

ICF-1171I Series Quick Installation Guide

Version 1.0, June 2022

Technical Support Contact Information
www.moxa.com/support

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P/N: 1802011710010



Overview

Introduction

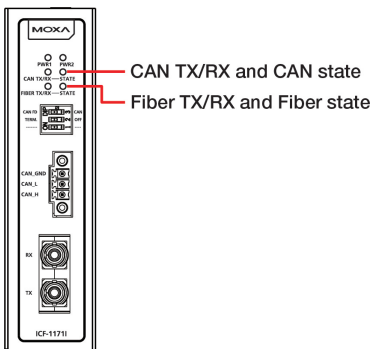
The ICF-1171I Series CAN-to-fiber converters are used in pairs to connect two CAN (CAN 2.0) or two CAN FD (ISO CAN FD) devices or networks via single-mode or multi-mode optical fiber. The ICF-1171I CAN-to-fiber converters provide 2 kV isolation protection for the CAN interface and dual power inputs to ensure that your CAN system works uninterrupted.

The ICF-1171I Series can separate and protect critical segments of the system from the rest of the CAN network and is protocol independent, allowing it to work with all the different CAN protocols and frame lengths. In other words, the higher layer CAN protocols, based on CAN (CAN 2.0) and CAN FD (ISO CAN FD), can work through the ICF-1171I Series.

To connect two CAN devices with a fiber-optic cable, two ICF-1171I Series converters are required.

Why an ICF-1171I CAN-to-fiber converter?

- **Extends the CAN Bus Transmission Distance**
Typically, the total transmission distance of a CAN (CAN 2.0) or CAN FD (ISO CAN FD) system can be extended by 2 km (multi-mode fiber) or by 40 km (single-mode fiber) using ICF-1171I converters. However, the reach of these extensions depends on the environment, architecture, etc.
- **Easily Fulfil Various Communication Scenarios**
Two CAN (CAN 2.0) networks or CAN FD (ISO CAN FD) networks can communicate with each other using different baudrates. The ICF-1171I converters can automatically detect the baudrate of the connected CAN (CAN 2.0) device and apply the baudrate itself. Therefore, you do not need to know the baudrate of the connected CAN (CAN 2.0) device, making it an extremely convenient feature. Baudrates can also be set to a predefined value via rotary switches. Please note that Automatic baudrate detection is only supported in CAN (CAN 2.0), not in CAN FD.
- **Easily Troubleshoot Communication Issues**
It is easy to check if an issue exists on the CAN bus or the fiber link. The ICF-1171I converters come with LEDs that indicate the fiber link state, fiber communication status, CAN bus state, and CAN bus communication status.



Features

- Extends the transmission distance of the overall CAN bus system
- Converts CAN signals to fiber and vice versa
- Supports CAN (or CAN 2.0, including CAN 2.0A and CAN 2.0B) and its extension CAN FD (CAN Flexible Data Rate); conforms to the ISO 11898 standard
- CAN (CAN 2.0) and CAN FD (ISO CAN FD) arbitration rate (or nominal bit rate, arbitration bit rate) is up to 1 Mbps; data rate is up to 5 Mbps
- Dual power inputs for redundancy
- DIP switch for 120 Ω terminal resistance
- Wide temperature range model available for -40 to 75°C environments ("T" models)
- Supports higher layer CAN protocols such as CANopen, DeviceNet, SAE J1939, etc.
- Supports point-to-point connection to another ICF-1171I

Package Checklist

Before installing the ICF-1171I Series, verify the package contains the following items:

- ICF-1171I Series CAN-to-fiber converter with a DIN-rail kit pre-locked on it
- Quick Installation Guide (printed)
- Warranty card

Optional Accessory

- **WK-30-02:** Wall-mounting kit, 2 plates, 4 screws, 30 x 66.8 x 2 mm

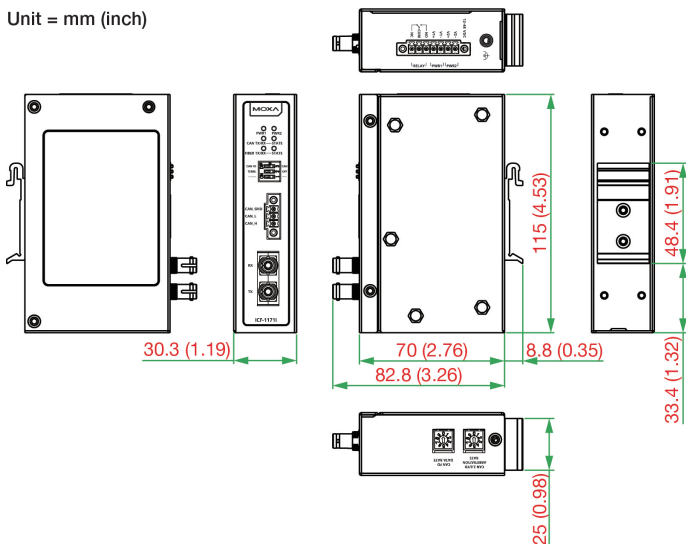
NOTE Please notify your sales representative if any of the above items are missing or damaged.

Mounting Dimensions

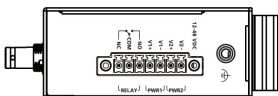
ICF-1171I-S-ST/ICF-1171I-M-ST

The appearance is the same for all, including wide-temperature (-T) models; the only difference is the label of the model.

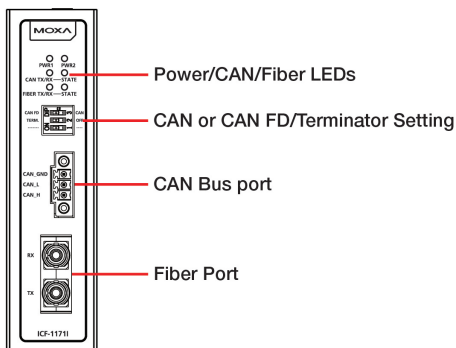
Unit = mm (inch)



Top View



Front View





ATTENTION

Electrostatic Discharge Warning!

To protect the product from damage because of electrostatic discharge, we recommend wearing a grounding device when handling your ICF-1171I Series.

Hardware Installation Procedure

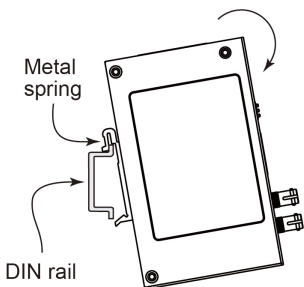
The ICF-1171I is designed to be attached to a DIN rail or mounted on a wall. For DIN-rail mounting, push down the spring and properly attach it to the DIN rail until it “snaps” into place. For wall mounting, install the wall-mount kit (optional) first and then screw the device onto the wall. An M3 screw is suggested, and the minimum length of the screw should be 7 mm.

The following figure illustrates the two suggested mounting options.

DIN-rail Installation

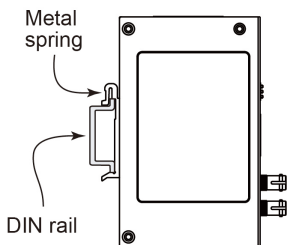
Step 1:

Insert the top of the DIN-rail into the slot just below the stiff metal spring.



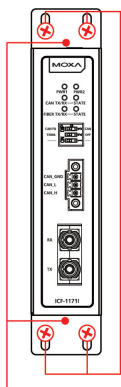
Step 2:

The DIN-rail attachment unit will snap into place as shown below.



To remove the ICF-1171I Series from the DIN rail, simply reverse steps 1 and 2 above.

Wall-mounting Installation



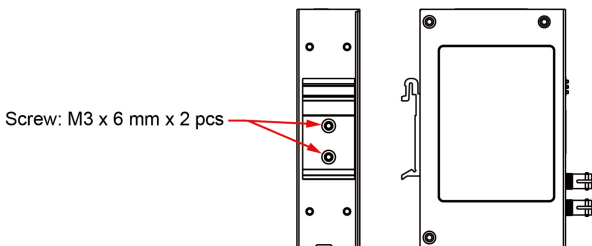
Step 2: Screw onto wall

Step 1: Install wall-mount kit

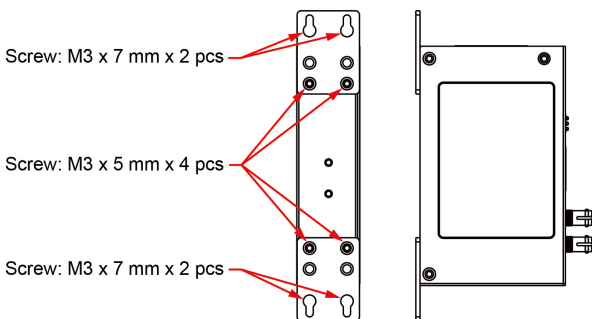
For wall mounting, the suggested direction of the product is upright—the same as for DIN-rail mounting.

The following figure illustrates how to attach the screws to the mounting kits:

DIN Rail:

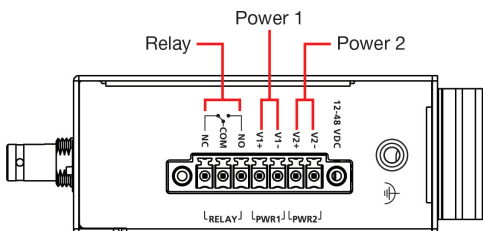


Wall-mount:



Power Input and Relay

The ICF-1171I supports dual power inputs for redundancy. When one power input fails, the relay will be triggered. Be sure to install the dual power inputs for the ICF-1171I Series and choose the correct relay output when connecting the alarm.



Please see the terminal block definition for power input and relay in the following table.

Relay (Normally closed)	Relay (Common)	Relay (Normally open)	DC Power input 1	DC Power input 1	DC Power input 2	DC Power input 2
N.C.	COM	N.O.	V1+	V1-	V2+	V2-

Please see the power input status and corresponding relay status in the following table:

Power input status	Relay status
Both power inputs are on/off	Normally closed (N.C.)
Power input 1 or power input 2 is on	Normally open (N.O.)

NOTE Before connecting the equipment to DC power inputs, make sure the DC power source voltage is stable

- The wiring of input terminal block shall be installed by a skilled person.
- Wire type: Cu
- Only use 28-14 AWG wire size, torque value 0.19 N-m.
- One individual conductor in a clamping point.

NOTE The equipment is intended to be supplied by the external power source (UL listed/ IEC 60950-1/ IEC 62368-1), which output complies with ES1/SELV, PS2/LPS, output rating is 12 to 48 VDC, 188.5 mA (max.), and ambient temperature 75°C

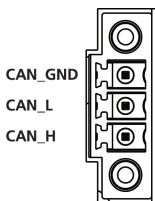
NOTE If you are using a Class I adapter, the power cord should be connected to an outlet with an earthing connection.

CAN Pin Assignment

Please see the terminal block definition for CAN bus port in the following table.

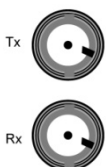
CAN High	CAN Low	CAN Signal Ground
CAN_H	CAN_L	CAN_GND

Make sure CAN high (CAN_H) is connected to the CAN high pin, and CAN low (CAN_L) is connected to the CAN low pin of your CAN device.

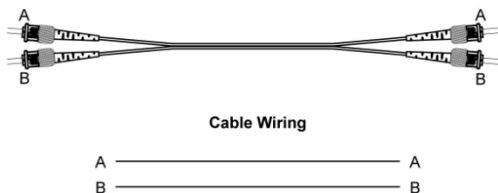


Fiber Cable

ST-Port Pinouts



ST-Port to ST-Port Cable Wiring



ATTENTION

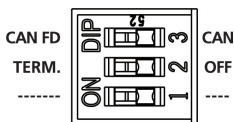
This is a Class 1 laser/LED product. Do not stare into the laser beam.

1. Caution—Use of the controls or adjustments or the performance of procedures other than those specified herein may result in hazardous radiation exposure."

2. Complies with 21 CFR 1040.10 and 1040.11, except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

Switch Settings

There are three DIP switches on the front panel of the ICF-11711 Series; DIP switch 1 is reserved for future use. See the usage below.



Use DIP switch 3 to set up CAN (CAN 2.0) or CAN FD (ISO CAN FD) mode. CAN in the table below is equal to CAN 2.0, and CAN FD is equal to ISO CAN FD.

CAN Mode	Switch 3
CAN FD	ON
CAN	OFF (default)

Use DIP switch 2 to enable terminator.

120 Ω Terminator	Switch 2
------------------	----------

Enable	ON
Disable	OFF (default)

There are two rotary switches at the bottom of the ICF-1171I Series, which is used to configure the arbitration rate or data rate of the CAN bus. Rotary switch 1 is used to set up the arbitration rate of CAN (CAN 2.0)/CAN FD (ISO CAN FD); rotary switch 2 is used to set up the data rate of CAN FD (ISO CAN FD).

Explore the following use cases to see how you use the rotary switches:

Use case 1: My devices use CAN (CAN2.0) with communication speed/bit rate of 1Mbps. How do I set up the baudrate of ICF-1171I?

You can set up a fixed baudrate by switching rotary switch 1 to PIN 1, and ignore rotary switch 2. Or, you can use auto baudrate by switching rotary switch 1 to PIN 0. When the ICF-1171I receives the data frames sent by the connected CAN device, it can detect the baudrate and set to itself.

The auto baudrate function sets up a sequence to initialize the baudrates supported by the ICF-1171I (e.g., 1Mbps, 800 kbps, 500kbps as in the table below).

Also, make sure the DIP switch in the front panel is set to "CAN" mode.

Use case 2: My devices use CAN FD (ISO CAN FD) with dual bit rates (or called BRS, Bit Rate Switch), nominal/arbitration rate is 1Mbps, and data rate is 2Mbps.

In this case, please set rotary switch 1 to PIN 1, and set rotary switch 2 to PIN 3. Also, make sure the DIP switch in the front panel is set to "CAN FD" mode.

Auto-baudrate is supported in CAN (CAN 2.0). To use auto baudrate, send the CAN data to the ICF-1171I. The ICF-1171I will detect the baudrate and apply to itself.

CAN 2.0/CAN FD Arbitration Rate	Rotary Switch 1 Pin Position
Auto baudrate (only in CAN 2.0)	0 (Default)
1 Mbps	1
800 kbps	2
500 kbps	3
250 kbps	4
125 kbps	5
50* kbps	6
25* kbps	7
Reserved	8
Reserved	9

*Arbitration rates 25 kbps and 50 kbps are only used in CAN (CAN 2.0); An arbitration rate equal to or above 125 kbps is supported in CAN FD (ISO CAN FD). For CAN FD (ISO CAN FD), the suggested ratio of arbitration rate to data rate ranges from 1:1 to 1:8.

CAN FD Data Rate	Rotary Switch 2 Pin Position
5 Mbps	0
4 Mbps	1
3 Mbps	2
2 Mbps	3 (Default)
1 Mbps	4

800 kbps	5
500 kbps	6
250 kbps	7
Reserved	8
Reserved	9

LED Indicators

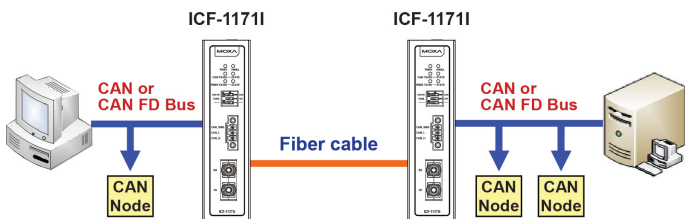
There are 6 LEDs on the front panel of the ICF-1171I.

LED	Color	Description
PWR1	Green	Steady ON: Power is being supplied to PWR1
	Off	Off: Power is NOT being supplied to PWR1, or another type of other power error
PWR2	Green	Steady ON: Power is being supplied to PWR2
	Off	Off: Power is NOT being supplied to PWR2, or another type of power error
CAN TX/RX	Green (Flashing)	CAN bus port is transmitting or receiving data
	Off	No communication on CAN bus
(CAN) STATE	Green	CAN is operating normally or the auto baudrate detection is successful (According to the CAN definition, it's called the Error active state; Transmit error counter or Receive error counter is below 127)
	Red (Flashing once per second)	<p>Communication errors have occurred (According to the CAN definition, it's called the Error passive state; Transmit error counter or receive error counter equals or exceeds 127). Error Passive becomes Error Active when communication (transmission and reception) returns to normal, in other words, when both the TEC and the REC decrease to less than or equal to 127.</p> <p>To eliminate this error, check the following:</p> <ol style="list-style-type: none"> 1. Check if the CAN cables are connected correctly (CAN high: CAN_H, CAN low: CAN_L) 2. Check the CAN bus termination 3. Check the status of the connected CAN devices 4. Check whether the baudrate settings of the CAN devices are in the supported range of the ICF-1171I's baudrate 5. Check for possible interferences in the environment <p>Resetting the ICF-1171I is not necessary in this case until it becomes Bus-Off.</p>

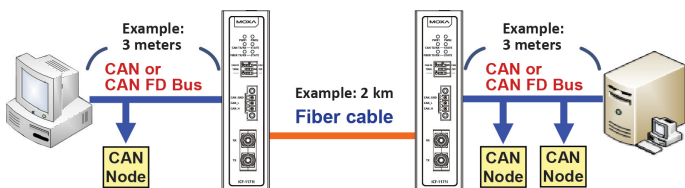
LED	Color	Description
	Red (Steady)	<p>The Bus-Off state, or the auto baudrate detection is unsuccessful</p> <p>(Bus-Off state: according to the CAN definition, when the transmit error count exceeds 255, a CAN node will enter the Bus-Off state.)</p> <p>When the LED is steady red, the reception/transmission of CAN messages is not possible.</p> <p>As there are two possible reasons for this condition, check the following to recover:</p> <ol style="list-style-type: none"> 1. Send CAN data/messages from the connected CAN node to the ICF-1171I, so the baudrate can be detected by ICF-1171I. 2. Reset the ICF-1171I by reconnecting the power input. <p>If this situation continues to happen, still check the following:</p> <ol style="list-style-type: none"> 1. Check if the CAN cables are connected correctly (CAN high: CAN_H, CAN low: CAN_L) 2. Check the CAN bus termination 3. Check the status of the connected CAN devices 4. Check the baudrate settings of the CAN devices are in the supported range of ICF-1171I's baudrate 5. Check possible interference in the environment
FIBER TX/RX	Green (Flashing)	The fiber port is transmitting or receiving CAN data
	Off	No communication on fiber
(Fiber) STATE	Green	The fiber signal is detected, and the link is on
	Red	The fiber signal is not detected, or the link is off

Typical Scenarios Using the ICF-1171I

Connecting two CAN or two CAN FD networks



Extending Transmission Distances



Typically, the total transmission distance of a CAN (CAN 2.0) or CAN FD (ISO CAN FD) system can be extended by 2 km (multi-mode fiber) or by 40 km (single-mode fiber) using ICF-1171I converters. Note that the ICF-1171I can be connected to another ICF-1171I in a point-to-point connection.

NOTE The transmission distance of the CAN bus side (not including the fiber side) is limited by the "baudrate", as stated in the ISO 11898 standard. The faster the baudrate, the shorter the transmission distance.

Specifications

CAN Communication	
CAN Bus Interface	ISO 11898, Terminals (CAN_H, CAN_L, CAN_GND)
Protocols Supported	DIP switch selector for CAN (CAN 2.0) and CAN FD (ISO CAN FD) (ISO 11898)
CAN Connector	3-pin removable screw terminal
Termination Resistor	DIP switch selector for a 120-Ω terminal resistor
Baudrate	CAN (CAN 2.0): arbitration rate up to 1 Mbps (supports auto baudrate) CAN FD (ISO CAN FD): arbitration rate up to 1 Mbps, data rate up to 5 Mbps (does not support auto baudrate)
System Delay	18 μs* for a pair of ICF-1171Is
*18 μs is tested under CAN 1Mbps, using one CAN device and one ICF-1171I with a loopback fiber cable.	
Isolation Protection	2 KV
LED Indicators	PWR1, PWR2, CAN TX/RX, CAN STATE, FIBER TX/RX, FIBER STATE
Receive Buffer	8 data frames

Fiber Communication	
Connector Type	ST (single-mode and multi-mode), 100Base-FX
Cable Requirements	9/125 μm (single-mode) or 62.5/125 μm (multi-mode)
Wavelength	1310 nm (single-mode and multi-mode)
Tx Power	> -5 dBm (single-mode) or > -20 dBm (multi-mode)
Rx Range	-3 to -34 dBm (single-mode), -3 to -32 dBm (multi-mode)
Environmental Limits	
Operating Temperature	0 to 60°C (32 to 140°F) -40 to 75°C (-40 to 167°F) for -T model
Storage Temperature	-40 to 85°C (-40 to 185°F)
Ambient Relative Humidity	5 to 95% (non-condensing)
Power	
Input Power Voltage	12 to 48 VDC dual power input for redundancy
Relay Output	1 digital output relay to alarm (normal: closed) with current-carrying capacity of 1 A @ 30 VDC
Mechanical Specifications	
Dimensions	30.3 × 70 × 115 mm (1.19 × 2.76 × 4.53 in)
Material	Metal
Gross Weight	294 g (0.65 lb)

사용자안내문 (User Guide)

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

(This equipment has KC approval for use in industrial environments and could possibly interfere with household equipment.)

기 종별 Type of Equipment	사용자안내문 User Guide
A 급 기기 (업무용 방송 통신기 자재) Class A Equipment (Broadcasting and Communication Equipment for Industrial and Commercial Use)	이 기기는 업무용 (A 급) 전자파 적합 기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정 외의 지역에서 사용하는 것을 목적으로 합니다. This equipment is the EMC conformity equipment (Class A) for Industrial and Commercial Use. The seller or user should take note of this as this equipment can be used in places that exclude homes.