

# Overview Manual

14221-5247-3000

*Rev. B, September 2023*



## Two47™ Base Station



**L3HARRIS®**  
FAST. FORWARD.

## MANUAL REVISION HISTORY

REV	DATE	REASON FOR CHANGE
-	Feb/23	Initial release.
A	May/23	Revised Section 5.3.
B	Sep/23	Added 700 MHz.

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PSPC Business

Technical Publications

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# 1 REGULATORY AND SAFETY INFORMATION

## 1.1 SAFETY SYMBOL CONVENTIONS

The following conventions are used throughout this manual to alert the user to general safety precautions that must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere violates safety standards of design, manufacture, and intended use of the product. L3Harris assumes no liability for the customer's failure to comply with these standards.



The **WARNING** symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** symbol until the conditions identified are fully understood or met.



The electrical hazard symbol is a **WARNING** indicating there may be an electrical shock hazard present.



The **CAUTION** symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in damage to the equipment or severely degrade equipment performance.



The **NOTE** symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.



The **ESD** symbol calls attention to procedures, practices, or the like, which could expose equipment to the effects of Electro-Static Discharge. Proper precautions must be taken to prevent ESD when handling circuit boards or modules.

## 1.2 IMPORTANT SAFETY INSTRUCTIONS

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water.
- Clean only with dry cloth.
- Where required, this equipment shall be installed in a restricted access location.
- The power socket-outlet shall be installed near the equipment and shall be easily accessible.

- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched; particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.



- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

- Warning: The lightning bolt signifies an alert to the user of the presence of un-insulated "dangerous voltage" within the product's enclosure that may be of significant magnitude to constitute a risk of electric shock to persons.



- Warning: The exclamation point alerts the user to the presence of important operation and maintenance (service) instructions in the literature accompanying the product.
- Outdoor Use Warning: To reduce the risk of Fire or Electric Shock, Do Not Expose This Apparatus to Rain or Moisture.
- Wet Location Warning: Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.
- The building installation shall provide a means for connection to the protective earthing and the equipment shall be connected to that means.
- For permanently connected equipment, a readily accessible power disconnect device shall be incorporated external to the equipment.
- A service person will check if the socket-outlet from which the equipment is to be powered provides a connection to the building protective earth. If not, the service person will arrange for installation of a protective earthing conductor from the separate protective earthing terminal to the protective earth wire in the building.



The equipment must be connected to an earthed mains socket-outlet.  
Udstyret skal tilsluttes en jordet stikkontakt.

### 1.3 MAXIMUM PERMISSIBLE EXPOSURE LIMITS

DO NOT TRANSMIT with this base station and antenna when persons are within the Maximum Permissible Exposure (MPE) Radius of the antenna. The MPE Radius is the minimum distance from the antenna axis that ALL persons should maintain to avoid RF exposure higher than the allowable MPE level set by the FCC.



**Failure to observe these limits may allow all persons within the MPE radius to experience RF radiation absorption, which exceeds the FCC maximum permissible exposure (MPE) limit. It is the responsibility of the base station operator to ensure that the maximum permissible exposure limits are observed at all times during base station transmission. The base station licensee is to ensure that no bystanders are within the radius limits.**

### 1.4 DETERMINING MPE RADIUS

The Maximum Permissible Exposure radius is unique for each site and is determined during site licensing time based on the complete installation environment (i.e., co-location, antenna type, transmit power level, etc.). Determination of the MPE distance is the responsibility of the installation licensee. Calculation of the MPE radius is required as part of the site licensing procedure with the FCC.

### 1.5 SAFETY TRAINING INFORMATION



**The Two47 base station generates RF electromagnetic energy during transmit mode. This base station is designed for and classified as “occupational use only” meaning it must be used only in the course of employment by individuals aware of the hazards and the ways to minimize such hazards. This base station is not intended for use by the “general population” in an uncontrolled environment. It is the responsibility of the base station licensee to ensure that the maximum permissible exposure limits determined in the previous section are observed at all times during transmission. The base station licensee is to ensure that no bystanders come within the radius of the maximum permissible exposure limits.**

When licensed by the FCC, this base station complies with the FCC RF exposure limits when persons are beyond the MPE radius of the antenna. In addition, your L3Harris base station installation complies with the following Standards and Guidelines regarding RF energy and electromagnetic energy levels and evaluation of such levels for exposure to humans:

- FCC OET Bulletin 65 Edition 97-01 Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
- American National Standards Institute (C95.1 – 1992), IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
- American National Standards Institute (C95.3 – 1992), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.



To ensure that your exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use, do not operate the base station in a manner that would create an MPE distance exceeding that allowable by the FCC.



This equipment generates or uses radio frequency energy. Any changes or modifications to this equipment not expressly approved by L3Harris may cause harmful interference and could void the user's authority to operate the equipment.

## 1.6 REGULATORY APPROVALS

### 1.6.1 Federal Communications Commission

The transmitting device described within this manual has been tested and found to meet the following regulatory requirements:

FCC FILING DATA FOR TWO47 BASE STATION			
FREQUENCY BAND (MHz)	POWER OUTPUT (ADJUSTABLE) (Watts)	EMISSION DESIGNATOR	APPLICABLE FCC RULES
851.0 – 869.0 MHz 769.0 – 775.0 MHz	100.0 W	8K00F1D/E	Part 90
851.0 – 869.0 MHz 769.0 – 775.0 MHz	100.0 W	9K70D1W	Part 90
851.0 – 869.0 MHz 769.0 – 775.0 MHz	100.0 W	9K80D7W	Part 90
851.0 – 869.0 MHz 769.0 – 775.0 MHz	100.0 W	18K8D1W	Part 90
851.0 – 869.0 MHz 769.0 – 775.0 MHz	100.0 W	12K5D1W	Part 90

This receiver associated with this transmitting device has been tested and declared to meet the regulatory requirements defined in the following sub-sections.

#### 1.6.1.1 FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and,
2. This device must accept any interference received, including interference that may cause undesired operation.



### 1.6.1.2 Information to the User

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment does generate, use, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user must correct the interference at his or her own expense.

### 1.6.2 ISED CANADA

ISED CANADA FILING DATA FOR TWO47 BASE STATION		
FREQUENCY BAND (MHZ)	ISED CANADA CERTIFICATION NUMBER	APPLICABLE ISED CANADA RULES
851 – 869 MHz	3636B-0168	RSS-119
768 – 776 MHz	3636B-0172	RSS-119

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.



**The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field exceeding Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website [www.hc-sc.gc.ca/rpb](http://www.hc-sc.gc.ca/rpb).**

**L'installateur de cet équipement radio doit garantir que l'antenne est trouvée ou montrée tel qu'il n'émet pas de champ de RF plus de la Santé les limites du Canada pour la population générale; consultez le Code 6 de Sécurité, disponible de la Lande le site Internet du Canada [www.hc-sc.gc.ca/rpb](http://www.hc-sc.gc.ca/rpb).**

This device complies with ISED CANADA license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs / récepteurs exempts de licence qui sont conformes aux RSS exemptes de licence d'Innovation, Sciences et Développement économique Canada. Son fonctionnement est soumis aux deux conditions suivantes:

1. Cet appareil ne doit pas provoquer d'interférences.
2. Cet appareil doit accepter toutes les interférences, y compris les interférences susceptibles d'entraîner un fonctionnement indésirable de l'appareil.

## 2 SPECIFICATIONS

### 2.1 GENERAL

<b>Size (Base Station):</b>	1 Channel per 1 Rack Unit Shelf 1.75 H x 19 D in (4.445 H x 48.26 D cm)
<b>Power:</b>	-48 VDC standard (90-230 VAC optional)
<b>Ambient Temperature Range:</b>	-22° to +140°F (-30° to +60°C)
<b>Humidity:</b>	90% @ 122° F (+50°C)
<b>Altitude:</b>	Operational: Up to 15,000 ft (4,572 m) Shippable: Up to 50,000 ft (15,240 m)

### 2.2 TRANSMITTER

<b>Frequency Range (MHz):</b>	
• 800 MHz	851 - 869
• 700 MHz	769 - 775 (US); 768 - 776 (Canada)
<b>Rated Power Output (W):</b>	100
<b>RF Output Impedance (ohm):</b>	50
<b>Conducted Spurious and Harmonic Emissions (dBc):</b>	<-70
<b>Frequency Stability (ppm):</b>	<0.1
<b>Channel Spacing (kHz):</b>	12.5
<b>Synthesizer Step Size (kHz):</b>	6.25

### 2.3 RECEIVER

<b>Frequency Range (MHz):</b>	
• 800 MHz:	806 - 817; 806 - 825 (Intl.)
• 700 MHz:	798 - 806
<b>Sensitivity, TIA-P25 (dBm):</b>	<-119
<b>RF Output Impedance (ohm):</b>	50
<b>Intermodulation Rejection, TIA-P25 (dB):</b>	>80
<b>Spurious and Image Rejection (dB):</b>	≥90
<b>Frequency Stability (ppm):</b>	<0.1
<b>Channel Spacing (kHz):</b>	12.5
<b>Synthesizer Step Size (kHz):</b>	6.25

### 2.4 OPERATIONAL MODES

MODE	MODULATION	BIT RATE (KBPS)	EMISSION DESIGNATOR
P25 Phase 1	C4FM	9.6	8K00F1D/E
P25 Phase 1 Simulcast HVD-FDMA	WCQPSK	9.6	9K70D1W
P25 Phase 2	H-DQPSK	12	9K80D7W
HVD-SMR	HVD	19.2	18K8D1W
HVD-NPSPAC	HVD	19.2	12K5D1W

### 3 INTRODUCTION

The Two47 base station seamlessly integrates with your existing system, while providing the flexibility to build the solution that is right for you. Communicate across any network; manage and update your system from anywhere. The Two47 base station consolidates the functionality of the MASTR® V baseband, receiver, transmitter, amplifier, and the traffic controller into one compact unit, providing space, cost, and energy savings.

The Two47 base station includes the following features:

- Software upgradable for effortless management and updates.
- Easily upgradeable to evolve with your operation.
- Multiple points of redundancy for reliable communication with dispatch.
- Universal standards and components (P25, ARM processors) provide a scalable platform to build on.
- Compact, modular layout.
- Built to the most stringent cybersecurity standards.

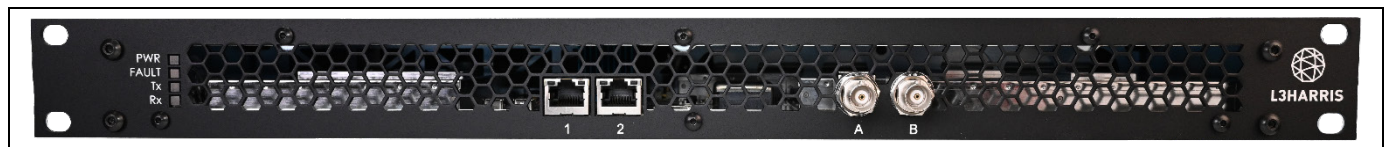


Figure 3-1: Two47 Base Station

## 4 RELATED PUBLICATIONS

Related publications include manuals listed in Table 4-1. Consult these manuals as necessary for additional installation and maintenance information on the Two47 base station.

**Table 4-1: Related Publications**

TITLE	PUBLICATION NUMBER
Two47 Base Station Installation and Configuration Manual	14221-5247-4000
Two47 Base Station Application and Assembly Diagrams	14221-5247-4010
Two47 Base Station Service Manual	14221-5247-5000
Electrostatic Discharge Protection Instruction Manual	LBI-38737
Site Grounding and Lightning Protection Guidelines	AE/LZT 123 4618/1
Tower Requirements and General Specifications Installation Manual	LBI-39185
VIDA Virtual Site Platform Administrator's Manual	14221-3100-2140
VIDA Network Sentry Software Release Notes	14221-5555-8020
MME for VIDA Virtual Site Software Release Notes	14221-4100-8080
PMIPS and MME Application for VIDA Virtual Site Installation and Configuration	14221-4100-4020
VIDA Device Manager User's Manual	MM-016371-001
VIDA Device Manager Software Release Notes	MS-013171-001
Two47 System Software Release Notes	14221-5247-8000
Enterprise Network Manager Installation and Configuration Manual	14221-3100-4290
Trimble® GM200 Application Software Release Notes	14221-5300-8030
Microchip TP4100 Software Release Notes	14221-5300-8020
Combilent Two47 700/800 TTA RMC Software Release Notes	14221-5300-8010
Combilent Two47 700/800 Combiner Software Release Notes	14221-5300-8000



**NOTE**

Resources provided by the Technical Assistance Center (TAC) are available when additional assistance is required. Refer to Section 7.1 for TAC contact information.

## 5 TWO47 BASE STATION OVERVIEW

### 5.1 MULTI-CHANNEL BASE STATION SHELF ASSEMBLY

Two47 base station design allows for up to ten channels, antenna equipment, and network infrastructure in a single rack.

### 5.2 TWO47 TIMING REFERENCES

The Two47 Base Station utilizes one of two external IEEE1588 timing references:

- GM200: Thunderbolt® PTP GM200 IEEE-1588 Grandmaster Clock
- TP4100: Microsemi/Microchip TimeProvider® 4100

For non-Simulcast installations, the standard configuration is a redundant pair of GM200s. In this configuration, one GM200 is configured as the Primary Clock and the other GM200 is configured as the Secondary Clock.

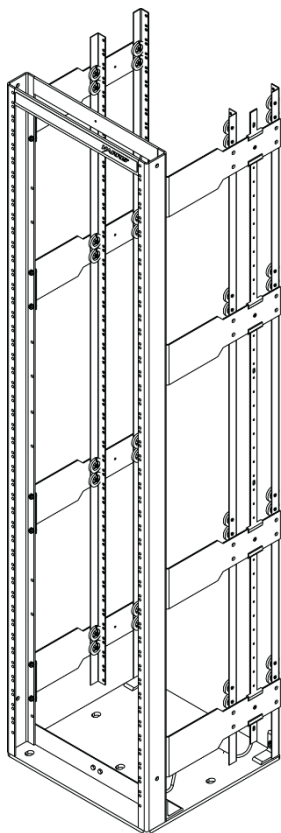
For Simulcast installations, the standard configuration is one TP4100 and one GM200. In this configuration, the TP4100 is configured as the Primary Clock and the GM200 is configured as the Secondary Clock.

See the manuals for the GM200 and TP4100 third-party products for details on specifications and configuration. These manuals are available from L3Harris with the media kits that contain the software supported for the particular release of Two47 Base Station.

Refer to the *Two47 Base Station Installation and Configuration Manual*, 14221-5247-4000, for more information on configuring timing references.

### 5.3 RACK AND CABINET ASSEMBLIES

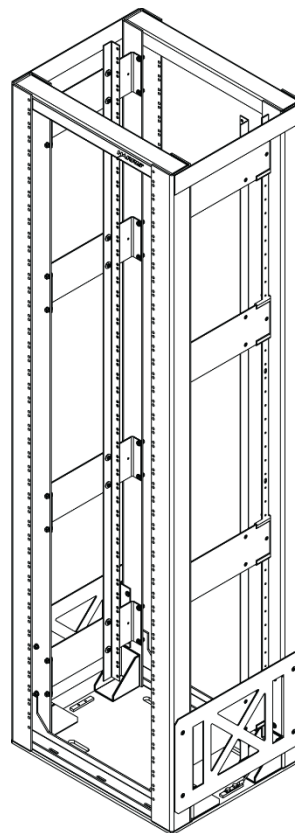
This Two47 base station configuration is available in an extra deep 86-inch x 45-RU open rack, part number BAT150196/22 (refer to Figure 5-1). A cabinet (refer to Figure 5-2), and a seismic rated open rack, (refer to Figure 5-3) will be added in the near future. Each model supports installation of 19-inch rack mountable equipment.



**Figure 5-1: 86-inch  
Open Rack  
Assembly**



**Figure 5-2: 86-  
inch Extra Deep  
Cabinet**



**Figure 5-3: Seismic  
Rated Open Rack  
Assembly**

## 6 PROGRAMMING AND DIAGNOSTICS

### 6.1 VIDA DEVICE MANAGER

Setup, configuration, and programming of a Two47 base station is performed using VIDA Device Manager. VIDA Device Manager is an easy-to-use programming tool designed around a Windows-based file management system that permits users to configure and manage devices within their system. The user can save/open personalities using the Windows file system.

The user interface, the Device Management Console (DMC), allows users to configure and manage IP-accessible devices in their Two47 radio system. It allows users to edit device personalities and permits users to perform the following actions:

- Read Version
- Load Code
- Reset
- Read Personality
- Write Personality

The DMC stores device connection information and all personalities (by default) for the supported devices within the radio system. The information stored includes device definitions, device plug-ins, device Client plug-ins, device personalities, device code, device connections, and device details. The Repository provides an interface to access, modify, and create the information.

Refer to the *VIDA Device Manager User's Manual* and the online help for instructions on using the application.



VIDA Device Manager provides detailed, context-sensitive help for all parameters. To view the help for any of the Two47 Base Station's Personality parameters, press **F1** when that Personality parameter is selected.

## 6.2 LED INDICATIONS

There are four LEDs for each Two47 base station. These LEDs are arranged vertically on the front of the Two47 Base Station. Each LED is assigned to one of: PWR (Power), FAULT, Tx (Transmit), and Rx (Receive).

- PWR (First/Top LED) has three states: Green, Amber, Off.
- FAULT (Second LED) has three states: Green, Red, Off.
- Tx (Third LED) has two states: Green, Off.
- Rx (Fourth/Bottom LED) has two states: Green, Off.

### 6.2.1 Power (First/Top LED)

- Green = Powered on and the CPU is running.
- Amber = Applications are initializing.
- Off = Powered off.

### 6.2.2 Fault (Second LED)

- Green = The Transmitter/Receiver Board (TRB) has no faults that take the base station out of service. However, because there are additional faults separate from the TRB that can take the base station out of service, see the Two47 Service Manual, 14221-5247-5000, for details on viewing all of the faults.
- Red = TRB has a fault that takes the base station out of service.
- Off = TRB has not booted.

### 6.2.3 Transmit (Third LED)

- Green = Transmitting.
- Off = Not transmitting.



To prevent personal injury, treat the Two47 base station as if it is transmitting RF power whenever power is applied to the Two47 base station. While the Transmit LED indicates whether the Two47 base station is currently transmitting RF power, it does NOT indicate whether the Two47 base station may immediately thereafter be transmitting RF power (e.g., due to the automatic clearing of a fault, an automatic mode change, a configuration change, a call assignment, etc.). Before powering on the Two47 base station, ensure that a proper RF load is attached and that all RF cables are in proper working condition and are securely connected.

### 6.2.4 Receive (Fourth/Bottom LED)

- Green = Receiving a valid P25 call
- Off = Not receiving a valid P25 call



## 6.3 DIAGNOSTICS

The Two47 base station has built-in self-diagnostics and fault reporting. Station faults can be remotely monitored via fault reporting from one or more of the following resources:

- Via the VIDA network through the Enterprise Network Manager (ENM).
- By telnet session while connected locally to a Two47 base station.

For more information regarding ENM *polling* and *trapping*, refer to the *Enterprise Network Manager Installation and Configuration Manual*, 14221-3100-4290.

For more information regarding Two47 Base Station faults and troubleshooting recommendations, refer to the *Two47 Base Station Service Manual*, 14221-5247-5000.

## 7 CUSTOMER SERVICE

### 7.1 TECHNICAL SUPPORT

The Technical Assistance Center's (TAC) resources are available to help with overall system operation, maintenance, upgrades and product support. TAC is the point of contact when answers are needed to technical questions.

Product specialists, with detailed knowledge of product operation, maintenance and repair provide technical support via a toll-free (in North America) telephone number. Support is also available through mail, fax and e-mail.

For more information about technical assistance services, contact your sales representative, or contact the Technical Assistance Center at the following:

North America:	1-800-528-7711
International:	1-434-385-2400
Fax:	1-434-455-6712
E-mail:	<a href="mailto:PSPC_tac@l3harris.com">PSPC_tac@l3harris.com</a>

### 7.2 TECH-LINK ONLINE SERVICES

For more information about this and other L3Harris PSPC products, visit Tech-Link at <https://premier.pspc.harris.com/>.

Tech-Link is a one stop link to Technical Documentation (downloadable PDFs), Software Revisions, Feature Encryption, pictorials of parts and accessories, and other information pertaining to our products.

### 7.3 CUSTOMER CARE

If any part of the system equipment is damaged on arrival, contact the shipper to conduct an inspection and prepare a damage report. Save the shipping container and all packing materials until the inspection and the damage report are completed. In addition, contact the Customer Care center to arrange for replacement equipment. Do not return any part of the shipment until you receive detailed instructions from an L3Harris representative.

Contact the Customer Care center at <https://www.l3harris.com/all-capabilities/pspc-customer-care> or:

#### **North America:**

Phone Number:	1-800-368-3277
Fax Number:	1-321-409-4393
E-mail:	<a href="mailto:PSPC_CustomerFocus@l3harris.com">PSPC_CustomerFocus@l3harris.com</a>

#### **International:**

Phone Number:	1-434-385-2857
Fax Number:	1-321-409-4394
E-mail:	<a href="mailto:PSPC_InternationalCustomerFocus@l3harris.com">PSPC_InternationalCustomerFocus@l3harris.com</a>

## 8 WARRANTY

Please register this product within 10 days of purchase. Registration validates the warranty coverage and enables L3Harris to contact you in case of any safety notifications issued for this product.

Registration can be made on-line at the Customer Care center webpage:

<https://www.l3harris.com/all-capabilities/pspc-customer-care>

While on the webpage, please review the applicable battery and/or product warranty literature.

## **About L3Harris Technologies**

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