Moxa Industrial Media Converter

IMC-101G
Hardware Installation Guide

Second Edition, August 2009

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Overview

Moxa's IMC-101G industrial gigabit media converter is designed for reliable and stable operation in harsh industrial environments, and provides industrial grade media conversion between 10/100/1000BaseT(X) and 1000BaseSX/LX/LHX/ZX connections. The IMC-101G's reliable industrial design is excellent for keeping your industrial automation applications running continuously, and comes with a relay output warning alarm to help prevent damage.

This product has a wide operating temperature range of -40 to 75°C, and is designed to withstand a high degree of vibration and shock. The rugged hardware design makes the IMC-101G perfect for ensuring that your Ethernet equipment can withstand critical industrial applications, such as in hazardous locations (Class 1 Division 2/Zone 2), and complies with CE, FCC, UL, DNC and GL Standards

ATTENTION

Throughout this Hardware Installation Guide, we often use IMC as an abbreviation for Moxa Industrial Media Converter:

IMC= Moxa Industrial Media Converter

Package Checklist

The IMC-101G industrial media converter is shipped with the items listed below. If any of these items is missing or damaged, please contact your customer service representative for assistance.

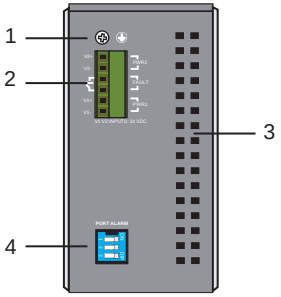
- Moxa Industrial Media Converter
- Hardware Installation Guide
- Moxa Product Warranty Statement

Features

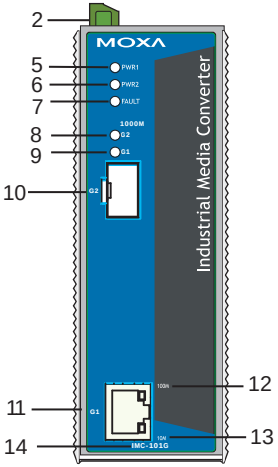
- Supports 10/100/1000BaseT(X) auto-negotiation, auto-MDI/MDI-X, and 1000BaseSX/LX/LHX/ZX SFP available
- Supports Link Fault Pass-Through
- Relay Output alarm when a port breaks or the power fails
- Redundant 12 to 45 VDC power inputs
- DIN-Rail and panel mountable
- Standard operating temperature range of 0 to 60°C, or extended operating temperature range of -40 to 75°C for "-T" models

Panel Layouts of IMC-101G Series

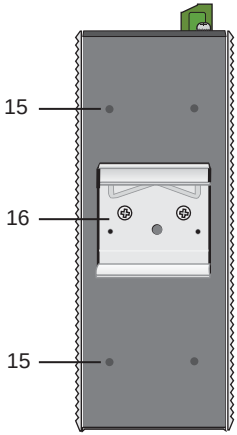
Top Panel View



Front Panel View

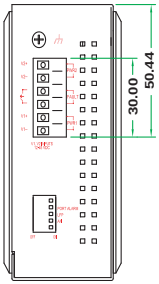


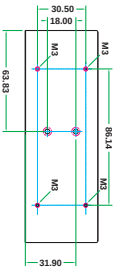
Rear Panel View



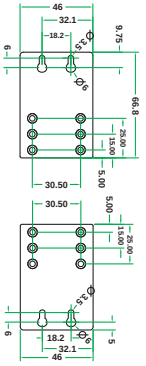
1. Grounding screw
2. Terminal block for power inputs (PWR1/PWR2) and relay output
3. Heat dissipation orifices
4. Dip switches
5. Power input PWR1 LED
6. Power input PWR2 LED
7. Fault LED
8. SFP port's 1000 Mpbs G2 LED
9. TP port's 1000 Mpbs G1 LED
10. 1000Base SFP Fiber port
11. 10/100/1000BaseT(X) port
12. TP port's 100 Mbps LED
13. TP port's 10 Mbps LED
14. Model name
15. Screw hole for wall mounting kit
16. DIN-Rail mounting kit

Dimensions

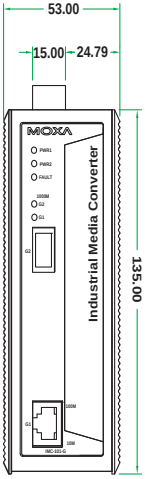


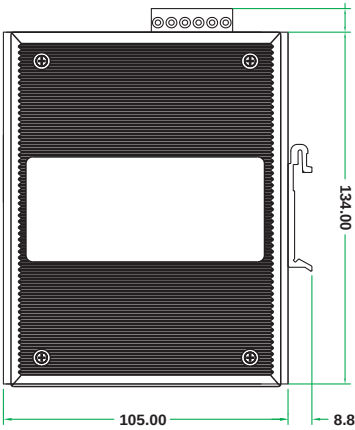


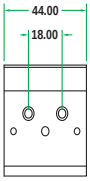
Rear Panel



Panel Mounting Kit



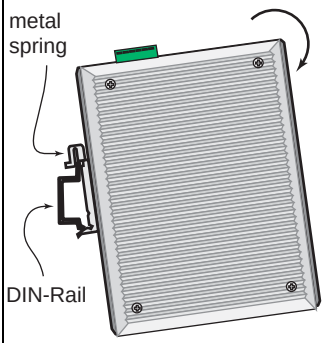
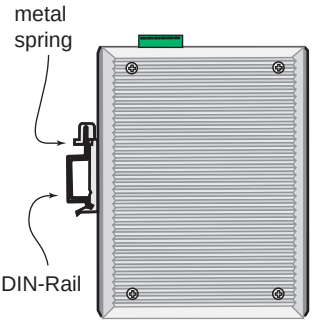




Din-Rail Attachment

DIN-Rail Mounting

The aluminum DIN-Rail attachment plate should be fixed to the back panel of the IMC-101G when you take it out of the box. If you need to reattach the DIN-Rail attachment plate to the IMC-101G, make sure the stiff metal spring is situated towards the top, as shown in the figures below.

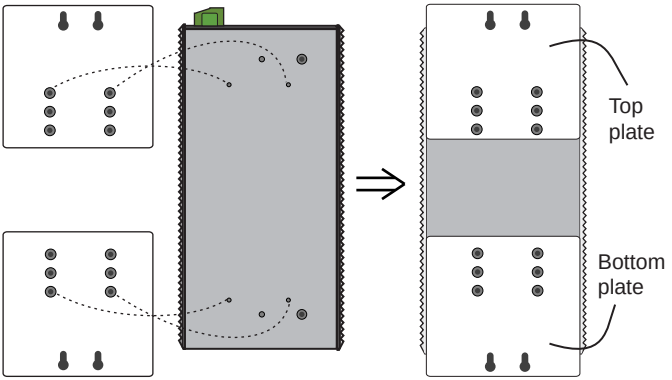
STEP 1: Insert the top of the DIN-Rail into the slot just below the stiff metal spring.	STEP 2: The DIN-Rail attachment unit will snap into place as shown below.
	

To remove the Moxa Industrial Media Converter from the DIN-Rail, simply reverse Steps 1 and 2 above.

Wall Mounting (Optional)

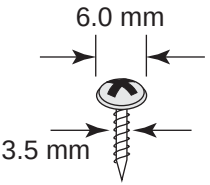
For some applications, you will find it convenient to mount the Moxa industrial media converter on the wall, as illustrated below.

STEP 1:
Remove the aluminum DIN-Rail attachment plate from the IMC-101G, and then attach the wall mount plates, as shown in the diagrams below.



STEP 2:

Mounting the IMC-101G on the wall requires 4 screws. Use the IMC-101G, with wall mount plates attached, as a guide to mark the correct locations of the 4 screws. The heads of the screws should be less than 6.0 mm in diameter, and the shafts should be less than 3.5 mm in diameter, as shown in the figure at the right.



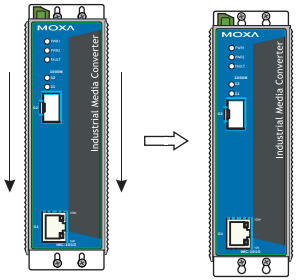
NOTE

Test the screw head and shank size by inserting the screw into one of the keyhole shaped apertures of the Wall Mounting Plates, before it is screwed into the wall.

Do **not** screw the screws in all the way—leave a space of about 2 mm to allow room for sliding the wall mount panel between the wall and the screws.

STEP 3:

Once the screws are fixed in the wall, insert the four screw heads through the large parts of the keyhole-shaped apertures, and then slide the IMC-101G downwards, as indicated below. Tighten the four screws for added stability.



II 3G ATEX Information

1. Certification number DEMKO 09 ATEX0812123x
2. Ambient range (-40˚C ≤ Tamb ≤ 75˚C)
3. Certification string (Ex nC nL IIC T4)
4. Standards covered (EN60079-0:2006, EN60079-15:2005)
5. The conditions of safe usage:
   - The Ethernet Communication Devices are to be mounted in an IP54 enclosure and used in an area of not more than pollution degree 2 as defined by IEC60664-1. A 4mm2 conductor must be used when connection to the external grounding screw is utilized. Conductors suitable for use in an ambient temperature of 93°C must be used for the Power Supply Terminal.

Wiring Requirements

WARNING

Do not disconnect modules or wires unless power has been switched off or the area is known to be non-hazardous. The devices may only be connected to the supply voltage shown on the type plate.

These devices must be supplied by a SELV source as defined in the Low Voltage Directive 2006/95/EC and 2004/108/EC.

ATTENTION

Safety First!

Be sure to disconnect the power cord before installing and/or wiring your Moxa Industrial Media Converter.

This equipment is approved by UL508. Use copper conductors only, 60/75°C, and tighten to 4.5 pound-inches.

ATTENTION

Safety First!

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

You should also pay attention to the following points:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point. **NOTE**: Do not run signal or communications wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.
- You can use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separated.
- It is strongly advised that you label wiring to all devices in the system when necessary.

Grounding the IMC-101G

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.

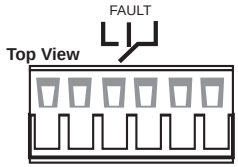
ATTENTION

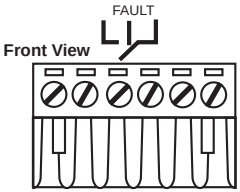
This product is intended to be mounted to a well-grounded mounting surface such as a metal panel.

Wiring the Alarm Contact

The Alarm Contact is made up of the two middle contacts of the terminal block on the IMC-101G's top panel. Refer to the next section for detailed instructions on how to connect the wires to the terminal block connector, and how to attach the terminal block connector to the terminal block receptor.

In this section, we explain the meaning of the two contacts used to connect the Alarm Contact.





FAULT: The two middle contacts of the 6-contact terminal block connector are used to detect both power faults and port faults. The two wires attached to the Fault contacts form an open circuit when:

1. The IMC-101G has lost power from one of the DC power inputs.

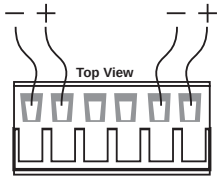
OR

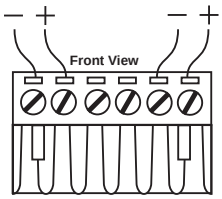
2. One of the ports for which the corresponding PORT ALARM DIP Switch is set to ON is not properly connected.

If neither of these two conditions occurs, the Fault circuit will be closed.

Wiring the Redundant Power Inputs

The top two contacts and the bottom two contacts of the 6-contact terminal block connector on the IMC-101G's top panel are used for the IMC-101G's two DC inputs. Top and front views of one of the terminal block connectors are shown here.





STEP 1: Insert the negative/positive DC wires into the V-/V+ terminals, respectively.

STEP 2: To keep the DC wires from pulling loose, use a small flat-blade screwdriver to tighten the wire-clamp screws on the front of the terminal block connector.

STEP 3: Insert the plastic terminal block connector prongs into the terminal block receptor, which is located on IMC-101G's top panel.

ATTENTION

Before connecting the IMC-101G to the DC power inputs, make sure the DC power source voltage is stable.

Communication Connections

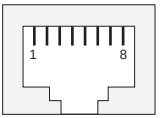
All IMC-101G models have one 10/100/1000 BaseT(X) Ethernet port, and one 1000Base SFP Fiber port.

10/100BaseT(X) Ethernet Port Connection

The 10/100BaseT(X) ports located on the IMC-101G's front panel are used to connect to Ethernet-enabled devices. Below we show pinouts for both MDI (NIC-type) ports and MDI-X (HUB/Switch-type) ports, and also show cable wiring diagrams for straight-through and cross-over Ethernet cables.

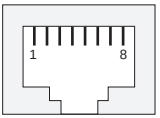
RJ45 (8-pin, MDI) Port Pinouts

Pin	Signal
1	Tx+
2	Tx-
3	Rx+
6	Rx-

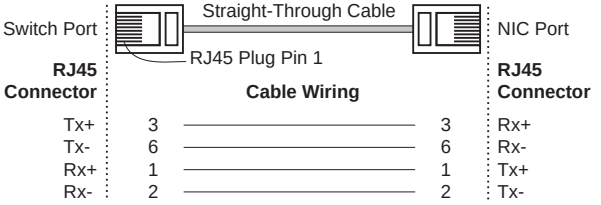


RJ45 (8-pin, MDI-X) Port Pinouts

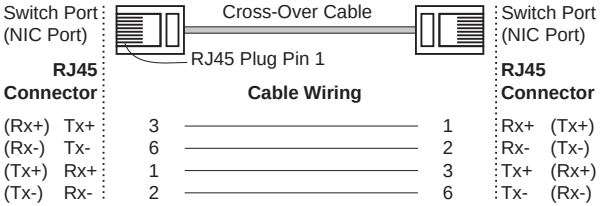
Pin	Signal
1	Rx+
2	Rx-
3	Tx+
6	Tx-



RJ45 (8-pin) to RJ45 (8-pin) Straight-through Cable Wiring



RJ45 (8-pin) to RJ45 (8-pin) Cross-over Cable Wiring

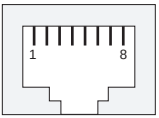


1000BaseT Ethernet Port Connection

1000BaseT data is transmitted on differential TRD+/- signal pairs over copper wires.

MDI/MDI-X Port Pinouts

Pin	Signal
1	TRD (0) +
2	TRD (0) -
3	TRD (1) +
4	TRD (2) +
5	TRD (2) -
6	TRD (1) -
7	TRD (3) +
8	TRD (3) -



1000BaseSFP Fiber Port

The gigabit Ethernet ports on the IMC-101G are 1000BaseSFP Fiber ports, which require using gigabit mini-GBIC fiber transceivers to work properly. Moxa provides complete transceiver models for different distance requirements.

Multi mode:

1000BaseSX	0 to 500 m, 850 nm (50/125 μm, 400 MHz*km)
	0 to 275 m, 850 nm (62.5/125 μm, 200 MHz*km)
1000BaseLX	0 to 1100 m, 1310 nm (50/125 μm, 800 MHz*km)
	0 to 550 m, 1310 nm (62.5.125 μm, 500 MHz*km)

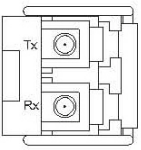
Single mode:

1000BaseLX	0 to 10 km, 1310 nm (9/125 μm, 3.5 PS/(nm*km)
1000BaseLHX	0 to 40 km, 1310 nm (9/125 μm, 3.5 PS/(nm*km)
1000BaseZX	0 to 80 km, 1550 nm (9/125 μm, 19 PS/(nm*km)

The concept behind the LC port and cable is quite straightforward. Suppose that you are connecting devices I and II; contrary to electrical signals, optical signals do not require a circuit in order to transmit data. Consequently, one of the optical lines is used to transmit data from device I to device II, and the other optical line is used transmit data from device II to device I, for full-duplex transmission.

Remember to connect the Tx (transmit) port of device I to the Rx (receive) port of device II, and the Rx (receive) port of device I to the Tx (transmit) port of device II. If you make your own cable, we suggest labeling the two sides of the same line with the same letter (A-to-A and B-to-B, as shown below, or A1-to-A2 and B1-to-B2).

LC-Port Pinouts



LC-Port to LC-Port Cable Wiring

Cable Wiring

Redundant Power Inputs

Both power inputs can be connected simultaneously to live DC power sources. If one power source fails, the other live source acts as a backup, and automatically supplies all of the IMC-101G's power needs.

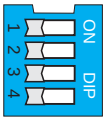
Alarm Contact

The IMC-101G has one Alarm Contact located on the top panel. For detailed instructions on how to connect the Alarm Contact power wires to the two middle contacts of the 6-contact terminal block connector, see the "Wiring the Alarm Contact" section above. A typical scenario would be to connect the Fault circuit to a warning light located in the control room. The light can be configured to switch on when a fault is detected.

The Alarm Contact has two terminals that form a Fault circuit for connecting to an alarm system. The two wires attached to the Fault contacts form an open circuit when (1) the IMC-101G has lost power from one of the DC power inputs, or (2) one of the ports for which the corresponding PORT ALARM Dip Switch is set to ON is not properly connected. If neither of these two conditions occurs, the Fault circuit will be closed.

DIP Switch Setting

IMC-101G DIP Switch



PORT ALARM
LFP
AN

NOTE: To activate updated DIP switch settings, power off and then power on the IMC-101G.

Dip Switch 1 (Default: Off)

ON: Enables the PORT Alarm. If the port's link fails, the relay will form an open circuit and the fault LED will light up.

Off: Disables the corresponding PORT Alarm. The relay will form a closed circuit and the Fault LED will never light up.

Dip Switch 2 (Default: ON)

ON: Enables LFP (Link Fault Pass-Through)

Off: Disables LFP (Link Fault Pass-Through)

Dip Switch 3 (Default ON: AUTO)

ON: FX port in Auto (auto-negotiation) mode

Off: Forces FX port to 1000M

Dip Switch 4

Reserved for future use

ATTENTION

When Force mode is used, the LFP function will be disabled.

LED Indicators

The front panel of the IMC-101G has several LED indicators. The function of each LED is described in the table below.

LED	Color	State	Description
PWR1	AMBER	On	Power is being supplied to power input PWR1
		Off	Power is not being supplied to power input PWR1
PWR2	AMBER	On	Power is being supplied to power input PWR2
		Off	Power is not being supplied to power input PWR2
FAULT	RED	On	When the corresponding PORT alarm is enabled, and the port's link is inactive.
		Off	When the corresponding PORT alarm is enabled and the port's link is active, or when the corresponding PORT alarm is disabled.
G2	GREEN	On	SFP port's 1000 Mbps link is active.
		Blinking	Data is being transmitted at 1000 Mbps.
		Off	SFP port's 1000 Mbps link is inactive.
G1	GREEN	On	TP port's 1000 Mbps link is active
		Blinking	Data is being transmitted at 1000 Mbps
		Off	TP port's 1000 Mbps link is inactive
10M	GREEN	On	TP port's 10 Mbps link is active
		Blinking	Data is being transmitted at 10 Mbps
		Off	TP port's 10 Mbps link is inactive
100M	GREEN	On	TP port's 100 Mbps link is active
		Blinking	Data is being transmitted at 100 Mbps
		Off	TP port's 100 Mbps link is inactive

Auto MDI/MDI-X Connection

The Auto MDI/MDI-X function allows users to connect the IMC101G's 10/100/1000BaseT(X) ports to any kind of Ethernet device, without paying attention to the type of Ethernet cable being used for the connection. This means that you can use either a straight-through cable or cross-over cable to connect the IMC-101G to Ethernet devices.

Dual Speed Functionality and Switching

The IMC-101G's 10/100/1000 Mbps RJ45 switched port auto negotiates with the connected device for the fastest data transmission rate supported by both devices. All models of the IMC-101G are plug-and-play devices, so that software configuration is not required at installation, or during maintenance. The half/full duplex mode for the RJ45 switched ports is user dependent and changes (by auto-negotiation) to full or half duplex, depending on which transmission speed is supported by the attached device.

Auto-Negotiation and Speed Sensing

All of the IMC-101G's RJ45 Ethernet ports independently support auto-negotiation for transmission speeds of 10 Mbps, 100 Mbps , and 1000 Mbps, with operation according to the IEEE802.3u standard.

This means that some nodes could be operating at 10 Mbps, while at the same time, other nodes are operating at 100 Mbps or 1000Mbps.

Auto-negotiation takes place when an RJ45 cable connection is made, and then each time a LINK is enabled. The IMC-101G advertises its capability for using 10 Mbps, 100 Mbps, or 1000 Mbps transmission speeds, with the device at the other end of the cable expected to advertise similarly. Depending on what type of device is connected, this will result in agreement to operate at a speed of 10 Mbps, 100 Mbps, or 1000 Mbps.

If an IMC-101G's RJ45 Ethernet port is connected to a non-negotiating device, it will default to 10 Mbps speed and half-duplex mode, as required by the IEEE802.3u standard.

Specifications

Technology	
Standards	IEEE802.3, 802.3u, 802.3x, 802.3z/ab, Link Fault Pass-Through
Interface	
RJ45 Ports	10/100BaseT(X) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection
SFP Ports	Optional 1000BaseSX/LX/LHX/ZX (LC connector)
LED Indicators	PWR1, PWR2, FAULT, 10/100M(TP port), 1000M (TP and Fiber port)
DIP Switches	Port break alarm mask, Link Fault Pass Through, SFP AN/Force
Alarm Contact	One relay output with current carrying capacity of 1A @ 24 VDC

Optical Fiber: 1000BaseSX/LX/LHX/ZX

Distance

Multi mode:	1000BaseSX: 0 to 500 m, 850 nm (50/125 µm, 400 MHz*km) 0 to 275 m, 850 nm (62.5/125 µm, 200 MHz*km) 1000BaseLX: 0 to 1100 m, 1310 nm (50/125 µm, 800 MHz*km) 0 to 550 m, 1310 nm (62.5.125 µm, 500 MHz*km)
Single mode:	1000BaseLX: 0 to 10 km, 1310 nm (9/125 µm, 3.5 PS/(nm*km) 1000BaseLHX: 0 to 40 km, 1310 nm (9/125 µm, 3.5 PS/(nm*km) 1000BaseZX: 0 to 80 km, 1550 nm (9/125 µm, 19 PS/(nm*km)

Power

Input Voltage:	24 VDC (12 to 45 VDC), Redundant inputs
Input Current:	0.11A (@24V)
Connection:	Removable Terminal Block
Overload Current Protection:	2.5A@25°C
Reverse Polarity Protection:	Present

Mechanical

Casing:	IP30 protection, metal case
Dimensions (W x H x D):	53 x 135 x 105 mm (2.1 x 5.3 x 4.1 in)
Weight:	630 g
Installation:	DIN-Rail or Wall Mounting (optional kit)

Environment

Operating Temperature:	0 to 60˚C (32 to 140˚F), -40 to 75˚C (-40 to 167˚F) for -T models
Storage Temperature:	-40 to 85˚C (-40 to 185˚F)
Ambient Relative Humidity:	5 to 95% (non-condensing)

Regulatory Approvals

Safety:	UL 508

Hazardous location:

UL/cUL Class1, Division 2, Groups A, B, C, and D
ATEX Class1, Zone 2, EEx nC IIC
EMI: FCC Part 15, CISPR (EN55022) class A
EMS: EN61000-4-2 (ESD), level 3
EN61000-4-3 (RS), level 3
EN61000-4-4 (EFT), level 3
EN61000-4-5 (Surge), level 2
EN61000-4-6 (CS), level 3
Shock: IEC60068-2-27
Freefall: IEC60068-2-32
Vibration: IEC60068-2-6

WARRANTY 5 years

Serial Number

The serial number of a product is made up of 12 alphanumeric characters and includes the region in which the product was manufactured, the year and month the product was manufactured, the product category, and the production number.

Position in Serial Number	Meaning	Possible Values	Example(s)
1	Production Region	0 to 9, or D to Z	"T" means Taiwan
2 and 3	Year	Z = 0, A = 1, B = 2, ... I = 9	ZH = 2008, II = 2009
4	Month	A = JAN, B = FEB, C = MAR, ... L = DEC	
5	---	0	Reserved for future use
6 and 7	Product Category	B-type: 00, 01, ..., 09 E-type: 10, 11, ..., 99	
8 to 12	Production Number	B-type: 00001 to 65535 E-type: 00001 to 99999	

For example, a product with serial number **TZDL012012456** was manufactured in Taiwan in December of 2004, is an E-type 12 product, and is the 12,456th product of this type that has been manufactured.

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