

Packet Spilling of Small Packets After Parity Error/Bad Address for UT200SpW4RTR SpaceWire Router

Table 1: Cross Reference of Applicable Products

Product Name:	Manufacturer Part Number	SMD #	Device Type	Internal PIC*
4-PORT SPACEWIRE ROUTER	UT200SpW4RTR	NA Note 1	NA	WD41A

Note 1: WD41A will not be sold against the SMD. All SMD shipments will be with Rev B Silicon.

*PIC = Product Identification Code

1.0 Overview

An anomaly with the 4-Port SpaceWire router has been discovered that can cause 8 bytes of a packet following an error packet to be spilled per ECSS-E-ST-50-12C, section 10.5.2.c.

The conditions that will cause the anomaly are a small packet (less than 200 bytes), and a parity error occurs in the look up table space (0x0020 – 0x00FF), or a bad/invalid address (per ESCC-E-ST-50-12C section 11.3.4), combined with the internal receive FIFO flag for the target port being not empty. It should be noted that if a parity error in the look up table space occurs the user should rewrite the look up table configuration space (0x0020 to 0x00FF). See Figure 1 for failure logic diagram.

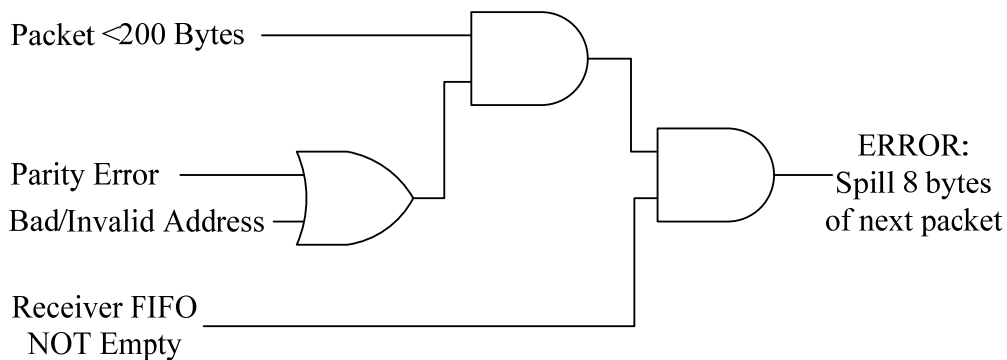


Figure 1. Logic Diagram of Anomaly

The conditions described will cause 8 bytes of the packet following the error packet to be spilled. There is a chance that the router will continue to spill 8 bytes of a packet following an error packet if parity errors and bad addresses are continuously sent.

Based on preliminary data the probability of this anomaly occurring is once every 9,800 years with the UT200SpW4RTR in operation in a geosynchronous orbit and the Adam's 90% worst case environment.

2.0 Corrective Action

This anomaly can be prevented by ensuring that the packets on the SpW network are larger than 200 bytes, ensuring that there are no Parity Errors, or Bad Address packets on the network. If the anomaly is encountered two options are offered that will recover the UT200SpW4RTR into normal operation.

2.1 Option #1

The first option is to clear the receive FIFO of the SpaceWire port on which the anomaly has occurred. This can be accomplished by writing to configuration register 0x0115. The following example demonstrates how to reset the faulted FIFO.

Assume that port 2 of the UT200SpW4RTR encountered the anomaly and is spilling packets. The user writes to the bit that corresponds to port 2 in register 0x0115.

**Please note that additional address bytes may be required, depending on the user's system configuration.

Write the following byte sequence directly into port 5 of the router;

- No Address Bytes are required

- 0x00: for configuration

- Router ID: 00 as default assuming router ID has not been set

- Protocol ID: 00 for no protocol used

- Packet Type: 00 is Write

- Set up Configuration Space:
 - Address LSB: 15 for Receive FIFO Reset
 - Address MSB: 01

- Write in Data:
 - Data LSB: 02 this corresponds to port 2 MSB [0][0][0][1][0] LSB
 - Data MSB: 00

- Checksum: 0x18. This is the sum of the final destination address, router ID, packet type, address, and data bytes.
 $0x00+0x00+0x00+0x15+0x01+0x02+0x00 = 0x18$

- EOP: 100000000

The SpaceWire packet takes the form shown in Figure 2. Figure 3 shows the same SpaceWire packet in data character format.

	00	00	00	00	15	01	02	00	18	10000000
0 or More Address Bytes	0x00	Router ID	Protocol ID	Packet Type	Address LSB	Address MSB	Data LSB	Data MSB	Check Sum	EOP

Figure 2. Corrective Action #1 packet format

EOP	1	0	0	0	0	0	0	0	0	
Check Sum	0	0	0	0	1	0	0	1	0	0x18
Data MSB	0	0	0	0	0	0	0	0	0	0x00
Data LSB	0	0	0	0	0	0	0	1	0	0x02
Address MSB	0	0	0	0	0	0	0	0	1	0x01
Address LSB	0	0	0	0	1	0	1	0	1	0x15
Packet Type	0	0	0	0	0	0	0	0	0	0x00
Protocol ID	0	0	0	0	0	0	0	0	0	0x00
Router ID	0	0	0	0	0	0	0	0	0	0x00
0x00	0	0	0	0	0	0	0	0	0	0x00
	8									0

Figure 3. Corrective Action #1 data character format

2.2 Option #2

The second option to recover from the anomaly is to reset the router. Resetting the UT200SpW4RTR is accomplished by writing to register 0x0114. A write command to this address will reset the entire router, and the user will need to reconfigure.

The following sequence shows how to reset the entire router. **Please note that additional address bytes may be required, depending on the user's system configuration.

Write the following byte sequence directly into port 5 of the router.

- No Address Bytes required
- 0x00: for configuration
- Router ID: 00 as default assuming router ID has not been set
- Protocol ID: 00 for no protocol used
- Packet Type: 00 is Write

- Set up Configuration Space:
 - Address LSB: 14 for Receive FIFO Reset
 - Address MSB: 01
- Write in Data:
 - Data LSB: 00
 - Data MSB: 00
- Checksum: 0x15. This is the sum of the final destination address, router ID, packet type, address, and data bytes.
 $0x00+0x00+0x00+0x14+0x01+0x00+0x00 = 0x15$
- EOP: 100000000

The SpaceWire packet and data character format take the from shown in Figures 4 and 5.

	00	00	00	00	14	01	00	00	15	100000000
0 or More Address Bytes	0x00	Router ID	Protocol ID	Packet Type	Address LSB	Address MSB	Data LSB	Data MSB	Check Sum	EOP

Figure 4. Corrective Action #2 packet format

EOP	1	0	0	0	0	0	0	0	0	
Check Sum	0	0	0	0	1	0	1	0	1	0x15
Data MSB	0	0	0	0	0	0	0	0	0	0x00
Data LSB	0	0	0	0	0	0	0	0	0	0x00
Address MSB	0	0	0	0	0	0	0	0	1	0x01
Address LSB	0	0	0	0	1	0	1	0	0	0x14
Packet Type	0	0	0	0	0	0	0	0	0	0x00
Protocol ID	0	0	0	0	0	0	0	0	0	0x00
Router ID	0	0	0	0	0	0	0	0	0	0x00
0x00	0	0	0	0	0	0	0	0	0	0x00
	8									0

Figure 5. Corrective Action #2 data character format

3.0 Rev A vs. Rev B

Revision A of the UT200SpW4RTR contains this anomaly. Revision B will correct this errata.