5 Communications links

The TE3000/3001 has two communications links – USB and RS232.
The connection sockets are found on the rear of the unit, and cables are supplied.
Both links function in full duplex asynchronous serial mode, and are effectively wired in parallel.
Any transmission from the unit appears on both the USB and RS232 simultaneously.
Likewise, any transmission to the unit will be received simultaneously; hence it is important not to send commands through both links at the same time. This is rarely a problem as most users only use one communications link at a time.

The TE3000/3001 software automatically scans for a unit upon start up.

5.1 RS232

The RS232 link requires a standard 9 pin serial cable (supplied with the unit).
This is a useful link for older computers or custom setups.
The serial setup is fixed as follows:

Baud Rate	9600*
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Table 6: Serial port setup

**115200 is available on firmware V9.0 and above*

5.2 USB

The USB link requires a standard printer cable (supplied with the unit).
This link emulates an RS232 protocol over USB using FT232R hardware.
As such, it requires a driver on the computer to interpret the data.
This should be automatically installed with the TE3000/3001 software.
If required, the driver can be updated or re-installed any time by visiting the FTD website and downloading the appropriate virtual COM port (VCP) driver from:
http://www.ftdichip.com/Drivers/VCP.htm
Follow the installation guides.
Once installed, the USB link should appear on the computer as a comm. port device.
Note that the USB cable must be plugged in to both the computer and the TE3000/3001 before it will be recognised by the computer.
The serial setup is the same as the RS232 setup in table 6.

5.3 Serial communication format

The TE3000/3001 analyser accepts RS232 ASCII commands from any compatible source connected to either the USB or RS232 inputs. These commands are used by the software to generate and retrieve swept data from the device, but may be used by any custom program able to send and receive RS232 ASCII data. The format of both commands and returned data are listed in table 7. The unit returns data in its native format, polar impedance.

Command Issued Example	Explanation	Return Data Example	Explanation
V	Return version number	TE3000 F/W V1.0<cr>	Model and firmware version
H	Return current cal kit	N-m<cr> N-f<cr> SMD<cr> PROBE<cr>	Returns current cal kit
J	Return cal type	CUSTOM<cr> STD<cr>	Returns current cal type
K	Return cal start	100000<cr>	Current cal start is 100kHz
L	Return cal stop	300000000<cr>	Current cal stop is 300MHz
I	Return current serial data format	Format=REC Z (Freq,R,I) <cr>	Returns current serial data format
S68.43<cr>	Set sweep start frequency to 68.43Mhz	Start=68430000<cr>	Confirm start freq (Hz)
E120.4<cr>	Set sweep end frequency to 120.4MHz	Stop=120400000<cr>	Confirm stop freq (Hz)
P200<cr>	Set sweep frequency points to 200	Points=200<cr>	Confirm points
N	Perform a linear sweep from start frequency to end frequency with the set number of frequency points. Returned data is in the current serial data format set by the 'Cformat' command. Equation 1 below explains the linear frequency point distribution.	POL Z (Freq,Mag,Deg)<cr> 100000,1.618E-1,-9.438E-1<cr> 200000,0.548E-1,-9.589E-1<cr> 300000,-5.019E-2,-9.838E-1<cr> …. ….. 2000000,-1.678E-1,-9.465E-1<cr> END<cr>	The first line contains a description of the output format. Each successive line contains the measured value in scientific format at the designated frequency.
G<cr>	Perform a logarithmic sweep from start frequency to end frequency with the set number of frequency points. Returned data is in the current serial data format set by the 'Cformat' command. Equation 2 below explains the logarithmic frequency point distribution.	POL Z (Freq,Mag,Deg)<cr> 100000,1.618E-1,-9.438E-1<cr> 110000,0.548E-1,-9.589E-1<cr> 130000,-5.019E-2,-9.838E-1<cr> …. ….. 2000000,-1.678E-1,-9.465E-1<cr> END<cr>	The first line contains a description of the output format. Each successive line contains the measured value in scientific format at the designated frequency.

F45.67<cr>	Return a single measurement at the frequency of 45.67 MHz.	45670000,1.618E-1,-9.438E-1<cr>	Return data is in the current serial data format, set by the R command. This command is useful for arbitrary frequency lists.
B<cr>	Perform a linear interference scan from start frequency to end frequency with the set number of frequency points.	INTERFERENCE<cr> 100000,12.0<cr> 200000,6.7<cr> etc… 2000000,12.4<cr> END<cr>	The returned values are mVrms appearing at the input at the designated frequency.
Cformat<cr> …. polZ<cr> recZ<cr> polY<cr> recY<cr> polS<cr> recS<cr> VSWR<cr Q<cr>	Set serial data format: Polar impedance Rect impedance Polar admittance Rect admittance Polar reflection coef Rect reflection coef VSWR Quality factor	 Format=POL Z (Freq,Mag,Deg)<cr> Format=REC Z (Freq,R,I) <cr> Format=POL Y (Freq,Mag,Deg)<cr> Format=REC Y (Freq,R,I) <cr> Format=POL S (Freq,Mag,Deg) <cr> Format=REC S (Freq,R,I) <cr> Format=Freq,VSWR<cr> Format=Q<cr>	 Confirm data format
Caveraging<cr> …. 64<cr>	Set averaging to 64	Averaging=64<cr>	Confirm averaging
Coutput<cr> …. 20<cr>	Set RF output to 20%	Output=50%<cr>	Confirm output
Czo<cr> …. 35.0<cr>	Set Zo to 35.0Ω	Zo=35.0<cr>	Confirm Zo
Caveraging<cr> …. 64<cr>	Set averaging to 64	Averaging=64<cr>	Confirm averaging
Cmode<cr> …. S11<cr> or S21<cr>	Set measurement mode Reflection Transmission	 Mode=S11<cr> or Mode=S21<cr>	Confirm measurement mode
Cbaud<cr> …. 9600<cr> or 115200<cr>	Set baud rate 9.6k or 115.2k	 Baud=9.6k<cr> or Baud=115.2k<cr>	Confirm baud rate

Table 7: Serial communication format

<cr> is an ASCII carriage return equivalent to chr(13) or \r in C++

To calculate the value of the frequency points in a sweep:

Start=Start Frequency
Stop=Stop Frequency
Span=*Stop*–*Start*
Points=Total number of frequency points
Point=current point index (0,1,2….*Points*-1)

For a Linear Sweep use equation 1:

$$Frequency = Start + Span \frac{Point}{Points - 1}$$

For a Logarithmic Sweep use equation 2:

$$Frequency = Start \left(\frac{Start}{Stop} \right)^{\left(\frac{Point}{Points - 1} \right)}$$

The precision of any frequency command is 6 decimal places. For example S45.434565<cr> will set the start frequency to 45.434565MHz. This is stored in the analyser as a long integer and returned in integer format as: 45434565 Hz.

Be aware that other commands exist to up and download calibration data to the unit. Take care not to send arbitrary characters to the RS232 link, and inadvertently ruin the calibration data.