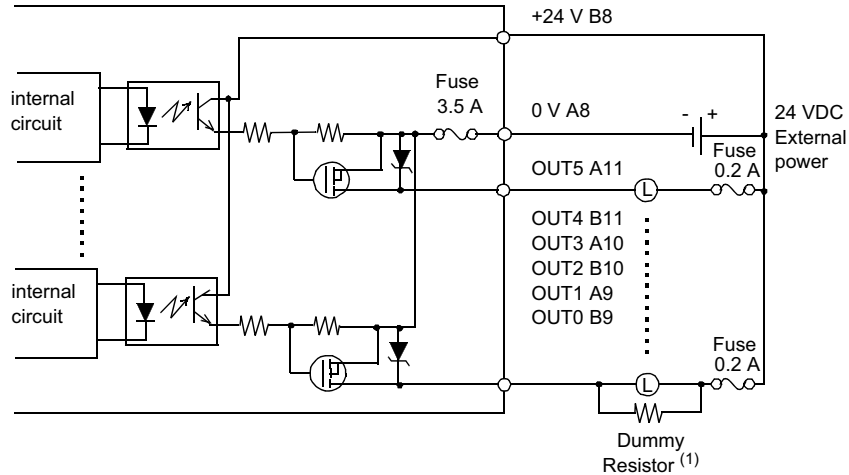
(1) Dotted line shows connection to sink output type

Output Specifications

Output Terminal		OUT0 to OUT3	OUT4 to OUT5
Rated Voltage		24 VDC	
Allowable Voltage Range		20.4...28.8 VDC	
Output Method	XBT GC1100U	Sink Output	
	XBT GC1100T	Source Output	
Maximum Load Current		0.2 A/point, 1.2 A/common	
Output Voltage Drop		0.5 VDC or less	
Output Delay Time	OFF to ON	5 μ s or less (With output at 24 VDC, 200 mA)	0.5 ms or less (With output at 24 VDC, 200 mA)
	ON to OFF	5 μ s or less (With output at 24 VDC, 200 mA)	0.5 ms or less (With output at 24 VDC, 200 mA)
Voltage Leakage (when OFF)		0.1 mA or less	
Clamp Voltage		39 V \pm 1 V	
Type of Output		Transistor Output	
Common Lines		1	
Common Design		6 points/1 common line	
External Connection		22-pin connector (also used for Input)	

Output Terminal	OUT0 to OUT3	OUT4 to OUT5
Output Protection Type	Output is unprotected	
Internal Fuse	2.5 A, 125 V Chip fuse (not replaceable)	
Surge Control Circuit	Zener diode	
Output Points	6	
Output Signal Display	No LED indicators	
Status Display Element	None	
Isolation Method	Photocoupler Isolation	
External Power Supply	24 VDC	

XBT GC1100U Output Circuit (Sink type):



(1) (Example) The output delay time (OFF to ON) is 1.5 μ s where the output current is 50 mA. Install an external dummy resistor to increase the amount of current when faster response is required when the load is light.

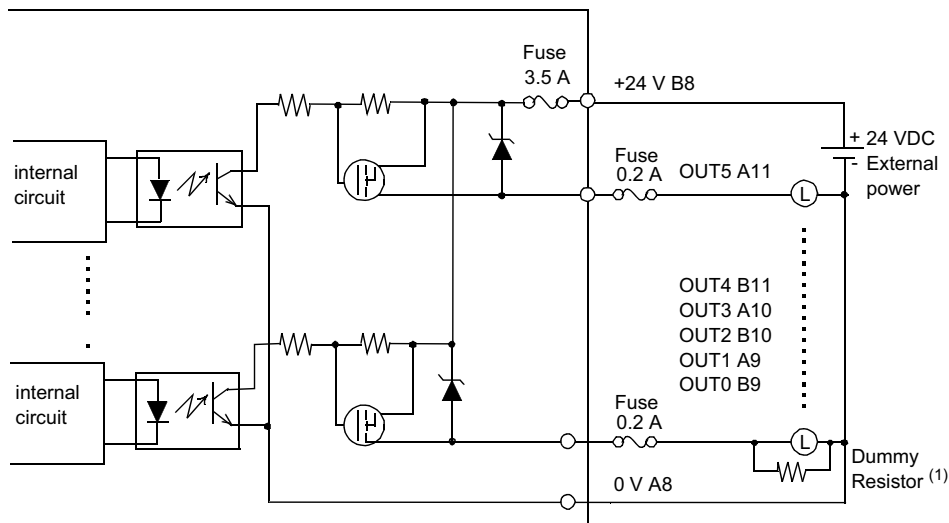
⚠ WARNING

OUTPUT SHORT CIRCUIT OR OVERVOLTAGE

Install an appropriate slow-blow fuse to protect the output line from a short-circuit or connection overload condition.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

XBT GC1100T Output Circuit (Source type):



⁽¹⁾ (Example) The output delay time (OFF to ON) is 1.5 μ s where the output current is 50 mA. Install an external dummy resistor to increase the amount of current when faster response is required when the load is light.

⚠ WARNING

OUTPUT SHORT CIRCUIT OR OVERVOLTAGE

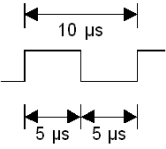
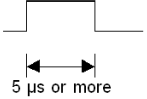
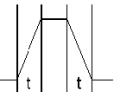
Install an appropriate slow-blow fuse to protect the output line from a short-circuit or connection overload condition.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

High-Speed Counter / Pulse Catch Input Specifications

DIO Standard Input/Output is used as a High-Speed Counter Input. The setup is done by SoMachine.

For more information see Magelis XBT GC HMI Controller Programming Guide (*see Magelis XBTGC HMI Controller, Programming Guide*).

Characteristics	Counter		Pulse Catch
Input	24 VDC Open Collector		24 VDC Open Collector
	Single Phase (4 points)	2 Phase (1 point or 2 points)	
Input Points	CT0 (IN0), CT1 (IN2), CT2 (IN4), CT3 (IN6)	CT0 (IN0), CT1 (IN2) (used as pair) CT0: A Phase, CT1: B Phase CT2 (IN4), CT3 (IN6) CT2: A Phase, CT3: B Phase	IN0, IN2, IN4, IN6
Min. Pulse Width (Pulse Input)			Input signal ON width 
Count Speed (Rise, Fall time)	 $t = 1 \mu\text{s}$ or less (100 kpps)		-
Phase	1 Phase	90 degree phase differential 2-phase signal 1 phase + directional signal	-
High Speed Count Frequency	100 kHz	50 kHz	-
Count Edge designation	Available	Not Available	-
Count Register	32 Bit UP/DOWN Counter		-
Counter Mode change	Set through software		-
Upper/Lower Limit Setting	Not Available		-
Preload - Prestrobe	Available		-
Marker Input (Counter Value Clear)	None	IN3, IN7	-

Pulse/PWM Output Specifications

DIO Standard Input/Output is used as a Pulser Output or PWM Output. The setup is done by SoMachine.

For more information see Magelis XBT GC HMI Controller Programming Guide (*see Magelis XBTGC HMI Controller, Programming Guide*).

Characteristics	Pulse Output	PWM Output
Output Points	4 points	
Output Method	PLS0 to PLS3 (OUT0 to OUT3) defined by user	PWM0 to PWM3 (OUT0 to OUT3) defined by user
Load Voltage	24 VDC	
Min. Load Current	1 mA	
Max. Output Frequency	Up to 65 kHz possible per point (set through software)	
Pulse Acceleration/Deceleration Speed	Available	-
ON Duty	50% +/-10% (at 65 kHz) ⁽¹⁾	19 to 81% (at 65 kHz) ⁽²⁾

⁽¹⁾ The ON Duty tolerance (10%) will be reduced if the Output frequency is low.

⁽²⁾ The ON Duty (effective range) will be widened if the Output frequency is low.

Wiring to the DIO Connector

Introduction

⚠ CAUTION

HMI UNIT DAMAGE

Be sure to remove the DIO Connector from the XBT GC unit prior to wiring.

Failure to follow these instructions can result in injury or equipment damage.

Screwdriver Required to Wire Connectors

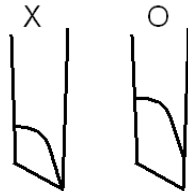
Recommended type: 1891348-1 (Tyco Electronics AMP)

If another manufacturer is used, be sure the part has the following dimensions:

- point depth: 1.5 mm (*0.06 in*)
- point height: 2.4 mm (*0.09 in*)

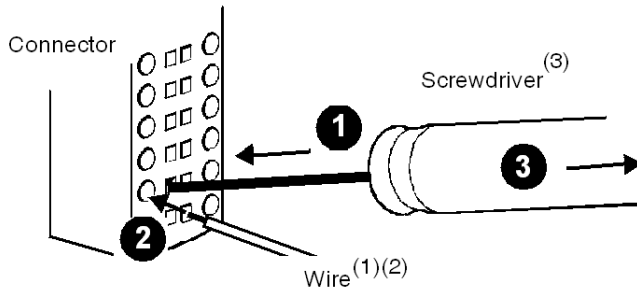
Point shape must be DIN5264A, and meet Security Standard DN EN60900.

Also, the screwdriver tip must be flat as indicated in order to access the narrow hole of the connector:



The connectors are a spring clamp type.

Procedure



(1) Wire should be 0.20 mm² (24 AWG) 24 AWG to 0.80 mm² 18 AWG, with the end twisted. Applicable wire sizes are UL1015 and UL1007.

(2) Strip 7.0mm [0.28in.] of jacket from the wire. Strip only the amount of jacket required. If too much jacket is removed, the ends may short against each other or against the terminals, which can create an electric short. If not enough jacket is removed, the wire may not make sufficient contact with the terminal.

Insert each wire completely into its opening. Improper insertion can lead to a loss of unit power or short circuit, either against the wire filaments or against the terminals, or to over heating of the wire and terminal.

(3) Do not rotate the point of the screwdriver inside the square-shaped opening. It may damage the equipment.

⚠ WARNING

IMPROPER WIRING PRACTICES CAN MAKE EQUIPMENT INOPERABLE

- Use only the specified wire sizes for I/O channels and power supplies.
- Prepare wires and make connections as specified in this documentation.
- Do not connect more than one wire per terminal block connector.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

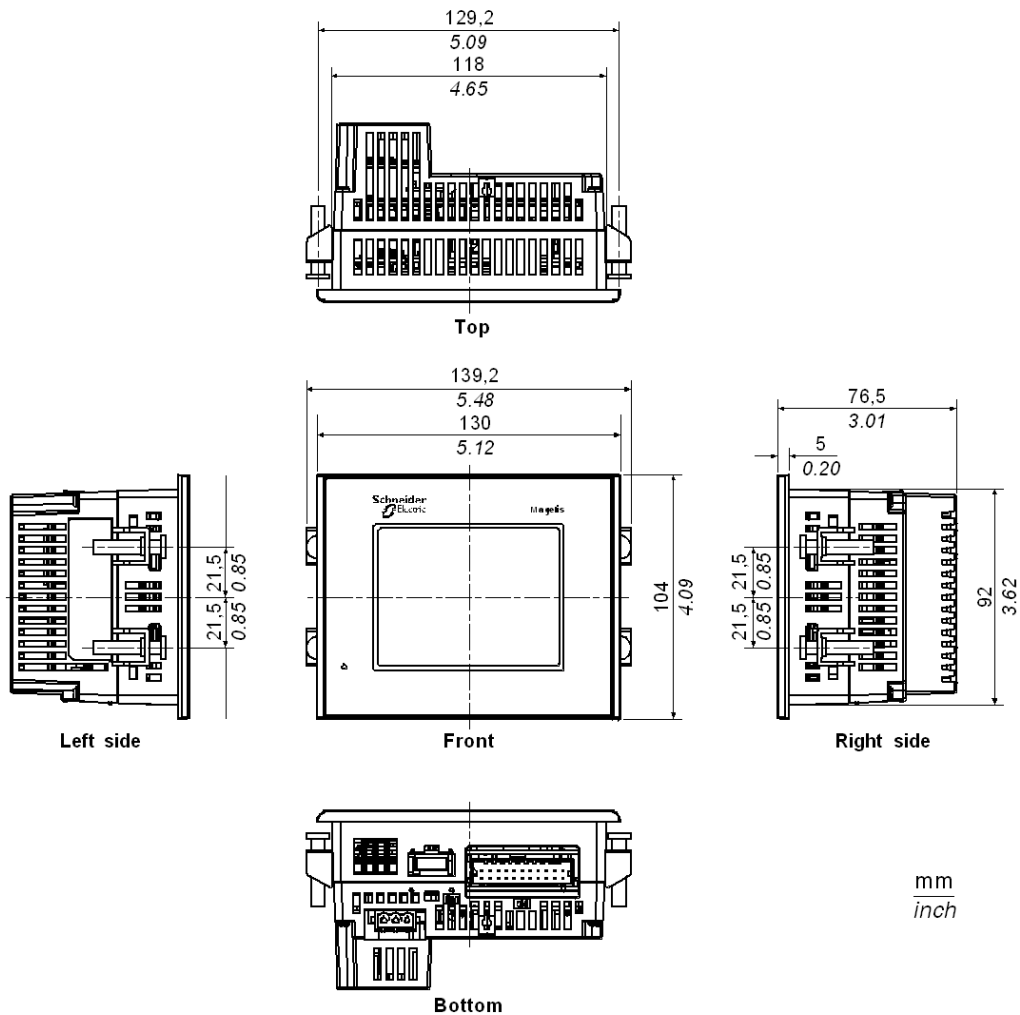
Use the following procedure to connect the wires to the connectors:

Step	Action
1	Insert the screwdriver into the square-shaped hole. This will open the wire's round-shaped hole.
2	Hold the screwdriver and insert the wire into the wire's round-shaped hole.
3	Take out the screwdriver from the square-shaped hole. The round-shaped hole will then close, and the wire will be held securely in place.

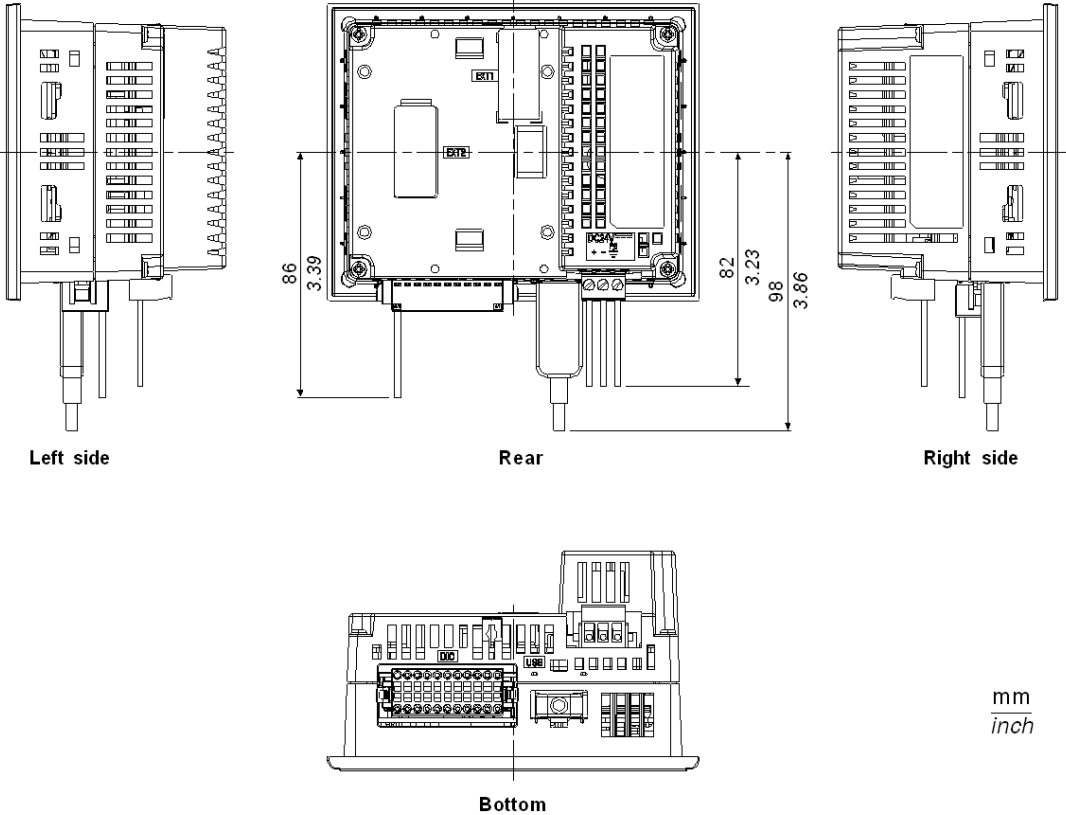
NOTE: To remove the wire, re-insert the screwdriver into the square-shaped hole and when the wire's spring clamp releases, pull the wire out.

XBT GC1000 Series Dimensions

Installation Fasteners Attached Dimensions

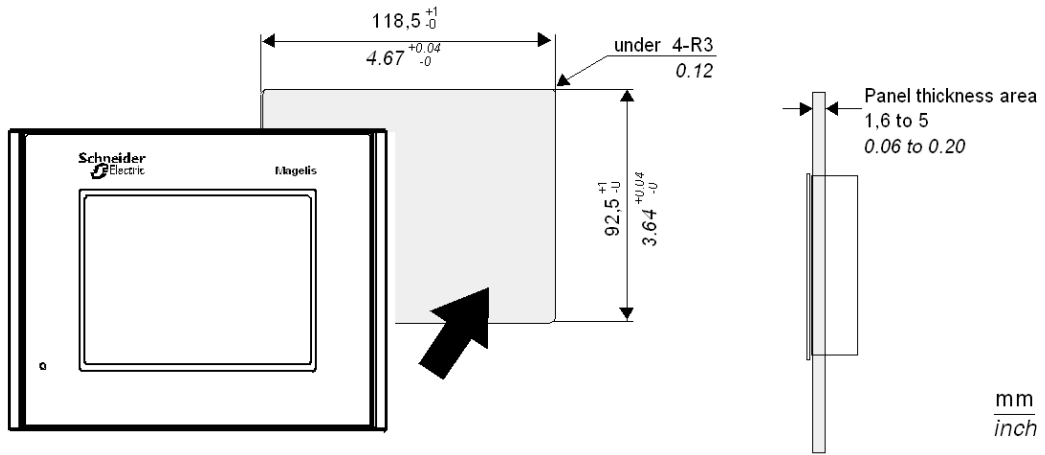


Cable Attached Dimensions

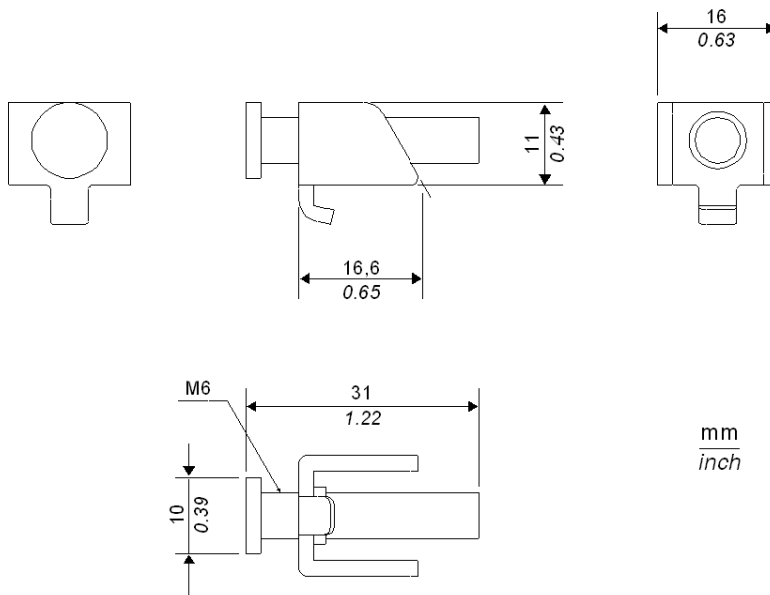


Important: All the above values are designed to allow for cable bending. The dimensions given here are representative values depending on the type of connection cable used. Therefore, they are all intended for reference only.

Panel Cut Dimensions



Installation Fasteners



Section 2.2

XBT GC2000 Series Specifications

Introduction

This section describes the specifications of the XBT GC2000 Series units.

What Is in This Section?

This section contains the following topics:

Topic	Page
General Specifications	52
Performance Specifications	54
Interface Specifications	57
Wiring to the DIO Connector	68
XBT GC2000 Series Dimensions	70

General Specifications

Electrical Specifications

Characteristics		Specifications
Power Supply	Input Voltage	24 VDC
	Rated Voltage	19.2...28.8 VDC
	Allowable Voltage Drop	3 ms (max.)
	Power Consumption	27 W (max.)
	In-Rush Current	30 A (max.)
Voltage endurance between power terminal and frame ground (FG)		1000 VAC 20 mA for 1 minute
Insulation resistance between power terminal and FG		500 VDC 10 M Ω (min.)

Environmental Specifications

Characteristics		Specifications
Physical	Ambient Temperature	0...50 °C (32... 122 °F) ⁽¹⁾
	Storage Temperature	-20...60 °C (-4... 140 °F)
	Ambient Humidity	10...90% RH (Wet bulb temperature: 39 °C max. (102.2 °F) - no condensation)
	Storage Humidity	10...90% RH (Wet bulb temperature: 39 °C max. (102.2 °F) - no condensation)
	Dust	0.1 mg/m ³ and below (non-conductive levels)
	Pollution Degree	For use in Pollution Degree 2 environment
	Atmosphere	Free of corrosive gases
	Atmospheric endurance (XBT GC operation altitude)	800 to 1114 hPa (2000 m (6,561 ft) max.)
Mechanical	Vibration Resistance	IEC61131-2 compliant 5 to 9 Hz single-amplitude 3.5 mm (0.14 in) 9 to 150Hz constant-accelerated velocity 9.8 m/s ² X, Y, Z directions for 10 cycle (100 minute)
	Mechanical Shock Resistance	IEC61131-2 compliant (147m/s ² X, Y, Z directions for 3 repetitions)

Characteristics		Specifications
Electrical	Electromagnetic interference (EMI) immunity (via EMI simulator)	Voltage: 1000 V _{p-p} Pulse Duration: 1 μs Rise Time: 1 ns
	Electrostatic Discharge Immunity	6 kV (complies with EN 61000-4-2 Level 3)

(1) Extended use in environments where ambient temperature is 40°C (104 °F) or higher may degrade the display quality and result in decreased contrast.

Structural Specifications

Installation	Specifications
Grounding	Grounding resistance of 100 Ω 2 mm ² (AWG 14), thicker wire or your country's applicable standard. (Same for FG and SG terminals)
Structure	Rating: IP65 NEMA #250 TYPE 4X/13 (Front surface at panel embedding) Feature size: All-in-one Installation configuration: Panel embedding
Cooling Method	Natural air circulation
Weight Approx.	1.0 kg (2.2 lb) max. (unit only)
External Dimensions	W167.5 mm (6.59 in) X H135.0 mm (5.31 in) X D78.0 mm (3.07 in)
Panel Cut Dimensions	W156.0 mm (6.14 in) X H123.5 mm (4.86 in) ⁽¹⁾ Panel thickness: 1.6...5.0 mm (0.06...0.20 in)]

(1) All tolerances are +1/-0mm and R in angle are below R3.

Performance Specifications

Performance Specifications

Model		XBT GC2120•	XBT GC2230•, XBT GC2330•
Backup memory (Alarm, retain variables...) ⁽¹⁾		SRAM 512 K byte	
Interface	Serial Interface	COM1: RS232C / RS422 / RS485 Asynchronous Transmission: Data Length: 7 bit / 8 bit Parity: none, odd or even Stop Bit: 1 bit / 2 bit Data Transmission Speed: 2400 bps to 115.2 Kbps Connector: SUB-D 9 pin plug	
	Ethernet Interface	-	Ethernet (IEEE802.3u, 10BASE-T/100BASE-TX) Connector: modular jack connector (RJ-45)
	DIO Interface	Interface for external I/O equipment Input/Output points: 16-point inputs, 16-point outputs Connector: 38 pins	
	AUX Unit Interface / Expansion Unit (EXT2)	Interface for external additional unit only (such as communication equipment) (external)	
	USB Host Interface	Conforms to USB1.1. (TYPE-A conn.) x 1 Power Supply Voltage: 5 VDC 5% Output Current: 500 mA (max.) Communication Distance: 5 m max. (16.4 ft)	
	Expansion Module Interface	Interface for Expansion Modules Three Expansion Modules can be inserted	
Clock Accuracy ⁽²⁾		+/- 65 seconds/ month (at room temperature)	
Maximum Application HMI + Control		16 MB FLASH EPROM	

(1) It is user active capacity.

(2) The XBT GC internal clock may add or lose seconds over time. At normal operating temperatures and conditions, with the XBT GC operating from its lithium battery, the accuracy is within 65 seconds per month. Variations in operating conditions and battery life can cause this tolerance to vary from -380 to +90 seconds per month. For systems where this degree of variation will be insufficient, be sure to monitor any potential loss of accuracy and make adjustments when required.

NOTE:

- When the message "RAAA051 Low battery" is displayed, supply power to the display unit and fully charge the battery. The battery charges within 24 hours to a level which allows backup operation. Completing a full charge requires about 96 hours (4 days).
- Lithium battery life:
 - 10 years when the ambient temperature of the battery is 40°C (104°F) or less,
 - 4.1 years when the ambient temperature of the battery is 50°C (122°F) or less,
 - 1.5 years when the ambient temperature of the battery is 60°C (140°F) or less.

When used for backup:

- approximately 100 days, with a fully charged battery,
- approximately 6 days, with a half-charged battery.

Display Specifications

Model	XBT GC2120•	XBT GC2230•	XBT GC2330•
Display Type	Monochrome LCD	STN Color LCD	TFT Color LCD
Resolution	W320 x H240 pixels		
Dot pitch	W0.36 mm (0.01 in) x H0.36 mm (0.01 in)		
Effective Display Area	W117.2 mm (4.61 in) x H88.4 mm (3.48 in)		W115.2 mm (4.54 in) x H86.4 mm (3.40 in)
Color/Shade level	Black and White (16 Shades) (Enables blink feature)	4096 Colors (Enables blink feature)	65,536 Colors (No 3-speed blink)/16,384 Colors (3-speed blink)
Backlight	White LED		
	Note: Not user replaceable. When replacement is required, contact your local distributor.		
Brightness control	8 levels of adjustment available via touch panel		
Contrast Adjustment	8 levels of adjustment available via touch panel	-	
Display Service Life	MTBF value: 50,000 hrs. (TYP) Note: Backlight display service life is not included.		
Backlight Service Life	50,000 hrs. or more (at 25°C (77°F) and continuous operation - period until backlight brightness decreases to 50%)		
Language Fonts	Japanese: 6962 (JIS Standards 1 & 2) (including 607 non-kanji characters) ANK: 158 (Korean fonts, Simplified Chinese and Taiwanese traditional Chinese fonts are downloadable.)		
Text composition	Character Sizes	Standard font: 8x8, 8x16, 16x16 and 32x32 dot fonts Stroke font: 6 to 127 dot fonts	
	Font Sizes	Standard font: Width can be expanded up to 8 times. Height can be expanded up to 8 times ⁽¹⁾	

Specifications

Model		XBT GC2120•	XBT GC2230•	XBT GC2330•
Text	8 x 8 dots	40 Char. x 30 rows		
	8 x 16 dots	40 Char. x 15 rows		
	16 x 16 dots	20 Char. x 15 rows		
	32 x 32 dots	10 Char. x 7 rows		

(1) Font sizes other than those above can be set up by software.

Touch Panel Specifications

Characteristics	Specifications
Type	Resistive Film (analog)
Resolution	1024 x 1024
Service Life	1,000,000 times or more

Interface Specifications

Presentation

This section describes the specifications of each interface of the XBT GC2000 Series unit.

Important:

- The XBT GC unit's serial Interface is not isolated. When the host (PLC) unit is also not isolated, be sure to connect the #5 SG (Signal Ground) terminal to reduce the risk of damaging the RS232C/RS422/RS485 circuit.
- In the XBT GC unit, SG (signal ground) and FG (frame ground) are connected internally. When connecting an external device to the XBT GC using the SG terminal, be sure to check that no short-circuit loop is created when you setup the system.

DANGER

ELECTRIC SHOCK

- Make a direct connection between the frame ground (FG) terminal and ground.
- Do not connect other devices to ground through the frame ground (FG) terminal of this device.
- Install all cables according to local codes and requirements. If local codes do not require grounding, follow a reliable guide such as the US National Electrical Code, Article 800.

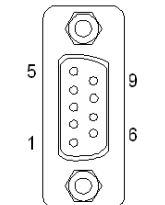
Failure to follow these instructions will result in death or serious injury.

NOTE: When isolation is necessary, you can use the RS232C isolation unit (XBT ZGI232) on COM1.

Serial Interfaces (COM1)

This interface is used to connect an RS232C/RS422/RS485 cable. Communication method is switched via software. SUB-D 9-pin plug connector is used.

In the case of RS232C :

Pin Arrangement	Pin N°	RS232C		
		Signal Name	Direction	Meaning
 <p>(XBT GC unit side)</p>	1	CD	Input	Carrier Detect
	2	RD (RXD)	Input	Receive Data
	3	SD (TXD)	Output	Send Data
	4	ER (DTR)	Output	Data Terminal Ready
	5	SG	-	Signal Ground
	6	DR (DSR)	Input	Data Set Ready
	7	RS (RTS)	Output	Request to Send
	8	CS (CTS)	Input	Send Possible
	9	CI (RI) / VCC	Input / -	Called status display 5 V 5% Output 0.25 A ⁽¹⁾
	Shell	FG	-	Frame Ground (Common with SG)

⁽¹⁾ The RI/VCC selection for Pin #9 is switched via software. The VCC output is not protected against overcurrent. To help avoid damage, use only the rated current and install an appropriately rated fuse.

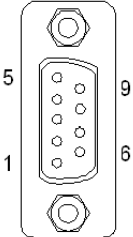
NOTICE

INOPERABLE EQUIPMENT DUE TO OVERCURRENT OR SHORTCIRCUIT

Install a 0.25 A slow-blow fuse to protect the VCC output.

Failure to follow these instructions can result in equipment damage.

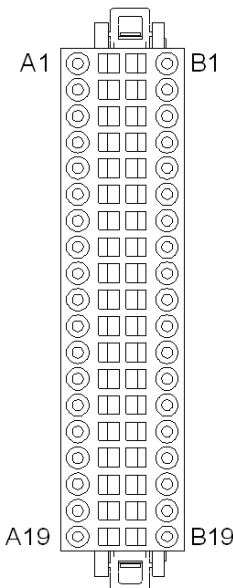
In the case of RS422 / RS485 :

Pin Arrangement	Pin N°	RS422 / RS485		
		Signal Name	Direction	Meaning
 <p>(XBT GC unit side)</p>	1	RDA	Input	Receive Data A(+) / RxD0
	2	RDB	Input	Receive Data B(-) / RxD1
	3	SDA	Output	Send Data A(+) / TxD0
	4	ERA	Output	Data Terminal Ready A(+)
	5	SG	-	Signal Ground
	6	CSB	Input	Send Possible B(-) / TxD1
	7	SDB	Output	Send Data B(-)
	8	CSA	Input	Send Possible A(+)
	9	ERB	Output	Data Terminal Ready B(-)
	Shell	FG	-	Frame Ground / Shield (Common with SG)

DIO Interface (Connector)

When preparing the cable to connect the wiring, check the pin numbers inscribed on the DIO Connector.

Connector XBT ZGDIO2 :

Pin Arrangement	Pin N°	Signal Name	Pin N°	Signal Name
 <p>(Cable connection side)</p>	A1	IN1	B1	IN0 (CT0)
	A2	IN3	B2	IN2 (CT1)
	A3	IN5	B3	IN4 (CT2)
	A4	IN7	B4	IN6 (CT3)
	A5	IN9	B5	IN8
	A6	IN11	B6	IN10
	A7	IN13	B7	IN12
	A8	IN15	B8	IN14
	A9	NC	B9	COM
	A10	Sink: NC Source: +24V	B10	Sink: +24V Source: +24V
	A11	Sink: 0V Source: NC	B11	Sink: 0V Source: 0V
	A12	OUT1 (PLS1, PWM1)	B12	OUT0 (PLS0, PWM0)
	A13	OUT3 (PLS3, PWM3)	B13	OUT2 (PLS2, PWM2)
	A14	OUT5	B14	OUT4
	A15	OUT7	B15	OUT6
	A16	OUT9	B16	OUT8
	A17	OUT11	B17	OUT10
	A18	OUT13	B18	OUT12
	A19	OUT15	B19	OUT14

NOTE: Parenthesized signal names () indicate when Pulse Output (PLS•), PWM Output (PWM•), or Counter Input (CT•) are used.

Input Specifications

Characteristics		Specifications
Rated Voltage		24 VDC
Maximum Allowable Voltage		28.8 VDC
Input Method		Sink/Source Input
Rated Current		6.5 mA (24 VDC) (IN0, IN2, IN4, IN6) 5 mA (24 VDC) (Other input)
Input Resistance		Approx. 3.7 K Ω (IN0, IN2, IN4, IN6) Approx. 4.7 K Ω (Other input)
Input Derating		See <i>Input Derating, page 62</i>
Input Points		16
Common Lines		1
Common Design		16 points/1 common line
Operation Range	ON Voltage	19 VDC or more
	OFF Voltage	5 VDC or less
Input Delay Time ⁽¹⁾	OFF to ON	0.5 to 20 ms ⁽²⁾
	ON to OFF	0.5 to 20 ms ⁽²⁾
Input Signal Display		No LED indicators
Status Display		None
Isolation Method		Photocoupler Isolation
External Connection		38-pin connector (used with Output section)
External Power Supply		24 VDC

⁽¹⁾ In the case of IN0, IN2, IN4, and IN6, the input delay time generates a 5 μ s-delay. For example, in the case of a 0.5 ms-cycle sampling:

$$5 \mu\text{s (ON to OFF)} + 0.5 \text{ ms (sampling cycle)} + 5 \mu\text{s (OFF to ON)} = 0.5 \text{ ms}$$

A minimum 0.51 ms-restriction is imposed on the input pulse width.

In the case of IN1, IN3, IN5, and from IN7 to IN15, the input delay time generates a 0.5 ms-delay.


For example, in the case of a 0.5 ms-cycle sampling:

$$0.5 \text{ ms (ON to OFF)} + 0.5 \text{ ms (sampling cycle)} + 0.5 \text{ ms (OFF to ON)} = 1.5 \text{ ms.}$$

A minimum 1.5 ms-restriction is imposed on the input-pulse width.

⁽²⁾ Digital filter can be set at intervals of 0.5 ms.

Input Derating

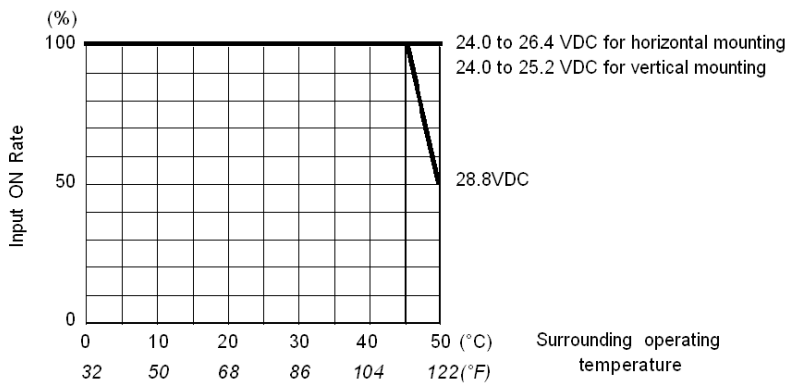
 **WARNING**

OVERVOLTAGE AND OVERHEATING CAN CAUSE UNINTENDED OPERATION

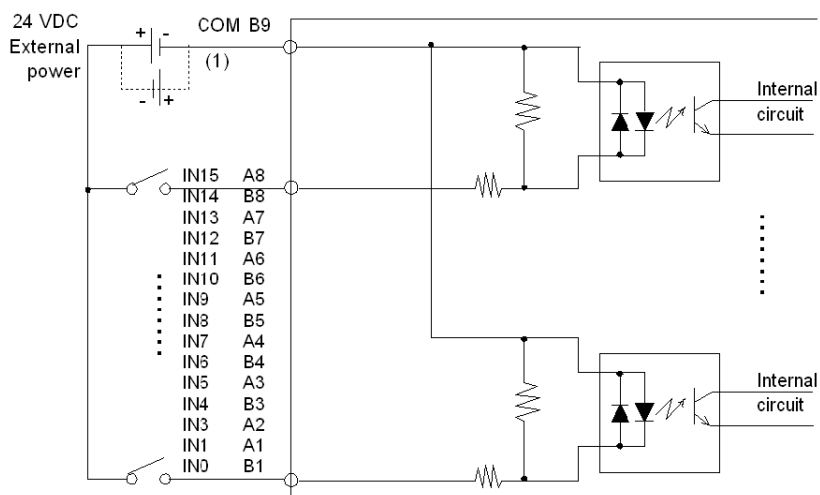
Do not exceed the XBT GC input voltage rating, the rated input ON voltage, or the number of input points.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Refer to the following drawing and perform Input Derating within the XBT GC unit's rated range.



Input Circuit



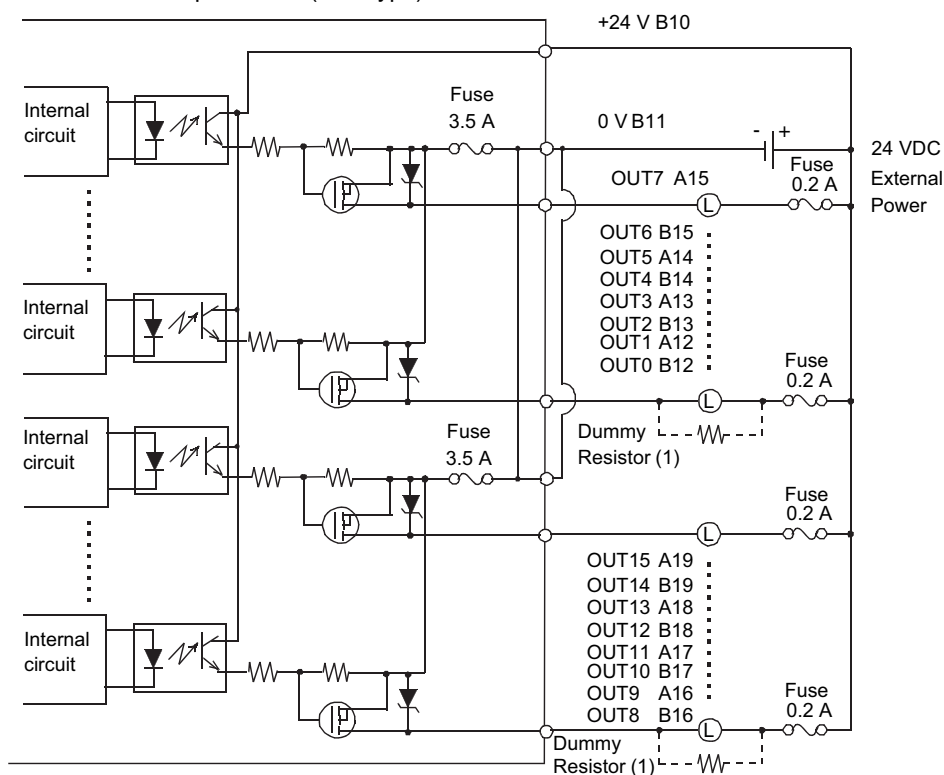
(1) Dotted line shows connection to sink output type

Output Specifications

Output Terminal		OUT0 to OUT3	OUT4 to OUT15
Rated Voltage		24 VDC	
Allowable Voltage Range		20.4...28.8 VDC	
Output Method	XBT GC2••0U	Sink Output	
	XBT GC2••0T	Source Output	
Maximum Load Current		0.2 A/point, 1.6 A/common	
Output Voltage Drop		0.5 VDC or less	
Output Delay Time	OFF to ON	5 μ s or less (With output at 24 VDC, 200 mA)	0.5 ms or less (With output at 24 VDC, 200 mA)
	ON to OFF	5 μ s or less (With output at 24 VDC, 200 mA)	0.5 ms or less (With output at 24 VDC, 200 mA)
Current Leakage (when OFF)		0.1 mA or less	
Clamp Voltage		39 V \pm 1 V	
Type of Output		Transistor Output	
Common Lines		2	
Common Design		8 points/1 common line x 2	
External Connection		38-pin connector (also used for Input)	
Output Protection Type		Output is unprotected	

Output Terminal	OUT0 to OUT3	OUT4 to OUT15
Internal Fuse	2.5 A, 125 V Chip fuse (not replaceable)	
Surge Control Circuit	Zener diode	
Output Points	16	
Output Signal Display	No LED indicators	
Status Display Element	None	
Isolation Method	Photocoupler Isolation	
External Power Supply	24 VDC	

XBT GC2••0U Output Circuit (Sink type):



(1) (Example) The output delay time (OFF to ON) is 1.5 μ s where the output current is 50 mA. Install an external dummy resistor to increase the amount of current when faster response is required when the load is light.

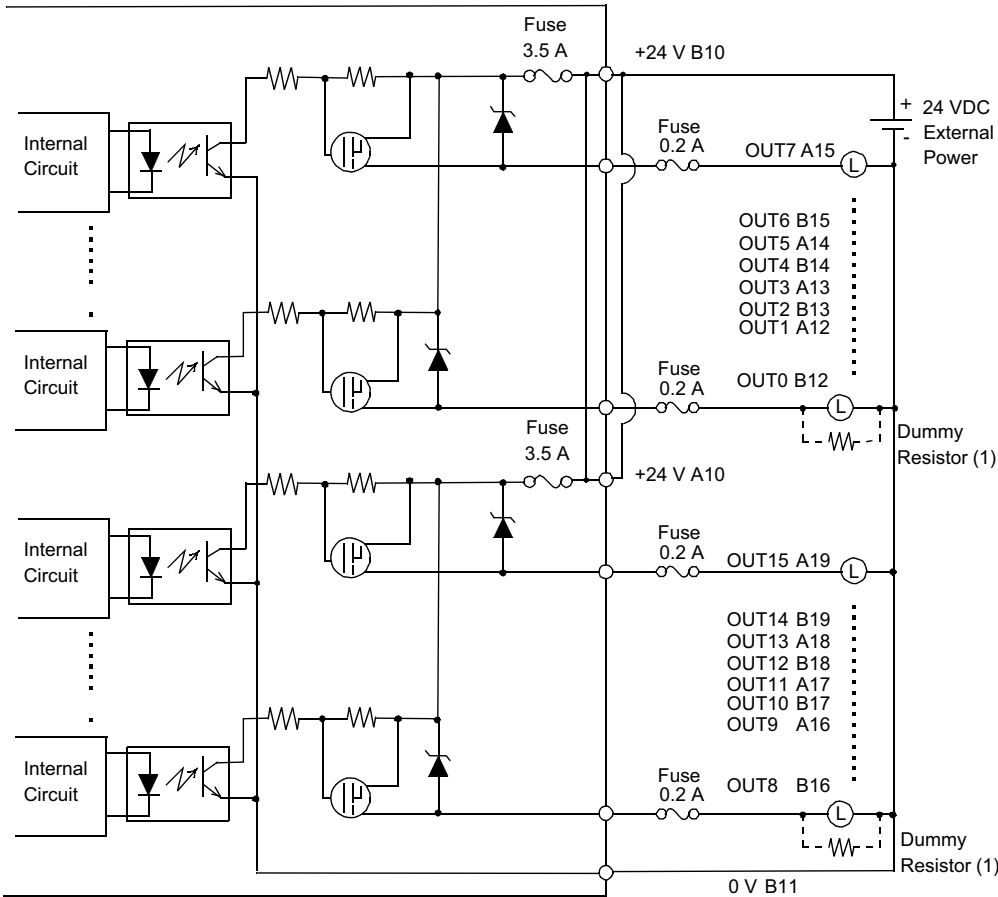
⚠ WARNING

OUTPUT SHORT CIRCUIT OR OVERVOLTAGE

Install an appropriate slow-blow fuse to protect the output line from a short-circuit or connection overload condition.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

XBT GC2••0T Output Circuit (Source type):



(1) (Example) The output delay time (OFF to ON) is 1.5 μ s where the output current is 50 mA. Install an external dummy resistor to increase the amount of current when faster response is required when the load is light.

⚠ WARNING

OUTPUT SHORT CIRCUIT OR OVERVOLTAGE

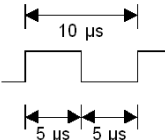
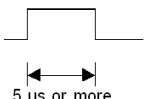
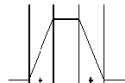
Install an appropriate slow-blow fuse to protect the output line from a short-circuit or connection overload condition.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

High-Speed Counter / Pulse Catch Input Specifications

DIO Standard Input/Output is used as a High-Speed Counter Input. The setup is done by SoMachine.

For more information see Magelis XBT GC HMI Controller Programming Guide (*see Magelis XBTGC HMI Controller, Programming Guide*).

Characteristics	Counter		Pulse Catch
Input	24 VDC Open Collector		24 VDC Open Collector
	Single Phase (4 points)	2 Phase (1 point or 2 points)	
Input Points	CT0 (IN0), CT1 (IN2), CT2 (IN4), CT3 (IN6)	CT0 (IN0), CT1 (IN2) (used as pair) CT0: A Phase, CT1: B Phase CT2 (IN4), CT3 (IN6) CT2: A Phase, CT3: B Phase	IN0, IN2, IN4, IN6
Min. Pulse Width (Pulse Input)			Input signal ON width 
Count Speed (Rise, Fall time)	 t = 1 µs or less (100 kpps)		-
Phase	1 Phase	90 degree phase differential 2-phase signal 1 phase + directional signal	-
High Speed Count Frequency	100 kHz	50 kHz	-

Characteristics	Counter		Pulse Catch
Count Edge designation	Available	Not Available	-
Count Register	32 Bit UP/DOWN Counter		-
Counter Mode change	Set through software		-
Upper/Lower Limit Setting	Not Available		-
Preload - Prestrobe	Available		-
Marker Input (Counter Value Clear)	None	IN3, IN7	-

Pulse/PWM Output Specifications

DIO Standard Input/Output is used as a Pulser Output or PWM Output. The setup is done by SoMachine.

For more information see Magelis XBT GC HMI Controller Programming Guide (*see Magelis XBTGC HMI Controller, Programming Guide*).

Characteristics	Pulse Output	PWM Output
Output Points	4 points	
Output Method	PLS0 to PLS3 (OUT0 to OUT3) defined by user	PWM0 to PWM3 (OUT0 to OUT3) defined by user
Load Voltage	24 VDC	
Min. Load Current	1 mA	
Max. Output Frequency	Up to 65 kHz possible per point (set through software)	
Pulse Acceleration/Deceleration Speed	Available	-
ON Duty	50% +/-10% (at 65 kHz) ⁽¹⁾	19 to 81% (at 65 kHz) ⁽²⁾

⁽¹⁾ The ON Duty tolerance (10%) will be reduced if the Output frequency is low.

⁽²⁾ The ON Duty (effective range) will be widened if the Output frequency is low.

Wiring to the DIO Connector

Introduction

CAUTION

HMI UNIT DAMAGE

Be sure to remove the DIO Connector from the XBT GC unit prior to wiring.

Failure to follow these instructions can result in injury or equipment damage.

Screwdriver Required to Wire Connectors

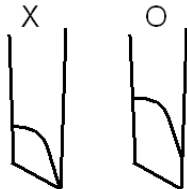
Recommended type: 1891348-1 (Tyco Electronics AMP)

If another manufacturer is used, be sure the part has the following dimensions:

- point depth: 1.5 mm (*0.06 in*)
- point height: 2.4 mm (*0.09 in*)

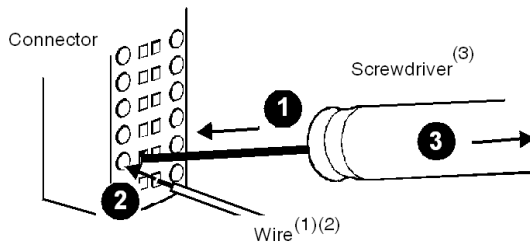
Point shape must be DIN5264A and meet standard DN EN60900.

Also, the screwdriver tip must be flat as indicated in order to access the narrow hole of the connector:



The connectors are a spring clamp type.

Procedure



(1) Wire should be 0.20 mm² (24 AWG) to 0.80 mm² (18 AWG), with the end twisted. Applicable wire sizes are UL1015 and UL1007.

(2) Strip 7.0 mm (0.28 in) of jacket from the wire. Strip only the amount of jacket required. If too much jacket is removed, the ends may short against each other or against the terminals, which can create an electric short. If not enough jacket is removed, the wire may not make sufficient contact with the terminal.

Insert each wire completely into its opening. Improper insertion can lead to a loss of unit power or short circuit, either against the wire filaments or against the terminals, or to over heating of the wire and terminal.

(3) Do not rotate the point of the screwdriver inside the square-shaped opening. It may damage the equipment.

⚠ WARNING

IMPROPER WIRING PRACTICES CAN MAKE EQUIPMENT INOPERABLE

- Use only the specified wire sizes for I/O channels and power supplies.
- Prepare wires and make connections as specified in this documentation.
- Do not connect more than one wire per terminal block connector.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

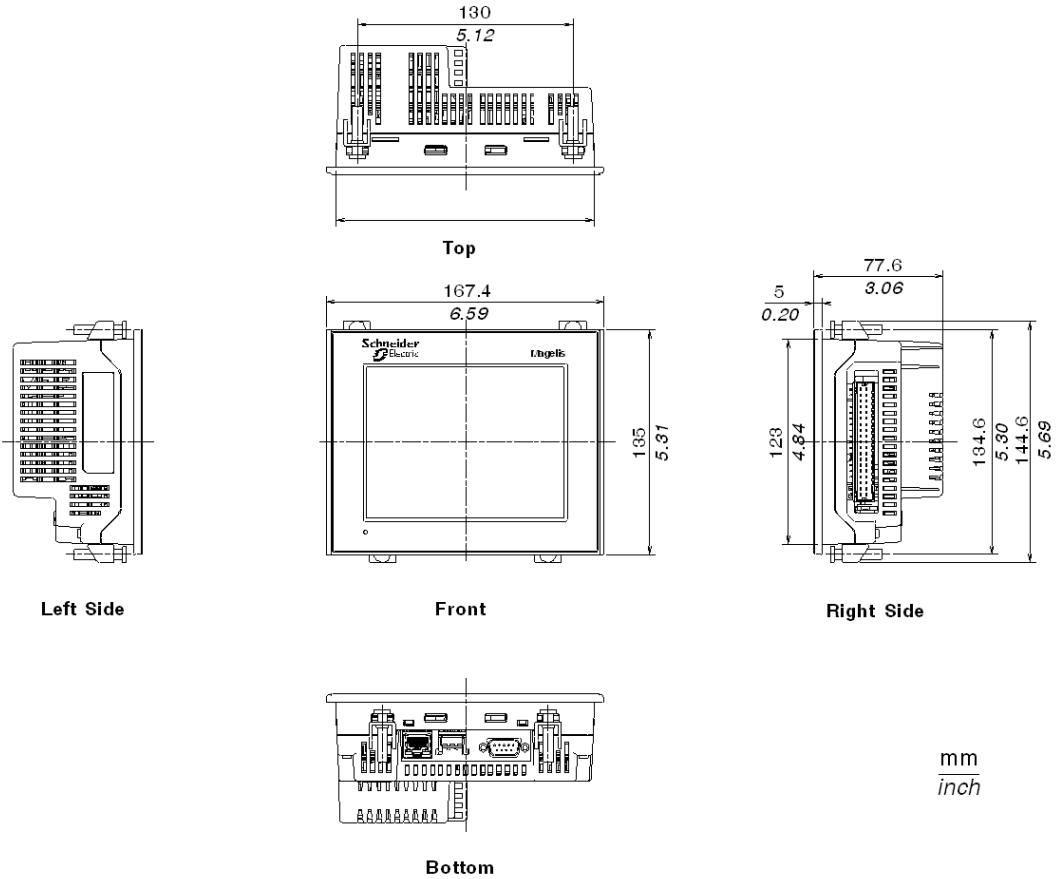
Use the following procedure to connect the wires to the connectors:

Step	Action
1	Insert the screwdriver into the square-shaped hole. This will open the wire's round-shaped hole.
2	Hold the screwdriver and insert the wire into the wire's round-shaped hole.
3	Take out the screwdriver from the square-shaped hole. The round-shaped hole will then close, and the wire will be held securely in place.

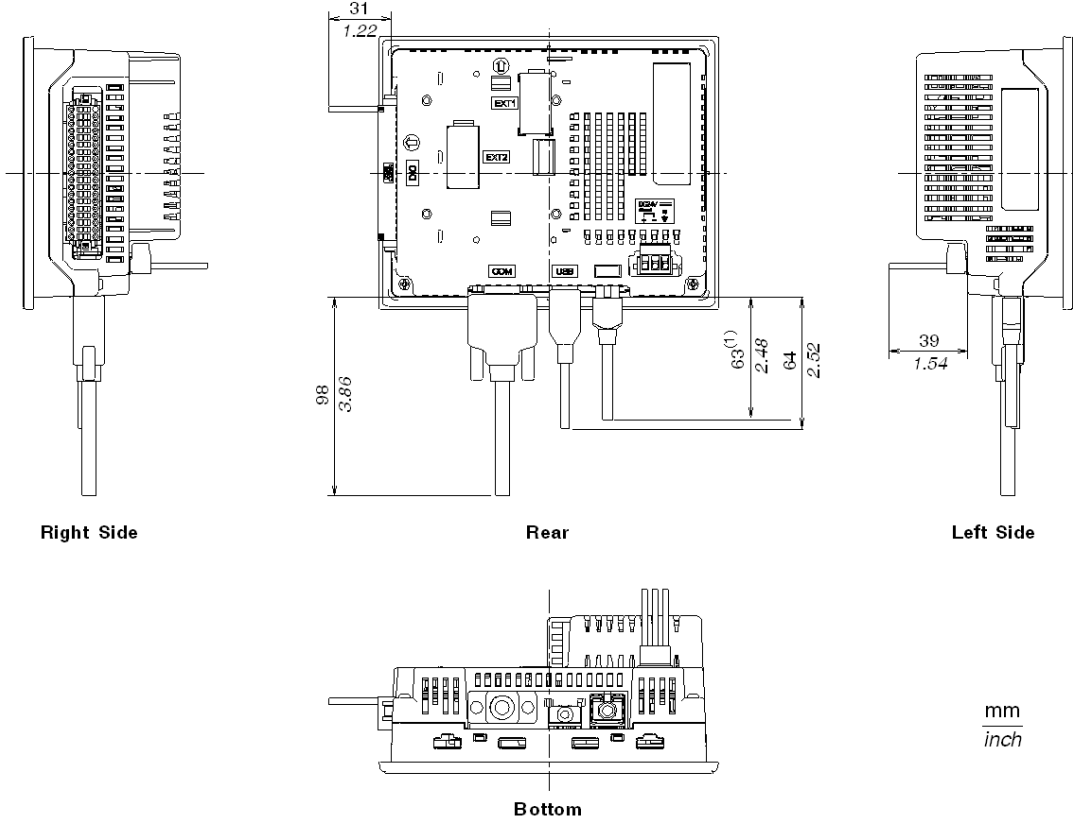
NOTE: To remove the wire, re-insert the screwdriver into the square-shaped hole and when the wire's spring clamp releases, pull the wire out.

XBT GC2000 Series Dimensions

Installation Fasteners Attached Dimensions



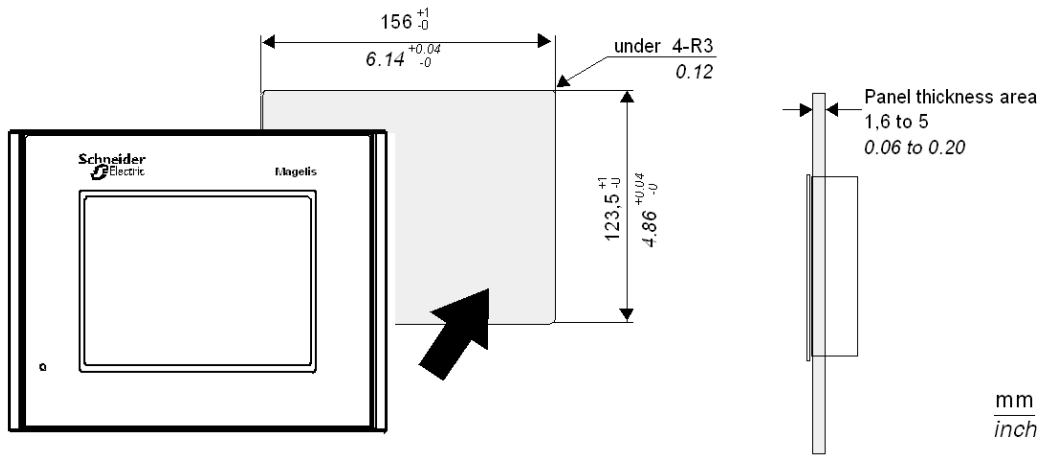
Cable Attached Dimensions



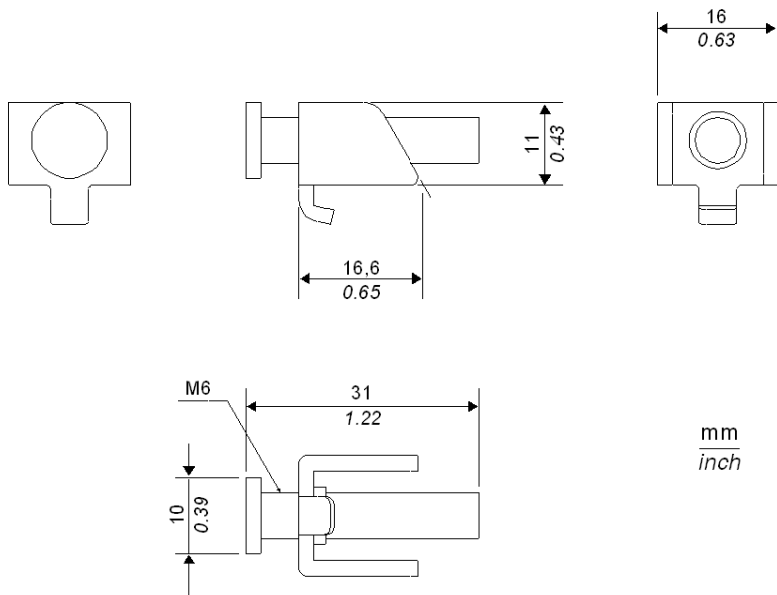
(1) The XBT GC2120• is not equipped with an Ethernet interface.

Important: All the above values are designed to allow for cable bending. The dimensions given here are representative values depending on the type of connection cable used. Therefore, they are all intended for reference only.

Panel Cut Dimensions



Installation Fasteners



Chapter 3

Sample of the Circuit Diagrams

Section 3.1

Examples of Particular I/O Connections

Introduction

This section shows examples of connections between the XBT GC and a pulse motor amplifier or a rotary encoder.

What Is in This Section?

This section contains the following topics:

Topic	Page
Connection to Pulse Motor Amplifier (Pulse System)	75
Connection to a Rotary Encoder	77

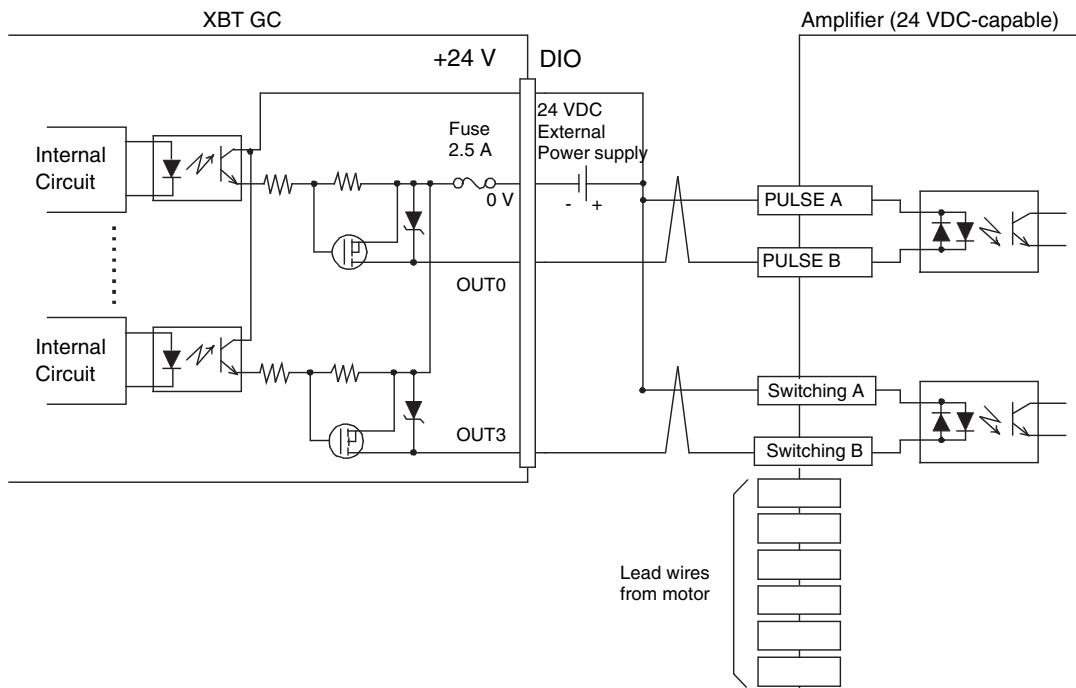
Connection to Pulse Motor Amplifier (Pulse System)

Presentation

The following circuit diagrams show examples of connections between the XBT GC and a pulse motor amplifier (when the transistor can be connected to the amplifier).

NOTE: The circuit of the pulse motor amplifier is illustrated by the 24 VDC pulse system. However, the withstand voltage and the operating current of the coupler, which receives pulse signals, vary by manufacturer. Please consult the amplifier manufacturer documentation before using.

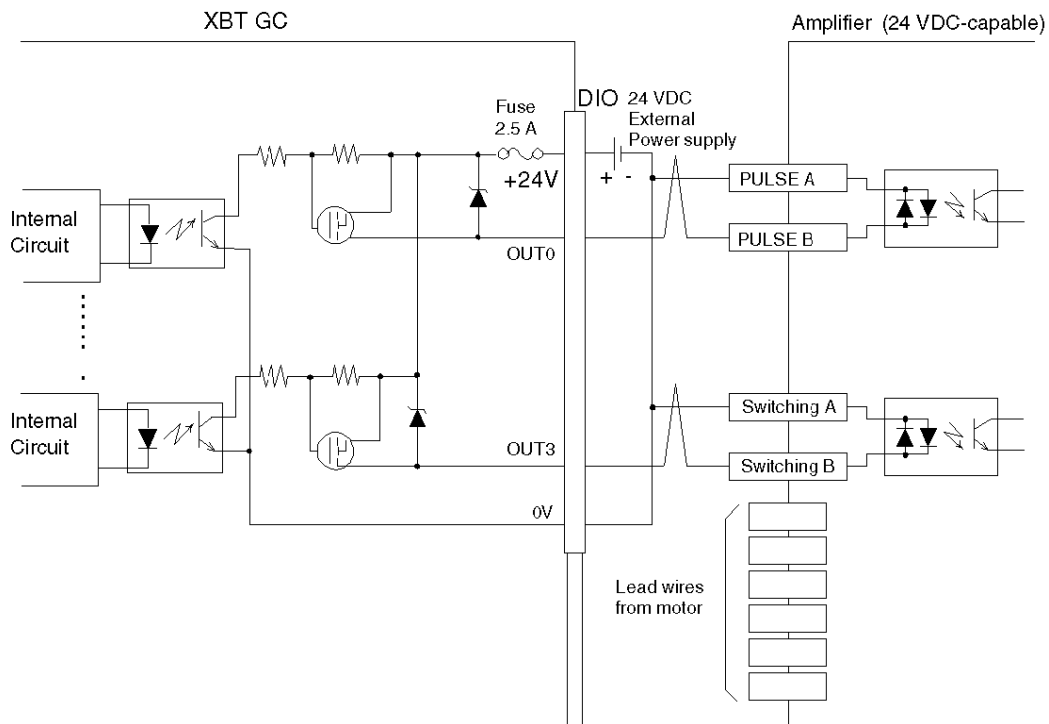
Output Sink Type



NOTE:

- The output terminals for XBT GC pulses are the ones that have the signal names OUT0, OUT1, OUT2, and OUT3. For setting details, refer to the programming software online help.
- Output signals for switching do not have to be connected to terminals that accommodate high-speed output, and can be connected to general-purpose terminals (XBT GC1000 series: OUT 4 and OUT5, XBT GC2000 series: OUT4 through OUT15).

Output Source Type



NOTE:

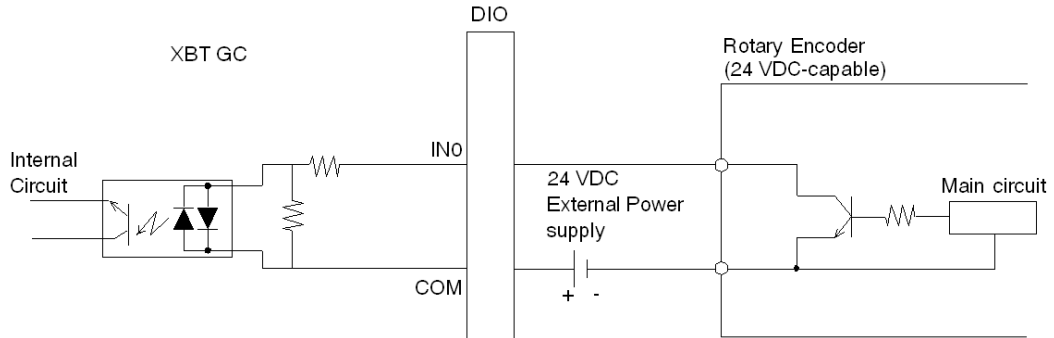
- The output terminals for XBT GC pulses are the ones that have the signal names OUT0, OUT1, OUT2, and OUT3. For setting details, refer to the programming software online help.
- Output signals for switching do not have to be connected to terminals that accommodate high-speed output and can be connected to general-purpose terminals (XBT GC1000 series: OUT 4 and OUT5, XBT GC2000 series: OUT4 through OUT15).

Connection to a Rotary Encoder

Presentation

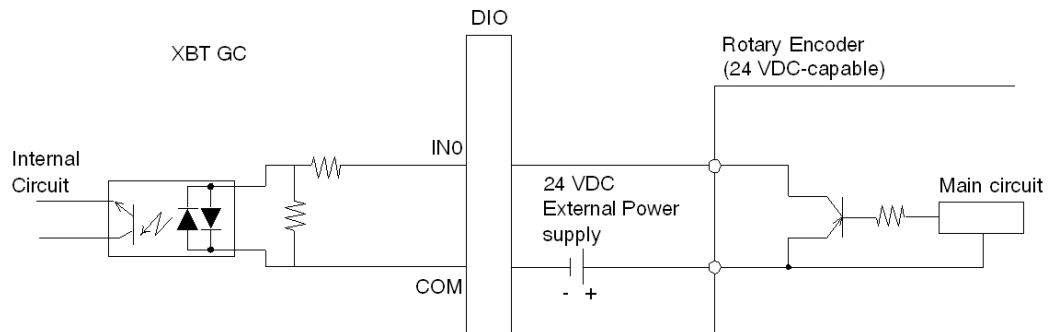
The following circuit diagrams show examples of connections between the XBT GC and a rotary encoder (when the transistor can be connected to the rotary encoder).

Output Sink Rotary Encoder



NOTE: The output terminals for LT counters are the ones that have the signal names IN0, IN2, IN4, and IN6. For setting details, refer to the programming software online help.

Output Source Rotary Encoder



NOTE: The output terminals for XBT GC counters are the ones that have the signal names IN0, IN2, IN4, and IN6. For setting details, refer to the programming software online help.

Chapter 4

Installation and Wiring

Introduction

This chapter describes the installation and wiring of XBT GC Series units.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	Installation	80
4.2	Wiring Considerations	87
4.3	Telefast Cables	103
4.4	USB Cable Clamp Attachment/Removal	108

Section 4.1

Installation

Installation

Introduction

Before installing the unit into a cabinet or panel, read the instructions below.

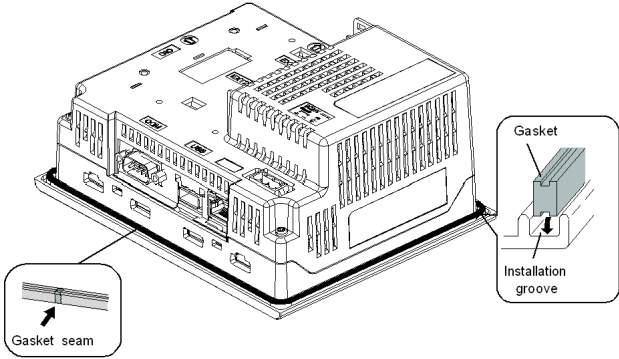
The installation gasket and installation fasteners (screw installation fasteners or spring clips) are required when installing the unit.

Mount the terminal in an enclosure that provides a clean, dry, robust and controlled environment.

Gasket setup requirements

The gasket helps maintain the protection ratings of the unit, and provides additional protection from vibration.

Stage	Description
1	Before installing the unit into a cabinet or panel, check that the Installation gasket is securely attached to the unit.
2	A gasket which has been used for a long period of time may have scratches or dirt on its surface, and could have lost much of its dust and drip resistance. Change the gasket once a year or when scratches or dirt become visible (<i>see page 118</i>).
3	Do not insert the gasket seam of the installation gasket in the corner of the unit. Insert the gasket seam only in the straight sections of the groove at the bottom of the product. If you insert the gasket seam incorrectly, the gasket will be pulled so that it may cause the installation gasket to be torn.

Stage	Description
4	<p>Make sure the gasket is inserted into the panel bottom face as shown in the following:</p> 

⚠ WARNING

LOSS OF PANEL OR CABINET INGRESS PROTECTION RATING

- Insert the gasket correctly in the groove as described in this documentation.
- Do not stretch the gasket.
- Do not insert the gasket seam in groove corners.
- Only install the gasket seam in the straight section of the gasket groove at the bottom of the unit.
- Verify that the upper surface of the gasket protrudes approximately 2.0 mm (0.08 in.) above the edge of the groove.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Creating a Panel Cut

Create the correct sized opening required to install the XBT GC, using the installation dimensions given.

Determine the panel thickness according to the panel thickness range with due consideration of panel strength.

See:

- XBT GC1000 Series: see *Panel Cut Dimensions*, [page 50](#)
- XBT GC2000 Series: see *Panel Cut Dimensions*, [page 72](#)

NOTE: Check that the installation panel or cabinet's surface is flat, in good condition and has no jagged edges. Also, to further improve rigidity and gasket performance, metal reinforcing strips can be attached to the inside of the panel, near the Panel Cut, to increase the panel's strength.

⚠ CAUTION

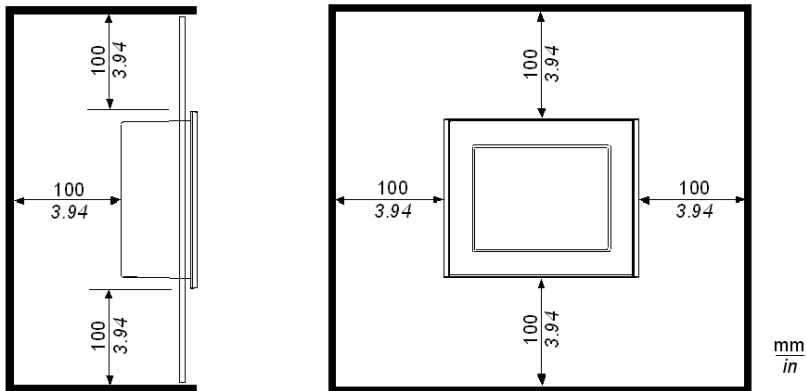
MECHANICALLY UNSTABLE EQUIPMENT

Do not use the cardboard display stand for industrial operation.

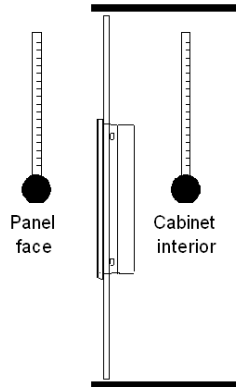
Failure to follow these instructions can result in injury or equipment damage.

Installation Requirements

For easier maintenance, operation and improved ventilation, be sure to install the XBT GC at least 100 mm (*3.94 in*) away from adjacent structures and other equipment:

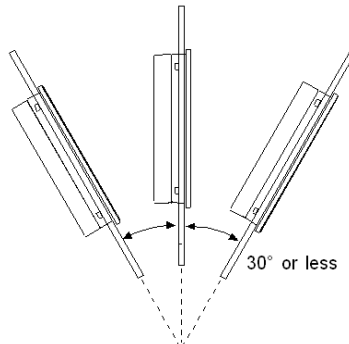


Be sure that the surrounding air temperature and the ambient humidity are within their designated ranges. (Surrounding air temperature: 0 to 50°C (32 to 122°F), Ambient humidity: 10 to 90% RH, Wet bulb temperature: 39°C (102.2°F) max.). When installing the XBT GC on the panel of a cabinet or enclosure, "Surrounding air temperature" indicates both the panel face and cabinet or enclosure's internal temperature:



Be sure that heat from surrounding equipment does not cause the XBT GC to exceed its standard operating temperature.

When installing the XBT GC in a slanted panel, the panel face should not incline more than 30°:



- When installing the XBT GC in a slanted panel, and the panel face inclines more than 30°, the surrounding operating temperature must not exceed 40°C (104°F). You may need to use forced air cooling (fan, A/C) to ensure the surrounding operating temperature is 40°C (104°F) or below.
- The XBT GC1000 series does not support portrait mounting. When the XBT GC2000 series is used with the EX module attached to the rear side, it cannot be mounted in portrait orientation.

Installing the XBT GC

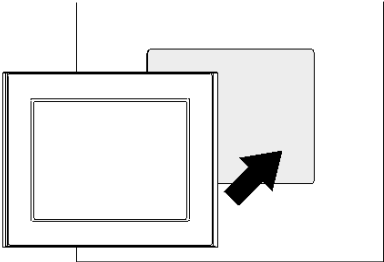
⚠ CAUTION



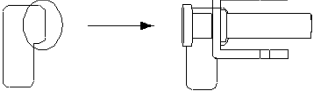
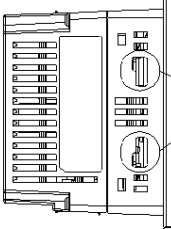
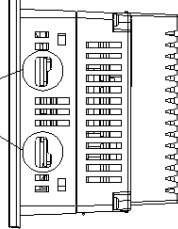
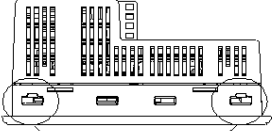
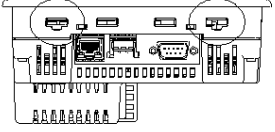
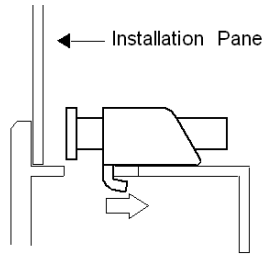
MECHANICALLY UNSTABLE TERMINAL

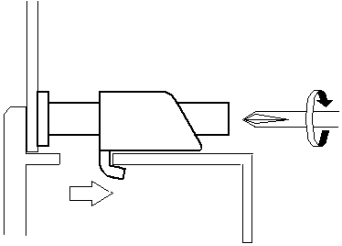
Keep terminal stabilized in the panel cut-out while you are installing or removing the screw fasteners.

Failure to follow these instructions can result in injury or equipment damage.

Installation procedure:

Step	Action	Description
1	Insert the XBT GC into the panel cut.	

Step	Action	Description
2	<p>Insert the installation fasteners into the XBT GC insertion slots, at the left and right side or top and bottom side of the unit. (total: 4 slots)</p> <p>Important: Insert each installation fastener securely into the slot's recess (shaded area). If the fasteners are not correctly attached, the XBT GC unit may shift or fall out of the panel</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>left and right</p> </div> <div style="text-align: center;">  <p>top and bottom</p> </div> </div> <p>Example XBT GC1000 Series:</p> <div style="text-align: center;">  </div>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Left side</p> </div> <div style="text-align: center;">  <p>Right side</p> </div> </div> <p style="text-align: center;">XBT GC1000 Series</p> <div style="text-align: center;">  <p>Top side</p> </div> <div style="text-align: center;">  <p>Bottom side</p> </div> <p style="text-align: center;">XBT GC2000 Series</p>
3	<p>Insert each of the fasteners shown below. Be sure to pull the fastener back until it is flush with the rear of the attachment hole.</p>	<div style="text-align: center;">  <p>← Installation Panel</p> </div>

Step	Action	Description
4	<p>Use a Phillips screwdriver to tighten each fastener screw and secure the XBT GC in place.</p> <p>Important:</p> <ul style="list-style-type: none"> ● Tightening the screws with too much force can damage the XBT GC unit's plastic case. ● The torque required to tighten these screws is 0.5 Nm (<i>4.4 lb-in</i>). 	

Tightening the screw with excessive force can damage the plastic case of the unit.

⚠ CAUTION

BROKEN CASE OR BROKEN FASTENER

Do not exert more than 0.5 Nm (4.4 lb-in) of torque when tightening the fastener screws.

Failure to follow these instructions can result in injury or equipment damage.

NOTE: Screw installation fasteners are required for NEMA Type 4 rating for the XBT GC series.

Section 4.2

Wiring Considerations

Introduction

This section describes the procedures and requirements for wiring.

What Is in This Section?

This section contains the following topics:

Topic	Page
Connecting the Power Cord	88
Connecting the Power Supply	90
Wiring Requirements	92
Grounding	95
Wiring Considerations	98
Installation Precautions	99

Connecting the Power Cord

Power Cord Specifications and Considerations

This section describes the procedures and considerations for wiring power cords.

⚠ WARNING

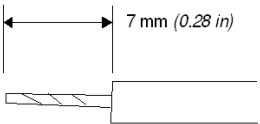
ELECTRIC SHORT CIRCUIT OR OVERVOLTAGE

- Remove power before wiring to the power terminals of the unit.
- Do not connect unit directly to line voltage.
- Use only an SELV rated 24 Vdc power supply.
- Install a power interruption switch in the power line connected to the unit.
- Connect the frameground terminal to the protective ground (PE) of your installation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Refer to grounding (*see page 95*) for more information.

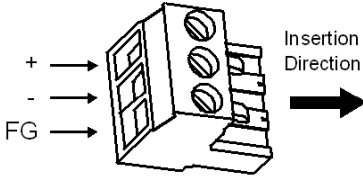
Power Cord Specifications:

Characteristic	Specification
Power Cord Diameter	0.75...2.5 mm ² (18... 12 AWG)
Conductor Type	Simple or twisted wire
Conductor Length	 <p style="text-align: center;">7 mm (0.28 in)</p>

NOTE:

- Use copper conductors only.
- If the conductor end (individual) wires are not twisted correctly, the end wires may either short against each other, or against an adjacent terminal.

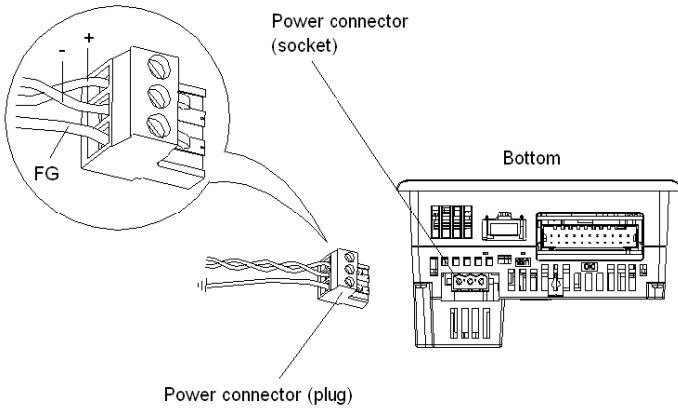
Power Connector (Plug) Specifications:

Illustration	Signal	Description
	+	24 VDC
	-	0 V
	FG	FG Grounding terminal connected to the XBT GC

Connecting the Power Cord

NOTE:

- Be sure to remove the connector from the XBT GC unit prior to starting wiring.
- The temperature rating of field installed conductors: 75 °C (167 °F) only.

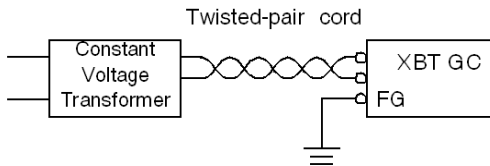
Step	Action
1	Confirm that the power cord is unplugged from the power supply.
2	Strip the insulation of the power cord, twist the wire ends and connect them to the Power Connector (Plug). NOTE: <ul style="list-style-type: none"> • Use a flat-blade screwdriver (Size 0.6 X 3.5) to tighten the terminal screws. • The torque required to tighten these screws is 0.5...0.6 Nm (4.4...5.3 lb-in). • Do not solder the cable connection.
3	Reattach the Power Connector (Plug):  <p>Note: Be sure to twist the power cords together, up to the power connector.</p>

Connecting the Power Supply

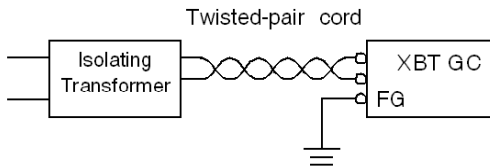
Presentation

This section describes the precautions for supplying a power voltage.

If the supplied voltage exceeds the XBT GC unit's range, connect a constant voltage transformer (see *Specifications, page 31*):



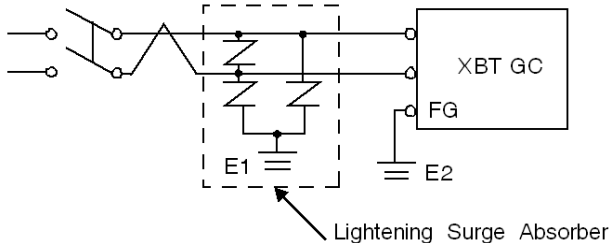
For between the line and ground, select a power supply that is low in electromagnetic interference. If there is an excess amount of electromagnetic interference, connect an isolating transformer:



NOTE: Use constant voltage and isolating transformers with capacities exceeding Power Consumption value.

- To increase the electromagnetic interference resistance quality of the power cord, simply twist each power wire before attaching the power connector.
- The power supply cable must not be bundled or positioned close to main circuit lines (high voltage, high current) or input/output signal lines.
- To avoid excess electromagnetic interference, make the power cord as short as possible.
- 24 VDC input unit must be used with a Class 2 power supply.

Connect a lightning surge absorber, as shown in the diagram, to deal with power surges:



NOTE:

- Be sure to ground the surge absorber (E1) separately from the XBT GC unit (E2).
- Select a surge absorber that has a maximum circuit voltage greater than that of the peak voltage of the power supply.

Wiring Requirements

Introduction

There are several rules that must be followed when wiring a inputs and outputs.

For I/O modules that have more than one terminal block or connector that is identical, any of them can be potentially plugged into any socket.

Despite the indicators on the terminal blocks, connectors and modules, it is possible to incorrectly install the terminal blocks or connectors and create incorrect wiring.

Plugging a connector into the wrong socket could cause unintended behavior of the application.

DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

Connect the terminal blocks to their designated location.

Failure to follow these instructions will result in death or serious injury.

NOTE: Clearly and uniquely label each terminal block and connector with an appropriate system of identification.

Rules

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

The following rules must be applied when wiring the I/O modules:

- I/O and communication wiring must be kept separate from the power wiring. Route these 2 types of wiring in separate cable ducting.
- Verify that the operating conditions and environment are within the specification values.
- Use proper wire sizes to meet voltage and current requirements.
- Use copper conductors only.

- Use twisted-pair, shielded cables for analog, expert and/or fast I/O.
- Use twisted-pair, shielded cables for networks and field bus (CANopen, serial, Ethernet).

WARNING

UNINTENDED EQUIPMENT OPERATION

- Use shielded cables for all input, output and communication types specified above.
- Properly ground the cable shields as indicated in the related documentation.
- Route communications and I/O cables separately from power cables.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

For more details, refer to Grounding (*see Modicon TM2, Digital I/O Modules, Hardware Guide*).

Refer to Modicon TM2 Analog I/O Modules (*see Modicon TM2, Analog I/O Modules, Hardware Guide*) and TM2 Digital I/O Modules (*see Modicon TM2, Digital I/O Modules, Hardware Guide*) for more information.

Protecting Outputs from Inductive Load Damage

Depending on the load, a protection circuit may be needed for the outputs on the controllers and certain modules. Inductive loads using DC voltages may create voltage reflections resulting in overshoot that will damage or shorten the life of output devices.

CAUTION

OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

Use an appropriate external protective circuit or device to reduce the risk of inductive direct current load damage.

Failure to follow these instructions can result in injury or equipment damage.

If your controller or module contains relay outputs, these types of outputs can support up to 240 Vac. Inductive damage to these types of outputs can result in welded contacts and loss of control. Each inductive load must include a protection device such as a peak limiter, RC circuit or flyback diode. Capacitive loads are not supported by these relays.

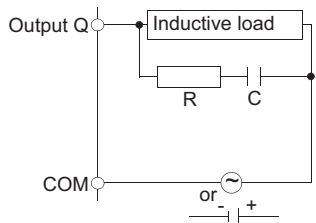
WARNING

RELAY OUTPUTS WELDED CLOSED

- Always protect relay outputs from inductive alternating current load damage using an appropriate external protective circuit or device.
- Do not connect relay outputs to capacitive loads.

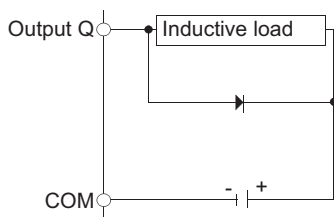
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Protective circuit A: this protection circuit can be used for both AC and DC load power circuits.



- C represents a value from 0.1 to 1 μF .
- R represents a resistor of approximately the same resistance value as the load.

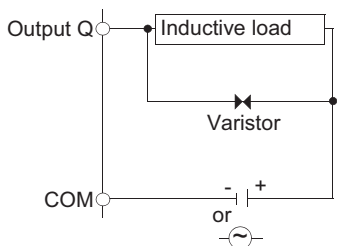
Protective circuit B: this protection circuit can be used for DC load power circuits.



Use a diode with the following ratings:

- Reverse withstand voltage: power voltage of the load circuit x 10.
- Forward current: more than the load current.

Protective circuit C: this protection circuit can be used for both AC and DC load power circuits.



- In applications where the inductive load is switched on and off frequently and/or rapidly, ensure that varistor's continuous energy rating (J) exceeds the peak load energy by 20% or more.

NOTE: The above schematics show sinking DC outputs, but would apply equally to source outputs.

Grounding

Presentation

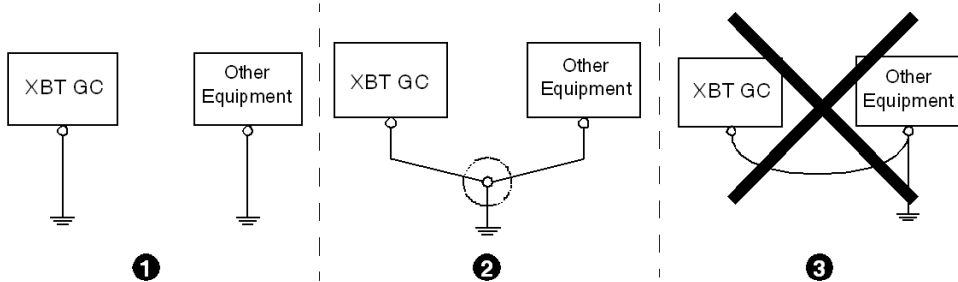
This section describes the requirements for grounding.

Grounding the XBT GC unit

⚠ WARNING

IMPROPER GROUNDING

Make the connection to ground independent of the ground connection to other equipment.
Failure to follow these instructions can result in death, serious injury, or equipment damage.



Label	Description
1	Exclusive Grounding: BEST
2	Common Grounding: OK
3	Common Grounding: NOT OK

- Check that the grounding resistance is 100 Ω or less.
- The power terminal ground (FG) and the Serial Line terminal ground (SG) are internally connected in the XBT GC. When connecting an external device to the XBT GC using the serial line terminal, be sure to check that no ground loop is created when you setup the system.
- The grounding wire should have a cross sectional area greater than 2 mm² (14 AWG). Create the grounding point as close to the XBT GC unit as possible, and make the wire as short as possible. When using a long grounding wire, replace the thin wire with a thicker wire and place it in a duct.
- If exclusive grounding is not possible, use a common grounding point (diagram 2). A grounding lug or equivalent should be used for the grounding point.

NOTE: If the equipment does not function properly when grounded, check for ground loops or inadequate grounding.

Grounding I/O and Communications Connections

Electromagnetic radiation may interfere with control communications and/or input/output signals to the control system.

Use shielded, properly grounded cables for all analog and high-speed inputs or outputs and communication connections. If you do not use shielded cable for these connections, electromagnetic interference can cause signal degradation. Degraded signals can cause the controller or attached modules and equipment to perform in an unintended manner.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

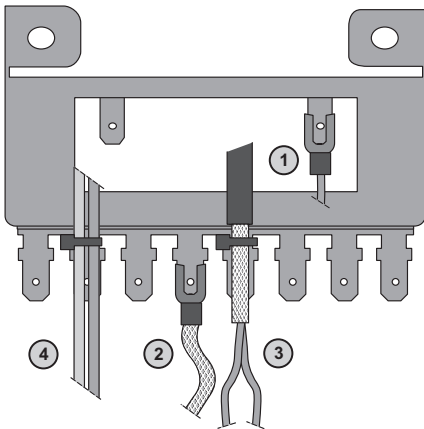
- Use shielded cables for all fast I/O, analog I/O and communication signals.
- Ground cable shields for all analog I/O, fast I/O and communication signals at a single point¹.
- Route communication and I/O cables separately from power cables.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

¹Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

Grounding Bar TM2XMTGB

The figure below shows how to connect the grounding bar TM2XMTGB:



- 1 Controller functional grounding
- 2 Modules functional grounding
- 3 Analog and fast I/O cable shielding
- 4 Cable attachment

NOTE: Schneider Electric recommends the use of the TM2XMTGB the Grounding Bar for use with all TM2 I/O modules.

 **WARNING**

ACCIDENTAL DISCONNECTION FROM PROTECTIVE GROUND (PE)

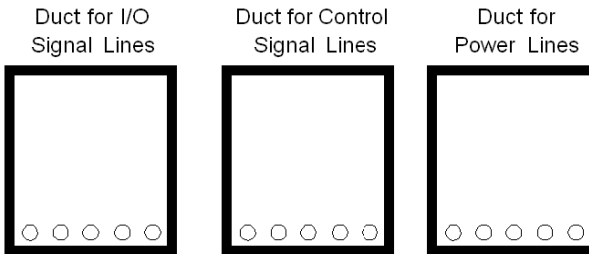
- Do not use the TM2 XMTGB Grounding Bar to provide a protective ground (PE).
- Use the TM2 XMTGB Grounding Bar only to provide a functional ground (FE).

Failure to follow these instructions can result in death, serious injury, or equipment damage.

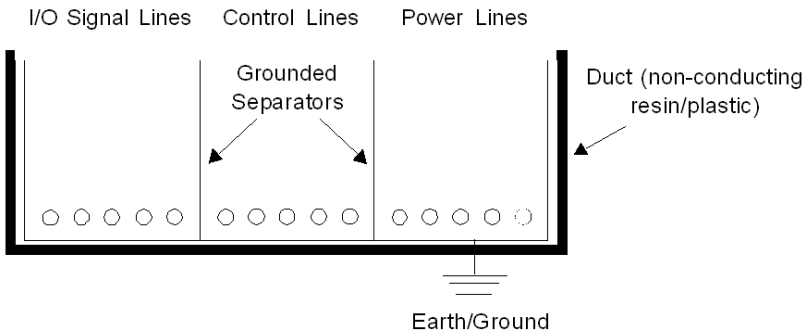
Wiring Considerations

Presentation

To help prevent electromagnetic interference, separate all control, communication, and power lines by placing them in a separate ducts:



If different wires must be placed in the same duct, separate them with an earthed/grounded divider:



NOTE: If the lines cannot be separated, use shielded lines and create a ground from the shield line.

- Use interference reducing external wiring methods to increase overall system reliability.
- To prevent power surges or electromagnetic interference, use ducts to separate all DC I/O or current circuit wires from communication cables.
- To help avoid electromagnetic interference, communication cables must be wired separately from high-frequency lines and power lines such as high-voltage lines, high-current lines and inverters.

Installation Precautions

Presentation

Sudden external power outages or an unexpected stop of the XBT GC unit may cause unintended consequences.

WARNING

UNINTENDED EQUIPMENT OPERATION

Configure circuits involved in personnel safety (emergency stop circuits, protection circuits, interlock circuits, etc.) externally to the XBT GC.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This section describes examples of the system circuit design to improve system reliability and performance.

Control System Best Practices

In the design of a control system, consider any potential power-up delays for the different components in the system. Create a program which checks the status of the XBT GC unit. When remote I/O is used, create a program that checks the status of the terminal with a logic program.

For example, connect voltage relay coils to the power supply circuit of the XBT GC output unit and the power supply circuit of the connected control equipment, and connect the contact to the XBT GC input unit. Configure the circuit to check the ON signal from the voltage relay in the logic program before executing the ladder of the control equipment connected to the XBT GC output unit.

Rated Voltage

Be sure to supply an appropriate power supply voltage to your XBT GC that is within the specified range.

Power-down

XBT GC unit enters power-down status when an instantaneous power interruption of the rated voltage continues for 10 ms or longer.

When the XBT GC unit enters power-down status, it stops the calculation even if the instruction is not finished.

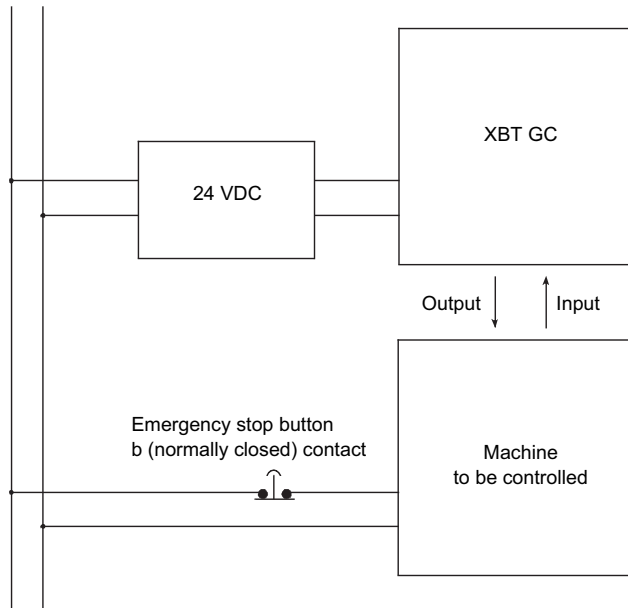
For example, when the XBT GC unit enters power-down status while 100 words of data are being transferred by an FMOV instruction, the transfer stops midway.

Consequently, design your program with consideration to power-down occurrences.

Emergency Stop Circuit

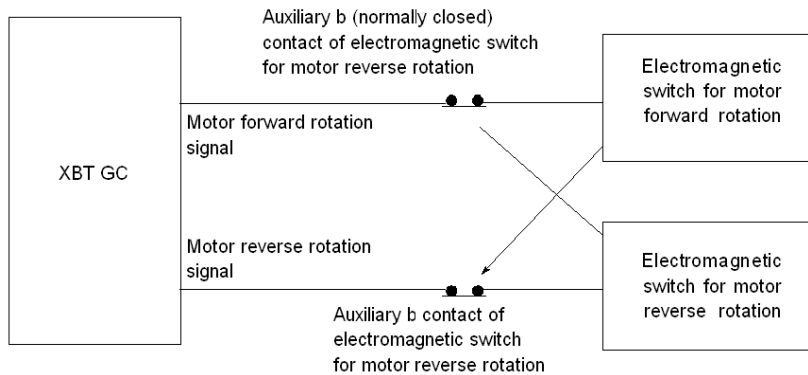
Do not process emergency stop signals with a software program by inputting the signal to the XBT GC.

Configure the emergency stop circuit externally to the XBT GC as shown in the figure below:



Interlock Circuit 1

To use the XBT GC or a PLC to control a motor circuit for forward/reverse rotation, configure the interlock circuit shown below externally to the XBT GC.



After executing an internal program, the XBT GC outputs ON/OFF information to the output devices at the same time. For example, the electromagnetic switches for forward and reverse rotation of a motor are turned on and off at the same time. Consequently, a situation may arise in which both of the main contacts of the motor circuits for the electromagnetic switches for forward and reverse rotation may turn on, causing a short-circuit of the R and T phases. To avoid this situation, you need to provide the interlock circuit shown above or use an electromagnetic switch equipped with a mechanical interlock for a forward/reverse circuit.

Always assume that output signals from the XBT GC, for example forward and reverse commands, can overlap.

⚠ CAUTION

OUTPUT SIGNAL OVERLAP

Provide an external means, such as an intelock circuit, to ensure that output overlap does not result in transient short circuit conditions or other undesired consequences.

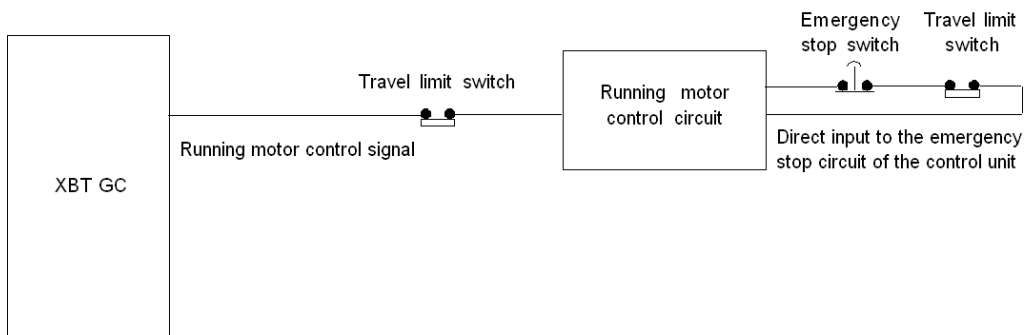
Failure to follow these instructions can result in injury or equipment damage.

Interlock Circuit 2

Design a reliable measure to configure interlock circuits with external hardware devices such that unintended operation of the XBT GC does not lead to hazardous conditions.

For a system which requires a running motor to stop before all other processes when a travel limit switch is activated, never design a system in which the signals from the travel limit switch are input to the input terminals of the XBT GC and then processed using software.

Configure a circuit that reliably stops the running motor using hardware as shown below:



Section 4.3

Telefast Cables

Telefast Cables

Presentation

This table shows the compatibility of Telefast modules and XBT GC units.

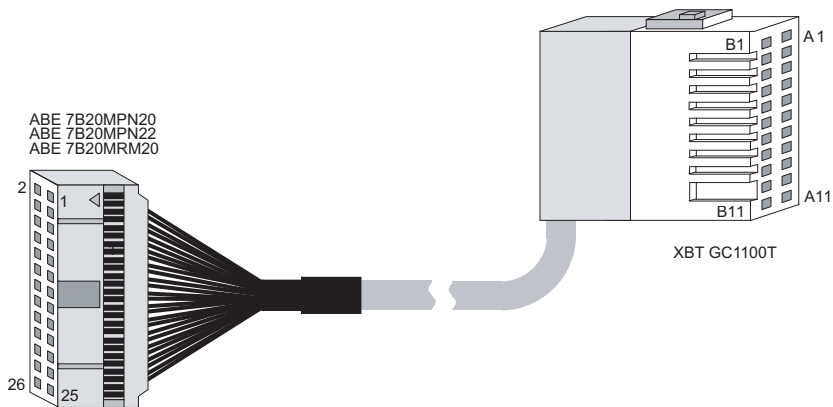
Telefast Module Description			XBT GC1000T Series		XBT GC2000T Series	
Type	Channel	Reference	12 Inputs	6 Outputs Source	16 Inputs	16 Outputs Source
Passive Sub-bases	20	ABE 7B20MPN2•	X ⁽¹⁾		-	-
	16	ABE 7E16EPN20	-	-	X	-
		ABE 7E16SPN2•	-	-	-	X
Output adapter bases	20	ABE 7B20MRM20	X ⁽²⁾		-	-
	16	ABE 7E16SRM20	-	-	-	X
Cable Reference	-	XBT ZGABE1	X		-	X
	-	XBT ZGABE2	-	-	X	

⁽¹⁾ 6 channels used for 8 available

⁽²⁾ 6 channels used for 8 available with 2 transistor outputs and 4 relay outputs

NOTE: The Telefast cables and modules are not compatible with sink type XBT GC units (U suffix).

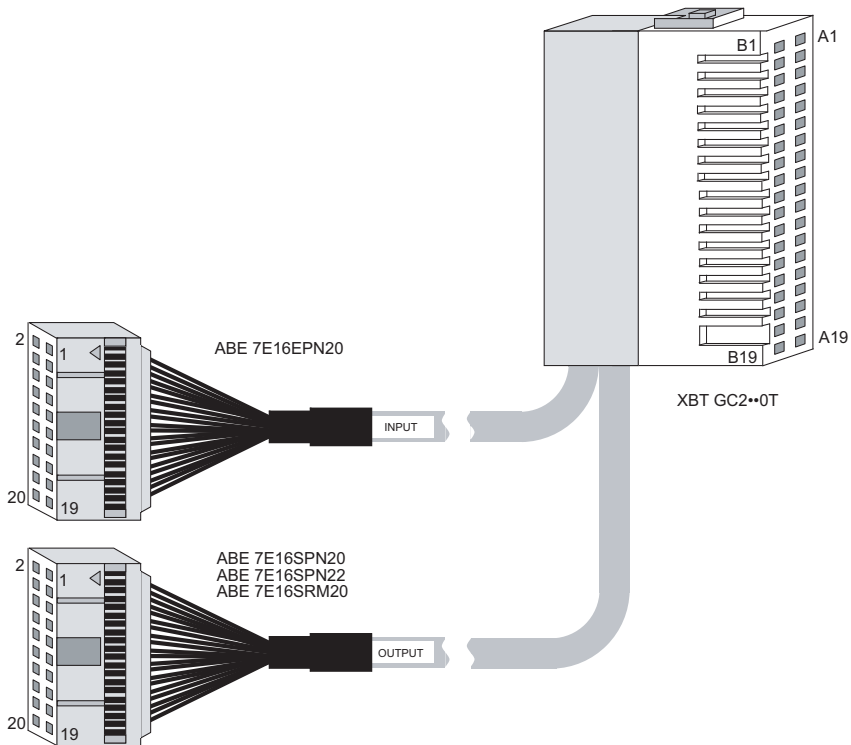
XBT ZGABE1 Cable



XBT GC1100T		ABE 7B20MPN20• (12I Source + 8O Passive source) ABE 7B20MRM20 (12I Source + 6O Relay + 2O Transistor)
DIO connector - Female 22 pins		HE10 connector - Female 26 pins
I0	B1	26
I1	A1	24
I2	B2	22
I3	A2	20
I4	B3	18
I5	A3	16
I6	B4	14
I7	A4	12
I8	B5	10
I9	A5	8
I10	B6	6
I11	A6	4
I com	B7	3 (0 V)
Q0	B9	25 (S0)
Q1	A9	23 (S1)
Q2	B10	21
Q3	A10	19
Q4	B11	17

XBT GC1100T		ABE 7B20MPN20• (12I Source + 8O Passive source) ABE 7B20MRM20 (12I Source + 6O Relay + 2O Transistor)
DIO connector - Female 22 pins		HE10 connector - Female 26 pins
Q5	A11	15
+24V	B8	5 (+24V)
0V	A8	1 (0V)

XBT ZGABE2 Cable



XBT GC2**0T		ABE 7E16EPN20 (16I Source - 16O Passive source)	ABE 7E16SPN2* (16O Passive source) ABE 7E16SRM20 (16O Relay)
DIO connector Female - 38 pins		Input connector Female HE10 - 20 pins	Output connector Female HE10 - 20 pins
I0	B1	20	-
I1	A1	18	-
I2	B2	16	-
I3	A2	14	-
I4	B3	12	-
I5	A3	10	-
I6	B4	8	-
I7	A4	6	-
I8	B5	19	-
I9	A5	17	-
I10	B6	15	-
I11	A6	13	-
I12	B7	11	-
I13	A7	9	-
I14	B8	7	-
I15	A8	5	-
I com	B9	4 (0V)	-
Q0	B12	-	20
Q1	A12	-	18
Q2	B13	-	16
Q3	A13	-	14
Q4	B14	-	12
Q5	A14	-	10
Q6	B15	-	8
Q7	A15	-	6
Q8	B16	-	19
Q9	A16	-	17
Q10	B17	-	15
Q11	A17	-	13
Q12	B18	-	11
Q13	A18	-	9

XBT GC2••0T		ABE 7E16EPN20 (16I Source - 16O Passive source)	ABE 7E16SPN2• (16O Passive source) ABE 7E16SRM20 (16O Relay)
DIO connector Female - 38 pins		Input connector Female HE10 - 20 pins	Output connector Female HE10 - 20 pins
Q14	B19	-	7
Q15	A19	-	5
+24V	A10	-	3 (+24V)
+24V	B10	-	4 (+24V)
0V	B11	-	1 (0V)

Section 4.4

USB Cable Clamp Attachment/Removal

Introduction

This clamp is used to prevent the USB cable connected to the USB Host Interface on the bottom of the XBT GC unit from being unplugged due to vibration or other causes.

DANGER

RISK OF EXPLOSION

Confirm that the USB cable has been attached with the USB cable clamp before using the USB host interface in hazardous locations as described in UL1604.

Failure to follow these instructions will result in death or serious injury.

What Is in This Section?

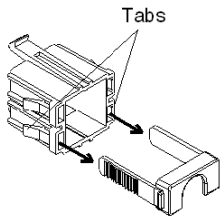
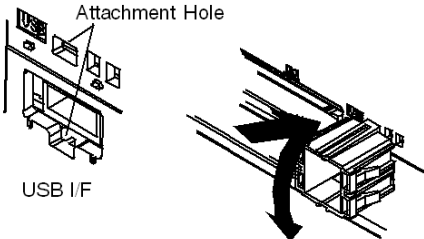
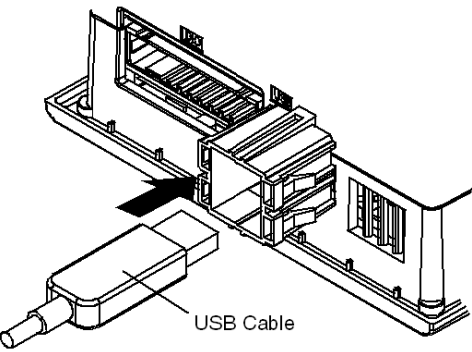
This section contains the following topics:

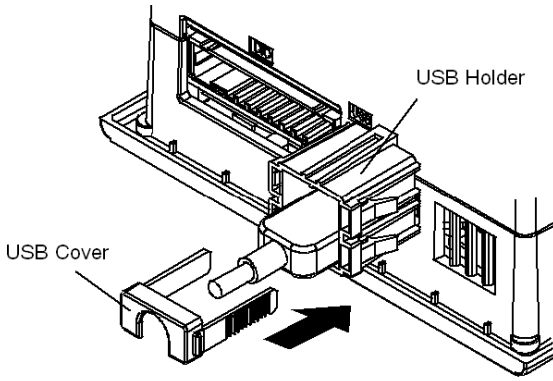
Topic	Page
XBT GC1000 Series: USB Cable Clamp	109
XBT GC2000 Series: USB Cable Clamp	111

XBT GC1000 Series: USB Cable Clamp

Attachment

Procedure:

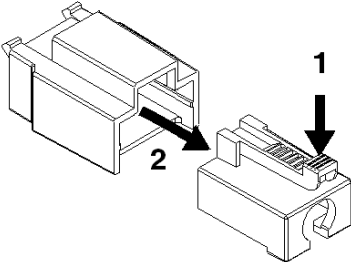
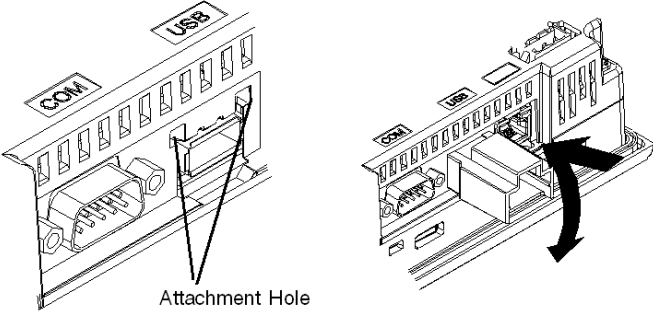
Step	Action
1	<p>Before starting the procedure, orient the two tabs on both sides of the USB Holder in the direction of the arrows in the figure and remove the USB Cover:</p>  <p style="text-align: center;">Tabs</p>
2	<p>With the main unit display part positioned so that it is facing down, attach the USB holder to the USB host interface. Do this by inserting the picks on the USB holder itself into the attachment holes on the main unit. Insert the upper hook first:</p>  <p style="text-align: center;">Attachment Hole</p> <p style="text-align: center;">USB I/F</p>
3	<p>Insert the USB cable into the USB Host Interface:</p>  <p style="text-align: center;">USB Cable</p>

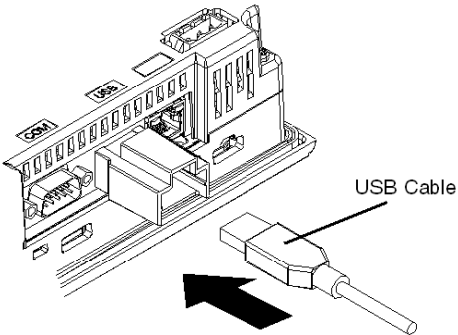
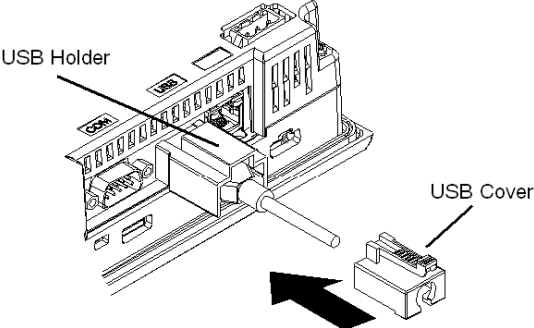
Step	Action
4	<p data-bbox="293 203 1068 253">Attach the USB cover to the USB host interface. Insert the USB cover into the tab of the USB holder:</p>  <p data-bbox="293 683 1068 711">Important: Insert the USB cover in the orientation shown in the illustration above.</p>

XBT GC2000 Series: USB Cable Clamp

Attachment

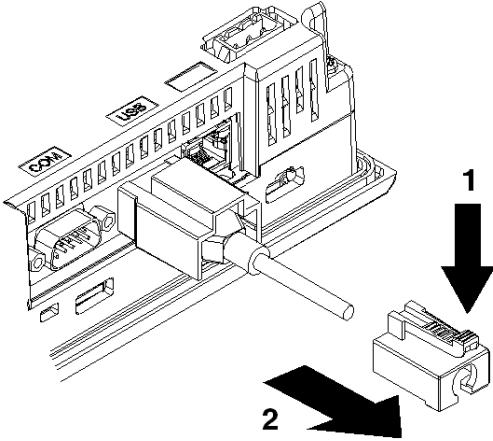
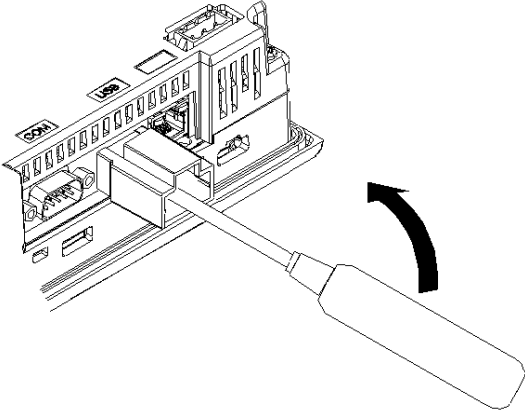
Procedure:

Step	Action
1	<p>Before starting the procedure, pull out the USB cover from the USB holder by holding the top and bottom of the USB holder and pressing down the tab on the USB cover:</p> 
2	<p>With the main unit display part positioned so that it is facing down, attach the USB holder to the USB host interface. Insert the picks on the top of the USB holder into the attachment holes on the main unit, then insert the holder into the USB host interface so that the holder is secured in the main unit:</p> 

Step	Action
3	<p>Insert the USB cable into the USB Host Interface:</p>  <p>The diagram shows a perspective view of a device's front panel with a USB host interface. A USB cable is shown to the right of the interface, with a black arrow pointing towards the interface opening.</p>
4	<p>Attach the USB cover to the USB host interface. Hold the USB cover in the orientation shown in the figure and insert it into the USB holder:</p>  <p>The diagram shows a perspective view of the device's front panel. A USB holder is visible on the front panel. A USB cover is shown to the right of the holder, with a black arrow pointing towards the holder.</p> <p>Important: Insert the USB cover in the orientation shown in the illustration above.</p>

Removal

Procedure:

Step	Action
1	<p data-bbox="323 289 1094 337">Pull out the USB cover from the USB holder by pressing down the tab on the USB cover:</p> 
2	<p data-bbox="323 852 1085 927">Insert the tip of a flat-blade screwdriver into the hole on the bottom of the USB holder and raise the handle so that the USB holder detaches from the USB host interface:</p> 

Chapter 5

Maintenance

Introduction

This chapter explains the precautions and inspection criteria that the XBT GC requires.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Cleaning the Display	116
Periodic Check Points	117
Replacing the Installation Gasket	118
Replacing the Backlight	120

Cleaning the Display

Recommendations

When the surface or frame of the display becomes dirty, soak a soft cloth in water with a neutral detergent, wring the cloth tightly and wipe the display.

 CAUTION
IMPROPER EQUIPMENT CARE <ul style="list-style-type: none">● Do not use paint thinner, organic solvents or a strong acid compound to clean the unit.● Do not use hard or pointed objects to clean or operate the touch-screen panel. Failure to follow these instructions can result in injury or equipment damage.

Periodic Check Points

Introduction

To keep your XBT GC unit in its best condition, please inspect the following points periodically.

Operation Environment

- Is the operating temperature within the allowable range (0 - 50 °C)(32 - 122 °F)?
- Is the operating humidity within the specified range (10 - 90 %RH, dry bulb temperature of 39 °C (102.2 °F) or less)?
- Is the operating atmosphere free of corrosive gasses?

When using the XBT GC unit inside a panel, the ambient environment refers to the interior of the panel.

Electrical Specifications

Is the input voltage appropriate?

19.2...28.8 VDC

Related Items

- Are all power cords and cables connected properly? Have any become loose?
- Are all mounting brackets holding the unit securely?
- Are there many scratches or traces of dirt on the installation gasket?

Replacing the Installation Gasket

Presentation

The installation gasket provides protection against dust and moisture.

NOTE:

- A gasket which has been used for a long period of time may have scratches or dirt on it and could have lost much of its water resistance. Be sure to change the gasket at least once a year, or when scratches or dirt become visible.
- The XBT GC unit installation gasket's model number is as follows.

Model	Reference
XBT GC1000 Series	XBT ZG51
XBT GC2000 Series	XBT ZG52

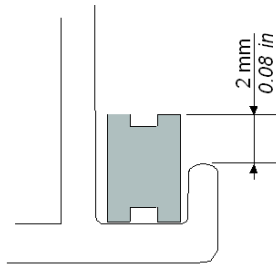
Installation Gasket Attachment Procedure

Step	Description
1	Place the XBT GC on a flat, level surface facing the display face downwards.
2	Remove the gasket from the XBT GC.
3	Attach the new gasket to the XBT GC. Be sure to insert the gasket into the XBT GC's groove so that the gasket's groove sides are vertical.
4	Check that the gasket is attached correctly to the XBT GC.

⚠ WARNING**LOSS OF PANEL OR CABINET INGRESS PROTECTION RATING**

- Insert the gasket correctly in the groove as described in this documentation.
- Do not stretch the gasket.
- Do not insert the gasket seam in groove corners.
- Only install the gasket seam in the straight section of the gasket groove at the bottom of the unit.
- Verify that the upper surface of the gasket protrudes approximately 2.0 mm (0.08 in.) above the edge of the groove.

Failure to follow these instructions can result in death, serious injury, or equipment damage.



Replacing the Backlight

Important Notice

The XBT GC's backlight cannot be replaced by the user. When the backlight needs to be replaced, please contact your local distributor.

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wiring requirements, *92*

