Twido
Programmable Controllers
Hardware Reference Guide

TWD USE 10AE   Version 1.0
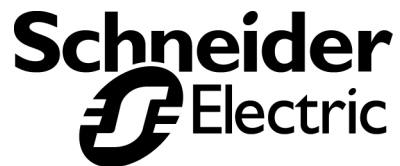
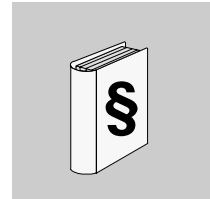**Schneider Electric**

Table of Contents

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, 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 an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE   Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons. Assembly and installation instructions are provided in the Twido Hardware Reference Guide, TWD USE 10AE.

Additional Safety Information   Those responsible for the application, implementation or use of this product must ensure that the necessary design considerations have been incorporated into each application, completely adhering to applicable laws, performance and safety requirements, regulations, codes and standards.

General Warnings and Cautions

	WARNING
STOP	**EXPLOSION HAZARD**
	• Substitution of components may impair suitability for Class I, Div 2 compliance.
	• Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
	Failure to observe this precaution can result in severe injury or equipment damage.

	WARNING
STOP	**UNINTENDED EQUIPMENT OPERATION**
	• Turn power off before installing, removing, wiring, or maintaining.
	• This product is not intended for use in safety critical machine functions. Where personnel and or equipment hazards exist, use appropriate hard-wired safety interlocks.
	• Do not disassemble, repair, or modify the modules.
	• This controller is designed for use within an enclosure.
	• Install the modules in the operating environment conditions described.
	• Use the sensor power supply only for supplying power to sensors connected to the module.
	• Use an IEC60127-approved fuse on the power line and output circuit to meet voltage and current requirements. Recommended fuse: Liitlefuse 5x20 mm slowblow type 218000 series/Type T.
	Failure to observe this precaution can result in severe injury or equipment damage.

About the book
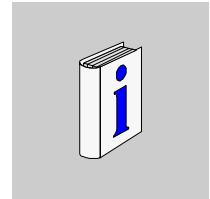
At a Glance

Document Scope   This manual provides parts descriptions, specifications, wiring schematics, installation, set up, and troubleshooting information for all Twido products.

Validity Note   The information in this manual is applicable only for Twido products.

Product Related Warnings   Schneider Electric assumes no responsibility for any errors that appear in this document. No part of this document may be reproduced in any form or means, including electronic, without prior written permission of Schneider Electric.

Twido Overview

1

At a Glance

Introduction

This chapter provides an overview of the Twido products, the maximum configurations, the main functions of the controllers, and an overview of the communication system.

What's in this Chapter?

This chapter contains the following topics:

About Twido

Introduction
The Twido controller is available in two models:
- Compact
- Modular

The Compact controller is available with:
- 10 I/O
- 16 I/O
- 24 I/O

The Modular controller is available with:
- 20 I/O
- 40 I/O

Additional I/O can be added to the controllers using expansion I/O modules. There are:
- 14 digital or relay I/O modules
- 4 analog I/O modules

There are also several options that can be added to the base controllers:
- Memory cartridges
- Real-Time Clock (RTC) cartridge
- Communication adapters
- Communication expansion modules (Modular controller only)
- Operator display module (Compact controller only)
- Operator display expansion module (Modular controller only)
- Input simulators
- Programming cables
- Digital I/O cables
- TeleFast cable system kits with I/O interfaces

Controller Models

The following table lists the controllers:

Controller Name	Part Number	Points	Point Type	Input/Output Type	Power Supply
Compact 10 I/O	TWDLCAA10DRF	6	Inputs	24 VDC	100/240 VAC
		4	Outputs	Relay	
Compact 16 I/O	TWDLCAA16DRF	9	Inputs	24 VDC	100/240 VAC
		7	Outputs	Relay	
Compact 24 I/O	TWDLCAA24DRF	14	Inputs	24 VDC	100/240 VAC
		10	Outputs	Relay	
Modular 20 I/O	TWDLMDA20DUK	12	Inputs	24 VDC	24 VDC
		8	Outputs	Transistor Sink	
Modular 20 I/O	TWDLMDA20DTK	12	Inputs	24 VDC	24 VDC
		8	Outputs	Transistor Source	
Modular 20 I/O	TWDLMDA20DRT	12	Inputs	24 VDC	24 VDC
		6 2	Output Output	Relay Transistor Source	
Modular 40 I/O	TWDLMDA40DUK	24	Inputs	24 VDC	24 VDC
		16	Outputs	Transistor Sink	
Modular 40 I/O	TWDLMDA40DTK	24	Inputs	24 VDC	24 VDC
		16	Outputs	Transistor Source	

Digital Expansion I/O Modules

The following table lists the digital and relay expansion I/O modules:

Module Name	Part Number	Points	Point Type	Input/Output Type	Terminal Type
Input Modules					
8-point Input	TWDDDI8DT	8	Inputs	24 VDC	Removable terminal block
16-point Input	TWDDDI16DT	16	Inputs	24 VDC	Removable terminal block
16-point Input	TWDDDI16DK	16	Inputs	24 VDC	Connector
32-point Input	TWDDDI32DK	32	Inputs	24 VDC	Connector
Output Modules					
8-point Output	TWDDDO8UT	8	Outputs	Transistor Sink	Removable terminal block
8-point Output	TWDDDO8TT	8	Outputs	Transistor Source	Removable terminal block
8-point Output	TWDDRA8RT	8	Outputs	Relay	Removable terminal block
16-point Output	TWDDRA16RT	16	Outputs	Relay	Removable terminal block
16-point Output	TWDDDO16UK	16	Outputs	Transistor Sink	Connector
16-point Output	TWDDDO16TK	16	Outputs	Transistor Source	Connector
32-point Output	TWDDDO32UK	32	Outputs	Transistor Sink	Connector
32-point Output	TWDDDO32TK	32	Outputs	Transistor Source	Connector
Mixed Modules					
4-point Input/ 4-point Output	TWDDMM8DRT	4	Inputs	24 VDC	Removable terminal block
		4	Outputs	Relay	
16-point Input/8-point Output	TWDDMM24DRF	16	Inputs	24 VDC	Non-removable terminal block
		8	Outputs	Relay	

Analog Expansion I/O Modules

The following table lists the analog expansion I/O modules:

Module Name	Part Number	Channel	Channel Type	Details	Terminal Type
2 High Level Inputs	TWDAMI2HT	2	Inputs	12 bits 0-10V, 4-20mA	Removable terminal block
1 High Level Output	TWDAM01HT	1	Output	12 bits 0-10V, 4-20mA	Removable terminal block
2 High Level Inputs/ 1 Output	TWDAMM3HT	2 1	Inputs Output	12 bits 0-10V, 4-20mA	Removable terminal block
2 Low Level Inputs/ 1 High Level Output	TWDALM3LT	2 1	Inputs Output	12 bits 0-10V, 4-20mA, RTD, Thermocouple	Removable terminal block

Options

The following table lists the options:

Option Name	Part Number
Operator display module	TWDXCPODC
Operator display expansion module	TWDXCPODM
RTC cartridge	TWDXCPRTC
Memory cartridge 32 K EEPROM	TWDXCPMFK32
Memory cartridge 64 K EEPROM	TWDXCPMFK64
Communication adapter, RS485, miniDIN	TWDNAC485D
Communication adapter, RS232, miniDIN	TWDNAC232D
Communication adapter, RS485, terminal	TWDNAC485T
Communication expansion module, RS485, miniDIN	TWDNOZ485D
Communication expansion module, RS232, miniDIN	TWDNOZ232D
Communication expansion module, RS485, terminal	TWDNOZ485T
6-point Input simulator	TWDXSIM6
9-point Input simulator	TWDXSIM9
14-point Input simulator	TWDXSIM14
5 mounting strips	TWDDXMT5
2 terminal blocks (10 positions)	TWDFTB2T10
2 terminal blocks (11 positions)	TWDFTB2T11
2 terminal blocks (13 positions)	TWDFTB2T13
2 terminal blocks (16 positions)	TWDFTB2T16T
2 connectors (20 pin)	TWDFCN2K20
2 connectors (26 pin)	TWDFCN2K26

Cables   The following table lists the cables:

Cable Name	Part Number
Programming Cables	
PC to controller programming cable	TSXPCX1031
Mini-DIN to free wire communication cable	TSXCX100
Digital I/O Cables	
3 meter, connector for controller to free wire	TWDFCW30M
5 meter, connector for controller to free wire	TWDFCW50M
3 meter, connector for expansion I/O module to free wire	TWDFCW30K
5 meter, connector for expansion I/O module to free wire	TWDFCW50K
TeleFast Cable System Kits with I/O Interfaces	
Cabling kit, 16 input TeleFast base, 1 meter cable	TWDFST16D10
Cabling kit, 16 input TeleFast base, 2 meter cable	TWDFST16D20
Cabling kit, 16 output relay TeleFast base, 1 meter cable	TWDFST16R10
Cabling kit, 16 output relay TeleFast base, 2 meter cable	TWDFST16R20
Cabling kit, 16 input/8 output relay TeleFast base, 1 meter cable	TWDFST20DR10
Cabling kit, 16 input/8 output relay TeleFast base, 2 meter cable	TWDFST20DR20

Maximum Hardware Configuration

Introduction   This section provides the maximum hardware configurations for each controller.

Maximum Hardware Configurations   The following table lists the maximum number of configuration items for each controller:

Controller Item	Compact Controller			Modular Controller		
TWD...	LCAA10DRF	LCAA16DRF	LCAA24DRF	LMDA20DUK LMDA20DTK	LMDA20DRT	LMDA40DUK LMDA40DTK
Base digital inputs	6	9	14	12	12	24
Base digital outputs	4	7	10	8	8	16
Max Expansion I/O modules - digital or analog	0	0	4	4	7	7
Max digital inputs (controller I/O + exp I/O)	6	9	14+(4x32)= 142	12+(4x32)= 140	12+(7x32)= 236	24+(7x32)= 248
Max digital outputs (controller I/O + exp I/O)	4	7	10+(2x32)= 74	8+(4x32)= 36	8+(7x32)= 232	16+(7x32)= 240
Max digital I/O (controller I/O + exp I/O)	10	16	24+(4x32)= 152	20+(4x32)= 148	20+(7x32)= 244	40+(7x32)= 264
Max relay points	4 base only	7 base only	10 base + 32 expansion	64 expansion only	6 base + 96 expansion	96 expansion only
Potentiometers	1	1	2	1	1	1
Built-in analog inputs	0	0	0	1	1	1
Max analog I/O (controller I/O + exp I/O)	0 In/0 Out	0 In/0 Out	8 In/4 Out	9 In/4 Out	15 In/7 Out	15 In/7 Out
Remote controllers	7	7	7	7	7	7
Serial ports	1	2	2	2	2	2
Cartridge slots	1	1	1	2	2	2
Largest application/ backup size (KB)	8	16	32	32	64	64

Controller Item	Compact Controller			Modular Controller		
TWD...	LCAA10DRF	LCAA16DRF	LCAA24DRF	LMDA20DUK LMDA20DTK	LMDA20DRT	LMDA40DUK LMDA40DTK
Optional memory cartridge (KB)	32[1]	32[1]	32[1]	32 or 64	32 or 64	32 or 64
Optional RTC cartridge	yes[1]	yes[1]	yes[1]	yes	yes	yes
Optional Operator Display	yes	yes	yes	yes[2]	yes[2]	yes[2]
Optional 2nd port	no	yes	yes	yes[2]	yes[2]	yes[2]

Note:
1. A Compact controller can have either a memory cartridge or an RTC cartridge.
2. A Modular controller can have either an Operator Display expansion module (with an optional communication adapter) or a communication expansion module.

Main Functions of the Controllers

Introduction   By default all I/O on the controllers are configured as digital I/O. However, certain I/O can be assigned to specific tasks during configuration such as:
- RUN/STOP input
- Latching inputs
- Fast counters:
  - Single up/down counters - 5 kHz (1-phase)
  - Very fast counters - 20 kHz up/down counting (two-phase)
- Controller status output
- Pulse Width Modulation (PWM)
- Pulse (PLS) generator output

Twido controllers are programmed using TwidoSoft which enables the following functions to be used:
- PWM
- PLS
- Fast counters and very fast counters

Main Functions   The following table lists the main functions of the controllers:

Function	Description	
Scanning	Normal (cyclical) or periodic (constant) (2 to 150 ms)	
Execution time	0.14 µs to 0.9 µs for a list instruction	
Memory capacity	Data: 1500 memory words for all controllers, 128 memory bits for TWDLCAA10DRF and TWDLCAA16DRF, 256 memory bits for all other controllers.	
	Program: Compact 10 I/O controller: 700 list instructions Compact 16 I/O controller: 2000 list instructions Compact 24 I/O and Modular 20 I/O controllers: 3000 list instructions Modular 20 Relay and 40 I/O controllers: 6000 list instructions (with a 64 K cartridge otherwise 3000 list instructions)	
RAM backup	By lithium secondary battery. Backup duration is approximately 30 days (typical) at 25°C (77°F) after battery is fully charged. The charging time is 15 hours for charging from 0% to 90% of full charge. Battery life is 5 years when charging for 9 hours and discharging for 15 hours. The battery cannot be replaced.	
Programming port	EIA RS-485	
Expansion I/O modules	Compact 10 and 16 I/O controllers: no expansion modules Compact 24 and Modular 20 I/O controllers: up to 4 expansion I/O modules Modular 20 Relay and 40 I/O controllers: up to 7 expansion I/O modules	
Remote controllers	Up to 7 per controller. Maximum distance between controllers: 50 m (164 feet). Maximum length of entire network 200 m (650 feet).	
Modbus link	Non-isolated EIA RS-485 type, maximum length limit to 200 m. ASCII or RTU mode.	
Remote link	Remote link communications	
Dedicated function blocks	PWM/PLS	All Modular controllers: 2
	Fast counters	All Compact controllers: 3 All Modular controllers: 2
	Very fast counters	All Compact controllers: 1 All Modular controllers: 2
Potentiometers	Compact controller 24 I/O: 2 All other controllers: 1	
Built-in analog channel	Compact controllers: none Modular controllers: 1 Input	

Function	Description		
Programmable input filter	Input filter time can be changed during configuration No filtering or filtering at 3 ms or 12 ms I/O points are configured in groups		
Special I/O	Inputs	RUN/STOP: Any one of the base inputs	
		Latching: up to 4 inputs (%I0.2 to %I0.5)	
		Built-in analog input connected to %I0.0 according to frequency meter	
		Fast counter: 5 kHz maximum Very fast counter: 20 kHz maximum Frequency meter: 1 kHz to 20 kHz maximum	
	Outputs	Controller status output: 1 of 3 outputs (%Q0.1 to %Q0.3)	
		PLS: 27.4 kHz maximum	
		PWM: 20 kHz maximum	

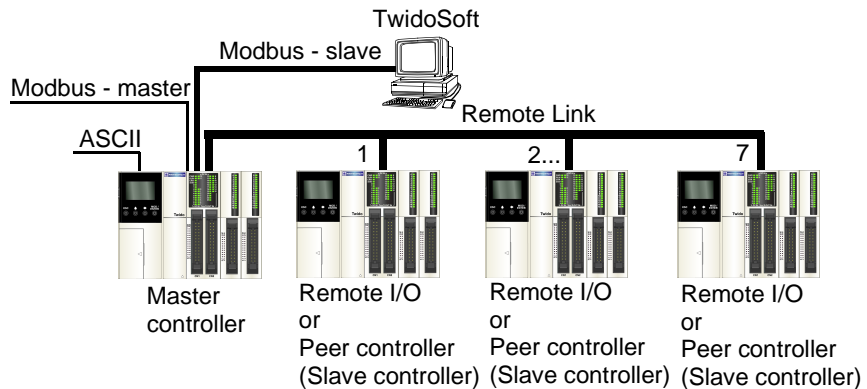# Communication Overview

Introduction   Twido controllers have one, or an optional second, serial port that is used for real-time or system management services. The real-time services provide data distribution functions for exchanging data with I/O devices and messaging functions for communicating to external devices. System management services manage and configure the controller through TwidoSoft. Either serial port is used for any of these services but only serial port 1 is for communicating with TwidoSoft.

To provide these services, there are three protocols available on each controller:

- Remote Link (RTU and ASCII)
- Modbus
- ASCII

Communications Architecture   The following diagram shows a communication architecture with all three protocols.

Remote Link Protocol   The Remote Link protocol is a high-speed master/slave bus designed to communicate a small amount of data between the Master controller and up to seven Remote Slave controllers. Application or I/O data is transferred, depending on the configuration of the Remote controller. A combination of Remote controller types is possible where some can be Remote I/O and some can be Peer controllers.

Modbus Protocol   The Modbus protocol is a master/slave protocol that allows for one master to request responses from slaves or to take action based on the request. The master can address individual slaves or can initiate a broadcast message to all slaves. Slaves return a message (response) to queries that are addressed to them individually. Responses are not returned to broadcast queries from the master.
Modbus Master Mode - The Modbus master mode allows the controller to initiate a Modbus query transmission, with a response expected from a Modbus slave.
Modbus Slave Mode - The Modbus slave mode allows the controller to respond to Modbus queries from a Modbus master and is the default communications mode if no communication is configured.

ASCII Protocol   The ASCII protocol allows communication between the controller and a simple device such as a printer.

Descriptions, Specifications, and Wiring

2

At a Glance

Introduction

This chapter provides wiring rules and recommendations, overviews, parts descriptions, specifications, and wiring schematics for the Twido products.

What's in this Chapter?

This chapter contains the following sections:

2.1 Wiring Rules and Recommendations

Wiring Rules and Recommendations

Introduction   There are several rules that must be followed when wiring a controller or module. Recommendations, when needed, are provided on how to comply with the rules.

	DANGER
	ELECTRIC SHOCK
⚡	● Be sure to remove ALL power from ALL devices before connecting or disconnecting inputs or outputs to any terminal or installing or removing any hardware. ● Be sure to connect the grounding wire to a proper ground.
	Failure to observe this precaution will result in death or serious injury.

|	**WARNING**
	FAILURE OF OUTPUTS
STOP	If outputs should fail, outputs may remain on or off. Where personnel and or equipment hazards exist, use appropriate hard-wired safety interlocks.
	Failure to observe this precaution can result in severe injury or equipment damage.

Rules

- Each terminal accepts up to two 18 AWG (0.82 mm^2) through 28 AWG (0.08 mm^2) wires fitted with cable ends or tags.
- Output module fusing is the responsibility of the user. It is not within the Twido product itself. Select a fuse appropriate for the load with respect to the electrical codes.
- Depending on the load, a protection circuit may be needed for relay outputs on modules.
- The power supply wire should be between 18 AWG (0.82 mm^2) and 22 AWG (0.33 mm^2). Use the shortest wire length possible.
- The grounding wire should be 16 AWG (1.30 mm^2).
- Power supply wires routed inside the panel must be kept separate from I/O and communication wiring. If possible, route wiring in separate cable ducting.
- Take care when wiring output modules that are designed to work as either sink or source. Incorrect wiring can cause equipment damage.
- Make sure that the operating conditions and environments are within the specification values.
- Use proper wire size to meet voltage and current requirements.

Contact Protection Circuit for Relay and Transistor Outputs

Depending on the load, a protection circuit may be needed for the relay output on the controllers and certain modules. Choose a protection circuit, from the following diagrams, according to the power supply. Connect the protection circuit to the outside of the controller or relay output module.
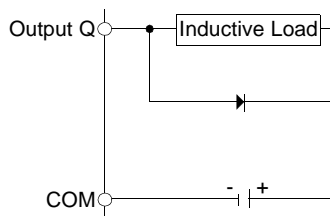
Protection Circuit A: This protection circuit can be used when the load impedance is smaller than the RC impedance in an AC load power circuit.
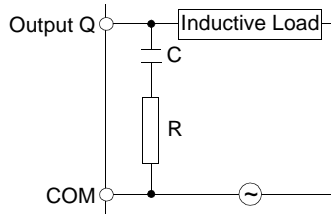
● C represents a value from 0.1 to 1 μF.
● R represents a resistor of approximately the same resistance value as the load.

Protection Circuit B: This protection circuit can be used for both AC and DC load power circuits.
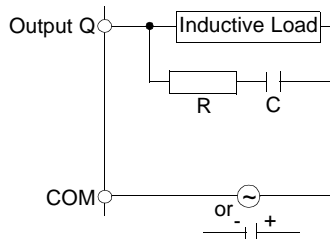
● C represents a value from 0.1 to 1 μF.
● R represents a resistor of approximately the same resistance value as the load.

Protection Circuit C: 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.

Protection Circuit D: This protection circuit can be used for both AC and DC load power circuits.
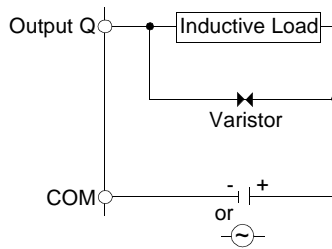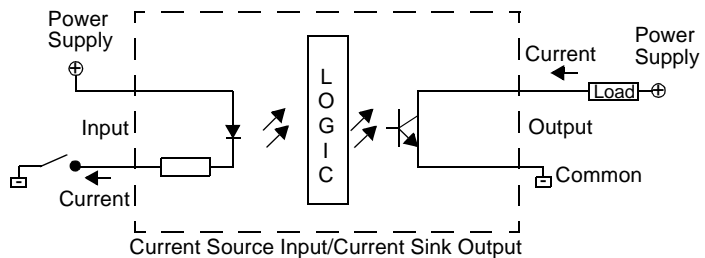

Explanation of Sink Input/ Source Output
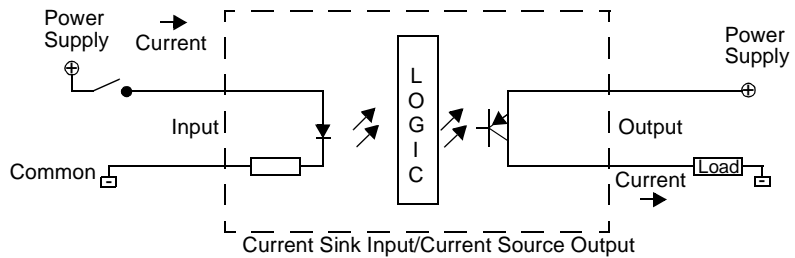
Current Sink Input/Current Source Output

Input side COM field terminal connects to the "-" terminal or common of the field power supply. Output side COM field terminal connects to +24V field power supply.

Explanation of Source Input/ Sink Output

Current Source Input/Current Sink Output

Input side COM field terminal connects to +24V field power supply. Output side COM field terminal connects to the "-" terminal or common of the field power supply.

2.2 Compact Controller

At a Glance

Introduction

This section provides an overview, parts description, specifications, and wiring schematics of the Compact controllers.
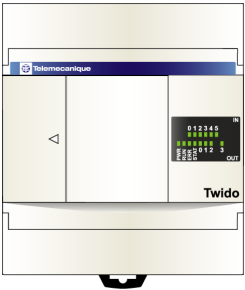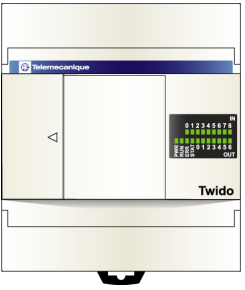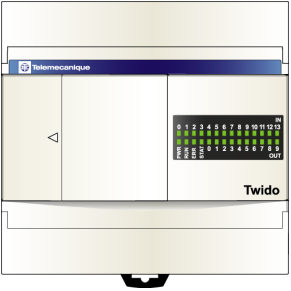
What's in this Section?

This section contains the following topics:

Overview of Compact Controllers

Introduction   The following section provides an overview of the Compact controllers.

Illustrations   The following illustrations are the Compact controllers:

Controller Type	Illustration
The Compact 10 I/O controller: ● has 6 digital inputs and 4 relay outputs ● has 1 potentiometer ● has 1 integrated serial port ● accepts one optional cartridge (RTC or memory - 32 KB only) ● accepts an optional operator display module	TWDLCAA10DRF
The Compact 16 I/O controller: ● has 9 digital inputs and 7 relay outputs ● has 1 potentiometer ● has 1 integrated serial port ● has a slot for an additional serial port ● accepts one optional cartridge (RTC or memory - 32 KB only) ● accepts an optional operator display module	TWDLCAA16DRF
The Compact 24 I/O controller: ● has 14 digital inputs and 10 relay outputs ● has 2 potentiometers ● has 1 integrated serial port ● has a slot for an additional serial port ● accepts up to 4 expansion I/O modules ● accepts one optional cartridge (RTC or memory - 32 KB only) ● accepts an optional operator display module	TWDLCAA24DRF

Description of Analog Potentiometers
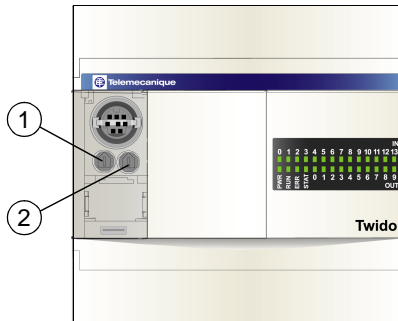
Introduction

The following section describes the analog potentiometer on the Compact controllers.

Description

The TWDLCAA10DRF controller and TWDLCAA16DRF controller have one analog potentiometer. The TWDLCAA24DRF controller has two analog potentiometers. The first analog potentiometer can be set to a value between 0 and 1023. For the TWDLCAA24DRF, the second potentiometer can be set between 0 and 511. The value is stored in system words and is updated in every scan. For more information on setting the analog potentiometer, see the Twido Software Reference Guide.

Analog Potentiometer on a Compact Controller

The following figure shows the analog potentiometers on a Compact controller. This figure is the TWDLCAA24DRF controller.

Legend

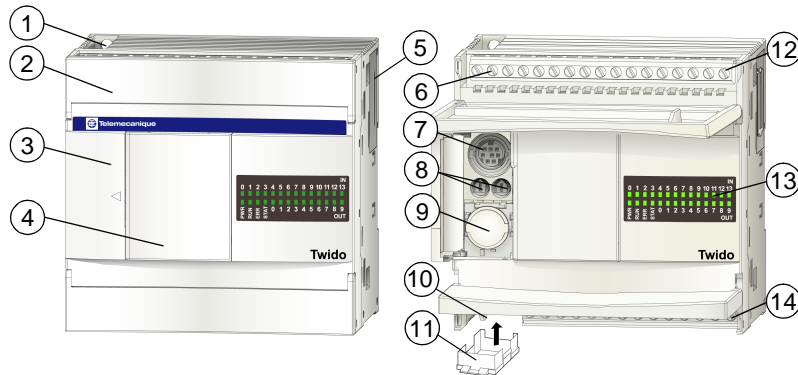| Label	Description
1	Analog potentiometer 1
2	Analog potentiometer 2

Parts Description of a Compact Controller

Introduction   The following section describes the parts of a Compact controller. Your controller may differ from the illustrations but the parts will be the same.

Parts Description of a Compact Controller

The following figure shows the parts of a Compact controller. This figure is the TWDLCAA24DRF controller.

Legend

Label	Description
1	Mounting hole
2	Terminal cover
3	Hinged lid
4	Removable cover to operator display connector
5	Expansion connector - only on the TWDLCAA24DRF
6	Sensor power terminals
7	Serial port 1
8	Analog potentiometers - TWDLCAA10DRF and TWDLCAA16DRF have one
9	Serial port 2 connector - TWDLCAA10DRF does not have one
10	100 to 240 VAC power supply terminals
11	Cartridge connector - located on the bottom of the controller
12	Input terminals
13	LEDs
14	Output terminals

General Specifications for the Compact Controllers

Introduction   This section provides general specifications for the Compact controllers.

Normal Operating Specifications

Compact Controller	TWDLCAA10DRF	TWDLCAA16DRF	TWDLCAA24DRF
Operating temperature	0 to 55°C (32°F to 131°F) operating ambient temperature		
Storage temperature	-25°C to +70°C (-13°F to 158°F)		
Relative humidity	Level RH1, 30 to 95% (non-condensing)		
Pollution degree	2 (IEC60664)		
Degree of protection	IP20		
Corrosion immunity	Free from corrosive gases		
Altitude	Operation: 0 to 2,000 m (0 to 6,565 ft) Transport: 0 to 3,000 m (0 to 9,840 ft)		
Vibration resistance	When mounted on a DIN rail: 10 to 57 Hz amplitude 0.075 mm, 57 to 150 Hz acceleration 9.8 ms^2 (1G), 2 hours per axis on each of three mutually perpendicular axes. When mounted on a panel surface: 2 to 25 Hz amplitude 1.6 mm, 25 to 100 Hz acceleration 39.2 ms^2 (4G) Lloyd's 90 min per axis on each of three mutually perpendicular axes.		
Shock resistance	147 ms^2 (15G), 11 ms duration, 3 shocks per axis, on three mutually perpendicular axes (IEC 61131)		
Weight	230 g	250 g	305 g

Power Supply Specifications

Compact Controller	TWDLCAA10DRF	TWDLCAA16DRF	TWDLCAA24DRF
Rated power voltage	100 to 240 VAC		
Allowable voltage range	85 to 264 VAC		
Rated power frequency	50/60 Hz (47 to 63 Hz)		
Maximum input current	0.25 A (85 VAC)	0.30 A (85 VAC)	0.45 A (85 VAC)
Maximum power consumption	30 VA (264 VAC), 20 VA (100 VAC) This controller's power consumption includes 250 mA sensor power.	31 VA (264 VAC), 22 VA (100 VAC) This controller's power consumption includes 250 mA sensor power.	40 VA (264 VAC), 33 VA (100 VAC) This controller plus 4 I/O modules' power consumption includes 250 mA sensor power.
Allowable momentary power interruption	20 ms (at the rated inputs and outputs) (IEC61131)		
Dielectric strength	Between power and ground terminals: 1,500 VAC, 1 min Between I/O and ground terminals: 1,500 VAC, 1 min		
Insulation resistance	Between power and ground terminals: 10 MΩ minimum (500 VDC) Between I/O and ground terminals: 10 MΩ minimum (500 VDC)		
Noise resistance	AC power terminals: 1.5 kV, 50 ns to 1 μs I/O terminals (coupling clamp): 1.5 kV, 50 ns to 1 μs		
Inrush current	35 A maximum	35 A maximum	40 A maximum
Grounding wire	UL1007 16 AWG (1.30 mm^2)		
Power supply wire	UL1015 22 AWG (0.33 mm^2), UL1007 18 AWG (0.82 mm^2)		
Effect of improper power supply connection	Reverse polarity: normal operation Improper voltage or frequency: permanent damage may be caused Improper lead connection: permanent damage may be caused		

Functional Specifications for the Compact Controllers

Introduction   This section provides functional specifications for the Compact controllers.

Communication Function Specifications

Communication Port	Port 1 (RS485)	Port 2 (RS232) Communication Adapter: TWDNAC232D	Port 2 (RS485) Communication Adapters: TWDNAC485D TWDNAC485T
Standards	RS485	RS232	RS485
Max baud rate	PC link: 19,200 bps Remote link: 38,400 bps	19,200 bps	PC link: 19,200 bps Remote link: 38,400 bps
Maintenance communication (PC link)	Possible	Possible	Possible
ASCII communication	Possible	Possible	Possible
Remote communication	7 possible	Not possible	7 Possible
Maximum cable length	Maximum distance between controllers: 50 m (164 feet).	Maximum distance between controllers: 50 m (164 feet).	Maximum distance between controllers: 50 m (164 feet).
Isolation between internal circuit and communication port	Not isolated	Not isolated	Not isolated

Built-in Function Specifications

Sensor power supply	Output voltage/current	24 VDC (+10% to -15%), 250 mA
	Overload detection	Not available
	Isolation	Isolated from the internal circuit

I/O Specifications for the Compact Controller

Introduction   This section provides I/O specifications for the Compact controllers.

**DC Input
Specifications**

Compact Controller	TWDLCAA10DRF	TWDLCAA16DRF	TWDLCAA24DRF
Input points	6 points in 1 common line	9 points in 1 common line	14 points in 1 common line
Rated input voltage	24 VDC sink/source input signal		
Input voltage range	20.4 to 28.8 VDC		
Rated input current	I0 and I1: 11 mA I2 to I13: 7 mA/point (24 VDC)		
Input impedance	I0 and I1: 2.1 kΩ I2 to I13: 3.4 kΩ		
Turn on time	I0 to I1: 35 μs + filter value I2 to I13: 40 μs + filter value		
Turn off time	I0 and I1: 45 μs + filter value I2 to I13: 150 μs + filter value		
Isolation	Between input terminals: not isolated Internal circuit: photocoupler isolated		
Input type	Type 1 (IEC 61131)		
External load for I/O interconnection	Not needed		
Signal determination method	Static		
Effect of improper input connection	Both sinking and sourcing input signals can be connected. If any input exceeding the rated value is applied, permanent damage may be caused.		
Cable length	3 m (9.84 ft) for compliance with electromagnetic immunity		

Input Operating Range   The input operating range of the Type 1 (IEC 61131-2) input module is shown below.

Input Internal Circuit   The input internal circuit is shown below.

Latching or High Speed Sink or Source Inputs

Inputs I0 and I1

Standard Sink or Source Input

Inputs I2 to I13
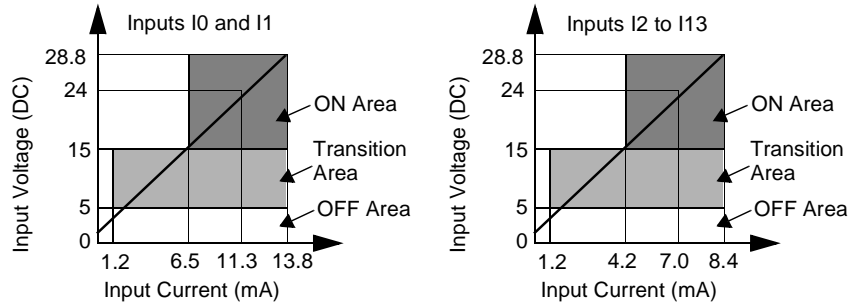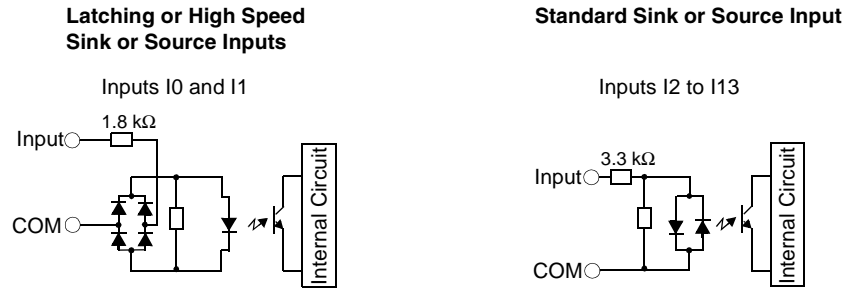
I/O Usage Limits When using TWDLCAA16DRF and TWDLCAA24DRF at an ambient temperature of 55°C (131°F) in the normal mounting direction, limit the inputs and outputs, respectively, which turn on simultaneously along line (1).
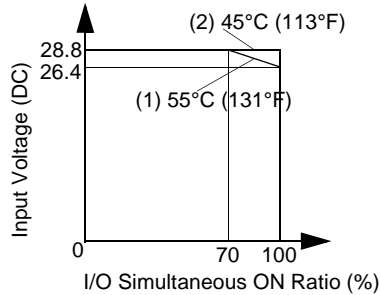
When using TWDLCAA16DRF and TWDLCAA24DRF at 45°C (113°F), all I/O can be turned on simultaneously at input voltage 28.8 VDC as indicated with line (2). When using TWDLCAA10DRF, all I/O can be turned on simultaneously at 55°C (131°F), input voltage 28.8 VDC.

For other possible mounting directions, see *Controller and Expansion I/O Module Mounting Positions, p. 144*.

Relay Output Specifications

Compact Controller	TWDLCAA10DRF	TWDLCAA16DRF	TWDLCAA24DRF
Output points	4 points	7 points	10 points
Output points per common line: COM0	3 NO contacts	4 NO contacts	4 NO contacts
Output points per common line: COM1	1 NO contacts	2 NO contacts	4 NO contacts
Output points per common line: COM2	—	1 NO contacts	1 NO contacts
Output points per common line: COM3	—	—	1 NO contacts
Maximum load current	2 A per point 8 A per common line		
Minimum switching load	0.1 mA/0.1 VDC (reference value)		
Initial contact resistance	30 mΩ maximum		
Electrical life	100,000 operations minimum (rated load 1,800 operations/h)		
Mechanical life	20,000,000 operations minimum (rated load 18,000 operations/h) Internal circuit: photocoupler isolated		
Rated load (resistive/ inductive)	240 VAC/2 A, 30 VDC/2 A		
Dielectric strength	Between output to internal circuit: 1,500 VAC, 1 min Between output to terminals (COMs): 1,500 VAC, 1 min		

Output Delay   The output delay is shown below.

OFF delay: 10 ms maximum
Chatter: 6 ms maximum
ON delay: 6 ms maximum
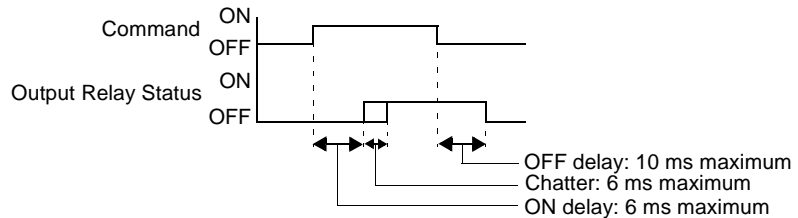
**Relay Output
Contact**

The relay output contact is shown below.
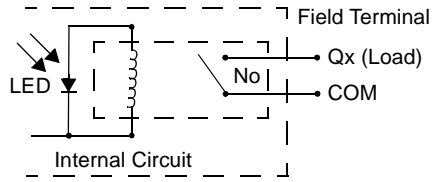
Compact Controller Wiring Schematics

Introduction   This section shows examples of wiring schematics for Compact controllers.

> **Note:** These schematics are for external wiring only.

> **Note:** The shaded boxes are markings on the controller. The I and Q numbers are the input and output points.

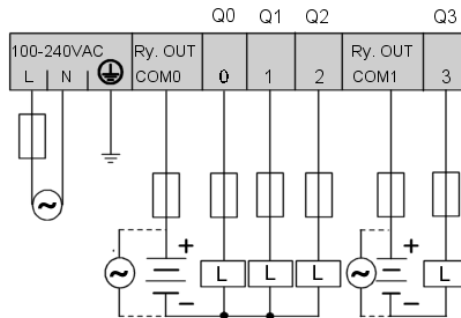**DC Source Input Wiring Schematic**   The schematic is for the TWDLCAA10DRF, TWDLCAA16DRF, and TWDLCAA24DRF controllers.
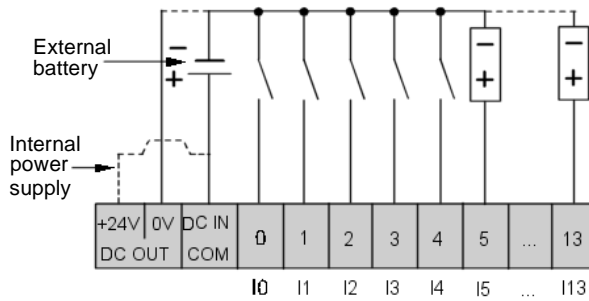
DC Sink Input Wiring Schematic   This schematic is for the TWDLCAA10DRF, TWDLCAA16DRF, and TWDLCAA24DRF controllers.
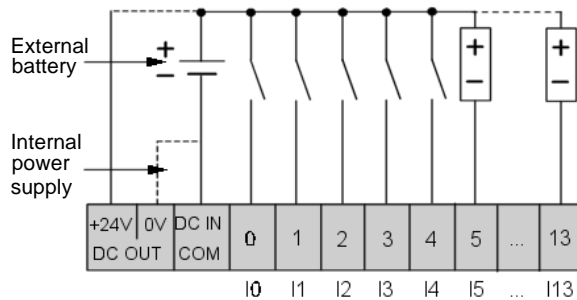
AC Power and Relay Output Wiring Schematic

This schematic is for the TWDLCAA10DRF controller.

This schematic is for the TWDLCAA16DRF controller.
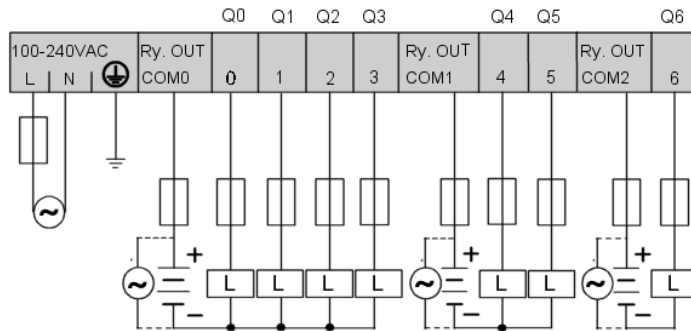
This schematic is for the TWDLCAA24DRF controller.
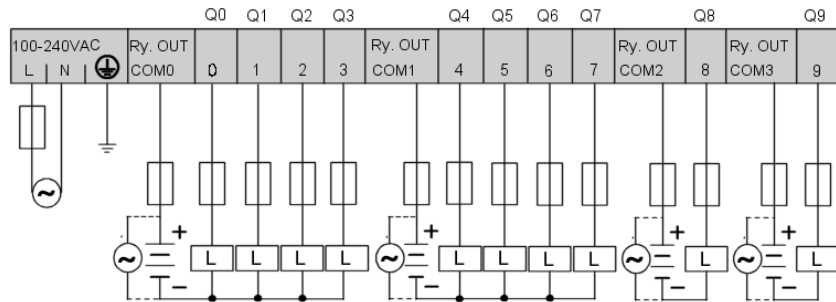
2.3 Modular Controller

At a Glance

Introduction   This section provides an overview, parts description, specifications, and wiring schematics of the Modular controllers.

What's in this Section?   This section contains the following topics:

Topic	Page
Overview of Modular Controllers	47
Description of Analog Potentiometers	49
Overview of Analog Voltage Input	50
Parts Description of a Modular Controller	51
General Specifications for the Modular Controllers	52
Functional Specifications for the Modular Controllers	54
I/O Specifications for the Modular Controllers	56
Modular Controller Wiring Schematics	62
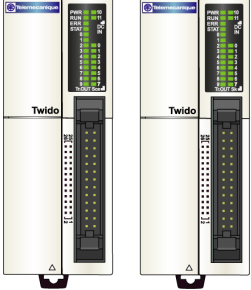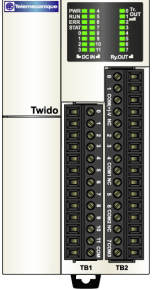
Overview of Modular Controllers
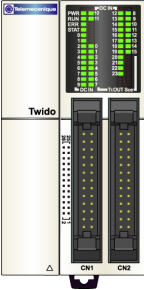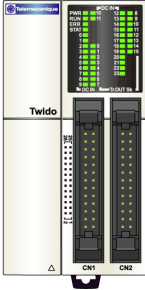
Introduction   The following section provides an overview of the Modular controllers.

Illustrations   The following illustrations are the Modular controllers.

| Controller Type	Illustration
The Modular 20 I/O controller: ● is available in two models: with transistor source outputs (TWDLMDA20DTK) or with transistor sink outputs (TWDLMDA20DUK) ● has 12 digital inputs and 8 transistor source or sink outputs ● has 1 analog voltage input connector ● has 1 analog potentiometer ● has 1 integrated serial port ● has a connector for wiring ● accepts up to 4 expansion I/O modules ● accepts both optional cartridges (RTC and memory - 32 KB or 64 KB) ● accepts either an optional operator display expansion module or an optional communication expansion module	TWDLMDA20DTK TWDLMDA20DUK
The Modular 20 I/O controller: ● has 12 digital inputs, 6 relay outputs, and 2 transistor source outputs ● has 1 analog voltage input connector ● has 1 analog potentiometer ● has 1 integrated serial port ● has a terminal block for wiring ● accepts up to 7 expansion I/O modules ● accepts both optional cartridges (RTC and memory - 32 KB or 64 KB) ● accepts either an optional operator display expansion module or an optional communication expansion module	TWDLMDA20DRT

Controller Type	Illustration
The Modular 40 I/O controller: • is available in two models: with transistor source outputs (TWDLMDA40DTK) or with transistor sink outputs (TWDLMDA40DUK) • has 24 digital inputs and 16 transistor source or sink outputs • has 1 analog voltage input connector • has 1 analog potentiometer • has 1 integrated serial port • has a connector for wiring • accepts up to 7 expansion I/O modules • accepts both optional cartridges (RTC and memory - 32 KB or 64 KB) • accepts either an optional operator display expansion module or an optional communication expansion module	TWDLMDA40DTK TWDLMDA40DUK

Description of Analog Potentiometers

Introduction   The following section describes the analog potentiometer on the Modular controllers.

Description   The TWDLMDA20DUK, TWDLMADA20DTK, TWDLMDA20DRT, TWDLMDA40DUK, and TWDLMADA40DTK controllers have one analog potentiometer. The analog potentiometer can be set at a value from 0 through 1024. The value is stored in system words and is updated in every scan. For more information on setting the analog potentiometer, see the Twido Software Reference Guide.

Analog Potentiometer on a Compact Controller   The following figure shows the analog potentiometer on a Modular controller. This figure is the TWDLMDA40DUK controller.
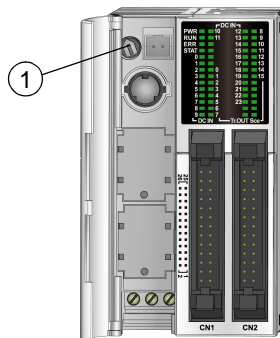
Legend

Label	Description
1	Analog potentiometer 1

Overview of Analog Voltage Input

Introduction   The following section describes the analog voltage input on the Modular controllers.

Description   All Modular controllers have one analog voltage input. The analog voltage input connects an analog voltage source of 0 through 10 VDC. The analog voltage is converted to a value of 0 through 512 and is stored in a system word.

Parts Description of a Modular Controller

Introduction   The following section describes the parts of a Modular controller. Your controller may differ from the illustrations but the parts will be the same.

Parts Description of a Modular Controller   The following figure shows the parts of a Modular controller. This figure is the Modular 40 I/O controller.

10 not shown, left side of controller
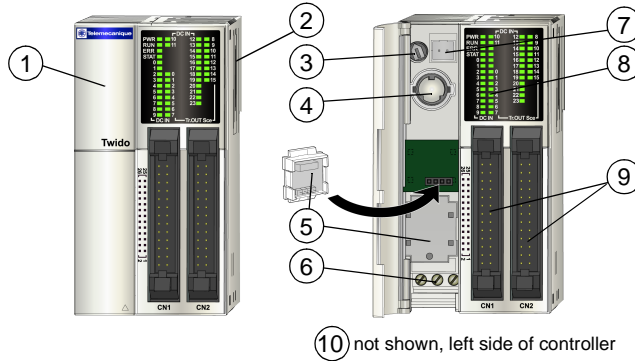
Legend

Label	Description
1	Hinged lid
2	Expansion connector
3	Analog potentiometer
4	Serial port 1
5	Cartridge covers
6	24 VDC power supply terminals
7	Analog voltage input connector
8	LEDs
9	I/O terminals
10	Communication connector

General Specifications for the Modular Controllers

Introduction   This section provides general specifications for the Modular controllers.

Normal Operating Specifications

Modular Controller	TWDLMDA20DTK TWDLMDA20DUK	TWDLMDA20DRT	TWDLMDS40DTK TWDLMDS40DUK
Operating temperature	0 to 55°C (32°F to 131°F) operating ambient temperature		
Storage temperature	-25°C to +70°C (-13°F to 158°F)		
Relative humidity	Level RH1, 30 to 95% (non-condensing)		
Pollution degree	2 (IEC60664)		
Degree of protection	IP20		
Corrosion immunity	Free from corrosive gases		
Altitude	Operation: 0 to 2,000 m (0 to 6,565 ft) Transport: 0 to 3,000 m (0 to 9,840 ft)		
Vibration resistance	When mounted on a DIN rail: 10 to 57 Hz amplitude 0.075 mm, 57 to 150 Hz acceleration 9.8 ms^2 (1G), 2 hours per axis on each of three mutually perpendicular axes. When mounted on a panel surface: 2 to 25 Hz amplitude 1.6 mm, 25 to 100 Hz acceleration 39.2 ms^2 (4G) Lloyd's 90 min per axis on each of three mutually perpendicular axes.		
Shock resistance	147 ms^2 (15G), 11 ms duration, 3 shocks per axis, on three mutually perpendicular axes (IEC 61131).		
Weight	140 g	185 g	180 g

**Power Supply
Specifications**

Modular Controller	TWDLMDA20DTK TWDLMDA20DUK	TWDLMDA20DRT	TWDLMDS40DTK TWDLMDS40DUK
Rated power voltage	24 VDC		
Allowable voltage range	20.4 to 26.4 VDC (including ripple)		
Maximum input current	Controller plus 4 I/O Modules	Controller plus 7 I/O Modules	
	15 W (26.4 VDC)	19 W (26.4 VDC)	19 W (26.4 VDC)
Allowable momentary power interruption	10 ms (at 24 VDC)		
Dielectric strength	Between power and ground terminals: 500 VAC, 1 min Between I/O and ground terminals: 1,500 VAC, 1 min		
Insulation resistance	Between power and ground terminals: 10 MΩ minimum (500 VDC) Between I/O and ground terminals: 10 MΩ minimum (500 VDC)		
Noise resistance	DC power terminals: 1.0 kV, 50 ns to 1 μs I/O terminals (coupling clamp): 1.5 kV, 50 ns to 1 μs		
Inrush current	50 A maximum (24 VDC)		
Grounding wire	UL1015 22 AWG (0.33 mm^2), UL1007 18 AWG (0.82 mm^2)		
Power supply wire	UL1015 22 AWG (0.33 mm^2), UL1007 18 AWG (0.82 mm^2)		
Effect of improper power supply connection	Reverse polarity: no operation, no damage Improper voltage or frequency: permanent damage may be caused Improper lead connection: permanent damage may be caused		

Functional Specifications for the Modular Controllers

Introduction   This section provides functional specifications for the Modular controllers.

Communication Function Specifications

Communication Port	Port 1 (RS485)	Port 2 (RS232) Communication Expansion Module (TWDNOZ232D) or Operator Display Expansion Module (TWDXCPODM) with Communication Adapter (TWDNAC232D)	Port 2 (RS485) Communication Expansion Modules (TWDNOZ485D) or (TWDNOZ485T) or Operator Display Expansion Module (TWDXCPODM) with Communication Adapter (TWDNAC485D) or (TWDNAC485T)
Standards	RS485	RS232	RS485
Maximum baud rate	PC link: 19,200 bps Remote link: 38,400 bps	19,200 bps	PC link: 19,200 bps Remote link: 38,400 bps
Maintenance communication (PC link)	Possible	Possible	Possible
ASCII communication	Possible	Possible	Possible
Remote communication	7 possible	Not possible	7 Possible
Maximum cable length	Maximum distance between controllers: 50 m (164 feet).	Maximum distance between controllers: 50 m (164 feet).	Maximum distance between controllers: 50 m (164 feet).
Isolation between internal circuit and communication port	Not isolated	Not isolated	Not isolated

Built-in Function Specifications

Analog voltage input	Quantity	1 point
	Input voltage range	0 to 10 VDC
	Input impedance	Approximately 100 kΩ
	Data range	0 to 512
PWM/PLS output	Quantity	2 points
	Maximum frequency	20 kHz

I/O Specifications for the Modular Controllers

Introduction   This section provides I/O specifications for the Modular controllers.

**DC Input
Specifications**

Modular Controller	TWDLMDA20DUK TWDLMDA20DTK	TWDLMDA20DRT	TWDLMDA40DUK TWDLMDA40DTK
Input points	12 points in 1 common line	12 points in 1 common line	24 points in 2 common lines
Rated input voltage	24 VDC sink/source input signal		
Input voltage range	20.4 to 26.4 VDC		
Rated input current	I0, I1, I6, I7: 5 mA/point (24 VDC) I2 to I5, I8 to I23: 7 mA/point (24 VDC)		
Input impedance	I0, I1, I6, I7: 5.7 kΩ I2 to I5, I8 to I23: 3.4 kΩ		
Turn on time	I0 to I7: 35 µs + filter value I8 to I23: 40 µs + filter value		
Turn off time	I0, I1, I6, I7: 45 µs + filter value I2 to I5, I8 to I23: 150 µs + filter value		
Isolation	Between input terminals: not isolated Internal circuit: photocoupler isolated		
Input type	Type 1 (IEC 61131)		
External load for I/O interconnection	Not needed		
Signal determination method	Static		
Effect of improper input connection	Both sinking and sourcing input signals can be connected. If any input exceeding the rated value is applied, permanent damage may be caused.		
Cable length	3m (9.84 ft) for compliance with electromagnetic immunity		
Connector insertion/ removal durability	100 times minimum		

Input Operating Range

The input operating range of the Type 1 (IEC 61131-2) input module is shown below.
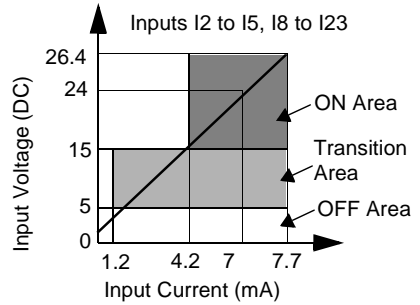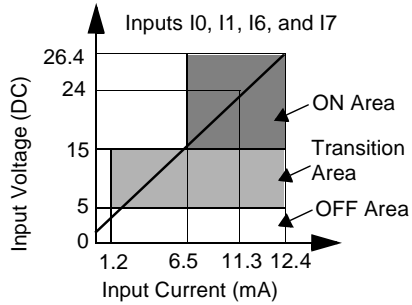
Input Internal Circuit

The input internal circuit is shown below.

I/O Usage Limits When using TWDLMDA20DUK and TWDLMDA20DTK at an ambient temperature of 55°C (131°F) in the normal mounting direction, limit the inputs and outputs, respectively, which turn on simultaneously along line (1).

When using TWDLMDA40DUK and TWDLMDA40DTK limit the inputs and outputs, respectively, which turn on simultaneously along line (2).
When using at 40°C (104°F) all I/O can be turned on simultaneously at 26.4 VDC as indicated with line (3).
When using TWDLMDA20DRT all I/O can be turned on simultaneously at 55°C (131°F), input voltage 26.4 VDC.

Transistor Sink and Source Output Specifications

Modular Controller	TWDLMDA20DUK TWDLMDA20DRT TWDLMDA40DUK	TWDLMDA20DTK TWDLMDA40DTK
Output type	Sink output	Source output
Output points per common line	TWDLMDA20DUK and TWDLMDA20DTK TWDLMDA20DRT TWDLMDA40DUK and TWDLMDA40DTK	8 points in 1 common line 2 points in 1 common line 16 points in 2 common lines
Rated load voltage	24 VDC	
Maximum load current	1 A per common line	
Operating load voltage range	20.4 to 28.8 VDC	
Voltage drop (on voltage)	1 V maximum (voltage between COM and output terminals when output is on)	
Rated load current	0.3 A per output point	
Inrush current	1 A maximum	
Leakage current	0.1 mA maximum	
Clamping voltage	39 V +/-1V	
Maximum lamp load	8 W	
Inductive load	L/R = 10 ms (28.8 VDC, 1 Hz)	
External current draw	100 mA maximum, 24 VDC (power voltage at the +V terminal)	100 mA maximum, 24 VDC (power voltage at the -V terminal)
Isolation	Between output terminal and internal circuit: photocoupler isolated Between output terminals: not isolated	
Connector insertion/removal durability	100 times minimum	
Output delay - turn on time	Q0, Q1: 5 µs maximum Q2 to Q15: 300 µs maximum	
Output delay - turn off time	Q0, Q1: 5 µs maximum Q2 to Q15: 300 µs maximum	

Relay Output Specifications

Modular Controller	TWDLMDA20DRT
Number of outputs	8 points including 6 relay and 2 transistor source outputs
Output points per common line - COM0	2 points
Output points per common line - COM1	3 NO contacts
Output points per common line - COM2	2 NO contacts
Output points per common line - COM3	1 NO contacts
Maximum load current	2 A per point 8 A per common line
Minimum switching load	0.1 mA/0.1 VDC (reference value)
Initial contact resistance	30 mΩ maximum
Electrical life	100,000 operations minimum (rated load 1,800 operations/h)
Mechanical life	20,000,000 operations minimum (rated load 18,000 operations/h)
Rated load (resistive/inductive)	240 VAC/2 A, 30 VDC/2 A
Dielectric strength	Between output to internal circuit: 1,500 VAC, 1 min Between output to terminals (COMs): 1,500 VAC, 1 min
Connector insertion/removal durability	100 times minimum

Output Delay   The output delay is shown below.
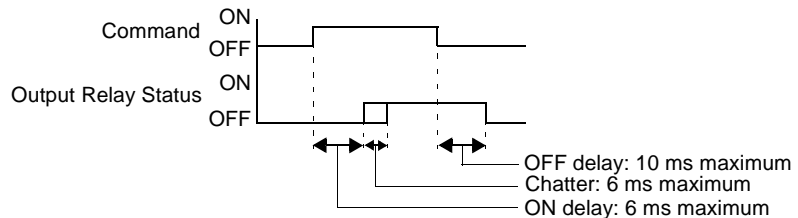
OFF delay: 10 ms maximum
Chatter: 6 ms maximum
ON delay: 6 ms maximum

Relay Output Contact

The relay output contact is shown below.

LED
No
Field Terminal
Qx (Load)
COM
Internal Circuit

Transistor Source Output Contact

The transistor source output contact is shown below.

±
P-chan
COM (+24V)
Q Output
V+ (COM)
LED
Internal

Transistor Sink Output Contact

The transistor sink output contact is shown below.

±
N-chan
COM (COM)
Q Output
V+ (+24V)
Internal
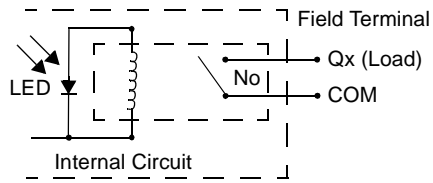
Modular Controller Wiring Schematics

Introduction   This section shows examples of wiring schematics for the Modular controllers.

> **Note:** These schematics are for external wiring only.

> **Note:** The shaded boxes are markings on the controller. The I and Q numbers are the input and output points.

TWDLMDA20-DUK Wiring Schematic   This schematic is for the TWDLMDA20DUK controller with connector.
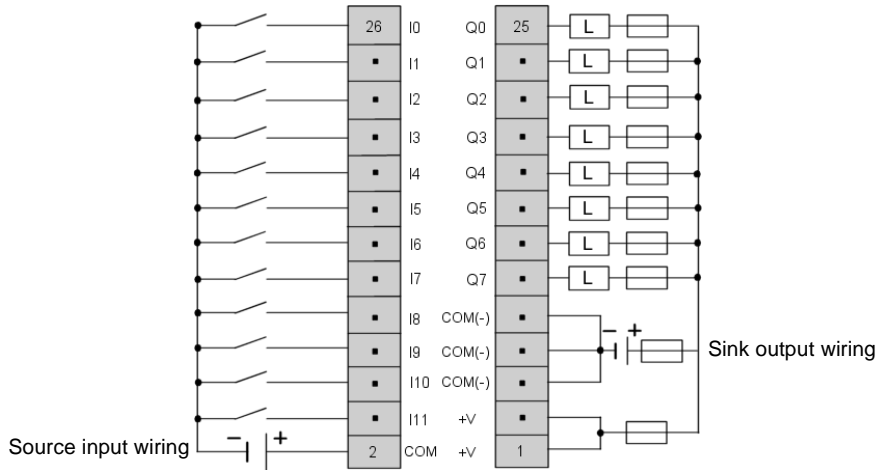
- The COM(-) terminals are connected together internally.
- The COM and COM(-) terminals are **not** connected together internally.
- The +V terminals are connected together internally.
- Connect a fuse that is appropriate for the load.

TWDLMDA20-DTK Wiring Schematic

This schematic is for the TWDLMDA20DTK controller with connector.
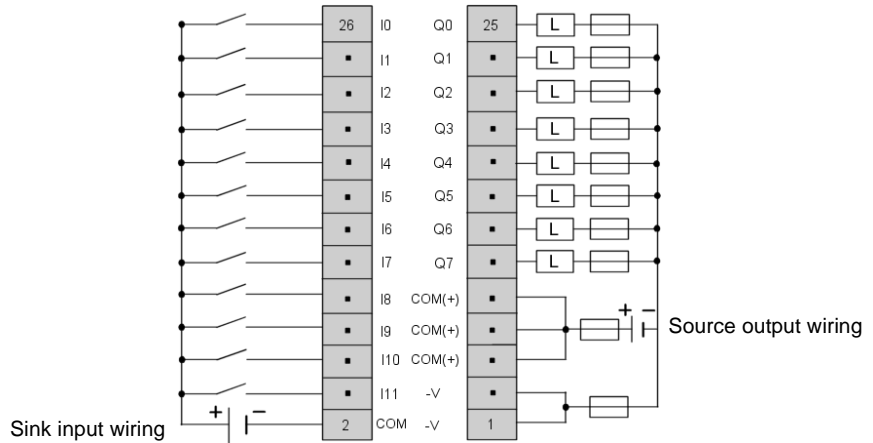
- The COM(+) terminals are connected together internally.
- The COM and COM(+) terminals are **not** connected together internally.
- The -V terminals are connected together internally.
- Connect a fuse that is appropriate for the load.

TWDLMDA20-DRT Wiring Schematic

This schematic is for the TWDLMDA20DRT controller with terminal block.
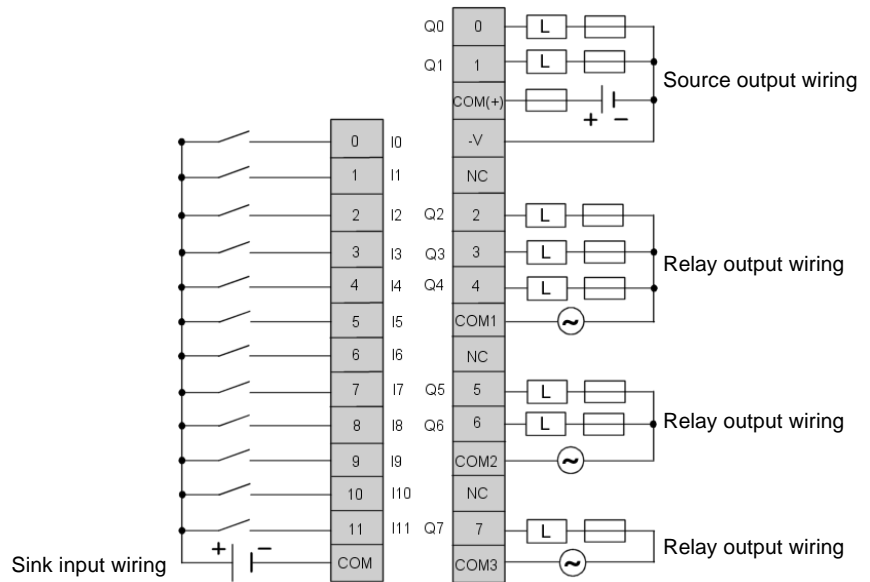
- Output points 0 and 1 are transistor source outputs, all other output points are relay.
- The COM terminals are **not** connected together internally.
- Connect a fuse that is appropriate for the load.

TWDLMDA40-DUK Wiring Schematic

This schematic is for the TWDLMDA40DUK controller with connector.
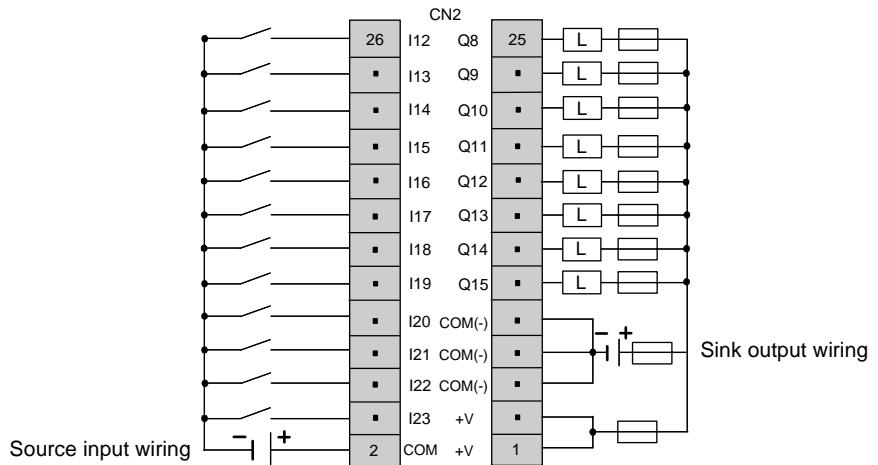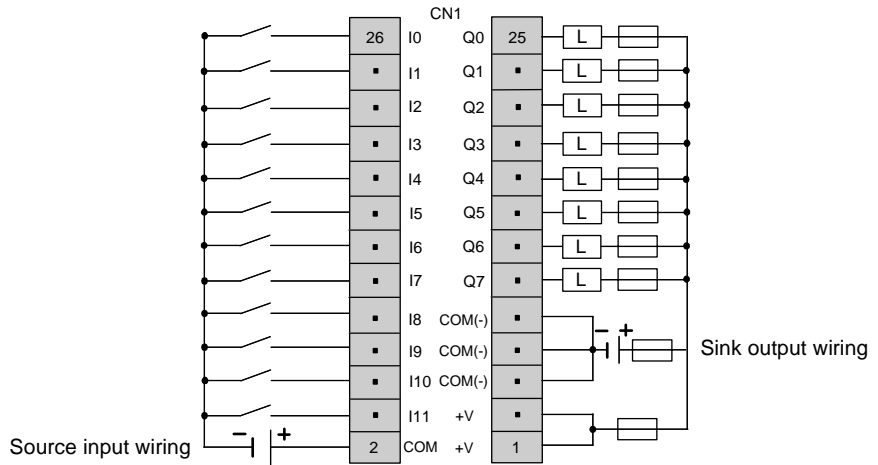
- The terminals on CN1 and CN2 are **not** connected together internally.
- The COM(-) terminals are connected together internally.
- The COM and COM(-) terminals are **not** connected together internally.
- The +V terminals are connected together internally.
- Connect a fuse that is appropriate for the load.

TWDLMDA40-DTK Wiring Schematic

This schematic is for the TWDLMDA40DTK controller with connector.
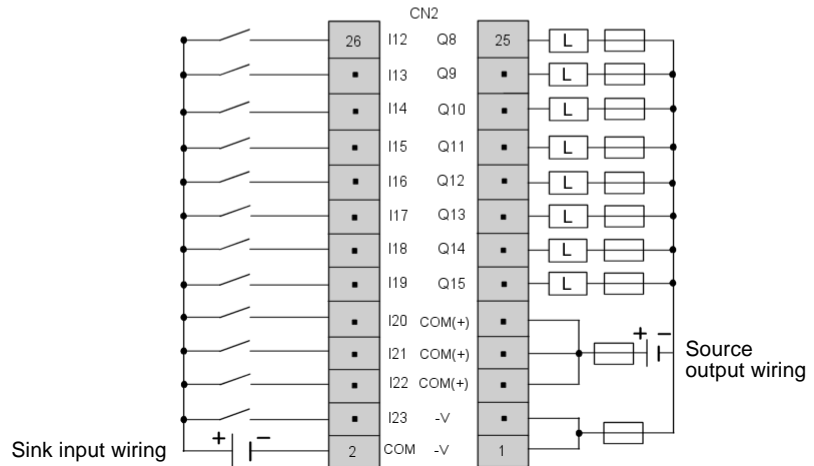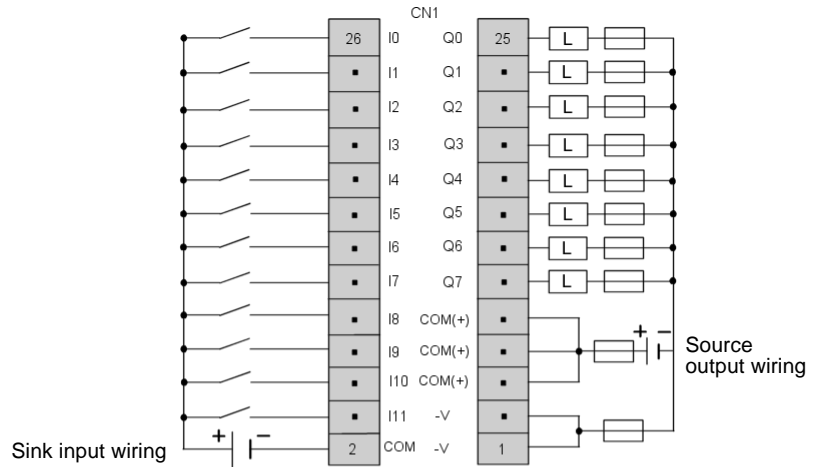
- The terminals on CN1 and CN2 are **not** connected together internally.
- The COM(+) terminals are connected together internally.
- The COM and COM(+) terminals are **not** connected together internally.
- The -V terminals are connected together internally.
- Connect a fuse that is appropriate for the load.

2.4 Digital I/O Modules

At a Glance

Introduction   This section provides an overview, specifications, and wiring schematics of the digital I/O modules.

What's in this Section?   This section contains the following topics:

Overview of Digital I/O Modules
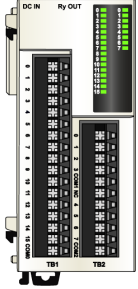
Introduction   The following section provides an overview of the digital I/O modules.

Illustrations   The following illustrations are the digital input, output, and mixed I/O modules.

Controller Type	Illustration
There are 4 digital input modules: • 8-point module with a terminal block (TWDDDI8DT) • 16-point module with a terminal block (TWDDDI16DT) • 16-point module with a connector (TWDDDI16DK) • 32-point module with a connector (TWDDDI32DK) These modules can be attached to any controller except the Compact 10 I/O and 16 I/O controllers.	TWDDDI8DT TWDDDI16DK TWDDDI16DT TWDDDI32DK

Controller Type	Illustration
There are 8 digital output modules: ● 8-point relay module with a terminal block (TWDDRA8RT) ● 16-point relay module with a terminal block (TWDDRA16RT) ● 8-point transistor sink module with a connector (TWDDDO8UT) ● 16-point transistor sink module with a connector (TWDDDO16UK) ● 32-point transistor sink module with a connector (TWDDDO32UK) ● 8-point transistor source module with a terminal block (TWDDDO8TT) ● 16-point transistor source module with a connector (TWDDDO16TK) ● 32-point transistor source module with a connector (TWDDDO32TK) These modules can be attached to any controller except the Compact 10 I/O and 16 I/O controllers.	TWDDRA8RT TWDDRA16RT TWDDDO8UT TWDDDO16UK TWDDDO32UK TWDDDO8TT TWDDDO16TK TWDDDO32TK

Controller Type	Illustration
There are 2 digital mixed input and output modules: • 4-point input/4-point output module with a terminal block (TWDDMM8RT) • 16-point input/8-point output module with a wire-clamp terminal block (TWDDMM24DRF) These modules can be attached to any controller except the Compact 10 I/O and 16 I/O controllers.	

Parts Description of Digital I/O Modules

Introduction   The following section describes the parts of a digital I/O module with a terminal block and with a connector. Your I/O module may differ from the illustrations but the parts will be the same.

Parts Description of a Digital I/O Module with a Terminal Block

The following figure shows the parts of a digital I/O module with a terminal block. This figure is the TWDDDIO8DT module.
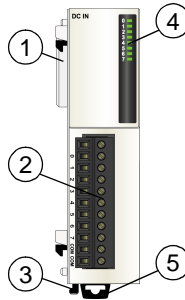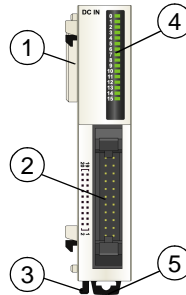

Legend

Label	Description
1	Expansion connector - one on each side, right side not shown
2	Terminal block
3	Latch button
4	LEDs
5	Clamp

Parts Description of a Digital I/O Module with a Connector

The following figure shows the parts of a digital I/O module with a connector. This figure is the TWDDDO16TK module.

Legend

Label	Description
1	Expansion connector - one on each side, right side not shown
2	Connector
3	Latch button
4	LEDs
5	Clamp

Specifications for the Digital I/O Modules

Introduction

This section is specifications for the digital I/O modules.

TWDDDI8DT, TWDDDI16DT, TWDDDI16DK, and TWDDDI32DK Specifications

Type Number	TWDDDI8DT	TWDDDI16DT	TWDDDI16DK	TWDDDI32DK
Input points	8 points in 1 common line	16 points in 1 common line	16 points in 1 common line	32 points in 2 common lines
Rated input voltage	24 VDC sink/source input signal			
Input voltage range	20.4 to 28.8 VDC			
Rated input current	7 mA/point (24 VDC)		5 mA/point (24 VDC)	
Input impedance	3.4 kΩ		4.4 kΩ	
Turn on time (24 VDC)	4 ms			
Turn off time (24 VDC)	4 ms			
Isolation	Between input terminals: not isolated Internal circuit: photocoupler isolated			
External load for I/O interconnection	Not needed			
Signal determination method	Static			
Effect of improper input connection	Both sinking and sourcing input signals can be connected. If any input exceeding the rated value is applied, permanent damage may be caused.			
Cable length	3m (9.84 ft) in compliance with electromagnetic immunity			
Connector insertion/ removal durability	100 times minimum			
Internal current draw - all inputs on	25 mA (5 VDC) 0 mA (24 VDC)	40 mA (5 VDC) 0 mA (24 VDC)	35 mA (5 VDC) 0 mA (24 VDC)	65 mA (5 VDC) 0 mA (24 VDC)
Internal current draw - all inputs off	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)	10 mA (5 VDC) 0 mA (24 VDC)
Weight	85 g	100 g	65 g	100 g

TWDDDI8DT, TWDDDI16DT, TWDDDI16DK, and TWDDDI32DK Operating Range

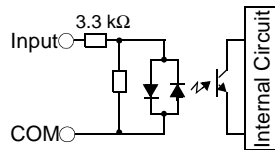The input operating range of the Type 1 (IEC 61131-2) input module is shown below.
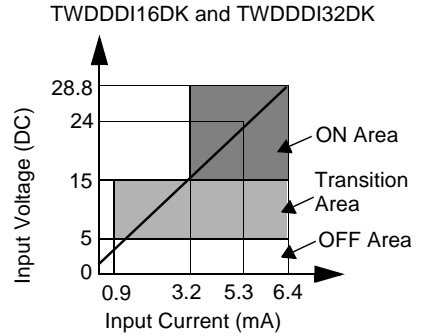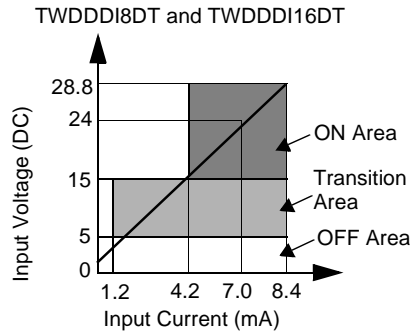
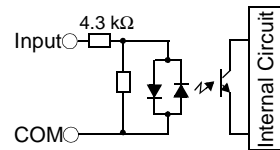**TWDDDI8DT, TWDDDI16DT, TWDDDI16DK, and TWDDDI32DK Internal Circuit**

The input internal circuit is shown below.

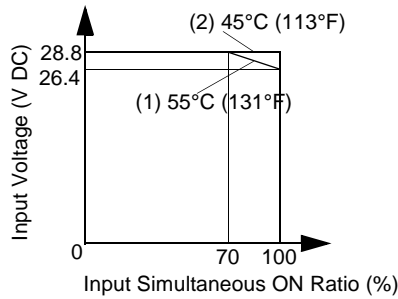**Standard Sink or Source Input**

TWDDDI8DT, TWDDDI16DT, TWDDDI16DK, and TWDDDI32DK Usage Limits

When using TWDDDI16DT at 55°C (131°F) in the normal mounting direction, limit the inputs which turn on simultaneously along line (1). At 45°C (113°F), all inputs can be turned on simultaneously at 28.8 VDC as indicated with line (2).

When using TWDDDI16DK and TWDDDI32DK at 55°C (131°F), limit the inputs which turn on simultaneously on each connector line (3). At 30°C (86°F), all inputs can be turned on simultaneously at 28.8 VDC as indicated with line (4).
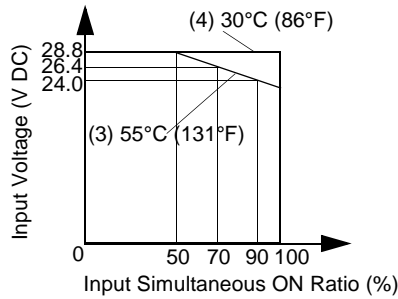
When using TWDDDI8DT, all inputs can be turned on simultaneously at 55°C (131°F), input voltage 28.8 VDC.

**TWDDRA8RT
and
TWDDRA16RT
Specifications**

CAUTION
Possible current overload
Size wire accordingly.
Failure to observe this precaution can result in injury or equipment damage.

Type Number	TWDDRA8RT	TWDDRA16RT
Output points and common lines	8 NO contacts in 2 common lines	16 NO contacts in 2 common lines
Maximum load current	2 A per point	
	7 A per common line	8 A per common line
Minimum switching load	0.1 mA/0.1 VDC (reference value)	
Initial contact resistance	30 mΩ maximum	
Electrical life	100,000 operations minimum (rated load 1,800 operations/hour)	
Mechanical life	20,000,000 operations minimum (rated load 18,000 operations/hour)	
Rated load (resistive/inductive)	240 VAC/2 A, 30 VDC/2 A	
Dielectric strength	Between output and terminals: 1,500 VAC, 1 minute Between output terminal and internal circuit: 1,500 VAC, 1 minute Between output terminals (COMs): 1,500 VAC, 1 minute	
Connector insertion/removal durability	100 times minimum	
Internal current draw - all outputs on	30 mA (5 VDC) 40 mA (24 VDC)	45 mA (5 VDC) 75 mA (24 VDC)
Internal current draw - all outputs off	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)
Weight	110 g	145 g

TWDDRA8RT and TWDDRA16RT Delay

The output delay is shown below.
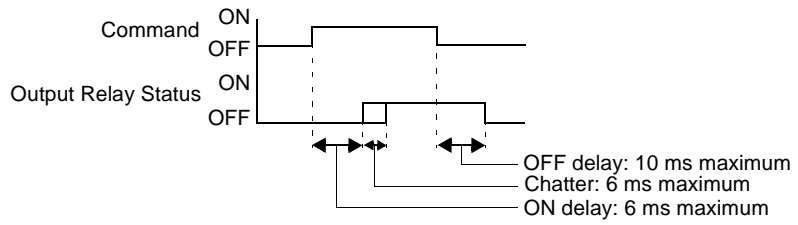
TWDDDO8UT,
TWDDDO16UK,
and
TWDDDO32UK
Specifications

| Type Number	TWDDDO8UT	TWDDDO16UK	TWDDDO32UK
Output type	Transistor sink output		
Output points per common line	8 points in 1 common line	16 points in 1 common line	32 points in 2 common lines
Rated load voltage	24 VDC		
Operating load voltage range	20.4 to 28.8 VDC		
Rated load current	0.3 A per output point	0.1 A per output point	
Maximum load current	0.36 A per output point 3 A per common line	0.12 A per output point 1 A per common line	
Voltage drop (on voltage)	1 V maximum (voltage between COM and output terminals when output is on)		
Inrush current	1 A maximum		
Leakage current	0.1 A maximum		
Clamping voltage	39 V +/-1V		
Maximum lamp load	8 W		
Inductive load	L/R = 10 ms (28.8 VDC, 1 Hz)		
External current draw	100 mA maximum, 24 VDC (power voltage at the +V terminal)		
Isolation	Between output terminal and internal circuit: photocoupler isolated Between output terminals: not isolated		
Connector insertion/removal durability	100 times minimum		
Internal current draw - all outputs on	10 mA (5 VDC) 20 mA (24 VDC)	10 mA (5 VDC) 40 mA (24 VDC)	20 mA (5 VDC) 70 mA (24 VDC)
Internal current draw - all outputs off	5 mA (5 V DC) 0 mA (24 V DC)	5 mA (5 V DC) 0 mA (24 V DC)	10 mA (5 V DC) 0 mA (24 V DC)
Output delay	Turn on time: 300 µs maximum Turn off time: 300 µs maximum		
Weight	85 g	70 g	105 g

TWDDDO8TT, TWDDDO16TK, and TWDDDO32TK Specifications

Type Number	TWDDDO8TT	TWDDDO16TK	TWDDDO32TK
Output type	Transistor source output		
Output points per common Line	8 points in 1 common line	16 points in 1 common line	32 points in 2 common lines
Rated load voltage	24 VDC		
Operating load voltage range	20.4 to 28.8 VDC		
Rated load current	0.3 A per output point	0.1 A per output point	
Maximum load current	0.36 A per output point 3 A per common line	0.12 A per output point 1 A per common line	
Voltage drop (on voltage)	1 V maximum (voltage between COM and output terminals when output is on)		
Inrush current	1 A maximum		
Leakage current	0.1 mA maximum		
Clamping voltage	39 V +/-1V		
Maximum lamp load	8 W		
Inductive load	L/R = 10 ms (28.8 VDC, 1 Hz)		
External current draw	100 mA maximum, 24 VDC (power voltage at the +V terminal)		
Isolation	Between output terminal and internal circuit: photocoupler isolated Between output terminals: not isolated		
Connector insertion/removal durability	100 times minimum		
Internal current draw - all outputs on	10 mA (5 VDC) 20 mA (24 VDC)	10 mA (5 VDC) 40 mA (24 VDC)	20 mA (5 VDC) 70 mA (24 VDC)
Internal current draw - all outputs off	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)	10 mA (5 VDC) 0 mA (24 VDC)
Output delay	Turn on time: 300 μs maximum Turn off time: 300 μs maximum		
Weight	85 g	70 g	105 g

TWDDMM8DRT and TWDDMM24DRF Input Specifications

	WARNING
STOP	**Effect of improper input connection**
	If any input exceeding the rated value is applied, permanent damage may be caused.
	Failure to observe this precaution can result in severe injury or equipment damage.

Type Number	TWDDMM8DRT	TWDDMM24DRF
I/O points	4 input and 4 outputs	16 inputs and 8 outputs
Rated input voltage	24 VDC sink/source input signal	
Input voltage range	20.4 to 28.8 VDC	
Rated input current	7 mA/point (24 VDC)	
Input impedance	3.4 kΩ	
Turn on time (24 VDC)	4 ms (24 VDC)	
Turn off time (24 VDC)	4 ms (24 VDC)	
Isolation	Between input terminals: not isolated Internal circuit: photocoupler isolated	
External load for I/O interconnection	Not needed	
Signal determination method	Static	
Effect of improper input connection	Both sinking and sourcing input signals can be connected.	
Cable length	3m (9.84 ft.) in compliance with electromagnetic immunity	
Connector insertion/removal durability	100 times minimum	Not removable
Internal current draw - all I/O on	25 mA (5 VDC) 20 mA (24 VDC)	65 mA (5 VDC) 45 mA (24 VDC)
Internal current draw - all I/O off	5 mA (5 VDC) 0 mA (24 VDC)	10 mA (5 VDC) 0 mA (24 VDC)
Weight	95 g	140 g

TWDDMM8DRT and TWDDMM24DRF Input Operating Range

The input operating range of the Type 1 (IEC 61131-2) input module is shown below.
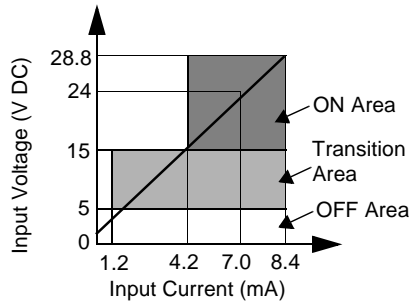
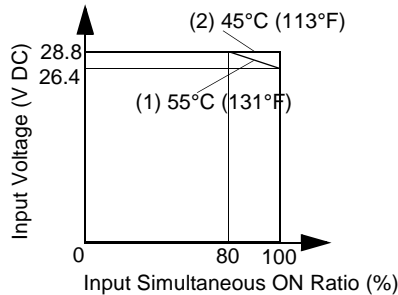**TWDDMM8DRT and TWDDMM24DRF Input Internal Circuit**

The input internal circuit is shown below.

Standard Sink or Source Input
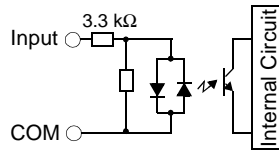
TWDDMM8DRT and TWDDMM24DRF Usage Limits

When using TWDDMM24DRF at an ambient temperature of 55°C (131°F) in the normal mounting direction, limit the inputs and outputs, respectively, which turn on simultaneously along line (1). At 45°C (113°F), all inputs and outputs can be turned on simultaneously at 28.8 VDC as indicated with line (2).

When using TWDDMM8DRT, all inputs and outputs can be turned on simultaneously at 55°C (131°F), input voltage 28.8 VDC.

TWDDMM8DRT and TWDDMM24DRF Output Specifications

Type Number	TWDDMM8DRT	TWDDMM24DRF
Output points and common lines	4 NO contacts in 1 common line	8 NO contacts in 2 common lines
Maximum load current	2 A per point 7 A per common line	
Minimum switching load	0.1 mA/0.1 VDC (reference value)	
Initial contact resistance	30 mΩ maximum	
Electrical life	100,000 operations minimum (rated load 1,800 operations/hour)	
Mechanical life	20,000,000 operations minimum (rated load 18,000 operations/hour)	
Rated load (resistive/inductive)	240 VAC/2 A, 30 VDC/2 A	
Dielectric strength	Between output and terminals: 1,500 VAC, 1 minute Between output terminal and internal circuit: 1,500 VAC, 1 minute Between output terminals (COMs): 1,500 VAC, 1 minute	

TWDDMM8DRT and TWDDMM24DR Output Delay

The output delay is shown below.
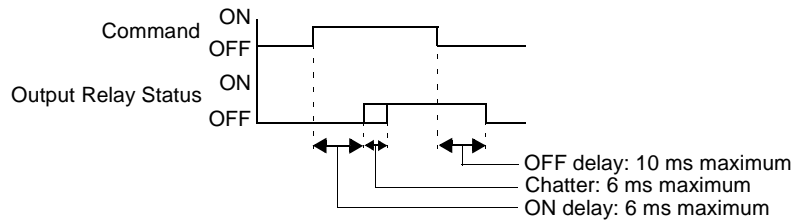
Relay Output Contact
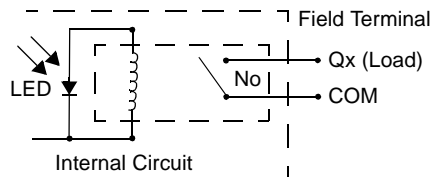
The relay output contact is shown below.

Transistor Source Output Contact
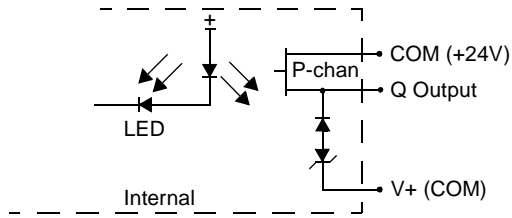
The transistor source output contact is shown below.

```
            +
        ╱   ╲         ┌─────┐ •── COM (+24V)
       ╱     ╲        │P-chan│
      ╱       ╲       └─────┘ •── Q Output
         LED               │
                          ╲│
                           │ •── V+ (COM)
            Internal
```

Transistor Sink Output Contact

The transistor sink output contact is shown below.

```
            +
        ╱   ╲         ┌─────┐ •── COM (COM)
       ╱     ╲        │N-chan│
      ╱       ╲       └─────┘ •── Q Output
                           │
                          ╲│
                           │ •── V+ (+24V)
            Internal
```
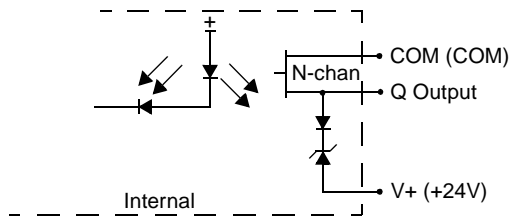
Digital I/O Module Wiring Schematics

Introduction   This section shows examples of wiring schematics for the digital I/O modules.

> **Note:** These schematics are for external wiring only.

> **Note:** The shaded boxes are markings on the digital I/O modules. The I and Q numbers are the input and output points.

TWDDDI8DT Wiring Schematic

This schematic is for the TWDDDI8DT module.
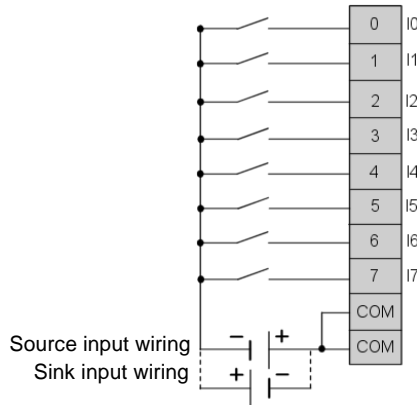
● The two COM terminals are connected together internally.

TWDDDI16DT Wiring Schematic

This schematic is for the TWDDDI16DT module.
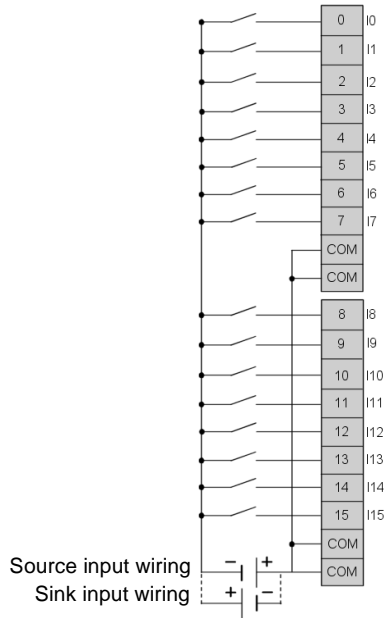
● The four COM terminals are connected together internally.

TWDDDI16DK Wiring Schematic

This schematic is for the TWDDDI16DK module.
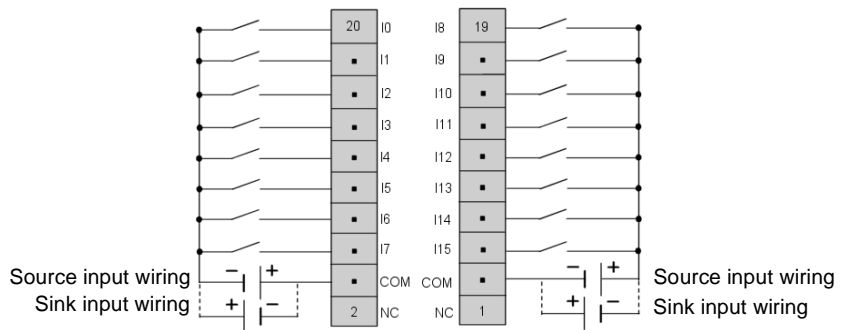
TWDDDI32DK Wiring Schematic

This schematic is for the TWDDDI32DK module.
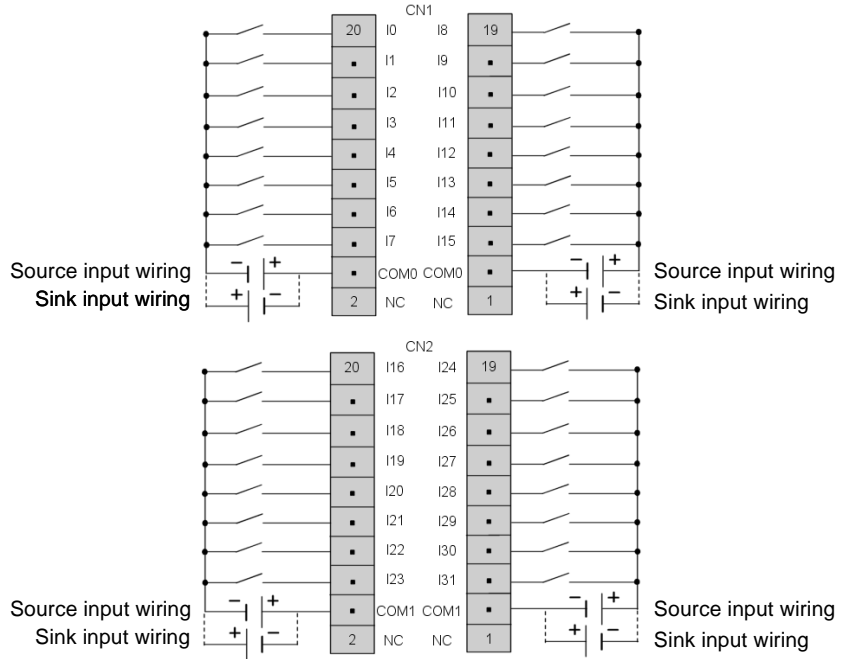
CN1

20	I0	I8	19
	I1	I9	
	I2	I10	
	I3	I11	
	I4	I12	
	I5	I13	
	I6	I14	
	I7	I15	
	COM0	COM0	
2	NC	NC	1

Source input wiring
Sink input wiring

Source input wiring
Sink input wiring

CN2

20	I16	I24	19
	I17	I25	
	I18	I26	
	I19	I27	
	I20	I28	
	I21	I29	
	I22	I30	
	I23	I31	
	COM1	COM1	
2	NC	NC	1

Source input wiring
Sink input wiring

Source input wiring
Sink input wiring

- The COM0 terminals are connected together internally.
- The COM1 terminals are connected together internally.
- The COM0 and COM1 terminals are **not** connected together internally.

TWDDRA8RT Wiring Schematic

This schematic is for the TWDDRA8RT module.
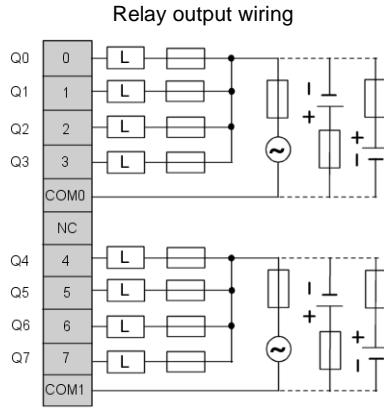
Relay output wiring

- The COM0 and COM1 terminals are **not** connected together internally.
- Connect an appropriate fuse for the load.

TWDDRA16RT Wiring Schematic

This schematic is for the TWDDRA16RT module.
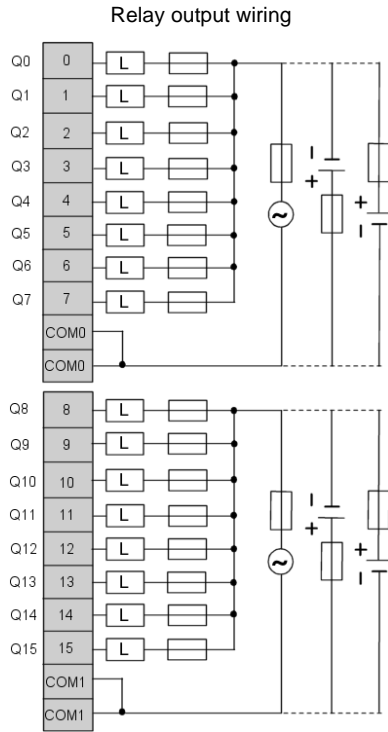
Relay output wiring

- The COM0 terminals are connected together internally.
- The COM1 terminals are connected together internally.
- The COM0 and COM1 terminals are **not** connected together internally.
- Connect an appropriate fuse for the load.

TWDDDO8UT Wiring Schematic

This schematic is for TWDDDO8UT module.

Sink output wiring
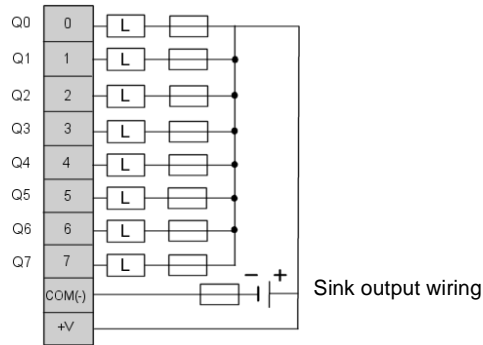
● Connect an appropriate fuse for the load.

TWDDDO16UK Wiring Schematic

This schematic is for the TWDDDO16UK module.
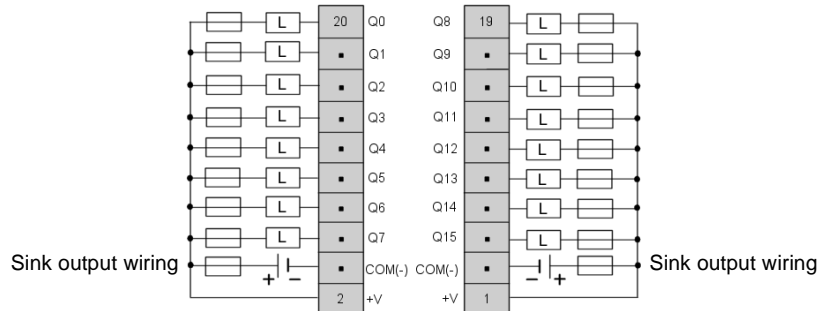
Sink output wiring

Sink output wiring

● The COM(-) terminals are connected together internally.
● The +V terminals are connected together internally.
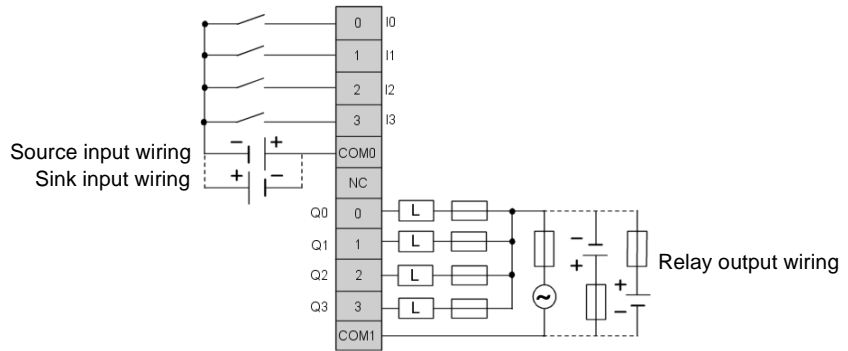● Connect an appropriate fuse for the load.

**TWDDDO32UK
Wiring
Schematic**

This schematic is for the TWDDDO32UK module.
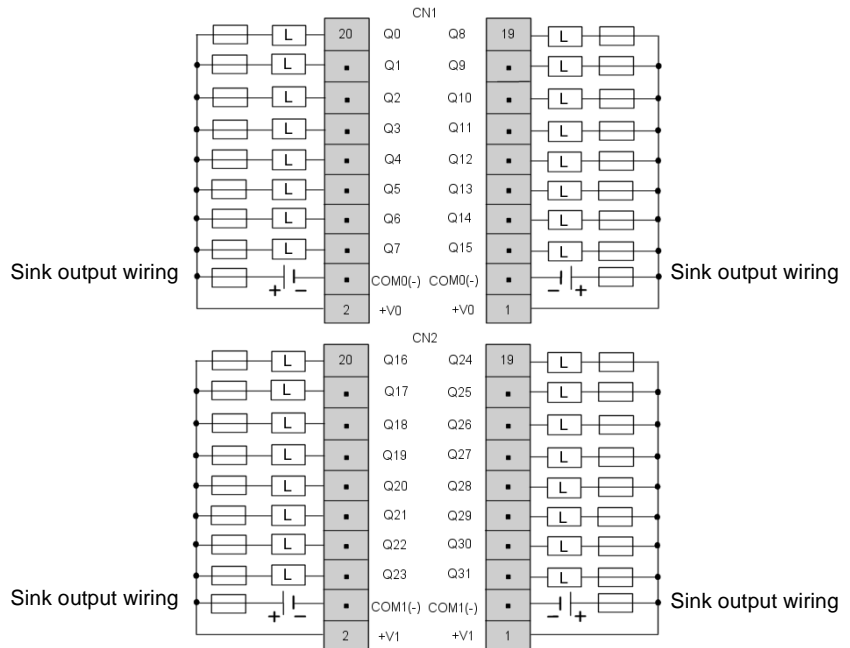
- Terminals on CN1 and CN2 are **not** connected together internally.
- The COM0(-) terminals are connected together internally.
- The COM1(-) terminals are connected together internally.
- The +V0 terminals are connected together internally.
- The +V1 terminals are connected together internally.
- Connect an appropriate fuse for the load.

TWDDDO8TT Wiring Schematic

This schematic is for the TWDDDO8TT module.
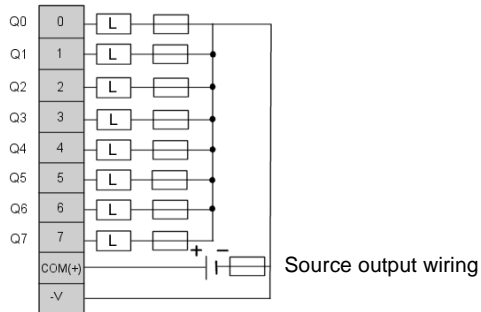
- Connect an appropriate fuse for the load.

TWDDDO16TK Wiring Schematic

This schematic is for the TWDDDO16TK module.
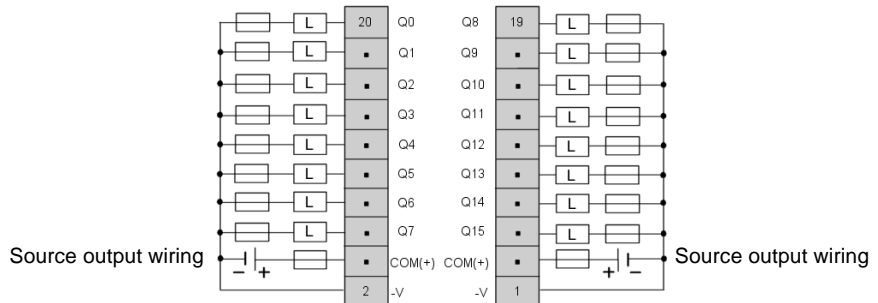
- The COM(+) terminals are connected together internally.
- The -V terminals are connected together internally.
- Connect an appropriate fuse for the load.

TWDDDO32TK Wiring Schematic

This schematic is for the TWDDDO32TK module.
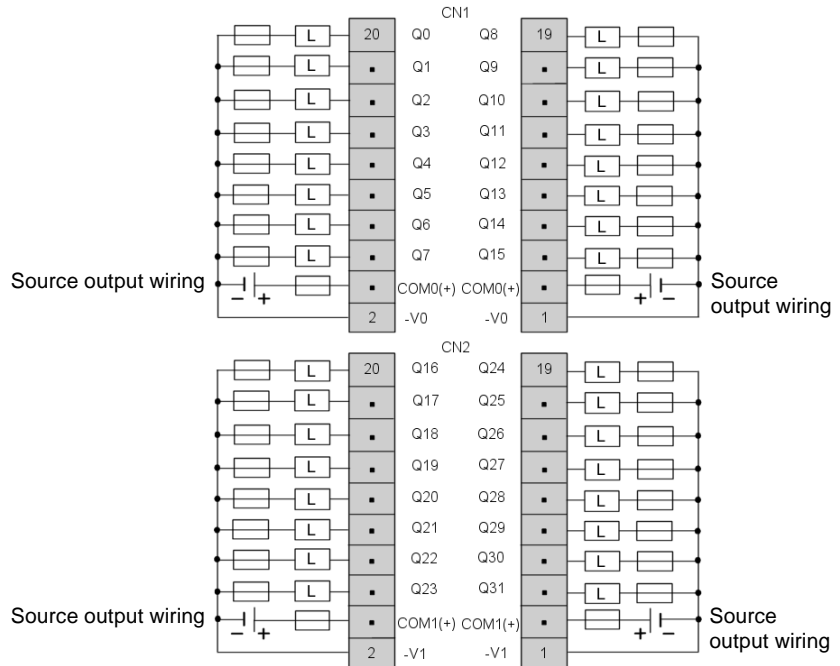
- Terminals CN1 and CN2 are **not** connected together internally.
- The COM0(+) terminals are connected together internally.
- The COM1(+) terminals are connected together internally.
- The -V0 terminals are connected together internally.
- The -V1 terminals are connected together internally.
- Connect an appropriate fuse for the load.

TWDDMM8DRT Wiring Schematic

This schematic is the TWDDMM8DRT module.

- The COM0 and COM1 terminals are **not** connected together internally.

TWDDMM24DRF Wiring Schematic

This schematic is for the TWDDMM24DRF module.
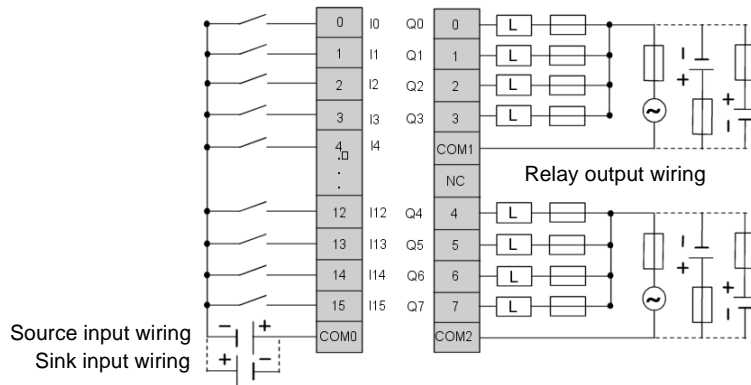
- The COM0, COM1 and COM2 terminals are **not** connected together internally.
- Connect an appropriate fuse for the load.

2.5 Analog I/O Modules

At a Glance

Introduction   This section provides an overview, specifications, and wiring schematics of the analog I/O modules.

What's in this Section?   This section contains the following topics:

Topic	Page
Overview of Analog I/O Modules	95
Parts Description of Analog I/O Modules	96
General Specifications for the Analog I/O Module	97
I/O Specifications for the Analog I/O Module	98
Analog I/O Modules Wiring Schematics	103
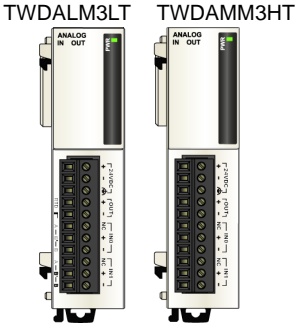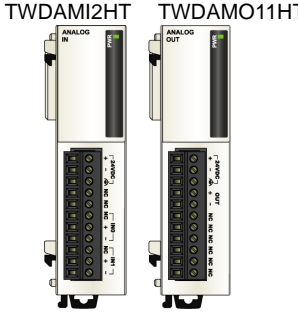
Overview of Analog I/O Modules

Introduction   The following section provides an overview of the analog I/O modules.

Illustrations   The following illustrations are the analog I/O modules.

Controller Type	Illustration
These 2 analog I/O modules are: • 2-point input/1-point output module with a terminal block, accepts thermocouple and resistance thermometer signals (TWDALM3LT) • 2-point input/1-point output module with a terminal block (TWDAMM3HT) These modules can be attached to any controller except the Compact 10 I/O and 16 I/O controllers.	
These 2 analog I/O modules are: • 2-point input module with a terminal block (TWDAMI2HT) • 1-point output module with a terminal block (TWDAMO11HT) These modules can be attached to any controller except the Compact 10 I/O and 16 I/O controllers.	

Parts Description of Analog I/O Modules

Introduction   The following section describes the parts of an analog I/O module. Your I/O module may differ from the illustrations but the parts will be the same.

Parts Description of an Analog I/O Module   The following figure shows the parts of an analog I/O module. This figure is the TWDALM3LT module.
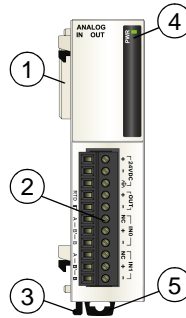
Legend

Label	Description
1	Expansion connector - one on each side, right side not shown
2	Removable terminal block
3	Latch button
4	LEDs
5	Clamp

General Specifications for the Analog I/O Module

Introduction   This section is general specifications for analog I/O modules.

**General
Specifications**

Type Number	TWDALM3LT	TWDAMM3HT	TWDAMI2HT	TWDAMO1HT
Rated power voltage	24 VDC			
Allowable voltage range	20.4 to 28.8 VDC			
Connector insertion/ removal durability	100 times minimum			
Internal current draw - internal power	50 mA (5 VDC) 0 mA (24 VDC)			
Internal current draw - external power	40 mA (24 VDC)		40 mA (24 VDC)	40 mA (24 VDC)
Weight	85 g			

I/O Specifications for the Analog I/O Module

Introduction   This section is I/O specifications for the analog I/O modules.

**Input
Specifications**

Analog Input Specifications	Voltage Input	Current Input	Thermocouple	Resistance Thermometer
Input range	0 to 10V DC	4 to 20 mA DC	Type K (0 to 1300°C) (32 to 2372°F) Type J (0 to 1200°C) (32 to 2192°F) Type T (0 to 400°C) (32 to 742°F)	Pt 100 3-wire type (-100 to 500°C) (-148 to 932°F)
Input impedance	1 MΩ min	10 Ω	1 MΩ min	1 MΩ min
Sample duration time	16 ms max		50 ms max	
Sample repetition time	16 ms max		50 ms max	
Total input system transfer time	32 ms + 1 scan time[1]		100 ms + 1 scan time[1]	
Input type	Single-ended input	Differential input		
Operating mode	Self-scan			
Conversion mode	ΣΔ type ADC			
Input error - maximum error at 25°C (77°F)	±0.2% of full scale		±0.2% of full scale plus reference junction compensation accuracy ±4°C max	±0.2% of full scale
Input error - temperature coefficient	±0.006% of full scale/°C			
Input error - repeatable after stabilization time	±0.5% of full scale			
Input error - nonlinear	±0.2% of full scale			
Input error - maximum error	±1% of full scale			

Analog Input Specifications	Voltage Input	Current Input	Thermocouple	Resistance Thermometer
Digital resolution	4096 increments (12 bits)			
Input value of LSB	2.5 mV	4 µA	K: 0.325°C (32.59°F) J: 0.300°C (32.54°F) T: 0.100°C (32.18°F)	0.15°C (32.27°F)
Data type in application program	0 to 4095 (12-bit data) -32768 to 32767 (optional range designation)[2]			
Monotonicity	Yes			
Input data out of range	Detectable[3]			
Noise resistance - maximum temporary deviation during electrical noise tests	±3% maximum when a 500V clamp voltage is applied to the power and I/O wiring			Accuracy is not assured when noise is applied
Noise resistance - common mode characteristics	Common mode reject ration (CMRR): -50 dB			
Noise resistance - common mode voltage	16 VDC			
Noise resistance - input filter	No			
Noise resistance - cable	Twisted-pair shielded cable is recommended for improved noise immunity		—	
Noise resistance - crosstalk	2 LSB maximum			
Dielectric strength	500 V between input and power circuit			
Type of protection	Photocoupler between input and internal circuit			
Maximum permanent allowed overload (no damage)	13 VDC	40 mA DC	—	
Selection of analog input signal type	Using software programming			
Calibration or verification to maintain rated accuracy	Approximately 10 years			

Note:
1. Total input system transfer time = sample repetition x 2 + 1 scan time.
2. The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear-converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.
3. When an error is detected, a corresponding error code is stored to a data register allocated to analog I/O operating status.

Output Specifications

Analog Input Specifications	Voltage output	Current Output
Output range	0 to 10 VDC	4 to 20 mA DC
Load impedance	2 kΩ minimum	300 Ω maximum
Application load type	Resistive load	
Settling time	20 ms	
Total output system transfer Time	20 ms + 1 scan time	
Output error - maximum error at 25°C (77°F)	±0.2% of full scale	
Output error - temperature coefficient	±0.015% of full scale/°C	
Output error - repeatable after stabilization time	±0.5% of full scale	
Output error - output voltage drop	±1% of full scale	
Output error - nonlinear	±0.2% of full scale	
Output error - output ripple	1 LSB maximum	
Output error - overshoot	0%	
Output error - total error	±1% of full scale	
Digital resolution	4096 increments (12 bits)	
Output value of LSB	2.5 mV	4 μA
Data type in application program	0 to 4095 (12-bit data) -32768 to 32767 (optional range designation)[1]	
Monotonicity	Yes	
Current loop open	—	Detectable[2]
Noise resistance - maximum temporary deviation during electrical noise tests	±3% maximum when a 500 V clamp voltage is applied to the power and I/O wiring	
Noise resistance - cable	Twisted-pair shielded cable is recommended for improved noise immunity	
Noise resistance - crosstalk	No crosstalk because of 1 channel output	
Dielectric strength	500 V between output and power circuit	
Type of protection	Photocoupler between output and internal circuit	
Selection of analog input signal type	Using software programming	

Analog Input Specifications	Voltage output	Current Output
Calibration or verification to maintain rated accuracy	Approximately 10 years	

Note:

1. The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear-converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.
2. When an error is detected, a corresponding error code is stored to a data register allocated to analog I/O operating status.

Analog I/O Modules Wiring Schematics

Introduction   This section shows examples of wiring schematics for the Analog I/O modules.

TWDALM3LT Wiring Schematic   This schematic is for the TWDALM3LT module.
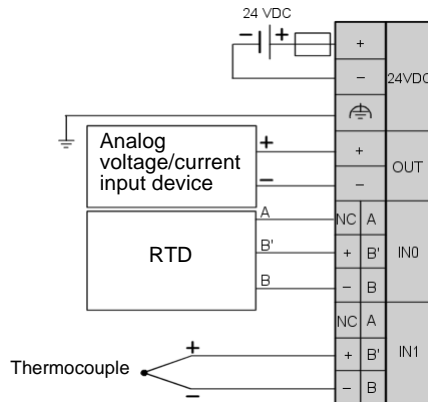
- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- When connecting an RTD, connect the three wires to terminals A, B', and B of input channel 0 or 1.
- When connecting a thermocouple, connect the two wires to terminals B' and B of input channel 0 or 1.
- Do not connect any wiring to unused channels.
- Do not connect the thermocouple to a hazardous voltage (60 VDC or 42.4 V peak or higher).

TWDAMM3HT Wiring Schematic

This schematic is for the TWDAMM3HT module.
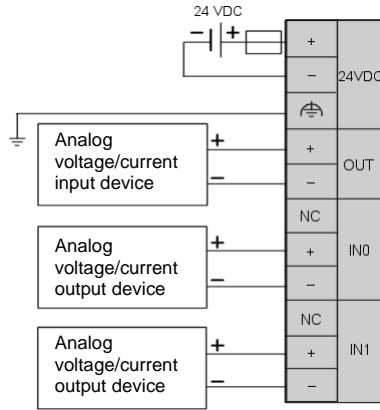
● Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
● Do not connect any wiring to unused channels.

TWDAMI2HT Wiring Schematic

This schematic is for the TWDAMI2HT module.
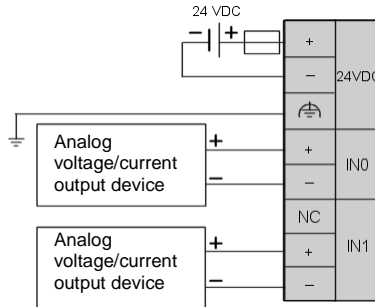
● Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
● Do not connect any wiring to unused channels.

TWDAMO1HT Wiring Schematic

This schematic is for the TWDAMO1HT module.
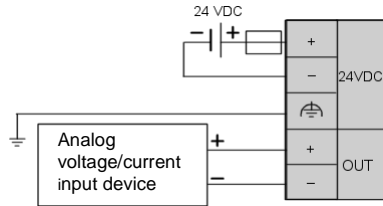
- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

2.6 Communication Options

At a Glance

Introduction

This section provides an overview, parts description, and specifications of the communication options.

What's in this Section?

This section contains the following topics:

Topic	Page
Overview of Communication Adapters and Expansion Modules	107
Parts Description of Communication Adapters and Expansion Modules	108
Specifications for Communication Adapters and Expansion Modules	110

Overview of Communication Adapters and Expansion Modules

Introduction   The following section provides an overview of the TWDNAC232D, TWDNAC485D, and TWDNAC485T communication adapters and the TWDNOZ232D, TWDNOZ485D, and TWDNOZ485T communication expansion modules.

Overview   All Twido controllers have one RS485 communication serial port 1. In addition, TWDLCAA16DRF and TWDLCAA24DRF controllers have a serial port 2 connector for an optional second RS485 or RS232 serial port. An optional communication adapter (TWDNAC232D, TWDNAC485D, and TWDNAC485T) is available to install on the serial port 2 connector. The TWDLCAA10DRF does not have a serial port 2 connector.

A communication expansion module (TWDNOZ232D, TWDNOZ485D, and TWDNOZ485T) is available to attach to any Modular controller for an optional second RS485 or RS232 serial port. Also, an operator display expansion module (TWDXCPODM) is available to attach to a Modular controller where an optional communication adapter (TWDNAC232D, TWDNAC485D, and TWDNAC485T) can be installed to the serial port 2 connector on the operator display expansion module. The RS485 serial port 2 is used for maintenance communication and remote link communication. The RS232 serial port 2 is used for user communication and ASCII device communication.

Parts Description of Communication Adapters and Expansion Modules

Introduction   The following section describes the parts of the TWDNAC232D, TWDNAC485D, and TWDNAC485T communication adapters and the TWDNOZ232D, TWDNOZ485D, and TWDNOZ485T communication expansion modules.

Parts Description of a Communication Adapter

The following figure shows the parts of the TWDNAC232D, TWDNAC485D, and TWDNAC485T communication adapters.

TWDNAC485T   TWDNAC232D
                   TWDNAC485D
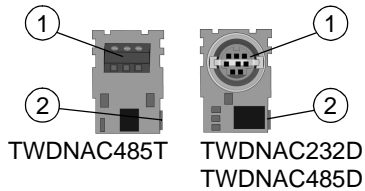
Legend

Label	Part	Description
1	Serial port 2	Adds an optional second RS485 or RS232 serial port.
2	Connector	Connects to the serial port 2 connector on TWDXCPODM operator display expansion module or TWDLCAA16DRF and TWDLCAA24DRF controllers.

Parts Description of a Communication Expansion Module

The following figure shows the parts of the TWDNOZ232D, TWDNOZ485D, and TWDNOZ485T communication expansion modules.

TWDNOZ232D
TWDNOZ485D

TWDNOZ485T
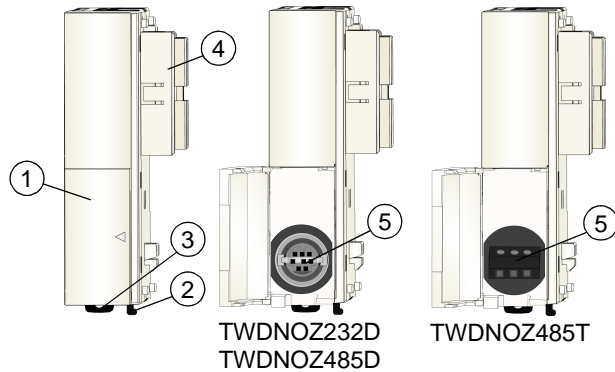
Legend

Label	Part	Description
1	Hinged door	Opens to access the serial port 2.
2	Clamp	Secures the module to a DIN rail.
3	Latch button	Holds/releases the module from a controller.
4	Communication connector	Connects to a Modular controller.
5	Serial port 2	Adds an optional second RS485 or RS232 serial port to a Modular controller.

Specifications for Communication Adapters and Expansion Modules

Introduction

This section is specifications for the TWDNAC232D, TWDNAC485D, and TWDNAC485T communication adapters and the TWDNOZ232D, TWDNOZ485D, and TWDNOZ485T communication expansion modules.

Communication Adapter and Expansion Module Specifications

The following table describes the communication adapter and expansion module specifications.

Part Number	TWDNAC232D TWDNOZ232D	TWDNAC485D TWDNOZ485D	TWDNAC485T TWDNOZ485T
Standards	RS232	RS485	RS485
Maximum baud rate	19,200 bps	PC Link: 19,200 bps Remote Link: 38,400 bps	PC Link: 19,200 bps Remote Link: 38,400 bps
Maintenance communication (PC Link)	Possible	Possible	Possible
ASCII communication	Possible	Possible	Possible
Remote link communication	Not possible	7 possible	7 Possible
Maximum cable length	Maximum distance between controllers: 50 m (164 feet).	Maximum distance between controllers: 50 m (164 feet).	Maximum distance between controllers: 50 m (164 feet).
Isolation between internal circuit and communication port	Not isolated	Not isolated	Not isolated

2.7   Operator Display Options

At a Glance

Introduction   This section provides an overview, parts description, and specifications of the
operator display options.

What's in this Section?   This section contains the following topics:

Topic	Page
Overview of Operator Display Modules and Expansion Modules	112
Parts Description of Operator Display Module and Expansion Module	113
Specifications for Operator Display Modules and Expansion Modules	115

Overview of Operator Display Modules and Expansion Modules

Introduction   The following section provides an overview of the TWDXCPODC operator display module and the TWDXCPODM operator display expansion module.

Overview   The operator display is an optional module that can be added to any of the controllers. It is installed into a Compact controller as a operator display module (TWDXCPODC) and it is assembled to a Modular controller using the operator display expansion module (TWDXCPODM). See *How to Install and Remove the Operator Display Module and Operator Display Expansion Module, p. 149*.
The operator display provides the following services:
● Displays the controller state information
● Allows the user to control the controller
● Allows the user to monitor and tune application data objects
The operator display has two states:
● Display state - Displays data
● Edit state - Allows the user to change data

Parts Description of Operator Display Module and Expansion Module

Introduction

The following section describes the parts of the TWDXCPODC operator display module and the TWDXCPODM operator display expansion module.

Parts Description of a Operator Display Module

The following figure shows the parts of the TWDXCPODC operator display module.

Legend

Label	Part	Description
1	Display screen	Shows menus, operands, and data.
2	ESC button	In Edit state - Returns to the previous display state and rejects changes made by the user.
3	Up arrow button	In Edit state - Changes the current edit element to the next value.
4	Right arrow button	In Display state - Advances to the next display state. In Edit state - Advances to the next editing element. The current editing element blinks.
5	MOD/ENTER button	In Display state - Works in MOD function, goes to the corresponding edit state. In Edit state - Works in ENTER function, returns to previous display state and accepts changes made by the user.
6	Operator display connector	Connects to the Compact controller.

Parts Description of a Operator Display Expansion Module

The following figure shows the parts of the TWDXCPODM operator display expansion module.

Legend

Label	Part	Description
1	Display screen	Shows menus, operands, and data.
2	ESC button	In Edit state - Returns to the previous display state and rejects changes made by the user.
3	Up arrow button	In Edit state - Changes the current edit element to the next value.
4	Right arrow button	In Display state - Advances to the next display state. In Edit state - Advances to the next editing element. The current editing element blinks.
5	MOD/ENTER button	In Display state - Works in MOD function, goes to the corresponding edit state. In Edit state - Works in ENTER function, returns to previous display state and accepts changes made by the user.
6	Operator display connector	Connects to a Modular controller.
7	Hinged door	Opens to access the serial port 2.
8	Latch button	Holds/releases the module from a controller.
9	Clamp	Secures the module to a DIN rail.
10	Serial port 2 connector	Connects to the connector on an optional TWDNAC232D, TWDNAC485D, or TWDNAC485T communication adapter.

Specifications for Operator Display Modules and Expansion Modules

Introduction
This section is specifications for the TWDXCPODC operator display module and the TWDXCPODM operator display expansion module.

Operator Display Module Specifications
The following table describes the operator display module specifications.

Part Number	TWDXCPODC
Power voltage	5 VDC (supplied from the controller)
Internal current draw	200 mA DC
Weight	20 g

Operator Display Expansion Module Specifications
The following table describes the operator display expansion module specifications.

Part Number	TWDXCPODM
Weight	78 g

2.8   Options

At a Glance

Introduction   This section provides an overview and specifications of the options.

What's in this Section?   This section contains the following topics:

Topic	Page
Overview of the Options	117
Specifications for the Options	118

Overview of the Options

Introduction

The following section provides an overview of the TWDXCPMFK32 and TWDXCPMFK64 memory cartridges, the TWDXCPRTC RTC cartridge, and the TWDXSIM6, TWDXSIM9, and TWDXSIM14 input simulators.

Overview of the Memory Cartridges

There are two optional memory cartridges, 32 KB (TWDXCPMFK32) and 64 KB (TWDXCPMFK64), available. The memory cartridges provide additional memory for application storage. The memory cartridges are used to:
● Provide a removable backup of the application.
● Load an application into a controller if certain conditions exist.
The following table presents the available memory cartridge for each controller.

Memory Cartridge	Compact 10 I/O	Compact 16 I/O	Compact 24 I/O	Modular 20 I/O	Modular 40 I/O
TWDXCPMFK32	yes	yes	yes	yes	yes
TWDXCPMFK64	no	no	no	yes	yes

The TWDXCPMFK32 memory cartridge is for back up only. The TWDXCPMFK64 memory cartridge is for back up and expansion.

Overview of the RTC Cartridge

An optional RTC cartridge (TWDXCPRTC) is available for all controllers. The RTC provides the controller with the current time and date. The RTC is required for the Schedule Blocks to operate.
When the controller is powered down, the RTC will keep time for 1000 hours at 25°C (77°F) or 300 hours at 55°C (131°F) when using a fully charged battery.

Overview of the Input Simulators

There are three input simulators: 6, 9, and 14 point. These are used only on the three Compact controllers. Used for debugging, you can control the relay inputs to test your application logic.

Specifications for the Options

Introduction

This section contains specifications for the TWDXCPMFK32 and TWDXCPMFK64 memory cartridges and the TWDXCPRTC RTC cartridge.

Memory Cartridge Specifications

The following table describes the memory cartridge specifications.

Memory Type	EEPROM
Accessible memory capacity	32 KB: TWDXCPMFK32 64 KB: TWDXCPMFK64
Hardware for storing data	Twido controller
Software for storing data	TwidoSoft
Quantity of stored programs	One user program is stored on one memory cartridge.
Program execution priority	When a memory cartridge is installed and enabled, the external user program will be loaded and executed if it differs from the internal program.

RTC Specifications

The following table describes the RTC specifications.

Accuracy	30 s/month (typical) at 25°C (77°F)
Backup duration	Approximately 30 days (typical) at 25°C (77°F) after backup battery fully charged
Battery	Lithium secondary battery
Charging time	Approximately 10 hours for charging from 0% to 90% of full charge
Replaceable	Can not replace battery

2.9 TeleFast Cable Systems

At a Glance

Introduction   This section provides an overview, specifications, base wiring schematics, and cable wiring specifications of the TeleFast cable systems.

What's in this Section?   This section contains the following topics:

Overview of the Twido TeleFast Cable System Kits

Introduction   The following section provides an overview of the TWDFST16D10, TWDFST16D20, TWDFST16R10, TWDFST16R20, TWDFST20DR10, and TWDFST20DR20 Fast Cable Systems.

Overview of the Fast Cable Systems   The following table lists the TeleFast Cable System kits and their contents.

Fast Cable System Kits	Cable Part Number	Cable Description	TeleFast Base	TeleFast Base Description
Kit for TWDDDI16DK or TWDDDI32DK - 16 Input Sink				
TWDFST16D10	ABF-TE20EP100	1 meter interconnect	ABE7H20E000	16-point Input
TWDFST16D20	ABF-TE20EP200	2 meter interconnect	ABE7H20E000	16-point Input
Kit for TWDDDO16TK or TWDDDO32TK - 16 Output Source				
TWDFST16R10	ABF-TE20SP100	1 meter interconnect	ABE7R16S111	16-point Output Relay
TWDFST16R20	ABF-TE20SP200	2 meter interconnect	ABE7R16S111	16-point Output Relay
Kit for TWDLMDA20DTK or TWDLMDA40DTK - 16 Input Sink/8 Output Source				
TWDFST20DR10	ABF-TP26MP100	1 meter interconnect	ABE7H20E000 ABE7R08S111	16-point Input 8-point Output Relay
TWDFST20DR20	ABF-TP26MP200	2 meter interconnect	ABE7H20E000 ABE7R08S111	16-point Input 8-point Output Relay

Illustration   The following illustration shows the Twido TeleFast cable system kits.
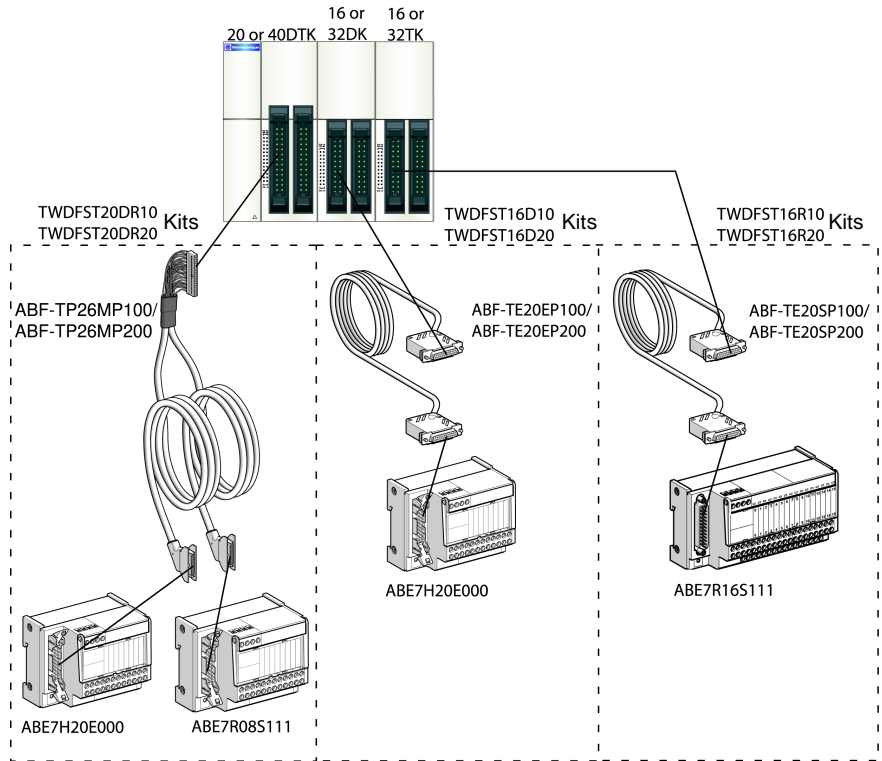
Specifications for the TeleFast Bases

Introduction   This section provides specifications for the ABE7R08S111, ABE7R16S111, and ABE7H20E000 TeleFast bases.

ABE7H20E000 Specifications

Passive Input TeleFast Base	ABE7H20E000
Number of channels	16
Input type	Sink Input
Base power supply	20.4 - 26.4 VDC
Supply protection	1 A Fast Blow
Input current	7 mA
Number of inputs per COM	16
Isolation	None (passive)

See Catalog 8501CT9801, "TeleFast 2 Prewiring System" for more specifications on this Telefast bases.

ABE7R08S111 and ABE7R16S111 Specifications

Relay Output TeleFast Base	ABE7R08S111	ABE7R16S111
Number of channels	8	16
Base DC power	20.4 - 28.8 VDC	
Supply protection	1 A Fast Blow	
Output contacts	8 NO	16 NO
Maximum VAC	250 VAC @ 50-60 Hz	
Maximum VDC	30 VDC	
Number of channels per COM	4	8
Max contact current	2 A	
Max current per module	12 A	
Isolation outputs to internal circuitry	2 K VAC	

See Catalog 8501CT9801, "TeleFast 2 Prewiring System" for more specifications on these Telefast bases.

Twido TeleFast Wiring Schematics

Introduction　　This section shows examples of wiring schematics for the TeleFast bases.

ABE7H20E00
Wiring
Schematic

This schematic is for the ABE7H20E000 TeleFast base.
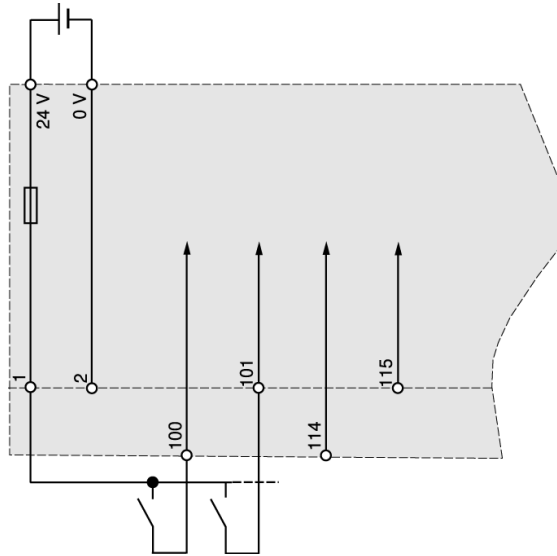
Note: Charge is inductive.

ABE7R08S111 Wiring Schematic

This schematic is for the ABE7R08S111 TeleFast base.

ABE7R16S111 Wiring Schematic

This schematic is for the ABE7R16S111 TeleFast base.

Wiring Specifications for the TeleFast Cables

Introduction   This section provides cable wiring specifications for the ABF-TE20EP100/200, ABF-TE20SP100/200, ABF-TP26MP100/200, TWDFCW30K/50K, and TWDFCW30M/50M TeleFast cables.

ABF-TE20EP100/200   The following table provides specifications for the ABF-TE20EP100/200 sink input cable wiring.

Twido Signal Name	Twido Pin Number	ABE7H20E000 Pin Number	ABE7H20E200 Signal Name
NC	1		NC
NC	2		NC
COM	3	20	COM
COM	4	18	COM
I15	5	16	I15
I7	6	8	I7
I14	7	15	I14
I6	8	7	I6
I13	9	14	I13
I5	10	6	I5
I12	11	13	I12
I4	12	5	I4
I11	13	12	I11
I3	14	4	I3
I10	15	11	I10
I2	16	3	I2
I9	17	10	I9
I1	18	2	I1
I8	19	9	I8
I0	20	1	I0

ABF-TE20SP100/200

The following table provides specifications for the ABF-TE20SP100/200 source cable wiring.

Twido Signal Name	Twido Pin Number	ABE7R16S111 Pin Number	ABE7R16S111 Signal Name
V+	1	20	COM
V+	2	18	COM
COM	3	I7	V+
COM	4	19	V+
Q15	5	16	Q15
Q7	6	8	Q7
Q14	7	15	Q14
Q6	8	7	Q6
Q13	9	14	Q13
Q5	10	6	Q5
Q12	11	13	Q12
Q4	12	5	Q4
Q11	13	12	Q11
Q3	14	4	Q3
Q10	15	11	Q10
Q2	16	3	Q2
Q9	17	10	Q9
Q1	18	2	Q1
Q8	19	9	Q8
Q0	20	1	Q0

**ABF-
TP26MP100/200**

The following table provides specifications for the ABF-TP26MP100/200 sink/source cable wiring.

Twido Signal Name	Twido Pin Number	ABE7R08S111 Pin Number	ABE7R08S111 Signal Name	ABE7R08S111 Pin Number	ABE7R08S111 Signal Name
V+	1	18	COM		
COM	2			18 or 20	COM
V+	3	20	COM		
I11	4			12	I11
COM	5	17	V+		
I10	6			11	I10
COM	7	19	V+		
I9	8			10	I9
COM	9	--	--	--	--
I8	10			10	I9
Q7	11	8	Q7		
I7	12			8	I7
Q6	13	7	Q6		
I6	14			7	I6
Q5	15	6	Q5		
I5	16			6	I5
Q4	17	5	Q4		
I4	18			5	I4
Q3	19	4	Q3		
I3	20			4	I3
Q2	21	3	Q2		
I2	22			3	I2
Q1	23	2	Q1		
I1	24			2	I1
Q0	25	1	Q0		
I0	26			1	I0

TWDFCW30K/50K

The following table provides specifications for the TWDFCW30K/50K with free wires for 20-pin Modular controller.

Pin Connector A Twido Connector Side	Wire Color
1	White
2	Brown
3	Green
4	Yellow
5	Grey
6	Pink
7	Blue
8	Red
9	Black
10	Violet
11	Grey/Pink
12	Red/Blue
13	White/Green
14	Brown/Green
15	White/Yellow
16	Yellow/Brown
17	White/Grey
18	Grey/Brown
19	White/Pink
20	Pink/Brown

Illustration
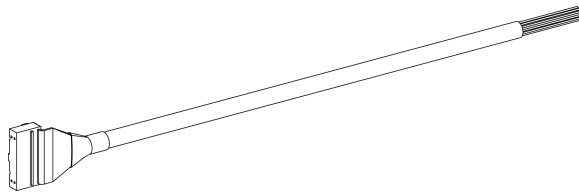
**TWDFCW30M/
50M**

The following table provides specifications for the TWDFCW30M/50M cable with free wires for 26-pin Modular controller.

Pin Connector A Twido Connector Side	Wire Color for Input	Wire Color for Output
26	Brown/Black	
24	Brown/Red	
22	Brown/Blue	
20	Pink/Brown	
18	Grey/Brown	
16	Yellow/Brown	
14	Brown/Green	
12	Red/Blue	
10	Violet	
8	Red	
6	Pink	
4	Yellow	
2	Brown	
25		White/Black
23		White/Red
21		White/Blue
19		White/Pink
17		White/Yellow
15		White/Green
13		White/Green
11		Grey/Pink
9		No Connect
7		Blue
5		Grey
3		Green
1		White

Illustration
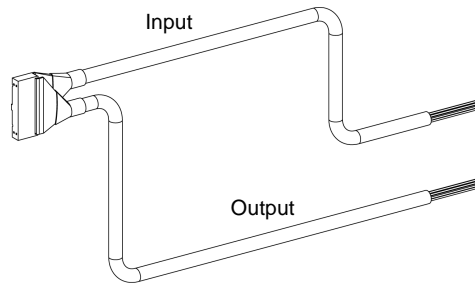
Installation

3

At a Glance

Introduction

This chapter provides dimensions, installation, and mounting instructions for the controllers, digital and analog expansion I/O modules, and options.

What's in this Chapter?

This chapter contains the following topics:

Dimensions of the Compact Controllers

Introduction   The following section shows the dimensions for all Compact controllers.

TWDLCAA10-DRF and TWDLCAA16-DRF

The following diagrams show the dimensions for the TWDLCAA10DRF and TWDLCAA16DRF Compact controllers.

80.0 mm (3.17 in)

70.0 mm (2.78 in)

90.0 mm (3.54 in)

4.5 mm* (0.18 in)
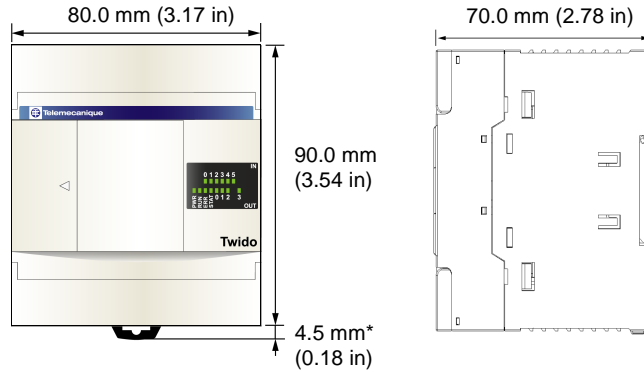
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

TWDLCAA24-DRF   The following diagrams show the dimensions for the TWDLCAA24DRF Compact controller.

95.0 mm (3.74 in) 70.0 mm (2.78 in)

90.0 mm (3.54 in)

4.5 mm* (0.18 in)
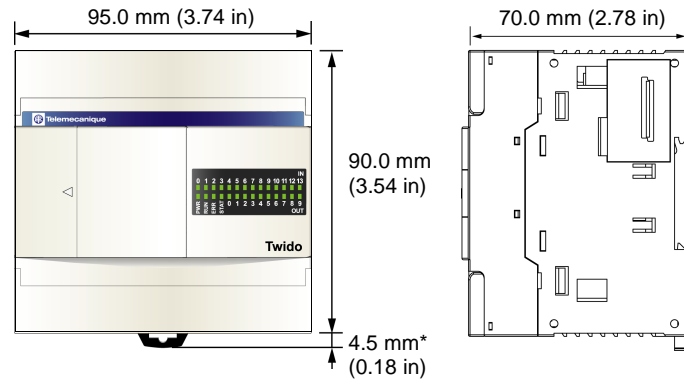
| Note: | * 8.5 mm (0.33 in) when the clamp is pulled out. |

Dimensions for the Modular Controllers

Introduction   The following section shows the dimensions for all Modular controllers.

TWDLMDA20-DRT Dimensions   The following diagrams show the dimensions for the TWDLMDA20DRT Modular controller.
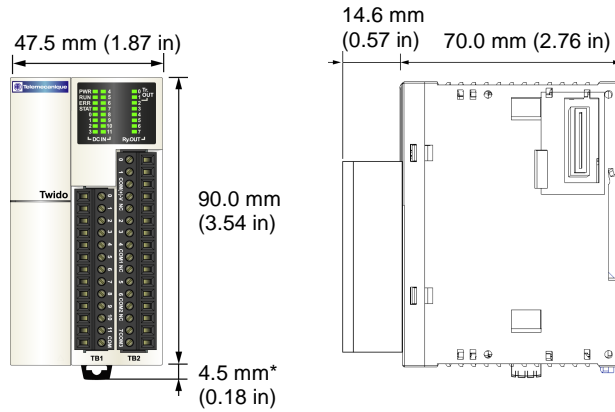
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

TWDLMDA20-DUK and TWDLMDA20-DTK Dimensions

The following diagrams show the dimensions for the TWDLMDA20DUK and TWDLMDA20DTK Modular controllers.

35.4 mm (1.39 in)

11.3 mm (0.44 in)   70.0 mm (2.76 in)

90.0 mm (3.54 in)

4.5 mm* (0.18 in)
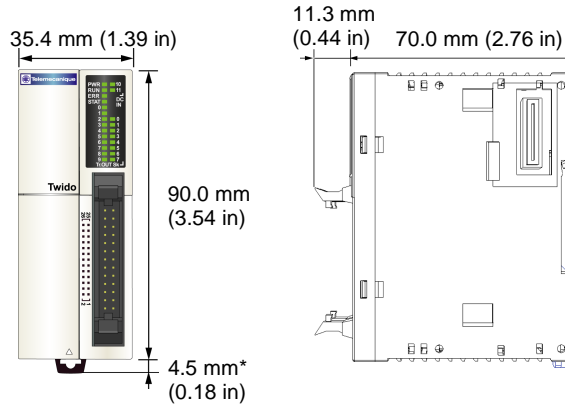
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

TWDLMDA40-DUK and TWDLMDA40-DTK Dimensions

The following diagrams show the dimensions for the TWDLMDA40DUK and TWDLMDA40DTK Modular controllers.

47.5 mm (1.87 in)

11.3 mm (0.44 in)   70.0 mm (2.76 in)

90.0 mm (3.54 in)

4.5 mm* (0.18 in)
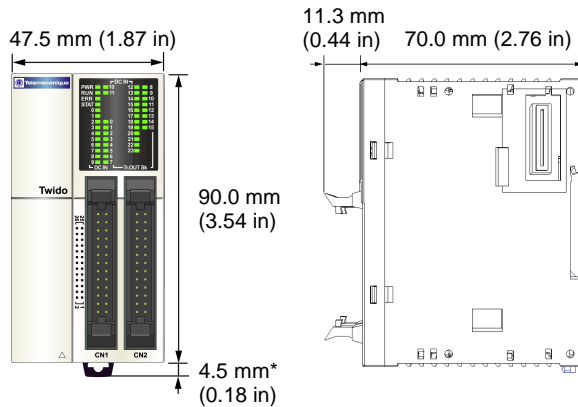
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Dimensions for the Digital and Analog I/O Modules

Introduction   The following section shows the dimensions for all digital and analog I/O modules.

Digital I/O and   Analog Modules   The following diagrams show the dimensions for the TWDDDI8DT, TWDDRA8RT, TWDDDO8TT, TWDDDO8UT, TWDDMM8DRT digital I/O modules and TWDALM3LT, TWDAMM3HT, TWDAMI2HT, and TWDAMO1HT analog I/O modules.
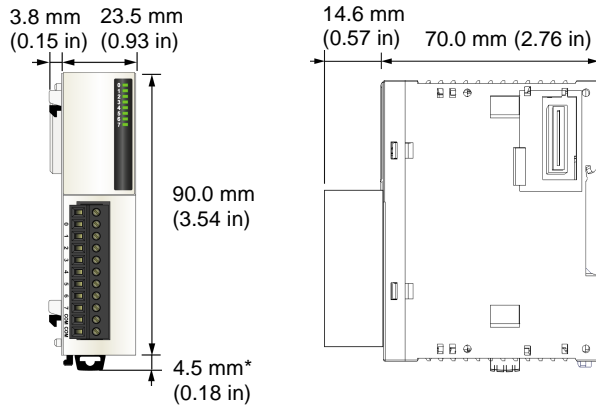
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Digital I/O Modules

The following diagrams show the dimensions for the TWDDDI16DT and TWDDRA16RT digital I/O modules.

3.8 mm
(0.15 in)   23.5 mm
(0.93 in)

14.6 mm
(0.57 in)   70.0 mm (2.76 in)

90.0 mm
(3.54 in)

4.5 mm*
(0.18 in)
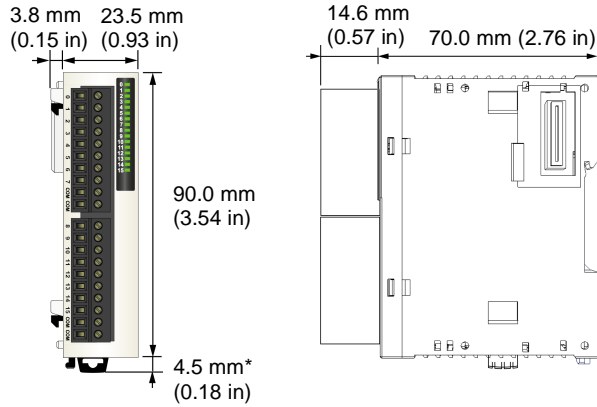
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Digital I/O Modules

The following diagram show the dimensions for the TWDDMM24DRF digital I/O module.
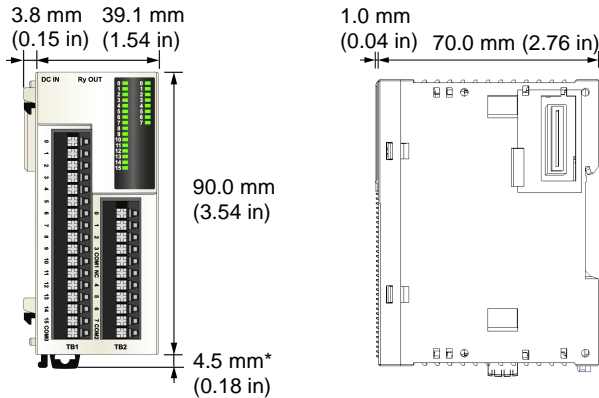
3.8 mm
(0.15 in)   39.1 mm
(1.54 in)

1.0 mm
(0.04 in)   70.0 mm (2.76 in)

90.0 mm
(3.54 in)

4.5 mm*
(0.18 in)

Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Digital I/O Modules

The following diagrams show the dimensions for the TWDDDI16DK, TWDDDO16TK, and TWDDDO16UK digital I/O modules.
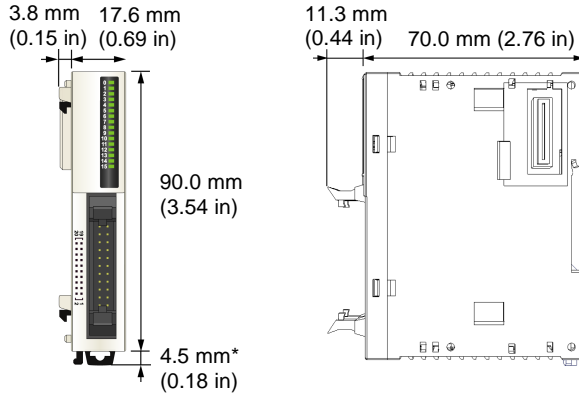
3.8 mm
(0.15 in)

17.6 mm
(0.69 in)

11.3 mm
(0.44 in)

70.0 mm (2.76 in)

90.0 mm
(3.54 in)

4.5 mm*
(0.18 in)

Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Digital I/O Modules

The following diagrams show the dimensions for the TWDDDI32DK, TWDDDO32TK, and TWDDDO32UK digital I/O modules.

3.8 mm
(0.15 in)

29.7 mm
(1.17 in)

11.3 mm
(0.44 in)

70.0 mm (2.76 in)

90.0 mm
(3.54 in)

CN1 CN2

4.5 mm*
(0.18 in)
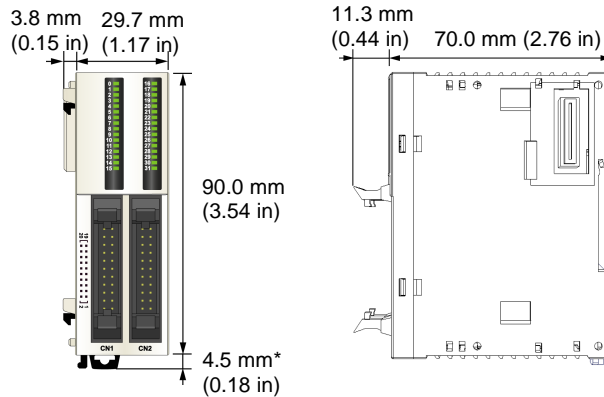
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Dimensions for the Operator Display Module, Operator Display Expansion Module, and Communication Expansion Modules

Introduction   The following section shows the dimensions for the operator display module (TWDXCPODC), operator display expansion module (TWDXCPODM), and for all communication expansion modules (TWDNOZ232D, TWDNOZ485Z, and TWDNOZ485D).

Operator Display Module Dimensions   The following diagram shows the dimensions for the operator display module (TWDXCPODC).

35.0 mm
(1.38 in)

42.0 mm
(1.65 in)

Operator Display Expansion Module Dimensions   The following diagram shows the dimensions for the operator display expansion module (TWDXCPODM).

38.0 mm   13.9 mm
(1.38 in)   (0.55 in)

71.0 mm
(2.80 in)

90.0 mm
(3.54 in)

4.5 mm*
(0.18 in)
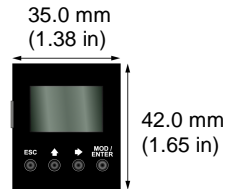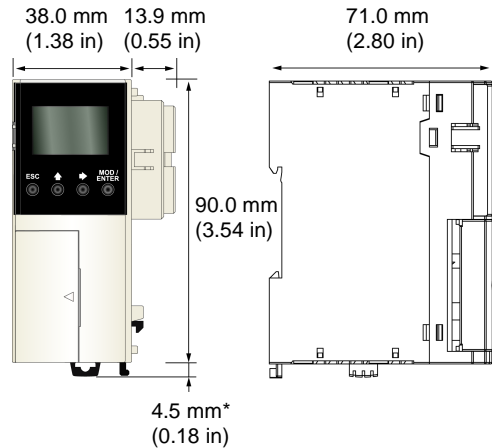
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Communication Expansion Module Dimensions

The following diagram shows the dimensions for all communication expansion modules (TWDNOZ232D, TWDNOZ485Z, and TWDNOZ485D).

38.0 mm (1.38 in)   13.9 mm (0.55 in)   71.0 mm (2.80 in)

90.0 mm (3.54 in)

4.5 mm* (0.18 in)
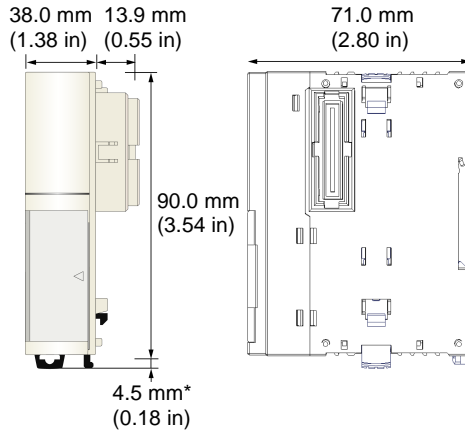
Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Dimensions of the TeleFast Bases

Introduction   The following section shows the dimensions for the TeleFast bases.

ABE7H20E000   The following diagrams show the dimensions for the ABE7H20E000 Input TeleFast
base.
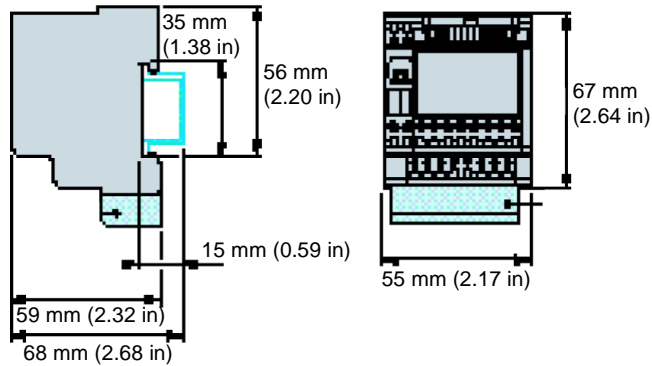
ABE7R08S111   The following diagrams show the dimension for the ABE7R08S111 Relay TeleFast
base.
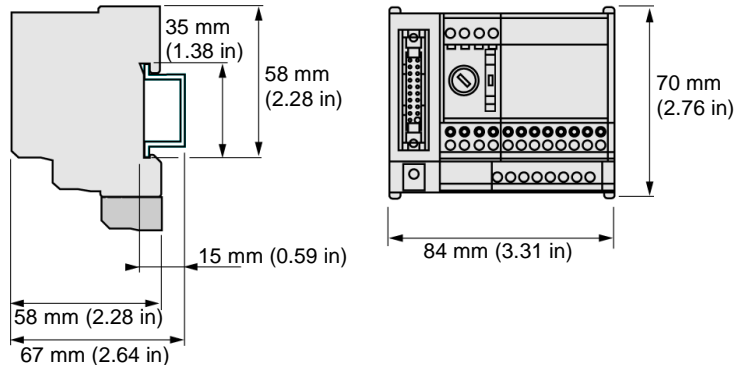
ABE7R16S111   The following diagrams show the dimensions for the ABE7R16S111 Relay TeleFast
base.
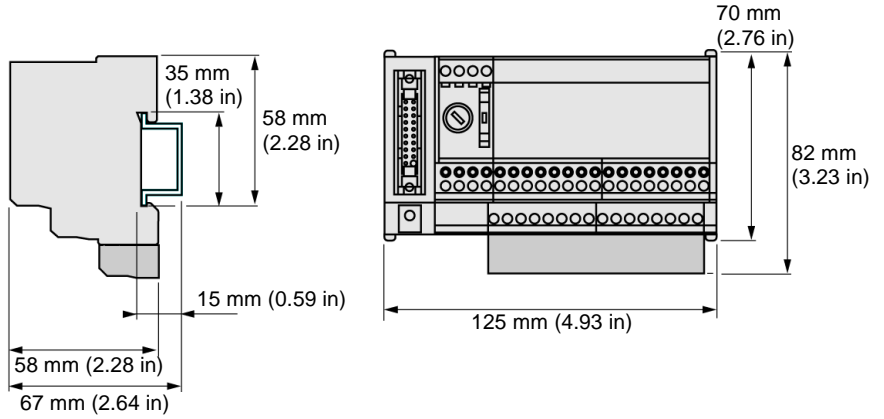
Installation Preparation

Introduction   The following section provides information on preparation for all Twido controllers and expansion I/O modules.

Before Starting   Before installing any of the Twido products read the Safety Information at the beginning of this book.

	CAUTION
⚠	**EQUIPMENT DAMAGE**
	Before removing any module or adapter, turn off the power to the controller. Otherwise, the module, adapter, or controller may be damaged, or the controller may not operate correctly.
	Failure to observe this precaution can result in injury or equipment damage.

Note: All options and expansion I/O modules should be installed before assembling and installing a Twido system on a DIN rail, to a mounting plate, or in a control panel. The Twido system should be removed from a DIN rail, a mounting plate, or a control panel before disassembling the modules.

Controller and Expansion I/O Module Mounting Positions

Introduction   This section shows the correct and incorrect mounting positions for all controllers and expansion I/O modules.

> **Note:** Keep adequate spacing for proper ventilation and to maintain an ambient temperature between 0°C (32°F) and 55°C (131°F).

Correct Mounting Position for all Controllers and Expansion I/O Modules

Controllers and expansion I/O modules must be mounted horizontally on a vertical plane as shown in the figures below.
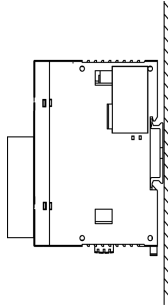
Compact controller with an expansion I/O module
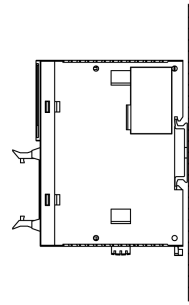
Modular controller with an expansion I/O module

Correct and Incorrect Mounting Positions for the Compact Controller

A Compact controller should only be positioned as shown in "Correct Mounting Position for all Controllers with Expansion I/O Modules" figure. When the ambient temperature is 35°C (95°F) or below, the Compact controller can also be mounted upright on a horizontal plane as shown in (1). When the ambient temperature is 40°C (113°F) or below, the Compact controller can also be mounted sideways on a vertical place as shown in figure (2). Figure (3) shows an incorrect mounting position.
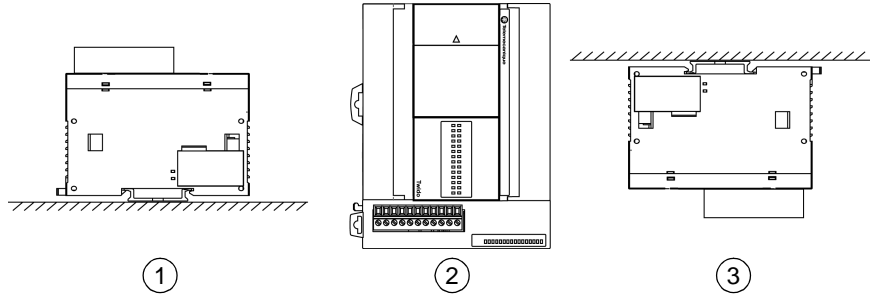
Incorrect Mounting Positions for the Modular Controllers

A Modular controller should only be positioned as shown in "Mounting Position for all Controllers and Expansion I/O Modules" figure. The figures below show the incorrect mounting positions for all Modular controllers.

⚠	**CAUTION**
	Placing heat generating devices near the controller system
	Do not place heat generating devices such as transformers and power supplies underneath the controllers or expansion I/O modules.
	Failure to observe this precaution can result in injury or equipment damage.

How to Assemble an Expansion I/O Module to a Controller

Introduction   This section shows how to assemble an expansion I/O module to a controller. This procedure is for the Compact and Modular controllers. Your controller and expansion I/O module may differ from the illustrations in this procedure.

⚠	**CAUTION**
	UNEXPECTED EQUIPMENT OPERATION
	● If you change the hardware configuration of the I/O expansion bus and do not update the software to reflect that change, the expansion bus will no longer operate. ● Be advised that the local base inputs and outputs will continue to operate.
	Failure to observe this precaution can result in injury or equipment damage.

Assembling an Expansion I/O Module to a Controller

The following procedure shows how to assemble a controller and expansion I/O module together.

Step	Action
1	Remove the expansion connector cover from the controller.
2	Make sure the black latch button on the I/O module is in the up position.
3	Align the connector on the left side of the expansion I/O module to the connector on the right side of the controller.
4	Press the expansion I/O module to the controller until it "clicks" into place.
5	Push down the black latch button on the top of the expansion I/O module to lock the module to the Compact controller.
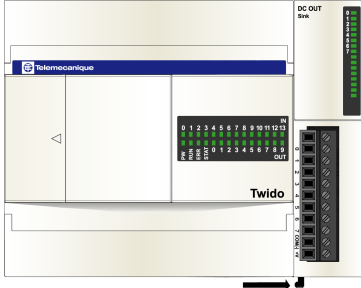
How to Disassemble an Expansion I/O Module from a Controller

Introduction

This section shows how to disassemble an expansion I/O module from a controller. This procedure is for both Compact and Modular controllers. Your controller and expansion I/O module may differ from the illustrations in these procedures but the basic mechanism procedures are applicable.

Disassembling an Expansion I/O Module from a Controller

The following procedure shows how to disassemble an expansion I/O module from a controller.

Step	Action
1	Remove the assembled controller and expansion I/O module from the DIN rail before disassembling them. See *How to Install and Remove a Controller and Expansion I/O Module from a DIN Rail, p. 160*.
2	Push up the black latch from the bottom of the expansion I/O module to disengage it from the controller.
3	Pull apart the controller and expansion I/O module.

How to Install and Remove the Operator Display Module and Operator Display Expansion Module

Introduction
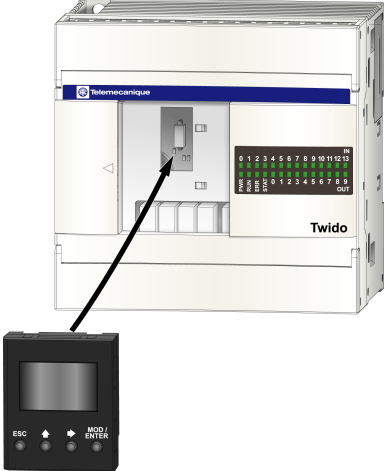
This section shows how to install and remove the TWDXCPODC operator display module and the TWDXCPODM operator display expansion module.

Installing the Operator Display Module into a Compact Controller

The following procedure shows how to install the TWDXCPODC operator display module into a Compact controller.
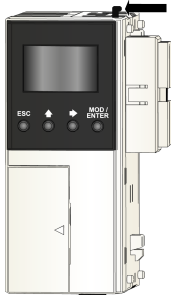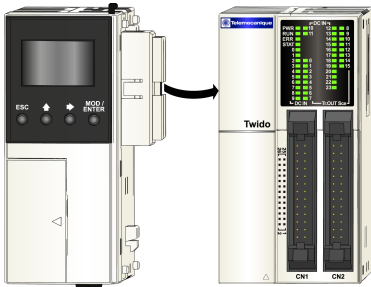
Step	Action
1	Remove the operator display connector cover on the Compact controller.
2	Locate the operator display connector inside the Compact controller.

Step	Action
3	Push the operator display module into the operator display connector in the Compact controller until it "clicks".

Assembling the Operator Display Expansion Module to a Modular Controller

The following procedure shows how to assemble the TWDXCPODM operator display expansion module to a Modular controller.
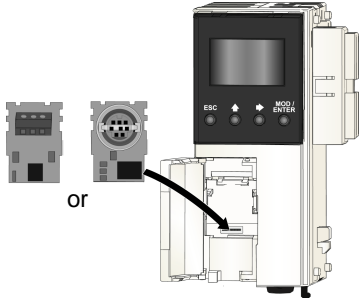
Step	Action
1	Remove the communication connector cover on the left side of the Modular controller.
2	Make sure the black latch button on the operator display expansion module is in the up position.
3	Align the connector opening on the left side of the Modular controller to the connector on the right side of the operator display expansion module.
4	Press the operator display expansion module to the Modular controller until it "clicks" into place.
5	Push down the black latch button on the top of the operator display expansion module to lock the module to the Modular controller.

Removing the Operator Display Expansion Module from a Modular Controller

To remove the TWDXCPODM operator display expansion module from a Modular controller see *How to Disassemble an Expansion I/O Module from a Controller, p. 148.*

How to Install and Remove a Communication Adapter and Expansion Module

Introduction This section shows how to install and remove the TWDNAC232D, TWDNAC485D, or TWDNAC485T communication adapter into a Compact controller's port 2 and in a TWDXCPODM operator display expansion module. This section also shows how to assemble and disassemble the TWDNOZ232D, TWDNOZ485D, and TWDNOZ485T communication expansion module to a Modular controller. Your controller may differ from the illustrations in these procedures but the basic mechanism procedures are applicable.

Installing the Communication Adapter into a Compact Controller's Port 2 The following procedure shows how to install the TWDNAC232D, TWDNAC485D, or TWDNAC485T communication adapter into a Compact controller's port 2.

Step	Action
1	Open the hinged lid.
2	Remove the cartridge cover located on the bottom of the Compact controller.
3	Push the communication adapter's connector into the Compact controller's port 2 connector until it "clicks".
4	Look in the opening at the bottom of the Compact controller where the cartridge cover resided and make sure the communication adapter's connector is seated in the Compact controller's port 2 connector. Adjust the adapter if it is not seated correctly.
5	Attach the cartridge cover.

Installing a Communication Adapter in the Operator Display Expansion Module

The following procedure shows how to install the TWDNAC232D, TWDNAC485D, or TWDNAC485T communication adapter in a TWDXCPODM operator display expansion module.

Step	Action
1	Open the hinged lid.
2	Push the communication adapter's connector into the operator display expansion module's connector until it "clicks".
3	Close the hinged lid.

Assembling a Communication Expansion Module to a Modular Controller

The following procedure shows how to assemble the TWDNOZ485D, TWDNOZ232D, or TWDNOZ485T communication expansion module to a Modular controller.

Step	Action
1	Remove the communication connector cover on the left side of the Modular controller.
2	Make sure the black latch button on the communication expansion module is in the up position.
3	Align the connector opening on the left side of the Modular controller to the connector on the right side of the communication expansion module.
4	Press the communication expansion module to the Modular controller until it "clicks" into place.
5	Push down the black latch button on the top of the communication expansion module to lock the module to the Modular controller.

Disassembling a Communication Expansion Module from a Modular Controller

To disassemble a communication expansion module from a Modular controller, see *How to Disassemble an Expansion I/O Module from a Controller, p. 148*.

How to Install a Memory or RTC Cartridge
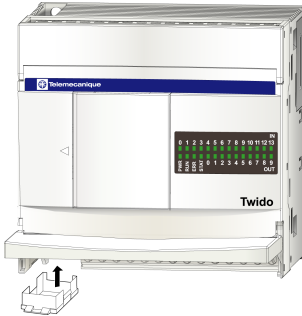
Introduction   This section shows how to install the TWDXCPMFK32 memory cartridge in a Compact controller, the TWDXCPMFK32 or TWDXCPMFK64 memory cartridge in a Modular controller, and the TWDXCPRTC RTC cartridge in a Compact controller and Modular controller.

Installing a Cartridge in a Compact Controller   The following procedure shows how to install the TWDXCPMFK32 memory or the TWDXCPRTC RTC cartridge in a Compact controller. Only one of these cartridges can be installed in the Compact controller.
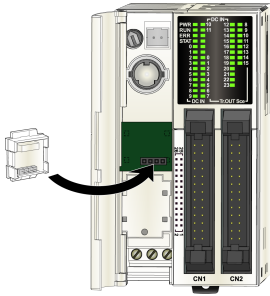
	CAUTION
⚠️	**EQUIPMENT DAMAGE**
	When handling the cartridges, do not touch the pins. The cartridge's electrical elements are sensitive to static electricity. Use proper ESD procedures when handling a cartridge.
	Failure to observe this precaution can result in injury or equipment damage.

Step	Action
1	Open bottom terminal cover.
2	Remove the cartridge cover.
3	Push the cartridge into the cartridge connector until it "clicks".
4	Close the terminal cover.

Installing a Cartridge in a Modular Controller

The following procedure shows how to install the TWDXCPMFK32 or TWDXCPMFK64 memory cartridge or the TWDXCPRTC RTC cartridge in a Modular controller. Only one RTC cartridge can be installed. A memory cartridge and an RTC cartridge can be installed at the same time.

Step	Action
1	Open the hinged door.
2	Remove the cartridge cover by holding and pulling the opposite edges of the cover until it is out.
3	Push the cartridge into the Modular controller's connector until it "clicks".
4	Close the hinged door.
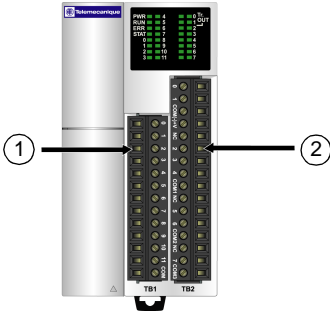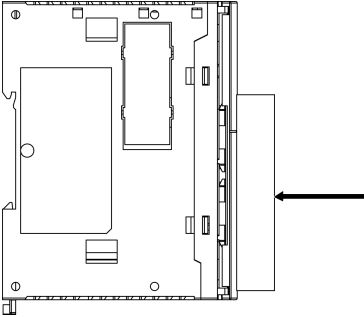
How to Remove a Terminal Block

Introduction   This section shows how to remove a terminal block from the TWDLMDA20DRT Modular controller.

Removing a Terminal Block   The following procedure shows how to remove a terminal block from the TWDLMDA20DRT Modular controller.

Step	Action
1	Power off to the Modular controller and disconnect all wires. **Note:** The terminal block on the left (1) must be removed before the terminal block on the right (2).
2	Remove terminal block (1) by holding the center of the terminal block and pulling it out straight.
3	Repeat step 2 to remove terminal block (2).

	CAUTION
⚠️	**Pulling the terminal block out from the top or bottom of the block**
	Do not pull the terminal block out from the top or bottom of the block.
	Failure to observe this precaution can result in injury or equipment damage.

How to Install and Remove a Controller and Expansion I/O Module from a DIN Rail
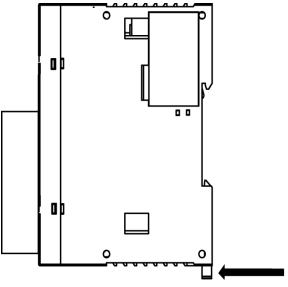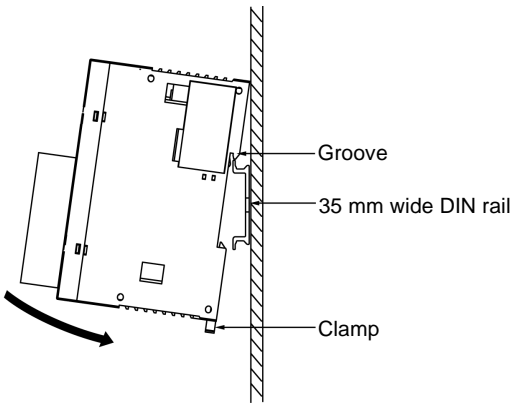
Introduction   This section shows how to install and remove controllers and expansion I/O modules from a DIN rail. Your controller and expansion I/O module may differ from the illustrations in these procedures but the basic mechanism procedures are applicable.

> **Note:** When mounting controllers on a DIN rail, use two end stops, type AB1-AB8P35 or equivalent.
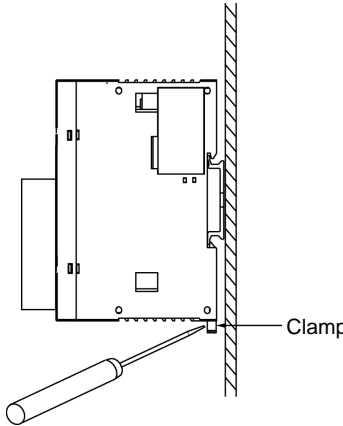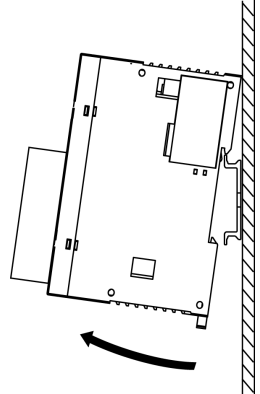
**Installing a
Controller and
Expansion I/O
Module to a DIN
Rail**

The following procedure shows how to install a controller and expansion I/O module
to a DIN rail.

Step	Action
1	Fasten the DIN rail to a panel using screws.
2	Pull out the clamp at the bottom of the controller and expansion I/O module.
3	Put the top groove of the controller and expansion I/O module on the DIN rail and press the modules toward the DIN rail.
4	Push the clamp into the DIN rail.
5	Place mounting clips on both sides of the modules to prevent the system from moving sideways.

Removing a Controller and Expansion I/O Module from a DIN Rail

The following procedure shows how to remove a controller and expansion I/O module from a DIN rail.

Step	Action
1	Insert a flat screwdriver into the slot in the clamp. Clamp
2	Pull out the clamp.
3	Pull the controller and expansion I/O module off the DIN rail from the bottom.

How to Direct Mount on a Panel Surface

Introduction This section shows how to install mounting strips directly on controllers, expansion I/O modules, operator display expansion module, and communication expansion modules. This section also provides mounting hole layouts for each controller and module. Your controller or module may differ from the illustrations in these procedures but the basic mechanism procedures are applicable.

Installing a Mounting Strip The following procedure shows how to install a mounting strip.

Step	Action
1	Remove the clamp from the back side of the module by pushing the clamp inward.
2	Insert the mounting strip, with the hook entering last, into the slot where the clamp was removed.
3	Slide the mounting strip into the slot until the hook enters into the recess in the module.

Mounting Hole Layout for Compact Controllers The following diagram shows the mounting hole layout for all the Compact controllers.
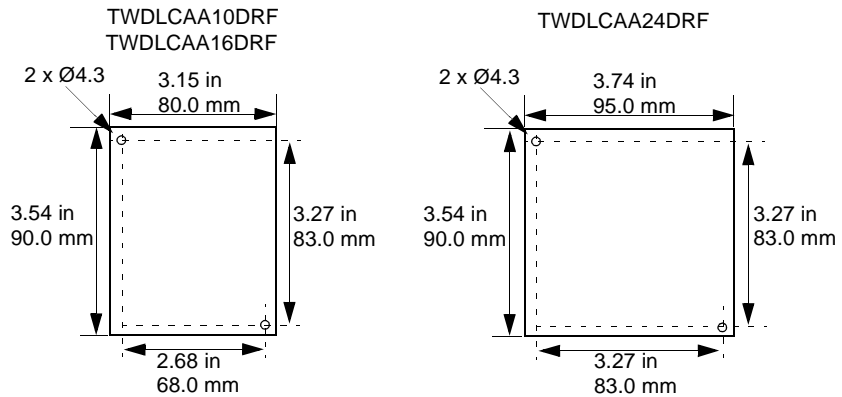
Mounting Hole Layout for Modular Controllers

The following diagram shows the mounting hole layout for all the Modular controllers.

TWDLMDA20DUK
TWDLMDA20DTK

TWDLMDA20DRT
TWDLMDA40DUK
TWDLMDA40DUK

1.39 in
35.4 mm

0.95 in
24.1 mm

2 x Ø4.3

3.54 in
90.0 mm

4.06 in
103.0 mm

3.0 mm

1.87 in
47.5 mm

0.95 in
24.1 mm

2 x Ø4.3

3.54 in
90.0 mm

4.06 in
103.0 mm

3.0 mm
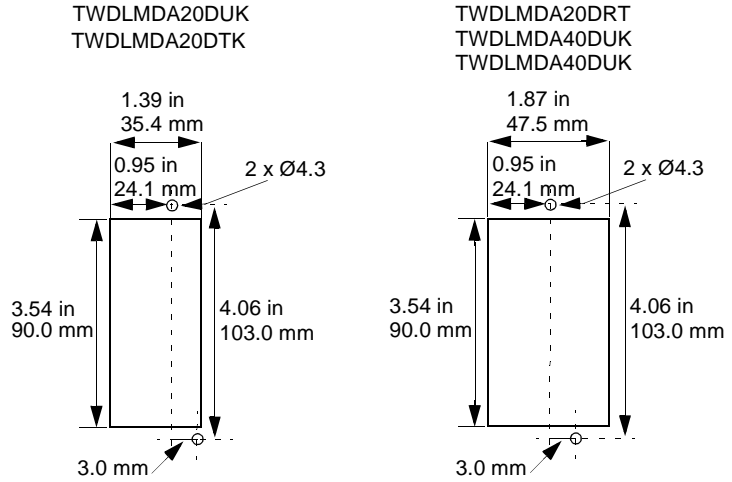
Mounting Hole Layout for Expansion I/O Modules

The following diagram shows the mounting hole layout for the expansion I/O modules.

TWDDDI8DT   TWDDMM8DRT   TWDDDI16DK
TWDDDI16DT   TWDALM3LT   TWDDDO16TK
TWDDRA8RT   TWDAMM3HT   TWDDDO16UK
TWDDRA16RT   TWDAMI2HT
TWDDDO8UT   TWDAMO1HT
TWDDDO8TT
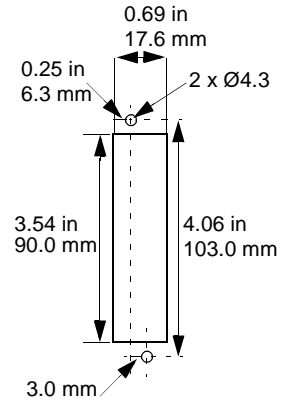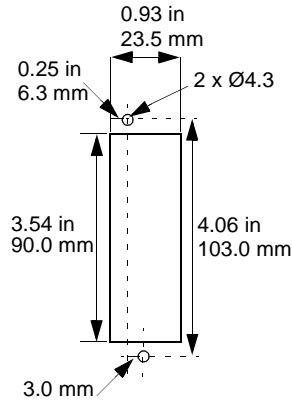
TWDDDI32DK
TWDDDO32TK
TWDDDO32UK

TWDDDO32UK
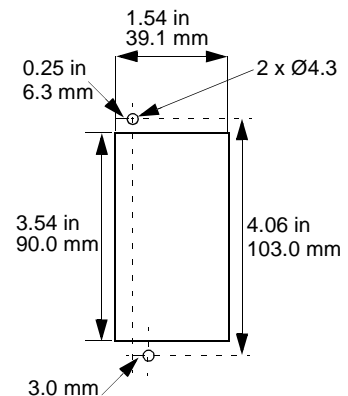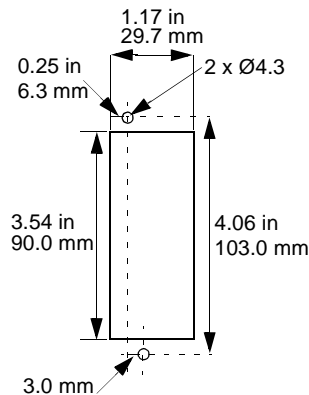
Mounting Hole Layout for Communication Expansion and Operator Display Expansion Modules

The following diagram shows the mounting hole layout for the communication expansion and operator display expansion modules.

TWDNOZ485D
TWDNOZ232D
TWDNOZ485T

TWDXCPODM

0.89 in
22.5 mm

0.25 in
6.3 mm

2 x Ø4.3

3.54 in
90.0 mm

4.06 in
103.0 mm

3.0 mm

1.50 in
38.0 mm

0.25 in
6.3 mm

2 x Ø4.3

3.54 in
90.0 mm

4.06 in
103.0 mm

3.0 mm
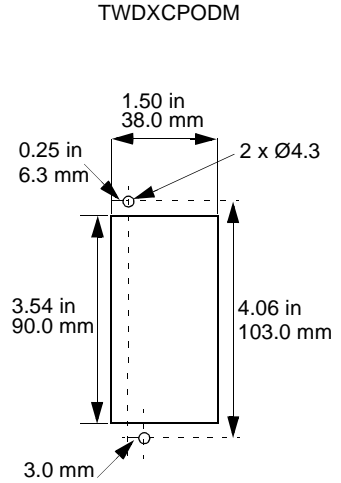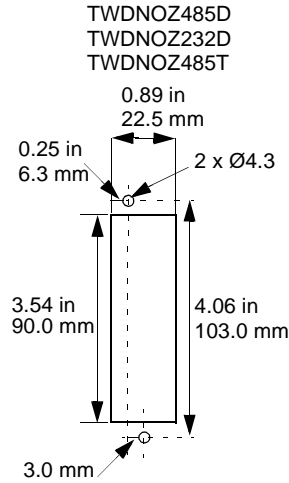
Minimum Clearances for Controllers and Expansion I/O Modules in a Control Panel

Introduction

This section provides the minimum clearances for controllers and expansion I/O modules in a control panel.

Minimum Clearances for a Compact Controller and Expansion I/O Modules

In order to maintain a natural circulation of air around the Compact controller and expansion I/O modules in a control panel, observe the minimum clearances shown in the figures below.
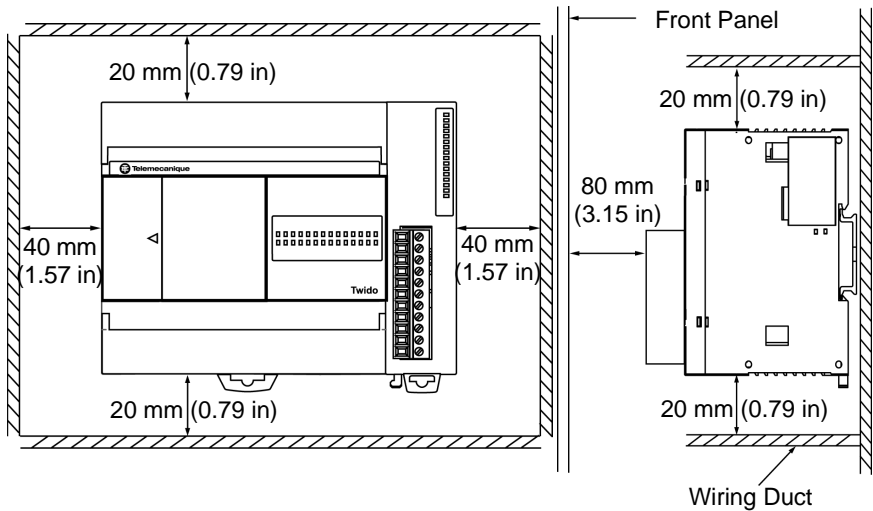
Minimum Clearances for a Modular Controller and Expansion I/O Modules

In order to maintain a natural circulation of air around the Modular controller and expansion I/O modules in a control panel, observe the minimum clearances shown in the figures below.
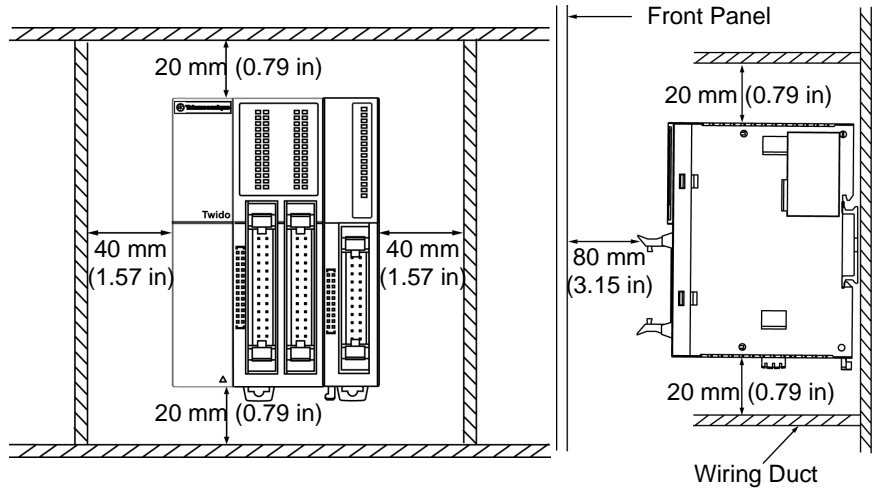
How to Connect the Power Supply

Introduction   This section describes how to connect the power supply to the Compact and Modular controllers.

> **Note:** When operating outside of the specified voltage range, outputs may not switch accordingly. Use appropriate hard-wired safety interlocks and voltage monitoring circuits.

Connect a Power Supply to a Compact Controller   The following diagram shows how to connect a power supply to a Compact controller.
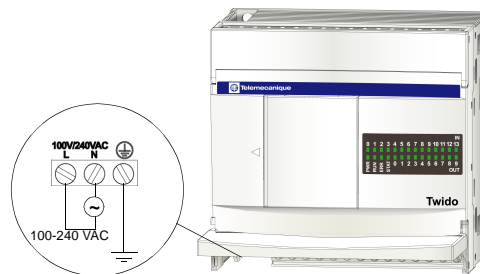
Compact Controller Power Supply Specifications

The following table provides power supply information for the Compact controller.

Item	Specifications
Power supply voltage	Rated power voltage: 100 to 240 VAC Allowable range: 85 to 264 VAC Failure - depends on quantity of used input and output points. Generally, failure is detected when voltage drops below 85 VAC, stopping operation to prevent malfunction. **Note:** Momentary power interruption for 20 ms or less at 100 to 240 VAC is not recognized as failure.
Inrush current flow at power-up	TWDLCAA10DRF and TWDLCAA16DRF: 35 A maximum TWDLCAA24DRF: 40 A maximum
Power supply wiring	UL1015 AWG22 (0.64 mm^2) or UL1007 AWG18 (1.02 mm^2) Make the power supply wiring as short as possible.
Ground wiring	UL1007 AWG16 (1.30 mm^2) Do not connect ground wire in common with ground wire of motor equipment.

Connect a Power Supply to a Modular Controller

The following diagram shows how to connect a power supply to a Modular controller.
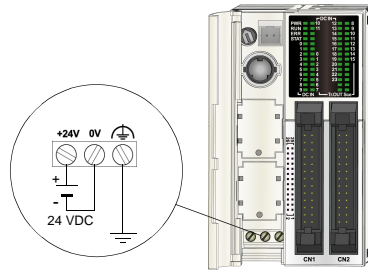
Modular Controller Power Supply Specifications

The following table provides power supply information for the Modular controller.

Item	Specifications
Power supply voltage	Rated power voltage: 24 VDC Allowable range: 20.4 to 26.4 VDC Failure - depends on quantity of used input and output points. Generally, failure is detected when voltage drops below 20.4 VDC, stopping operation to prevent malfunction. **Note:** Momentary power interruption for 10 ms or less at 24 VDC is not recognized as failure.
Inrush current flow at power-up	50 A maximum
Power supply wiring	UL1015 AWG22 (0.64 mm^2) or UL1007 AWG18 (1.02 mm^2) Make the power supply wiring as short as possible.
Ground wiring	UL1015 AWG22 (0.64 mm^2) or UL1007 AWG18 (1.02 mm^2) Do not connect ground wire in common with ground wire of motor equipment.

Special Functions

4

At a Glance

Introduction

This chapter provides an introduction and I/O assignments for the Twido controllers' special functions. For information on configuring and using these special functions see the Twido Software Reference Guide.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
RUN/STOP Input	174
Controller Status Output	174
Latching Input	174
Fast Counting	175
Very Fast Counters	176
Pulse (PLS) Generator Output	178
Pulse Width Modulation (PWM) Output	178

RUN/STOP Input

Introduction   This section provides basic information on the RUN/STOP input special function.

Principle   The RUN/STOP input is a special function that can be assigned to any one of the base controller inputs. This function is used to start or stop a program.

Determining the State of Run/ Stop Input   At power up, if configured, the controller state is set by the Run/Stop input:
- if RUN/STOP input is at state 0, controller is in STOP mode.
- if RUN/STOP input is at state 1, controller is in RUN mode.

While the controller is powered, a rising edge on the RUN/STOP input state sets the controller to RUN. The controller is stopped if the RUN/STOP input is at 0. If the RUN/STOP input is at 0, a RUN command from a connected PC is ignored by the controller.

Controller Status Output

Introduction   This section provides basic information on the controller status output special function.

Principle   The controller status output is a special function that can be assigned to one of three outputs (%Q0.0.1 and %Q0.0.3) on a base or a remote controller.
At power up, if there is no controller error see *Troubleshooting Using the Controller's LEDs, p. 182*, the controller status output changes to 1. This function can be used in safety circuits external to the controller, for example, to control:
- The power supply to the output devices.
- The controller power supply.

Latching Input

Introduction   This section provides basic information on the latching inputs special function.

Principle   The latching inputs is a special function that can be assigned to one of four inputs (%I0.0.2 to %I0.0.5) on a base or a remote controller. This function is used to memorize any pulse with a duration less than the controller scan time. When a pulse is shorter than one scan and has a value greater than or equal to 100 μs, the controller latches the pulse, which is then updated in the next scan.

Fast Counting

Introduction   This section provides basic information on the fast counting special function.

Principle   The base controllers have two fast counter types:
- A single up counter with a maximum frequency of 5 kHz.
- A single down counter with a maximum frequency of 5 kHz.

The single up counter and single down counter functions enable counting or down counting of pulses (rising edges) on a digital I/O. Compact controllers can have 3 fast counters. Modular controllers can have 2 fast counters.

Digital I/O Assignment for a Fast Counter   The digital I/O assignment for fast counters depends on whether digital I/O was assigned for the optional pre-set and catch inputs on the very fast counters. See *Very Fast Counters, p. 176* for more information.

Very Fast Counters

Introduction This section provides basic information on the very fast counting special function.

Principle The base controllers have five very fast counter types:
- An up/down counter with a maximum frequency of 20 kHz.
- An up/down 2-phase counter with a maximum frequency of 20 kHz.
- A single up counter with a maximum frequency of 20 kHz.
- A single down counter with a maximum frequency of 20 kHz.
- A frequency meter with a maximum frequency of 20 kHz.

The up/down counter, up/down 2-phase counter, single up counter, and single down counter functions enable counting of pulses from 0 to 65535. The frequency meter function measures the frequency of a periodic signal in Hz.

Digital I/O Assignment for a Very Fast Counter on all Controllers The following tables lists the assigned I/O for one very fast counter on all controllers models.

Functions	First Input (pulses)	Second Input (pulses or Up/Down)	Preset Input	Catch Input	First Reflex Output	Second Reflex Output
Up/down counter	%I0.0.1 (pulses)	%I0.0.0*	%I0.0.2**	%I0.0.3**	%Q0.0.2**	%Q0.0.3**
Up/down 2-phase counter	%I0.0.1 (pulses Phase A)	%I0.0.0 (pulses Phase B)	%I0.0.2**	%I0.0.3**	%Q0.0.2**	%Q0.0.3**
Single up counter	%I0.0.1 (pulses)	Not used	%I0.0.2**	%I0.0.3**	%Q0.0.2**	%Q0.0.3**
Single down Counter	%I0.0.1 (pulses)	Not used	%I0.0.2**	%I0.0.3**	%Q0.0.2**	%Q0.0.3**
Frequency meter	%I0.0.1 (pulses)	Not used	Not used	Not used	Not used	Not used

Note:
- * Indicates Up/Down
- ** Optional use

Digital I/O Assignment for the Other Very Fast Counter on Modular Controllers

The following tables lists the assigned I/O for the other very fast counter on Modular controllers only.

Functions	First Input (pulses)	Second Input (pulses or Up/ Down)	Preset Input	Catch Input	First Reflex Output	Second Reflex Output
Up/down counter	%I0.0.7 (pulses)	%I0.0.6*	%I0.0.5**	%I0.0.4**	%Q0.0.4**	%Q0.0.5**
Up/down 2-phase counter	%I0.0.7 (pulses Phase A)	%I0.0.6 (pulses Phase B)	%I0.0.5**	%I0.0.4**	%Q0.0.4**	%Q0.0.5**
Single up counter	%I0.0.7 (pulses)	Not used	%I0.0.5**	%I0.0.4**	%Q0.0.4**	%Q0.0.5**
Single down counter	%I0.0.7 (pulses)	Not used	%I0.0.5**	%I0.0.4**	%Q0.0.4**	%Q0.0.5**
Frequency meter	%I0.0.7 (pulses)	Not used	Not used	Not used	Not used	Not used

Note:
- * Indicates up/down
- ** Optional use

Pulse (PLS) Generator Output

Introduction   This section provides basic information on the PLS special function.

Principle   The PLS is a special function that can be assigned to output %Q0.0.0 or %Q0.0.1 on a base or a peer controller. A user-defined function block generates a signal on output %Q0.0.0 or %Q0.0.1. This signal has a variable period but has a constant duty cycle, or on to off ratio of 50% of the period.

Pulse Width Modulation (PWM) Output

Introduction   This section provides basic information on the PWM special function.

Principle   The PWM is a special function that can be assigned to output %Q0.0.0 or %Q0.0.1 on a base or a peer controller. A user-defined function block generates a signal on output %Q0.00 or %Q0.0.1. This signal has a constant period with the possibility of varying the duty cycle, or on to off ratio. This function can be used to manage analog output modules.

Powering-Up and Troubleshooting

5

At a Glance

Introduction

This chapter provides the procedure for the first time a controller is powered-up, checking the I/O connections, and troubleshooting the controller using the LEDs.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Procedure for First Time Power-Up of a Controller	180
Checking I/O Connections on the Base Controller	181
Troubleshooting Using the Controller's LEDs	182

Procedure for First Time Power-Up of a Controller

Introduction   This section explains powering-up a controller for the first time.

Power-Up Self   At power-up, the firmware will perform tests to ensure the proper functioning of the
Diagnostics   controller. Each major hardware component is tested for consistency. This includes
                    the on-board PROM and RAM. Later in the booting sequence, the application is
                    tested, using a checksum, before it can be executed.

First Time   There are four status LEDs that signify the state and condition of the controller. The
Power-Up   LED labeled PWR directly monitors the power supplied to the controller. It can not
Procedure   be changed by the application and can not be modified by the executive firmware.
                    The first time the controller is powered up, it will be in a non-configured state with no
                    application programming present. This state is indicated by a blinking ERR LED. If
                    the ERR LED is not blinking or if any of the Input/Output LEDs are illuminated,
                    without the presence of an external signal, see *Troubleshooting Using the
                    Controller's LEDs, p. 182*.

Checking I/O Connections on the Base Controller

Introduction   This section provides a procedure for checking the I/O connections.

	WARNING
STOP	**Unintended operation of external equipment** Avoid unintended operation of external equipment. Make sure that: ● Power fuses are removed from the motor controls. ● Pneumatic and hydraulic inputs are closed. **Failure to observe this precaution can result in severe injury or equipment damage.**

Checking I/O Connections Procedure

The following procedure ensures that the I/O connections are connected:

Step	Action
1	To test the I/O connections, the controller needs to be in the non-configured state. To accomplish this: ● If an Operator Display is attached, press ESC to power cycle the controller. After the controller restarts, the Operator Displays indicates "NCF". ● From TwidoSoft, issue the erase command from the Controller menu.
2	With the controller in the non-configured state, change system bit %S8 to 0. At state 0, the controller outputs are kept in their existing state.
3	Check the inputs by activating each external sensor. To accomplish this: ● Check that each of the input LEDs for the corresponding bit changes state. ● Using TwidoSoft's Operate Controller dialog, check that each of the input LEDs for the corresponding bit changes state.
4	Check the outputs by setting the bit corresponding to each output state to 1. To accomplish this: ● Check that each of the output LEDs for the corresponding bit changes state. ● Using TwidoSoft's Operate Controller dialog, check that each of the output LEDs for the corresponding bit changes state.
5	To complete this procedure, change system bit %S8 to 1. This is automatically accomplished by downloading a valid user application.

Troubleshooting Using the Controller's LEDs

Introduction   This section provides information on the controller's operating status and troubleshooting using the LEDs.

Status of the Controller

The following table displays the different LED states on a base controller, peer controller, and remote controller.

LED Status		Base Controller or Peer Controller	Remote Controller
RUN green	○	Application not executed	Incorrectly or not connected
	✖	Controller is in STOP mode or execution fault	Same as base controller
	●	Controller is in RUN mode	Same as base controller
ERR red	○	OK	OK
	✖	Application not executable	N/A
	●	Internal faults (watchdog, etc.)	Same as base controller
STAT green	○	Controlled by the user or application through system bit %S69	Same as base controller
	✖	N/A	N/A
	●	Controlled by the user or application through system bit %S69	Same as base controller
○ Off		✖ Flashing	● Illuminated

Status of the Digital I/O Module

LED Status		Digital I/O Module
I/O LEDs	○	I/O not active
	●	I/O active
○ Off		● Illuminated

Agency Compliance

6

Agency Requirements

Introduction   This section provides agency standards for the Twido products.

Standards   Twido controllers comply with the main national and international standards
                       concerning electronic industrial control devices.
                       The following are specific controller requirements:
                       - EN61131-2 (IEC61131-2)
                       - UL508
                       - UL1604/CSA 213 Class I Division 2 Groups A, B, C, D

Appendices

At a Glance

Introduction   This appendix provides information on common IEC symbols used in this manual.

What's in this Appendix?   The appendix contains the following chapters:

Chapter	Chapter name	Page
A	IEC Symbols	187

A

IEC Symbols
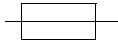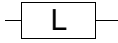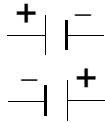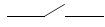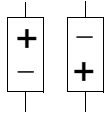
Glossary of Symbols

Introduction   This section contains illustrations and definitions of common IEC symbols used in describing Twido wiring schematics.

Symbols Common IEC symbols are illustrated and defined in the table below:

	Fuse
L	Load
~	AC power
+ − / − +	DC power
	Digital sensor/input, for example, contact, switch, initiator, light barrier, and so on.
	Earth ground
+ − / − +	2-wire sensor
	Thermocouple element

Glossary
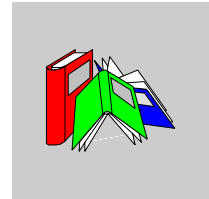
A

Analog Potentiometer   Can be used to preset a value for an analog timer. All Modular controllers and Compact 10 and 16 I/O controllers have one potentiometer. The Compact 24 I/O controller has two.

Analog Voltage Input Connector   Connects an analog voltage source of 0 through 10 VDC. The analog voltage is converted to a digital value and is stored in a system word.

C

Cartridge Connector   A connector to attach an optional memory cartridge or an RTC.

Catch Input   Ensures reception of short input pulses (rising pulse of 40 µs or falling pulse of 150 µs minimum) from sensors without regard to the scan time.

Communication Adapter   An optional cartridge that can be attached to any Compact controller or Operator Display Expansion Module to provide an optional Serial Port 2.

Communication Expansion Module   An optional module that can be attached to any Modular controllers communications expansion bus to provide an optional Serial Port 2.

Controller Status Output	A special function. This function is used in safety circuits, external to the controller, to control the power supply to the output devices or the controller power supply.

E

ERR LED	An LED that illuminates when an error occurs in the controller.
Expansion Connector	A connector to attach expansion I/O modules.
Expansion Cover	A cover to protect the expansion connector.
Expansion I/O Module	Either a digital or analog module that adds additional I/O to the base controller.

F

Fast Counting	A special function, it is available as a single up counter and single down counter. These functions enable up counting or down counting of pulses (rising edges) on a digital I/O. Compact controllers can have three fast counters. Modular controllers can have two fast counters.
Free Wire	The end of a digital I/O cable that does not have a connector. The internal wires are exposed. This scheme provides connectivity from Modular I/O to discrete I/O points.

I

I/O	Input/Output.
I/O Terminals	Terminals on all Modular controllers and expansion I/O modules used to connect input and output signals. The input terminals accept both sink and source DC input signals. The output terminals are either transistor source or sink or relay contacts.
IN LED	An LED that illuminates when a corresponding input is on. All modules have IN Leds.

Input Filter	A special function that rejects input noises. This function is useful for eliminating input noises and chatter in limit switches. All inputs provide a level of input filtering using the hardware. Additional filtering using the software is also configurable through TwidoSoft.
Input Simulators	An optional accessory for Compact controllers that is used for debugging. It can simulate input sensors to test application logic.
Input Terminals	Terminals on the top of all Compact controllers used to connect input signals from input devices such as sensors, push buttons, and limit switches. The input terminals accept both sink and source DC input signals.

L

Latching Input	A special function. This function is used to memorize any pulse with a duration less than the controller scan time. When a pulse is shorter than one scan and has a value greater than or equal to 100 s, the controller latches the pulse, which is then updated in the next scan.

M

Memory Cartridge	An optional cartridge available in two sizes: 32 KB and 64 KB (64 KB not available on Compact). It can be added to any controller for removable backup of applications or to load an application, if certain conditions exist.
Modbus Master Mode	Allows the controller to initiate a Modbus query transmission, with a response expected from a Modbus slave.
Modbus Slave Mode	Allows the controller to respond to Modbus queries from a Modbus master and is the default communications mode if no communication is configured.

O

Operator Display Expansion Module	An optional module that can be attached to any Modular controller to display program information.

Operator Display Module	An optional module that can be attached to any Compact controller to display program information.
OUT LED	An LED that illuminates when a corresponding output is on. All modules have OUT Leds.
Output Terminals	Terminals on the bottom of all Compact controllers used to connect output signals from output devices such as electromechanical relays and solenoid valves. The internal output relay contact is rated up to 240 VAC/2A or 30 VDC/2A.

P

PLS	A special function. This user-defined function block generates a signal on output %Q0.0.0 or %Q0.0.1. This signal has a variable period but has a constant duty cycle, or on to off ratio of 50% of the period.
Power Supply Terminals	The power supply is connected to these terminals to provide power to the controller. The power voltage for a Compact controller is 100-240 VAC and 24 VDC for a Modular controller.
PWM	A special function. This user-defined function block generates a signal on output %Q0.00 or %Q0.0.1. This signal has a constant period with the possibility of varying the duty cycle, or on to off ratio. This function can be used to manage analog output modules.
PWR LED	An LED that illuminates when power is supplied to the controller.

R

Removable Cover	A cover on all Compact controllers that can be removed to install an optional Operator Display.
RTC	Real-Time Clock.
RUN LED	An LED that illuminates when the controller is executing a program.

S

Sensor Power Terminals Supplies power to the field side sensors (24 VDC, 250 mA). Output terminals are only intended for input devices and should not be used as a source for driving external loads.

Serial Port 1 An EIA RS-485 connector used to download and monitor the controller operation using TwidoSoft. Can also be configured as EIA RS-232.

Serial Port 2 An optional port that can be configured as either EIA RS-232 or EIA RS-485.

STAT LED An LED that blinks on and off to indicate a specific status of the user program.

T

Terminal Cover A cover on all Compact controllers to protect the input and output terminals.

V

Very Fast Counting A special function it is available as an up/down counter, an up/down 2-phase counter, a single up counter, a single down counter, and frequency meter. The counter functions enable counting of pulses from 0 to 65535. The frequency meter function measures the frequency of a periodic signal in Hz.

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