

Terminal Emulators



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Computer Terminals



In olden times, the human interface to a computer was a mechanical terminal connected by a serial cable. Characters were typed on a keyboard and the computer's response was printed on paper. Terminals using video screens of scrolling text eventually replaced them.

Terminal Emulator

An app that runs on a modern computer



A terminal emulator is a program connects to a PIT reader to type command and view the responses. Since it runs on a personal computer, there can be local functions such as saving the data to a file.

Terminal Emulator

- Terminal emulators exist for most operating systems
- They are often free or inexpensive
- Lots of good and lots of bad ones
- Some have telnet and SSH internet protocols

telnet and SSH (Secure Shell) protocols use ethernet or WiFi connections to access command consoles of remote devices.

Data Capture

- Scrollback buffer size is usually limited
- Capture files save everything to a storage device
 - Open a new file
 - Type commands to retrieve data
 - Wait until results finish
 - Close the file

Scrollback buffers allow viewing text that has scrolled off the screen. When uploading lots of data, this can exceed the size of the scroll buffer. The solution is to open a capture file to save everything on a storage device.

Serial Ports

Different types, depending on purpose

RS-232, USB, Bluetooth	Point to point
RS-422, RS-485	Point to multipoint
Ethernet, WiFi	Packet network

Connections to our readers can be using RS-232, Bluetooth or USB with the adapter cable. Our reader data network uses RS-422 to connect multiple readers together with cable lengths up to 1 KM between readers.

RS-232 Serial Port

- RS-232 is point-to-point serial connection
- Standards from 1960s with many variations
- Bits are sent by changing the voltage at a fixed rate
- -12V for 1, +12V for 0
- DB9 connector is commonly used



RS stands for recommended standard.

RS-232 Serial Port

- Data speed in bits per second (baud)
- Number of bits in a byte (modern systems use 8)
- Parity data check
 - Bit indicates if the number of 1's is even or odd
 - Often the 8th bit in byte (7 data bits plus parity)
- Stop bits - 1 or 2 sent between bytes

These are the minimum settings to configure an RS-232 serial port.

RS-232 Serial Port

- Hardware flow control
 - DTR/RTS pins have signals to start and stop data
- Software flow control (XON/XOFF)
 - ^S to stop data, ^Q to resume
- Local echo
 - If the device does not echo, local echo is needed

If data is being lost during transfer, flow control can tell the sender to stop the data until it is ready for more. Both ends need to support flow control.

Many devices will echo back characters as they are typed. If not, most terminal emulators will echo it locally to display what is being typed.

RS-232 Serial Port

- Line endings
 - CR Carriage return (cursor to left column)
 - LF Linefeed (shift vertical one line)
- Windows and our readers use both CR and LF
- Mac, Unix and Linux use LF

The end of a line of text can be either a carriage return, linefeed or both. If the lines are being double spaced, check the settings for the line ending.

RS-232 Serial Port

Miscellaneous Settings

- Character delay, line delay
- Backspace and Delete characters
- Buffer size for scrolling history
- Timestamp added to each line

Delays can add time between characters or lines if the data is too fast

Backspace moves the cursor back one but may not delete since that is a different character. Standards vary so settings are used to match.

Many emulators allow setting the size of scrolling buffer.

A timestamp can sometimes be added to each line to record the moment it arrived.

Not all emulators support the same features

Settings for ORFID Readers

- 115200 baud (previous reader model is 57600)
- No handshake
- 8 data bits
- No parity
- No echo

The Terminal Emulator Guide has specific reader settings for many terminal programs. The PDF is on the “Software and Manuals” page.

Serial Ports

- Windows COM port
 - RS232 port on older machines
 - USB is modern serial interface
 - Bluetooth is a COM port
- Identify COM number using the Device Manager

Windows identifies ports as COM and are numbered (COM1, COM2). They are used for USB ports, internal modems, Bluetooth and other serial devices. The Device Manager shows what is connected to each COM port which changes with each Windows configuration.

Serial Ports

- Mac, Unix and Linux use `tty` device name
 - List all ports with command `ls /dev/tty*`
 - USB-to-serial cable example `/dev/tty.usbserial-1470`
 - Bluetooth example `/dev/tty.ORFID_000123456`

Mac, Unix and Linux use device names starting with `tty` and are in the device folder `/dev`. Listing the directory of the folder shows all the devices. Serial devices start with `tty`.

Terminal Emulator Software

- Windows
 - Windows Terminal (built in)
 - Coolterm
 - Tera Term

Windows Terminal is an emulator built into Windows. Coolterm and Tera Term are two very good programs that are free.

Terminal Emulator Software

- Mac, Unix, Linux, Raspberry Pi
 - Coolterm
 - terminal, screen
 - minicom

Coolterm is available for MacOS and Raspberry Pi. terminal or screen apps are usually included with Unix and Linux. minicom is a popular program for the Raspberry Pi.

Terminal Emulator Software

- Android
 - Kai's Serial Bluetooth Terminal
 - Kai's Serial USB Terminal
 - Kai's Serial WiFi Terminal



A nice setup is an Android tablet with a waterproof case running Kai's Serial Bluetooth Terminal. Capture files can be stored on the tablet and emailed or uploaded to a cloud service.

Terminal Emulator Software

- iOS
 - Apple does not permit serial port access
 - telnet and SSH apps are allowed

Apple does not allow access to serial or Bluetooth ports in iPhones or iPads. Apps that use telnet and SSH protocols to connect over WiFi or ethernet are permitted.

Terminal Emulator Apps

putty encounters errors when updating reader firmware and is not recommended



Warning

Oregon RFID App for Android

Graphic interface that sends commands when buttons are pressed



Although it is not a terminal emulator, our app emulates a person by typing commands when buttons are pressed.

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