

BINAR PRODUCTION SYSTEMS

FLC Tool

CAMERA ASSEMBLY VERIFICATION

USER MANUAL



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FLC Tool – User manual

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The "►" symbols in this manual are references to other manual sections.

(► 3.2) for example, refers to section 3.2.

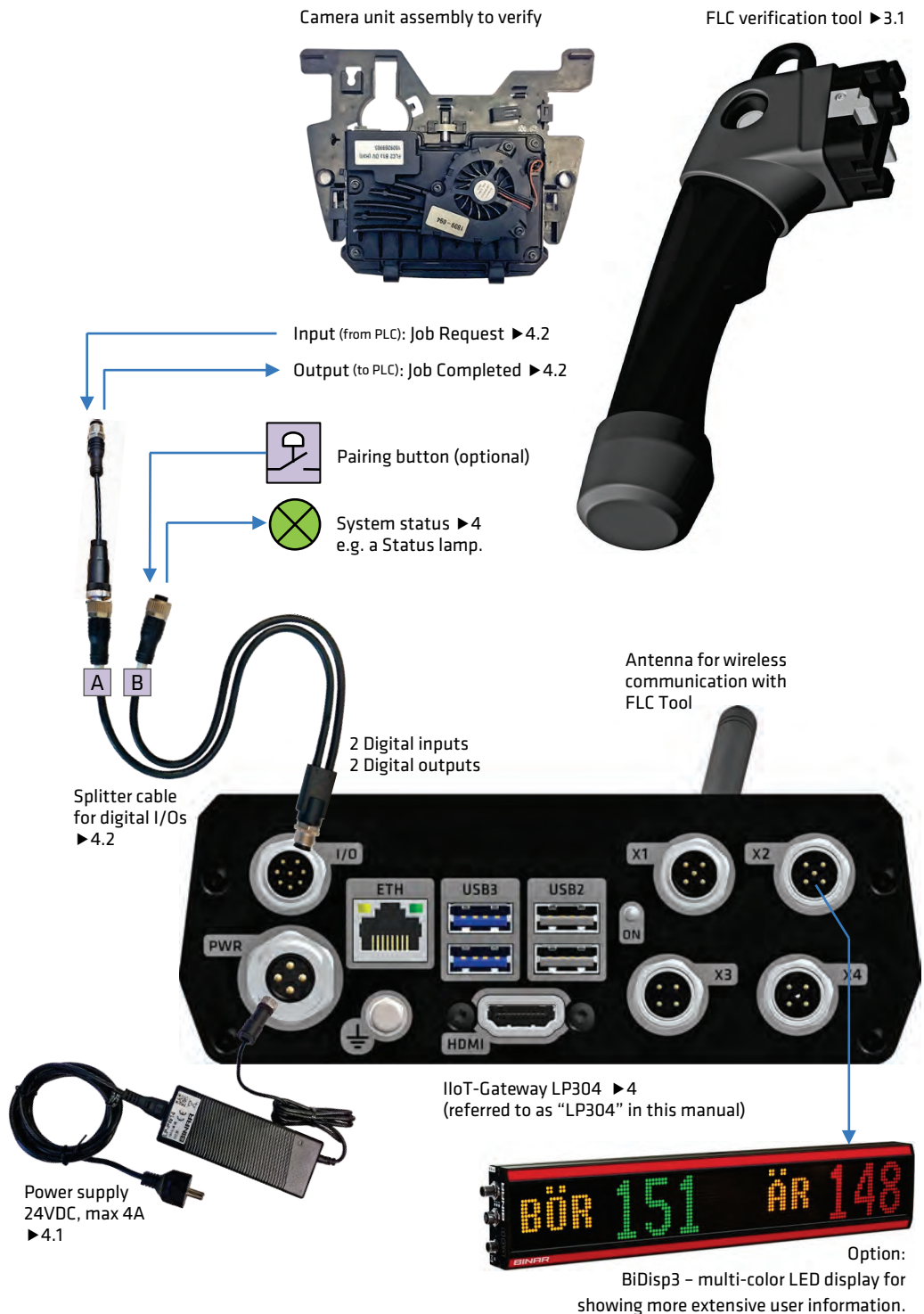
If the manual is read as a pdf file, the references are clickable and link to the designated section.

1 System overview

FLC, developed for Volvo Cars, is a special tool used for verifying that a front window camera has been mounted correctly.

FLC uses wireless communication to receive job orders and report results back. Two inductive sensors are used to verify the assembly and two "RGY" LEDs provide process information to the operator during operation. There is also an internal WiFi module available for future use/options. ►3.1

FLC communicates with the IIoT (Industrial Internet of Things) Gateway LP304 (referred to as "LP304" in this manual) through which job orders/results are transferred. LP304 has a touch screen interface and digital I/Os for communicating system control and operator information. There is also a Gigabit Ethernet port for future optional uses. ►4



2 Operating the system – Step-by-step

After all the hardware are mounted and all wiring is done:

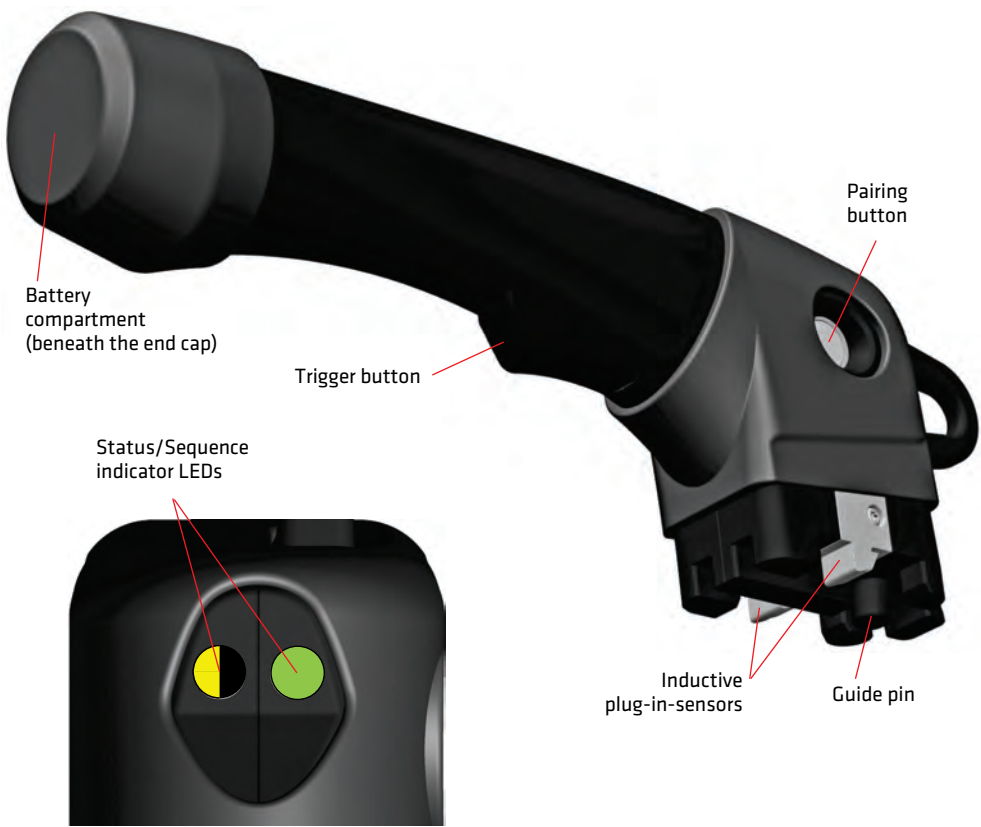
- Power ON LP304.
- Wait for appr. 45 seconds for LP304 to start up.
The default screen will show on LP304.



- If no FLC tool has been paired yet, then perform the pairing operation ► 3.3.
- Wait for a Job Request and then perform the verification ► 3.2 (► 3.1).

3 The FLC tool

3.1 Overview



3.2 LED symbols used throughout the manual

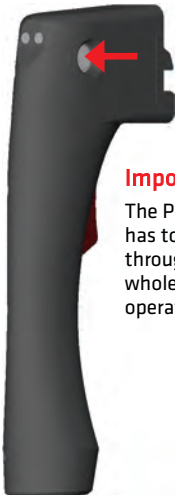
Status/Sequence LED symbols used in this manual			
Style			
Color	Steady	Slow blink 1/sec (1Hz)	Fast blink 5/sec (5Hz)
Green			
Yellow			
Red			
Red/Yellow			

3.3 Pairing

For the FLC tool to be able to receive and perform jobs, it must first be “paired” with its base station (the IIoT-Gateway LP304). Make sure that the FLC tool is within range of the base station while performing the pairing operation.

1

Press (and hold) the Pairing button



Important!
The Pairing button has to be pressed throughout the whole Pairing operation.

2

Push the Trigger button (no need to keep pressed).



3

The LEDs will do 3 fast green blinks per second, while seeking contact with the base station (LP304).



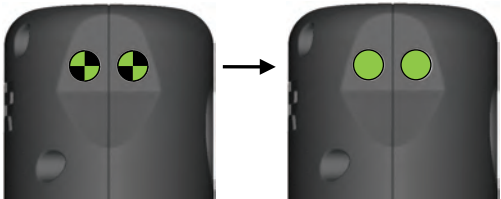
4

Set the Base station (LP304) ready for pairing as well (this may be done prior to step 1-3 if one wish).
Either
press (and keep pressing) the Pairing button of the base station ▶ 4.5.2
or
click the Pairing button at the LP304 touch screen interface.

Note –
LP304 has a 180 sec pairing timeout.

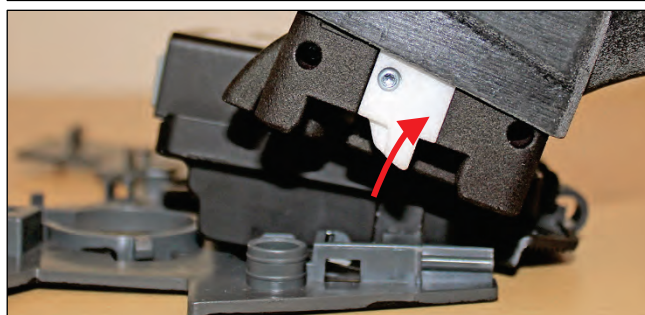
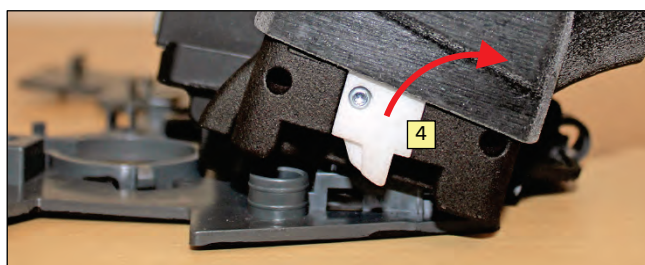
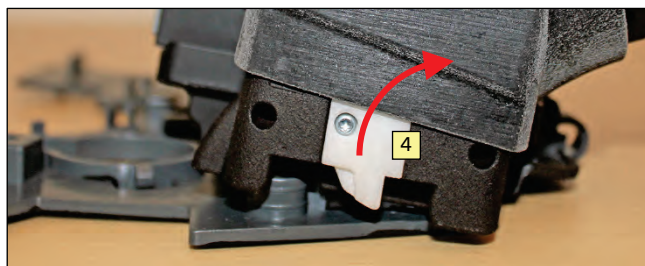
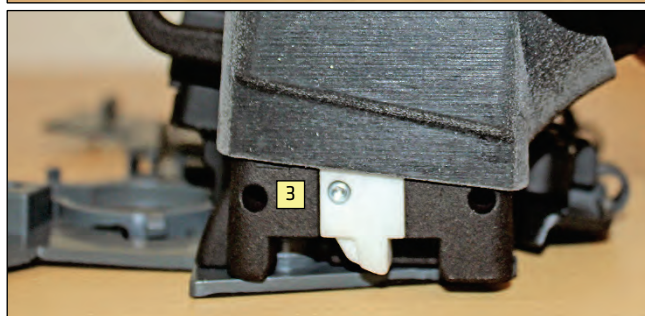
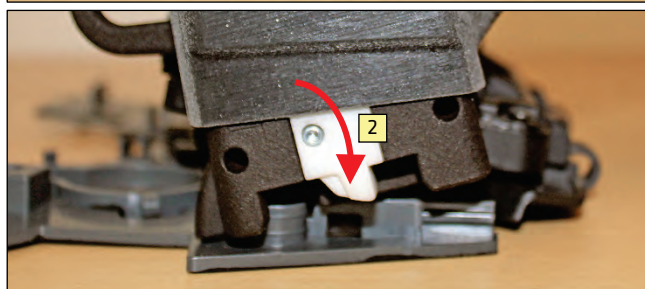
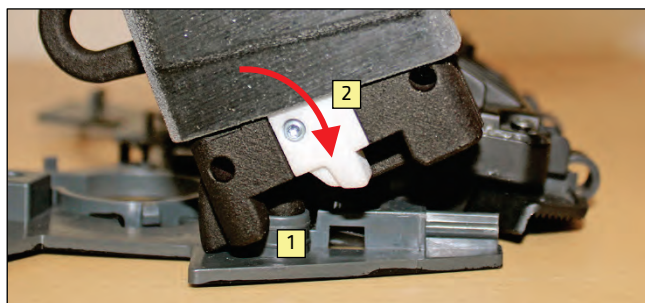
5

When the FLC tool makes contact and pairs with the base station this is indicated by 5 fast green blinks followed by a few seconds of steady green light.



3.1 How to apply and remove the FLC tool

Here is the way to apply and remove the FLC tool.



APPLYING

With the tool at a slight angle insert the front guide pin into its corresponding hole [1] and turn the tool downwards [2] into place [3].

If the camera unit is not mounted correctly at the side to verify, the tool will not be able to come all the way down.

However, if the camera unit is just a tiny bit out of place, the tool itself is meant to push the unit into place.

REMOVING

To remove the tool after verification, angle it backwards [4], the opposite way it was applied, as shown in the images to the right.

To remove the tool this way is important for avoiding unnecessary wear to the sensor surfaces.

3.2 Operation – the verification sequence

1

Push the Trigger button to start.

Note -
The Trigger button may be pressed throughout the operation but does not have to be.



2

Both LEDs will blink fast yellow for a short moment while the inductive sensors are being calibrated.



3

After that both LEDs will blink slowly yellow (steady yellow if in Offline mode ▶3.3.)
The FLC tool is now ready for operation.



Note – 30 sec timeout:

Verification must be completed within 30 seconds, otherwise the operation must be restarted (by pushing the FLC trigger button again).

4

Position the FLC tool at the first side to verify (left or right side doesn't matter).

If the assembly was done correctly the yellow blinking LED closest to the camera unit will turn steady green.

If not, the assemblage has to be corrected.



5

Then position the FLC tool at the other side.

If this side is also mounted correctly the other yellow blinking LED will turn green.

After a few seconds both green LEDs will turn off, indicating a successful verification.



3.3 Offline mode

The offline mode makes it possible to perform a verification sequence totally independent of the supervisory system. This may be useful for e.g. post adjustments or for testing the tool itself.

3.3.1 Entering Offline mode

1

Push and hold the Trigger button.



2

While still pressing the Trigger button, press the Pairing button 5 times in a row (max 1 sec between each time).



3

The LEDs will show steady yellow light for 3 seconds indicating that the Offline mode is enabled.



3.3.2 Offline mode operation

The Offline operation is performed exactly as the online operation (►3.2). The only difference is that instead of the LEDs blinking slowly yellow during the operation, they will show a steady yellow light.

3.3.3 Leaving Offline mode

To return to normal operation just pair to the LP304 gateway again ►3.3.

3.4 Error/Warning cases

When activating the FLC tool by pressing the trigger button the following Error/Warning indications may occur.

Fast blinking RED

Inductive sensor fault.



Reason:

The sensor at the side of the blinking LED may be faulty.

Solution:

Replace the sensor ►3.6.1.
If that doesn't solve the problem replace the FLC tool.

Slow blinking RED

No contact with the base station (LP304).



Possible reasons/solutions:

- Base station is out of range (operation range is up to 10 m (line-of-sight)).
- Base station is shut down or broken.
- No Pairing has been performed.

Steady RED

No active job order exists.



Solution:

Wait for a job order.

Fast blinking RED/YELLOW

Pairing no longer valid.



Reason:

Another FLC tool has been paired to the same station (LP304) as this tool, and therefore the pairing is no longer valid.

Solution:

Perform the pairing operation again ►3.3

3.5 Batteries

The FLC tool is powered by two 1.5V AA Lithium batteries (Energizer, type Ultimate Lithium 12-2039).

3.5.1 Battery LOW warning

The estimated battery life is appr. 100.000 verification operations.

When the battery capacity starts to run low, the operator is warned by e.g. a lamp connected to the Out2 digital output signal or (optional) by a message shown on a BiDisp display ► 4.2.

3.5.2 Replacing batteries

Start by pulling of the end cap to expose the battery lid.



To open the battery compartment, turn the lid 90° counter clockwise.

Batteries are inserted with the positive (+) pole facing outwards.

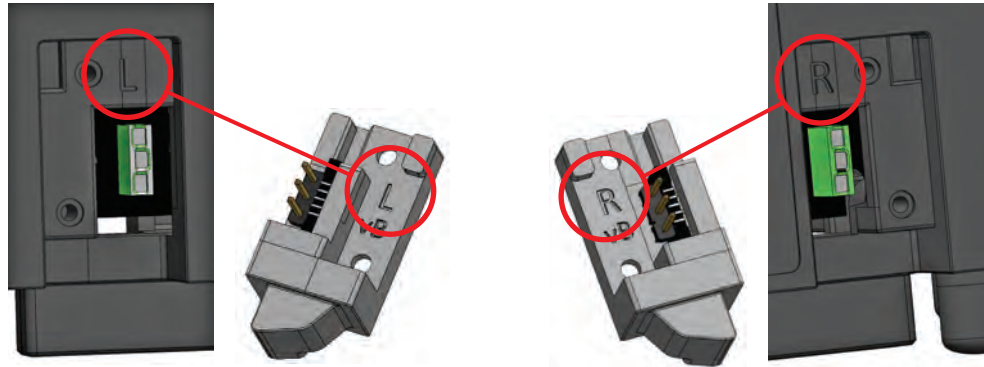
Beware! Because the battery lid is spring loaded, it can easily fly away when you loosen it.



3.6 Inductive plug-in-sensors

The FLC tool has two inductive “plug-in-sensors”, one at each side. The sensors can be replaced in case of malfunction or wear.

There is a left hand and a right hand variant of the sensors. The left hand sensor will not fit the right side and vice versa. The letters “L” and “R” inprinted in the housing and the sensor units will tell which sensor to use at which side.



3.6.1 Replacing the inductive sensors

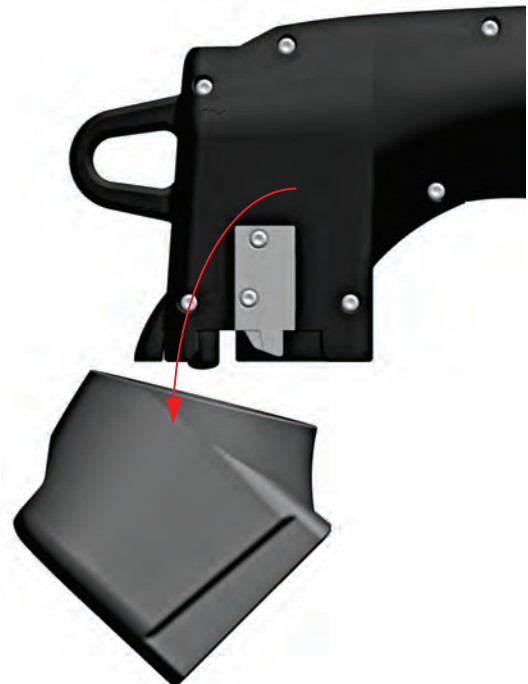


Note that the FLC tool contains ESD-sensitive electronics (sensitive to electrostatic discharge). When replacing sensors the inside electronics will be somewhat exposed.

Avoid touching the electronics and be sure to be well grounded.

1

Start by carefully pulling of the front cap to expose the plug-in-sensors. Be careful not to damage the thin walls at the bottom.



2

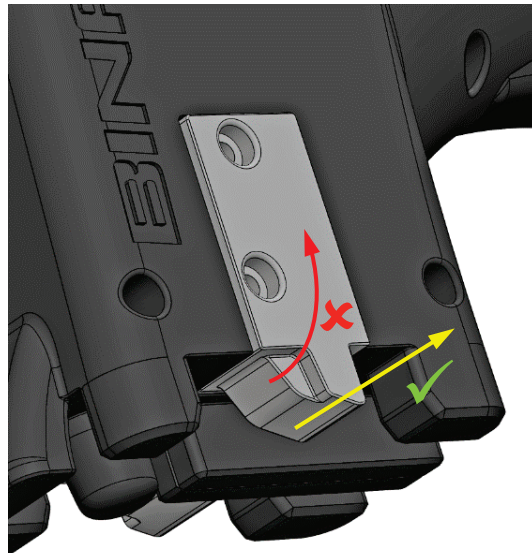
Remove the screws holding the sensor to be replaced.



3

Gently pull the sensor straight upwards.

It can be a little tough but do not try to pry it up, just gently work it upwards.

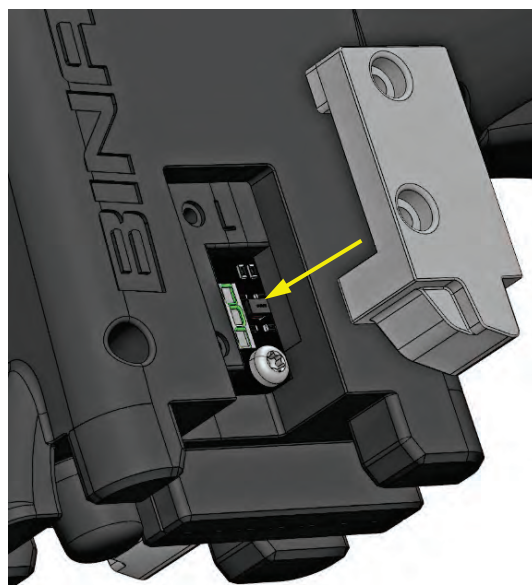


4

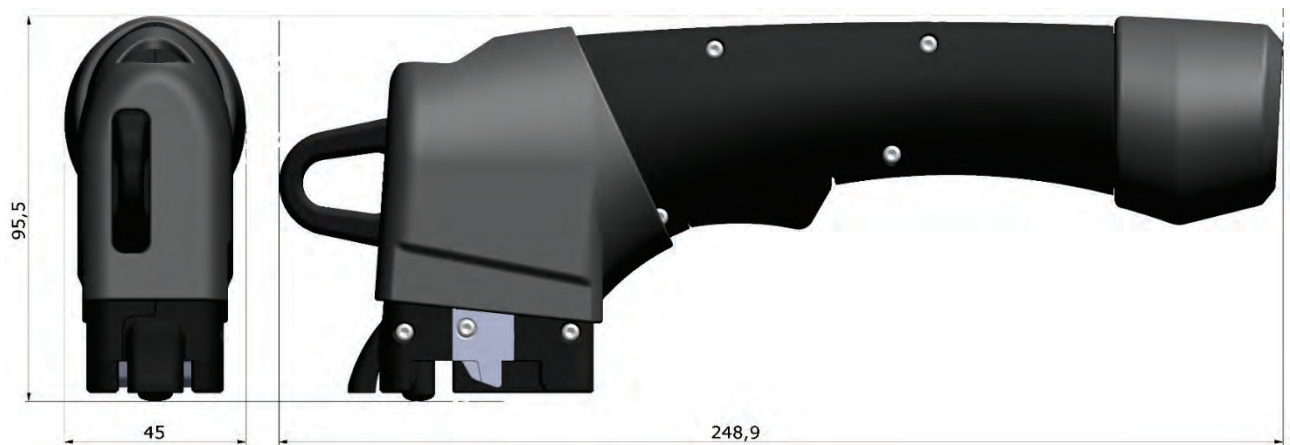
Put the replacement sensor in place by gently pushing it straight downwards.

Then apply the screws. Be sure not to tighten them to hard – that will damage the housing threads.

Finally mount the the front cap back again, the opposite way it was dismantled.



3.7 Mechanical dimensions



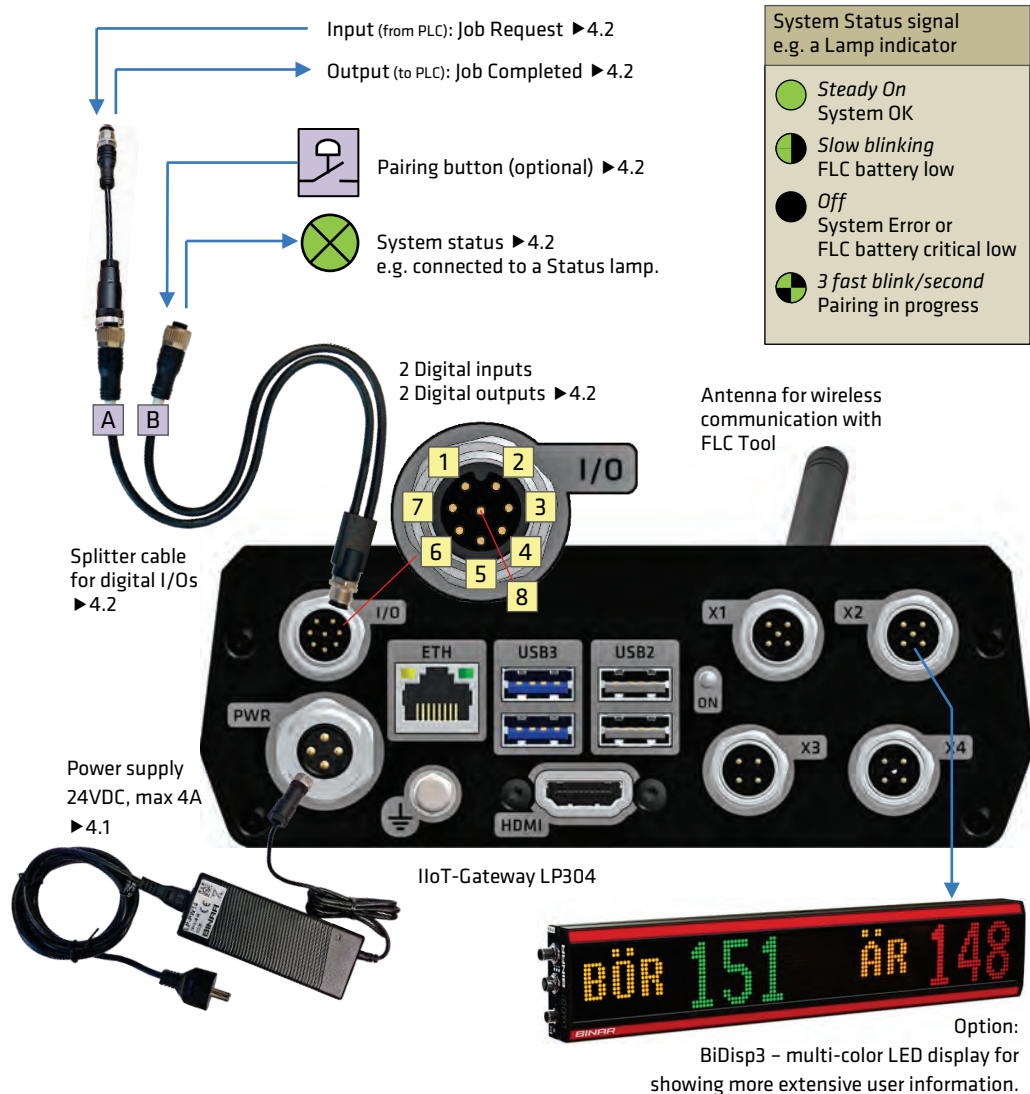
Tool holder, wall mounted.
Part no 53014



Tool holder, desk mounted.
Part no 53018

4 IIoT-Gateway LP304

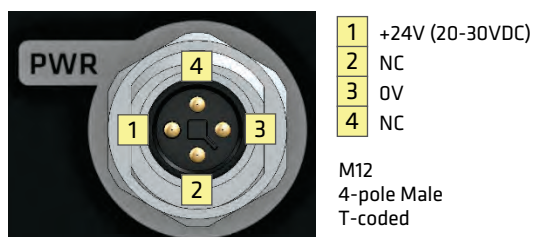
FLC communicates with LP304 through which job orders/results are transferred. LP304 has a touch screen interface and digital I/Os for communicating system control and operator information.



4.1 Power supply

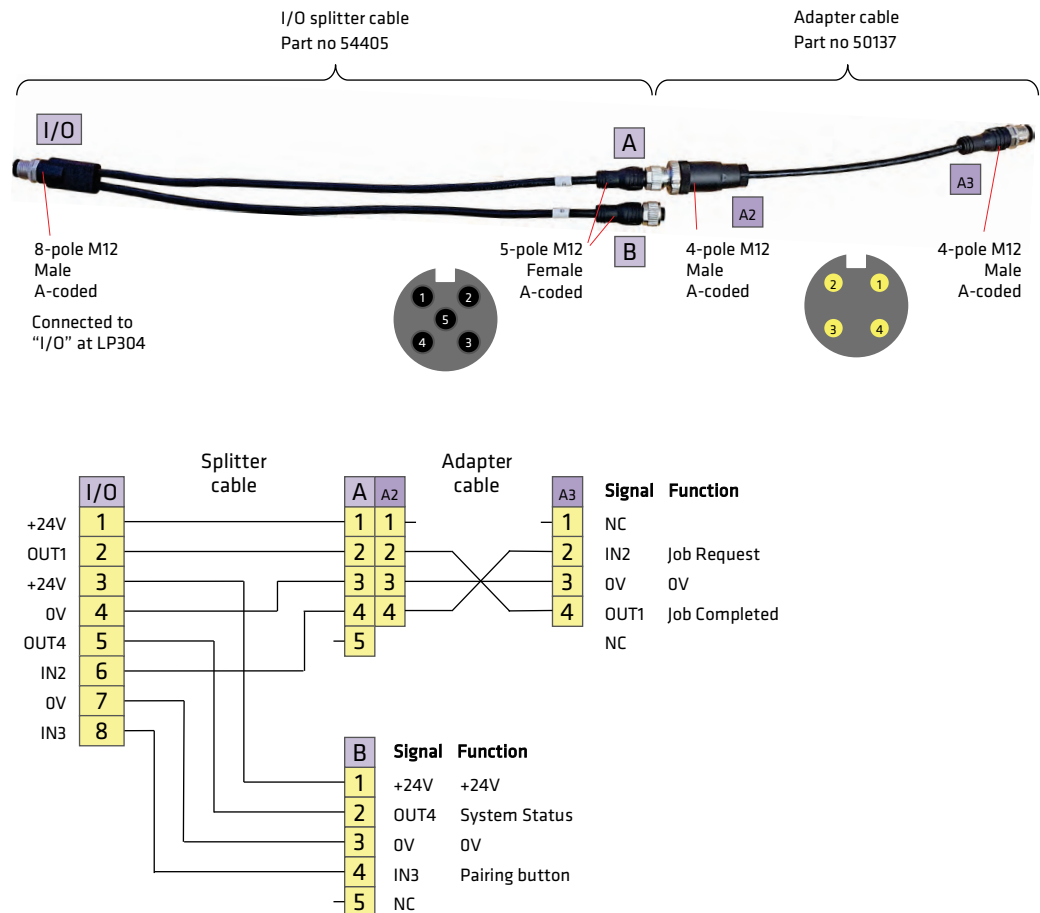
LP304 is powered by 24VDC, max 4A, connected to the "PWR" connector (4-pole M12, male, T-coded).

A suitable power supply is LP-PW14 from Binar Solutions AB (part no 51336).



4.2 Connecting the I/O signals

The I/O signals needed for the FLC system to work are connected to the 8-pole M12 connector "I/O" at the front of the LP304 by means of a splitter cable dividing the I/O signals into two 5-pole M12 connectors, A and B (see section below). To the A connector there is an adapter cable connected as well.



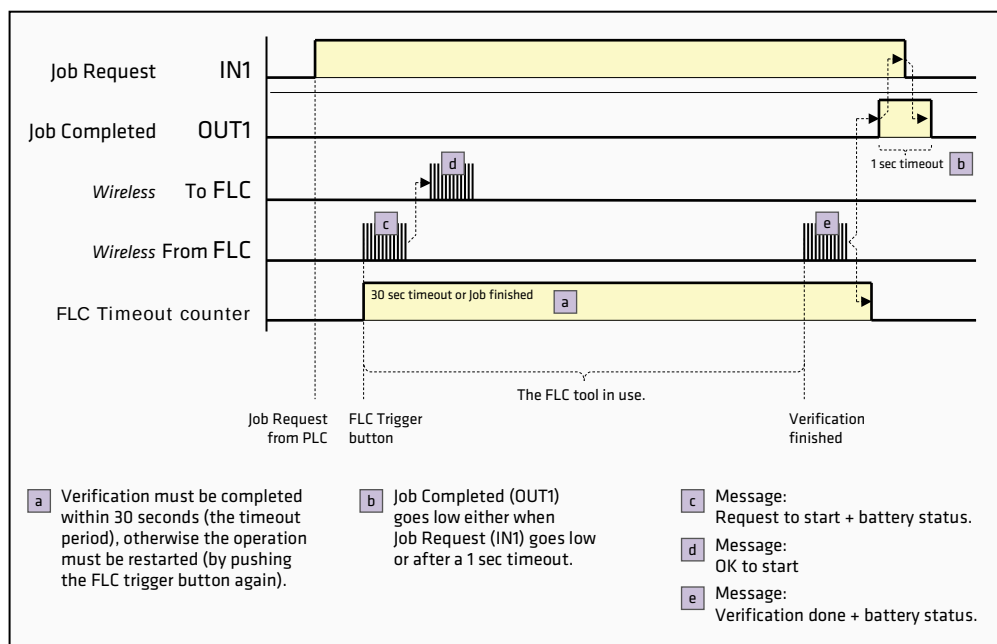
Digital Inputs

Type	+24VDC Positive logic
Signal levels	Logical 0 < +5VDC; Logical 1 > +15VDC

Digital Outputs

Type	+24VDC Positive logic
High level voltage	High level voltage = Supply voltage
Output current	Max 2A / output
Short circuit protected	Yes

Normal verification sequence:



4.3 BiDisp3 (optional)

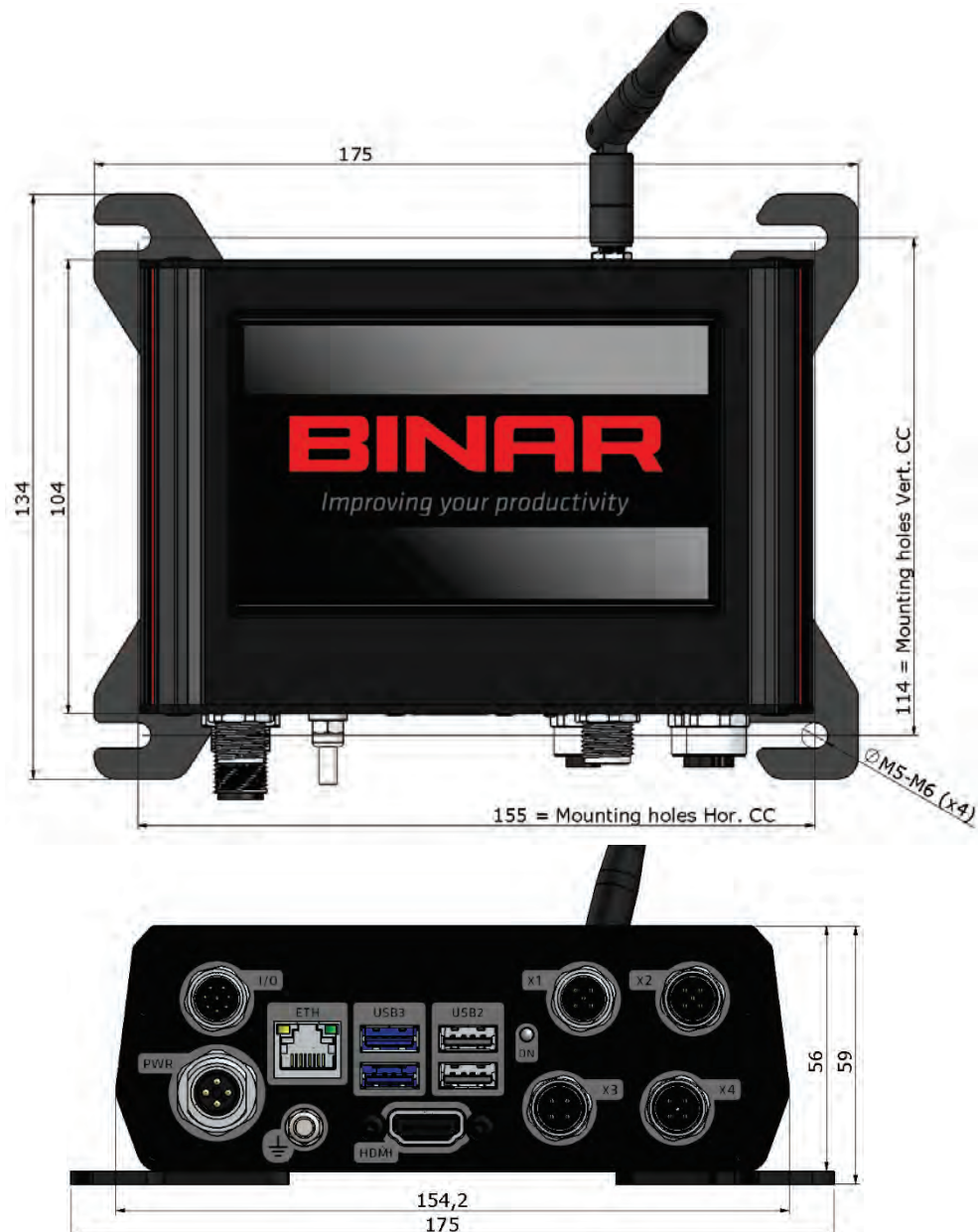
To provide the operator with more comprehensive and clearer process information an optional BiDisp3 multi-color LED display may be connected to the "X2" connector at LP304 (CAN bus).



4.4 Mechanical dimensions and mounting

LP304 comes with mounting brackets attached and mounting is done by means of four screws, size M5 to M6 (see dimensions below).

Mounting is preferably done in line of sight of the FLC tool, with the display at least at operator's eye level, preferably a bit higher. DO NOT place LP304 in a metal enclosure as that would block the wireless communication.



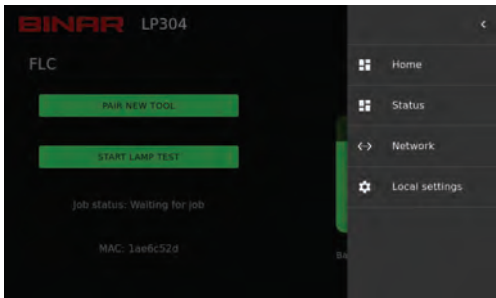
4.5 User Interface

4.5.1 Home page



The status row [A] will show current system status –

Waiting for job	There is no current job order.
New job waiting	A new job is ordered and waits to be done.
Do perform job	The FLC tool is activated and verification is to be performed.
Job done	The job is completed.
No active job	The FLC tool is activated when there is no job ordered.
Battery low	Battery low (and no active job).
Pairing	Pairing is in progress.
Paired	Pairing is completed.



The main menu [B] –

Home	Return to Home page
Status	Show System status page ▶4.5.4
Network	Not used for this application
Local settings	Show Local Settings page

4.5.2 Pairing

The full pairing sequence is described in section ▶3.3.
The base station can be set for pairing by pressing the “PAIR NEW TOOL” button.

The pairing process can be aborted by pressing the “STOP PAIRING” button.



4.5.3 Lamp test

To start Lamp test press button “START LAMP TEST”.
This will make a lamp or other indicator driven by the System status signal (Out4 ▶4.2) blink slowly (1Hz).

To stop Lamp test press button “STOP LAMP TEST”.



4.5.4 Battery status

Note that the battery status of the FLC tool is only communicated to the system when the FLC tool is activated and there is a job waiting. The screen therefore reflects the status that applied at last job performed.

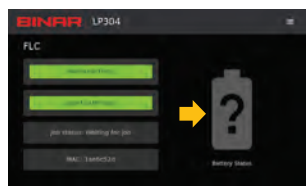
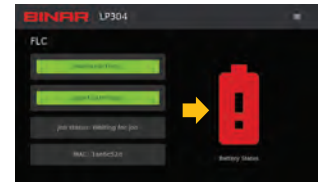
The battery symbol to the right shows the battery status.



When battery is low the symbol turns yellow.



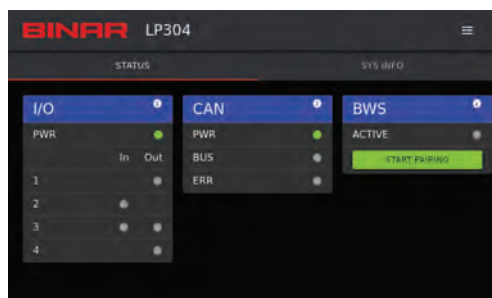
When battery is critical low the symbol turns red.



Unknown battery status.

This is shown in case LP304 hasn't received battery status from FLC, e.g. at start-up or after pairing.

4.5.5 System status



Section I/O

Shows the I/O signal status.

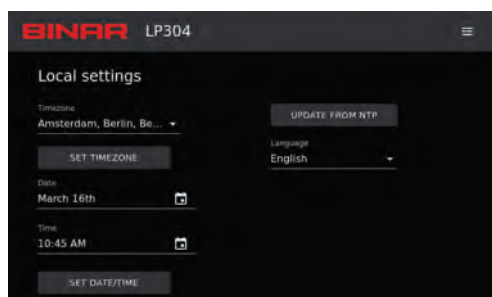
Section CAN

Shows status for the CAN bus (connectors X1 and X2)

Section BWS

Not used for this application.
DO NOT press the "START PAIRING" button.

4.5.6 Local settings



Language

Sets the application language

None of the other functions at this page are used for this application.

5 Technical Data

FLC TOOL

Part no.	35935
Recommended batteries	2 pcs. Make: Energizer; Type: Ultimate Lithium 12-2039
Ambient temperature	0 – 40°C (non-condensing)
CE-marked	Yes
Enclosure class	IP42
Dimensions	L248.9 x w45 x h95.5 mm
Operation range	Up to 10 meters (line-of-sight)

LP304

Part no.	55000
Power supply	20-30VDC (24VDC nom.)
Max input current	4A
Power connector	M12, 4-pole Male, T-coded
Ambient temperature	0 – 40°C (non-condensing)
CE-marked	Yes
Enclosure class	IP42
Weight	0.7 kg (incl bracket)
Dimensions	w154.2 x d104 x h56 mm (excl connectors, antenna, and brackets)

6 Parts and accessories

FLC tool

PART NO	PART	DESCRIPTION
35935	FLC tool	Complete with plug-in-sensors, end/front cover and batteries. ►5
53019	Plug-in-sensor kit	Left and Right plug-in-sensor
35939	End cover	
35940	Front cover	
36022	Battery lid	
31782	Battery (1 pcs)	Energizer, Ultimate Lithium 12-2039
53020	FLC Toolbelt	
53014	FLC Tool holder	Cup, wall mounted
53018	FLC Tool holder	Cup, desk mounted

LP304 IIoT Gateway

PART NO	PART	DESCRIPTION
55000	LP304 IIoT Gateway	►5
35851	LP304 Antenna	
51329	LP-PW13 Power supply	24VDC, 8.0A. M12, 4-pole female, T-coded

Cabling

PART NO	PART	DESCRIPTION
50138	I/O splitter cable	M12 8-p female to 2x M12 5-p female. A-coded. Length 39 cm.
50137	I/O adaptor cable	M12 4-p male to M12 4-p male. A-coded. Length 22 cm.
50132	LP132 I/O cable 10 m	M12 4-p male to M12 4-p female. A-coded.
50233	LP233 CAN cable 10 m	M12 5-p male to M12 5-p female. A-coded.
50239	LP239 Bus termination	M12 5-p female. A-coded.

Miscellaneous

PART NO	PART	DESCRIPTION
51113	LP113 Push button	Green LED lamp. M12 I/O connections.
54405	Bidisp3/128/C display	128 x 16 px, 2 x CAN, 1 x RS232.

7 Troubleshooting

FLC Tool

Also see section ►11 Error/Warning cases

Situation	Possible cause	Cause/Solution§
Fast blinking red LED (one or both)*	Inductive sensor fault. The sensor at the side of the blinking LED may be faulty.	Replace the sensor ►3.6.1. If that doesn't solve the problem, replace the FLC tool.
Slow blinking red LEDs*	No contact with the base station (LP304).	- Base station is out of range (operation range is up to 10 m (line-of-sight)). - Base station is shut down or broken. - No Pairing has been performed.
Steady red LEDs*	No active job order exists.	Wait for a job order.
Fast blinking alternately red/yellow LEDs*	Pairing no longer valid.	Another FLC tool has been paired to the same station (LP304) as this tool, and therefore the pairing is no longer valid. Perform the pairing operation all over again ►3.3
None of the LEDs will light up*	No batteries mounted or mounted in wrong direction. Batteries need to be replaced. Hardware failure.	Check/replace batteries. If that doesn't solve the problem, replace the FLC tool.
One of the LEDs will not light up*	Hardware failure	Replace the FLC tool.
Pairing button doesn't respond	Hardware failure	Replace the FLC tool.

* When pressing the Trigger button

LP304 Gateway

Situation	Possible cause	Cause/Solution§
Status lamp* slow blinking	FLC battery low.	Replace FLC batteries.
Status lamp* off	FLC battery critical low or System error	Replace FLC batteries. If that doesn't solve the problem contact the system administrator.
LP304 screen is black/System show no life signs	Power supply malfunction. Hardware failure	Check the power supply. If that doesn't solve the problem, contact the system administrator.
Operation range too short	Antenna broken. Hardware failure.	Check/replace the antenna. If that doesn't solve the problem, contact the system administrator.
Receiving no job orders.	Cabling faulty/malfunction	Check I/O status at LP304 Status page ►4.5.5. Verify the cabling.

* Or other indicator driven by the System status signal (Out4) ►4.2

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FCC Warning

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.