



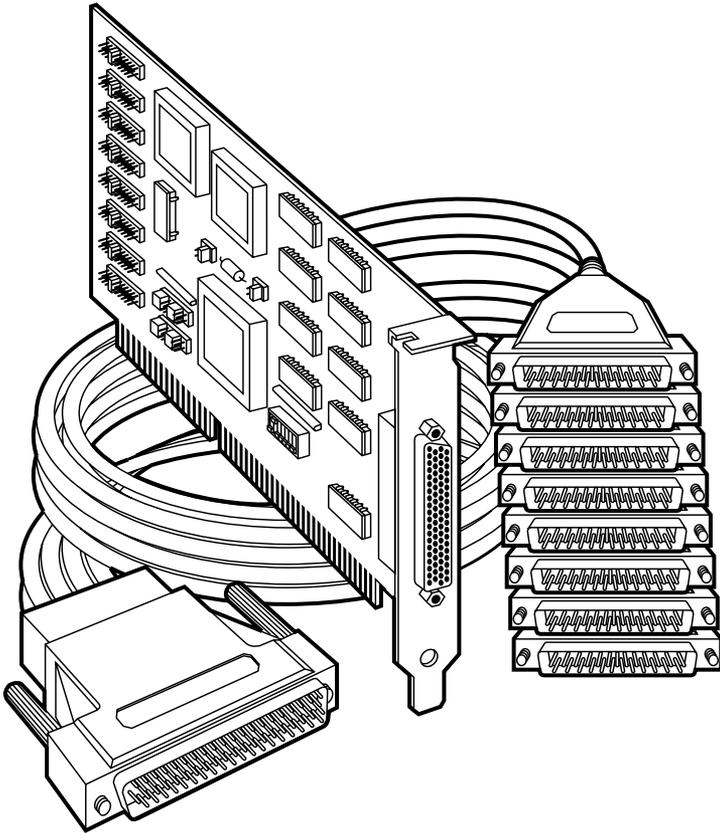
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1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746



8-Port RS-232 Serial Interface

8-Port High-Speed RS-232 Serial Interface



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NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

EMC Directive

Products bearing the CE label fulfill the requirements of the EMC directive (89/336/EEC) and of the low-voltage directive (73/23/EEC) issued by the European Commission.

To obey these directives, the following European standards must be met:

- **EN55022 Class A** - “Limits and methods of measurement of radio interference characteristics of information technology equipment”
- **EN50082-1** - “Electromagnetic compatibility—Generic immunity standard”
Part 1 : Residential, commercial, and light industry
- **EN60950 (IEC950)** - “Safety of information technology equipment, including electrical business equipment”

WARNING!

Always use the cable provided with this product if possible. If an alternate cable is required, use a high-quality shielded cable to maintain compliance with FCC/EMC directives.

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1. Specifications

Temperature Tolerance —	Operating: 32 to 122°F (0 to 50°C); Storage: -4 to +158°F (-20 to +70°C)			
Speed —	IC112C-R3: Up to 115.2 kbps; IC112C-HS-R3: Up to 460.8 kbps; IC182C: 460.8 kbps and higher			
Communications Chip —	IC112C-R3: 16554 UART; IC112C-HS-R3: 16654 UART; IC182C: 16950 UART			
Humidity Tolerance —	10 to 90% relative humidity, noncondensing			
MTBF —	Greater than 150,000 hours (calculated)			
Power Consumption —	<i>Supply line</i>	+12 VDC	-12 VDC	+5 VDC
	<i>Rating</i>	110 mA	130 mA	320 mA
Size —	Board length: 7 inches (17.8 cm); Board height including goldfingers: 4.2 inches (10.7 cm); Board height excluding goldfingers: 3.9 inches (9.9 cm)			

2. Introduction

2.1 Overview

The 8-Port RS-232 Serial Interface provides the PC with eight RS-232 asynchronous ports, allowing connection to any device that uses the RS-232 electrical interface.

The 8-Port RS-232 Serial Interface is shipped with the items listed below. If any items are missing or damaged, call (724) 746-5500.

- The 8-Port RS-232 Serial Interface
- (1) Octopus cable with (8) DB25 connectors
- (2) serial utility software diskettes
- This user manual

2.2 Factory-Default Settings

The 8-Port RS-232 Serial Interface factory-default settings are:

Port #	Base Address	IRQ	E12
Port 1	280	2/9	DIV4
Port 2	288	3	
Port 3	290	4	
Port 4	298	5	
Port 5	2A0	2/9	
Port 6	2A8	3	
Port 7	2B0	4	
Port 8	2B8	5	

To install the 8-Port RS-232 Serial Interface using factory-default settings, refer to **Chapter 4**.

For your reference, record installed 8-Port RS-232 Serial Interface settings below:

Port #	Base Address	IRQ	E12
Port 1			
Port 2			
Port 3			
Port 4			
Port 5			
Port 6			
Port 7			
Port 8			

The table below illustrates the port assignments for the factory-default setting.

Port #	DB25#	Address	Example
1	1	Base+0	280-287
2	2	Base+8	288-28F
3	3	Base+16	290-297
4	4	Base+24	298-29F
5	5	Base+32	2A0-2A7
6	6	Base+40	2A8-2AF
7	7	Base+48	2B0-2B7
8	8	Base+56	2B8-2BF

2.3 Technical Description

The 8-Port RS-232 Serial Interface provides 8 additional serial ports for terminals, modems, and printers. The 8-Port RS-232 Serial Interface (IC112C-R2) uses the 16554 UART chip, and the 8-Port High-Speed RS-232 Serial Interface (IC112C-HS-R2) uses the 16654 UART chip. These chips feature programmable baud rate, data format, interrupt control, and a 16-byte FIFO. The IC182C uses the 16950 UART chip and has a 128-byte FIFO.

2.3.1 FEATURES

- Eight RS-232 ports with full modem control signals.
- PAL addressing option allowing “Turn Key” configurations.
- Selectable/sharable interrupts (IRQs 2/9-7,10,11,12, and 15).
- Interrupt status port for Windows NT™ (listed in the NT Hardware compatibility list) and Green Leaf COM: libraries.
- (8) DB25 male connectors provided on the octopus cable.

2.3.2 INTERRUPT STATUS PORT

The 8-Port RS-232 Serial Interface provides the user with an Interrupt Status Port (ISP) for greater throughput when servicing multiple ports on a single interrupt line. The ISP is a read-only 8-bit register that sets a corresponding bit when an interrupt is pending. Port 1 interrupt line corresponds with Bit D0 of the status port, Port 2 with D1, etc.

The ISP can be addressed two different ways. If header E11 is in the **Switch** position, the Status Register is located at Base+7 on each port (for example, Base = 280 Hex, Status Port = 287, 28F... etc.). This allows any one of eight locations to be read to obtain the value in the status register. All eight status ports on the 8-Port RS-232 Serial Interface are identical, so any one of the eight can be read. If header E11 is in the **PAL** position, the status port can be addressed at any location.

Example: This indicates that Channel 2 has an interrupt pending.

Bit Position:	7	6	5	4	3	2	1	0
Value Read:	0	0	0	0	0	0	1	0

2.3.3 DB25 CONNECTOR PIN ASSIGNMENTS

Signal	Name	Pin #	Mode
GND	Ground	7	
TD	Transmit Data	2	Output
RTS	Request To Send	4	Output
DTR	Data Terminal Ready	20	Output
RD	Receive Data	3	Input
CTS	Clear To Send	5	Input
DSR	Data Set Ready	6	Input
DCD	Data Carrier Detect	8	Input
RI	Ring Indicator	22	Input

3. Card Setup

If you're using the factory-default settings (see **Section 2.2**), you can skip this chapter and go straight to **Chapter 4**.

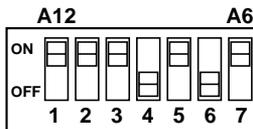
The 8-Port RS-232 Serial Interface contains several jumper straps that must be set for proper operation unless you're using the factory-default settings.

3.1 Address Selection

The 8-Port RS-232 Serial Interface occupies 64 I/O locations and can be addressed two different ways. If header E11 is set to the **Switch** position, the 8-Port RS-232 Serial Interface occupies 64 consecutive I/O locations and the DIP-switch is used to set the base address for these locations. The starting address for these 64 I/O locations must be on a 64-byte boundary: Hex 200, 240, 280, or 2C0. Be careful when selecting the base address, as some selections conflict with existing PC ports. The following table shows several examples that usually do not cause a conflict. Refer to **Chapter 5** for common address contentions.

Address	Switch Position Setting:						
	1	2	3	4	5	6	7
100-13F	On	On	On	On	Off	On	On
180-1BF	On	On	On	On	Off	Off	On
240-27F	On	On	On	Off	On	On	Off
280-2BF	On	On	On	Off	On	Off	On
2C0-2FF	On	On	On	Off	On	Off	Off
300-3FF	On	On	On	Off	Off	On	On
500-53F	On	On	Off	On	Off	On	On
580-5BF	On	On	Off	On	Off	Off	On
1500-153F	Off	On	Off	On	Off	On	On
1580-15BF	Off	On	Off	On	Off	Off	On

The following illustration shows the correlation between the DIP-switch setting and the address bits used to determine the base address. In the example below, address 280 (Factory Default) is selected as a base.



NOTE

Setting the switch “On” or “Closed” corresponds to a “0” in the address, while leaving it “Off” or “Open” corresponds to a “1.”

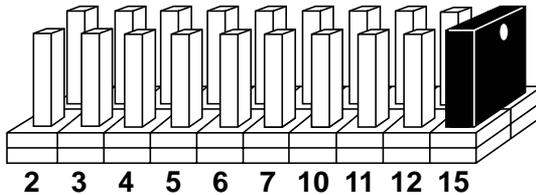
3.2 PAL Addressing

If header E11 is set to the **PAL** position, the board can be addressed at a customized location. Using the PAL option will allow you to obtain COM1: through COM4: addresses, XENIX® COM: addresses, or any other standard or nonstandard address configuration. Using the PAL feature is a cost-effective means of solving complex addressing problems.

3.3 IRQ Selection

Each port on the 8-Port RS-232 Serial Interface has an interrupt jumper that may have to be set prior to use. The software you are using with the board will determine which interrupts, if any, are to be used. The DOS serial-port interface software does not use interrupts, but interrupt buffer programs do. DOS does not require the interrupt to be set, but most multi-user operating systems will. Consult the particular manual for the software that you are using to determine the proper setting.

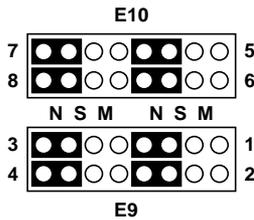
To set the interrupt for a particular port, first select the header for the port desired. Headers E1 through E8 correspond to Ports 1 through 8. Next select an IRQ by placing one of the jumpers on the header location that corresponds to the IRQ number that you want to use. Below is an example of a selected IRQ (15 is selected).



3.4 Interrupt Mode Options

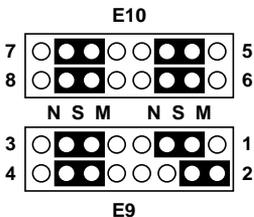
The 8-Port RS-232 Serial Interface will allow each port to have an independent interrupt level or share an interrupt with another port on the adapter. The 8-Port RS-232 Serial Interface will even share interrupts with a compatible port that is located on another adapter. The 8-Port RS-232 Serial Interface can operate in three interrupt modes. Header E9 determines the interrupt mode for Ports 1 through 4, and header E10 determines the interrupt mode for ports 5 through 8.

N indicates the normal, single-interrupt-per-port mode. **S** indicates the shared-interrupt mode, which allows more than one port to access a single IRQ. Any two or more ports can share a common IRQ by placing the jumpers on the same IRQ setting, and setting the appropriate selections at E1 through E8. Consult your particular software for IRQ selection. If no interrupt is desired, remove the jumper. **M** indicates the inclusion of a 1K-ohm pull-down resistor required on one port when sharing interrupts.



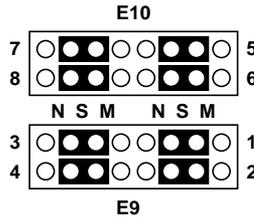
Header E9 and E10, Normal IRQ Mode.

Set jumpers to **S** for shared interrupt mode on all blocks sharing an IRQ except one. Set that port block for **M**. This provides the pull-down resistor circuit that makes IRQ sharing possible. If you are using more than one 8-Port RS-232 Serial Interface or a compatible adapter in a bus, you should only have one port set to **M**. The following example shows all eight ports sharing a single IRQ.



Header E9 and E10, Shared IRQ Mode.

Set all jumpers to **S** if you are using more than one 8-Port RS-232 Serial Interface in a bus or you wish to completely remove the pull-down resistor for hardware compatibility. *Setting the 8-Port RS-232 Serial Interface in this configuration when it is not accompanied by a pull-down resistor will prevent the ports from triggering an interrupt.*

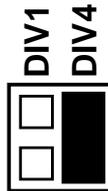


Header E9 and E10, Sharing IRQs with Another Adapter.

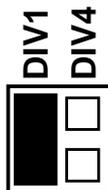
3.5 Clock Modes

The 8-Port RS-232 Serial Interface employs a unique clocking option that allows the user to select from divide by 4 or divide by 1 clocking modes. This mode is selected at E12.

To select the baud rates commonly associated with COM ports (2400 bps, 4800 bps, 9600 bps, 19.2 Kbps,...115.2 Kbps), place the jumper in the divide-by-4 mode (marked DIV4). See the illustration below.



To select the maximum data rate (460.8 Kbps), place the jumper in the divide-by-1 (marked DIV1) position.



3.6 Baud Rates and Divisors for the Div1 Mode

The following table shows some common data rates and the matching data rates you should choose if using the adapter in the Div1 mode.

For This Data Rate	Choose This Data Rate
1200 bps	300 bps
2400 bps	600 bps
4800 bps	1200 bps
9600 bps	2400 bps
19.2 Kbps	4800 bps
57.6 Kbps	14.4 Kbps
115.2 Kbps	28.8 Kbps
230.4 Kbps	57.6 Kbps
460.8 Kbps	115.2 Kbps

If your communications package allows the use of baud-rate divisors, choose the appropriate divisor from the following table:

For This Data Rate	Choose This Divisor
1200 bps	384
2400 bps	192
4800 bps	96
9600 bps	48
19.2 Kbps	24
38.4 Kbps	12
57.6 Kbps	8
115.2 Kbps	4
230.4 Kbps	2
460.8 Kbps	1

4. Installation

The 8-Port RS-232 Serial Interface can be installed in any 16-bit PC expansion slot. Make sure all the jumpers are set correctly first: See **Section 2.2** and **Chapter 3**.

IMPORTANT

You MUST set up the operating system BEFORE you physically install the Card.

4.1 Software Installation

If you are installing an ISA adapter in DOS, OS/2®, or QNX, please refer to the appropriate directory on one of the Serial Utilities Disks for instructions.

4.1.1 WINDOWS 3.1X

Please refer to the /WINDOWS sub-directory on the Serial Utilities Diskette for help files and current information on the installation of the Card in this operating environment.

4.1.2 WINDOWS 95/98 USERS

For the ISA card, run setup on disk two of the Serial Utilities Diskettes before installing the card. Make note of the resources that Windows assigns the adapter, and set the adapter to match those resources. Power down the computer and install the adapter as described in **Section 4.2**. If you wish to change any resources assigned to the adapter, refer to the help file installed in the Black Box folder in the **Start, Programs** menu.

4.1.3 WINDOWS NT

For the ISA card, run setup on disk two of the Serial Utilities Diskettes before installing the card. After installing the software, refer to the help file that automatically comes up for installation instructions.

4.2 Hardware Installation

The ISA Card can be installed in any of the PC expansion slots. The Card contains several jumper straps for each port that you must set for proper operation.

1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover.
3. Locate an available slot and remove the blank metal slot cover.

8-PORT RS-232 SERIAL INTERFACE

4. Gently insert the Card into the slot. Make sure that the Card is seated properly.
5. Replace the screw.
6. Replace the cover.
7. Connect the power cord.

Installation is complete.

5. Troubleshooting

Use the Serial Utility software for troubleshooting procedures.

1. Identify all I/O adapters currently installed in your system. This includes your on-board serial ports, controller cards, sound cards, etc. The I/O addresses used by these adapters and the IRQ (if any) should be identified.
2. Configure your adapter so that there is no conflict with currently installed adapters. No two adapters can occupy the same I/O address.
3. Make sure the adapter is using a unique IRQ. While the adapter does allow the sharing of IRQs, many other adapters (such as SCSI adapters and on-board serial ports) do not. The IRQ is typically selected via an on-board header block. Refer to **Chapter 3** for help in choosing an I/O address and IRQ.
4. Make sure the adapter is securely installed in a motherboard slot.
5. When running DOS or Windows 3.x, refer to the Serial Utilities disk 1 to verify that the adapter is configured correctly. The supplied diskette contains an easy-to-use diagnostic program, SSD, that will verify if an adapter is configured properly. Refer to the README file on the supplied diskette for detailed instructions on using SSD.
6. For Windows 95 and Windows NT, the diagnostic tool **WinSSD** is installed on the Start Menu during the setup process. First find the ports using the Device Manager, then use WinSSD to verify that the ports are functional.
7. Always use the diagnostic software when troubleshooting a problem. This will rule out any software issues as the source of the problem.
8. The following are known I/O conflicts:
 - The 278 and 378 settings may conflict with your printer I/O adapter.
 - 3B0 cannot be used if a monochrome adapter is installed.
 - 3F8-3FF is typically reserved for COM1.
 - 2F8-2FF is typically reserved for COM2.
 - 3E8-3EF is typically reserved for COM3.
 - 2E8-2EF is typically reserved for COM4.

9. Please refer to your included diskette for any post-production manual updates and application specific information.

5.1 Calling Black Box

If you determine that your 8-Port RS-232 Serial Interface is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box at 724-746-5500.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

5.2 Shipping and Packaging

If you need to transport or ship your 8-Port RS-232 Serial Interface:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the 8-Port RS-232 Serial Interface for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Materials Authorization (RMA) number.

Appendix A. RS-232

Quite possibly the most widely used communication standard is RS-232. It has been defined and revised several times and is often referred to as RS-232C, RS-232D, or RS-232E, or as EIA/TIA-232C, EIA/TIA-232D, or EIA/TIA-232E. It is defined as “*Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange.*”

The mechanical implementation of RS-232 is on a DB25 connector. The IBM® PC defined the RS-232 port on a DB9 connector, and subsequently the EIA/TIA approved this implementation as the EIA/TIA-574 standard. This standard has defined as the “*9-Position Non-Synchronous Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange.*” Both implementations are in widespread use.

RS-232 is capable of operating at data rates up to 20 Kbps for 50 ft. The absolute maximum data rate may vary due to line conditions and cable lengths. RS-232 often operates at 38.4 Kbps over very short distances. The voltage levels defined by RS-232 range from -12 to +12 volts.

RS-232 is a single-ended or unbalanced interface, meaning that a single electrical signal is compared to a common signal (ground) to determine binary logic states. A voltage of +12 volts (usually +3 to +10 volts) represents a binary 0 (space) and -12 volts (-3 to -10 volts) denotes a binary 1 (mark).

The RS-232 and the EIA/TIA-574 specification define two types of interface circuits: Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The 8-Port RS-232 Serial Interface is a DTE interface.

Appendix B. Asynchronous Communication

In serial data communications, individual bits of a character are transmitted consecutively to a receiver that assembles the bits back into a character. Data rate, error checking, handshaking, and character framing (start/stop bits) are pre-defined and must correspond at both the transmitting and receiving ends.

Asynchronous communications is the standard means of serial data communication for PC compatibles and PS/2 computers. The original PC was equipped with a communication, or COM, port that was designed around an 8250 Universal Asynchronous Receiver Transmitter (UART). This device allows asynchronous serial data to be transferred through a simple and straightforward programming interface. Character boundaries for asynchronous communications are defined by a starting bit, followed by a pre-defined number of data bits (5, 6, 7, or 8). The end of the character is defined by the transmission of a pre-defined number of stop bits (usual 1, 1.5, or 2).

An extra bit used for error detection is often appended before the stop bits. This special bit is called the parity bit. Parity is a simple method of determining if a data bit has been lost or corrupted during transmission. There are several methods for implementing a parity check to guard against data corruption. Common methods are called Even Parity or Odd Parity. Sometimes parity is not used to detect errors on the data stream. This is referred to as No Parity.

Because each bit in asynchronous communications is sent consecutively, it is easy to generalize asynchronous communications by stating that each character is wrapped (framed) by pre-defined bits to mark the beginning and end of the serial transmission of the character. The data rate and communication parameters for asynchronous communications have to be the same at both the transmitting and receiving ends. The communication parameters are baud rate, parity, number of data bits per character, and stop bits (for example, 9600, N, 8, 1).

