



# AN08 - RX ERRORS When Monitoring CAN Data

Seeing RX ERRORS when trying to monitor CAN data with your ELM327 or ELM329 based scan tool? Maybe this application note can help.

Many people are familiar with using the AT MA, AT MR and AT MT commands for monitoring messages on an OBDII data bus. With CAN systems, we also provide the AT CRA command as well as the AT CF and AT CM commands. Now, as of version 2.3 there is an AT FT command as well.

With so many ways to monitor data flow, it is no wonder that vehicle manufacturers are starting to limit the data that you can see, and also limit how you can physically gain access to this data. Gateway circuits are beginning to appear and for good reason. A test gone wrong with an experimental circuit that you connect to a vehicle should never compromise the operation of the vehicle.

When OBD testing first began, scan tool designs were based on the assumption that they were to be connected to an active data bus. In the case of CAN systems, that meant that there would already be two bus terminating resistors in place, and that there would be at least two devices communicating on the bus. With some gateway circuits, this may not be the case, however, and as a result you may need to change how you communicate with some vehicles.

One problem that we have occasionally seen are receive error messages when attempting to monitor the CAN bus in some vehicles. In these cases, it was found that the problem was actually due to the fact that our integrated circuits (the ELM327 and the ELM327L, as well as the ELM329 and ELM329L) do not normally send an acknowledge bit while listening to the CAN data. That is, they normally operate in a 'silent mode' while monitoring.

If you begin experiencing receive errors while monitoring data, your problem may also be due to the use of the 'silent mode'. What you might see is something like what we found with one vehicle that we tested:

```
ELM327 v2.3

>AT H1
OK

>01 00
SEARCHING...
7E9 06 41 00 98 1A 80 13
7E8 06 41 00 BF 9F A8 93
```

```
>AT MA
4E0 24 00 44 01 00 00 00 00 <RX ERROR
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00 <RX ERROR
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00 <RX ERROR
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00 <RX ERROR
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00 <RX ERROR
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
BUFFER FULL

>
```

As you can see, there were a great number of errors reported. By turning the CAN Silent Mode off, that same vehicle then reported:

```
ELM327 v2.3

>AT H1
OK

>0100
SEARCHING...
7E9 06 41 00 98 1A 80 13
7E8 06 41 00 BF 9F A8 93

>AT CSM0
OK

>AT MA
45A 5A 04 00 44 01 00 00 00 <DATA ERROR
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00 <DATA ERROR
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00 <DATA ERROR
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00 <DATA ERROR
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00 <DATA ERROR
45A 5A 04 00 44 01 00 00 00 <DATA ERROR
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00 <DATA ERROR
4E0 24 00 44 01 00 00 00 00
STOPPED

>
```



## AN08 - RX ERRORS When Monitoring CAN Data

It seems that all of the messages are now being received correctly (since the receive error messages are gone), but there are a number of data errors being reported instead. While the Rx Errors do take priority over Data Errors, the data errors are actually being correctly reported in this case, as 5A is not a valid PCI byte for OBDII messages.

Turning off the automatic formatting function will eliminate checks for valid OBDII messages, and stop these data errors from being reported. This is shown in the following log from our testing:

```
ELM327 v2.3

>AT H1
OK

>0100
SEARCHING...
7E8 06 41 00 BF 9F A8 93
7E9 06 41 00 98 1A 80 13

>AT CSM0
OK

>AT CAF0
OK

>AT MA
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
STOPPED

>01 00
SEARCHING...
7E8 06 41 00 BF 9F A8 93 00
7E9 06 41 00 98 1A 80 13 00

>
```

Notice that when a standard OBDII request was made at the end of that session, the ELM327 then responded with 'SEARCHING...' before the data appeared. This is because the current protocol had

been deactivated (closed) when monitoring began. This is always done when monitoring begins to ensure that the IC is as silent as possible - no periodic (wakeup) messages sent, no in frame response bytes inserted, and no acknowledge bits sent (unless enabled with AT CSM0).

Finally, combining all of the above with an AT FT filter to only see messages with E0 (and then 5A) in the second and third ID digits, results in:

```
ELM327 v2.3

>AT H1
OK

>0100
SEARCHING...
7E9 06 41 00 98 1A 80 13
7E8 06 41 00 BF 9F A8 93

>AT CSM0
OK

>AT CAF0
OK

>AT FT E0
OK

>AT MA
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
4E0 24 00 44 01 00 00 00 00
STOPPED

>AT FT 5A
OK

>AT MA
45A 5A 04 00 44 01 00 00 00
45A 5A 04 00 44 01 00 00 00
45A 5A 04 00 44 01 00 00 00
45A 5A 04 00 44 01 00 00 00
45A 5A 04 00 44 01 00 00 00
45A 5A 04 00 44 01 00 00 00
45A 5A 04 00 44 01 00 00 00
45A 5A 04 00 44 01 00 00 00
STOPPED

>AT FT
OK

>AT MA
```



## AN08 - RX ERRORS When Monitoring CAN Data

---

```
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
45A 5A 04 00 44 01 00 00 00
4E0 24 00 44 01 00 00 00 00
STOPPED
```

>

As you can see in the last portion of this log, sending AT FT without any address being specified removes the FT filter, and all of the messages are then shown.

To summarize, when you see receive errors appearing in your monitored data, it may not be because of any failure in your scan tool, or in your vehicle. It may well be that how that vehicle communicates is different from previous ones that you've tested, and that you need to modify your testing procedure because of it.

We hope that this application note was of help to you. Let us know if you have suggestions for others, as you may not be the only person having the same problem.