

ViaSat PDC Interoperability Report

This report outlines the results of an investigation into the interoperability of the ViaSat VDC-400 (PDC) with the AN/PSC-5 (EMUT) radio and Motorola Saber II handheld radio.

AN/PSC-5

An interoperability problem was reported between the VDC-400 (with version 3.1.80 firmware) and the PSC-5 (with version 5 firmware). The problem seemed to center around the signalling interface between the PSC-5 and VDC-400.

Observations

The Clear to Send (CTS) output from the EMUT Radios seemed glitchy in the following ways:

1. The first type of glitch occurred after Request to Send (RTS) had been asserted by the PDC, but before the TX Clock from the PSC-5 started. This seemed to cause the PDC to transmit only the first 4 bytes of a message (3 sets of 0xBB and the first byte of SOM) and then send 0xBB for the remainder of the transmission. Message transmission was only affected if the selected PDC Crypto mode used CTS, such as KG-84 Half Duplex. Other PDC modes which did not wait for CTS (eg. KY-57 and ANDVT) allowed messages to transmit reliably.
2. The second type of glitch occurred in the very beginning of transmission. In this case, the CTS and TXC signals would become inactive shortly after the beginning of transmission (usually about 4ms at 2400 bps) and both signals would resume after about 1ms. It is unclear how this glitch caused problems, since the glitch occurred during the transmission of the header pad characters. Setting the PDC's Turn-Around Delay parameter to be greater than 2.0 seconds seemed to solve this problem.

PDC Firmware Fixes

The PDC's Interrupt Service Routine was modified to reset SCC interrupts twice before exiting the ISR. This caused the problems associated with the first type of glitch to go away. All other firmware changes were unable to alleviate the second type of glitch, however raising the Turn-Around Delay did help. Some recent code changes have ensured that the Turn-Around Delay is operating properly, which may not have been the case earlier (i.e. Turn-Around Delay was not being obeyed in some RX to TX turnarounds).

Conclusions

PDCs that have version 3.1.80 firmware should be configured to use ANDVT crypto mode when connected to a PSC-5. PDCs using newer firmware should use the KG-84 Half Duplex setting, although ANDVT mode will also work. All PDCs interfacing to EMUTs should set the Turn Around Delay parameter to be greater than 2.0 seconds. All of these settings should also apply to the other members of the ADC family, although they have not all been fully tested.

Cable Connections

Below is a table of the cable connections we used when testing the PDC with the AN/PSC-5 radio. The PDC connector is ViaSat part number CBL-009090-0000. The AN/PSC-5 AUX connector part number is MS27467T15B35S. A fully assembled cable is available from ViaSat, part number CBL-009075-0000.

Signal Mnemonic	PDC Pin Number (Color)	AN/PSC-5 AUX Conn. Pin Number	Description
RXC	2 (Black/White)	4	Receive Clock Input
RXD	4 (Brown/White)	5	Receive Data Input
DCD	5 (Red)	6	Data Carrier Detect
TXC	7 (Orange)	4	Transmit Clock Input
RTS	8 (Orange/White)	29	Request to Send Input
CTS	10 (Yellow/White)	28	Clear to Send Input
TXD	11 (Green/White)	3	Transmit Data Output
GND	12 (Green)	2, 20, 26	Signal Ground

SABER II Handheld Radios

The following interoperability problem with the VDC-400 and Saber II handheld secure radio was reported. If the PDC and Saber radio were not powered on in a specific sequence, data transmission would not be successful. Further, the PDC had to be configured for operation with a STU-III to work at all.

Observations

The PDC - Saber II interface required a specific startup sequence in order to ensure proper operation. The PDC and DTS/Win needed to be powered up and running before the Saber II was turned on. The Saber II would also need to be power cycled after a PDC reset. If this sequence was not obeyed, data transmissions would not be successful. When the PDC was powered up, it would pulse the Push to Talk (PTT) and Request to Send (RTS) signals, which the Saber radio did not like. This PTT pulse would cause the Sabre radio connected to the PDC to not transmit. The PDC had to be configured for STU-III operation, since in this mode it uses separate transmit and receive clocks and waits for a CTS from the crypto. However in this mode, the PDC also thinks the crypto is full duplex, yet the Sabre radios are half duplex. With the PDC configured for operation with a STU-III, if the Turn-Around Delay was non-zero, the PDC would not transmit after receiving data, since the clocks from the Saber are continuous.

PDC Firmware Fixes

The PDC firmware was modified to eliminate the PTT pulse upon startup. This caused the PDCs to be able to transmit messages, regardless of the powerup sequence. The

STU-III mode Turn-Around Delay was fixed to allow the PDC to transmit after a reception, even with the receive clock running.

Conclusions

When operating with a Saber II radio, the PDC needs to be configured for operation with a STU-III. The PDC's Turn-Around Delay parameter can be any value. All of these settings should also apply to the other members of the ADC family, although they have not been fully tested.

Cable Connections

Below is a table of the cable connections we used when testing the PDC with the SABER II radio. The PDC connector is ViaSat part number CBL-009077-0000. The SABER II data connector is ITT Cannon part number MIKQ6-7SH003.

Signal Mnemonic	PDC Pin Number (Color)	AN/PSC-5 AUX Conn. Pin Number	Description
RXC	2 (Black/White)	3	Receive Clock Input
RXD	4 (Brown/White)	5	Receive Data Input
DCD	5 (Red)	2	Data Carrier Detect
TXC	7 (Orange)	3	Transmit Clock Input
RTS	8 (Orange/White)	6	Request to Send Input
CTS	10 (Yellow/White)	4	Clear to Send Input
TXD	11 (Green/White)	7	Transmit Data Output
GND	12 (Green)	SHIELD	Signal Ground

PDC Firmware

A firmware upgrade is necessary for interoperability with AN/PSC-5, SABER II, and similar radios, and it is optional for interfacing with any other equipment. Contact ADC Technical Support at ViaSat for further information.

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