

User's Manual

QEC-M-070T

DMP Vortex86EX2

EtherCAT Master Controller

7" Open Frame Panel PC with 4-wire Resistive Touch Screen

(Revision 1.0B)

REVISION

DATE	VERSION	DESCRIPTION
2022/03/18	Version1.0A	New Release
2022/06/04	Version1.0B	Edit EMC Description

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- https://www.icop.com.tw/resource_entrance

For EtherCAT solution service, support or tutorials, 86Duino IDE introduction, functions, languages, libraries, etc. Please visit the QEC website:

- QEC: <https://www.qec.tw/>

This Manual is for the QEC series.

SAFETY INFORMATION

- Read these safety instructions carefully.
- Please carry the unit with both hands and handle it carefully.
- Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
- Do not expose your QEC device to rain or moisture to prevent shock and fire hazards.
- Power Input voltage +24VDC @ 220mA (Typ.)
- Operating temperature between -20~+70°C.
- Keep away from humidity.
- When external storage is the main operating system storage, please turn off the power before inserting or removing it. Do not open the cabinet to avoid electrical shock. Refer to your nearest dealer for qualified personnel servicing.
- Never touch un-insulated terminals or wire unless your power adaptor is disconnected.
- Locate your QEC device as close as possible to the socket outline for easy access and avoid force caused by the entangling of your arms with surrounding cables from the QEC device.
- If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.

WARNING!



DO NOT ATTEMPT TO OPEN OR TO DISASSEMBLE THE CHASSIS (ENCASING) OF THIS PRODUCT. PLEASE CONTACT YOUR DEALER FOR SERVICING FROM QUALIFIED TECHNICIAN.

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Ch. 1

General Information

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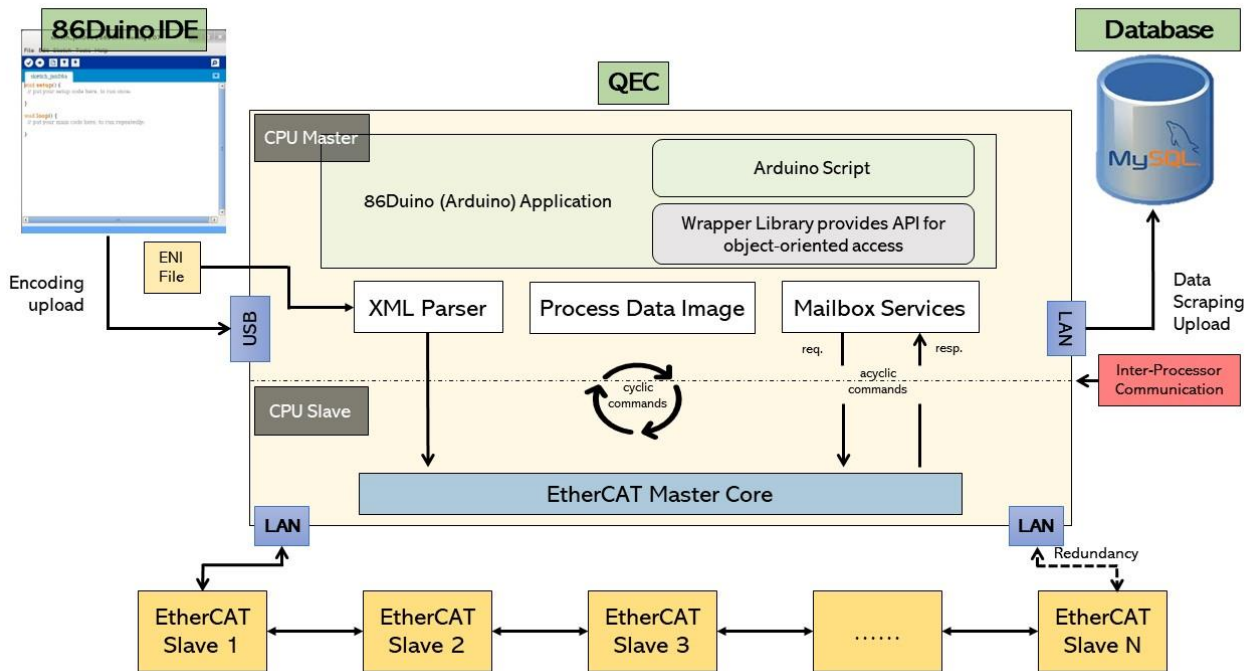
1.1 Introduction

QEC (Quick to EtherCAT) is an Arduino-based EtherCAT System solution, through the Vortex86EX2 processor developed by DMP Electronics, meets the requirements of hardware and software Real-time. Become an EtherCAT device whose hardware and software are user-friendly and satisfy all users who expect to use EtherCAT in the market.

The list below gives a short summary of the master features:

- Designed as a real-time Arduino Integrated development environment
- Distributed Clocks support
 - Configuration of the slave's DC parameters through the application interface.
 - Synchronization (offset and drift compensation) of the distributed slave clocks to the reference clock.
 - Optional synchronization of the reference clock to the master clock or the other way round.
- CANopen over EtherCAT (CoE)
 - SDO upload, download and information service.
 - Slave configuration via SDOs.
 - SDO access from userspace and from the application.
- File Access over EtherCAT (FoE)
 - Loading and storing files via the command-line tool.
 - Updating a slave's firmware can be done easily.
- Configuring EtherCAT cable redundancy
 - Two independent Ethernet interfaces can be used for EtherCAT cable redundancy.
 - Cable redundancy offers resilience for the cabling.
 - Interruptions of the EtherCAT communication due to broken wires or unplugged LAN cables are avoided.
- 86Duino IDE (Arduino based)
 - Simple-to-use API of Arduino with many examples
 - ArduBlock (Scratch tool)
 - HMI Editor (HMI design tool)
 - 86EVA (EtherCAT-based Virtual Arduino)

1.1.1 QEC-M Systems Diagram



1.1.2 Software Support

The 86Duino integrated development environment (IDE) software makes it easy to write code and upload it to QEC-M. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Arduino IDE, Processing, DJGPP, and other open-source software.



1.2 Specifications

CPU BOARD SPECIFICATIONS

CPU	DMP Vortex86EX2 Processor, Master:600MH/Slave 400MHZ
Memory	1GB DDRIII onboard
Storage	32MB SPI Flash / MicroSD / eMMC onboard (Option)
LCD Display	7-inch TFT 800x480 Resolution LCD with resistive touch screen
LAN	1Gbps Ethernet RJ45 x1 10/100Mbps Ethernet RJ45 x2 for EtherCAT
Expansion	Mini PCIe x1 with Micro SIM Card Holder
I/O Connector	2.54mm 2-pin header for Power Connector 1.25mm 4-pin header for EXT I2C TFT Driver 1.25mm 4-pin header for Touch Screen 1.25mm 4-pin wafer for Line-Out Power DC Input/Output Connector x1 Micro SIM Card Holder x1 Micro USB (Type-B) x1 LCD Connector x1 VGA Connectorx1 Mini PCIe slot x1 USB Host x3 Speaker x1
Arduino Compatible Connector	2.54mm 10-pin female header for I2C0, MCM, GPIO 2.54mm 8-pin female header for MCM, GPIO, COM1(TTL) 2.54mm 8-pin female header for Power source 2.54mm 6-pin female header for ADC/GPIO 2.54mm 6-pin female header for GPIO, VCC and GND 2.54mm 6-pin female header for CAN0 and CAN1 bus 2.54mm 10-pin header for SPI0 bus, RESET-, GPIO and I2C1 2.54mm 10-pin header for SPI1 bus, RESET-, GPIO and RS485 function (COM4)
Protocol	EtherCAT
Control Cycle Time	125 μ s (min.)
Software Support	86Duino IDE <small>(The environment is written in Java and based on Arduino IDE, Processing, DJGPP, and other open-source software)</small>

MECHANICAL & ENVIRONMENT

Power Connector	6-pin Power Input /Output
Power Requirement	+24VDC @ 220mA (Typ.)
Power Consumption	7Watt (Typical)
Operating Temperature	-20°C ~ +70°C
Storage Temperature	-30 ~ +85°C
Operating Humidity	0% ~ 90% Relative Humidity, Non-Condensing
Dimensions	186 x 121.05 x 31.05 mm (7.32"x4.76"x1.2")
Weight	485g

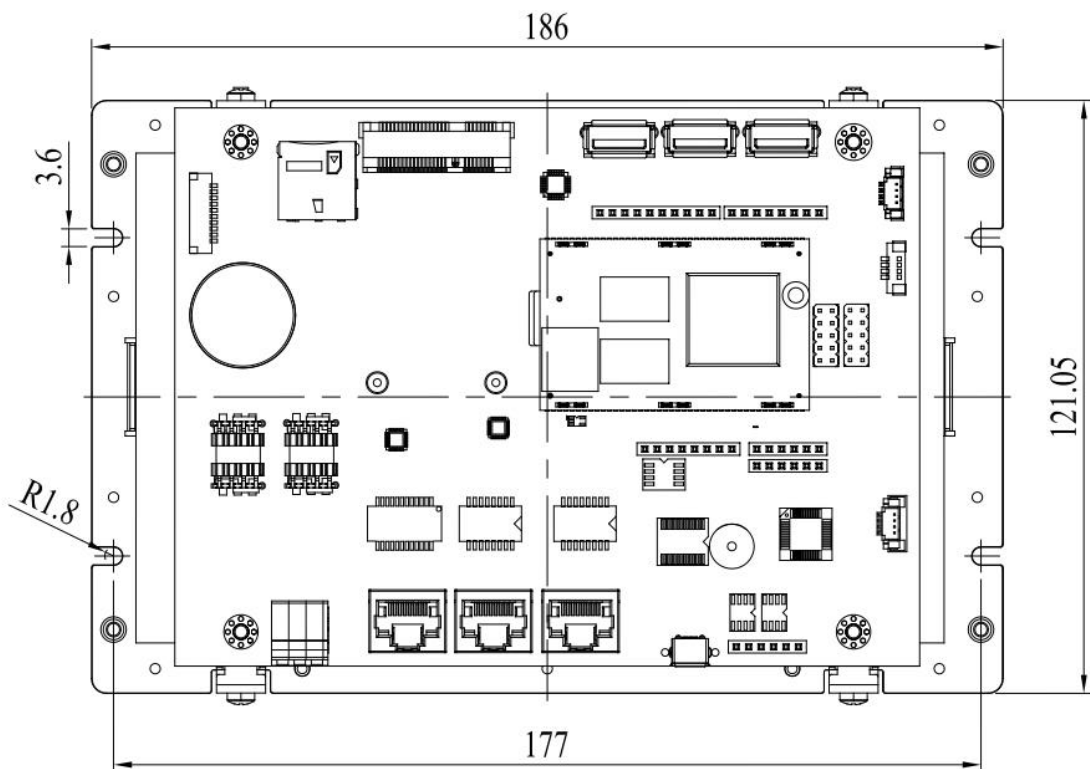
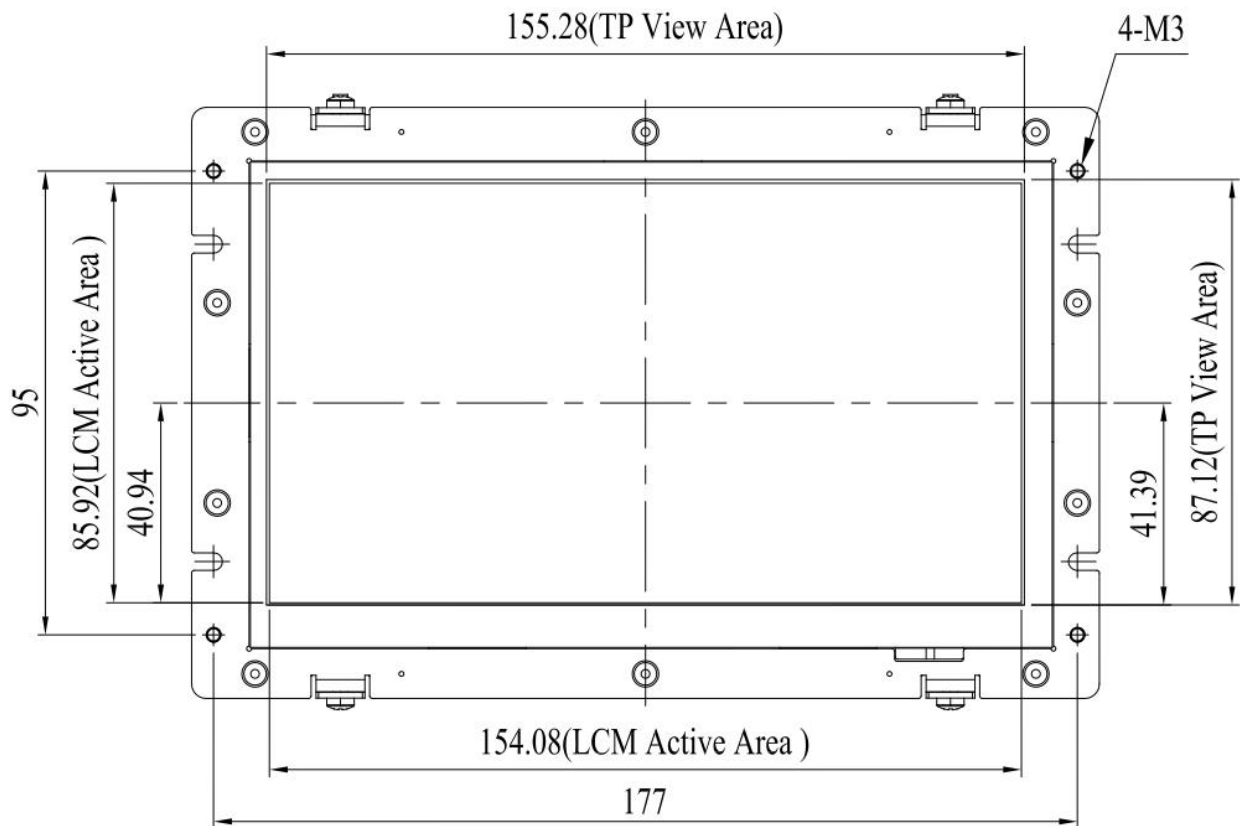
LCD SPECIFICATIONS

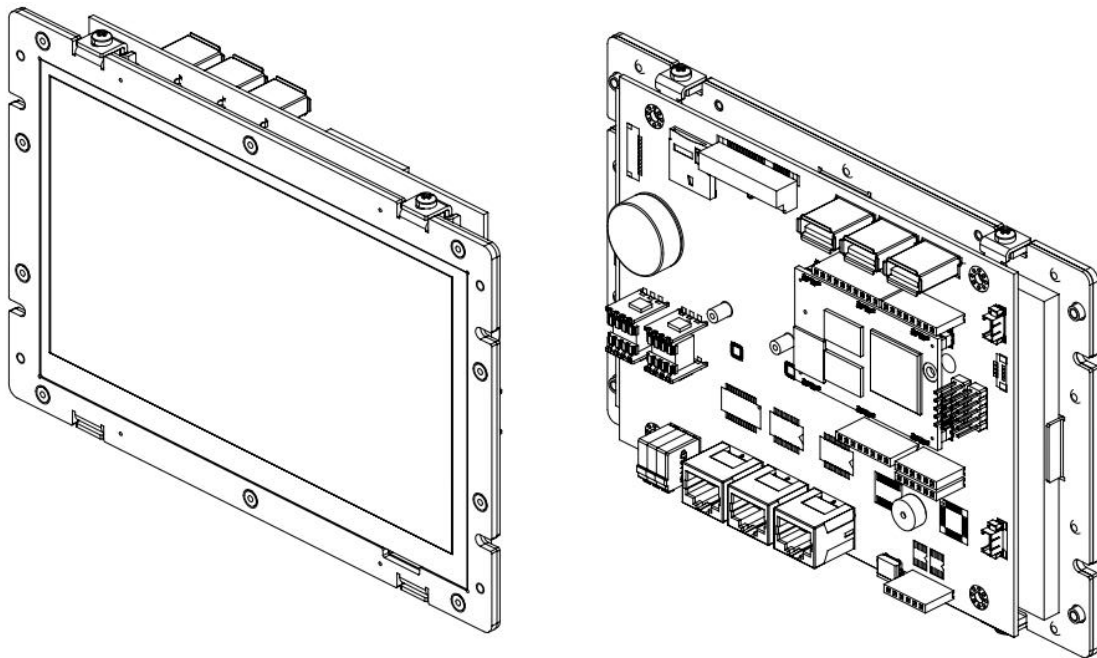
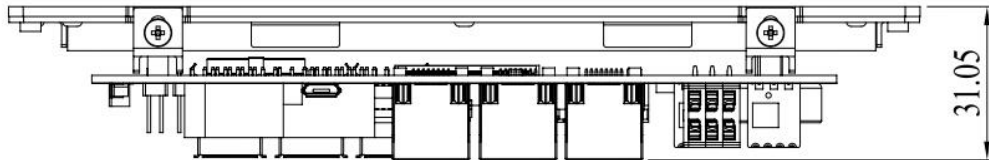
Display Type	7" WVGA TFT LCD
Backlight Unit	LED
Display Resolution	800(W) x 480(H)
Brightness (cd/m ²)	400 nits
Contrast Ratio	800: 1
Display Color	16.7M
Pixel Pitch (mm)	0.1926 (H) x 0.179 (V)
Viewing Angle	Vertical 130°, Horizontal 160°
Backlight Lifetime	20,000 hrs

TOUCHSCREEN

Type	Analog Resistive
Resolution	Continuous
Transmittance	80%
Controller	PS/2 interface
Durability	1 million

1.3 Dimensions





1.4 Inspection standard for TFT-LCD Panel

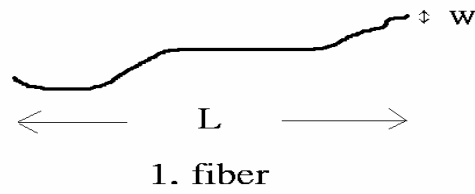
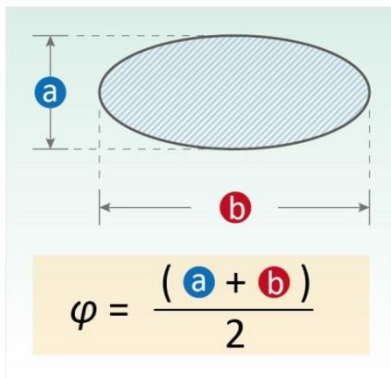
DEFECT TYPE			LIMIT				Note	
VISUAL DEFECT	INTERNAL	SPOT	$\varphi < 0.15\text{mm}$		Ignore		Note1	
			$0.15\text{mm} \leq \varphi \leq 0.5\text{mm}$		$N \leq 4$			
			$0.5\text{mm} < \varphi$		$N=0$			
		FIBER	$0.03\text{mm} < W \leq 0.1\text{mm}, L \leq 5\text{mm}$		$N \leq 3$		Note1	
			$1.0\text{mm} < W, 1.5\text{mm} < L$		$N=0$			
		POLARIZER BUBBLE	$\varphi < 0.15\text{mm}$		Ignore		Note1	
			$0.15\text{mm} \leq \varphi \leq 0.5\text{mm}$		$N \leq 2$			
			$0.5\text{mm} < \varphi$		$N=0$			
		Mura	It' OK if mura is slight visible through 6%ND filter					
ELECTRICAL DEFECT	BRIGHT DOT	A Grade			B Grade			
		C Area	O Area	Total	C Area	O Area	Total	Note3
		$N \leq 0$	$N \leq 2$	$N \leq 2$	$N \leq 2$	$N \leq 3$	$N \leq 5$	Note2
	DARK DOT	$N \leq 2$	$N \leq 3$	$N \leq 3$	$N \leq 3$	$N \leq 5$	$N \leq 8$	
	TOTAL DOT	$N \leq 4$			$N \leq 5$	$N \leq 6$	$N \leq 8$	Note2
	TWO ADJACENT DOT	$N \leq 0$	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	Note4
	THREE OR MORE ADJACENT DOT	NOT ALLOWED						
	LINE DEFECT	NOT ALLOWED						

(1) One pixel consists of 3 sub-pixels, including R, G, and B dot. (Sub-pixel = Dot)

(2) Little bright Dot acceptable under 6% ND-Filter.

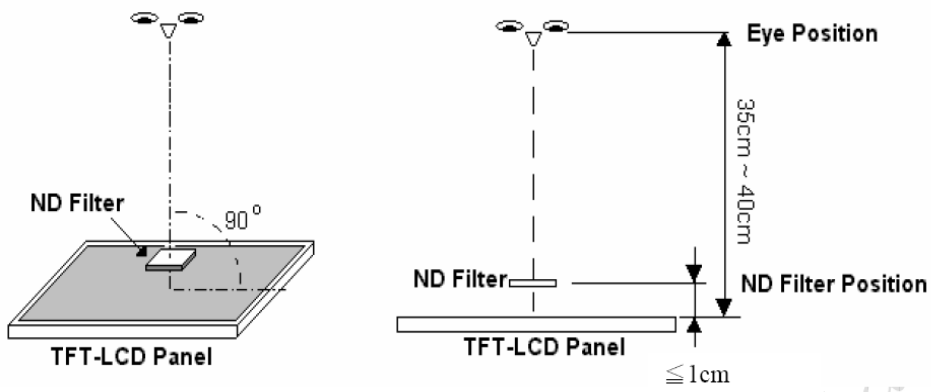
(3) If require G0 grand (Total dot $N \leq 0$), please contact region sales.

[Note 1] W: Width[mm]; L: Length[mm]; N: Number; φ : Average Diameter.

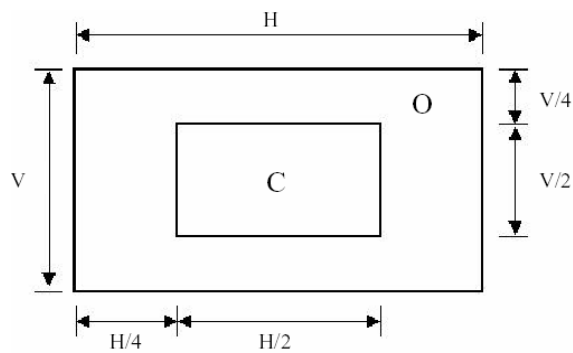


(a) White / Black Spot (b) Polarizer Bubble

[Note 2] Bright dot is defined through 6% transmission ND Filter as following.

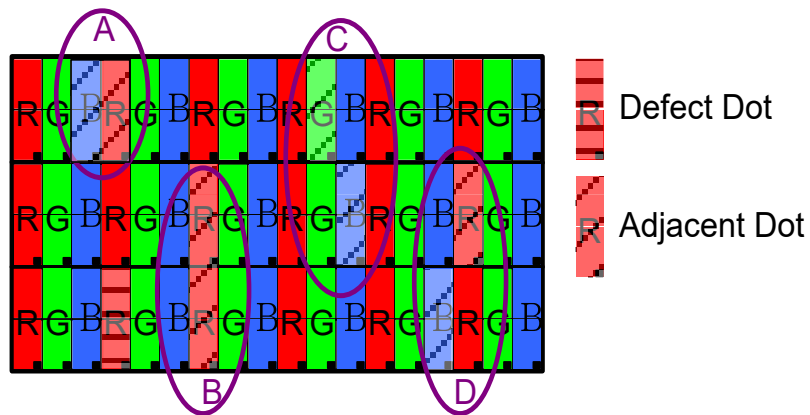


[Note 3] Display area



C Area: Center of display area **O Area:** Outer of display area

[Note 4] Judge the defect dot and the adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dark adjacent dot. And they will be counted 2 defect dots in total quantity.



The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

1.5 Ordering Information

PART NUMBER	DESCRIPTION
QEC-M-070T	Vortex86EX2 Processor 600MHz-based EtherCAT Master Controller, support Arduino

Ch. 2

Hardware Installation

[2.1 CPU Board Outline](#)

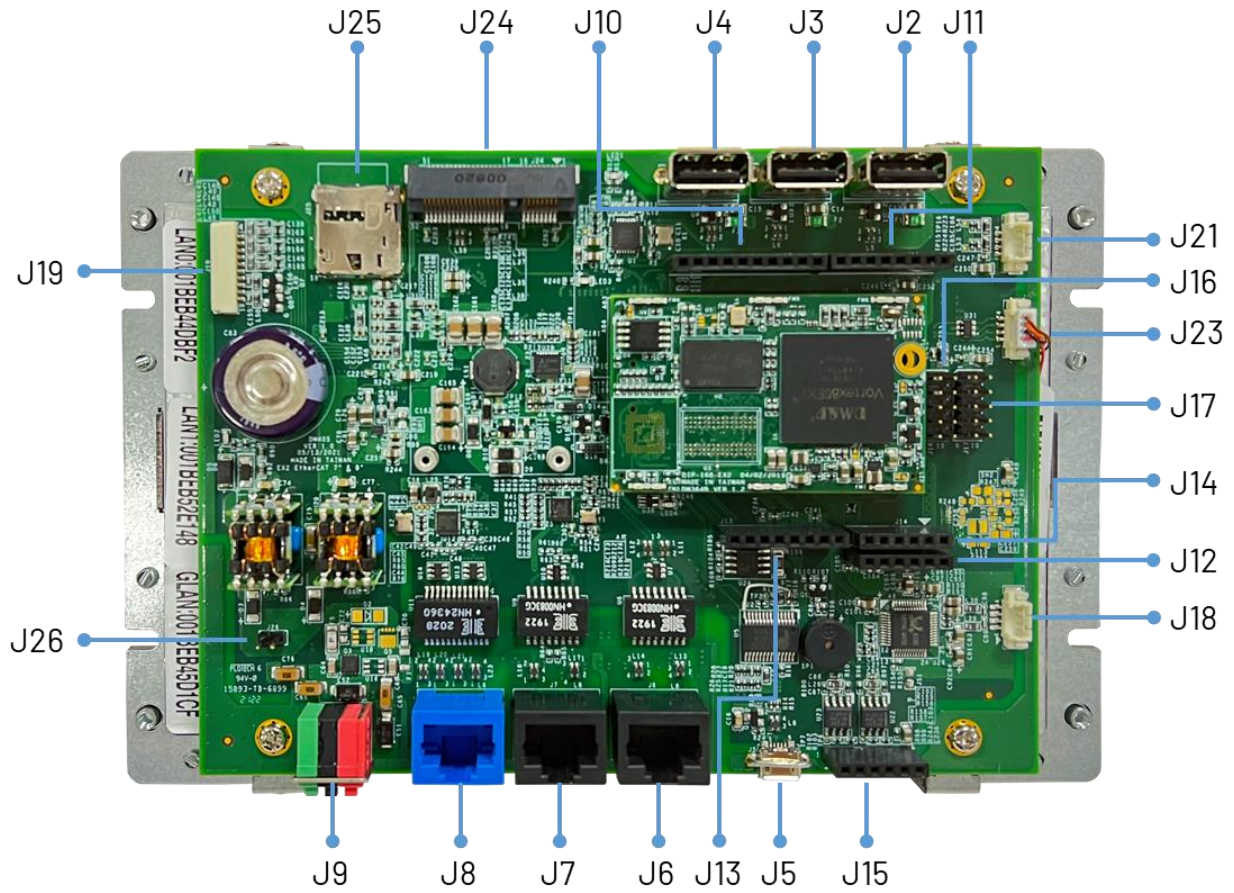
[2.2 Connector Summary](#)

[2.3 Connector Pin Assignments](#)

[2.4 External I/O Overview](#)

[2.5 Watchdog Timer](#)

2.1 CPU Board Outline



2.2 Connector Summary

No.	Description	Type of Connections	Pin #
J2/J3/J4	USB Host	1.25mm 5-pin wafer	6-pin
J5	Micro USB	Micro USB Type-B	11-pin
J6	R6040-LAN1	1.25mm 8-pin wafer	8-pin
J7	R6040-LAN2	1.25mm 8-pin wafer	8-pin
J8	Giga LAN	1.25mm 8-pin wafer	8-pin
J9	Power Input Connector	2.00mm 6-pin wafer	6-pin
J10	I2C0, MCM, GPIO	2.54mm female header	10-pin
J11	MCM, GPIO, COM1(TTL)	2.54mm female header	8-pin
J12	GPIO, VCC, GND	2.54mm female header	6-pin
J13	Power source, RESET-	2.54mm female header	8-pin
J14	ADC/GPIO	2.54mm female header	6-pin
J15	CAN0 and CAN1 bus	2.54mm female header	6-pin
J16	SPI0 bus, RESET-, GPIO, I2C1	2.54mm header	10-pin
J17	SPI1 bus, RESET-, GPIO, RS485 (COM4)	2.54mm header	10-pin
J18	Line-out	1.25mm 4-pin wafer	4-pin
J19	VGA	1.25mm 10-pin VGA	10-pin
J20	TFT LCD	2.0mm 50-pin LCD Connector	50-pin
J21	EXT I2C TFT Driver	1.25mm 4-pin header	4-pin
J22/J23	Touch Screen	1.25mm 4-pin header	4-pin
J24	MINI PCIe	Mini PCIe Slot	52-pin
J25	SIM Card Holder	Micro SIM Socket	10-pin
J26	POWER CONNECTOR	2.54mm header	2-pin

2.3 I/O Connectors

For the external I/O details, visit [Ch2.4](#).

J2/J3/J4: USB Host

Pin#	Signal Name
1	VCC_LCD
2	MUSBD-
3	MUSBD+
4	GND
5	FGND1
6	FGND1

J5: Micro USB Type-B

Pin#	Signal Name
1	VCC
2	D-
3	D+
4	ID
5	GND
6	PAD1
7	PAD2
8	-
9	-
H1	FGND1
H2	FGND1

J6: R6040-LAN1 (Primary EtherCAT)

Pin#	Signal Name
L1	TD+
L2	TD-
L3	RO+
L4	NC
L5	NC
L6	RO-
L7	NC
L8	NC

J7: R6040-LAN2 (Secondary EtherCAT)

Pin#	Signal Name
L1	TD+
L2	TD-
L3	RO+
L4	NC
L5	NC
L6	RO-
L7	NC
L8	NC

J8: Giga LAN

Pin#	Signal Name
L1	GTX+
L2	GTX-
L3	GRX+
L4	GTXC+
L5	GTXC-
L6	GRX-
L7	GRXD+
L8	GRXD-

J9: Power Input Connector

Pin#	Signal Name
1	FGND
2	FGND
3	VpGND
4	VsGND
5	Vp
6	Vs

J12: GPIO, VCC, GND

Pin#	Signal Name
1	GP94
2	GP95
3	GP96
4	GP97
5	GND
6	VCC

J10: I2C0, MCM, GPIO

Pin#	Signal Name
1	GP90
2	MCM-9
3	MCM-10
4	MCM-11
5	GP91
6	MCM-13
7	GND
8	-
9	I2C0_SDA
10	I2C0_SCL

J13: Power source, RESET-

Pin#	Signal Name
1	VCC
2	GND
3	GND
4	VCC
5	VCC3
6	RESET-
7	VCC3
8	-

J11: MCM, GPIO, COM1(TTL)

Pin#	Signal Name
1	RXD1#
2	TXD1#
3	GP00
4	MCM-3
5	GP02
6	MCM-5
7	MCM-6
8	GP05

J14: ADC/GPIO

Pin#	Signal Name
1	GP57ADC
2	GP56ADC
3	GP43ADC
4	GP42ADC
5	GP41ADC
6	GP40ADC

J15: CAN0 and CAN1 bus

Pin#	Signal Name
1	CAN1_L
2	CAN1_H
3	GND
4	CAN0_L
5	CAN0_H
6	VCC3

J18: Line-out

Pin#	Signal Name
1	LOUT_R1
2	GND_AUD
3	GND_AUD
4	LOUT_L1

J16: SPI0 bus, RESET-, GPIO,**I2C1**

Pin#	Signal Name	Pin#	Signal Name
1	SPI0_DI	2	VCC
3	SPI0_CLK	4	SPI0_D0
5	RESET-	6	GND
7	SPI0_CS	8	GP92
9	I2C1_SCL	10	I2C1_SDA

J19: VGA

Pin#	Signal Name
1	ROUT
2	GND
3	GOUT
4	GND
5	BOUT
6	GND
7	HSYNC_A
8	GND
9	VSYNC_A
10	GND

J17: SPI1 bus, RESET-, GPIO,**RS485 (COM4)**

Pin#	Signal Name	Pin#	Signal Name
1	SPI1_DI	2	VCC
3	SPI1_CLK	4	SPI1_D0
5	RESET-	6	GND
7	SPI1_CS	8	GP93
9	RS485+	10	RS485-

J21: EXT I2C TFT DRIVER

Pin#	Signal Name
1	VCC
2	GND
3	I2C_SCL_TFT
4	I2C_SDA_TFT

J20: LCD

Pin#	Signal Name	Pin#	Signal Name
1	VLED+	2	VLED+
3	VLED-	4	VLED-
5	GND	6	VCOM3V35
7	VCC3	8	VCC3
9	FFP1DE	10	FFP1VS
11	FFP1HS	12	FFPD7
13	FFPD6	14	FFPD5
15	FFPD4	16	FFPD3
17	FFPD2	18	FFPD1
19	FFPD0	20	FFPD15
21	FFPD14	22	FFPD13
23	FFPD12	24	FFPD11
25	FFPD10	26	FFPD9
27	FFPD8	28	FFPD23
29	FFPD22	30	FFPD21
31	FFPD20	32	FFPD19
33	FFPD18	34	FFPD17
35	FFPD16	36	GND
37	FFP1CLK	38	GND
39	SHLR	40	UPDN
41	VGH18V	42	VGL-6V
43	AVDD9V6	44	GRB_RST
45	-	46	VCOM3V35
47	DITH	48	GND
49	GND	50	GND

J23: Touch Screen

Pin#	Signal Name
1	X-
2	Y-
3	X+
4	Y+

J24: MINI PCIe

Pin#	Signal Name	Pin#	Signal Name
1	WAKE#	2	+3.3V
3	Reserved / +5V Power-out	4	GND
5	Reserved / +5V Power-out	6	NC
7	N/C	8	SIM-VCC
9	GND	10	SIM-IO
11	REFCLK-	12	SIM-CLK
13	REFCLK+	14	SIM-RST
15	GND	16	SIM-VPP
Mechanical Key			
17	Reserved / RI	18	GND
19	Reserved / DTR	20	NC
21	GND	22	PERST#
23	PERn0	24	+3.3V
25	PERp0	26	GND
27	GND	28	NC
29	GND	30	NC
31	PETn0	32	NC
33	PETp0	34	GND
35	GND	36	USB_D-
37	GND	38	USB_D+
39	+3.3V	40	GND
41	+3.3V	42	LED_WWAN#
43	GND	44	Reserved / DCD
45	Reserved / CTS	46	Reserved / DSR
47	Reserved / RTS	48	NC
49	Reserved / RXD	50	GND
51	Reserved / TXD	52	+3.3V

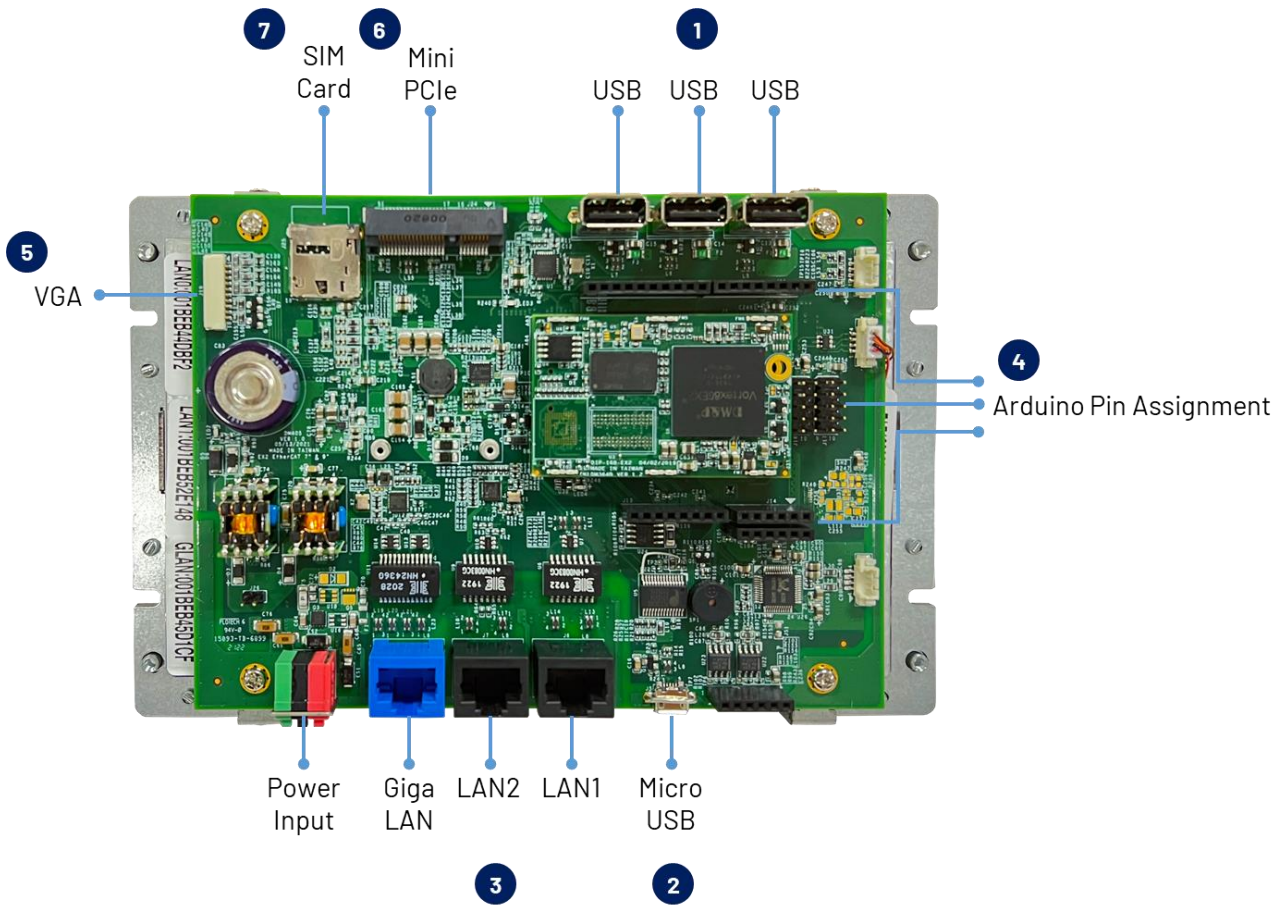
J25: SIM Card Holder

Pin#	Signal Name	Pin#	Signal Name
1	VCC	2	RST
3	CLK	4	GND
5	VPP	6	IO
7	-	8	-

J26: POWER CONNECTOR

Pin#	Signal Name
1	Us
2	VsGND

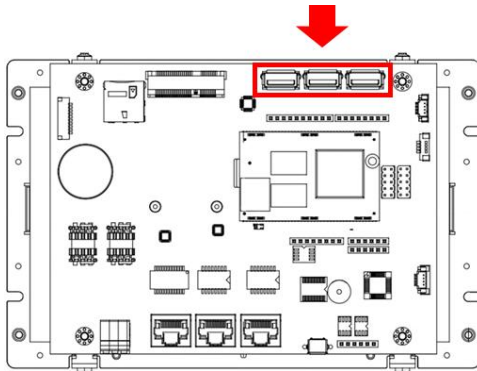
2.4 External I/O Overview



NOTE

1. Standard USB.
2. Micro USB is mainly for the programming upload.
3. LAN1, LAN2, and Giga LAN are for the EtherCAT communication.
4. Arduino Standard Pin and QEC additional Arduino Pin.
5. 10 Pin Flat Ribbon VGA.
6. Mini PCIe.
7. SIM Card.

2.4.1 USB

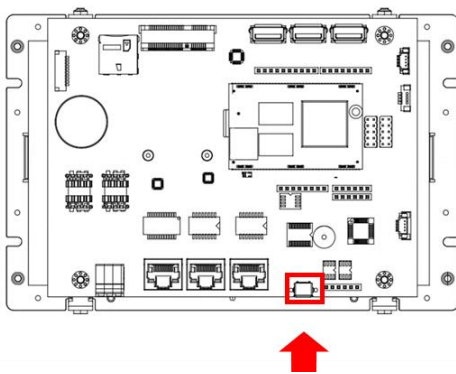


Standard USB with Hot-plug.

You can plug in the Keyboard, Mouse, or USB stick to control the QEC-M-070T.

2.4.2 Micro USB

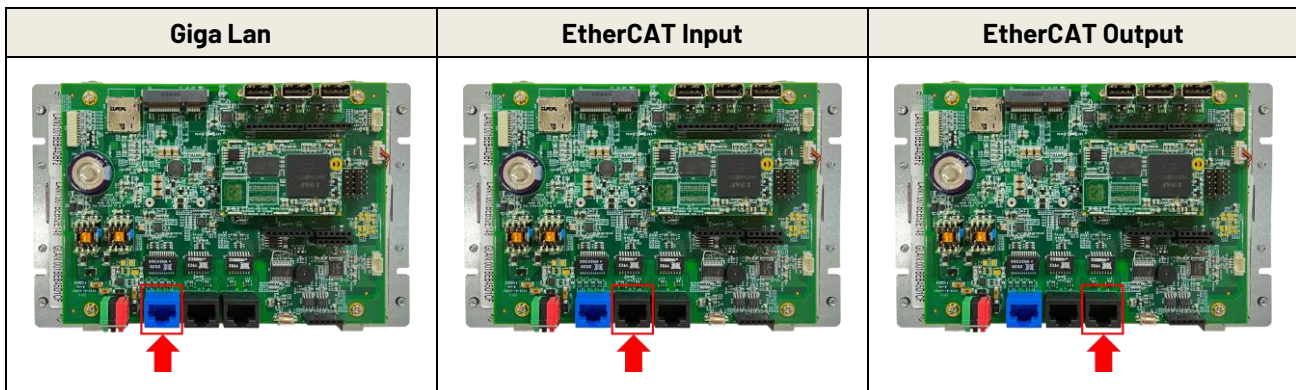
The Micro USB is mainly for programming upload.



For quick start guide, please see [Ch. 3](#).

2.4.3 LAN1/LAN2/Giga LAN

There are three LAN ports in QEC-M-070T, two for EtherCAT communication and one for external Ethernet work. The EtherCAT Lan on the QEC-M divides into Input and Output for cable redundancy.



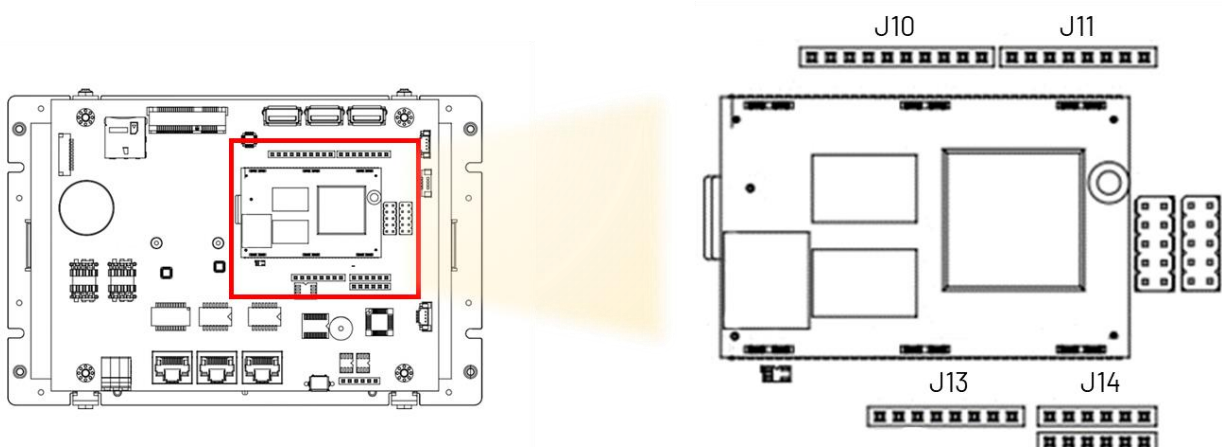
* Giga Lan with the Blue shell.

2.4.4 Arduino pin Assignment

We have kept the Arduino pin on the QEC-M-070T. Users can easily control these pins via software (86Duino IDE).

Arduino standard pins:

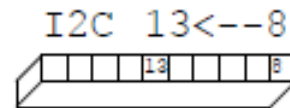
You can use the following pins like 86Duino One board.



J10: I2C0, MCM, GPIO

Pin#	Signal Name
1	GP90
2	MCM-9
3	MCM-10
4	MCM-11
5	GP91
6	MCM-13
7	GND
8	-
9	I2C0_SDA
10	I2C0_SCL

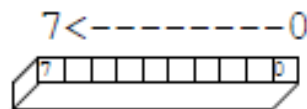
Female 2.54 Function Conn.



J11: MCM, GPIO, COM1(TTL)

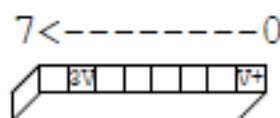
Pin#	Signal Name
1	RXD1#
2	TXD1#
3	GP00
4	MCM-3
5	GP02
6	MCM-5
7	MCM-6
8	GP05

Female 2.54 Function Conn.



J13: Power source, RESET-

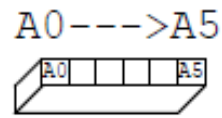
Pin#	Signal Name
1	VCC
2	GND
3	GND
4	VCC
5	VCC3
6	RESET-
7	VCC3
8	-



Female 2.54 Function Conn.

J14: ADC/GPIO

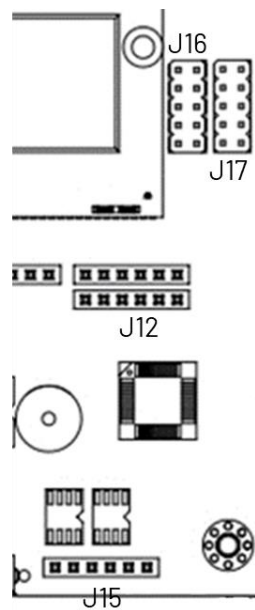
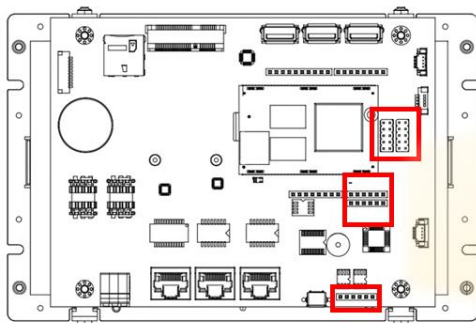
Pin#	Signal Name
1	GP57ADC
2	GP56ADC
3	GP43ADC
4	GP42ADC
5	GP41ADC
6	GP40ADC



Female 2.54 Function Conn.

QEC Arduino pins:

There are other pins on the QEC-M-070T.
Please contact ICOP for the details.



J12: GPIO, VCC, GND

Pin#	Signal Name
1	GP94
2	GP95
3	GP96
4	GP97
5	GND
6	VCC



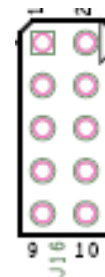
J15: CAN0 and CAN1 bus

Pin#	Signal Name
1	CAN1_LL
2	CAN1_HH
3	GND
4	CAN0_LL
5	CAN0_HH
6	VCC3



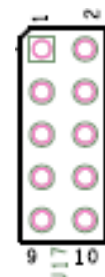
J16: SPI0 bus, RESET-, GPIO, I2C1

Pin#	Signal Name	Pin#	Signal Name
1	SPI0_DI	2	VCC
3	SPI0_CLK	4	SPI0_D0
5	RESET-	6	GND
7	SPI0_CS	8	GP92
9	I2C1_SCL	10	I2C1_SDA



J17: SPI1 bus, RESET-, GPIO, RS485 (COM4)

Pin#	Signal Name	Pin#	Signal Name
1	SPI1_DI	2	VCC
3	SPI1_CLK	4	SPI1_D0
5	RESET-	6	GND
7	SPI1_CS	8	GP93
9	RS485+	10	RS485-



2.5 Watchdog Timer

There are two watchdog timers in Vortex86EX2 processor, we also provide DOS, Linux and WinCE example for your reference. Please contact ICOP for more detail information.

Ch. 3

Quick Start guide

[3.1 Package Contents](#)

[3.2 Hardware Configuration](#)

[3.3 Software Driver Installation](#)

[3.4 Set up the QEC-M for 86Duino](#)

3.1 Package Contents

The package includes the following items:

- QEC-M-070T
- Cable-set
- Product warranty card

If any of these items are missing or damaged, contact the dealer.

Save the shipping materials and carton to ship or store the product in the future.

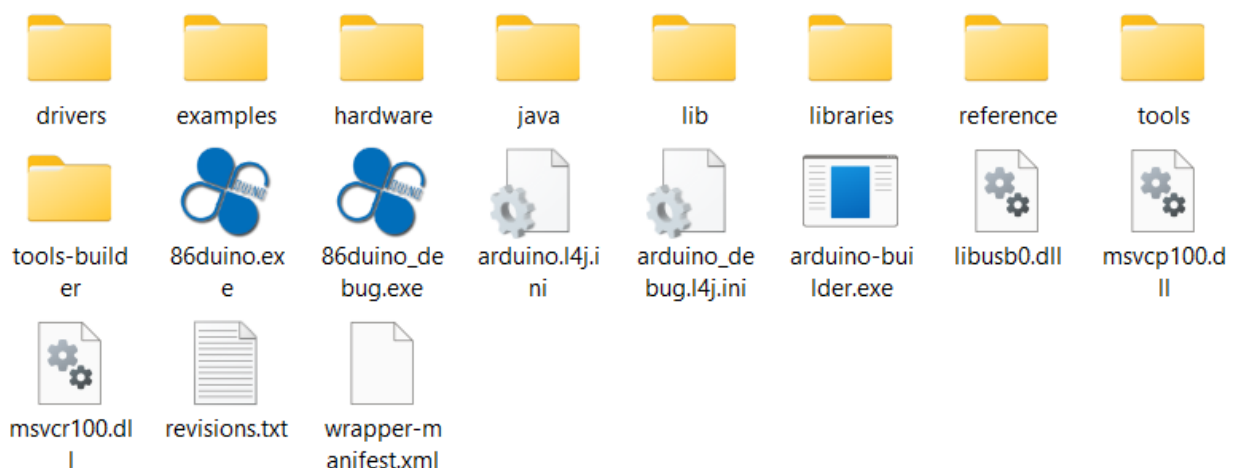
3.2 Hardware Configuration

The QEC-M Series will preinstall the development environment before shipping. User just needs to download the software and follow this user manual to set up the system configuration.

3.3 Software Driver Installation

You would download the software for QEC-M Series in the following steps:

1. Go to QEC website > Software and scroll down to find the "Download." Choose the corresponding 86Duino IDE version and download.
2. You will get a zip file, and please extract it.
3. After the above steps, you can see 86duino.exe.

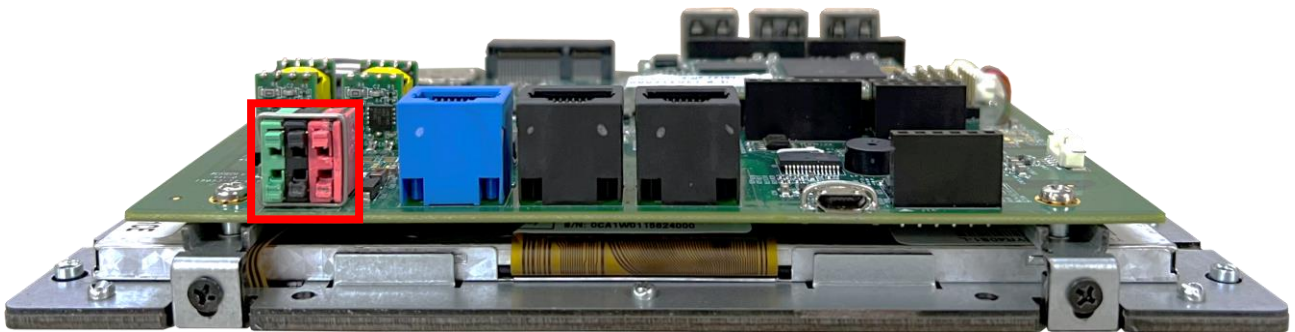


3.4 Set up the QEC-M for 86Duino

This section works with the QEC-M products series and is based on Windows OS.

Plugin the power supply

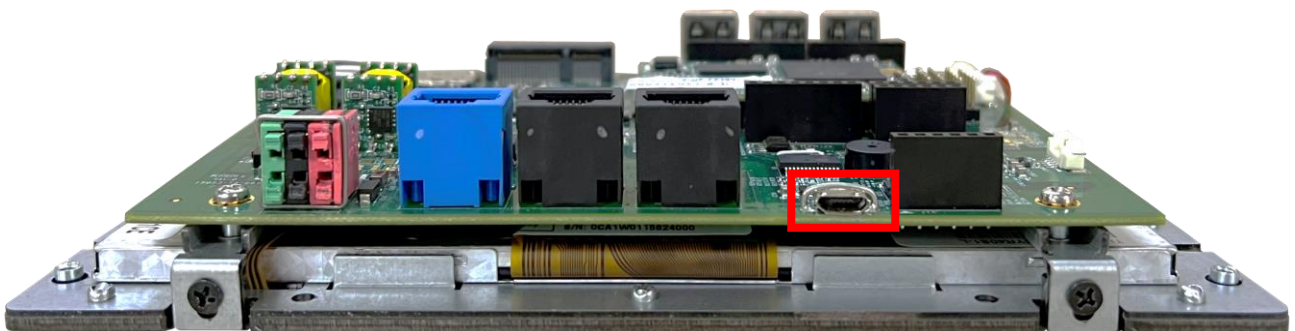
There are two groups for the Power Supply in QEC-M-070T, Vs and Vp; Both power requirements can be range in 5V to 56V wide Voltages. After powering on, you'll see the power LED light up.



Note: Vs for the system power; Vp for the peripheral power.

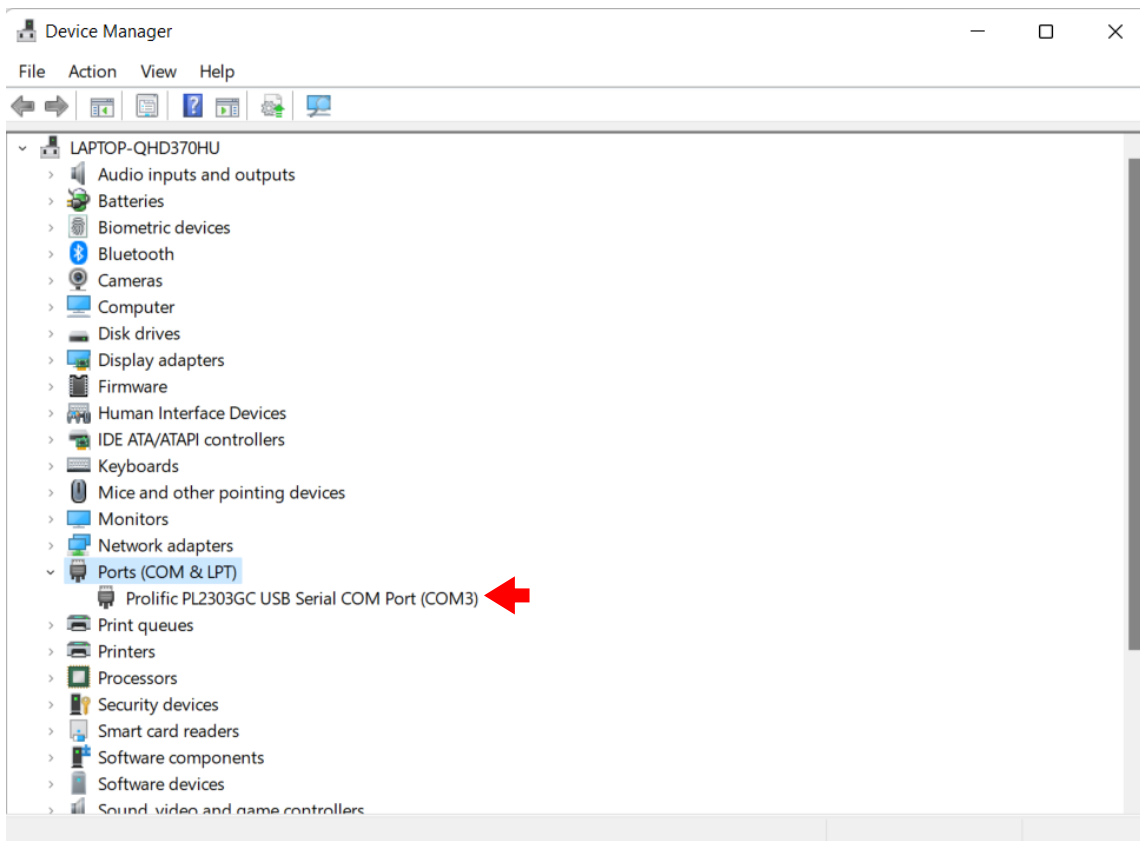
Connect the USB cable with PC

Please use the Micro USB to USB from QEC-M-070T to your PC which install the 86Duino IDE.



Verify if the device is detected or not

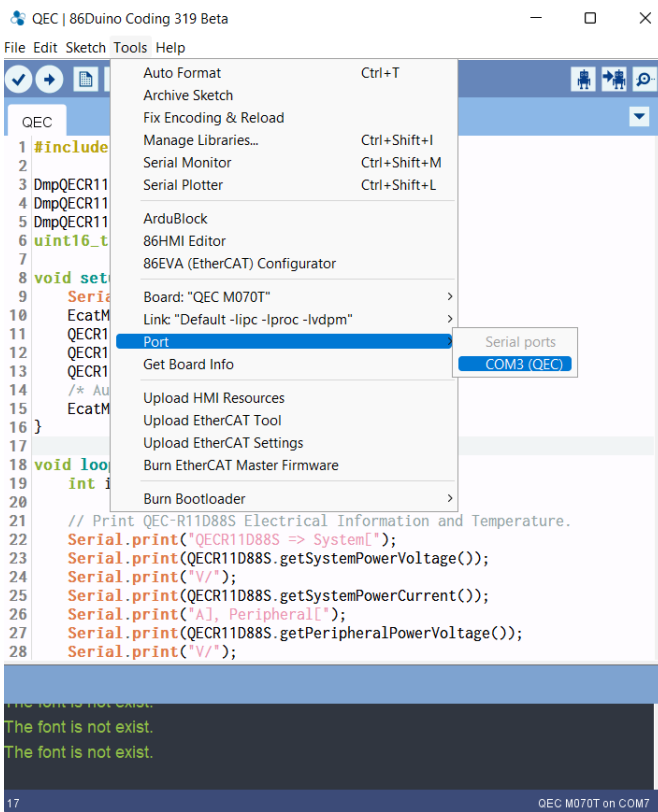
Open Device Manager -> Ports (COM & LPT) in your PC and expand the ports, you should see that the "Prolific PL2303GC USB Serial COM Port (COMx)" is detected, if not you need to install the required drivers.



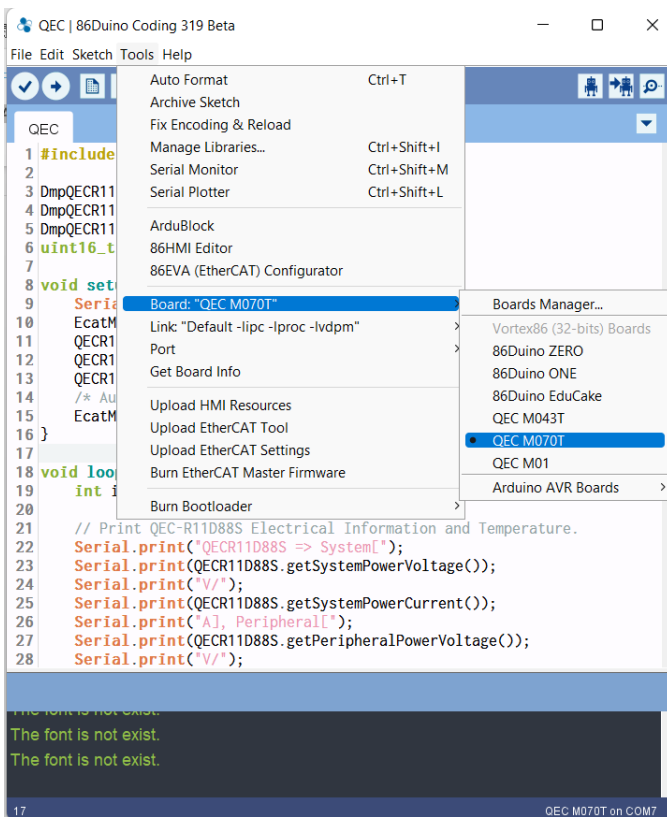
Write your first sketch

- Open the 86Duino IDE
- Open the Tools menu from Menu bar

- Select the assigned COM port for QEC-M-070T. (Here is COM3)



- Select "86Duino QEC" for the board.



- Put your code into the editor.

Upload your first sketch!

Hit the right arrow button (upload) next to the upload button. Now while the code uploads, you should see the LEDs next to Tx and Rx blinking indicating data transfer between the board and the computer.

If this is your first time running 86Duino sketch files, we suggest you check out [how to set up the QEC-M-043T for 86Duino](#) before proceeding.

Video: <https://youtu.be/ZMNMtvRCLbs>

Ch. 4

Software Function

[4.1 Software Description](#)

[4.2 Function List](#)

[4.3 Function Description](#)

4.1 Software Description

The 86Duino IDE developed by the QEC team is specially designed for industrial field control systems, bringing simple and powerful functions into the industrial field through the open-source Arduino.

Please visit qec.tw for 86Duino IDE details.

4.2 Function List

Used in QEC series products.

EthercatMaster Class Functions

Initialization Functions:

- begin()
- end()
- isRedundancy()
- libraryVersion()
- firmwareVersion()

Access to slave information Functions:

- getSlaveCount()
- getVendorID()
- getProductCode()
- getRevisionNumber()
- getSerialNumber()
- getAliasAddress()
- getSlaveNo()

Control Functions:

- start()
- stop()
- getSystemTime()
- getWorkingCounter()

- getExpectedWorkingCounter()

EthercatDevice_XXX Class General Functions

Access to slave information Functions:

- getVendorID()
- getProductCode()
- getRevisionNumber()
- getSerialNumber()
- getAliasAddress()
- getSlaveNo()
- readSII()
- readSII8()
- readSII16()
- readSII32()
- writeSII()
- writeSII8()
- writeSII16()
- writeSII32()

Process Data Objects (PDO) Functions:

- pdoBitWrite()
- pdoBitRead()
- pdoGetOutputBuffer()
- pdoGetInputBuffer()
- pdoWrite()
- pdoWrite8()
- pdoWrite16()
- pdoWrite32()
- pdoRead()
- pdoRead8()
- pdoRead16()
- pdoRead32()

CANopen over EtherCAT (CoE) Functions:

- sdoDownload()
- sdoDownload8()

- sdoDownload16()
- sdoDownload32()
- sdoUpload()
- sdoUpload8()
- sdoUpload16()
- sdoUpload32()
- getODlist()
- getObjectDescription()
- getEntryDescription()

File over EtherCAT (FoE) Functions:

- readFoE()
- writeFoE()

EthercatDevice_Generic Class Functions

Universal objects for various brands of EtherCAT devices.

Initialization Functions:

- attach()
- detach()

4.3 Function Description

Usage restrictions:

- Zone1 => Before master.begin()
- Zone2 => After master.begin()[Before master.start()]
- Zone3 => After master.start()

API	Functions Description	Limitation			Cyclic Callback Suitability
		Zone1	Zone2	Zone3	
EthercatMaster Function					
Initialize Functions					
begin	EtherCAT Master Initialize. All slaves will enter PRE-OP state if success.	-	-	-	
end	EtherCAT Master shutdown.		V		
isRedundancy	Check EtherCAT uses redundancy or not.		V	V	V
libraryVersion	The version of EtherCAT Master library.	V	V	V	V
firmwareVersion	The version of EtherCAT firmware. Call this after begin().		V	V	V
Get Slave Information Functions					
getSlaveCount	Get the Count of the EtherCAT Slave on the EtherCAT bus.		V	V	V
getVendorID	Get the Vendor ID of the EtherCAT Slave on the EtherCAT bus.		V	V	V
getProductCode	Get the Product Code of the EtherCAT Slave on the EtherCAT bus.		V	V	V
getRevisionNumber	Get the Revision Number of the EtherCAT Slave on the EtherCAT bus.		V	V	V
getSerialNumber	Get the Serial Number of the EtherCAT Slave on the EtherCAT bus.		V	V	V
getAliasAddress	Get the Alias Address of the EtherCAT Slave on the EtherCAT bus.		V	V	V
getSlaveNo	Get the Number of the EtherCAT Slave according to the Alias Address, Vendor ID, Product Code, Revision Number, and Serial Number.		V	V	V
Control Functions					
start	Start EtherCAT communication: Automatic Freerun mode.		V		
stop	Stop EtherCAT Master.			V	
getSystemTime	Get system time of current cycle.			V	V
getWorkingCounter	Get working counter of current cycle.			V	V
getExpectedWorkingCounter	Get expected working counter.			V	V
EthercatDevice_XXX Class General Function					

Access to EtherCAT Slave information functions					
getVendorID	Get the Vendor ID of the EtherCAT Slave.		V	V	V
getProductCode	Get the Product Code of the EtherCAT Slave.		V	V	V
getRevisionNumber	Get the Revision Number of the EtherCAT Slave.		V	V	V
getSerialNumber	Get the Serial Number of the EtherCAT Slave.		V	V	V
getAliasAddress	Get the Alias Address of the EtherCAT Slave.		V	V	V
getSlaveNo	Get the Number of the EtherCAT Slave.		V	V	V
readSII	Read the EEPROM of the EtherCAT Slave.		V	V	
readSII8	Read the EEPROM of the EtherCAT Slave. (8-bit)		V	V	
readSII16	Read the EEPROM of the EtherCAT Slave. (16-bit)		V	V	
readSII32	Read the EEPROM of the EtherCAT Slave. (32-bit)		V	V	
writeSII	Write the EEPROM of the EtherCAT Slave.		V	V	
writeSII8	Write the EEPROM of the EtherCAT Slave. (8-bit)		V	V	
writeSII16	Write the EEPROM of the EtherCAT Slave. (16-bit)		V	V	
writeSII32	Write the EEPROM of the EtherCAT Slave. (32-bit)		V	V	
Process Data Objects (PDO) Functions					
pdoBitWrite	Write Bit of Process Data Output.			V	V
pdoBitRead	Read Bit of Process Data Input.			V	V
pdoGetOutputBuffer	Get Slave Process Data Output Pointer.			V	V
pdoGetInputBuffer	Get Slave Process Data Input Pointer.			V	V
pdoWrite	Write Slave Process Data Output.			V	V
pdoWrite8	Write Slave Process Data Output. (unit8_t)			V	V
pdoWrite16	Write Slave Process Data Output. (unit16_t)			V	V
pdoWrite32	Write Slave Process Data Output. (unit32_t)			V	V
pdoRead	Read Slave Process Data Input.			V	V
pdoRead8	Read Slave Process Data Input. (unit8_t)			V	V
pdoRead16	Read Slave Process Data Input. (unit16_t)			V	V
pdoRead32	Read Slave Process Data Input. (unit32_t)			V	V
CAN Application Protocol over EtherCAT (CoE) Functions					
sdoDownload	(CoE) Write the object to EtherCAT Slave device.		V	V	
sdoDownload8	(CoE) Write the object to EtherCAT Slave device. (unit8_t)		V	V	
sdoDownload16	(CoE) Write the object to EtherCAT Slave device. (unit16_t)		V	V	
sdoDownload32	(CoE) Write the object to EtherCAT Slave device. (unit32_t)		V	V	
sdoUpload	(CoE) Read the object from EtherCAT Slave device to EtherCAT Master.		V	V	
sdoUpload8	(CoE) Read the object from EtherCAT Slave device to EtherCAT Master. (unit8_t)		V	V	

sdoUpload16	(CoE) Read the object from EtherCAT Slave device to EtherCAT Master. (unit16_t)		V	V	
sdoUpload32	(CoE) Read the object from EtherCAT Slave device to EtherCAT Master. (unit32_t)		V	V	
getODlist	(CoE) Get the object list from EtherCAT Slave device to EtherCAT Master.		V	V	
getObjectDescription	(CoE) Get the object list's Description from EtherCAT Slave device to EtherCAT Master.		V	V	
getEntryDescription	(CoE) Get the entry description with Slave index.		V	V	
File over EtherCAT (FoE) Functions					
readFoE	(FoE) Read Slave file.		V		
writeFoE	(FoE) Write Slave file.		V		
EthercatDevice_Generic Functions (For all of EtherCAT Device generic objects)					
Initialize Functions					
attach	Specify the EtherCAT Slave number and mount it on the EtherCAT Master.		V	V	
detach	Dismount the EtherCAT slave object.		V	V	

Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster. Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, originality to use this product. Vendor will not be liable for any claim made by any other related party. Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

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