KRAMER

USER MANUAL
MODEL:

SwitchableUSB
Device Configuration Network Protocol

Contents

Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

1 Overview

SwitchableUSB™ Device Configuration Network Protocol provides the ability to discover and configure ExtremeUSB® extenders on a local ethernet network. The protocol works on top of UDP, so it should be possible to write a configuration client for almost any platform. The devices will listen on UDP port 6137 for incoming messages and replies will be sent back to the port that the request originated from. The USB extenders will include a DHCP client that will enable them to obtain an IP address from a DHCP server on the network. The devices may alternatively be assigned a static network configuration using UDP broadcast packets in the form of a Use Static IP message described later in this document.
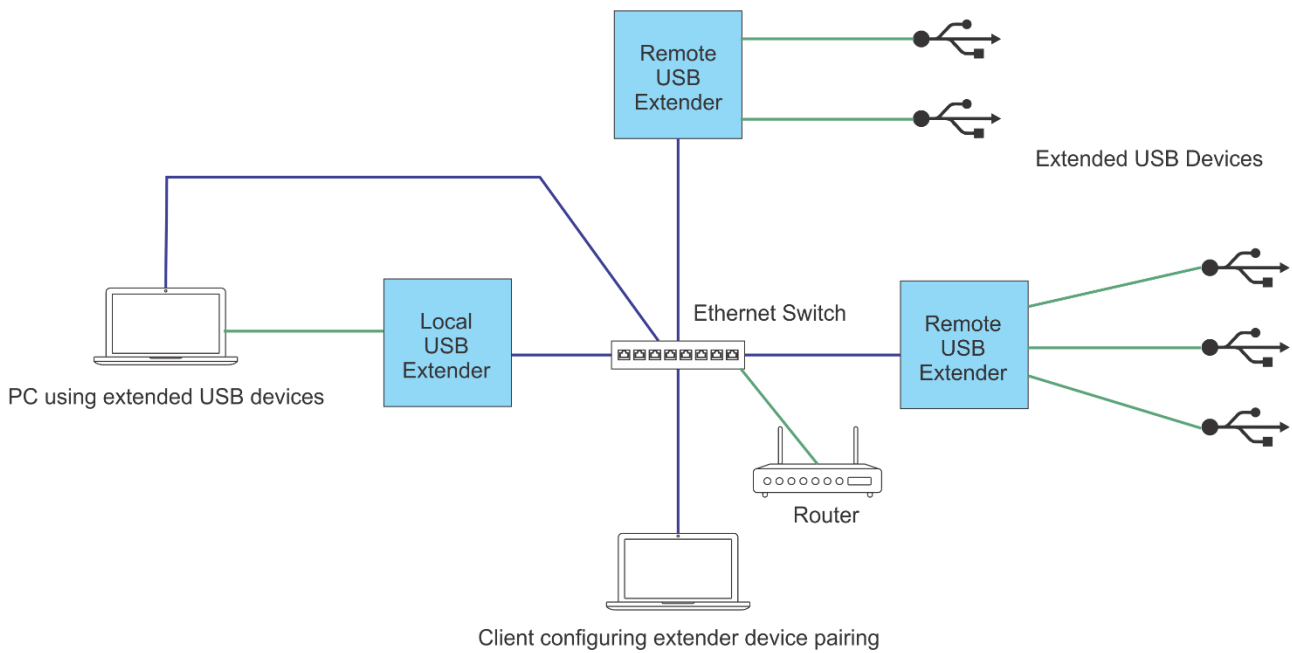
Figure 1: USB extenders on a local network

2 General Information

2.1 Generic Packet Structure

All packets contain the following:

Magic Number	A value (0x2F03F4A2) which gives some confidence that the data which follows is a configuration message.
Message ID	When the client sends a request, it chooses any value to insert in this field. The device responding to the request will set this field in the reply to the same value it received in the request.
Protocol Version	An integer from 0-255. All devices will support protocol 0 and one other protocol version. The Reply Device Information message will inform a client which version of the protocol it must speak in order to communicate with the device.
Command	An integer from 0-255. This is the identifier of the command. The combination of the protocol version and the command identify a unique message type. In other words, command 5 in protocol 1 is likely different from command 5 in protocol 3.

- All multi-byte fields are packed as big endian.

- Messages are at least 10 bytes and at most 136 bytes in length.

- Any string fields should be encoded using UTF-8.

2.2 Network Broadcast Notes

Further information about Network Broadcast Notes can be found at the **references section**.

2.2.1 Subnet Broadcast

To broadcast a packet to a subnet you only have to use the broadcast IP of the subnet. For example to broadcast to a network configured as an IP range of 192.168.5.xxx, and a netmask of 255.255.255.0, the IP 192.168.5.255 is the broadcast IP address. For example to broadcast to a network configured as an IP range of 10.xxx.xxx.xxx, and a netmask of 255.0.0.0, the IP 10.255.255.255 is the broadcast IP address.

Routers will drop broadcast IP packets, destined for an address outside of the source address device's network; which means that any broadcast packet must originate on the same network as the target devices.

2.2.2 All Local Subnet Broadcast

By broadcasting to the IP address 255.255.255.255 a broadcast packet can be sent out, without previously knowing what the local network is. Microsoft Windows will however only send the packet out the first configured network interface, so on a computer with multiple interfaces, each interface should sent a broadcast network packet separately.

2.2.3 Mismatched Network Configuration

When broadcasting to a subnet using the network broadcast address (for example 192.168.5.255), and the device is configured for a different network (for example IP=10.0.9.23, netmask=255.0.0.0), then the device will not respond to the broadcast as it will not recognize the IP address as a valid broadcast.

This shouldn't happen with a proper DHCP server allocated addresses out of the same pool for the network. It could potentially happen when assigning static IP addresses, and moving units between networks. If this does happen the unit will need to be reset to DHCP by the push button, as described in the user's guide, and then the static IP address can be assigned to the unit.

3 Supported Messages

3.1 Request Device Information

This message is sent from the client to a device in order to solicit a Reply Device Information message. This message can be sent in a broadcast UDP message in order to discover all the configurable USB extenders on the local network.

Byte Offset

```
  +--------------------------------------+--------------------------------------+
0 | Magic Number                                                                |
  +                                      +                                      +
2 |                                                                             |
  +--------------------------------------+--------------------------------------+
4 | Message ID                                                                  |
  +                                      +                                      +
6 |                                                                             |
  +--------------------------------------+--------------------------------------+
8 | Protocol Version = 0                 | Command = 0                          |
  +--------------------------------------+--------------------------------------+
```

3.2 Reply Device Information

This message is sent from a device to a client in response to a Request Device Information message.

3.2.1 Field Descriptions

MAC Address	The device's MAC address.
IP Address	The device's current IP address.
Network Acquisition Mode	0=DHCP, 1=Static
Supported Protocol Version	All devices must support protocol 0 and one other protocol number. This value specifies which protocol version that is.
Vendor	A 32-byte NUL terminated string containing the device's vendor name.
Product	A 32-byte NUL terminated string containing the device's product name.
Revision	A 12-byte NUL terminated string containing the device's revision number.

Byte Offset

```
    +--------------------------------------------+--------------------------------------------+
 0  | Magic Number                                                                            |
    +                                            +
 2  |                                                                                         |
    +--------------------------------------------+--------------------------------------------+
 4  | Message ID                                                                              |
    +                                            +
 6  |                                                                                         |
    +--------------------------------------------+--------------------------------------------+
 8  | Protocol Version = 0                       | Command = 1                                |
    +--------------------------------------------+--------------------------------------------+
10  | MAC Address                                                                             |
    +                                            +
12  |                                                                                         |
    +                                            +
14  |                                                                                         |
    +--------------------------------------------+--------------------------------------------+
16  | IP Address                                                                              |
    +                                            +
18  |                                                                                         |
    +--------------------------------------------+--------------------------------------------+
20  | Network Acquisition Mode                   | Supported Protocol Version                 |
    +--------------------------------------------+--------------------------------------------+
22  | Vendor                                                                                  |
    +                                            +
    .                                            .                                            .
    .                                            .                                            .
    .                                            .                                            .
    +                                            +
52  |                                                                                         |
    +--------------------------------------------+--------------------------------------------+
54  | Product                                                                                 |
    +                                            +
    .                                            .                                            .
    .                                            .                                            .
    .                                            .                                            .
    +                                            +
84  |                                                                                         |
    +--------------------------------------------+--------------------------------------------+
86  | Revision                                                                                |
    +                                            +
    .                                            .                                            .
    .                                            .                                            .
    .                                            .                                            .
    +                                            +
96  |                                                                                         |
    +--------------------------------------------+--------------------------------------------+
```

3.3 Ping

This message is sent from a client to a device. It is used to check if a device is active. An Acknowledge message will be sent by the device in response.

Byte Offset

```
   +---------------------------------------+---------------------------------------+
 0 | Magic Number                                                                  |
   +                                       +                                       +
 2 |                                                                               |
   +---------------------------------------+---------------------------------------+
 4 | Message ID                                                                    |
   +                                       +                                       +
 6 |                                                                               |
   +---------------------------------------+---------------------------------------+
 8 | Protocol Version = 0                  | Command = 2                           |
   +---------------------------------------+---------------------------------------+
```

3.4 Acknowledge

This message is a generic ACK message that will be sent in response to all requests made by clients that do not require returning an additional data payload in the response. The Message ID field should be sufficient to determine which message is being ACKed.

Byte Offset

```
   +-----------------------------------+---------------------------------------+
 0 | Magic Number                                                              |
   +                                   +                                       +
 2 |                                                                           |
   +-----------------------------------+---------------------------------------+
 4 | Message ID                                                                |
   +                                   +                                       +
 6 |                                                                           |
   +-----------------------------------+---------------------------------------+
 8 | Protocol Version = 0              | Command = 3                           |
   +-----------------------------------+---------------------------------------+
```

3.5 Request Extended Device Information

Sent by a client to a device in order to obtain additional information about the device that is not included in the Reply Device Information message from protocol 0.

Byte Offset

```
   +---------------------------------------+---------------------------------------+
0  | Magic Number                                                                  |
   +                                       +                                       +
2  |                                                                               |
   +---------------------------------------+---------------------------------------+
4  | Message ID                                                                    |
   +                                       +                                       +
6  |                                                                               |
   +---------------------------------------+---------------------------------------+
8  | Protocol Version = 3                  | Command = 0                           |
   +---------------------------------------+---------------------------------------+
```

3.6 Reply Extended Device Information

Sent by a device to a client in response to a Request Extended Device Information message.

3.6.1 Field Descriptions

ENCODER/DECODER	0=Device is a ENCODER, 1=Device is a DECODER
Paired With MAC Address	MAC address of a device that this device is paired with. This field is optional and may be repeated up to 7 times.

Byte Offset

```
        +-----------------------------------------+-----------------------------------------+
     0 | Magic Number                                                                        |
        +                                         +                                         +
     2 |                                                                                     |
        +-----------------------------------------+-----------------------------------------+
     4 | Message ID                                                                          |
        +                                         +                                         +
     6 |                                                                                     |
        +-----------------------------------------+-----------------------------------------+
     8 | Protocol Version = 3                     | Command = 1                             |
        +-----------------------------------------+-----------------------------------------+
    10 | ENCODER/DECODER                                      | Paired With MAC Address      |
|
  +--> +-----------------------------------------+                                          +
  |  12 |                                                                                   |
  |     +                                         +                                         +
  |  14 |                                                                                   |
  |     +                                         +-----------------------------------------+
  |  16 |                                         |
  +--> +-----------------------------------------+
  |
  +--- Repeated 0 or 1 times for a DECODER or a ENCODER in point-to-point mode or 0 to 7 times for
a ENCODER with virtual hub enabled
```

3.7 Pair To Device

Sent by a client to a device to instruct a device to try to pair with a different device specified in this message. A client must send this message to a ENCODER and a DECODER to instruct them to pair together, but the order of the two messages does not matter. The device will respond with an Acknowledge message if it is able to pair with a new device or a Negative Acknowledge message otherwise. The transmission of the Acknowledge message only indicates that an attempt will be made to establish a link between the devices, not that a link is already established.

3.7.1 Field Descriptions

Pair To Device MAC Address	The MAC address that the client is telling the device to attempt to pair with.

Byte Offset

```
    +----------------------------------------+----------------------------------------+
  0 | Magic Number                                                                    |
    +                                        +                                        +
  2 |                                                                                 |
    +----------------------------------------+----------------------------------------+
  4 | Message ID                                                                      |
    +                                        +                                        +
  6 |                                                                                 |
    +----------------------------------------+----------------------------------------+
  8 | Protocol Version = 3                   | Command = 2                            |
    +----------------------------------------+----------------------------------------+
 10 | Pair To Device MAC Address                                                      |
    +                                        +                                        +
 12 |                                                                                 |
    +                                        +                                        +
 14 |                                                                                 |
    +----------------------------------------+----------------------------------------+
```

3.8 Remove Device Pairing

Sent by a client to a device to instruct a device to discard any existing pairing it has. This will effectively disconnect any USB devices that were downstream of the remote extender. The client must send a Remove Device Pairing message to each of the devices in the pairing. The device will send an

Acknowledge message in response to a Remove Device Pairing message or a Negative Acknowledge if the device is already unpaired or paired to a different device than the one specified.

3.8.1 Field Descriptions

Paired MAC Address	The MAC address that the client is telling the device to disassociate from.

Byte Offset

```
    +---------------------------------------+---------------------------------------+
  0 | Magic Number                                                                  |
    +                                       +                                       +
  2 |                                                                               |
    +---------------------------------------+---------------------------------------+
  4 | Message ID                                                                    |
    +                                       +                                       +
  6 |                                                                               |
    +---------------------------------------+---------------------------------------+
  8 | Protocol Version = 3                  | Command = 3                           |
    +---------------------------------------+---------------------------------------+
 10 | Paired MAC Address                                                            |
    +                                       +                                       +
 12 |                                                                               |
    +                                       +                                       +
 14 |                                                                               |
    +---------------------------------------+---------------------------------------+
```

3.9 Request Device Topology

Sent by a client to a ENCODER device in order to obtain the set of USB devices in the system. A DECODER device will send a Negative Acknowledge message in response to this message.

Byte Offset

```
   +---------------------------------------+---------------------------------------+
 0 | Magic Number                          |                                       |
   +                                       +                                       +
 2 |                                       |                                       |
   +---------------------------------------+---------------------------------------+
 4 | Message ID                            |                                       |
   +                                       +                                       +
 6 |                                       |                                       |
   +---------------------------------------+---------------------------------------+
 8 | Protocol Version = 3                  | Command = 4                           |
   +---------------------------------------+---------------------------------------+
```

3.10 Reply Device Topology

Sent by a ENCODER device in response to a Request Device Topology message. This message is of variable length depending on the number of devices that are in the system. The combination of the information is enough for a client to build and display a device tree.

3.10.1 Field Descriptions

USB Address	An integer from 0 to 127.
USB Address Of Parent	An integer from 1 to 127. If a USB Address is seen which is not listed as the USB Address Of Parent for any of the devices, then that device is the root of the device topology.
Port On Parent	An integer from 1 to 127. 0 is not a valid number for a port on a hub, so this field will only be 0 if there is no USB device upstream before the host.
Is Device A Hub	0=FALSE, 1=TRUE
USB Vendor Id	The USB vendor id from the device descriptor.
USB Product Id	The USB product id from the device descriptor.

Byte Offset

```
      +-----------------------------------+-----------------------------------+
   0 | Magic Number                                                          |
      +                                   +                                   +
   2 |                                                                       |
      +-----------------------------------+-----------------------------------+
   4 | Message ID                                                            |
      +                                   +                                   +
   6 |                                                                       |
      +-----------------------------------+-----------------------------------+
   8 | Protocol Version = 3              | Command = 5                       |
+-->  +-----------------------------------+-----------------------------------+
|  10 | USB Address                      | USB Address Of Parent             |
|     +-----------------------------------+-----------------------------------+
|  12 | Port On Parent                   | Is Device A Hub                   |
|     +-----------------------------------+-----------------------------------+
|     | USB Vendor Id                                                        |
|     +-----------------------------------+-----------------------------------+
|     | USB Product Id                                                       |
+-->  +-----------------------------------+-----------------------------------+
|
+--- Repeated 0 to MAX_USB_DEVICES(= 32) times
```

3.11 Use DHCP

Sent by a client to a device to tell a device that it should use DHCP to obtain an IP. This message may be sent as either as a UDP broadcast packet or a packet directed to a specific IP in the case that the device has a valid, known static IP address already. Regardless of whether the message was sent as a broadcast or not, the device will only switch into DHCP mode if the Target MAC Address field matches the MAC address of the device. When a valid Use DHCP message is received the device will send an Acknowledge message from its current IP address before discarding its static address configuration and beginning acquisition of an IP address via DHCP. If a Use DHCP message is received when the device is already in DHCP mode, the device will send an Acknowledge message, but this will not trigger any other action on the device such as IP renewal. The client is able to tell which mode a device is in by inspecting the Network Acquisition Mode field of the Reply Device Information message.

3.11.1 Field Descriptions

Target MAC Address	The MAC address of the device which will be set to use DHCP to obtain an IP address.

Byte Offset

```
     +-------------------------------------+-------------------------------------+
  0  | Magic Number                                                              |
     +                                                                           +
  2  |                                                                           |
     +-------------------------------------+-------------------------------------+
  4  | Message ID                                                                |
     +                                                                           +
  6  |                                                                           |
     +-------------------------------------+-------------------------------------+
  8  | Protocol Version = 3                | Command = 6                         |
     +-------------------------------------+-------------------------------------+
 10  | Target MAC Address                                                        |
     +                                                                           +
 12  |                                                                           |
     +                                                                           +
 14  |                                                                           |
     +-------------------------------------+-------------------------------------+
```
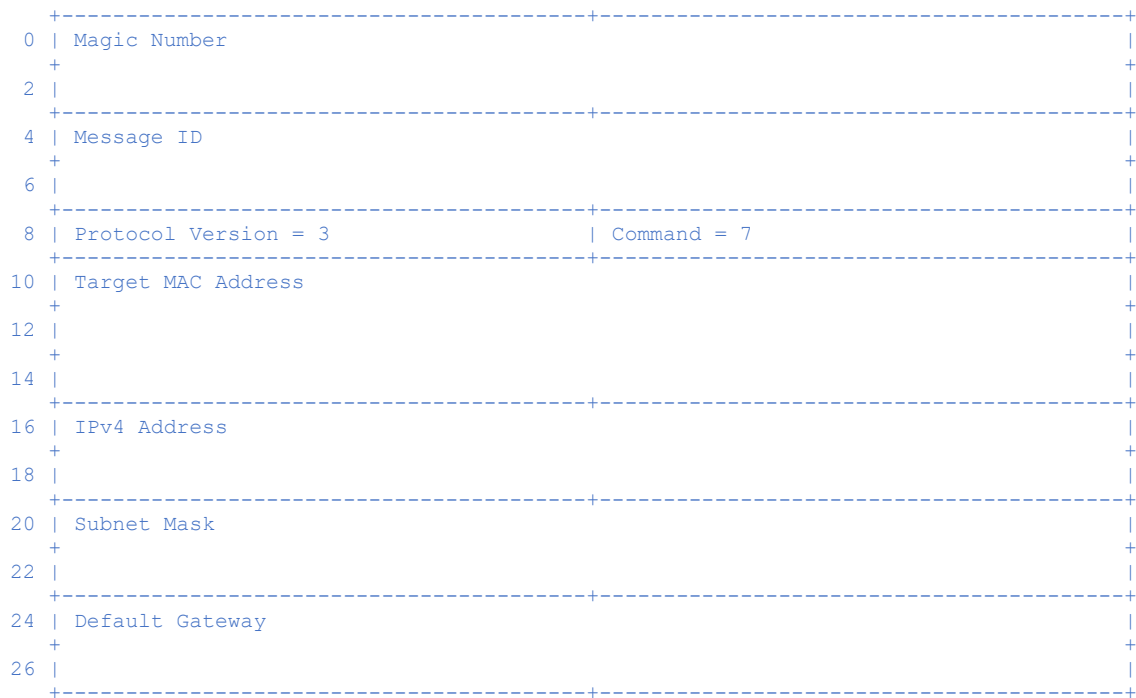
3.12 Use Static IP

Sent by a client to a device to tell a device that it should use the static network configuration contained within this message. The IP, subnet mask and default gateway as well as the network configuration are stored in permanent storage, so the device will keep the same network configuration after being power cycled. Similarly to the Use DHCP message, this message may be broadcast or sent to a specific device. An acknowledge message will always be sent back to the client when a Use Static IP message is received by a device providing that the Target MAC Address parameter matches the MAC address of the device. Sending a Use Static IP message to a device already in a static configuration will enable a client to change the IP, subnet mask or default gateway of the device.

3.12.1 Field Descriptions

Target MAC Address	The MAC address of the device which will be set to use static network configuration.
IPv4 Address	The IPv4 address being assigned to this device encoded as a 32 bit integer.
Subnet Mask	The subnet mask of the network that this device is on.
Default Gateway	Sets the default gateway of the device.

Byte Offset

```
    +---------------------------------------+---------------------------------------+
  0 | Magic Number                                                                  |
    +                                       +                                       +
  2 |                                                                               |
    +---------------------------------------+---------------------------------------+
  4 | Message ID                                                                    |
    +                                       +                                       +
  6 |                                                                               |
    +---------------------------------------+---------------------------------------+
  8 | Protocol Version = 3                  | Command = 7                           |
    +---------------------------------------+---------------------------------------+
 10 | Target MAC Address                                                            |
    +                                       +                                       +
 12 |                                                                               |
    +                                       +                                       +
 14 |                                                                               |
    +---------------------------------------+---------------------------------------+
 16 | IPv4 Address                                                                  |
    +                                       +                                       +
 18 |                                                                               |
    +---------------------------------------+---------------------------------------+
 20 | Subnet Mask                                                                   |
    +                                       +                                       +
 22 |                                                                               |
    +---------------------------------------+---------------------------------------+
 24 | Default Gateway                                                               |
    +                                       +                                       +
 26 |                                                                               |
    +---------------------------------------+---------------------------------------+
```

3.13 Negative Acknowledge

This message is a generic NAK message that may be sent in response to a Pair To Device, Remove Device Pairing or Request Device Topology message. It indicates to the client that their request was received, but that no action will be taken as a result of that message. The Message ID field should be sufficient to determine which message is being NAKed.

Byte Offset

```
   +----------------------------------+----------------------------------+
 0 | Magic Number                                                        |
   +                                  +                                  +
 2 |                                                                     |
   +----------------------------------+----------------------------------+
 4 | Message ID                                                          |
   +                                  +                                  +
 6 |                                                                     |
   +----------------------------------+----------------------------------+
 8 | Protocol Version = 3             | Command = 8                      |
   +----------------------------------+----------------------------------+
```

3.14 Use Filtering Strategy

Sent by a client to a device to tell the device that it should use a certain type of filtering strategy contained within this message. The filtering strategy denotes which type of devices will be filtered out by the extenders. An acknowledgement message will be sent back to the client if the extender supports device class filtering, and a valid strategy was selected. Otherwise, a NAK will be sent to the client.

3.14.1 Field Descriptions

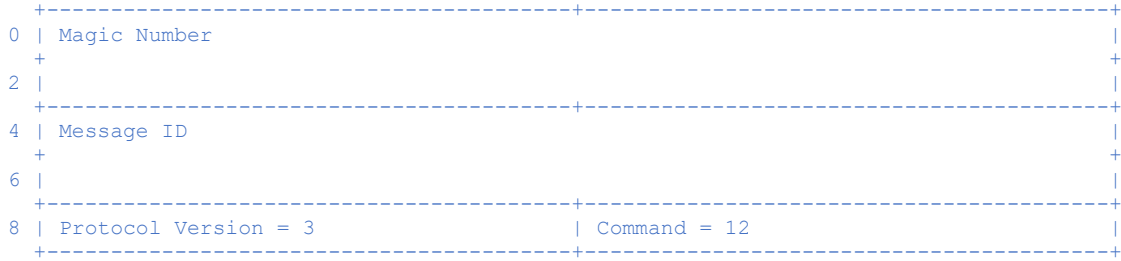| Filtering Strategy	0: Allow all devices 1: Block all devices except HID and hub 2: Block mass storage devices 3: Block all devices except HID, hub, and smartcard 4: Block all devices except audio and vendor specific

Byte Offset

```
     +---------------------------------------+---------------------------------------+
   0 | Magic Number                                                                  |
     +                                       +                                       +
   2 |                                                                               |
     +---------------------------------------+---------------------------------------+
   4 | Message ID                                                                    |
     +                                       +                                       +
   6 |                                                                               |
     +---------------------------------------+---------------------------------------+
   8 | Protocol Version = 3                   | Command = 9                          |
     +---------------------------------------+---------------------------------------+
  10 | Filtering Strategy                     |
     +---------------------------------------+
```

3.15 LED Locator On

This message is sent from a client to a device. Upon receiving this message, the led pattern is started on the device. It is used to locate a specific device.

Byte Offset

```
   +---------------------------------------+---------------------------------------+
 0 | Magic Number                                                                  |
   +                                       +                                       +
 2 |                                                                               |
   +---------------------------------------+---------------------------------------+
 4 | Message ID                                                                    |
   +                                       +                                       +
 6 |                                                                               |
   +---------------------------------------+---------------------------------------+
 8 | Protocol Version = 3                  | Command = 10                          |
   +---------------------------------------+---------------------------------------+
```

3.16 Led Locator Off

This message is sent from a client to a device. Upon receiving this message, the led pattern is stopped on the device. It only works when the led pattern is active on the device.

Byte Offset

```
  +---------------------------------------+---------------------------------------+
0 | Magic Number                          |                                       |
  +                                       +                                       +
2 |                                       |                                       |
  +---------------------------------------+---------------------------------------+
4 | Message ID                            |                                       |
  +                                       +                                       +
6 |                                       |                                       |
  +---------------------------------------+---------------------------------------+
8 | Protocol Version = 3                  | Command = 11                          |
  +---------------------------------------+---------------------------------------+
```

3.17 Reset Device

This message is sent from a client to a device. Upon receiving this message, the device resets.

Byte Offset

```
   +---------------------------------------+---------------------------------------+
 0 | Magic Number                                                                  |
   +                                       +
 2 |                                                                               |
   +---------------------------------------+---------------------------------------+
 4 | Message ID                                                                    |
   +                                       +
 6 |                                                                               |
   +---------------------------------------+---------------------------------------+
 8 | Protocol Version = 3                  | Command = 12                          |
   +---------------------------------------+---------------------------------------+
```

3.18 Request Configuration Response Data

This message is sent from the client to a device in order to solicit a Reply Configuration Response Data message.

Byte Offset

```
   +---------------------------------------+---------------------------------------+
 0 | Magic Number                          |                                       |
   +                                       +                                       +
 2 |                                       |                                       |
   +---------------------------------------+---------------------------------------+
 4 | Message ID                            |                                       |
   +                                       +                                       +
 6 |                                       |                                       |
   +---------------------------------------+---------------------------------------+
 8 | Protocol Version = 3                  | Command = 13                          |
   +---------------------------------------+---------------------------------------+
```
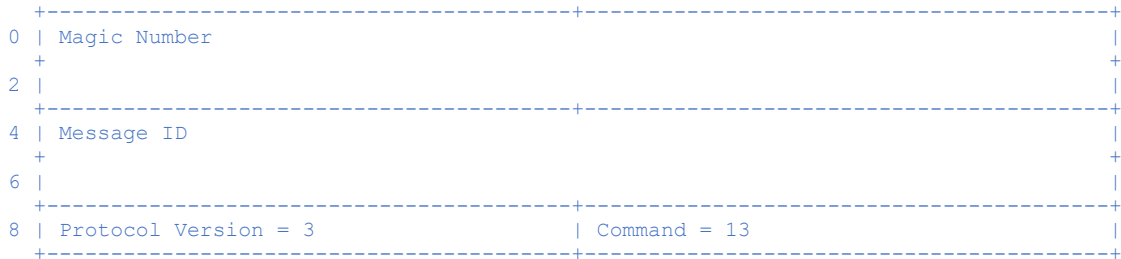
3.19 Reply Configuration Response Data

This message is sent from a device to a client in response to a Request Configuration Response Data.

3.19.1 Field Descriptions

High Speed	0=Disabled, 1=Enabled
MSA	0=Disabled, 1=Enabled
Vhub	0=Disabled, 1=Enabled
Current Filter Status	- No filter - Block mass storage devices - Block all but HID and Hub devices - Block all but HID, HUB and smartcard devices - Block all but Audio and Vendor Specific devices
IP Acquisition Mode	0=DHCP, 1=Static
Reserved	This field is reserved, and is set to 0
MAC Address	The device's MAC address
Paired With MAC Address	MAC address of a device that this device is paired with. This field is optional and may be repeated up to 7 times
Port Number	Port number that this device is connected to
IP Address	The device's current IP address
Subnet Mask	The subnet mask of the device
Default Gateway	The default gateway for the device
DHCP Server	The DHCP server of the device
Num of Vhub ports	The number of downstream ports of the device
VID	The Vendor ID of the device
PID	The Product ID of the device
Brand ID	The Brand ID of the device
Vendor	A 32-byte NUL terminated string containing the device's vendor name
Product	A 32-byte NUL terminated string containing the device's product name
Revision	A 12-byte NUL terminated string containing the device's revision number

Byte Offset

```
     +---------------------------------------+---------------------------------------+
   0 | Magic Number                                                                  |
     +                                       +                                       +
   2 |                                                                               |
     +---------------------------------------+---------------------------------------+
   4 | Message ID                                                                    |
     +                                       +                                       +
   6 |                                                                               |
     +---------------------------------------+---------------------------------------+
   8 | Protocol Version = 3                  | Command = 14                          |
     +---------------------------------------+---------------------------------------+
  10 | High Speed status                     | MSA status                            |
     +---------------------------------------+---------------------------------------+
  12 | Vhub status                           | Current Filter Status                 |
     +---------------------------------------+---------------------------------------+
  14 | IP Acquisition Mode                   | Reserved                              |
     +---------------------------------------+---------------------------------------+
  16 | MAC Address                                                                   |
     +                                       +                                       +
  18 |                                                                               |
     +                                       +                                       +
  20 |                                                                               |
```

```
      +------------------------------------------------+------------------------------------------+
   22 | Reserved                                       |                                          |
      +------------------------------------------------+------------------------------------------+
   24 | Paired with MAC Address                        |                                          +
      +                                                .                                          .
      .                                                .                                          .
      .                                                .                                          .
      .                                                .                                          .
      +                                                                                           +
   64 |                                                |                                          |
      +------------------------------------------------+------------------------------------------+
   66 | Port Number                                    |                                          |
      +------------------------------------------------+------------------------------------------+
   68 | IP Address                                     |                                          |
      +                                                                                           +
   70 |                                                |                                          |
      +------------------------------------------------+------------------------------------------+
   72 | SubNet Mask                                    |                                          |
      +                                                                                           +
   74 |                                                |                                          |
      +------------------------------------------------+------------------------------------------+
   76 | Default Gateway                                |                                          |
      +                                                                                           +
   78 |                                                |                                          |
      +------------------------------------------------+------------------------------------------+
   80 | DHCP Server                                    |                                          |
      +                                                                                           +
   82 |                                                |                                          |
      +------------------------------------------------+------------------------------------------+
   84 | Number of Vhub Ports                           | Reserved                                 |
      +------------------------------------------------+------------------------------------------+
   86 | VID                                            |                                          |
      +------------------------------------------------+------------------------------------------+
   88 | PID                                            |                                          |
      +------------------------------------------------+------------------------------------------+
   90 | Vendor                                         |                                          +
      +                                                .                                          .
      .                                                .                                          .
      .                                                .                                          .
      .                                                .                                          .
      +                                                                                           +
  120 |                                                |                                          |
      +------------------------------------------------+------------------------------------------+
  122 | Product                                        |                                          +
      +                                                .                                          .
      .                                                .                                          .
      .                                                .                                          .
      .                                                .                                          .
      +                                                                                           +
  152 |                                                |                                          |
      +------------------------------------------------+------------------------------------------+
  154 | Revision                                       |                                          +
      +                                                .                                          .
      .                                                .                                          .
      .                                                .                                          .
      .                                                .                                          .
      +                                                                                           +
  166 |                                                |                                          |
      +------------------------------------------------+------------------------------------------+
```

3.20 Request Link Status

This message is sent from the client to a device in order to obtain the link status of the paired units.

Byte Offset

```
  +-------------------------------------+-------------------------------------+
0 | Magic Number                                                              |
  +                                     +
2 |                                                                           |
  +-------------------------------------+-------------------------------------+
4 | Message ID                                                                |
  +                                     +
6 |                                                                           |
  +-------------------------------------+-------------------------------------+
8 | Protocol Version = 3                | Command = 15                        |
  +-------------------------------------+-------------------------------------+
```
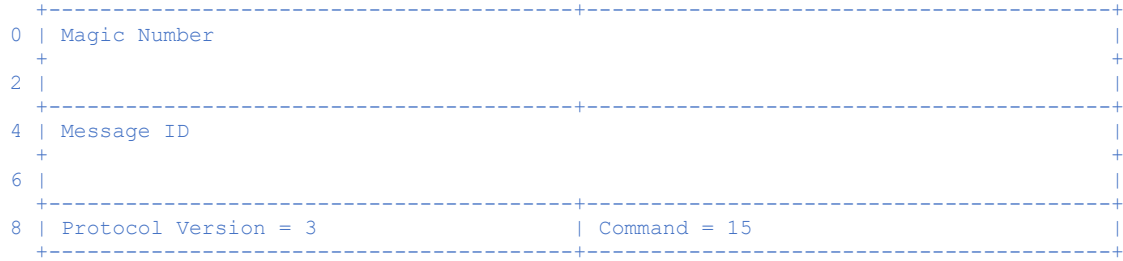
3.21 Reply Link Status

This message is sent from the device to a client in response to a Request Link Status Information message. The message will contain information for all 7 devices that could be paired. If the number of paired devices is less than 7, the unpaired fields are set to 0. Thus, the size of the structure sent remains the same regardless of the number of paired units.

3.21.1 Field Descriptions

Paired Devices	Number of paired devices	
Link Status	The value of this field is set as follows:	
	Value	**Description**
	0	Device not paired
	1	Device paired and linked
	2	Device paired but not linked
Reserved	This field is reserved by Icron and is set to 0	
Paired With MAC Address	Each MAC address uses 6 bytes, and will be set to zero if there isn't a device paired	

Byte Offset

```
     +-----------------------------------+---------------------------------------+
   0 | Magic Number                                                              |
     +                                   +                                       +
   2 |                                                                           |
     +-----------------------------------+---------------------------------------+
   4 | Message ID                                                                |
     +                                   +                                       +
   6 |                                                                           |
     +-----------------------------------+---------------------------------------+
   8 | Protocol Version = 3              | Command = 16                          |
     +-----------------------------------+---------------------------------------+
  10 | Link Status of device 1           | Link Status of device 2               |
     +-----------------------------------+---------------------------------------+
  12 | Link Status of device 3           | Link Status of device 4               |
     +-----------------------------------+---------------------------------------+
  14 | Link Status of device 5           | Link Status of device 6               |
     +-----------------------------------+---------------------------------------+
  16 | Link Status of device 7           | Reserved                              |
     +-----------------------------------+---------------------------------------+
  18 | MAC Address of device 1                                                   |
     +                                   +                                       +
  20 |                                                                           |
     +                                   +                                       +
  22 |                                                                           |
     +-----------------------------------+---------------------------------------+
  24 | MAC Address of device 2                                                   |
     +                                   +                                       +
  26 |                                                                           |
     +                                   +                                       +
  28 |                                                                           |
     +-----------------------------------+---------------------------------------+
  30 | MAC Address of device 3                                                   |
     +                                   +                                       +
  32 |                                                                           |
     +                                   +                                       +
  34 |                                                                           |
     +-----------------------------------+---------------------------------------+
  36 | MAC Address of device 4                                                   |
     +                                   +                                       +
  38 |                                                                           |
     +                                   +                                       +
  40 |                                                                           |
     +-----------------------------------+---------------------------------------+
```

Kramer Electronics Ltd.

```
42 | MAC Address of device 5                                               |
   +                                                                       +
44 |                                                                       |
   +                                                                       +
46 |                                                                       |
   +---------------------------------------+-------------------------------+
48 | MAC Address of device 6                                               |
   +                                                                       +
50 |                                                                       |
   +                                                                       +
52 |                                                                       |
   +---------------------------------------+-------------------------------+
54 | MAC Address of device 7                                               |
   +                                                                       +
56 |                                                                       |
   +                                                                       +
58 |                                                                       |
   +---------------------------------------+-------------------------------+
```

3.22 Remove All Pairings

This command is sent by a client to a device to instruct the device to clear all of its pairings. This message may be sent to a device that currently has no pairings, but will have no effect.

Byte Offset

```
   +----------------------------------------+----------------------------------------+
 0 | Magic Number                           |                                        |
   +                                        +                                        +
 2 |                                        |                                        |
   +----------------------------------------+----------------------------------------+
 4 | Message ID                             |                                        |
   +                                        +                                        +
 6 |                                        |                                        |
   +----------------------------------------+----------------------------------------+
 8 | Protocol Version = 3                   | Command = 17                           |
   +----------------------------------------+----------------------------------------+
```

3.23 Force Pair To Device

This command is sent by a client to a device to instruct the device to clear all of its existing pairings and then try to pair with a different device specified in this message. A client must send this message to a ENCODER and a DECODER to instruct them to pair together, but the order of the two messages does not matter. The device will respond with an Acknowledge message if it is able to pair with a new device or a Negative Acknowledge message otherwise. The transmission of the Acknowledge message only indicates that an attempt will be made to establish a link between the devices, not that a link is already established.

3.23.1 Field Descriptions

Pair To Device MAC Address	The MAC address that the client is telling the device to attempt to pair with.

Byte Offset

```
    +---------------------------------------+---------------------------------------+
  0 | Magic Number                                                                  |
    +                                                                               +
  2 |                                                                               |
    +---------------------------------------+---------------------------------------+
  4 | Message ID                                                                    |
    +                                                                               +
  6 |                                                                               |
    +---------------------------------------+---------------------------------------+
  8 | Protocol Version = 3                  | Command = 18                          |
    +---------------------------------------+---------------------------------------+
 10 | Force Pair To Device MAC Address                                              |
    +                                                                               +
 12 |                                                                               |
    +                                                                               +
 14 |                                                                               |
    +---------------------------------------+---------------------------------------+
```

4 Appendix A

4.1 Abbreviations

ENCODER – Local Extender

DECODER – Remote Extender

UDP – User Data Protocol

USB – Universal Serial Bus

DHCP – Dynamic Host Configuration Protocol

IP – Internet Protocol

IPv4 – Internet Protocol version 4

TBD – To Be Determined

ACK – Acknowledgement

NAK – Negative Acknowledgement

MAC Address – Media Control Access Address HID – Human Interface Device

4.3 References

https://en.wikipedia.org/wiki/IPv4_subnetting_reference

The warranty obligations of Kramer Electronics Inc. ("Kramer Electronics") for this product are limited to the terms set forth below:

What is Covered

This limited warranty covers defects in materials and workmanship in this product.

What is Not Covered

This limited warranty does not cover any damage, deterioration or malfunction resulting from any alteration, modification, improper or unreasonable use or maintenance, misuse, abuse, accident, neglect, exposure to excess moisture, fire, improper packing and shipping (such claims must be presented to the carrier), lightning, power surges, or other acts of nature. This limited warranty does not cover any damage, deterioration or malfunction resulting from the installation or removal of this product from any installation, any unauthorized tampering with this product, any repairs attempted by anyone unauthorized by Kramer Electronics to make such repairs, or any other cause which does not relate directly to a defect in materials and/or workmanship of this product. This limited warranty does not cover cartons, equipment enclosures, cables or accessories used in conjunction with this product.

Without limiting any other exclusion herein, Kramer Electronics does not warrant that the product covered hereby, including, without limitation, the technology and/or integrated circuit(s) included in the product, will not become obsolete or that such items are or will remain compatible with any other product or technology with which the product may be used.

How Long this Coverage Lasts

The standard limited warranty for Kramer products is seven (7) years from the date of original purchase, with the following exceptions:

1. All Kramer VIA hardware products are covered by a standard three (3) year warranty for the VIA hardware and a standard three (3) year warranty for firmware and software updates; all Kramer VIA accessories, adapters, tags, and dongles are covered by a standard one (1) year warranty.

2. Kramer fiber optic cables, adapter-size fiber optic extenders, pluggable optical modules, active cables, cable retractors, ring mounted adapters, portable power chargers, Kramer speakers, and Kramer touch panels are covered by a standard one (1) year warranty. Kramer 7-inch touch panels purchased on or after April 1st, 2020 are covered by a standard two (2) year warranty.

3. All Kramer Calibre products, all Kramer Minicom digital signage products, all HighSecLabs products, all streaming, and all wireless products are covered by a standard three (3) year warranty.

4. All Sierra Video MultiViewers are covered by a standard five (5) year warranty.

5. Sierra switchers & control panels are covered by a standard seven (7) year warranty (excluding power supplies and fans that are covered for three (3) years).

6. K-Touch software is covered by a standard one (1) year warranty for software updates.

7. All Kramer passive cables are covered by a lifetime warranty.

Who is Covered

Only the original purchaser of this product is covered under this limited warranty. This limited warranty is not transferable to subsequent purchasers or owners of this product.

What Kramer Electronics Will Do

Kramer Electronics will, at its sole option, provide one of the following three remedies to whatever extent it shall deem necessary to satisfy a proper claim under this limited warranty:

1. Elect to repair or facilitate the repair of any defective parts within a reasonable period of time, free of any charge for the necessary parts and labor to complete the repair and restore this product to its proper operating condition. Kramer Electronics will also pay the shipping costs necessary to return this product once the repair is complete.

2. Replace this product with a direct replacement or with a similar product deemed by Kramer Electronics to perform substantially the same function as the original product. If a direct or similar replacement product is supplied, the original product's end warranty date remains unchanged and is transferred to the replacement product.

3. Issue a refund of the original purchase price less depreciation to be determined based on the age of the product at the time remedy is sought under this limited warranty.

What Kramer Electronics Will Not Do Under This Limited Warranty

If this product is returned to Kramer Electronics or the authorized dealer from which it was purchased or any other party authorized to repair Kramer Electronics products, this product must be insured during shipment, with the insurance and shipping charges prepaid by you. If this product is returned uninsured, you assume all risks of loss or damage during shipment. Kramer Electronics will not be responsible for any costs related to the removal or re-installation of this product from or into any installation. Kramer Electronics will not be responsible for any costs related to any setting up this product, any adjustment of user controls or any programming required for a specific installation of this product.

How to Obtain a Remedy Under This Limited Warranty

To obtain a remedy under this limited warranty, you must contact either the authorized Kramer Electronics reseller from whom you purchased this product or the Kramer Electronics office nearest you. For a list of authorized Kramer Electronics resellers and/or Kramer Electronics authorized service providers, visit our web site at www.kramerav.com or contact the Kramer Electronics office nearest you.

In order to pursue any remedy under this limited warranty, you must possess an original, dated receipt as proof of purchase from an authorized Kramer Electronics reseller. If this product is returned under this limited warranty, a return authorization number, obtained from Kramer Electronics, will be required (RMA number). You may also be directed to an authorized reseller or a person authorized by Kramer Electronics to repair the product.

If it is decided that this product should be returned directly to Kramer Electronics, this product should be properly packed, preferably in the original carton, for shipping. Cartons not bearing a return authorization number will be refused.

Limitation of Liability

THE MAXIMUM LIABILITY OF KRAMER ELECTRONICS UNDER THIS LIMITED WARRANTY SHALL NOT EXCEED THE ACTUAL PURCHASE PRICE PAID FOR THE PRODUCT. TO THE MAXIMUM EXTENT PERMITTED BY LAW, KRAMER ELECTRONICS IS NOT RESPONSIBLE FOR DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION, OR UNDER ANY OTHER LEGAL THEORY. Some countries, districts or states do not allow the exclusion or limitation of relief, special, incidental, consequential or indirect damages, or the limitation of liability to specified amounts, so the above limitations or exclusions may not apply to you.

Exclusive Remedy

TO THE MAXIMUM EXTENT PERMITTED BY LAW, THIS LIMITED WARRANTY AND THE REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, REMEDIES AND CONDITIONS, WHETHER ORAL OR WRITTEN, EXPRESS OR IMPLIED. TO THE MAXIMUM EXTENT PERMITTED BY LAW, KRAMER ELECTRONICS SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IF KRAMER ELECTRONICS CANNOT LAWFULLY DISCLAIM OR EXCLUDE IMPLIED WARRANTIES UNDER APPLICABLE LAW, THEN ALL IMPLIED WARRANTIES COVERING THIS PRODUCT, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL APPLY TO THIS PRODUCT AS PROVIDED UNDER APPLICABLE LAW. IF ANY PRODUCT TO WHICH THIS LIMITED WARRANTY APPLIES IS A "CONSUMER PRODUCT" UNDER THE MAGNUSON-MOSS WARRANTY ACT (15 U.S.C.A. §2301, ET SEQ.) OR OTHER APPLICABLE LAW, THE FOREGOING DISCLAIMER OF IMPLIED WARRANTIES SHALL NOT APPLY TO YOU, AND ALL IMPLIED WARRANTIES ON THIS PRODUCT, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR THE PARTICULAR PURPOSE, SHALL APPLY AS PROVIDED UNDER APPLICABLE LAW.

Other Conditions

This limited warranty gives you specific legal rights, and you may have other rights which vary from country to country or state to state.

This limited warranty is void if (i) the label bearing the serial number of this product has been removed or defaced, (ii) the product is not distributed by Kramer Electronics or (iii) this product is not purchased from an authorized Kramer Electronics reseller. If you are unsure whether a reseller is an authorized Kramer Electronics reseller, visit our web site at www.kramerav.com or contact a Kramer Electronics office from the list at the end of this document.

Your rights under this limited warranty are not diminished if you do not complete and return the product registration form or complete and submit the online product registration form. Kramer Electronics thanks you for purchasing a Kramer Electronics product. We hope it will give you years of satisfaction.

KRAMER

⚠ **SAFETY WARNING**
Disconnect the unit from the power supply before opening and servicing

For the latest information on our products and a list of Kramer distributors, visit our website where updates to this user manual may be found.

We welcome your questions, comments, and feedback.