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Communications and Firmware Upgrade Instructions

Overview

This document describes how to use the Model 2306-LAN Battery/Charger Simulator and connect to a local area network (LAN) and how to upgrade the firmware.

The Model 2306-LAN is a TCP/IP protocol supported instrument. There is one LAN port that supports full connectivity on a 10 Mbps or 100 Mbps network. The 2306-LAN automatically detects the network speed.

Figure 1: Model 2306-LAN connection location
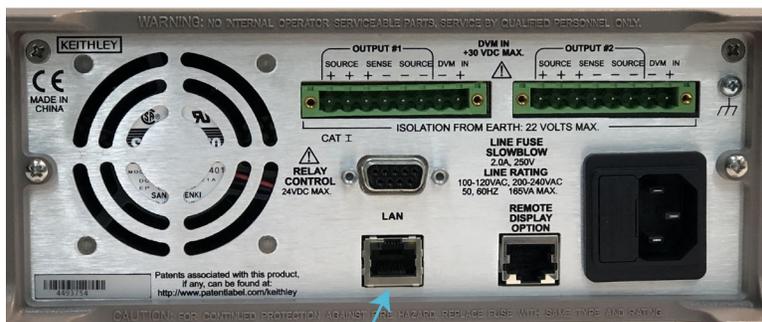
LAN port

NOTE

Contact your network administrator to confirm your specific network requirements before setting up a LAN connection.

If you have problems setting up the LAN, refer to LAN troubleshooting (on page 14).

Set up LAN communication on the instrument

The following information describes how to set up manual or automatic LAN communications.

See the *Model 2302/2302-PJ/2306/2306-PJ/23-6-VS Battery/Charger Simulator Quick Results Guide* (document number: 2306-903-01) for other setup information and the *Model 2302/2302-PJ/2306/2306-PJ/23-6-VS Battery/Charger Simulator Instruction Manual* (document number: 2306-901-01) for other operating instructions on tek.com/keithley.

LAN cable connection

Connect a LAN cable from your computer to the LAN port on the rear panel of the 2306-LAN.

Figure 2: Model 2306-LAN cable connection

LAN cable
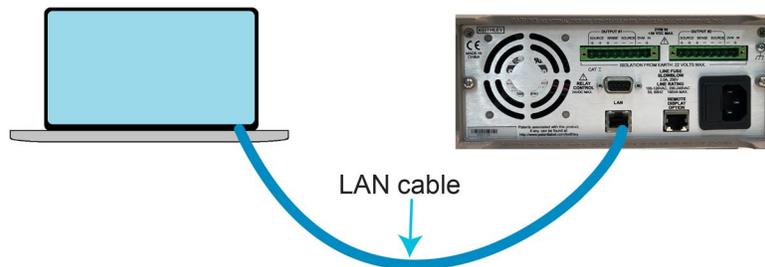
Each device on a LAN (corporate or private) requires a unique IP address. Contact your corporate information technology (IT) department for details about obtaining an IP address before you connect the 2306-LAN to a corporate or private network.

NOTE

Contact your corporate IT department for permission before you connect the 2306-LAN to a corporate network.

When the 2306-LAN is shipped, the IP configuration is set to manual and is set to the following values:

Instrument IP address: 192.168.0.2

Gateway: 192.168.0.1

Subnet mask: 255.255.255.0

These values persist through a power cycle unless they are changed or the LAN RESET button is selected. If the LAN RESET button is selected, the TCP/IP mode is set to manual. For more detail on the LAN RESET button, refer to the .

Configure your computer and the IP address of the instrument on the same network, as indicated in the following graphic.

- Set the computer IP address: `192.168.0.3`
- Set the instrument IP address (this is the instrument default): `192.168.0.2`
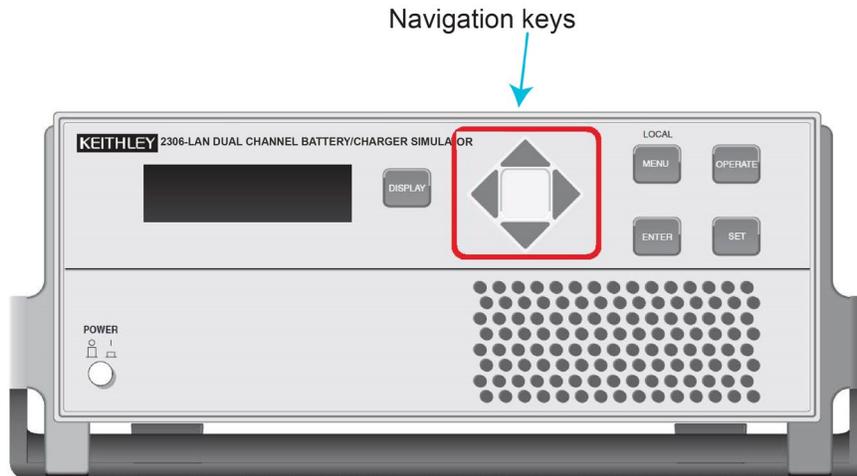
Figure 3: Model 2306-LAN configure computer
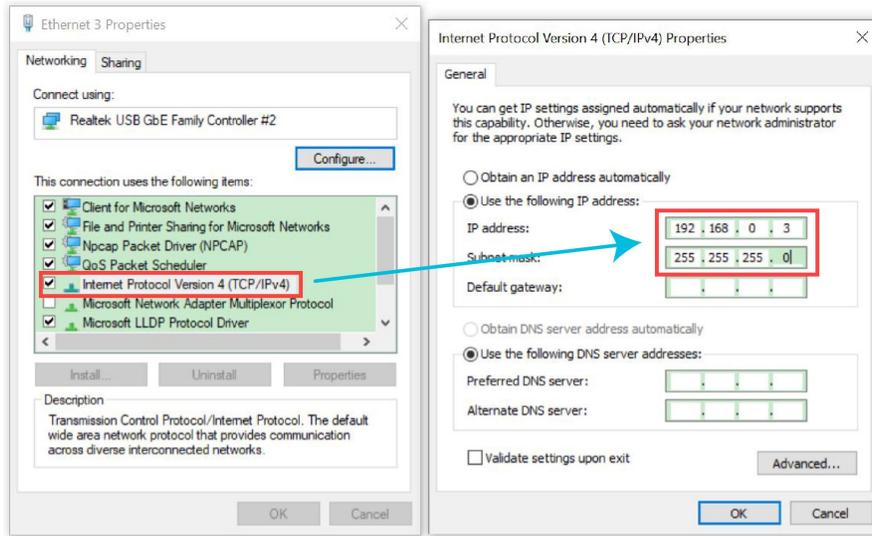
Check communication settings

Before configuring the LAN, you can check the communications settings on the instrument without making any changes. Use the navigation keys as indicated in the following figure to navigate through the menu items.

Figure 4: Model 2306-LAN front panel

To check communications settings on the instrument from the front panel:

1. Press **MENU** to activate the menu and use the ▲ (up) and ▼ (down) keys to navigate through the primary menu items.

2. Navigate until `VIEW OR CHANGE: LAN` is displayed on the screen.

3. Press **ENTER** to access the LAN menu. Use the ▲ (up) and ▼ (down) keys to navigate through the LAN menu items.

   - `METHOD` (DHCP method)
   - `IP-ADDRESS`
   - `GATEWAY`
   - `SUBNET-MASK`
   - `LAN RESET` (you can reset the LAN here, if needed)
   - `PORT`
   - `MAC_ADDRESS` (this cannot be changed)

4. Press **ENTER** to access the menu and review the settings for the interface.

5. Press **ENTER** again to save changes or press **MENU** to leave the menu without making any changes.

Manually setup the LAN configuration

The following information details how to set up the 2306-LAN IP configuration, IP address, gateway, subnet mask, port, and LAN configuration on the instrument from the front panel.

NOTE

Contact your corporate information technology (IT) department to secure a valid IP address for the instrument when placing the instrument on a corporate network.
The instrument IP address has leading zeros, but the computer IP address does not.

To manually set up the instrument from the front panel:

NOTE

Press **MENU** to leave the menu without making any changes. Press **ENTER** to save and return to the main menu.

1. Press **MENU** to activate the menu. Use the ▲ (up) and ▼ (down) keys to go to **VIEW OR CHANGE: LAN**.

2. Press **ENTER** to access the LAN menu. Use the ▲ and ▼ keys to navigate through the LAN menu items.

3. To set the IP configuration DHCP method, go to the **METHOD** menu and press **ENTER.** Use ▲ and ▼ to display **MANUAL** or **AUTO** and change the IP configuration.

4. To set the IP address, go to **IP-ADDRESS** and press **ENTER**. Use ▲ and ▼ and ◄ and ► to enter a valid IP address. The default IP address is 192.168.000.002.

5. To set the GATEWAY, go to **GATEWAY** and press **ENTER**. Use ▲ and ▼ and ◄ and ► to enter a valid GATEWAY address. The default GATEWAY is 192.168.000.001.

6. To set the SUBNET-MASK, go to **SUBNET-MASK** and press **ENTER**. Use ▲ and ▼and ◄ and ► to enter a valid SUBNET-MASK. The Default SUBNET-MASK is 255.255.255.000.

7. To set the PORT, go to **PORT** and press **ENTER**. Use ▲ and ▼ and ◄ and ► to enter a valid PORT number. The default PORT is 5025. Range (0 through 65535).

8. To reset the LAN configuration, go to **LAN RESET** and press **ENTER**. Select **YES** to reset all LAN configurations (select **CANCEL** to keep the current LAN configuration).

9. Press **ENTER** for the LAN configuration to take effect and return to the main menu.

LAN configuration through a computer

You will need to download the 2306-LAN Configuration Tool from the [Product Support and Downloads web page](). This tool provides the interface needed to set up the 2306-LAN IP address, subnet mask, gateway, and port from a computer. Once the executable file for the configuration tool has been downloaded to your computer, the following information describes how to install and use the tool.

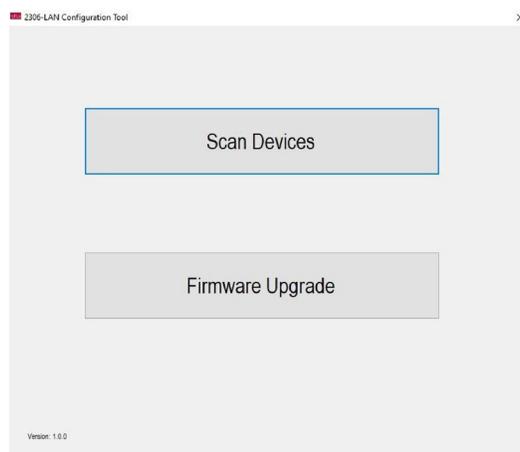For firmware upgrade information, go to [Firmware upgrade instructions]() (on page 12).

NOTE

Do not use this configuration procedure for the Series 2300 models 2302, 2303, 2306, or 2308 instruments.

***To use the LAN Configuration Tool:***

1. Double-click the `2306-LAN Configuration Tool.exe` file.

2. Select **Scan Devices**.

Figure 5: Scan devices

3. Select **Scan** (refer to the following figure). All IP information for the instrument is displayed automatically (the default IP is 192.168.0.2). The following figure and table identify the settings in the 2306-LAN Configuration Tool.

Figure 6: Model 2306-LAN configuration tool
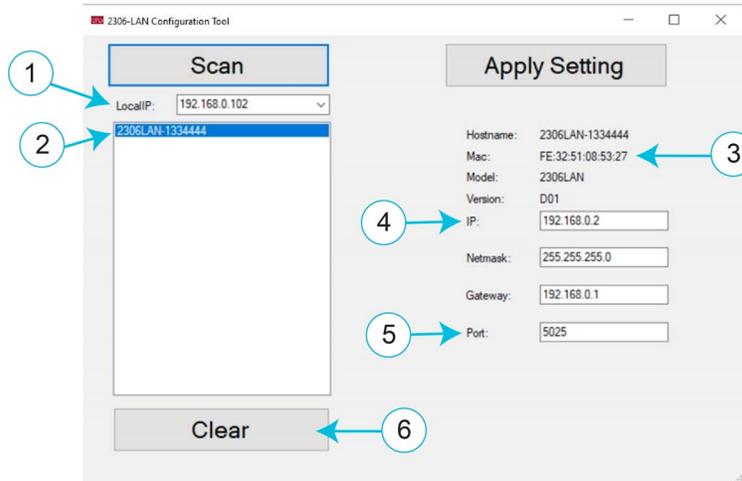
LAN configuration setting	Description
1	Local IP address of your computer
2	Instrument serial number
3	Instrument MAC address
4	Instrument IP address
5	Port (5025 is the default)
6	Select **Clear** to clear all of the display value

4. Change the IP address, subnet mask , gateway, and port, as needed (the port default is 5025).

5. Select **Apply Setting**.

The following table indicates the range of IP addresses that can be used on the 2306-LAN instrument.

Class	IP range (set up on instrument)
A	**1**.0.0.0 through **126**.255255.255
B	**128**.0.0.0 through **191**.255.255.255
C	**192**.0.0.0 through **223**-255.255.255

AUTO-MDIX

NOTE

The Model 2306-LAN does not support automatic MDIX (medium dependent interface crossover) feature. However, with an AUTO-MDIX network card, it is possible. We recommend using straight-through cables to connect the 2306-LAN to switches or routers, and crossover cables to connect the 2306-LAN workstations or servers. Also, if the Model 2306-LAN instrument is connected to a personal computer, router, ethernet switch, or other devices that contain an enabled AUTO-MDIX network card, you can use either type of cable.

LAN interface protocols

You can use one of following LAN protocols to communicate with the 2306-LAN instrument.

Port number	Protocol
1024	VXI-11
5025	Raw socket

NOTE

You can only use one remote interface at a time. Although multiple ethernet connections to the instrument can be opened, only one can be used to control the instrument at a time.

VXI-11: Similar to a GPIB cable and supports message boundaries and service requests (SRQs). A VXI-11 driver or VISA software is required.

Raw socket: Basic ethernet connection that communicates similarly to RS-232 without explicit message boundaries. The instrument always terminates messages with a line feed. However, binary data may include bytes that resemble line feed characters and it may be difficult to distinguish between data and line feed characters.

Programming C# examples

See the following <u>VXI-11 protocol C# example</u> (on page 8) and the <u>Raw socket protocol C# example</u> (on page 9) for detail.

VXI-11 protocol C# example

When you use the VXI-11 protocol to communicate with a 2306-LAN instrument, use the C# (C-sharp) programming language using the following example (in the order indicated) to program your instrument.

1. Open resource.
2. Configure resource.
3. Send a command or READ data.

```csharp
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using Ivi.Visa;
namespace Idn
{
 class Program
 {

   static void Main(string[] args)
   {
   var system_dmm =(Ivi.Visa.IMessageBasedSession)
   Ivi.Visa.GlobalResourceManager.
   Open ("TCPIP0::192.168.0.2::inst0::INSTR");
   // Set timeout value to 60 seconds
   system_dmm.TimeoutMilliseconds = 60000;
   system_dmm.SendEndEnabled = true;
   system_dmm.TerminationCharacterEnabled = true;
   //return character
   system_dmm.TerminationCharacter = 0xa;


   //system_dmm.FormattedIO.WriteLine("*rst");
   //system_dmm.FormattedIO.WriteLine("*cls");
   system_dmm.FormattedIO.WriteLine("*IDN?");
   Console.WriteLine("\nInstrumnet ID: {0}\n",
   system_dmm.FormattedIO.ReadLine());
   Console.WriteLine("\nSet and output Sour1 volt to 1V ,and Sour2 volt to 2V\n");
   system_dmm.FormattedIO.WriteLine(":sour:volt 1;:output on;:sour2:volt 2;
   :output2 on");
   system_dmm.FormattedIO.WriteLine("read?;");
   Console.WriteLine("\nSour1 volt value:    {0} ", system_dmm.FormattedIO.ReadLine());
   system_dmm.FormattedIO.WriteLine("read2?;");
   Console.WriteLine("Sour2 volt value:    {0}\n", system_dmm.FormattedIO.ReadLine());

   System.Threading.Thread.Sleep(4000);
   system_dmm.FormattedIO.WriteLine(":output off;:output2 off");
   // Close the session
   system_dmm.Dispose();
   }
 }
}
```

Raw socket protocol C# example

When you use the VXI-11 protocol to communicate with a 2306-LAN instrument, use the C# (C-sharp) programming language using the following example (in the order indicated) to program your instrument.

1. Set the IP address.
2. Set the port.
3. Connect to the instrument.
4. Send a command or READ data.

```csharp
static void Main(string[] args)
{
    //define IP address variable
    IPAddress ip;
    //define end point
    IPEndPoint ipe;
    //define a socket
    Socket clientSocket;
    //instrument address ip: 192.168.0.2
    ip = IPAddress.Parse("192.168.0.2");
    // set instrument TCP port:5025
    ipe = new IPEndPoint(ip, 5025);
    clientSocket = new Socket(AddressFamily.InterNetwork, SocketType.Stream,
    ProtocolType.Tcp);
    //Connect to instrument through LAN
    clientSocket.Connect(ipe);
    //send message
    string idnCommand = ":SOUR:VOLT 5;:OUTP ON;:READ?";
    //send command
    set 5v, output on, read volt value
    //Command encodes to byte array
    byte[] sendBytes = Encoding.ASCII.GetBytes(idnCommand);
    //send command
    clientSocket.Send(sendBytes);

    C//windows console output
    Console.WriteLine("Send:   " + idnCommand);

    //receive message
    string recStr = "";
    //define receiving array . length 4096 bytes
    byte[] recBytes = new byte[4096];
    //receive command response
    int bytes = clientSocket.Receive(recBytes, recBytes.Length, 0);
    //encoding to strings
    recStr = Encoding.ASCII.GetString(recBytes, 0, bytes);
    //console output strings
    Console.WriteLine("2306-LAN feedback:   " + recStr);
    clientSocket.Close();
    //pause
    Console.Read();
}
```

NI-VISA example program

NOTE

NI-VISA is National Instruments (NI™) implementation of the VISA standard. The Keithley I/O Layer (KIOL) contains a licensed version of the NI-VISA Runtime Engine that contains only the binary files (DLLs) that allow the NI-VISA drivers to operate.

If you already have NI software (such as LabVIEW™ or LabWindows™) installed, you have a valid license that can be used with Keithley drivers and application software.

If you do not have NI software installed, you must Install Keithley I/O Layer to install the drivers.

VXI-11 NI-VISA protocol example

In the example program, you can query the model information of the instrument using the `*idn?` command, as shown in the following figure.

The VISA resource name must be configured, as shown in the following figure.

**Figure 7: Model 2306-LAN NI-VISA programming example (VXI-11)**
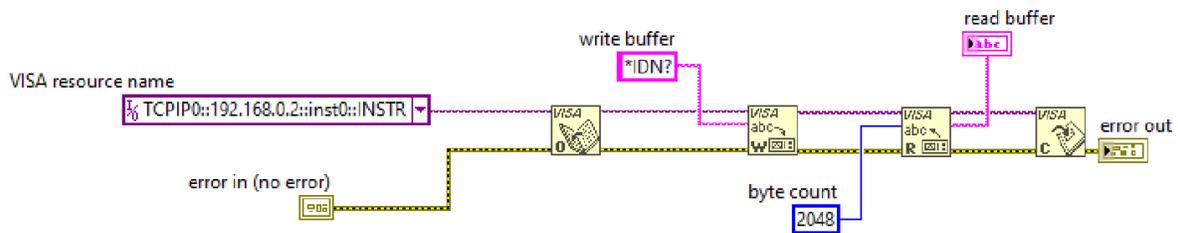
Raw socket NI-VISA protocol example

In the example program, you can query the model information of the instrument using the `*idn?` command, as shown in the following figure.

Also, the list below and the following figure indicate the items that need to be configured:

- TCPIPO
- Send End En
- Suppress End En
- TermChar En
- TermChar

Figure 8: Model 2306-LAN NI-VISA programming example
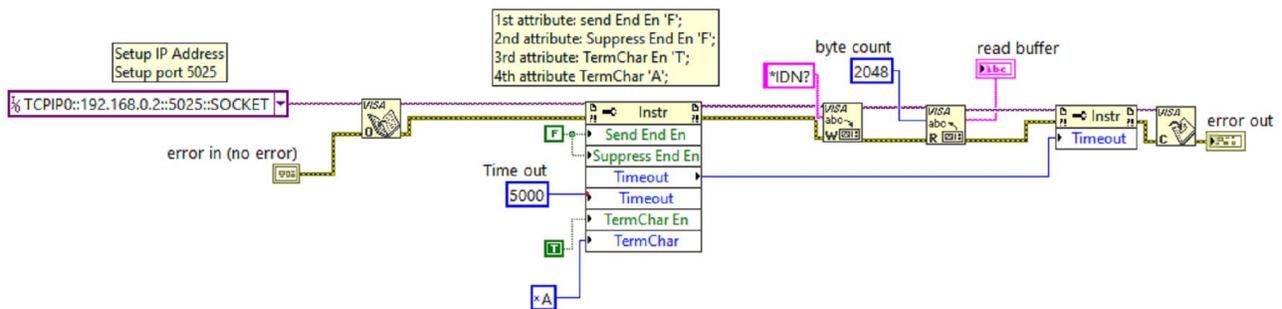
Use a semicolon (;) after each command when you send a command through ethernet with NI-VISA (see the example in the following figure). Using a semicolon keeps commands separated so they are not combined into one command. If the commands are combined, they will not execute properly.

Figure 9: Model 2306-LAN NI-VISA programming semicolon
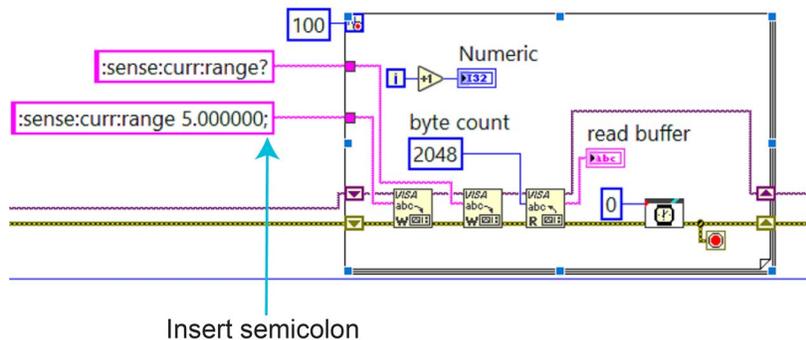
Firmware upgrade instructions

Download the 2306-LAN Configuration Tool from the Product Support and Downloads web page. This tool provides the interface needed to upgrade the firmware and set up the 2306-LAN IP address, netmask, gateway, and port from a computer. Once the executable file for the configuration tool has been downloaded to your computer, the following information describes how to install and use the tool.

You also need to download the firmware you want to install on your Model 2306-LAN instrument from the Product Support and Downloads web page.

Go to LAN configuration through a computer (on page 5) for more information about LAN configuration.

NOTE

Do not use this configuration procedure for the Series 2300 models 2302, 2303, 2306, or 2308 instruments.

Connect a LAN cable from your computer to the LAN port on the rear panel of the 2306-LAN. Set the computer IP address (`192.168.0.3`) and the Subnet mask (`255.255.255.0`), and set the instrument IP address (`192.168.0.2`).

To use the LAN configuration tool:

1. Double-click the `2306-LAN Configuration Tool.exe` file.
2. Select **Firmware Upgrade** (see the following figure).

Figure 10: 2306-LAN Firmware Upgrade
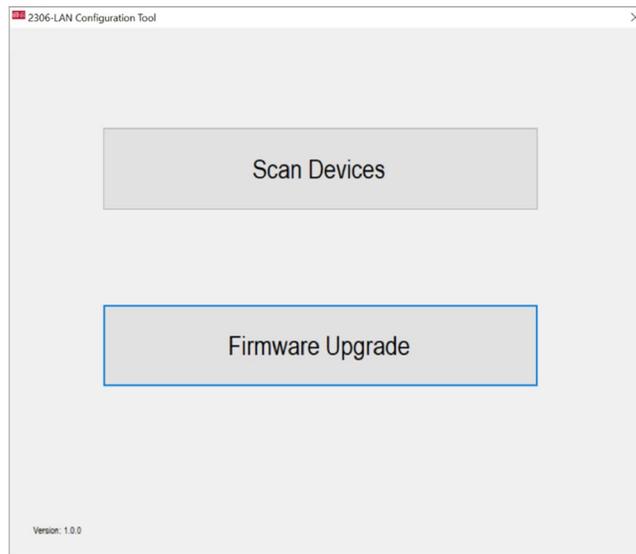
3. Select the Local IP to your computer IP address (**192.168.0.3**), as shown in the following figure.

Figure 11: Upgrade LAN firmware
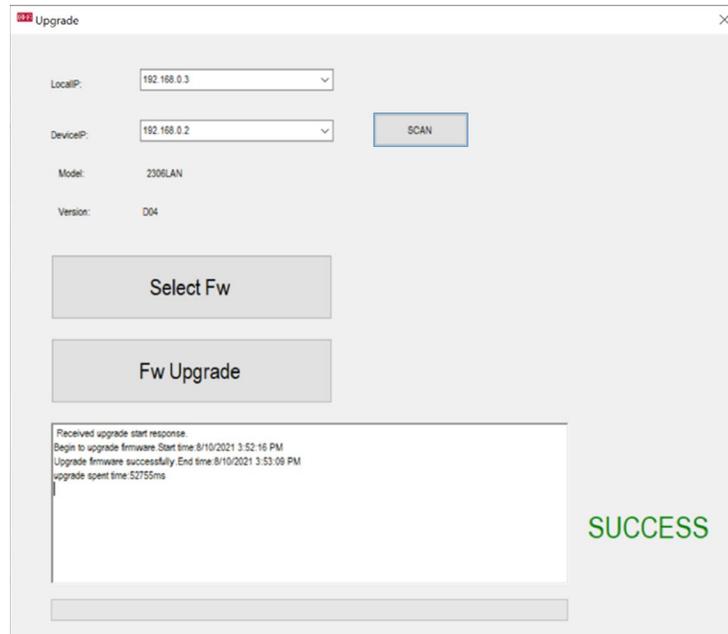
4. Select **Scan**. The IP information of the instrument is displayed (the default IP address is `192.168.0.2`).

5. Select **Select Fw** to choose the firmware file saved on your computer.

6. Select **Fw Upgrade** to proceed.

You will see the word `SUCCESS` when the upgrade is complete.

LAN troubleshooting

If you are unable to connect to the instrument, check the following items:

- Verify that the network cable is in the LAN port on the rear panel of the instrument. Refer to Overview (on page 1) for the location of the LAN port.
- Verify that the network cable is in the correct port on the computer. The LAN port of a laptop may be disabled when the laptop is in a docking station. If this is the case, connect to the LAN port on the docking station.
- Verify that the correct ethernet configuration information for the card was used during the setup procedure.
- Verify that the network card in the computer is enabled.
- Verify that the IP address of the instrument is compatible with the IP address on the computer.
- Verify that the subnet mask address of the instrument is the same as the subnet mask address on the computer.
- Restart your computer and the instrument.

If the above actions do not correct the problem, contact your system administrator.

Product support

Contact product support (Product Support and Downloads web page) if you have any problems or questions. Alternatively, you can arrange to have Keithley Instruments upgrade your firmware at the factory by calling your local Keithley Instruments support office.

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with nonhazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to the user documentation for complete product specifications.

If the product is used in a manner not specified, the protection provided by the product warranty may be impaired.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating properly, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the user documentation. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, perform safe installations, and repair products. Only properly trained service personnel may perform installation and service procedures.

Keithley products are designed for use with electrical signals that are measurement, control, and data I/O connections, with low transient overvoltages, and must not be directly connected to mains voltage or to voltage sources with high transient overvoltages. Measurement Category II (as referenced in IEC 60664) connections require protection for high transient overvoltages often associated with local AC mains connections. Certain Keithley measuring instruments may be connected to mains. These instruments will be marked as category II or higher.

Unless explicitly allowed in the specifications, operating manual, and instrument labels, do not connect any instrument to mains.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30 V RMS, 42.4 V peak, or 60 VDC are present. A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.

Operators of this product must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 V, no conductive part of the circuit may be exposed.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

For safety, instruments and accessories must be used in accordance with the operating instructions. If the instruments or accessories are used in a manner not specified in the operating instructions, the protection provided by the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories. Maximum signal levels are defined in the specifications and operating information and shown on the instrument panels, test fixture panels, and switching cards.

Chassis connections must only be used as shield connections for measuring circuits, NOT as protective earth (safety ground) connections.

The **WARNING** heading in the user documentation explains hazards that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in the user documentation explains hazards that could damage the instrument. Such damage may invalidate the warranty.

The **CAUTION** heading with the ⚠ symbol in the user documentation explains hazards that could result in moderate or minor injury or damage the instrument. Always read the associated information very carefully before performing the indicated procedure. Damage to the instrument may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits — including the power transformer, test leads, and input jacks — must be purchased from Keithley. Standard fuses with applicable national safety approvals may be used if the rating and type are the same. The detachable mains power cord provided with the instrument may only be replaced with a similarly rated power cord. Other components that are not safety-related may be purchased from other suppliers as long as they are equivalent to the original component (note that selected parts should be purchased only through Keithley to maintain accuracy and functionality of the product). If you are unsure about the applicability of a replacement component, call a Keithley office for information.

Unless otherwise noted in product-specific literature, Keithley instruments are designed to operate indoors only, in the following environment: Altitude at or below 2,000 m (6,562 ft); temperature 0 °C to 50 °C (32 °F to 122 °F); and pollution degree 1 or 2.

To clean an instrument, use a cloth dampened with deionized water or mild, water-based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., a data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

Safety precaution revision as of June 2018.