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Break definition

17 posts by 13 authors

John Antypas

9/7/88

I purchased a California Communications Corp. 2400 baud internal modem.
Overall, it works just fine under Unix, but I have yet to be able to
send a "break tone". The problem appears to be that CCC didn't know how
to handle a break. They claim the modem has a litteral serial port
on it so there should be no problems but...
CCC is willing to correct the problem but they need to know how to handle
the break. After all, there is no such thing as a break character. What
must they do to send a break and what do they do when a "break" is received?
How do external modems do this?

Many thanks.

Click here to Reply

Michael H. Warfield

9/8/88

- hide quoted text -

In article <402@ucrmath.UUCP> jantypas@ucrmath.UUCP (John Antypas) writes:
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>

        A break is sent on an async line by placing the line in
the "low" or "spacing" state (level, tone, what-ever) for two or
more charracter times. To a receiver this would be seen as a
charracter of all zeros, with a framing error (no stop bit) and
lasting at least 20 bit times (16 data bits plus 2 start bits
plus two stop bits total across the 2 charracter times). Note
that that is AT LEAST. Some UARTS support long and short breaks
where short breaks are of the same order of magnitude as two
charracter times but a long break may be 1/4 second or longer!
The modem per se should have little to do with a break (he simply
holds his transmission to send a looooonnnnnnngggggg series of
zero bits) but the UART or SIO has everything to do with it.
Some modems will, however, disconnect and drop carrier in the
event of a "long break". Some, but not all.

Michael H. Warfield (The Mad Wizard) | gatech.edu!galbp!wittsend!mhw
  (404) 270-2170 / 270-2098 | m...@wittsend.LBP.HARRIS.COM
An optimist believes we live in the best of all possible worlds.
A pessimist is sure of it!

DugalJP

9/8/88

In article <402@ucrmath.UUCP> jantypas@ucrmath.UUCP (John Antypas) writes:

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A break can be detected by many UARTS as a NULL received with a framing
error. Think of a break as a start bit that persists for much longer that
a character time, perhaps 250 ms. Many uarts can be programmed to send a
break with a special order, but if not, changing to the slowest baud and
sending a null might work. This of course is a real kludge and has nasty
side effects if the uart can't support different send and receive bauds.

Good luck getting your modem fixed ... I'm doubtful they'll fix it.

You may be able to add a break switch to your modem by modifying the
input to the RS232 line driver chip.

--
-- James Dugal,   N5KNX   USENET: ...!{dalsqnt,killer}!usl!jpd
Associate Director   Internet: j...@usl.edu
Computing Center   US Mail: PO Box 42770 Lafayette, LA 70504
University of Southwestern LA.   Tel. 318-231-6417   U.S.A.

Rick Richardson

9/9/88

In article <60...@galbp.LBP.HARRIS.COM> mhw@wittsend.UUCP (Michael H. Warfield) writes:
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>the "low" or "spacing" state (level, tone, what-ever) for two or
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>that that is AT LEAST. Some UARTS support long and short breaks

Where did you find the citation that a break is at least 20 bit times?
The only citation I could find (in some obscure CCITT spec) defined
break as the space condition for at least 130 milliseconds. There
was no formula based on the bps that the interface was operating at.

I'm not saying you are wrong, just that a while back I tried to
find this information and wasn't really happy with finding just
the one definition. I'm also not saying that all devices do this.
There are definitely devices that work the way you describe.

I believe that sending break as 130 milliseconds or longer of space (0)
is a better definition, though. No matter what the receiver
speed is set to (if greater than 110 bps), the receiver is
guaranteed to see a break.

I think the best bet is to try to detect short breaks if you
can, but always generate at least the full 130 milliseconds,
if not longer. Then again, a modem, or other communications (DCE)
device, should attempt to reconstruct the signal at the far end
as near as possible to the way it came in at the near end.
Garbage in...garbage out!!!! Short breaks in, short breaks out.
--
                Rick Richardson, PC Research, Inc.
                rick%pcrat.uucp@uunet.uu.net (INTERNET)
                   uunet!pcrat!rick (UUCP, Personal Mail)
..!pcrat!jetroff (JetRoff Info)   ..!pcrat!dry2 (Dhrystone Submissions)

Henry Spencer

9/10/88

In article <60...@galbp.LBP.HARRIS.COM> mhw@wittsend.UUCP (Michael H. Warfield) writes:

>>CCC is willing to correct the problem but they need to know how to handle
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>The modem per se should have little to do with a break (he simply
>holds his transmission to send a looooonnnnnnnggggggg series of
>zero bits) but the UART or SIO has everything to do with it.

At 300 baud, yes. At 2400, not so. Higher-speed modems are *NOT* just
transmitting the RS232 signal as tones; they are actually receiving the
characters, packaging them up in odd ways (e.g. more than one bit per line

the RS232 signal has to make sense (that's why fast modems have settings
for things like number of bits per character). It also means that
break requires special attention, since it is *not* a character! Tell
CCC to look up the V.22bis spec, which describes the signals on the wire
for a 2400-baud modem; it will tell them how to send a break over the
wire, and with luck will also tell them exactly when to send one and what
to do when they receive one.

Don't be too optimistic. If CCC does not know this stuff already, I
wouldn't buy a modem from them if it cost $4.95. They are incompetent.
They are not the only ones; this problem has been seen before.
--
NASA is into artificial | Henry Spencer at U of Toronto Zoology
stupidity. - Jerry Pournelle | uunet!attcan!utzoo!henry he...@zoo.toronto.edu

mhy...@cup.portal.com

9/11/88

In message <569@pcrat.UUCP> rick@pcrat.UUCP (Rick Richardson) asks:

> Where did you find the citation that a break is at least 20 bit times?
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> break as the space condition for at least 130 milliseconds. There
> was no formula based on the bps that the interface was operating at.

First some background:

  The bit (not baud) rate between the DTE side and the TELCO side of a
modem may differ. Using V.22bis (standard 2400 bps modem) as an example:
The spec calls for an TELCO bit rate of 2400 b/s +/- 0.01%. The DTE side
is allowed the range of 2400 b/s +1.0%, -2.5%. [+2.3%, -2.5% in modems with
``extend signalling rate range (optional)'' implemented].

  To handle the possible overspeed on input a modem is allowed to delete
stop bits now and again (no more than one stop bit deleted in every 8
characters sent [4 characters with extended option]). When the receiving
modem receives a character with a missing stop bit from the TELCO it adds
a stop bit to the DTE. It makes time for the added stop bit by making it
and the next 7 stop bits 12.5% shorter than a standard bit. [25% shorter
for the next 4 stop bits with the extended option].

  What does this have to do with a break? A break must be ``2M + 3'' bits
long at the receiver. This requirement allows the receiver to tell the
difference between a break and consecutive NULL characters, the first with
a deleted stop bit. Section 4.1.3 of V.22bis says:

        If the converter detects M to 2M + 3 bits all of ``start''
        polarity, where M is the number of bits per character in the
        selected format, the converter shall transmit 2M + 3 bits of
        ``start'' polarity.

M is typically 10 in async mode and 8 in sync mode.

--Marc

Marco S. Hyman   ...!sun!portal!cup.portal.com!mhyman
                       mhyman@cup.portal.com

Carl S. Gutekunst

9/12/88

Break definition (Some Answers from the Standards, LONG)

>Higher-speed modems are *NOT* just transmitting the RS232 signal as tones;
>they are actually receiving the characters, packaging them up in odd ways
>(e.g. more than one bit per line transition), and reversing the process at
>the other end.

Um, this is rather oversimplified. Allow to me explain, and in doing so give a
partial answer to the original question. There are several levels of things
going on here, each of which impose their own constraints.

First is the modulation scheme: how bits are encoded on the wire. All modems
at 300 bits-per-second or slower use frequency shift keying (FSK), which just
means that one tone means a mark (1) bit, and another tone means a space (0).
Note that an FSK modem is not transmitting bits per se; it is sending

the current state of the RS-232 Transmit Data line as a tone. The line can change state whenever it wishes, and the modem will follow.

Modems at 1200 bps and above all use some kind of phase-shift encoding, where multiple bits of data are encoded into a single phase shift of a carrier tone. Bell 212 and V.22 (1200 bps) use phase encoding (PE), where a pair of bits are represented by one of four phase changes: 0, 90, 180, or 270 degrees. V.22bis (2400 bps) modems use quadrature amplitude modulation (QAM), in which two bits specify an x-y quadrant, and two more bits specify a shift of phase and amplitude within the quadrant; so four bits are encoding in a single state change. In V.29 (9600 bps), the first bit specifies amplitude, and the next three specify phase angle (0, 45, 90, 135, etc.); again, 4 bits are encoded into a single state change.

V.32 (9600bps full duplex) defines two schemes: QAM similar to V.22bis, and a five-bit variation of QAM called trellis coding. In trellis coding, four bits are still encoded into a single state change, but a "redundant" bit is also calculated, for 32 distinct QAM states. (Anybody know how trellis coding got that name? I'd guess that is comes from the way that two of the data bits and the redundant bit are permuted based on the bits in the previous five-bit group. The bits climb all over themselves, like flowers climbing a trellis.)

In each case there exists a precise one-to-one relationship between _ b_ i_ t_ s on the digital side and state changes on the wire. This is very different from FSK, which is insensitive to bit boundaries. But note that the phase-encoding techniques remain insensitive to _ c_ h_ a_ r_ a_ c_ t_ e_ r framing. All characters are just
concatenated strings of bits, and break is just a string of space bits.

These high-speed standards were all designed for synchronous communications, in which all the bits dance in lockstep to the beat of the modem's clock. In asynchronous (which is what we all use for dialup and UUCP), the data bits are framed according to the transmitter's internal clock. This clock will almost certainly not even be the same speed (much less the same phase) as the modem's clock. This creates a major dilema: the modem _ m_ u_ s_ t run at exactly its nominal bits-per-second speed, but it has no control over the speed of the data being sent to it.

So the V.22bis standard provides a lengthy set of rules for how asychronous devices must behave. The critical elements of the V.22bis asynchronous specification are:

- The amount by which the asynchronous bit rate may deviate from the nominal speed of 2400bps. If the transmitter is running a little faster, then the modem must occasionally discard stop bits. If the transmitter is running slow, then the modem has to occassionally add stop bits.

- The precise specification of a break signal: from _ M to 2_ M+3 consecutive start (space) bits, where 'M' is the number of bits per character. In fact, if the modem receives a break shorter than 2M+3 bit times, it is required to extend it to the full time. Breaks longer than 2M+3 bits are passed through for their full duration. And a break must always be followed by 2_ M stop (mark) bits, to allow the receiver to resynchronize.

So, the real reason why fast modems need to know how many bits-per-character are being used is so they know where the stop bits are. And breaks are defined so that the modems will know when the normal progression of character frames is disrupted. (By the way, V.22bis only allows character sizes of 8, 9, 10, and 11 bits. Those of us in the UNIX and PC worlds always use is 10 bits: 1 start; 8 data; 1 stop.)

An added restriction arises in all _ p_ r_ a_ c_ t_ i_ c_ a_ l implementations of V.22bis and
other high-speed modems: they use microprocessors and UART chips. UART chips, being character oriented devices, are very fussy about character framing. :-)

Finally, modern modems are often "smart." At the least, they accept command strings to do autodialing and set options. At the most, they have modem protocols like Microcom's MNP and Telebit's PEP that bundle up characters, strip off the start and stop bits, perform compression, and do a lot of other character-oriented shredding. Here there is actual interpretation of the data going on, and the modem's CPU needs to know a lot more about the data than it does to simply satisfy the encoding scheme.

None of which answers the original question. :-)

The problem is that the CCC is an internal modem. When dealing with an external modem, you talk to a serial interface on the PC. The serial interface has

port with a bit in it that, when set by the CPU, drives the Transmit Data line into the space state. To send a break, the CPU sets this bit, spins for the appropriate number of CPU cycles, and then clears the bit. Voila, a break.

For the CCC modem, then vendor has to supply something equivalent: a bit that you can assert to cause a break. If they are really clever, they'll make it a toggle, so that the modem itself will time the break rather that you having to use the PC's CPU or timer to do it. An ugly alternative is an escape sequence: you send a magic sequence of characters, and the modem sends a break. My Cermetek 199A modem does this, and it's useless; UUCP uses *all* the characters, so I have to disable the modem's escape character.

<csg>

Carl S. Gutekunst

9/12/88

Break definition (Some Answers from the Standards, LONG)

Someone's gonna flame me for it elsewise, so I suppose I should mention how a Telebit TrailBlazer works. (I suppose this is preaching to the choir, but if you've carried through this far I might as well finish the job.)
The TrailBlazer uses a proprietary modulation scheme called Dynamic Adaptive Multicarrier Quadrature Amplitude Modulation (DAMQAM). Rather than the single high-frequency carrier used by other modulation schemes, the TrailBlazer uses 511 different low-frequency carriers. Each is QAM modulated at a rate of 12 baud (that is, 12 state changes per second); so each carrier has a data rate of 48 bits per second. Each carrier can be slowed down to 8 or 4 baud (32 or 16 bps), or dropped entirely. On real phone lines, quite a few carriers are dropped, and a number are slowed down to 8 baud; so the theoretical speed of 24528 bits per second is reduced to a real maximum of 18031. (Why an odd number? I don't know.) Note that since DAMQAM modulation broadcasts across the entire bandwidth of the telephone line, it is half duplex -- only one end can be transmitting at a time.

On top of DAMQAM, Telebit uses a proprietary data packetizing scheme, the Packetized Ensemble Protocol (PEP) that we've all come to know and love. PEP incorporates error correction, and a family of dataflow prediction schemes that make the modem appear to be full-duplex. This latter process is called "Adaptive Duplex," a term to which both Telebit and Racal-Vadic claim trademarks (the latter for the RV 9600-VP modem).

PEP and DAMQAM are trademarks of Telebit Corp, too. MNP is a trademark of Microcom. But you knew that, didn't you?

<csg>

Anthony A. Datri

9/13/88

Break definition (Some Answers from the Standards, LONG)

In article <39...@pyramid.pyramid.com> c...@pyramid.pyramid.com (Carl S. Gutekunst) writes:

>means that one tone means a mark (1) bit, and another tone means a space (0).
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So *that's* why modems are rated at 0-300 baud, not just 300 baud. I could _ n_ e_ v_ e_ r understand that before.

--
@disclaimer(Any concepts or opinions above are entirely mine, not those of my employer, my GIGI, or my 11/34)
beak is beak is not
Anthony A. Datri,SysAdmin,StepstoneCorporation,stpstn!aad

Michael H. Warfield

9/13/88

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