The Rolls-Royce Owners' Club of Australia

USB
Fitting a Digital Appliance to Your Car

USB - The Universal Serial Bus

By year 2000, the USB port had evolved into the predominant interface system for modern digital devices. It is continuing to become even more standardised and essential.

In addition to its fundamental data transfer feature, the compact USB Mini variant, functionally identical but with a compact plug and socket, is taking the lead in power supply configurations for daily devices such as mobile phones, cameras and hand-held computers.

The USB port is ideal for the interfacing of a multitude of external devices to host equipment. That host may be a computer, a motorcar, a television set or any manner of appliance.

A single USB socket may be safely expanded to multiple sockets, the limitation only being the power supply requirement of the combined applications to that expander.

On a common computer, the most common USB devices are the mouse, the keyboard, an external hard drive or DVD recorder, a memory stick, a VoIP-phone such as the ubiquitous Skype, a scanner, or a printer, to name but a few.

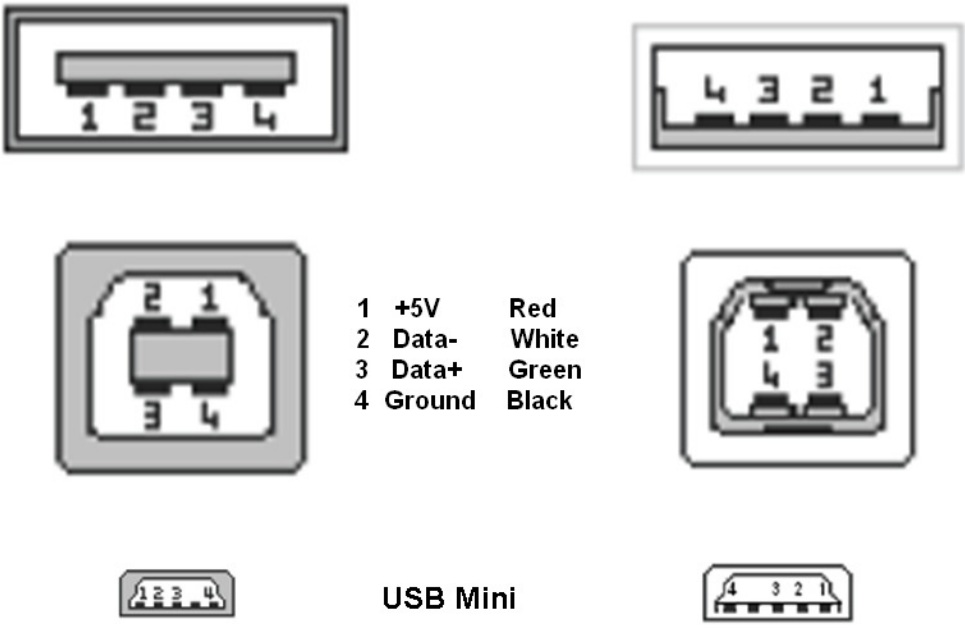
One host USB port may accommodate 127 slaves. The maximum data transfer rates are:

- 12 Mbit/sec for USB 1.1
- 480 Mbit/sec for USB 2.0

Sockets of standards USB 1.1 and Hi-Speed 2.0 have identical cables, sockets and pinouts.

Extremely handy is that USB provides a power supply for those devices, at a voltage of 5V and a limited combined current of 500mA. That makes it an ideal system for the standardisation of chargers for mobile phones, GPS systems and the like.

An external power supply is of course required for devices with larger current requirements.



The USB Socket The USB Plug

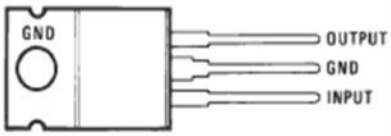
You may need to fit a USB socket indiscreetly to your car to power your electronic devices. Just find a discreet location for your USB socket.

It may be hidden completely for fixed devices, or simply concealed for removable devices. You may buy expensive kits commercially, or you may install a superior one.

Here you will see how to use a very inexpensive LM341-5.0 voltage regulator to apply a USB fitting to your car. The cost is a tiny fraction of that of a commercial kit, and the result will be magnitudes better.

The LM341

TO-220 Power Package (T)



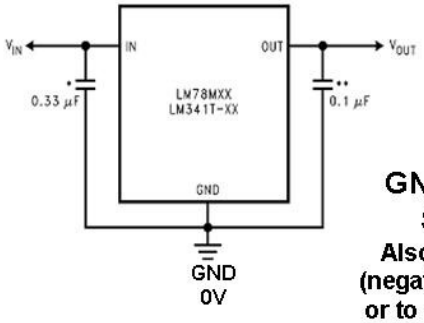
LM341-5.0, LM78M05C

Unless otherwise specified: V_{IN} = 10V, C_{IN} = 0.33 µF, C_O = 0.1 µF

Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_O	Output Voltage	I_L = 500 mA		4.8	5.0	5.2	V
		5 mA ≤ I_L ≤ 500 mA P_D ≤ 7.5W, 7.5V ≤ V_{IN} ≤ 20V		4.75	5.0	5.25	
$V_{R\ LINE}$	Line Regulation	7.2V ≤ V_{IN} ≤ 25V	I_L = 100 mA			50	mV
			I_L = 500 mA			100	
$V_{R\ LOAD}$	Load Regulation	5 mA ≤ I_L ≤ 500 mA				100	
I_Q	Quiescent Current	I_L = 500 mA			4	10.0	mA
ΔI_Q	Quiescent Current Change	5 mA ≤ I_L ≤ 500 mA				0.5	
		7.5V ≤ V_{IN} ≤ 25V, I_L = 500 mA				1.0	
V_n	Output Noise Voltage	f = 10 Hz to 100 kHz			40		µV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	f = 120 Hz, I_L = 500 mA			78		dB
V_{IN}	Input Voltage Required to Maintain Line Regulation	I_L = 500 mA		7.2			V
ΔV_O	Long Term Stability	I_L = 500 mA				20	mV/khrs

Input Voltage V_{IN}

to vehicle switched +12V (negative chassis vehicles) or to chassis (positive chassis vehicles)



Output: To USB Socket Pin 1

GND (0V) To USB Socket Pin 4

Also to vehicle chassis (negative chassis vehicles) or to switched -12V power (positive chassis vehicles)

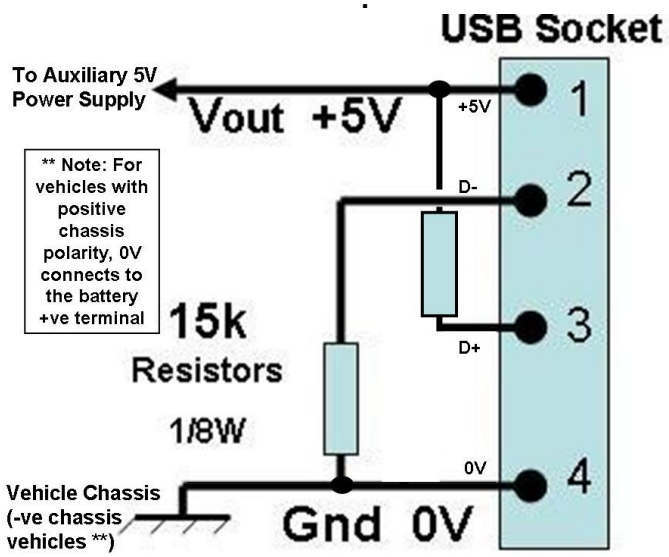
** Important Note for vehicles with a positive chassis polarity

In these cases, 0V connects to the battery -12V potential, and +12V connects to the chassis.

General Note

Pins 2 and 3 should either be connected to data or patched. They should not be left floating.
In order that the USB power supply be compatible with most USB devices wherever data connections are not available, the USB Socket's pins 2 (Data -) and 3 (Data +) should each be connected to Pin 4 (ground-chassis) and 1 (+5V) respectively using 15k resistors.

Some devices, including some MP3 players and GPS devices, will otherwise not charge



Recommended Connection Diagramme when No Data Connections are Available