LXI HiSLIP Extended Function

Revision 1.01

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Revision history

Revision	*Description*
October 18, 2011	Several editorial edits associated with feedback from the 1.00 vote. Updated references to IVI 6.1 HiSLIP protocol version 1.1. Removed references to locking, which LXI is no longer pursuing.
June 3, 2011	Added rules 20.7.6 (Advertise HiSLIP DNS-SD with HiSLIP port) and 20.8.4 (Preserve HiSLIP port across power cycles)
May 16, 2011	Added standard draft patent rights language to cover sheet.
March 8, 2011	Change 20.8.3 to a rule (Hislip Address string on web page). Fix formatting of 20.9.2. Revise 20.4.4 to specify HiSLIP behavior for LCI.
February 23, 2011	Remove resolved issue regarding use of alternate ports for HiSLIP, use 'LXI Device Specification 2011', add observations that rules referencing future LXI specs (LXI IPv6, LXI Connection Locking) are only recommendations until those specs are adopted. Clarify standardizing on IVI 6.1 HiSLIP protocol version 1.0.
January 26, 2011	Minor formatting fixes, use 'LXI Device Specification 2010', 4880 port use issue
January 11, 2011	Accepted all changes, removed now-resolved issues list.
December 14, 2010	Add locking rules, additional LXI standards relationships, and clean up text
December 13, 2010	Add section relating this to other extended functions. Clarify address strings in the LXI XML info document.
December 3, 2010	Include changes recommended by the Extended Function working group: remove Appendix B, move Appendix C (test procedures) to a separate document.
November 5, 2010	Add Test Appendix
October 26, 2010	Address issues from the initial LXI Consortium presentation
October 5, 2010	Adapt to use Extension Template
October 4, 2010	Initial draft

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20 LXI HiSLIP Extended Function

20.1 Introduction

The LXI HiSLIP Extended Function adds support for the IVI 6.1 HiSLIP protocol for fast instrument communication.

20.2 Purpose and Scope

This document is an extension of the LXI Device Specification 2011. Numbering for Section, **RULES,** and **RECOMMENDATIONS** is consistent with the hierarchy of the LXI Device Specification 2011.

20.2.1 Purpose

The LXI HiSLIP Extension defines use of the IVI HiSLIP protocol (IVI 6.1) for fast instrument communication.

HiSLIP has the following features:

- Sockets-like IO speed (approaching LAN saturation for large binary blocks)
- VXI-11-like Instrument-like behavior
    - Reliable 'EOM' (end of message) signaling, regardless of data content
    - Asynchronous SRQ (service request) signaling
    - Read instrument Status byte
    - Asynchronous Device Clear support
    - Group trigger
    - Remote/local mode switching
    - Better lock support:
        - VISA-compatible shared and exclusive locks with nesting.
        - Locks honored across PC's: Locks held in instrument.
        - Locking programs can coexist with lock-unaware programs
        - Short term locks only delay other program's instrument operations
    - Interrupted error detection/correction (MEPE message exchange control protocol subset for LAN)
- IPv6: Usable on IPv6 or IPv4 networks

20.2.2 Scope

This document defines a set of **RULES** and **RECOMMENDATIONS** for constructing a LXI Device conformant with the LXI HiSLIP Extension. Whenever possible these specifications use existing standards.

The standard specifies:

1. LXI HiSLIP protocol requirements,
2. LXI HiSLIP DNS-SD service announcement requirements,
3. LXI HiSLIP Web page requirements,
4. LXI HiSLIP device information XML requirements,
5. LXI HiSLIP device IPv4 and IPv6 requirements

20.3 Applicable Standards and Documents

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

20.3.1 Trade Association Standards[1,2,3]

IVI-6.1, "High-Speed LAN Instrument Protocol (HiSLIP)", Dated February 24, 2011, Revision 1.1

IVI VISA 5.0 specifications:

VPP-4.3: The VISA Library

20.4 Relationship to other LXI Standards

The LXI HiSLIP extended function relates to other LXI standards as specified below.

20.4.1 RULE – Comply with LXI Device Specification

Devices implementing the LXI HiSLIP extended function shall comply with the LXI Device Specification.

Observation

> The first version of the LXI specification defining the LXI Device Specification is 'LXI Device Specification 2011' dated March 1, 2011. That document contains a definition of terms regarding rule and recommendation language that applies to this document.

20.4.2 RULE – Obey LXI IPv6 if supporting IPv6 for HiSLIP

If devices support IPv6 HiSLIP connections, they shall also conform to the LXI IPv6 Extended Function.

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[1] IVI specifications are available from the IVI Foundation at http://www.ivifoundation.org
[2] LXI Standards are available from the LXI Consortium at http://www.lxistandard.org
[3] VXI-11 specifications are available from the VXI Bus Consortium at http://www.vxibus.org/

Observation

> This rule only applies to devices tested for conformance after the LXI IPv6 Extended Function is adopted. However, vendors should conform to the draft LXI IPv6 Extended Function if they support IPv6 HiSLIP in the interim.

20.4.3 **[This Rule Deleted in version 1.01]**

20.4.4 **RULE – Reset to Default HiSLIP Port and Close Connections on LCI**

HiSLIP devices shall respond to LCI (LAN Configuration Initialize) by resetting to the default HiSLIP port (4880) and closing all active HiSLIP connections.

Observation

> As a result of closing active HiSLIP connections, all HiSLIP locks are released.

20.5 LXI Device Conformance Requirements

The document "***LXI Consortium Policy for Certifying Conformance to LXI Consortium Standards***" gives specific requirements on conformance certification. Refer to Section 2 and Section 3 of that document for further information related to conformance of this extended function.

20.5.1 **RULE – Conformance Requirements**

The LXI HiSLIP function is an optional function for devices conforming to the LXI Core Device specification, as defined in section 1.4.4.2 of "LXI Device Specification 2011".

All LXI Devices implementing the LXI HiSLIP function as permitted by 1.4.4.1 of the "LXI Device Specification 2011" shall implement and conform to the requirements of all sections in this document in addition to any relevant requirements of 'LXI Device Specification 2011'.

20.6 LXI HiSLIP Protocol Requirements

20.6.1 **RULE – Implement the IVI 6.1 HiSLIP Protocol**

Devices implementing the LXI HiSLIP Function shall implement the HiSLIP protocol version 1.1, as defined in "IVI 6.1: High-speed LAN Instrument Protocol (HiSLIP) February 24, 2011".

20.6.2 **RULE – Accept IPv4 HiSLIP Connections**

LXI HiSLIP Devices shall accept HiSLIP connections over the IPv4 network.

20.6.3 **RECOMMENDATION – Accept IPv6 HiSLIP Connections**

LXI HiSLIP Devices should accept HiSLIP connections over the IPv6 network.

[This Rule Deleted in version 1.01]

20.7 LXI HiSLIP DNS-SD Service Requirements

20.7.1 **RULE – Advertise the HiSLIP DNS-SD Service**

Devices implementing the LXI HiSLIP Function shall advertise that they accept HiSLIP connections via the HiSLIP DNS-SD service announcement.

20.7.2 **RULE – Use the LXI Single Service Instance Name**

LXI devices shall use the same service name for all LXI DNS-SD services, including HiSLIP.

20.7.3 **RULE – Use Service Type Name '_hislip._tcp'**

HiSLIP DNS-SD service announcements shall use the mDNS service type name '_hislip._tcp'.

20.7.4 **RULE – Include Required TXT Record Keys**

HiSLIP DNS-SD service announcements shall have the following TXT record keys:

- txtvers=<version of TXT record>
    - Recommended, but may be omitted if the version is '1'. If omitted defaults to: "txtvers=1"
    - If included, must be the first TXT record key
- Manufacturer=<first element of response to IEEE 488.2 *IDN?>
- Model=<second first element of response to IEEE 488.2 *IDN?>
- SerialNumber=<third element of response to IEEE 488.2 *IDN?>
- FirmwareVersion=<fourth element of response to IEEE 488.2 *IDN ?>

Example:

- txtvers=1
- Manufacturer=Example Test Inc.
- Model=LXI-1
- SerialNumber=65193
- FirmwareVersion=1.0

20.7.5 **RULE – Advertise HiSLIP DNS-SD Service after '_lxi._tcp'**

The HiSLIP DNS-SD service advertisement shall follow advertisement of the LXI DNS-SD service.

Observation

> LXI requires that the http and lxi mDNS services are advertised first so that later LXI mDNS services can use the same conflict-resolved hostname and service name.

20.7.6 **RULE – Advertise HiSLIP DNS-SD Service with HiSLIP Port**

The HiSLIP DNS-SD service advertisement shall use the currently-configured HiSLIP port.

Observation

> The default HiSLIP port is 4880, but users can change this via the LXI LAN configuration web page.

20.8 LXI HiSLIP Web Interface

20.8.1 RULE – Include 'LXI HiSLIP' in Welcome Web Page "LXI Extended Functions"

Devices implementing the LXI HiSLIP function shall include 'LXI HiSLIP' in the 'LXI Extended Functions' display item of the welcome web page.

20.8.2 RULE – Include HiSLIP Address String in Welcome Web Page "LXI Device Address String"

The Welcome Web Page "LXI Device Address String" display item shall contain the HiSLIP address string necessary to request a HiSLIP connection that conforms with the VISA 5.0 HiSLIP address string format as specified in section 4.3.1 of "VPP-4.3: The VISA Library".

Observation

> The "LXI Device Address String" display item contains other address strings. Each address string should be on separate lines to facilitate copy and paste by users.
>
> The VISA HiSLIP address string takes the form:
>
> TCPIP[board]::host address[::HiSLIP device name[,HiSLIP port]][::INSTR]
> Where:
> **Board** is the network interface number (default 0).
> **Host address** is the hostname or IP address of the LXI device.
> **HiSLIP device name** begins with 'hislip'. Typically, 'hislip0' is used.
> **HiSLIP port** is the port number to use for connections, defaulting to 4880.
>
> Examples:
>
> TCPIP::1.2.3.4::hislip0::INSTR
> Addresses the device at IPv4 address 1.2.3.4 using the default interface board and HiSLIP port.
>
> TCPIP::[fe80::1]::hislip0::INSTR
> Addresses the device at IPv6 link local address fe80::1 using the default interface board and HiSLIP port.
>
> TCPIP::myHiSLIPInst.local::hislip0::INSTR
> Addresses the device at a local mDNS hostname using the default interface board and HiSLIP port.

20.8.3 RULE – Include HiSLIP port on the LXI LAN Configuration Web Page

The HiSLIP port shall be displayed on the LAN Configuration Web Page.

Observation

> While most users will want to use the HiSLIP 4880 default port, occasionally it may be necessary to use a different port. One such reason is moving HiSLIP connections to a port that passes through firewalls via a DMZ.

20.8.4 **RULE – Preserve HiSLIP port across power cycles**

The HiSLIP port setting shall be preserved across power cycles.

20.9 LXI HiSLIP XML Identification Document

20.9.1 **RULE – Include the HiSLIP Address String in LXI Identification XML**

LXI devices implementing HiSLIP shall include an 'InstrumentAddressString' XML element with the HiSLIP address string.

Examples:

<InstrumentAddressString>TCPIP::1.2.3.4::hislip0::INSTR</InstrumentAddressString>

<InstrumentAddressString>TCPIP::1.2.3.4::hislipAnalyzer::INSTR</InstrumentAddressString>

Observation

> The address string is for the instrument being defined by the current LXI XML Identification document. If other instruments can be addressed in the instrument, their address strings should appear in their own LXI XML identification document, with the parent or root LXI XML identification document containing a Connected Devices entry pointing to that child document.

20.9.2 RULE – Include the LXI HiSLIP Function in the <LxiExtendedFunctions> element

LXI devices implementing HiSLIP shall include a <Function> element in the <LxiExtendedFunctions> XML element with the FunctionName attribute of "LXI HiSLIP" and a Version attribute containing the version number of this document. If the port number used for HiSLIP is other than the standard HiSLIP port (4880), the <Function> element shall include a <Port> element with the value of the custom port number.

Examples:

```
<Function FunctionName="LXI HiSLIP" Version="1.0"/>
```

```
<Function FunctionName="LXI HiSLIP" Version="1.0">
  <Port>12345</Port>
</Function>
```

Appendix A Glossary and Use of Technical Terms (Normative)

The definitions of technical terms and acronyms in this appendix shall be used in interpreting the defined term or acronym in the context of this standard. Additional terms can be found in the LXI Device Specification document.

HiSLIP

HiSLIP is the High-speed LAN Instrument Protocol as adopted by IVI as the IVI 6.1 standard. It is based on TCP/IP and can be utilized on IPv4 or IPv6 networks.