

USB Interface for UHF RF Modem

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1. Introduction

This document defines the user interface for a RF modem using the UHF bands in the Amateur Radio Service. The interface is provided via the Universal Serial Bus (USB).

2. MAC Service and Interface

In order to provide compatibility with existing LLC sublayer and network layer implementations, the service shall be as defined in ANSI/IEEE 802.2-1998 section 2.3. The user interface shall be as defined for the data class interface in the Ethernet Networking Control Model in “Universal Serial Bus Class Definitions for Communication Devices”, version 1.1, 1999-1-19. This section provides a summary of the information in these documents.

The primary purpose of the modem is to transfer blocks of user data called MAC service data units or MSDUs. A MSDU consists of 1 to 1,536 bytes of user data that is sent from a source address to a destination address. Addresses are six bytes in length and their values may be a multicast address (a group of stations) or an individual address (exactly one station). Three service primitives are used to transfer user data:

The user issues a MAC-UNITDATA.request when it wishes to transmit data. The parameters are source address, destination address, user data, priority and service class.

The provider issues a MAC-UNITDATA.indication when a complete SNSDU has been received. The parameters are the source address, destination address, user data, reception status, priority and service class.



Figure 2. MIDU Format

These service primitives are mapped into MAC interface data units (MIDUs) that are carried by one or more USB bulk data transfers. An OUT transfer is a request and an IN transfer is an indication. The service parameters are formatted as defined in ANSI/IEEE 802.3-2002 for the destination address, source address and length fields of a MAC protocol data unit (MPDU). A complete MIDU consists of zero or more bulk data transfers of maximal length followed by one bulk data transfer with a length less than the maximum. The bulk transfer with a length less than maximum (including zero) is the end delimiter for the MIDU.

3. Management Service and Interface

The layer and system management interface shall be as defined for the communication class interface in the Ethernet Networking Control Model in “Universal Serial Bus Class Definitions for Communication Devices”, version 1.1, 1999-1-19. The following functions shall be implemented:

SetEthernetMulticastFilters – a minimum of sixteen 48-bit addresses of any format shall be supported.

SetEthernetPacketFilter – PACKET_TYPE_ALL_MULTICAST and PACKET_TYPE_PROMISCUOUS required.

GetEthernetStatistic – all selector codes shall be supported. Some counters may be mapped to non-802.3 information.

The SetEthernetMulticastFilters request shall be used to set the RF modem frequency and register the 48-bit individual address and any group addresses used to identify the station.

The first entry shall be the modem frequency in kHz represented as a binary coded decimal integer. There is no hardwired MAC address and the modem will not transmit until an individual MAC address is configured.

The primary station shall be configured by including an entry with a value of FFFFFFFF₁₆. The alternate primary station is FFFFFFFF₁₆ and FFFFFFFF₁₆.

The following statistics must be supported:

| Offset | Field Name | Description |
|--------|------------------------|--|
| D0 | XMIT_OK | MPDUs transmitted. |
| D1 | RCV_OK | MPDUs received. |
| D2 | XMIT_ERROR | MPDUs not transmitted. |
| D3 | RCV_ERROR | Total received MPDUs discarded. |
| D4 | RCV_NO_BUFFER | MPDUs discarded due to buffer overflow. |
| D5 | DIRECTED_BYTES_XMIT | MSDU data bytes transmitted to individual address. |
| D6 | DIRECTED_FRAMES_XMIT | MSDUs transmitted to individual address. |
| D7 | MULTICAST_BYTES_XMIT | MSDU data bytes transmitted to multicast address. |
| D8 | MULTICAST_FRAMES_XMIT | MSDUs transmitted to multicast address. |
| D9 | BROADCAST_BYTES_XMIT | MSDU data bytes transmitted to broadcast address. |
| D10 | BROADCAST_FRAMES_XMIT | MSDUs transmitted to broadcast address. |
| D11 | DIRECTED_BYTES_RCV | MSDU data bytes received from individual address. |
| D12 | DIRECTED_FRAMES_RCV | MSDUs received from individual address. |
| D13 | MULTICAST_BYTES_RCV | MSDU data bytes received from multicast address. |
| D14 | MULTICAST_FRAMES_RCV | MSDUs received from multicast address. |
| D15 | BROADCAST_BYTES_RCV | MSDU data bytes received from broadcast address. |
| D16 | BROADCAST_FRAMES_RCV | MSDUs received from broadcast address. |
| D17 | RCV_CRC_ERROR | MPDUs received with FEC error. |
| D18 | TRANSMIT_QUEUE_LENGTH | Number of MPDUs waiting for transmission. |
| D19 | RCV_ERROR_ALIGNMENT | Partial MPDUs received at end of PHY-SDU. |
| D20 | XMIT_ONE_COLLISION | Token MPDUs received (secondary) or transmitted (primary). |
| D21 | XMIT_MORE_COLLISIONS | 0 |
| D22 | XMIT_DEFERRED | Number of times transmission delayed by CCA busy. |
| D23 | XMIT_MAX_COLLISIONS | 0 |
| D24 | RCV_OVERRUN | Received MSDUs discarded due to lack of buffer. |
| D25 | XMIT_UNDERRUN | 0 |
| D26 | XMIT_HEARTBEAT_FAILURE | 0 |
| D27 | XMIT_TIMES_CRIS_LOST | 0 |
| D28 | XMIT_LATE_COLLISIONS | 0 |
| D29 | undefined | Number of Neighbor Table entries. |
| D30 | undefined | RSSI MPDUs transmitted. |
| D31 | undefined | RSSI MPDUs received. |

Table 1. Ethernet Statistics