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32 Voltage Levels & Signals: DTR, CTS, RTS

*voltage levels are defined along with the handshaking requirements for lines
ng DTR, CTS, RTS.*

cludes:
asics   RS232 standard   Software handshaking   Signals & voltage levels   Pinouts & connectors
. connections   RS232 cables

a standards: Serial data standards   RS422   RS449   RS485   20 mA current loop

32 standards include defined levels for the lines along with a mode of operation for the handshaking.

y any RS232 system can be assured of its correct operation. If the voltages fall within the defined levels,
eceivers are able to correctly detect the data that is being transmitted, or the state of the other lines.

s fall outside the required limits, then there can be uncertainty and data errors.

32 voltage levels

nat the RS 232 transmitters and receivers can be designed to a common standard, it is necessary to define
e levels that constitute the two logical states required for data transmission. The two states are defined as
e below.

RS232 SIGNAL LINE VOLTAGE LEVELS

SIGNAL VOLTAGE LEVELS VOLTS	LOGICAL STATE
-3 to -25	1
+3 to +25	0

necessary to define the voltage states for the control signals as these are widely used within RS 232.

RS232 CONTROL LINE VOLTAGE LEVELS

CONTROL VOLTAGE LEVELS VOLTS	LOGICAL STATE
-3 to -25	OFF
+3 to +25	ON

32 serial data transmission

is sent serially on RS232, each bit is sent one after the next because there is only one data line in each
. This mode of data transmission also requires that the receiver knows when the actual data bits are arriving

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RS232 is normally sent using ASCII (American Standard Code for Information Interchange). However other cluding the Murray Code or EBCDIC (Extended Binary Coded Decimal Interchange Code) can be used ell.

data itself a parity bit is sent. Again this requires setting because it is optional and it can be even or odd s is used to check the correctness of the received data and it can indicate whether the data has an odd or ber of logic ones. Unlike many systems these days there is no facility for error correction.

stop bit is sent. This is normally one bit long and is used to signify the end of a particular byte. Sometimes pits are required and again this is an option that can often be set on the equipment.

ata transmission is normally asynchronous. However transmit and receive speeds must obviously be the certain degree of tolerance is allowed. Once the start bit is sent the receiver will sample the centre of each the level. Within each data word the synchronisation must not differ by more than half a bit length otherwise rect data will be seen. Fortunately this is very easy to achieve with today's accurate bit or baud rate s.

2 Handshaking

nat data can be exchanged on an RS232 link, the control signals must indicate that the equipment at either e link is ready to send the data and ready to receive the data. This can be achieved in a number of ways, but e more common is to use the RTS , CTS, and DTR lines.

es are found in the Data Terminal Equipment, DTE and Data Communications Equipment, DCE as follows:

RS232 HANDSHAKING LINE DEFINITIONS

| LINE ABBREVIATION	LINE NAME	EQUIPMENT
RTS	Request to Send	DTE
CTS	Clear to Send	DCE
DTR	Data Terminal Ready	DTE

shaking exchange to start the data flow is quite straightforward and can be seen as a number of distinct

 put in the ON state by the DTE

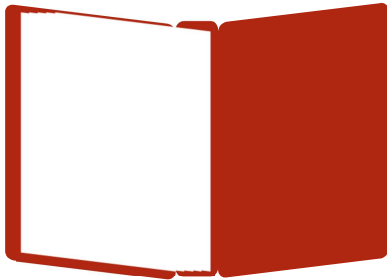CE then puts the CTS line into the ON state

TE then responds by placing the DTR line into the ON state.

TR line remains on while data is being transmitted.

RS232 handshaking signals
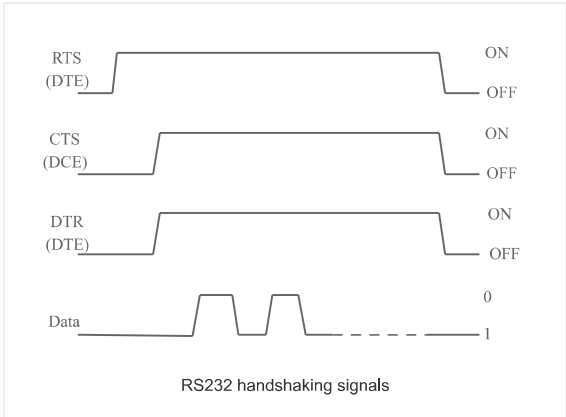
d of the transmission, DTR and RTS are pulled to the OFF state and then the DCE pulls the CTS line to the e. This series of handshake controls was devised to allow the DTE to request control of the communications the related modem, and then to let the modem inform the terminal equipment that the control has been

⌄ addition to this the operation of the handshaking with lines including RST, CTS and DTR, the of the system can be reliable and only send data when all equipment is ready.

PREVIOUS PAGE   NEXT PAGE

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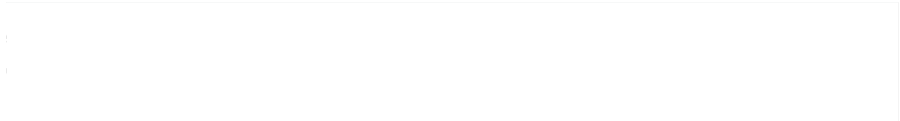
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