



# **INV-4E1**

**Ethernet over 4 - E1  
Interface Converter**

## **User's Manual**

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## 1. Product overview

As a 4E1 to 10/100Base-Tx converter designed to transmit Ethernet data through several E1 channels, INV-4E1 can conduct point-to-point transmission of Ethernet MAC frame data through one to 4 E1 channels, detect and use the effective E1 channels automatically, apply the reversed multiplexing technology to bind several E1 circuits together to transmit Ethernet data at 10/100Mbps, and allow certain transmission time delay between E1 circuits.

This equipment can make efficient use of a large amount of existing E1 circuit sources in the networking to expand the Ethernet transmission distance and application range. The highest transmission rate of transparent transmission design for the Ethernet data through one to four E1 circuits is 7.68Mbps. So it is a very good solution for the Ethernet broadband access, easy to expand the application scope and transmission distance of Ethernet.

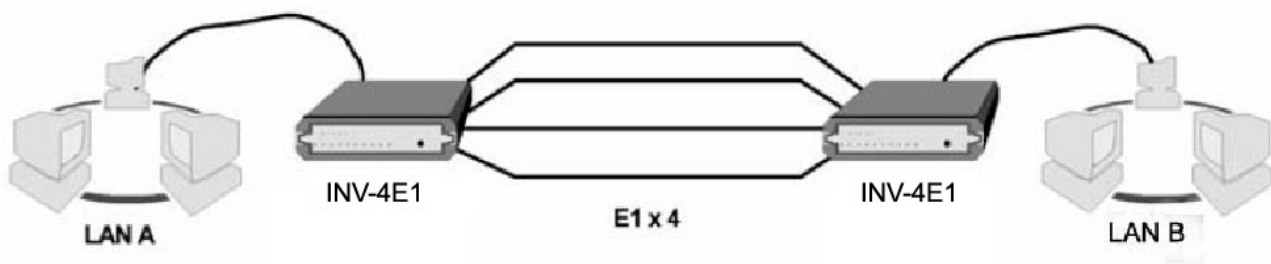
INV-4E1 is of high integration, strong reliability, low power, small size and complete function. It's best advantage is the broad transmission channel protected well, enabling stable working in bad situation. There is no adjusting point for the installation of the whole unit, easy to operate and simple to maintain.

## 2. Features

- MII interface comply with IEEE 802.3 protocol standard supports 10M/100M full duplex/semi-duplex working modes.
- Capable of transmitting transparently the ultra long frame, and supports the Ethernet switch with VLAN function.
- Built-in dynamic Ethernet MAC address (10,000 addresses) list in the chip and the local data frame filtering function.
- Built-in SDRAM (256K Byte) controller.
- E1 interface comply with ITU-T G.703, G.704 and G.823.
- E1 interface module contains the built-in clock recovery circuit and HDB3 code circuit.
- Supports the availability checking and automatic troubleshooting of 1 to 4 E1 channels.
- Visible and audible alarm indication.
- Real-time error code monitoring and automatic protection of E1 channels.
- E1 line loop back function supported.
- Allows the maximum 8ms time-delay of 4 channels, the system can stop to send data automatically when the time-delay is big.
- QFP144 package by 0.35μm CMOS process

## 3. Typical application

The INV-4E1 is not capable of fractional E1 operation or timeslot assignment. It should be used where only unframed, transparent 2.048Mbps transmissions are available.





## 4. Technical specification

### 4.1 E1 Interface

Framing	Unframed (transparent)
Line Code	HDB3
Bit Rate	2.048Mbps x 4 (7.68Mbps total)
Line Impedance	75 Ohms for BNC, 120 Ohms for RJ-45
Relative Receive Level	0 to -43dB
'Pulse' Amplitude	$\pm 2.37V \pm 10\%$ for 75 Ohms, $3.00V \pm 10\%$ for 120 Ohms
Transmit Frequency	2.048Mhz
Allowance	$\pm 50\text{ppm}$
Interface characteristics	Complies with ITU-T G.703
Jitter Performance	According to ITU-T G.823
Interface Connectors	BNC (Unbalanced) or RJ-45 (Balanced)

### 4.2 Console interface

The CONSOLE interface is network management interface, and it is limited to be used by manufacturers only.

### 4.3 Ethernet interface

- Interface: 10/100Base-TX, Full Duplex or Half Duplex
- Interface Standard: complies with IEEE-802.3u standard
- Interface rate: 10/100M auto-negotiation
- Interface connector: RJ-45
- Supports Auto-MDI/MDIX

### 4.4 General specification

Environmental Requirements	Work temperature	0 °C ~ +45 °C
	Humidity	≤90% non-condensing
Power Supply	-48VDC	-36VDC ~ -72VDC
	220AC	220VAC±20%
Power consumption		<10W
Dimension (mm)		265 (W) ×170 (D) ×45 (H)

## 5. Configuration

### 5.1 Front panel

5.1.1 Labels, LED indicators and dip switches on the front panel are shown in Figure 5-1 below:

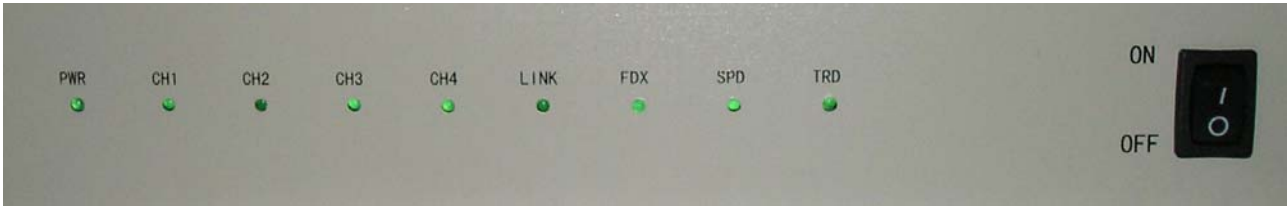


Figure 5-1

5.1.2 LED indicators & dip switches on the front panel are defined as below:

➤ Description of indicators:

LED	Color	ON	OFF
PWR	Green	Power supply is on	Power is off or disconnected
CH1	Green	1 <sup>st</sup> E1 input signal is ok	Loss of 1 <sup>st</sup> E1 input signal
CH2	Green	2 <sup>nd</sup> E1 input signal is ok	Loss of 2 <sup>nd</sup> E1 input signal
CH3	Green	3 <sup>rd</sup> E1 input signal is ok	Loss of 3 <sup>rd</sup> E1 input signal
CH4	Green	4 <sup>th</sup> E1 input signal is ok	Loss of 4 <sup>th</sup> E1 input signal
LINK	Green	Ethernet port is connection	Ethernet port is disconnection
FDX	Green	Ethernet is full-duplex	Ethernet is half-duplex
SPD	Green	Ethernet speed is 100Mbps	Ethernet speed is 10Mbps
TRD	Green	Ethernet data is transmitted	No Ethernet data is transmitted

### 5.2 Rear panel

5.2.1 Interface and connector on the rear panel are shown in Figure 5-2.

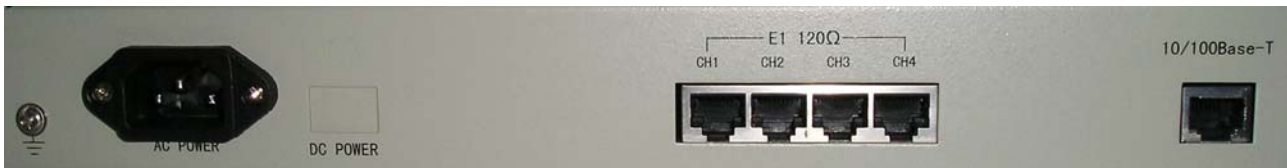


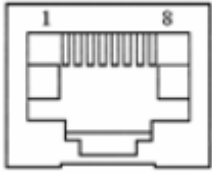
Figure 5-2

5.2.2 E1 interface 120Ω/RJ-45 definition:

RJ-45	E1 OUT			E1 IN		
	1 (GND)	2 (+)	3 (-)	5 (GND)	6 (+)	7 (-)

### 5.2.3 Balun HighTech HK-5201 RJ-45 Pinout definition:

If you want to use 75ohm/BNC connector, please use the balun.

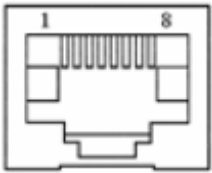


RJ-45 Pinout	Signal	Description
1	RX-	Receive Input, Negative
2	RX+	Receive Input, Positive
3	S1	Transmit Ground
4	TX-	Transmit Output, Negative
5	TX+	Transmit Output, Positive
6	S2	Receive Ground

#### Note:

- Power input (PWR): INV-4E1 interface converters support three kinds of voltage, 220VAC, -48VDC and +24VDC. **Please pay attention to the DC input and its negative polarities.** It is better to use a multimeter to check if the power polarity and voltage value are according with those marked on equipment.
- Ensure to fix a reliable grounding wire at the grounding point on the equipment.

### 5.3 10/100Base-T interface definition:



Pin	1	2	3	4	5	6	7	8
Function	TX+	TX-	RX+	NC	NC	RX-	NC	NC-

**Note:** NC means "no connection available"

## 6. Installation

Before installing the equipment, check the following conditions.

### 6.1 Field requirements

Clean and well ventilated.

Dry environment (relative humidity: 20% - 95%, no condensing).

### 6.2 Power supply

There shall be power supply applicable to the equipment in the installation field.

### 6.3 Cable Connection

#### 6.3.1 LAN connection

The equipment provides auto MII/MIIX interface in conformity with IEEE 802.3 protocol standard to support 10/100M full/semi-duplex work modes. It can run in any Ethernet work mode, i.e. supporting any Ethernet interface. According to the actual situation, prepare a crossed or straight-line cable in cooperation with RJ45 and connect one end with the UTP interface on the back board of the equipment and the other end with PC or SWITCH. When the equipment is open, if the connection is correct, LINK light will be ON.

#### 6.3.2 E1 connection

Insert the accessory BNC coaxial cable connector into E1 PORT. Then connect the equipment with transmission equipment (such as PDH or SDH optical multiplexer) with the coaxial cable.

- Check whether the E1 circuit is shortly connected, broken or poor in connection. If it goes through SDH equipment, the configuration of E1 circuit by network management must be checked.
- The error code rate of E1 circuit measured by an error code instrument must be lower than 10<sup>-7</sup>.

- The length of E1 coaxial cable shall be no more than 200M - 300M. The transmission time delay between each E1 line shall be no more than 8ms.

## 7. Trouble shooting

Phenomenon	Cause	Solution
Abnormal power supply	Power supply doesn't comply with the requirement.	Replace a power supply.
	Power switch is off	Turn on the power switch
	Power junction stud is loosing	Screw it
E1 link Malfunction	Value of the impedance doesn't match with the E1 interface.	Check the impedance setup of the equipment which is connected with INV-4E1.
	E1 interface has been wrongly connected.	Connect it in a correct way.
	Malfunction of the connected equipment	Ensure the equipment which is connected with INV-4E1 is working normally.
Ethernet port malfunction	The manufacture of network access line is not according to standard sequence.	Make sure the network access line is produced according to the standard sequence.
	Malfunction of uplink equipment or working status	Make sure the setup of the uplink equipment or working status is ok.

## 8. Accessories

Description	Quantity
INV-4E1 converter	1
User manual	1
BNC/RJ-45	8/4
AC power cord	1(only for AC type)