

KoreUSBCam

user manual

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1.4	10.11.2011	J. Tharin	Small corrections and C200 support

Trademark Acknowledgements:

IBM PC: International Business Machines Corp.

Macintosh: Apple Corp.

SUN Sparc-Station: SUN Microsystems Corp.

LabVIEW: National Instruments Corp.

Matlab: MathWorks Corp.

Webots: Cyberbotics

Khepera: K-Team and LAMI

Logitech: Logitech Int. SA

LEGAL NOTICE:

- The contents of this manual are subject to change without notice
- All efforts have been made to ensure the accuracy of the content of this manual. However, should any error be detected, please inform K-Team.
- The above notwithstanding, K-Team can assume no responsibility for any error in this manual.

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1 INTRODUCTION

Thank you for buying the KoreUSBCam module. With this module, you will be able to grab pictures and stream/process video images.

1.1. How to use this handbook

This handbook introduces the KoreUSBCam and its various operating modes. For a quick start, jump to [chapter 3: Usage](#).

If this handbook does not answer one of the problems you are confronted with, please consult the K-Team web site (www.k-team.com) and, especially the Forum and the FAQs.

- **Unpacking and Inspection:** KoreUSBCam package description and first start-up
- **Usage:** KoreUSBCam usage descriptions.
- **Annexes:** Detailed descriptions of several helpful tools and commands are explained.

1.2. Safety precautions

Here are some recommendations on how to correctly use the KoreUSBCam:

- **Keep the module away from wet area.** Contact with water could cause malfunction and/or breakdown.
- **Store your module in a stable position.** This will avoid the risks of falls, which could break it or cause damage to a person.
- **Do not attach any connectors while the module is powered on.** To avoid any damage, make all connections when the module power is off.
- **Never leave the KoreUSBCam powered when it is unused.** When you have finished working with KoreUSBCam, turn it off. It will save the battery life.

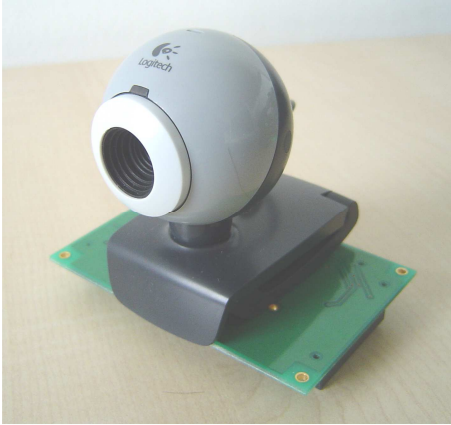
1.3. Recycling

Think about the end of life of your product! Parts of the module can be recycled and it is important to do so. By recycling you can help to create a cleaner and safer environment for generations to come. For those reasons please take care to the recycling of your product at the end of its life cycle, for instance sending back the product to the manufacturer or to your local dealer.

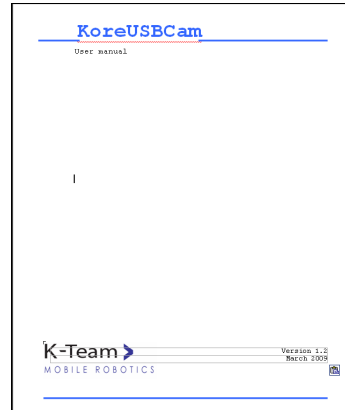
Thanks for your contribution to a cleaner environment!

2 UNPACKING AND INSPECTION

2.1. Package Contents



1. KoreUSBCam module



2. User manual

Figure 2.1: Contents of the KoreUSBCam Pack

Your package should contain the following items:

1. KoreUSBCam module
2. this present document

2.2. Specifications

The principal specifications of the KoreUSBCam module are listed below:

- images capture : 160 x 120 up to 640 x 480 pixels
- video acquisition : 160 x 120 up to 640 x 480 pixels, 5-15 fps, depending of video size and compression
- module size : 85 x 72 x 76 (width x length x height mm)
- module mass : 80 g.
- connector : 2 female ERNI 50 pins connectors, compatible with other K-Team Kore modules
- power : 5V, from ERNI connector
- video/image cable : USB2, from ERNI connector
- software drivers : gspca, videodev, v4l (video for linux) modules
- image software : wcggrabber, vgrabber
- video software : ktgrab, camsource

2.3. Required hardware and software

The required hardware and software to use the module is described below.

a) Required hardware

To use the KoreUSBCam module, you must have any of these components:

- KorebotLE with software kernel 2.6*
- KheperaIII + KorebotLE with software kernel 2.6*

* You can check the Kernel version with the command “*uname -r*”. The kernel and toolchain 2.6 for the Korebot is available at:

<http://ftp.k-team.com/korebot/toolchain-2.6-betaV0.1/>

b) Required software

On the KoreBotLE, the driver for the camera is installed by default when delivered with kernel 2.6. It is located on your KoreBotLE at the following path:

/lib/modules/YOUR_KERNEL_VERSION/kernel/drivers/usb/media/gspca.ko

where *YOUR_KERNEL_VERSION* may be *2.6.23-kb1*, *2.6.25-7-kb1* or above.

Depending on the KoreUSBCam module version you may have to update the driver:

- KoreUSBCam board with the QuickCam Chat camera (White/Blue colour):
→ The driver is already included on the KorebotLE.
- KoreUSBCam board with the new camera QuickCam E2500 camera (Black/Grey colour):
→ An update of the current driver must be done.

The procedure is explained below:

- download the driver at the following site:

http://ftp.k-team.com/korebot/koreusbcam/driver/gspca-kb2-YOUR_KERNEL_VERSION.ko.gz

- transfer the file to the KorebotLE (with *Minicom* or *ssh*, see [Annexes: ssh](#))
- extract it with the command:

```
gunzip gspca-kb2-YOUR_KERNEL_VERSION.ko.gz
```

- overwrite the previous driver module:

```
mv gspca.ko /lib/modules/YOUR_KERNEL_VERSION /kernel/drivers/usb/media/
```

- update module dependencies: ***depmod -a***
- reboot your Korebot: ***reboot***

- KoreUSBCam board with the new camera QuickCam C200 camera (front: dark gray back: light gray):

→ An update of the current driver must be done.

This new camera is using the uvc driver (no more the gspca driver).

a) Korebot LE kernel version check

The Korebot kernel must be 2.6.23.1. You can check the version with the command: ***uname -a***

You will have firstly to upgrade to Kernel 2.6.23.1 if not already done. Instruction for installing the new kernel, filesystem and compiler are here:

http://ftp.k-team.com/korebot/toolchain-2.6-betaV0.1/light_toolchain/development_light_kernel2.6_readme.txt

Pay just attention that it is no more possible to compile under Windows with this new toolchain!

You will have to use Linux, or a virtual machine (try Virtualbox from Sun Microsystem, which is free).

b) For installing the uvc camera driver

You will have to install the following driver:

http://ftp.k-team.com/korebot/koreusbcam/driver/uvcvideo_205_KorebotLE_driver.ko

- In the KorebotLE:copy the file to

/lib/modules/2.6.23.1-kb1/kernel/drivers/media/video/uvcvideo.ko

- update the modules with: ***depmod -a***

The sources of the driver can be found at:

http://ftp.k-team.com/korebot/koreusbcam/driver/source/uvcvideo_205_KorebotLE_driver_source.tar.bz2

c) Using the camera

You can start using and programming as suggested in

http://ftp.k-team.com/korebot/koreusbcam/KoreUSBCam_QuickUserManual_v1.2.pdf

The driver implements the Video4Linux 2 (V4L2) API.

Support for V4L1 is not planned by the Linux community.

3 Usage

3.1. Assembly

This sub-chapter explains how to connect the KoreUSBCam module, depending on your configuration:

- Plug the KoreUSBCam module onto the KoreBotLE as depicted below (*figure 3.1*):

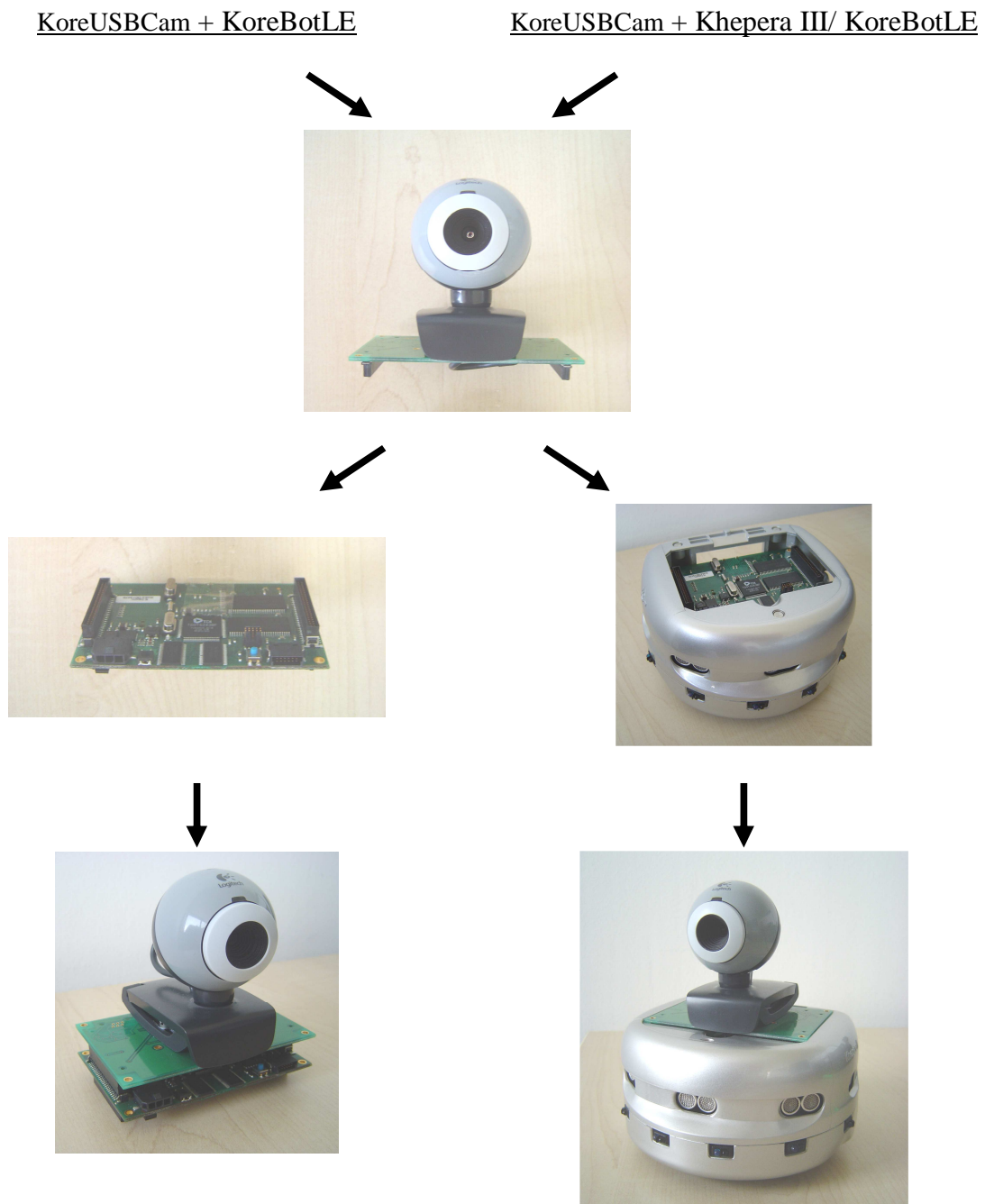


Figure 3.1: KoreUSBCam + KoreBotLE/ KheperaIII assembly

3.2. Power-up

- Power up the Korebot (or Khepera 3).
 - ⇒ During the boot of the Korebot, the camera is detected and its gspca module driver is automatically loaded.
 - Below a part of the boot sequence is depicted (fig. 3.2):

```
[ 13.110000] Linux video capture interface: v2.00
[ 13.130000] korebot_pcmcia_configure_socket(): Reset off sock 0
[ 13.150000] Korebot CF Init
[ 13.150000] korebot_init: skt->irq=78
[ 13.170000] korebot_pcmcia_configure_socket(): Reset off sock 1
[ 13.310000] korebot_pcmcia_configure_socket(): Reset off sock 0
[ 13.420000] /home/jtharin/projects/kernel2.6/development/gspcav1-20071224-kb2/gspca_core.c: USB GSPCA camera found.(ZC3XX)
[ 13.510000] /home/jtharin/projects/kernel2.6/development/gspcav1-20071224-kb2/gspca_core.c: [spca5xx_probe:4314] Camera type
JPEG
[ 13.540000] /home/jtharin/projects/kernel2.6/development/gspcav1-20071224-kb2/Vimicro/zc3xx.h: [zc3xx_config:588] Sensor
MC501CB
[ 13.590000] drivers/usb/otg/otg_linux.c: otg_hcd_endpoint_disable stub
[ 13.620000] drivers/usb/otg/otg_linux.c: otg_hcd_endpoint_disable stub
[ 13.650000] /home/jtharin/projects/kernel2.6/development/gspcav1-20071224-kb2/gspca_core.c: [spca5xx_getcapability:1262] maxw 640
maxh 480 minw 160 minh 0
[ 13.680000] usbcore: registered new interface driver gspca
[ 13.680000] /home/jtharin/projects/kernel2.6/development/gspcav1-20071224-kb2/gspca_core.c: gspca driver 01.00.20 registered
```

Figure 3.2: part of the boot sequence with detected camera

3.3. Images acquisition

For the C200 model, please check chapter 4.1 of

http://ftp.k-team.com/korebot/koreusbcam/KoreUSBCam_QuickUserManual_v1.2.pdf

- Grab an image with the following command:

```
wcggrabber --size=max --palette=RGB24 -R BGR -a -t 5 -n 0 >output.ppm
```

This takes an image named **output.ppm** in the current folder.

You can view the program options with **wcggrabber -h**

You can transfer the image by *Minicom* or *scp* (see Annexes 4.3).

3.4. Video streaming

This part describes two streaming applications you can use to display the camera video on a remote computer. For the C200 model, please check chapter 4.2 of

http://ftp.k-team.com/korebot/koreusbcam/KoreUSBCam_QuickUserManual_v1.2.pdf

a) ktgrab

ktgrab is a video server running on the Korebot. You can access it with the Java applet KTGrab. The instructions are explained below:

1. Get the ktgrab from <http://ftp.k-team.com/korebot/koreusbcam/application/>, file *ktgrab_libfg-0.3.1-kb1.tar.bz2*
2. Establish a connection with the computer (either network through usb, or wireless: see Annexes 4.2)
3. Transfer ktgrab to the KoreBot by Minicom or ssh (see Annexes).
4. Launch the streaming program *ktgrab* on the Korebot with the command:
ktgrab PORT WIDTH HEIGHT COMPRESSION

e.g: ***ktgrab 1234 320 240 1***

where the parameters are detailed below:

PORT : TCP communication port
WIDTH : video width: 160, 320, or 640
HEIGHT : video height: 120, 240 or 480
COMPRESSION : video compression type: 1= JPEG, 0 = RAW

Remark: these following parameters are reported as not working:

TCP port	width	height	Compression
1234	160	120	1
1234	640	480	0

5. On the computer, get and extract the KTGrab Java applet available at the following link:

<http://ftp.k-team.com/korebot/koreusbcam/application/>

To launch the applet, in the directory *KTGrab/build/classes*, run the following command:

java ktgrab.KTGrab KOREBOT_IP PORT

e.g: ***java ktgrab.KTGrab 10.0.0.2 1234***

where the parameters are detailed below:

KOREBOT_IP : Korebot IP address
PORT : TCP communication port (the same as above used for the Korebot)

b) Camsource / WebCamApplet

Camsource is the video server running on the Korebot. You can access it with an Internet browser or with the Java WebCamApplet as explained below.

1. Establish a connection with the computer (either network through usb, or wireless: see Annexes 4.2)
2. Launch the streaming program *camsource* on the Korebot with the command:
camsource

This capture pictures at low resolution (160x120) by default, you can change the configuration file */etc/camsource.conf* to get higher resolution, at the price of much lower frame rate (the webcam then compresses the image, and decompressing it on the ARM is relatively slow).

3. From a computer, you can access the video by the two following ways:

- a) With an Internet browser at the following URL:
http://KOREBOT_IP:9192/largequal
- b) You can also use the java applet *WebCamApplet*, available at the address below:
<http://ftp.k-team.com/korebot/tools/WebCamApplet.zip>

You can run it as a standalone application, with a command like this (change port 8888 to 8889 for high resolution images):

```
java WebCam KOREBOT_IP 8888 352 288
```

It will print picture interval in ms every time a picture is acquired (1000/the value gets the number of frames per second).

On the KoreBot you can stop the streaming with the command:

```
camsource -k
```

3.5. Programming

The standard video for Linux device (v4l) can be used. For the C200 model, please check chapter 4.2 of

http://ftp.k-team.com/korebot/koreusbcam/KoreUSBCam_QuickUserManual_v1.2.pdf

You can start by using the following source codes of the image capture programs *vgrabber*⁽¹⁾ or *wcggrabber*⁽²⁾ as examples:

You have to install the light toolchain 2.6⁽³⁾ and compile with it:

For *vgrabber*:

- source the *env.sh* to have the cross-compiler in the path (as explained in ⁽³⁾ “Development”)

- Build it with the command:
arm-angstrom-linux-gnueabi-gcc -o vgrabber vgrabber.c
- Transfer the file *vgrabber* to the *KoreBot* (by *Minicom* or *ssh*, see [Annexes: ssh](#))
You can take a picture with: *vgrabber> img.ppm*

For *wcggrabber*:

- source the *env.sh* to have the cross-compiler in the path (as explained in ⁽³⁾ “Development”)
- Execute *make -e* to build it.
- Transfer the file *wcggrabber* to the korebot
- Use it as explained in chapter 3: *Usage*

(1) <http://www.tazenda.demon.co.uk/phil/vgrabber.c>

(2) http://ftp.k-team.com/korebot/tools/wcggrabber-1.6.2_arm.tar.bz2

(3) http://ftp.k-team.com/korebot/toolchain-2.6-betaV0.1/light_toolchain/development_light_kernel2.6_readme.txt

4 Annexes

In this part, the detailed descriptions of several tools and helpful commands are explained.

4.1. Using a Wireless compact flash card

Two wireless compact flash models are supported. The card name and its driver are listed below:

A) Ambicom WL1100C-CF with `hostap_cs` driver module

B) Ambicom WL5400G-CF with `libertas_cs` driver module

Remark:

The following instructions are for the wireless compact flash A) **Ambicom WL1100C-CF**. With the model B) **WL5400G-CF**, you have to update your kernel and the driver as described at:

http://ftp.k-team.com/korebot/kernel/kernel2.6.25.7-kb1/Kernel2.6.25-7-kb1_WifiG-support.txt

Then you may replace the wireless port name *wlan0* by *eth0* in the following instructions.

1) insert a Wireless compact flash card in the Korebot

2) load the module by typing: *modprobe pxa2xx_cs*

You may load the Wifi module automatically by adding `pxa2xx_cs` in the file */etc/modules*.

You can use the following command `echo` to add the module name to the file:

```
echo pxa2xx_cs >> /etc/modules
```

3)

- i) WEP support

a) for configuring the wifi connection, type:

```
iwconfig wlan0 essid YOUR_SSID_OF_NETWORK
```

b) if the network is secured, enter the key by typing :

```
iwconfig wlan0 key YOUR_KEY
```

c) then set an ip address to the korebot:

```
ifconfig wlan0 YOUR_IP_ADDRESS
```

d) configure the gateway by entering the gateway ip:

```
route add default gw YOUR_GATEWAY_IP wlan0
```

e) insert the local domain name in /etc/resolv.conf

```
echo search YOUR_LOCAL_DOMAIN_NAME>>etc/resolv.conf
```

f) and the dns server

```
echo nameserver YOUR_DNS_SERVER_IP_ADDRESS>> /etc/resolv.conf
```

You can also create a file in /etc/network/if-pre-up.d named *wireless* to have these settings saved.

Put the following into it:

```
#!/bin/sh  
ifconfig wlan0 up  
iwconfig wlan0 essid YOUR_SSID_OF_NETWORK  
iwconfig wlan0 key s:YOUR_KEY  
ifconfig wlan0 YOUR_IP_ADDRESS  
route add default gw YOUR_GATEWAY_IP wlan0
```

And the following in a file named /etc/resolv.conf:

```
search YOUR_LOCAL_DOMAIN_NAME  
nameserver YOUR_DNS_SERVER_IP_ADDRESS
```

ii) WEP, WPA and other encryptions:

a) create a file named /etc/wpa_supplicant/wpa_supplicant.conf and insert your selected wireless encryption:

WEP:

```
#Shared WEP key connection (no WPA):  
network={  
ssid="YOUR_SSID"  
key_mgmt=NONE  
wep_key0="YOUR_WEP_KEY"  
auth_alg=SHARED  
wep_tx_keyidx=0  
priority=5  
}
```

WPA-TKIP:

- see instructions at:

http://ftp.k-team.com/korebot/kernel/modules/wpa-tkip/wpa-tkip_support.txt

```
#/etc/wpa_supplicant/wpa_supplicant.conf  
#with WPA-PSK TKIP:  
network={  
ssid="YOUR_SSID"  
psk="YOUR_PASS_KEY"
```



```
key_mgmt=WPA-PSK  
group=TKIP  
pairwise=TKIP  
proto=WPA  
priority=5  
}
```

You can check the following link for other encryptions:

http://hostap.epitest.fi/wpa_supplicant/

b) run the daemon controlling the wireless connection with the following command:
wpa_supplicant -c /etc/wpa_supplicant/wpa_supplicant.conf -i wlan0 -Dwext -B

You can also add the command above to a file
in `/etc/network/if-pre-up.d` named `wireless`:

```
#!/bin/sh  
ifconfig wlan0 up  
ifconfig wlan0 YOUR_IP_ADDRESS  
route add default gw YOUR_GATEWAY wlan0  
wpa_supplicant -c /etc/wpa_supplicant/wpa_supplicant.conf -i wlan0 -Dwext -B
```

4.2. Connecting to the Korebot with network over usb cable

a) launch the usb module on the Korebot:

```
modprobe g_ether
```

b) connect the computer to the Korebot USB slave port with an USB cable

c) configure the usb port on the Korebot:

```
ifconfig usb0 10.0.0.2/24
```

d) on the computer, configure also the usb port (you must be root, or use sudo):

```
ifconfig usb0 10.0.0.1/24
```

4.3. Transferring files using scp (ssh)

1) Establish a network connection between the computer and the korebot (using Wifi see chapter "Using a Wireless compact flash card", or using Ethernet over usb see chapter "Connecting to the Korebot with network over usb cable")

2) Execute the following command, where `FILE`, is the file to transfer, `KOREBOT_IP` the Korebot ip address: **scp FILE root@KOREBOT_IP:/home/root**

5 WARRANTY

K-TEAM warrants that the KoreUSBCam is free from defects in materials and workmanship and in conformity with the respective specifications of the product for the minimal legal duration, respectively one year from the date of delivery.

Upon discovery of a defect in materials, workmanship or failure to meet the specifications in the Product during the afore mentioned period, Customer must request help on K-Team Internet forum on <http://www.k-team.com/kforum/> by detailing:

- The type of KoreUSBCam used (version).
- The kernel version of the Korebot.
- The programming environment of the Korebot/robot (standard, version, OS).
- The standard use of Product before the appearance of the problem.
- The description of the problem.

If no answers have been received within two working days, Customer can contact K-TEAM support by phone or by electronic mail with the full reference of its order and KoreUSBCam serial number.

K-TEAM shall then, at K-TEAM's sole discretion, either repair such Product or replace it with the equivalent product without charging any technical labour fee and repair parts cost to Customer, on the condition that Customer brings such Product to K-TEAM within the period mentioned before. In case of repair or replacement, K-TEAM may own all the parts removed from the defective Product. K-TEAM may use new and/or reconditioned parts made by various manufacturers in performing warranty repairs and replacement of the Product. Even if K-TEAM repairs or replaces the Product, its original warranty term is not extended.

This limited warranty is invalid if the factory-applied serial number has been altered or removed from the Product.

This limited warranty covers only the hardware and software components contained in the Product. It does not cover technical assistance for hardware or software usage and it does not cover any software products contained in the Product. K-TEAM excludes all warranties expressed or implied in respect of any additional software provided with Product and any such software is provided "AS IS" unless expressly provided for in any enclosed software limited warranty. Please refer to the End User License Agreements included with the Product for your rights with regard to the licensor or supplier of the software parts of the Product and the parties' respective obligations with respect to the software.

This limited warranty is non-transferable.

It is likely that the contents of Customer's flash memory will be lost or reformatted in the course of the service and K-TEAM will not be responsible for any damage to or loss of any programs, data or other information stored on any media or any part of the Product serviced hereunder or damage or loss arising from the Product not being available for use before, during or after the period of service provided or any indirect or consequential damages resulting therefore.

IF DURING THE REPAIR OF THE PRODUCT THE CONTENTS OF THE FLASH MEMORY ARE ALTERED, DELETED, OR IN ANY WAY MODIFIED, K-TEAM IS NOT RESPONSIBLE WHATEVER. CUSTOMER'S PRODUCT WILL BE RETURNED TO CUSTOMER CONFIGURED AS ORIGINALLY PURCHASED (SUBJECT TO AVAILABILITY OF SOFTWARE).

Be sure to remove all third parties' hardware, software, features, parts, options, alterations, and attachments not warranted by K-TEAM prior to Product service. K-TEAM is not responsible for any loss or damage to these items.

This warranty is limited as set out herein and does not cover, any consumable items (such as batteries) supplied with the Product; any accessory products which is not contained in the Product; cosmetic damages; damage or loss to any software programs, data, or removable storage media; or damage due to (1) acts of God, accident, misuse, abuse, negligence, commercial use or modifications of the Product; (2) improper operation or maintenance of the Product; (3) connection to improper voltage supply; or (4) attempted repair by any party other than a K-TEAM authorized module service facility.

This limited warranty does not apply when the malfunction results from the use of the Product in conjunction with any accessories, products or ancillary or peripheral equipment, or where it is determined by K-Team that there is no fault with the Product itself.

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