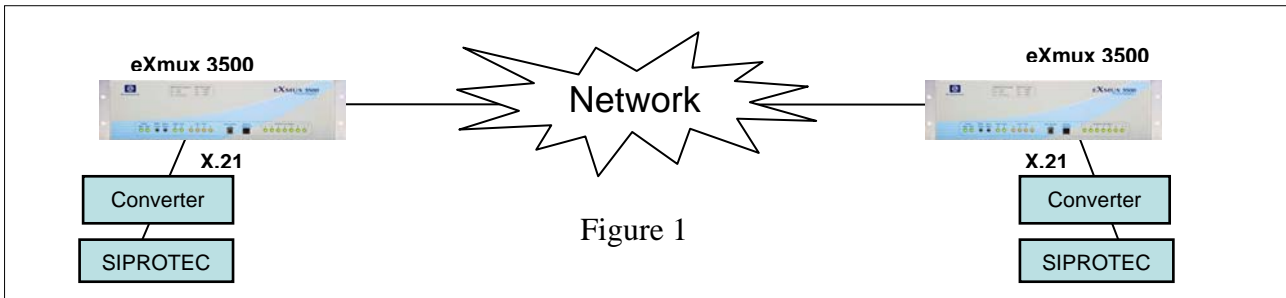


**Siemens SIPROTEC 7SD610 87L Relay over the RFL eXmux 3500 IP Access Multiplexer**

The RFL eXmux 3500 is a hardened IP Access Multiplexer engineered for mission critical infrastructures that seamlessly transport voice, serial, video and Ethernet data communications over Ethernet/IP or MPLS networks. The eXmux 3500 is a Layer 2 device with an integrated managed Ethernet switch which allows the eXmux 3500 to be used either in a private network with other eXmux 3500's or as part of a larger Ethernet/IP/MPLS network. Both fiber (using SFPs) and RJ-45 connections are available for the eXmux 3500; uplink speeds of up to a Gigabit are possible.

Figure 1 below depicts the eXmux 3500 as the communications system providing a point-to-point communications circuit between a pair of Siemens SIPROTEC 7SD610 relays. The network cloud is a general representation of an IP network and does not imply a direct point-to-point connection. The communications protocol interface for the Siemens SIPROTEC 7SD610 over the eXmux 3500 is synchronous X.21. The Siemens SIPROTEC relay 7SD610 requires the use of a Siemens 7XV5662-0AA01 fiber to X.21 converter to convert Siemen's proprietary fiber signal to X.21. Refer to the following table for the correct eXmux 3500 Interface Unit (IU) required for this X.21 protocol.

<u>Siemens Communications Interface</u>	<u>eXmux 3500 Interface Unit (IU)</u>
X.21	4-Port Synch. Multi-Protocol IU



**Network Performance Consideration**

Latency issues should always be considered when installing a teleprotection channel over any kind of multiplexer. The eXmux 3500 when applied over direct fiber connection with minimum jitter buffer delay settings (also referred to as Packet Delay Variation (PDV)) of 1-2ms, will yield a back-to-back communication channel delay of <5ms. In addition to the low latency, when setup in a redundant path configuration the eXmux 3500 has a unique Hitless Switching feature that guarantees no data is lost during any single path failure. For a network with anticipated traffic usage beyond 90% of bandwidth capacity, Quality of Service (QoS) features can always be used to ensure that TDM data has the highest priority.

The network topology should be designed with a minimum number of nodes between the two ends of any teleprotection channel to minimize the jitter buffer delay setting; this will minimize the overall latency. By using the VLAN capability of the eXmux 3500, a secure and direct bidirectional communications channel can be created for the relaying circuit.

**eXmux 3500 Interface Unit Settings:**

This application note assumes familiarity with the operation of the eXmux 3500 and the Siemens SIPROTEC 7SD610. The appropriate eXmux 3500 Interface Unit to be used for this circuit should be programmed before mapping. Refer to the eXmux 3500 manual for mapping procedures and specific interface wiring information for each of these IU's.

***eXmux 3500 Multi-Protocol Synch IU settings***

1. On General tab, choose X.21 Protocol.
2. On desired Port tab, set P(x) Interface Mode to **DCE**. Handshaking Delay **Disable**. RX Data-Out Polarity and TX Data-In Polarity to **NORMAL**. RX Clock Polarity and TX Clock Polarity to **NORMAL**.
3. On Bandwidth tab, set desired Port Bandwidth to **8** (512kbps).

A DB-15F to DB-25M cable is used to connect the Siemens SIPROTEC I/O to the eXmux 3500 Synch IU.

Refer to the chart below along with the eXmux 3500 and Siemens SIPROTEC 7SD610 manual for cabling pin out information. RFL can provide the following cable if desired.

Siemens SIPROTEC 7SD610 DB-15F	eXmux 3500 Sync IU DB-25M	Siemens SIPROTEC 7SD610 Signal
2	2	T (A)
9	14	T (B)
3	4	C (A)
10	19	C (B)
4	3	R (A)
11	16	R (B)
5	5	I (A)
12	13	I (B)
6	17	S (A)
13	9	S (B)
8	7	Signal Gnd

This application note may not apply to other vendors Teleprotection Channel as some settings may be different. Check with the vendor of the device you are using to determine the required eXmux 3500 settings. Contact RFL Electronics at 973-334-3100 for further assistance.