

LinkRunner® 10G

Advanced 10Gig Ethernet Tester

Overview

The LinkRunner 10G, is the most cost-effective solution for 10 Gig network testing. LinkRunner 10G simplifies testing and configuration of copper and fiber Ethernet networks, streamlining workflows by combining essential functions of installation and triage in a single, ruggedized unit.

This next-generation Android-based tester delivers complete network validation, qualification and troubleshooting, from the media (copper/fiber) to the application (layers 1-7), accelerating deployments, speeding problem identification, and improving the efficiency and effectiveness of network installers and operations teams.

- Install, test, verify, and troubleshoot technology upgrades, Multi-Gig (NBASE-T) and 10G networks with advanced Android™-based troubleshooting apps and purpose-built test hardware
- Physical layer testing includes cable (TDR) testing, toning, wiremapping, and LANBERT™ Media Qualification testing with cable SNR (Signal-to-Noise Ratio) measurements for Multi-Gig links
- Compatibility with standards compliant SFPs enables test and validation of any wired media (copper or fiber) for a variety of use models
- Validate up to 90W 802.3bt PSE with TruePower™ loaded Power over Ethernet (PoE) test
- Two LinkRunner 10G units can be used for line-rate performance testing to verify network capacity, performance and QoS, as well as service provider SLAs between sites

**Cost-Effective, Line-Rate
10Gig Ethernet Testing**



Key Features

Flexible Platform for a Variety of Testing Needs

The LinkRunner 10G has two Ethernet ports. The main test RJ-45 port supports Multi-Gig networks from 10/100/1000Mbps to 2.5/5/10G to verify link speed, SNR, and duplex advertised and connected. It can request and verify PoE power under load from up to 90W PSE's. Alternatively, it can interface to fiber networks via single/multi-mode SFP+ to test 1/10Gbps fiber-based Ethernet. The second RJ-45 management port connects to 10/100/1000Mbps Ethernet for remote control, and conducts network scanning and tests where needed. It is also the port for cable testing.

In addition to fiber optic transceivers (SX, LX, SR, LR, ZX, singlemode, multimode, etc.) the SFP+ slot can be utilized with a variety of standards-based interfaces, such as TwinAx or other Direct Attach Copper (DAC) cables, and vendor-specific transceivers.

As an Android-based device, LinkRunner 10G can use a variety of apps from the Link-Live app store for a variety of uses. The USB-A port provides connectivity for added USB adapters and third-party accessories such as printers, barcode scanners, fiber optic inspection cameras, and more. The use of a USB-based Wi-Fi adapter (such as the Edimax AC1200 for 802.11ac/b/g/n/) provides for connectivity and wireless testing using a third-party app.

The USB-C port is compatible with higher-power USB-C chargers, as well as external power-packs for all-day portable use.

Main Ethernet Test Ports (RJ-45 & SFP)





Simplifies tasks and empowers technicians to verify complex networks with next generation AutoTest

The LinkRunner 10G has out-of-the-box AutoTest profiles with best practice pass/fail thresholds for quick assessment of network configurations and services providing over 45 discreet test results/measurements in seconds.

AutoTest Element Configurations include:

- Switch port PoE validation up to 90W from PSE and TruePower™ load testing
- 802.1x authentication
- Link speed/duplex advertised vs. actual, Multi-Gig link SNR measurement
- VLAN Tagged traffic detection & monitoring
- Switch port identification with interface stats, connected devices and drill-down
- DHCP availability, response time, automatic detection of 2nd DHCP offer, and connect log
- DNS lookup (forward/reverse) availability and response time
- Gateway availability and response time
- Active connection test targets (Ping or TCP Connect)
- End-user response time measurement via HTTP

Multiple profiles can be created for complex networks with multiple VLANs supported per switch port, each with its own set of IP targets. These can then be organized into profile groups that execute each test against each profile in sequence. The result is that multiple VLANs can be verified and documented in one go. Since the pre-defined profiles can be executed individually, the profiles group serves as a resource for technicians to verify each specific VLAN during troubleshooting. With profile groups, engineers can transfer their network configuration and test knowledge to technicians, saving training time and effort.

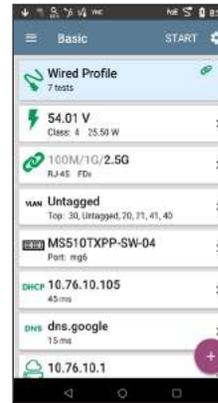
Multi-Gig Link Validation

With the expanding deployment of Multi-Gig switching (typically to feed greater bandwidth to Wi-Fi 6 access points), users are finding that their cable plant may not support the desired speed. Cable quality, length, installation workmanship, and noise in the environment all can contribute to “downshifting” to lower-than-expected speeds.

- **Cabling SNR Measurement** – LinkRunner 10G can now verify copper media for Multi-Gig capability (1 / 2.5 / 5 / 10Gig), and provide root cause diagnosis when link speed downshifting occurs.

24-Hour Monitoring for Intermittent Issues

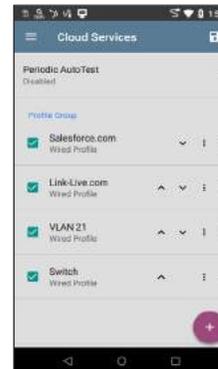
Periodic AutoTest: In this mode, AutoTest runs at specified intervals (from 1 minute to 24 hours) and sends the results to Link-Live to view the results over time. This is an effective way to “monitor” aspects of your network for an extended period, or to help diagnose intermittent issues without having to manually execute multiple tests. Results are automatically timestamped and can be prefixed with a user-entered comment for grouping or organization. Test results can be quickly analyzed in Link-Live using the filtering and sorting functions. Email notifications can warn you when errors are found.



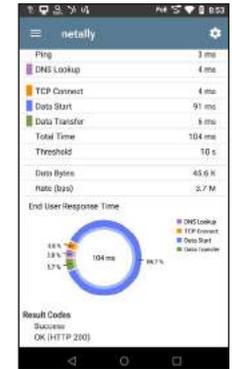
NBASE-T switch network with VLAN and 802.1x authentication



Add & customize profiles for standardized testing



Test profiles enable comprehensive, consistent infrastructure testing



HTTP test reveals cloud/web-based services response times



Cabling SNR measurement validates Multi-Gig links



Periodic AutoTest enables monitoring infrastructure for intermittent issues

10G copper/fiber wired performance tests for critical links and key devices

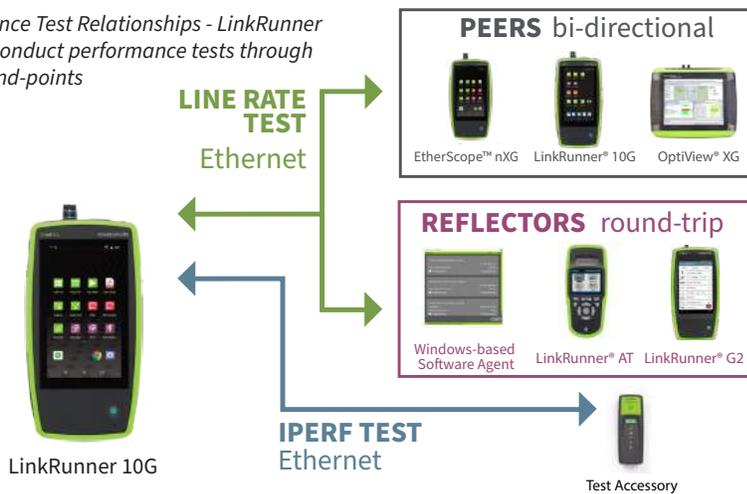
Two LinkRunner 10G units (or one unit paired with an EtherScope nXG) and the Network Performance Test (NPT) app can be used to stress critical network links, such as switch ports to servers/storage/Wi-Fi access points, uplinks or WAN links, with up to eight simultaneous data streams at up to 10G line-rate. It verifies the link's compliance to service level agreements (SLA) based on throughput, packet loss, QoS, delay and jitter.

This performance test can be run at up to full line-rate in order to measure the top-end bandwidth and quality of your network from end-to-end, or for particular network segments. It can also be utilized to bench-test switches for optimal configuration prior to rollout into production. For troubleshooting on a production network (where excessive test traffic could be detrimental), many users will configure the NPT feature with a low stream of traffic (even just 64Kbps) in order to characterize network quality, identify possible packet loss, delay and jitter, and validate QoS.

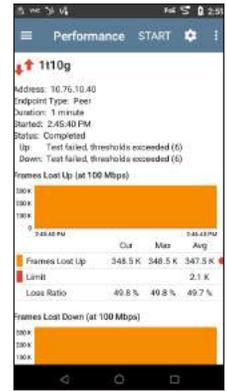
Settings for data streams and thresholds for VoIP or video service can be stored and recalled where needed, saving configuration time.

For key servers/services in the cloud or Internet, engineers can pre-define tests and thresholds to verify their connectivity and performance using ping, TCP connect, HTTP, or FTP. Continuous testing with response time measurements is available to verify consistency and identify intermittent issues. These tests can be easily recalled by field technicians to reduce configuration time or mistakes, to get more done faster.

Performance Test Relationships - LinkRunner 10G can conduct performance tests through various end-points



Performance test with up to 8 streams and 8 end points



Frame loss, jitter, and latency charted



iPerf throughput test with TCP or UDP frames



HTTP test against a webserver with end-user response-time analysis

TCP Connect Test -TCP Connect Test showing response time over time (up to last 24-hours)



List of Problems Automatically Detected by LinkRunner 10G Discovery Enabled

| | | |
|---|---------------------------------|---|
| Bad Subnet Mask | High Interface Utilization* | High Disk Utilization* |
| Duplicate IP Address | High Interface Errors* | High Memory Utilization* |
| DHCP Server Not Responding | High FCS Errors* | Recent Device Reboot* |
| LinkRunner 10G Received Used IP from DHCP | High Packet Discards* | Spanning Tree Topology Change |
| LinkRunner 10G Lost DHCP Lease | Detected Half-Duplex Interfaces | SNMPv3 Agent Responded to SNMPv1/v2 Query |
| Max Clients on SSID | High CPU Utilization* | |

*Problems detected wither user-definable threshold

LANBERT™ Media Qualification App

Your copper and fiber cable plant serves as the foundation of your network. But do you know whether it is of sufficient quality to provide the bandwidth required? With the insatiable growth in bandwidth, increasing speeds of Wi-Fi APs (with Multi-Gig 2.5/5Gbps backhauls), 1Gbps to 10Gbps upgrades, and deploying new fiber links, network professionals must have confidence that their network will transport that data error-free at the maximum speed possible. Downtime or intermittent loss and errors is simply not an option.

The quality of components and workmanship of installation is critical, but typical cable certification testers can be very expensive, single-purpose tools – making them cost-prohibitive for many installers and end-users. The new LANBERT media qualification app for NetAlly's multi-function professional instruments provides a simple and fast method of assessing the quality of transmission and available bandwidth.

LANBERT generates and measures the transmission of line rate Ethernet frames over your network cabling infrastructure, qualifying its ability to support 1G/10G on fiber and 100M/1G/2.5G/5G/10G on copper links.

Key Features

- Maximize utilization of your existing cable plant
- Qualify copper cable bandwidth for 2.5 / 5 / 10Gbps
- Validate 1Gbps/10Gbps fiber optic cabling and components
- Identify maximum error-free throughput

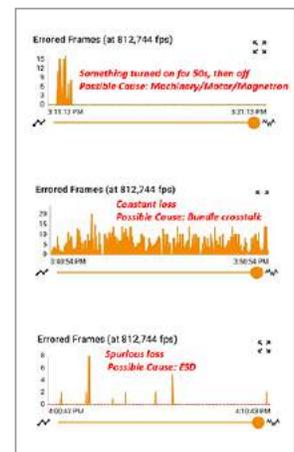
Running the LANBERT test using the EtherScope® nXG and/or LinkRunner® 10G as endpoints over a long duration (up to 24 hours) serves as a “soak test” to identify the presence of intermittent issues and noise events that can corrupt network traffic. With easy-to-read trend graphs and the ability to drill down to 1-second granularity, LANBERT helps you identify exactly when errors occur.

Poor quality components and/or installation workmanship can result in links that are susceptible to noise, whether induced from within cable bundles or from outside events such as electrostatic discharges (ESD), crosstalk, or electromagnetic (EMF) pulses caused by motors or other machinery. This can cause not only bit errors and frame loss but may prevent certain technologies (Multi-Gig) from linking at the designated speed causing a downshift to the next lower rate.

But beware of other testers offering similar capabilities! Standard Layer 2-only Ethernet access link testing will not validate layer-3 enterprise switches and routers. Because it does not test the IP (Internet Protocol) layer, this methodology cannot pass through Layer 3 devices. Thankfully, NetAlly's multifunction tools also feature the Layer 3 line-rate Network Performance Test app, that can transmit and test across your entire network infrastructure end-to-end – not just one access link and switch. It also includes up to 4 streams with individual L2 and L3 QoS and VLAN controls, essential capabilities for truly understanding the capacity and quality of packet transmission

The LANBERT app generates a stream of Ethernet frames onto a copper or fiber link which are redirected back to the EtherScope using one of three methods:

- 1) Single tester with physical loopback (for fiber, using a jumper between Tx and Rx; for twisted-pair cabling using an RJ-45 loopback connector – limited to 100Mbps)
- 2) Single tester with active remote loopback (switch port configured in loopback mode, or reflector test instrument (such as LinkRunner G2, for up to 1Gbps)
- 3) Dual tester, one in Generator mode, the other in Loopback mode, using two EtherScope nXG units, two LinkRunner 10G units, or one of each (up to 10Gbps copper or fiber testing.)

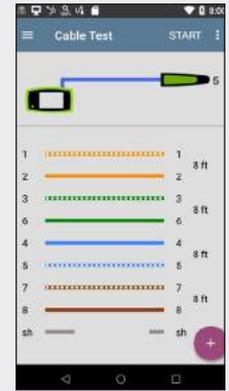
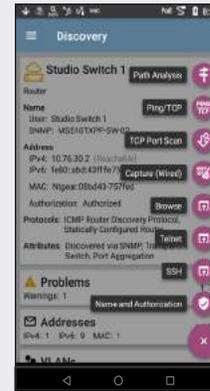


Additional Troubleshooting Tools

Packet Capture: You can capture up to 10G line-rate to create a PCAP file of up to 1Gigabyte. Packet slicing and filtering are supported, and PCAP files can be uploaded to the Link-Live Cloud Service for easy sharing.

Cable Test: determine length, shorts, and split pairs and locate opens on UTP cable. Verify the wiremap of UTP and ScTP cable with a WireView adapter. It can generate either analog tone or the unique digital tone for the Fluke Networks® IntelliTone™ Probe for quick cable tracing.

Android Apps: Users can download apps from the Link-Live app store to accomplish many tasks in addition to testing.



Tools, such as a browser, are available to conduct device level investigation

Cable test with Wiremap detecting distance to fault, including cable shield

Examples of Android apps available to download to LinkRunner 10G

| | |
|----------------------|--|
| Configuration | |
| Testing | |
| Documentation | |
| Collaboration | |

Automated Test Results Management

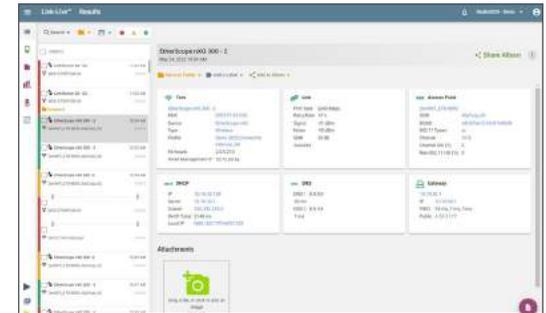
Serving as a centralized test results and device management system, Link-Live transforms team workflows with the ability to quickly and easily log, document, and report test activity from all NetAlly handheld network testers.

Once the instrument is connected to the Link-Live (available as a complimentary cloud service or private cloud/on-premise version) your test results are automatically uploaded to the dashboard for project management and reporting. You have the option of uploading additional files, screenshots, images, profiles, packet captures, location information, and comments anytime. Also, NetAlly instruments with AllyCare Support can receive firmware updates “over the network” from Link-Live as they become available.

An API is available to retrieve and integrate data from Link-Live into other management platforms, such as your trouble-ticket application or network management system. This gives you the ability to easily provide proof-of-performance and better manage jobs and staff efficiency.

This unified dashboard of both wired and Wi-Fi network connectivity results enables you to:

- Reduce results management overhead for multiple testers and users
- Enables seamless collaboration between site personnel and remote experts
- Attach photos, user comments to each result, adding context for future changes and troubleshooting

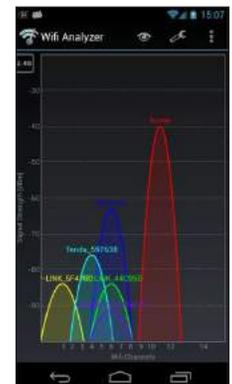


Simplify report generation across media types for network deployment documentation

Wi-Fi Network Visibility

With the use of a USB-A based Wi-Fi adapter (such as the Edimax AC1200 for 802.11ac/b/g/n) provides for connectivity and wireless testing using a third-party apps, available for download from the Link-Live app store. While not nearly as powerful as the tools available in EtherScope nXG or AirCheck G3, this capability provides an essential level of visibility where needed. Note, other than the upload/attachment of screen captures, there is no integration from third-party apps with Link-Live. Information collected from these apps cannot be saved to Link-Live (another reason to utilize EtherScope nXG or AirCheck G3 for Wi-Fi troubleshooting.)

Third-party apps, such as Wi-Fi Analyzer, can be used for WLAN visibility.



AllyCare-Enabled Features*

The following AllyCare-enabled features and capabilities of this product are enabled by having an active AllyCare Support services contract:

Discovery – Know who and what is on your network

The LinkRunner 10G discovery app automatically discovers your network immediately upon power-up. The discovery provides quick security and health audits of the network devices across multiple VLANs and subnets.

Devices are classified and correlated to provide complete visibility of their name, network addresses, VLAN, SSID, device type, and where available, traffic statistics. Engineers can name and set authorization status for devices discovered. Discovery results can be directly uploaded to the complimentary Link-Live Cloud Service for storage, conduct detailed analysis of devices discovered with filter and sort tools, or export to CSV/PDF files as documentation.

LinkRunner's discovery can be enriched by accessing SNMP MIBs of infrastructure devices. It shows details such as device configuration summary, interface configuration and traffic detail, SSIDs supported by WLAN Controllers, and devices directly connected to switches. Community strings entered are concealed from view.

Discover possible security risks caused by users and others: 2nd DHCP offers indicating possible rogue servers, unknown switches granting access to multiple devices.

The LinkRunner 10G's discovery automatically detects problems. It shows possible cause(s) for each problem detected, and it has integrated troubleshooting tools to investigate further to get to root cause.

Switch Management

Drill into switch interfaces via SNMP for additional diagnostics, including trend graphs on utilization, errors, discards, half-duplex (HDX), RSTP, and recent reboots.

Path Analysis

Shows the switch/router path connecting the LinkRunner 10G to an IP device on across wired and Wi-Fi networks, and even beyond the local network, e.g., from the LinkRunner 10G's test port to a server in the cloud or data center. The LinkRunner 10G offers built-in tools to conduct further analysis of the devices along the path: view configuration, interface traffic statistics, launch Telnet or browser, conduct port scan, ping and more.

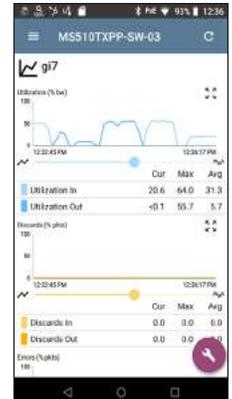
Cloud-Based Remote Control

All LinkRunner 10G owners can remotely control their tester on the same network using VNC. With AllyCare support, you get simple and secure remote-control that allows you to connect from Link-Live™ directly to your network-connected LinkRunner 10G anywhere in the world for troubleshooting and collaboration without leaving your desk! (Requires internet access.)

Device detail showing VLAN, interfaces, uptime, & more with drill-down



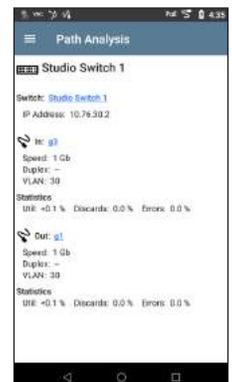
Interface traffic statistics - correlated for 24 hours to detect intermittent events



Path Analysis shows the device & interfaces that UDP/TCP traffic traverses



Shows the interfaces of devices present in path analysis



***NOTE:** All new LR10G-200 mainframes are sold with the first year (1 year) of AllyCare support included. At the end of your existing contract, you must renew your AllyCare Support contract to continue utilizing the AllyCare-enabled features described above.



AllyCare-Enabled Features* - continued

Network Topology Mapping – Integrated Wired and Wi-Fi Network Diagrams

No more struggling to keep manually drawn maps up to date! LinkRunner 10G (with AllyCare support) automatically discovers both your wired and Wi-Fi networks for instant mapping in NetAlly's Link-Live Cloud Service.]

These comprehensive, up-to-the-minute-accurate network diagrams show your network as it is NOW, integrating Layer 2 and Layer 3 topology information, including these connections: switch to host, switch to Access Point, AP to Wi-Fi client, switch to switch, switch to router, and router to router hops.

Now, users can now interact with the network in a flexible map-based user interface to quickly visually identify configuration and topology issues, speeding troubleshooting, and automatically create network documentation.

The LinkRunner 10G's patented discovery engine gathers data from its wired connection (via SNMP and other methods) and from the air (observing Wi-Fi traffic) to generate comprehensive network connectivity maps.

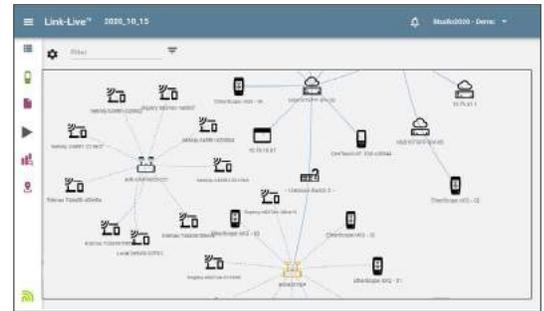
Easy to use filters and map controls allow you to see exactly what you want, and how you want it displayed. Quickly identify network and device configuration errors, and see 'unknown' switches and rogue devices. Element icons are color-coded to identify errors or warnings; double-clicking on any map element brings up its detailed discovery information, including status, problems, interface information, and more.

The importance of visualizing your network

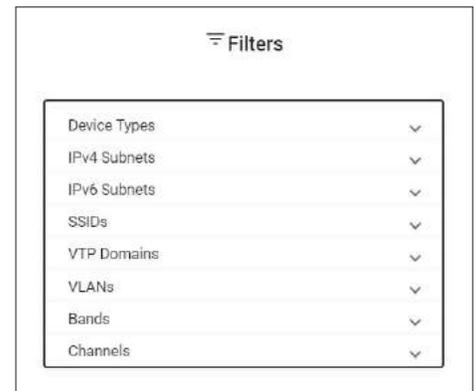
The faster engineers can “see” what is going on in their network, to know who is on the network and where they are connected, and what the path is from “here to there”, the faster they can get to root cause when troubleshooting performance issues. This is especially true for maintenance organizations or system integrators who often troubleshoot an “unknown” network. The problem is that traditional methods (CLI or element managers) take too long and present complex data that's often hard to interpret and difficult to correlate.

Documentation is an essential step for any project, such as pre-deployment network assessments and new technology rollouts, but it can take too much time to complete. From the graphical map-based user interface, one click sends the map data through a Visio file generator, pre-populating the diagram with all discovered devices, links, and corresponding configuration information, saving hours of manual effort, allowing further customization.

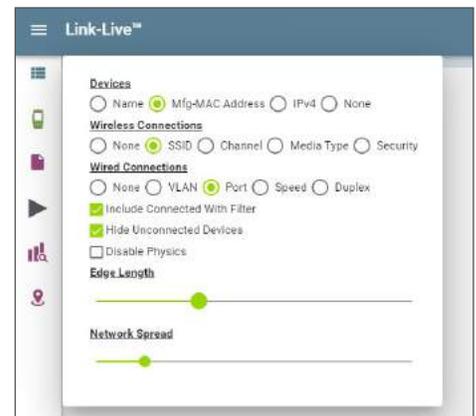
Ideal for enterprises or service organizations, LinkRunner 10G's mapping function saves hours of manual labor, allowing documentation to keep up as the network changes, or provide instant maps for client projects.



Link-Live makes it easy to collaborate and share maps to anyone who needs access, with no added licensing costs. One click exports your map to Microsoft Visio® where you can easily add notations and modify your map.



Filters allow you to choose the types of devices and network configurations to be shown.



Simple controls allow for instant customization of the map's appearance and displayed data

***NOTE:** All new LR10G-200 mainframes are sold with the first year (1 year) of AllyCare support included. At the end of your existing contract, you must renew your AllyCare Support contract to continue utilizing the AllyCare-enabled features described above.



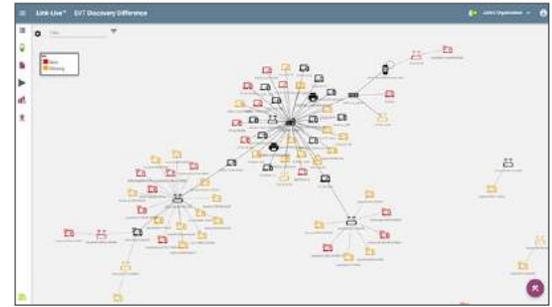
AllyCare-Enabled Features* - continued

Discovery Difference Analysis in Link-Live

Keeping track of network changes while at the same time detecting unauthorized devices connected to your network is essential for speeding troubleshooting and securing your infrastructure, but is very hard to do on a regular basis.

NetAlly's Link-Live cloud service makes it fast and easy. The Discovery Difference analysis simplifies the process of documenting network changes or identifying unauthorized devices by comparing two network discovery snapshots and automatically highlighting new or missing devices on your network. This analysis can be viewed as a network topology diagram or data table.

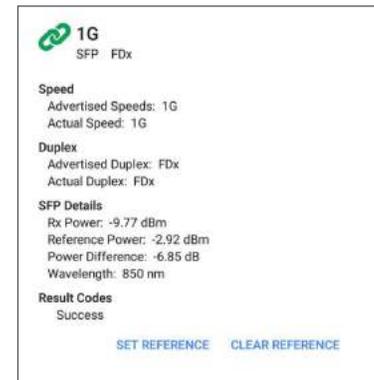
The first discovery test will provide a baseline of the original state of your network, and the second discovery test will provide a snapshot of the current state of your network. Link-Live will compare the two snapshots and then highlight what has changed over time. That includes new devices that were not originally part of your network, and devices that were removed.



Discovery Difference analysis in Link-Live

Optical Power Meter

When connected with fiber, the AutoTest Link card has been augmented with the ability to set a reference and display the current power reading relative to that reference. This is useful for saving the power level at the source as a reference, then measuring the fiber power loss at the far end.



Optical power meter

Models & Accessories

Inclusion of AllyCare Support

All new LR10G-200 mainframes are sold with the first year (1 year) of AllyCare support included. Additional year(s) of support may be added. Product registration and activation is required within 30 days of first power-on.

| Model Number/Name | Description |
|--------------------|---|
| LR10G-200 | LinkRunner 10G Advanced Ethernet Tester Includes: (1) LR10G mainframe with one year of AllyCare support (LR10G-200-1YS), G3-PWRADAPTER, SFP+MR-10G850, RJ-45 inline coupler, WIREVIEW wire mapper #1, <i>Quick Start Guide</i> , and shoulder sling bag. |
| LR10G-200-KIT | LinkRunner 10G Professional Kit Includes: (1) LR10G mainframe with one year of AllyCare support (LR10G-200-1YS), G3-PWRADAPTER, EXG-LR10G-HOLSTER, SFP+MR-10G850, SFP+MR-10G1310, RJ-45 inline coupler, WIREVIEW wire mapper #1-6, <i>Quick Start Guide</i> , and medium soft case. |
| LR10G-200-1YS | 1 year AllyCare Support for LR10G (Use for either LR10G-200 or LR10G-200-KIT) |
| LR10G-200-3YS | 3 year AllyCare Support for LR10G (Use for either LR10G-200 or LR10G-200-KIT) |
| G3-PWRADAPTER | AC Charger replacement/spare for LR-10G mainframe with country power cords |
| EXG-300-LR10G2-KIT | Etherscope nXG 10G Performance Kit Includes: (1) EtherScope nXG (EXG-300-KIT) and (1) LinkRunner 10G (LR10G-200) Purchase LR10G-200-1YS and EXG-300-1YS for 1 year of AllyCare support Purchase LR10G-200-3YS and EXG-300-3YS for 3 years of AllyCare support |
| EXG-LR10G-HOLSTER | Holster for LinkRunner 10G, EtherScope nXG, and EtherScope nXG CE |
| SFP+MR-10G850 | SFP+ Optical Transceiver Module, SX/SR, 1G/10G, 850nm, Multimode |
| SFP+MR-10G1310 | SFP+ Optical Transceiver Module, LX/LR, 1G/10G, 1310nm, Singlemode |
| US-WIFI-BT-USB | Edimax n150 Wi-Fi & Bluetooth USB Adapter for US and Canada |
| EU-WIFI-BT-USB | Edimax n150 Wi-Fi & Bluetooth USB Adapter for Europe |

Specifications

| General | |
|---|---|
| Dimensions | 4.05 in x 7.67 in x 2.16 in (10.3 cm x 19.5 cm x 5.5 cm) |
| Weight | 1.68 oz (0.77kg) |
| Battery | Rechargeable lithium-ion battery pack (7.2 V, 6.4 A, 46 Wh) |
| Battery Life | Typical operating life is 3-4 hours (Battery life from full charge varies depending on the feature being used); Typical charge time is 3 hours |
| Display | 5.0 in color LCD with capacitive touch screen (720 x 1280 pixels) |
| Host Interfaces | RJ-45 and SFP Analysis ports RJ-45 Cable Test and Management Port USB Type-A Port and USB Type-C On-the-Go Port |
| SD card slot | Supports Micro SD card storage - up to 64GB supported |
| Memory | Approximately 8 GB available for storing test results and user applications, 1 GB packet capture buffer |
| Charging | USB Type-C 45W adapter: 100-240 Vac, 50-60 Hz; DC Output Power 15 V (3 A) |
| Media Access | Copper: 10M/100M/1G/2.5G/5G/10G Fiber SFP Adapters: 1G/10GBASE-X |
| Supported IEEE Standards | Wired: 802.3/ab/ae/an/bz/i/u/z PoE: 802.3af/at/bt, Class 0-8 and UPOE |
| Cable Test | Pair lengths, opens, shorts, split pairs, crossed, straight through, and WireView ID Multi-Gig link Signal-to-Noise (SNR) measurement (5 dB threshold) |
| Environmental | |
| Operating Temperature | 32°F to 113°F (0°C to +45°C) NOTE: The battery will not charge if the internal temperature of the device is above 122°F (50°C). |
| Operating relative humidity (% RH without condensation) | 90% (50°F to 95°F; 10°C to 35°C) 75% (95°F to 113°F; 35°C to 45°C) |
| Storage temperature | -4°F to 140°F (-20°C to +60°C) |
| Shock and vibration | Meets the requirements of MIL-PRF-28800F for Class 3 Equipment |
| Safety | IEC 61010-1:2010: Pollution degree 2 |
| Altitude | Operating: 4,000 m; Storage: 12,000 m |
| EMC | IEC 61326-1: Basic Electromagnetic Environment; CISPR 11: Group 1, Class A |
| Certifications and Compliance | |
|  | Conforms to relevant European Union directives |
|  | Conforms to relevant Australian Safety and EMC standards |
|  | Complies with 47 CFR Part 15 requirements of the U.S. Federal Communications Commission |
|  | Listed by the Canadian Standards Association |

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