VXI-11 Discovery and Identification Extended Function

Revision 1.1

June 26, 2023

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Revision history

Revision	Description
1.1 June 26, 2023	Editorial Changes Changed title of Rule 10.1.3.1
1.1 May 10, 2022	Added Rules 10.1.3, 10.1.4 & 10.1.5 to specify LXI Discovery and Identification be disclosed on the Welcome page and in the xml identification document.
1.0 Nov 8, 2016	Initial Release

1 Overview

1.1 Introduction

Many LXI instruments communicate via the LAN through one of three protocols, VXI-11, raw sockets, and HiSLIP. The VXIbus Consortium published the [VXI-11Specification](#) in 1995. The IVI Foundation published the [HiSLIP Specification](#) in 2011 as a faster replacement for VXI-11. All these protocols provide mechanisms to send ASCII commands, such as Standard Commands for Programmable Instrumentation (SCPI), along with other familiar GPIB operations.

The LXI Consortium supports all of these protocols in the LXI Standard. All are available to instrument manufacturers whose instruments are LXI conformant. This document will focus on the VXI-11 Extended Function discovery function (*IDN?).

VXI-11 was designed to emulate the capabilities of GPIB, including those based upon hardware signals, such as service request (SRQ), serial poll, device trigger and device clear. It was first used in LAN to-GPIB gateways, before native LAN-based instruments became available. LAN-based instruments were standardized by implementing the LXI Specification, published in 2005.

VXI-11 was the only mandated discovery tool used in early versions of the LXI Standard. Later versions of the standard mandate mDNS and made VX-11 an optional Extended Functions, because it is less accepted in Ethernet and will not support IPv6.

The remaining portions of this document call out the rules, recommendations, observations, etc. for implementing the LXI VXI-11 Extended Function for LXI Device discovery and identification.

1.2 Purpose and Scope of this Document

1.2.1 Purpose

Each LXI Extended Function has its own document with unique section numbering that, if merged with the LXI Specification Core document, would produce a contiguous representation of the entire LXI Specification.

This document supplies the requirements for LXI conformance to the LXI VXI-11 Discovery and Identification Extended Function.

1.2.2 Scope

This document defines a common set of **RULES** and **RECOMMENDATIONS** for constructing a conformant LXI Device with one or more Extended Functions. Whenever possible these specifications use existing industry standards.

The original LXI Device Specification included both requirements for all LXI Devices and a number of Extended Functions in a single document. Common information remains in the LXI Device Specification and specific information related to the Extended Function moves to separate documents.

1.3 Definition of Terms

This document contains both normative and informative material. Unless otherwise stated the material in this document shall be considered normative.

NORMATIVE: Normative material shall be considered in determining whether an LXI Device is conformant to this standard. Any section or subsection designated as a RULE or PERMISSION is normative.

INFORMATIVE: Informative material is explanatory and is not considered in determining the conformance of an LXI Device. Any section or subsection designated as RECOMMENDATION, SUGGESTION, or OBSERVATION is informative. Unless otherwise noted examples are informative.

RULE: Rules **SHALL** be followed to ensure compatibility for LAN-based devices. A rule is characterized by the use of the words **SHALL** and **SHALL NOT**. These words are not used for any other purpose other than stating rules.

RECOMMENDATION: Recommendations consist of advice to implementers that will affect the usability of the final device. Discussions of particular hardware to enhance throughput would fall under a recommendation. These should be followed to avoid problems and to obtain optimum performance.

PERMISSION: Permissions are included to clarify the areas of the specification that are not specifically prohibited. Permissions reassure the reader that a certain approach is acceptable and will cause no problems. The word **MAY** is reserved for indicating permissions.

OBSERVATION: Observations spell out implications of rules and bring attention to things that might otherwise be overlooked. They also give the rationale behind certain rules, so that the reader understands why the rule must be followed. Any text that appears without heading should be considered as description of the specification.

1.4   Additional LXI Conformance Requirements

1.4.4 Extended Functions

1.4.4.1   General Description

The LXI Standard consists of the LXI Device Specification, required for all LXI Devices. In addition, it includes all optional Extended Functions.

LXI Extended Functions

Extended Functions come in the form of external documents. Each Extended Function document will have sections numbered as though they were part of the LXI Device Specification, but the documents are separate to simplify maintenance of the standard and to add new Extended Functions without altering the LXI Device Specification. The *Guide to LXI Documentation* identifies the Extended Function documents.

1.4.4.2   Conformance Requirements

The rules in this document define the conformance requirements for this Extended Function. In addition to the requirements for all LXI Devices found in the *LXI Device Specification*, an Extended Function may require conformance to another Extended Function. All these requirements are detailed in the following Rule:

LXI Device Specification Document:

- All LXI Devices shall conform to the rules found in Section 1.4 and all subsections

LXI VXI-11 Document (this document):

- Include all rules

10 LAN Discovery and Identification

This section extends the discovery and identification of the LXI Device Specification. LXI devices must support mDNS discovery. VXI-11 is an early form of discovery supported by many LAN-based devices.

10.1 RULE – Support VXI-11 Discovery Protocol

The VXI-11 protocol should be supported by all LXI Devices for discovery purposes. If an LXI Device supports the VXI-11 Discovery Protocol, it shall be accomplished by issuing a broadcast RPC call on the host's subnet. The broadcast RPC shall be to either the port-mapper itself on port 111 (querying for VXI-11 support) or the NULL procedure (procedure 0) on the Program Number assigned to the VXI-11 Core Service (0x0607AF).

10.1.1 RULE – VXI-11 Servers Respond Within One Second

If the VXI-11 discovery protocol is supported, it shall respond to a broadcast RPC to the NULL procedure within 1 second.

*Observation – SCPI *IDN? Usage*

A host may establish a VXI-11 connection to each discovered LXI Device and perform a SCPI *IDN? command to determine the LXI Device's manufacturer and model.

Since SCPI commands typically set the device into a Remote state due to the emulation of the GPIB interface, some manufacturers choose to single out this query and not allow the device to transition into the Remote state. This helps front panel users avoid having to press the Local key to resume front panel operations when some computer is querying devices on a shared LAN using the *IDN?.

10.1.2 RULE– SCPI *IDN?

If the LXI Device support the VXI-11 Discovery Protocol at a minimum an LXI Device that supports VXI-11 shall be able to respond to the IEEE 488.2 "*IDN?" command. This is a simple query that returns four comma-separated fields, which indicate manufacturer, model, serial number, and firmware version[1].

10.1.2.1 Permission – Additional VXI-11 and SCPI Support Is Optional

LXI Devices may support additional VXI-11 functionality and SCPI commands beyond that required for discovery.

10.1.3 LXI VXI-11 Web Interface Requirements

10.1.3.1 RULE – Include 'LXI VXI-11 Discovery and Identification' in Welcome Web Page "LXI Extended Functions"

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[1] For more information, see IEEE 488.2 Section 10.14.

Devices implementing the LXI VXI-11Discovery and Identification extended function shall include 'LXI VXI-11 Discovery and Identification' in the 'LXI Extended Functions' display item of the welcome web page.

10.1.4 LXI VXI-11 XML Identification Document Requirements

10.1.4.1 RULE – Include the LXI VXI-11 Function in the <LxiExtendedFunctions> element

LXI devices implementing VXI-11 Discovery and Identification extended function shall include a <Function> element in the <LxiExtendedFunctions> XML element with the FunctionName attribute of "LXI VXI-11 Discovery and Identification" and a Version attribute containing the version number of this document.

Examples:

<Function FunctionName="LXI VXI-11 Discovery and Identification" Version="1.1"/>

10.1.5 LXI VXI-11 mDNS Service Discovery Requirements

10.1.5.1 RULE – Advertise the LXI VXI-11 Service Type

The following service needs to be advertised by mDNS. See section 10.4.3.10 in the LXI Device Specification for further information.

Observation

> Devices should advertise the VXI-11 service *only* if they support a complete and useful VXI-11 implementation (e.g., full command interpreter for the device). Devices with only minimal VXI-11 services, as documented in *LXI VXI-11 Discovery and Identification Extended Function* are discouraged from advertising their VXI-11 service.
>
> VISA Address can be derived from the generated xml file associated with this device. Use the IP address or hostname and do not include the domain name. For Example: TCPIP::A-52230A-04585.local::inst0::INSTR

Service Type	TXT Record Keys	Description
vxi-11 (_vxi-11._tcp)	txtvers=<version of TXT record">; default "txtvers=1"; current version is 1 Manufacturer=<first element of response to IEEE 488.2 *IDN?> Model=<second element of response to IEEE 488.2 *IDN?> SerialNumber=<third element of	VXI-11 Server

	response to IEEE 488.2 *IDN?> FirmwareVersion=<fourth element of response to IEEE 488.2 *IDN?> Address=<VISA Address> Address=<VISA Address> Example: TCPIP::myHostName.local::inst0::INSTR	