



user manual



DRV3

Portable Digital Leakage Receiver

Please direct all questions to your local CPAT Flex sales office representative, or distributor, or contact CPAT Flex technical support at: www.cpatflex.com.

Copyright 2024 CPAT Flex Inc. All rights reserved.

This document contains proprietary information belonging to CPAT Flex and must not be utilized or disclosed without CPAT Flex's written authorization.

CPAT Flex reserves the right to make changes without notice. Changes affecting the operation of any component in this manual will be reflected in a subsequent revision.

CPAT Flex accepts no liability for any omissions or errors present in this document or for any damages that may arise from the utilization of the information provided herein.

DRV3 User Manual

First edition (v1.0): September 2014

Second edition (v1.1): November 2014

Third edition (v1.2): April 2017

Fourth edition (v1.3): January 2018

Fifth edition (v1.4): July 2024

Published by: CPAT Flex
8566 Ave de L'Esplanade, Montreal, Quebec
CANADA H2P 2R8

Sales and Support Team
+1-514-307-2728 | 1-888-307-2728 | support@cpatflex.com

www.cpatflex.com

Contents

1. General Information	5
1.1 About this Manual	5
1.2 Explanation of Symbols Used	5
1.3 Certifications	5
1.3.1 Tests Specifications	5
1.3.2 FCC Part 15 Class A	5
1.4 Technical Support	6
1.5 Calibration	6
1.6 CPAT Flex Website	6
2. System Components	7
2.1 Initial Verification	7
2.2 DRV3 Optional Accessories	9
2.2.1 Antennas	9
2.3 Features	9
2.4 Physical Overview	10
2.4.1 Startup	10
2.4.2 Front View Buttons and Display	11
2.4.3 Power and Data Interface	11
2.4.4 Docking Station (optional)	12
2.4.5 Antenna Connectors	14
2.4.6 Speaker	16
2.4.7 Battery	16
3. Setup	17
3.1 Docking station installation	17
3.1.1 Safety Precautions for Installation	17
3.1.2 Installing the Docking Station	18
3.2 DRV3 parameters	20
3.2.1 Accessing and Navigating the Setup Menus	20
3.2.2 Setting up Antennas	21
3.2.3 Using Spectrum Mode	22
3.2.4 Setting up Proximity	23
3.2.5 Setting up Bands	24
3.2.6 Setting up Sound	25
3.2.7 Setting up Units	27
3.2.8 Setting up Frequencies	28

3.2.9 Using Pressure Test Mode	29
3.2.10 Using Channel Tag Detection	30
3.2.11 Setting up Detection	32
3.2.12 Setting up the CW to QAM Delta	33
3.2.13 Setting up the Backlight	34
3.2.14 Setting up Contrast	34
3.2.15 Displaying DRV3's Internal Temperature	35
3.2.16 Setting Stand-by mode delay	35
3.2.17 Displaying the DRV3's Version	35
3.2.18 Displaying the DRV3 device ID	35
4. Operation and Maintenance	36
4.1 Reading the Measurement Mode Screen	36
4.2 Adjusting Volume During Normal Use	38
4.3 Using the Snapshot Feature	38
4.4 Charging the Battery	38
4.5 Replacing the Battery Pack	39
4.6 Updating the DRV3's Firmware	40
4.7 Cleaning	40
Appendix A – Specifications	41
Appendix B – Our Services	42
B.1 Customer Support	42
B.1.1 Equipment Return Instructions	42
B.2 Limited Product Warranty	43
B.2.1 Hardware	43
B.2.2 Software	43
B.2.3 Exclusions	43
B.2.4 Refurbished Parts and Prior Testing	44
B.2.5 Exclusive Remedies	44
B.2.6 Disclaimer	44
DRV3 Docking Station Installation Part A/B	45
DRV3 Docking Station Installation Part C/D/E	46

1. GENERAL INFORMATION

1.1 About this Manual

This manual describes the features, operation, and setup of the DRV3 portable digital leakage detection meter.

You will find important safety information in this manual. We strongly recommend that all users read this manual. Use of this product other than for its intended application may compromise the unit's safety features.

1.2 Explanation of Symbols Used

The following symbols are used on the DRV3 label and in this Manual.



Caution. Indicates that operations or procedures, if carried out without caution, may cause personal injury or damage to the unit.



Note. Indicates additional information about the product.

1.3 Certification

This section describes the certifications that the DRV3 complies with.

1.3.1 Test Specifications

FCC 47 CFR Part 15, Subpart B – Verification

ICES-003/NMB-003 Issue 4 February 2004

Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: Generic requirements.

1.3.2 FCC Part 15 Class A

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

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



NOTE

This equipment has been tested and found to comply with the limits for a Class B digital device, according 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 generates, uses, and can radiate radio frequency energy. If not installed and used according to the instruction manual, it may cause harmful interference to radio communications. Operating this equipment in a residential area is likely to cause harmful interference. In such cases, the user will need to correct the interference at their own expense.



NOTE

Any modifications made to this device that are not approved by CPAT Flex may invalidate the user's authority granted by the FCC to operate this equipment.

CES-003 Class A Notice - Avis NMB-003 Class A

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

1.4 Technical Support

CPAT Flex Technical Support Service is available from Monday through Friday from 9:00 AM to 5:00 PM Eastern Time.

Toll-free from the U.S. and Canada: 1-888-307-2728 / International: +1-514-307-2728

support@cpatflex.com

1.5 Calibration

Your DRV3 unit has been calibrated and tested at the factory and does not need further calibration before use. However, if the unit suffers damage or is repaired, it is recommended that the unit be tested by an authorized CPAT Flex service center. Also, if your company requires regular calibration of all equipment, or requires a calibration certificate for the DRV3, a calibration service is available through CPAT Flex. For more information on our calibration service, please contact your CPAT Flex representative.

1.6 CPAT Flex Website

CPAT Flex's website contains product specifications, information, press releases, brochures, downloads, and Frequently Asked Questions (FAQ).

Please visit our website at: www.cpatflex.com

2. System Components

The DRV3 is a portable signal leakage detection meter designed to operate in all-digital cable networks. It functions as a portable dual-band find-and-fix meter and as a monitoring device when part of the CPAT Flex system. It is frequency agile from 118 to 140 MHz (Mid band tuner) and from 572 to 960 MHz (LTE band tuner). The DRV3 can easily be set up via its intuitive user interface.

This section describes the DRV3 unit in detail, including its accessories, and helps you get started by explaining the features, the use of the buttons, and the powering and data interfaces on the unit.

2.1 Initial Verification

Your DRV3 unit is charged, calibrated, and ready to use right out of the box. Upon delivery, visually inspect each item for any damage that may have occurred during shipping.

If you notice any physical damage, please contact CPAT Flex:

- Toll-free from the U.S. and Canada: 1-888-307-2728
- International callers can dial: +1-514-307-2728

If there are no apparent signs of physical damage, turn on the unit by pressing the button for approximately three (3) seconds, and make sure the unit boots up properly.

Ensure no items are missing. Your package should include all standard items and any accessories you ordered. If you ordered the DRV3 portable leakage detection meter kit, the following items are included:

- DRV3 meter, including its rechargeable battery pack
- Rubber duck antenna, for Mid-band measurements, with BNC connector
- Rubber duck antenna, for LTE band measurements, with SMA connector
- Vehicle docking station
- Docking station's flex post
- AC adapter

If any of the standard accessories are lost or damaged, you can order a replacement. Please quote the following DRV3 part numbers when ordering.



Part No.	Accessory Description
1 110-00005-001	12V AC Adaptor
2 036-00020-001	USB 2.0 cable (type A Male-Male)
3 110-00010-001	12V DC car socket power cable
4 008-00002-001	Battery pack
5 111-00022-001	Mid-band rubber duck antenna 118-140 MHz (BNC connector)
6 111-00035-001	Portable antenna 572-960 MHz (SMA connector)
7 150-00032-001	Vehicle docking station
8 150-00031-001	DRV3
9 012-00020-001	Docking station's flex post

For orders, contact CPAT Flex at 1-888-307-2728 or +1-514-307-2728

2.2 DRV3 Optional Accessories

2.2.1 Antennas

The DRV3 comes with two rubber duck antennas for leakage detection. The one with the BNC connector is for the Mid-band. The one with the SMA connector is for the LTE band.



NOTE


Only antennas obtained from CPAT Flex can be used effectively with the DRV3. Each CPAT Flex antenna has been analyzed, and the appropriate compensation has been designed into the DRV3 for optimal results. CPAT Flex cannot guarantee proper results with an antenna from any other source.


Part No.	Antenna Accessories Description
112-00004-100	Mid Band Monopole Quarter-wave VHF Antenna Kit (includes magnetic base + whip antenna + BNC terminated cable)
112-00009-100	LTE Monopole Quarter-wave Antenna Kit (includes magnetic base + whip antenna + SMA terminated cable)

2.3 Features

The DRV3 is a high-performance dual-band find-and-fix leakage detection meter, which offers many features including:

- Fully agile in both bands, from 118-140 MHz (Mid-band tuner) and 572-960 MHz (LTE-band tuner)
- User-adjustable frequency displayed in 100 Hz steps
- 3 favorite frequency presets
- Based on CPAT Flex's leakage monitoring system technology



 **NOTE**
 In both bands, leakage detection is based on signal tag recognition to filter noise from real leakage points. This means that monitored frequencies must be tagged in order to detect leakage. See your documentation on the DSG1 device for more details on tagging channels.

 **NOTE**
 The monitoring frequencies selection to be used are dependent on the operator's channel allocation plan. We must consider over-the-air transmissions at selected DSG1 frequencies to avoid interference. The efficiency of detection depends on the frequency selection, other transmission parameters of the DSG1, the tag mode, and its amplitude.

2.4 Physical Overview

2.4.1 Startup

When you press the on/off button (hold ~ 3 sec.), the DRV3 begins to load its operating software and parameters. During this process, the power light on the top right of the DRV3 flashes green and red briefly, then remains lit green. The battery indicator light turns green briefly as the unit checks the battery, then changes to indicate power status as follows:

- Green  Plugged in and fully charged, operating on external power
- Orange  Plugged in and charging, and operating on external power

Off or Backlit Operating on battery power; lighting depends on backlight settings.

2.4.2 Front View Buttons and Display

The seven front panel buttons on the DRV3 allow you to turn on and off the unit, navigate menus, take snapshots, and toggle the unit's volume between mute and its preset reference level.



Figure 2: Front view of DRV3

2.4.3 Power and Data Interface

The DRV3 has one round pin interface on the bottom of the unit, used only to connect the AC adapter (supplied by CPAT Flex) when the docking station is not used. This connection allows you to recharge the battery and power the DRV3.

When the DRV3 is connected to the docking station, power and data connections with the unit are made through the 9 mating contacts located on the back of the unit, which line up with the docking station's 9 spring mating contacts.



Figure 3: Bottom view of DRV3 unit

2.4.4 Docking Station (optional)

The docking station provides a quick means of connecting and disconnecting the DRV3, without having to unplug any cables. The 9 spring mating contacts align with the 9 mating contacts on the rear of DRV3 to link power and data to the DRV3. In addition to this basic connection, there are two connections for the leakage detection antennas.

See section 2.4.5 Antenna Connectors on page 14 for further details.

The docking station is equipped with a round connector at the rear, used to power the unit and charge the battery while the DRV3 is docked. It also has a USB type A receptacle used as a data interface with the ARD4 autonomous recording device, allowing it to take control of the unit. This USB connection is also used for firmware upgrades.



Figure 4: Docking station and rear view of DRV3



WARNING:

Do not plug 2 adapters simultaneously to power the DRV3. The docking station is designed to prevent connecting a power adapter to the bottom of the DRV3 when docked.

The docking station is available with a flexible mounting post that is designed to be installed in a service vehicle. For further details and installation procedures, see section 3.1 Docking Station Installation starting on page 17.

2.4.5 Antenna Connector

The 2 connectors at the top of the unit are designed for the rubber duck antennas. These antennas are used only when the unit is not docked.



Figure 5: Top view of DRV3

As soon as the DRV3 is docked, there is an internal mechanical switch that transfers the RF input readings to the docking station. The docking station relays the RF signal from the antennas installed on the vehicle's rooftop.

The mid-band and the LTE-band antennas must be connected to the BNC connector and the SMA connector respectively, both located at the back of the docking station.



Figure 6: Rear view of docking station

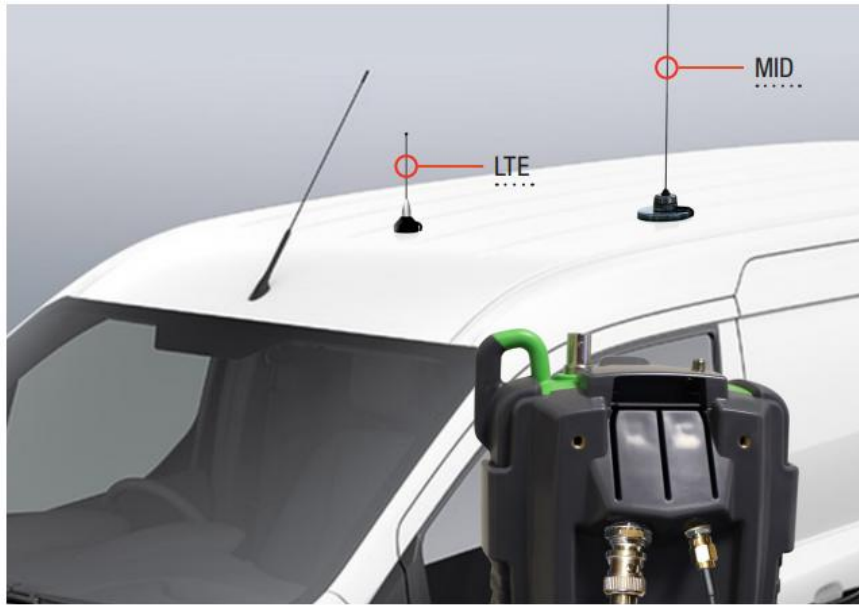


Figure 7: Rooftop antenna connections



NOTE

The link with the DRV3's tuners is made through the two small round connectors on the front of the docking station which align with the 2 holes protected by the slider located at the back of the DRV3. The slider automatically opens when docked. Do not insert any foreign objects into the sliders.

2.4.6 Speaker

The DRV3 is equipped with a speaker that emits an audio tone through the openings at the rear of the unit to provide audio feedback of RF measurements. Most of the time, the readings from both bands will be different. The audio tone will always reflect the highest leakage measurement.

2.4.7 Battery

The DRV3 is powered by a Li-Ion 7.2 V 3.1Ah battery pack that has a 5-pin connector to interface with the unit. Even though the battery pack may not be fully charged when the DRV3 is shipped, your unit is ready to use out of the box. For information on charging the battery, see section 4.4 Charging the Battery on page 38.

3. Setup

3.1 Docking Station Installation

3.1.1 Safety Precautions for Installation

Never install this product in places where, or in a manner that, it could injure the driver or passengers if the vehicle stops suddenly.

Never install this product in places where, or in a manner that, it may interfere with the driver's operation of the vehicle, such as on the floor in front of the driver's seat, or close to the steering wheel or shift lever.

Make sure there is nothing behind the dashboard, the floor, or the paneling when drilling holes in them. Be careful not to damage fuel lines, brake lines, electronic components, communication wires, or power cables. When using screws, do not allow them to come into contact with any electrical leads.

To ensure proper installation, use the supplied parts in the manner specified. If any parts other than the supplied ones are used, they may damage internal parts of this product, or they may work loose, and the product may become detached.

It is extremely dangerous to allow the cables to become wound around the steering column or shift lever. Be sure to install this product, its cables, and wiring away in such a way that they will not obstruct or hinder driving.

Make sure that leads cannot get caught in a door or the sliding mechanism of a seat, resulting in a short circuit.

Do not install this system where it may (i) obstruct the driver's vision, (ii) impair the performance of any of the vehicle's operating systems or safety features, including airbags, hazard lamp buttons, or (iii) impair the driver's ability to safely operate the vehicle.

Never install the system in front of or next to the place in the dash, door, or pillar from which one of your vehicle's airbags would deploy. Please refer to your vehicle's owner's manual for reference to the deployment area of the frontal airbags.

Do not install the system in a place where it will impair the performance of any of the vehicle's operating systems, including airbags and headrests.

3.1.2 Installing the Docking Station

The docking station is designed to allow simple connection/disconnection of the DRV3 from power, data, and external RF antennas. It typically mounts on a flex post secured to the vehicle's passenger floor near the 12 VDC power source so the DRV3 can remain in the support bracket while charging. You will require 3 screws (not included) to secure the flex post to the floor.



Figure 8: Docking station used in service vehicle



CAUTION!

Do not disconnect or modify any vehicle security systems such as airbags or seatbelts. Security system wires use yellow sleeves and yellow connectors. Accidental triggering of these systems may cause severe injuries.

To install the support bracket:

1. Install the Flex post.

- Firmly attach the Flex mount bracket to the vehicle floor using 3 metal screws (not included)
- Screw the post into the bracket.
- Affix the flex post to the bracket with the hexagonal screw.

2. Attach the docking station.

- Attach the DRV3 docking station to the Flex post assembly using the 4 pan head Phillips screws (included with the docking station).
- Adjust the docking station's angle and orientation, then tighten the thumbscrew to secure it in this position.

3. Connect the docking station cables.

- Connect the SMA cable from the vehicle roof antenna (LTE band) to the top right RF interface.
- Connect the BNC cable from the vehicle roof antenna (Mid band) to the top left RF interface.
- Plug in the DC cable to power vehicle accessories.
- Plug in the USB cable (required only if the DRV3 is used with an ARD4).
- Secure the cables with a cable tie.

4. Connect the DRV3 to ARD4 (optional).

- If you are using the ARD4 module, connect the other end of the USB cable from the docking station to the ARD4.

5. Insert the DRV3 into the docking station.

- Start by first sliding the bottom of the unit into the station.
- Then, gently press the top of the unit until the DRV3 slides under the top clip. You will hear a click when the clip engages.

For further details, see the installation diagrams on pages 45 and 46.

3.2 DRV3 Parameters

When used in autonomous measurement mode (with the optional ARD4 module), all operating parameters are set automatically by the ARD4.



NOTE

In autonomous measurement mode, access to menus is blocked to prevent any changes to operating parameters. The menus are available as soon as you exit this mode.



NOTE

After being set up in autonomous mode, the autonomous mode parameters will stay active until the user provides new settings.

When used as a find-and-fix tool, the parameters are set using the DRV3 menus. The following sections describe how to set up the DRV3 using the unit's own menus.

3.2.1 Accessing and Navigating the Setup Menus

Upon startup, the DRV3 defaults to measurement mode. To change the frequency, enable or disable tagging, adjust the volume, change the units of measure, or change any other display setting, you must switch to setup mode.

To go to setup mode, press any of the four arrow buttons. Once you are in the settings menu, you can move through the list of configurable elements by scrolling up and down with the arrows.

To change the settings of an element, press the right arrow or (▶) the Enter button (↵) when the cursor is over the desired element of the menu in the left column. This moves the cursor to the right column, where you can then select a new value among the presets or edit a numerical value by highlighting the digit and using the up or down arrow to obtain the desired number. To save a new setting and return to the left column, press the left arrow (◀) or the **Enter** button (↵). When editing numerical values, press **Enter** button (↵) or **Esc** to return to the left column.

In order to **save** values and exit the settings menu, press the left arrow (◀) or the **Enter** button (↵); to exit the menu **without** saving, press **Esc**.

Please refer to the following sections for details on configuring each element in the five separate pages that constitute the settings menu.

3.2.2 Setting up Antennas

The DRV3 uses 2 sets of antennas for each band (Mid/Aero and LTE bands). The 'DRV' set allows you to specify parameters for the antennas connected directly to the connectors on top of the DRV3. The 'roof' set is for the antennas connected to the docking station, linked via cables to antennas on the vehicle's roof or other external antennas.

**NOTE**

Do not change the antenna type in the DRV3 unless you are physically connecting a different antenna.

The DRV3 comes with a rubber duck antenna, and this is the default antenna type for leakage detection in portable mode. It is very important to make sure the DRV3's settings match the actual antenna type connected to the unit in order to accurately measure signal strength. Using an antenna that's not authorized by CPAT Flex, or setting up the DRV3 with the wrong antenna type will result in erroneous readings.

To change the antenna type:

1. In the settings menu (page 1), select Antennas.
2. Press the right arrow (▶) or the **Enter** button (↵), then scroll through the antenna types using the up and down arrows until you have highlighted the antenna connection you want to edit.

The possible values are:

- AERO ROOF
- AERO DRV
- LTE ROOF
- LTE DRV

3. Select the type of antenna that is physically connected to the selected antenna interface.

The possible values are:

- Rubber* is the default value.
- Dipole
- Monopole
- None** is an option used by CPAT Flex service personnel for maintenance/calibration purposes

4. Press **Enter** (↵) or Left Key to save your choice.

5. Press **Esc** to return to the settings menu and continue configuring other parameters. Press **Esc** again to return to measurement mode.



NOTE

In autonomous mode, the DRV3 always uses the 'roof' antennas since it requires the DRV3 to be docked in order to operate in this mode.

3.2.3 Using Spectrum Mode

Spectrum mode is used for on-the-spot diagnosis by CPAT support team but is also available for normal users. In this mode, the DRV3 can work as a simplified spectrum analyzer.

1. In the settings menu (page 1), select Spectrum.

2. Press the right arrow (▶) key to set spectrum mode.

The possible values are:

- OFF: Disable spectrum mode
- AERO TAG: Frequency domain representation of AERO signal for AM tag analysis
- LTE TAG: Frequency domain representation of LTE signal for AM tag analysis
- AERO: Spectrum analyzer with a center frequency of the selected AERO frequency and a span of 38KHz
- LTE: Spectrum analyzer with a center frequency of the selected LTE frequency and a span of 38KHz

3. Press **Enter** (↵) to save the chosen value.

4. Press **Esc** to activate spectrum mode. While in spectrum mode display, you can use directional arrows to change center frequency. Left and right arrow (◀)(▶) keys will respectively decrease and increase the current center frequency value by 1 kHz.

Up and down arrow (▼)(▲) will respectively decrease and increase current center frequency value by 10 KHz.

3.2.4 Setting up Proximity

The proximity setting is used to apply a correction factor to the distance between the DRV3 and the probable leakage source in order to give a reading equivalent to a 10ft/3m measurement. By selecting the distance, the DRV3 calculates the appropriate gain to apply to the reading and then provides a normalized reading.

To change the Proximity:

1. In the settings menu (page 2), select Proximity.
2. Press the right arrow (▶) to choose the estimated distance to the leakage point.

The possible values are:

- 3 meters (approx. 10 ft) * Default value
- 10 meters (approx. 30 ft)
- 25 meters (approx. 80 ft)

3. Depending on your selection, the DRV3 will then apply the appropriate gain to the reading to help you discriminate the noise source. Use the arrows to make your selection.

4. Press **Enter** (↵) to save the value.

5. Press **Esc** to return to measurement mode, or select another item in the settings menu and continue configuring other parameters.

3.2.5 Setting up Bands

The band setting is used to select the frequency ranges over which you are looking for leakage. The DRV3 is fully agile over two bands: a mid-range band from 118-140 MHz, and an LTE band from 572-960 MHz. By default, the DRV3 is set up for both bands, and your DRV3 screen is split in two when in measurement mode, in order to display values for both bands. If you enable only one of the bands, the screen is not split and only one leakage signal level is displayed.

**NOTE**

Using only one band will reduce power consumption by 30% to 40%, allowing for longer battery life.

To select the detection band:

1. In the settings menu (page 1), select Bands.
2. Press the right arrow (▶) to toggle between Aero/LTE (default), Aero (mid-range) or LTE.
3. Press **Enter** (↵) to save the value. The cursor automatically returns to the left column. Continue configuring other parameters if desired.
4. Press **Esc** to return to measurement mode.

3.2.6 Setting up Sound

Reference Volume

The DRV3 can emit an audible tone to provide audio feedback of measurements. The volume setting affects the basic reference level for the tone. During normal use, unless the 'mute' option is used, the tone increases with the leak's signal strength. The reference volume of the tone can be set to LOW, MED, or HIGH, or the sound can be turned off with the 'mute' option. In measurement mode, the DRV3's current volume setting is shown on screen with the following icons:

Low



Medium



High



Mute



NOTE

You can use the Esc key to toggle between Mute and the reference volume (low, medium, or high). However, to change the reference volume, you must use the setup menu.

Squelch

To prevent the DRV3 from emitting a tone for very low signal readings, the DRV3 is equipped with a squelch feature that allows you to adjust a threshold level, so only measured signals stronger than the selected threshold will trigger an audible tone. You can configure a threshold from 0 to 9999, in $\mu\text{V}/\text{m}$. By default, the DRV3 uses $\mu\text{V}/\text{m}$ as its unit of measure.



NOTE

Rules Governing Sound

In addition to the squelch level criteria, there are tag detection rules associated with the DRV3's audible tone function. If you are using channel tags to identify specific CATV networks for leakage detection, the DRV3 will take these tags into account before generating a tone when leakage is detected at a given frequency. See section 3.2.8 Using Channel Tag Detection on page 28 for information on enabling the tag detection feature in the DRV3.

Tag Detection	Aero/LTE	Detection Threshold	Tone Generated
Enabled and Tag Detected	Both Active	Reached	Yes, on strongest signal detected (Either Band)
Carrier Only	Both Active	Reached	Yes, on strongest signal detected (Either Band)
Enabled and Tag Detected	Only one band active	Reached	Yes, on signal in active band (other band ignored)
Carrier Only	Only one band active	Reached	Yes, on signal in active band (other band ignored)

To adjust the reference volume and the squelch level:

1. In the settings menu (page 2), select Sounds.
2. To change the reference level, highlight Volume and press the right arrow (▶) to access the volume options. Use the up and down arrows to select the desired reference level from the available options: mute, low, medium, and high. Press **Enter** (↵) to save the selected reference level. The cursor automatically returns to the left column after saving the squelch threshold.
3. To change the squelch threshold, highlight Squelch and press the right arrow (▶) to edit the threshold. Highlight each digit you want to edit and use the up and down arrows to change the threshold value between 0 and 9999 $\mu\text{V}/\text{m}$.
4. Press **Enter** (↵) to save the new value. The cursor automatically returns to the left column. Press **Esc** to return to the settings menu and continue configuring other parameters. Press **Esc** again to return to measurement mode.

3.2.7 Setting up Units

The DRV3 can display leakage levels in two different measurement units: $\mu\text{V}/\text{m}$ or $\text{dB}\mu\text{V}/\text{m}$. The most common unit used to measure signal leaks is $\mu\text{V}/\text{m}$ (microvolts per meter) and this is DRV3's default setting. Note that the squelch feature will always be calculated in $\mu\text{V}/\text{m}$. However, the DRV3 will apply the units of measure to the snapshot feature (see section 4.3 Using the Snapshot Feature on page 38) depending on which units you have selected.

To change the units of measure:

1. In the settings menu (page 2), select "Units."
2. Press the right arrow (▶) key, then toggle between $\mu\text{V}/\text{m}$ and $\text{dB}\mu\text{V}/\text{m}$ using the up and down arrows.
3. Press **Enter** (↵) to save your choice. The cursor automatically returns to the left column after saving the squelch threshold.
4. Continue editing other parameters, if desired, or press **Esc** to return to measurement mode

3.2.8 Setting up Frequencies

You can configure three (3) preset leakage monitoring frequencies for each of the DRV3's bands. These frequencies vary from one operator to another and can vary within different areas of the operator's network.

Make sure the frequencies you configure in the DRV3 match the leakage monitoring pilot signals used by the operator.



NOTE

The selected frequencies and tagging parameters must match those used with the DSG1, installed at the headend, to obtain leakage measurements.

To edit any preset frequency and select the active monitoring frequency:

1. In the settings menu (page 3), select Frequency.
2. Press the right arrow (▶) to access the band and frequency options.
3. Select the desired band (Mid/Aero or LTE) and then press the right arrow to display the list of preset frequencies (Freq 1, Freq 2, and Freq 3). The frequency currently in use is indicated with an asterisk *.
4. To edit any preset frequency, scroll through the list until you have highlighted the desired preset, and press the right arrow (▶). You can now use the right and left arrows to move the cursor to the desired digit in the frequency, and the up and down arrows to change the value. The new frequency must be within the tuning range of the DRV3 (118 MHz to 140 MHz/mid-band or 572 MHz to 960 MHz/LTE band) in 100 Hz steps.
5. To save the new frequency, press **Enter** (↵). If you press **Esc** while modifying a frequency, it cancels any changes and brings the cursor back to the list of presets.
6. Repeat steps 3 to 5 to set up all three presets for each band.
7. To select the frequency that you want to use for leakage detection, scroll through the list of preset numbers until you find the one that corresponds to the desired frequency, and press **Enter** (↵). The asterisk (*) appears next to the selected preset.
8. Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu and continue configuring other parameters.

3.2.9 Using Pressure Test Mode

Pressure test uses high RF level carriers to detect cable shielding integrity issues for in-house installations. A DRV3 in pressure test mode should be used with a DSG1 *Lite* that will inject high energy carriers into the local CATV network. While in pressure test mode, user-selected frequencies and tag mode are ignored. Both bands' frequencies will be preset to 126 MHz for mid-band and 612 MHz for LTE band.

1. In the settings menu (page 3), select PT Mode.
2. Press the right arrow (▶) key .
3. Press the up or down (▲) (▼) arrow to activate pressure test mode (ON) or deactivate pressure test mode (OFF).
4. Press **Enter** (↵) to save your choice.
5. Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu and continue configuring other parameters.

3.2.10 Using Channel Tag Detection

In order to use the DRV3's channel tag detection feature, you must have a channel tagger device, such as the DSG1, that inserts tags in specified channels carried on the CATV network. Channel tagging is commonly used where multiple cable operators are active, and tags allow each operator to identify the leaks under their responsibility.

A DRV3 can also be configured to detect leaking NTSC video signals in the mid-band. However, without investigating the leak source, it will not be possible to determine which operator the leak is coming from.

In order to allow the DRV3 to recognize channel tags, you must configure the DRV3's channel tag detection parameters so they match the settings used by the headend channel tagger.

The following table shows DRV3 tag settings:

Mode	Acronym	Range	Description
No tag (carrier only)	OFF	N/A	Tag detection is disabled but DRV3 will buzz if measured noise level is above sound squelch setting
AM	AM	3 - 110Hz	The tag for both bands is an AM modulation of the selected frequency.
FM	FM	N/A	Not available for normal use.
AM-NTSC	AMN	3 - 110Hz	Tag for both bands is an AM modulation, but any 60Hz modulation that may come from interfering NTSC video signals are ignored by the DRV3
AM-PAL	AMP	3 - 110Hz	Tag for both bands is an AM modulation, but any 50/100Hz modulation that may come from interfering PAL video signals are ignored by the DRV3
AM2	AM2	N/A	Not available for normal use.
DSB-SC	DS	0 - 999Hz	The tag for both bands is a DSB-SC modulation of the selected frequency.
Video DSB-SC	VDS	0 - 999Hz	The AERO band is configured to detect NTSC video signals, and the LTE tag is a DSB-SC modulation of the selected frequency.
Video AM	VAM	3 - 110Hz	The AERO band is configured to detect NTSC video signals, and the LTE tag is an AM modulation of the selected frequency.

The most common tag settings are AM and DSB-SC. For DSB-SC, we suggest using a modulation of 3600Hz or 6080Hz.

You can also adjust the detection threshold of the channel to allow the DRV3 to discriminate between channel noise and the tag signal. The detection threshold setting is at the end of the Tag Cfg menu.

Once properly set up, the letter 't' will appear at the bottom of the main measurement mode screen if the DRV3 detects the tag in the monitored frequencies. If the rules governing sound section 3.2.6 are respected, the 't' icon is replaced by a speaker icon.

To set up and enable/disable channel tag detection:

1. In the settings menu (page 3), select Tag Cfg. The current detection setting is displayed to the right.
2. Press the right arrow (▶) to edit the tagging options. An asterisk (*) appears next to the choice that is currently enabled.
3. To change a tag frequency, highlight the corresponding tag, then press the right arrow (▶) to edit the frequency of the tag's modulation, in hertz. Press **Enter** (↵) to save the value.
4. If necessary, adjust the noise Threshold offset for the channel tag. This value allows you to adjust by how much the tag modulation must stand out from the channel noise floor for tag detection. We suggest using a value of 21. Decreasing the value will increase DRV3's sensitivity but the probability of reporting ghost leaks will also increase.

On the opposite, increasing the value will reduce the risk of reporting ghost leaks but small leaks may not be detected by the DRV3. Highlight Threshold, press the right arrow (▶) and then use the arrow keys to edit each digit of the threshold value for the channel tag, from 3 to 35. Press **Enter** (↵) when you are done editing.

5. Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu and continue configuring other parameters. The selected tag is displayed in the middle top of the main measurement screen.

3.2.11 Setting up Detection

You can configure a minimum threshold for leaks in the Mid or LTE bands before the DRV3 considers that there is leakage. The possible values range from 0 to 999 μV per meter. The signal leak's strength must be equal to or greater than the value you configure in this setting in order for the DRV3 to indicate leakage.

**NOTE**

This setting is automatically set by the ARD4 upon entering autonomous mode. Normal users should not change this setting.

To edit detection levels:

1. In the settings menu (page 4), select Detection. The current detection setting is displayed to the right.
2. Select the band (Mid/Aero or LTE) for which you want to edit the detection level. Press the right arrow (▶) to move the cursor to the right column so you can begin editing.
3. Using the up and down arrows, change the value of each digit until you obtain the desired detection level from 0 to 999 $\mu\text{V}/\text{m}$. Press **Enter** (↵) when you are done editing to save the new value.
4. Repeat steps 2 and 3 for the other band, as applicable.
5. Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu and continue configuring other parameters.

3.2.12 Setting up the CW to QAM Delta

Leakage measurements in all digital networks must be referenced to the power level of the QAM signals carried on the network in the band of interest (Mid/Aero or LTE band). Because the DSG1 leakage carrier is generally injected at a different level than the QAM (generally lower), a parameter has to be set up in the DRV3 to compensate the readings.

This is done through the «CW/QAM» parameter. The CW/QAM parameter represents the difference between the QAM level and the DSG1 CW carrier level, in dB. The CW/QAM parameter can be a negative value if the leakage carrier is lower than the QAM or positive value if the leakage carrier is injected at a higher level than the QAM. It would be 0 if the DSG1 leakage carrier and the QAM signals are at the same level.

For ex.: If the DSG1 leakage signal is injected 20 dB below the QAM level, then CW/QAM would have to be set to (- 20).

To edit the CW to QAM offsets:

1. In the settings menu (page 4), select CW/QAM dB.
2. Press the right arrow (▶) to access the band and offset options.
3. Select the desired band (Mid/Aero or LTE) and then press the right arrow to move the cursor to the right column so you can edit each digit from -99 to +99. Press **Enter** (↵) when you are done editing in order to save the new value.
4. Repeat step 3 for the other band, as applicable.
5. Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu and continue configuring other parameters.

3.2.13 Setting up the Backlight

This parameter allows you to determine if the backlight is always on, always off, or if it turns off after a certain period of no keypad activity.

To adjust the backlight properties:

1. In the settings menu (page 4), select Backlight. The current setting is displayed to the right.
2. Press the right arrow to move to the options and use the up and down arrows to select the backlight properties from the available options.

ON	Remains on (lit)
AUTO 10s	Turns off after 10 seconds if no keys are pressed.
AUTO 30s	Turns off after 30 seconds if no keys are pressed.
AUTO 60s	Turns off after 60 seconds if no keys are pressed.
OFF	No backlight.

3. Press **Enter** (↵) to save your choice.
4. Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu and continue configuring other parameters.

3.2.14 Setting up Contrast

This parameter controls the screen contrast on the DRV3's display.

To adjust the contrast:

1. In the settings menu (page 5), select Contrast. The current setting is displayed to the right.
2. Press the right arrow to move to the options and use the up and down arrows to select the contrast value from 0 (least contrast) to 9 (highest contrast).
3. Press **Enter** (↵) to save your choice.
4. Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu and continue configuring other parameters.

3.2.15 Displaying the DRV3's Internal Temperature

This menu item provides a view-only access to the DRV3's temperature. To view the unit's internal temperature, go to the settings menu (page 5). The current temperature is displayed to the right, in Celsius (C) and in Fahrenheit (F).

Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu to configure or view other parameters.

3.2.16 Setting stand-by mode delay

While undocked and unplugged, the DRV3 can enter into a low consumption state to preserve battery life if no buttons have been pressed for a certain delay. This delay can be set to 1 min, 5 min or disabled.

1. In the settings menu (page 5), select Stand-by. The current setting is displayed to the right.
2. Press the right arrow to move to the options and use the up and down arrows to select the desired value.
3. Press **Enter** (↵) to save your choice.
4. Press **Esc** until you return to measurement mode or press the left arrow (◀) to return to the settings menu and continue configuring other parameters.

3.2.17 Displaying the DRV3's Version

This menu item provides a view-only access to the DRV3's internal software versions.

To view the version numbers, go to the settings menu (page 6).

Press **Esc** until you return to measurement mode, or press the left arrow (◀) to return to the settings menu to configure or view other parameters.

3.2.18 Displaying the DRV3's Device ID

This menu item provides a view-only access to the DRV3's identification.

To view the device ID, go to the settings menu (page 6). The unit's ID is displayed to the right. Press **Esc** until you return to measurement mode, or press the left arrow (◀) to return to the settings menu to configure or view other parameters.

4. Operation and Maintenance

4.1 Reading the Measurement Mode Screen

The DRV3 starts up in measurement mode by default and immediately detects and displays levels for the last frequency selected. Unless the DRV3 has been set up for single-band detection, it simultaneously monitors the selected frequencies in the Mid band and the LTE band.

Volume and Docking Status:

The volume and docking status shows the reference volume level for audible alert upon detecting leaks that exceed squelch criteria. Four (4) settings: mute, low, medium, and high. See section 3.2.5 Setting up Sound to set up the reference level and squelch criteria.

When docked, a truck icon will be displayed next to the speaker icon.

Proximity Factor and Tag Mode:

The screen alternately displays the proximity factor setting (see section 3.2.4 Setting up Proximity on page 23) and the selected tag mode (see section Using Channel Tag Detection on page 30)

Battery Charge Status:

The battery charge (dark field and percentage value) when operating on battery power, or a plug symbol when the DRV3 is connected to a power source via the docking station or the standalone AC converter.

The DRV3's screen in measurement mode shows the following information:

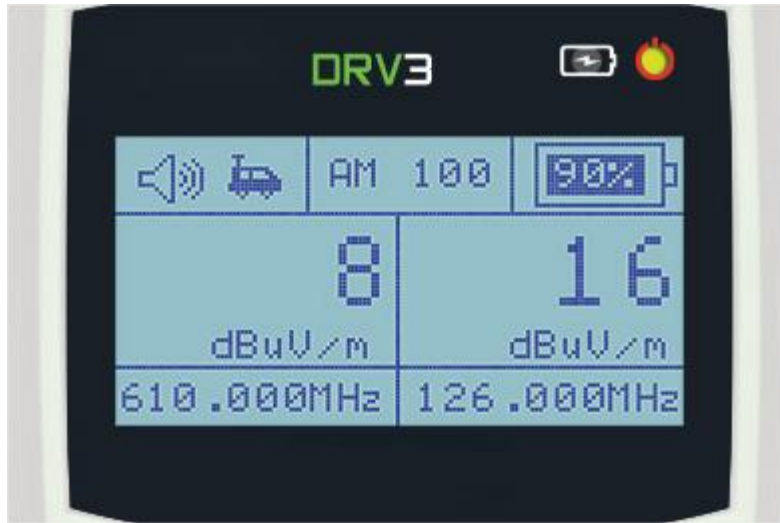


Figure 9: Measurement Mode Screen

In single-band mode:

Volume icon and docking icon	Proximity factor and tag mode (in alternation)	The screen displays the battery charge icon
The screen displays the last leakage level detected at the selected frequency Measurement unit ($\mu\text{V}/\text{m}$ or $\text{dB}\mu\text{V}/\text{m}$)		
Measurement unit ($\mu\text{V}/\text{m}$ or $\text{dB}\mu\text{V}/\text{m}$)	Snapshot icon with level of last snapshot taken (if applicable)	

In dual-band mode:

Volume icon and docking icon	Proximity factor and tag mode (in alternation)	Battery Charge icon
Last LTE band leakage level detected Measurement unit ($\mu\text{V}/\text{m}$ or $\text{dB}\mu\text{V}/\text{m}$)		The screen displays the last Mid/Aero band leakage level detected Measurement unit ($\mu\text{V}/\text{m}$ or $\text{dB}\mu\text{V}/\text{m}$)
Frequency (upon entering measurement mode) Snapshot icon with level of last snapshot taken (if applicable)	Frequency (upon entering measurement mode) Snapshot icon with level of last snapshot taken (if applicable)	

4.2 Adjusting Volume During Normal Use

The DRV3 emits an audible tone to help you locate the leakage source. The tone rises with signal strength, from about 200 Hz to about 800 Hz. In measurement mode, you can enable or mute the audio by pressing the volume key labeled Esc. To adjust the reference volume of the audio tone, see section 3.2.5 Setting up Sound on page 24.

4.3 Using the Snapshot Feature

During normal operation, you can capture the actual RF level measurement at your leakage monitoring frequency. This feature can help you compare levels you are reading in different locations or at different distances from the leakage source.

You can take a snapshot by pressing the key labeled (↵), which is also the Enter key. The captured level will appear in smaller numbers, to the right of the current leakage level reading. To take another snapshot, press the (↵) key again. The previous level that was captured is cleared and is replaced with the new snapshot.

4.4 Charging the Battery

The DRV3 can operate on battery power for hours when fully charged. The battery status indicator gives the battery charge level. To maintain good battery health and ensure the longest useful battery life, you must follow these recommendations for charging the battery:

1. Use only the battery pack and replacement battery pack available from CPAT Flex.
2. Use only the chargers available through CPAT Flex. The DRV3's status LED will turn **green** only when the battery is fully charged.
3. Charge the unit at room temperature. Do not place the unit in a location where extreme temperatures occur during charging. The DRV3 is equipped with additional protection to prevent the battery from charging when the temperature is above 40°C (104°F) or below 0°C (32°F).

4.5 Replacing the Battery Pack

The rechargeable Li-Ion battery pack is accessible via the DRV3's rear panel. You will not need to access the batteries unless they can no longer be recharged.

To change the battery pack:

1. Loosen the battery compartment's screw using a Philips head screwdriver and remove the panel.
2. Disconnect the 5-pin mating connector on the cable between the battery pack and the DRV3. Replace the battery pack only with a battery pack from CPAT Flex.
3. Plug in the 5-pin connector and replace the panel in the battery compartment. Secure the panel with the screw. In order to avoid damaging the DRV3's housing, do not overtighten the screw.

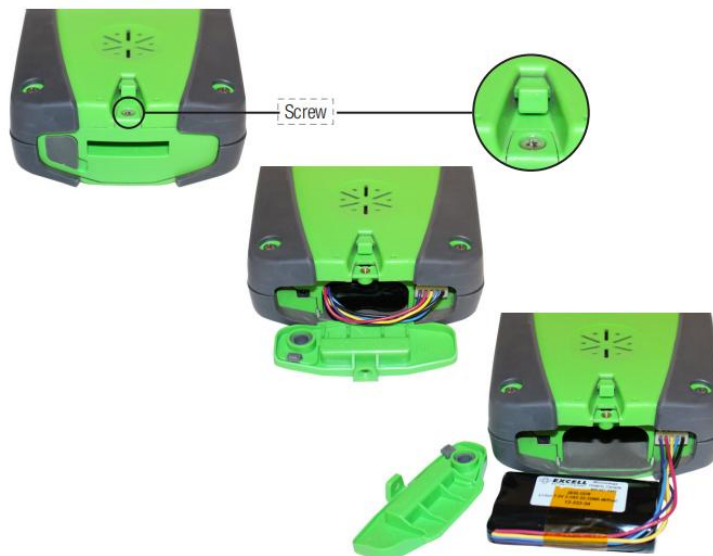


Figure 10: Battery compartment

4.6 Updating the DRV3's Firmware

From time to time, firmware updates may be available for the DRV3. The update can be automatically pushed by an ARD4, or manually using a computer.

When a new firmware update is available, the CPAT Flex support team will plan the update deployment with your manager.

To check which versions are currently installed in the DRV3, access the DRV3's setup mode by pressing the up or down arrow and scrolling to the version menu. There are three version numbers, each for different components of the DRV3.

4.7 Cleaning

Your DRV3 unit can be wiped clean with a damp cloth. Do not immerse the unit in water. Avoid solvents and commercial cleaners.

Appendix A – Specifications

TECHNICAL	DETAILS
Detector type	Dual-band digital receiver/demodulator
Frequency range	Agile from 118-140 MHz (Mid-Band) Agile from 572-960 MHz (LTE-Band)
Channel Tuning	Configurable via USB port and front panel buttons
Level range	2 to 4,000 $\mu\text{V}/\text{m}$ @ 3 meters (mid-band), 5 $\mu\text{V}/\text{m}$ to 4,000 $\mu\text{V}/\text{m}$ @ 3 meters (LTE-band)
Level accuracy	± 1.5 dB mid-band ± 2.5 dB LTE-band
System Tag	AM modulation 10-110 Hz DSB-SC modulation 3,500-7,000 Hz Video NTSC (mid-band only)
Audible Tone/Volume	Yes - varies with leak intensity
RF Level Scale display	Single scale from 0 to 4,000 $\mu\text{V}/\text{m}$
Measurement Units	$\mu\text{V}/\text{m}$ and dBuV/m
Power	Pack of 2 rechargeable Li-ion cells, 3,100 mAh
Operation time	2.5 hours nominal (both tuners activated) or 4.0 hours nominal (one tuner activated)
Charging Temperature	0°C to 45°C / 32°F to +113°F
Operating Temperature	0° to +40°C / 32°F to +104°F
Communication Port	USB serial port
PHYSICAL	DETAILS
Dimensions (H x W x D)	21 cm x 11 cm x 4 cm / 8.3" x 4.3" x 1.6"
Weight	850 g / 30 oz
DOCK STATION	DETAILS
Dimensions (H x W x D)	24 cm x 12.5 cm x 8 cm / 9.4" x 4.9" x 3.2"
Weight	240 g / 9 oz

* Specifications subject to change without prior notice.

Appendix B. Our Services

CPAT Flex offers a range of services to deploy and support purchased equipment through its Customer Support organization. Customer Support is included with every product sale and comprises business-hour technical assistance, in-warranty repair, and calibration.

B.1 Customer Support

Customer Support is available with the sale of every CPAT Flex product. Customer Support services include:

- Product and Service Literature
- Technical Assistance (Business Hour)
- Equipment Repair (Under Warranty Repair and Calibration Services)
- Equipment Return Authorizations (RA)

Contact a Customer Support representative through your local distributor or by accessing www.cpatflex.com for information on calibration and warranty policies.

B.1.1 Equipment Return Instructions

Please contact your local Customer Support location via telephone for a Return Authorization to accompany your equipment. For each piece of equipment returned for repair, attach a tag that includes the following information:

- Owner's name, address, and telephone number
- The serial number, product type, and model
- Warranty status (If you are unsure of the warranty status of your instrument, contact CPAT Flex's Customer Support.)
- A detailed description of the problem or service requested.
- The name and telephone number of the person to contact regarding questions about the repair.
- The return authorization (RA) number

If possible, return the equipment using the original shipping container and materials. If the original container is not available, pack the unit carefully to prevent damage during transit. If necessary, suitable packing materials can be obtained by contacting CPAT Flex Support.

CPAT Flex is not responsible for any damage that may occur during shipping. The customer should clearly mark the RA or reference number issued by CPAT Flex on the outside of the package and ship it prepaid and insured to CPAT Flex.

Equipment repaired or replaced under warranty will be returned at CPAT Flex's expense to the Customer (Canada/USA) or CPAT Flex's representative (all other countries).

All other non-warranty repairs will be returned at the customer's expense to the customer (Canada/ USA) or CPAT Flex's representative (all other countries).

B.2 Limited Product Warranty

B.2.1 Hardware

CPAT Flex warrants to the original end user (Customer) that the new CPAT Flex branded products will be free from defects in workmanship and materials, under normal use, for one (1) year from the date of original shipment.

CPAT Flex warrants repaired products for ninety (90) days from date of shipment. Any Product repaired or replaced under warranty is only warranted for the period of time remaining on the original warranty for the Product.

Any third-party products, including software, included with CPAT Flex products are not covered by this CPAT Flex warranty, and CPAT Flex makes no representations or warranties on behalf of such third parties. Any warranty on such products is from the supplier or licensor of the product.

B.2.2 Software

CPAT Flex warrants to the customer that new CPAT Flex branded software and firmware will perform in substantial conformance to program specifications for a period of ninety (90) days from the date of original shipment.

CPAT Flex warrants the media containing software against failure during the warranty period.

CPAT Flex makes no warranty or representation that the operation of the software products will be uninterrupted or error-free, or that all defects in the software products will be corrected.

B.2.3 Exclusions

This warranty excludes:

- Damage to the physical surface of the product, including cracks or scratches to any part.

- Damage caused by misuse, neglect, improper installation or testing, unauthorized attempts to open, repair, or modify the product, or any other cause beyond the intended use.
- Use of the product with any non-recommended device or service if such device or service causes the problem.
- Installation or maintenance of the product by someone other than CPAT Flex or persons certified by CPAT Flex.
- Changes to the customer environment in which the product was installed.
- Damage caused by accidents, fire, power changes, other hazards, or acts of nature.
- Consumable product or parts thereof (e.g., parts with an expected useful life of less than ninety (90) days, such as certain batteries).
- Product not returned following CPAT Flex's RA procedure.

B.2.4 Refurbished Parts and Prior Testing

The product may include reconditioned or refurbished parts or subassemblies and might have undergone testing before being sold.

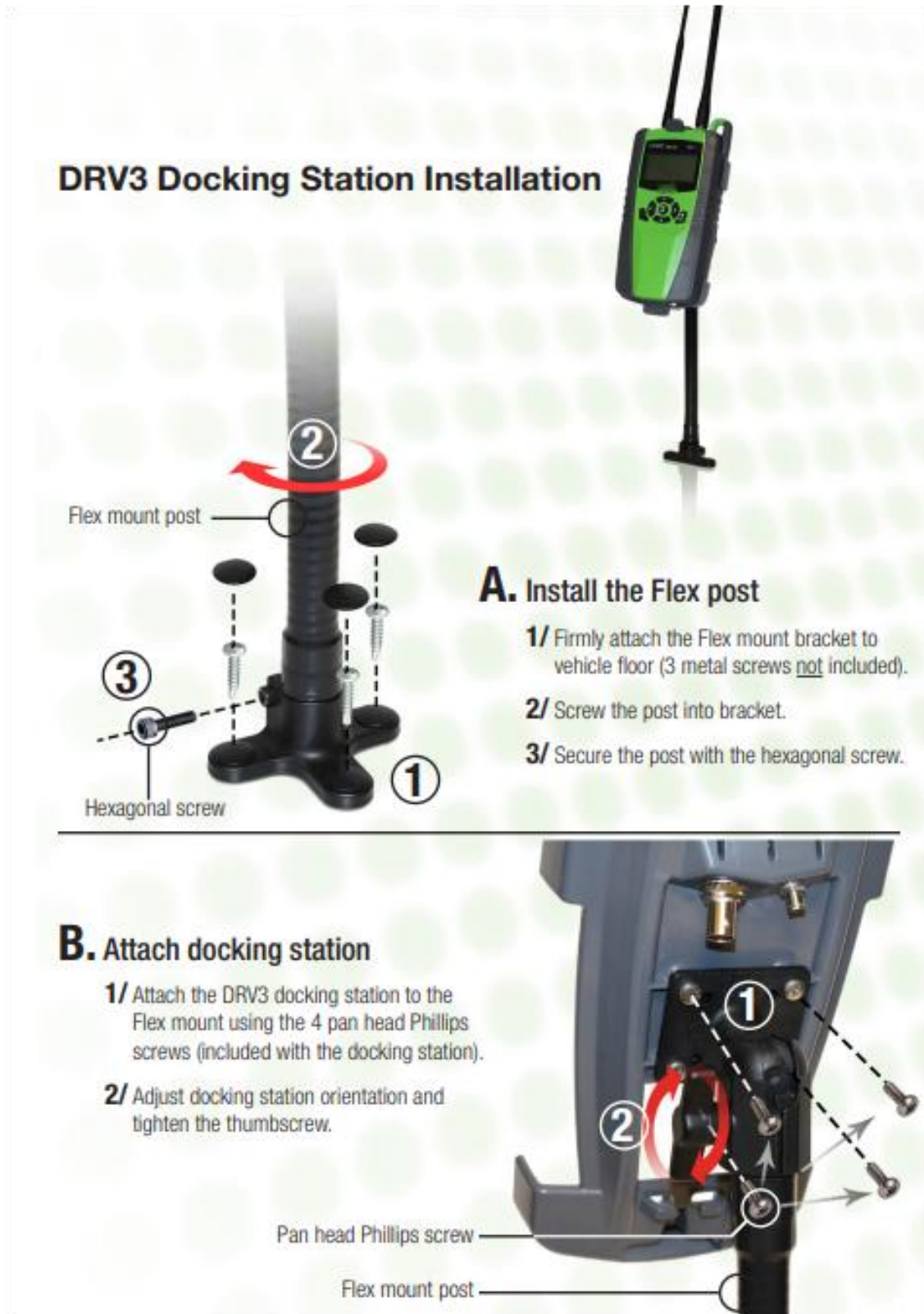
B.2.5 Exclusive Remedies

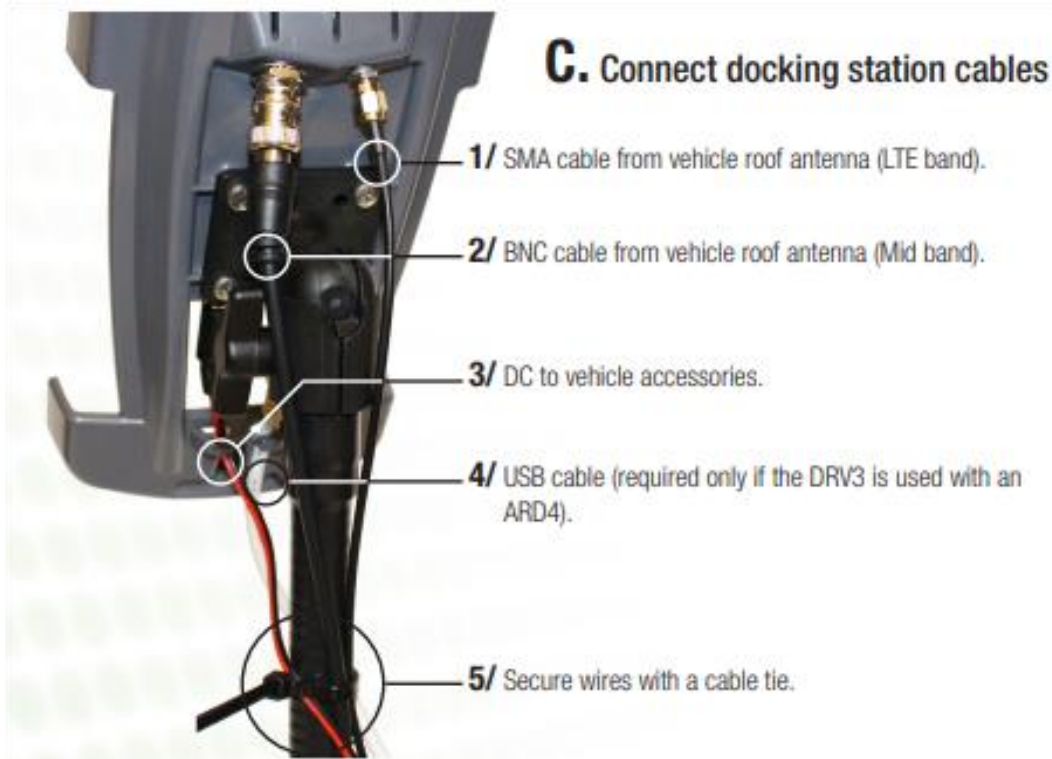
If any product materially fails to conform to the limited warranty set forth in this section (Limited Warranty) and actually fails during the applicable warranty period and under normal use, CPAT Flex shall, at its sole discretion, (i) repair or replace the non-conforming product to remedy the nonconformity identified by the customer in accordance with this section (Limited Product Warranty); or (ii) issue a credit to the customer for the amounts paid for the product in exchange for the return of the non-conforming product, in which case the customer's licenses to any firmware shall be automatically revoked. The customer hereby transfers to CPAT Flex title and ownership of any parts that CPAT Flex replaces.

B.2.6 Disclaimer

THE REMEDIES EXPRESSLY PROVIDED IN THIS SECTION WILL BE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES AND SHALL BE IN LIEU OF ANY OTHER RIGHTS OR REMEDIES CUSTOMER MAY HAVE AGAINST CPAT FLEX WITH RESPECT TO ANY NON-CONFORMANCE OF PRODUCTS. EXCEPT AS SPECIFIED IN THIS LIMITED PRODUCT WARRANTY, CPAT FLEX MAKES NO EXPRESS REPRESENTATIONS OR WARRANTIES WITH REGARD TO ANY PRODUCT.

CPAT FLEX DISCLAIMS ALL IMPLIED WARRANTIES, CONDITIONS, AND REPRESENTATIONS INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT, REGARDLESS OF THE LEGAL THEORY ON WHICH SUCH IMPLIED WARRANTY MAY BE BASED, INCLUDING, WITHOUT LIMITATION, CONTRACT, COURSE OF DEALING, USAGE, OR TRADE PRACTICE.





D. Connect the DRV3 to ARD4 (optional)

Note: See "CPAT FLEX Operation Manual" for the ARD4 installation details.



E. Dock: Insert the DRV3 into docking station



Published by CPAT Flex
8566 Ave de l'Esplanade
Montreal, Quebec
CANADA H2P 2R8

www.cpatflex.com
1-888-307-2728