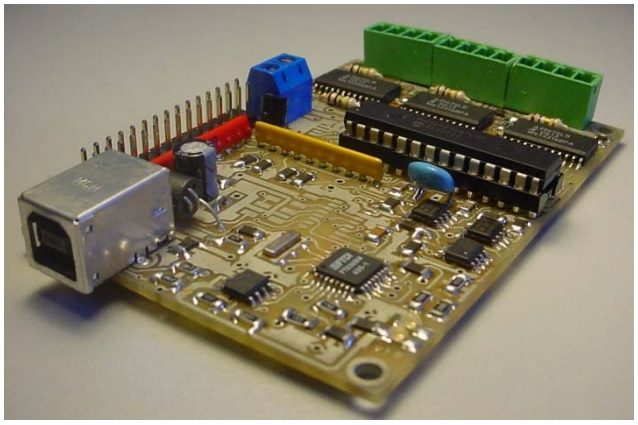
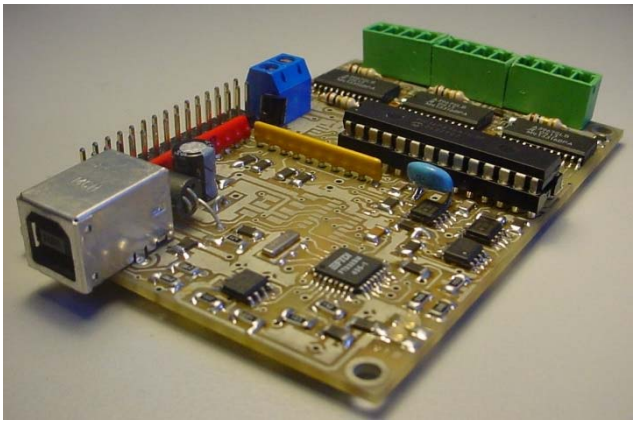
Axis Control Unit MT3USBMS
USER MANUAL

Rel. 01.00.0003
(Hardware code: MT3-U-MS-07)





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This manual in English is the original version.

Printed in Italy

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WARNING!
ELECTRICAL DEVICES COULD DAMAGE EQUIPMENT OR PROPERTY OR CAUSE PERSONAL INJURY

This guide contains instructions and technical features of the Axis Control Unit MT3USBMS.
Read with attention before attempting to install.
It is the responsibility of the technician to undertake all the safety rules provided by the law during the installation and the use of this device.
For any information which is not contained in this guide, please contact:

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REVISION HISTORY

Manual revision history

Revision/ Date	Change description	Author
01.00.0000 January, 2007	First version Released	Barbera D. Dugato S.
01.00.0001 June, 2015	Update document layout	Bottaccioli M.
01.00.0002 February, 2016	Update Windows compatibility	Bottaccioli M.
01.00.0003 August, 2016	Added ISO 9001:20015 logo	Bottaccioli M.

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GENERAL FEATURES

MT3USBMS is a small size low power control device which can control both **three bipolar and three unipolar stepper motors** (i.e. 8 and 4 lead motors, and 6 lead center tapped motors) and their respective limit/home detection sensors (one for each axis, with programmable polarity).
Motor **control** and the device **configuration** are achieved through **USB interface**, easily managed by the provided driver.
The **motor rotation speed** can be easily configured to answer user needs, the number of **half-steps or micro steps per second** can be set as needed.
The device updates the status of the End-of-run sensors when the motor is moving and when status register is requested (if the motor is moved manually, End-of-run signals will not trigger). This is due to the fact that the device accepts optical End-of-run sensors and in order to preserve sensors lifetime, they are powered only when the motor is moving.

The device is equipped with a **PWM** current control system on the motor phases. This device can reach a movement precision of 1/8 of step.

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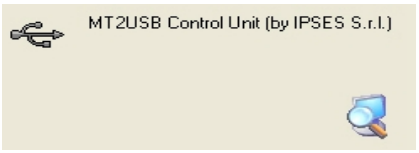
USB DRIVERS FOR PC

MT3USBMS is provided with a *Windows* driver which has two DLL: the first one, called VCP (Virtual Com Port), creates a virtual serial port for each device connected, allowing them to be controlled through a simple serial protocol. The second DLL, called D2XX, manages the communication directly toward the USB: with the DLL it is possible developing ad-hoc management software.



A demo software will be sent with the board, available for working by user. On the website *http://www.ipses* user manuals are available too for downloading and testing test the operation of various systems.
On specific demand, IPSES can develop any management and control software for the MT3USBMS unit.
On request drivers for *Apple OS-8*, *OS-9* e *OS-X* are available. The kernel *Linux* 2.4.0 (or later) already integrates the driver which can manage the MT3USBMS unit.

USB IPSES driver is certified for the most recent Microsoft operating systems:

- Microsoft Windows 2000 family
- Microsoft Windows XP family, x86
- Microsoft Windows Server 2003 family, x86
- Microsoft Windows Server 2003 family, x64
- Microsoft Windows XP family, x64
- Microsoft Windows Vista family, x86
- Microsoft Windows Vista family, x64
- Microsoft Windows Server 2008 family, x86
- Microsoft Windows Server 2008 family, x64
- Microsoft Windows 7
- Microsoft Windows 7 x64
- Microsoft Windows Server 2008 Release 2 family, x64
- Microsoft Windows 8 and 8.1
- Microsoft Windows 8 and 8.1 x64
- Microsoft Windows 10
- Microsoft Windows 10 x64

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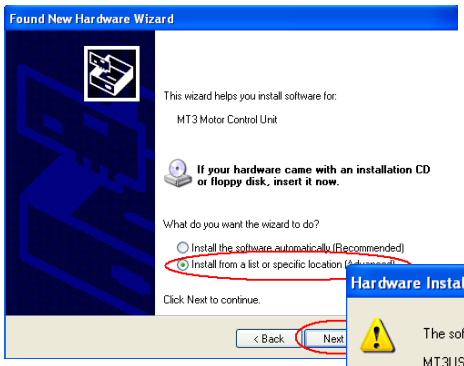
DRIVER INSTALLATION

To communicate with MT32USBMS device by PC, it is necessary to install IPSES S.r.l. USB driver. Follow the instructions listed below.

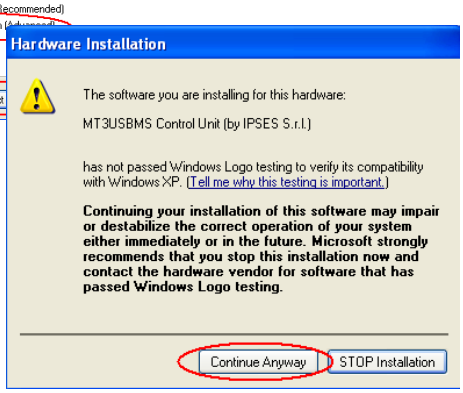
1) Link MT3USBMS and PC with USB cable. *Windows XP* operative system will detect a new device, showing a displayed message.

2) In the following window "Found New Hardware Wizard" choose "No, not this time" and then "Next".

3) Then choose "Install from a list or specific location (Advanced)" and "Next". Follow instructions displayed and set USB driver location.



4) During installation, operative system gives hardware installation warning. To proceed, "Continue Anyway": provided driver is *Windows XP* compatible.



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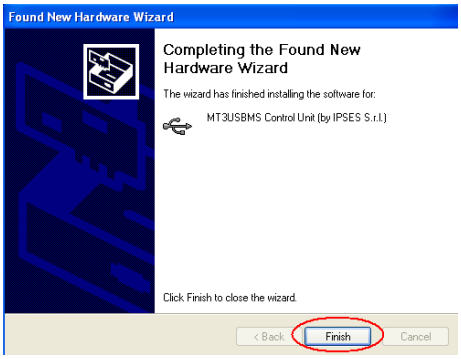


5) Installation is completed when “Found New Hardware Wizard” is displayed. To exit, choose “Finish”.

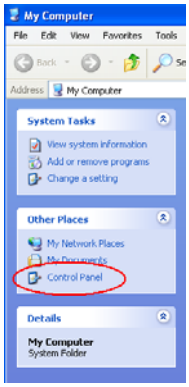
6) After completing previous device, new hardware “USB Serial Port” is found. Follow again instructions from step 2).

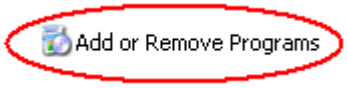
DRIVER REMOVAL

To correctly remove USB driver, follow instructions listed below.

1) Disconnect USB cable.

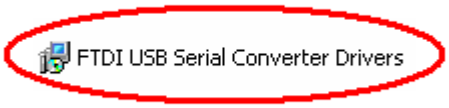
2) From Desktop, click “My Computer” icon and choose “Control Panel”.





3) Click “Add or Remove Programs” from the resource list displayed.

4) From program installed list select “FTDI USB Serial Converter Drivers” and proceed removal with “Change/Remove”.



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REMOTE CONTROL COMMUNICATION PROTOCOL

The communication of the axis control unit is achieved through a USB interface, made up by the two easy-to-use drivers, which are provided with the unit (serial port parameters are baud rate 19200, 1 stop bit, 8 bit for data, no parity bit and Hardware flow control).

The command strings are in ASCII code, terminated with <CR> character. The protocol is not case sensitive.

The following commands are implemented:

U	Requests the current global status of the unit (see further how the status is coded).
Pa,b,c	Moves the axes to the a, b and c positions on a coordinate grid (a, b and c are the absolute positions in micro-steps) where a, b and c values must be between -999.999 and +999.999.
Xa	Moves the X axis to an a position (absolute position in micro-steps) which must be between -999.999 and +999.999.
Yb	Moves the Y axis to a b position (absolute position in half-steps or micro-steps) which must be between -999.999 and +999.999.
Zc	Moves the Z axis to a c position (absolute position in half-steps or micro-steps) which must be between -999.999 and +999.999.
Da,b,c	Moves the axes by a, b and c movement (relative movements), where a, b and c are the movement values in micro steps (all values must be between -999.999 and +999.999). It's not possible to ignore the "b" or "c" parameter to move only one axis (to move an axis alone the two parameters not used must be fixed to zero; it's similar moving only two axis).
LXn	Enables the power-on home running on X axis (by n=1 the function is enabled, n=0 disabled).
LYn	Enables the power-on home running on Y axis (by n=1 the function is enabled, n=0 disabled).
LZn	Enables the power-on home running on Z axis (by n=1 the function is enabled, n=0 disabled).
L?	Gives the state about the power-on home running (see further the description of this register).
B0	Deactivates the breaking action when the motor is not running.
B1	Activates the breaking action, with PWM current control, when motor is stopped.
B?	Gives the status (enabled/disabled) of the braking action.
H	Moves all the axes to the *home position* (*negative limit detection*).
HX	Moves the X axis to the *home position* (*negative limit detection*).
HY	Moves the Y axis to the *home position* (*negative limit detection*).
HZ	Moves the Z axis to the *home position* (*negative limit detection*).
K	Stops immediately the movement of all the axes
KX	Stops the movement of the X axis.
KY	Stops the movement of the Y axis.
KZ	Stops the movement of the Z axis.
GXn	Perpetual motion of the X axis; when n>0 or omitted, this command allows forward movement, when n < 0 it allows backward movement.
GYn	Perpetual motion of the Y axis; when n>0 or omitted, this command allows forward movement, when n < 0 it allows backward movement.
GZn	Perpetual motion of the Z axis; when n>0 or omitted, this command allows forward movement, when n < 0 it allows backward movement.
Cn	Modality of axis motor movement: • n = 0: whole step. • n = 1: half step.

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	• n = 2: 1/4 of step. • n = 3: 1/8 of step.
C?	Requests the stepping mode of X axis motor movement.
FXn	Sets the current position on X axis. The n parameter has to be between -999.999 and +999.999.
Fyn	Sets the current position on Y axis. The n parameter has to be between -999.999 and +999.999.
FZn	Sets the current position on Z axis. The n parameter has to be between -999.999 and +999.999.
SVn	Sets to n the time for a period of one micro-step depending on the velocity range utilized (see further table 1 and following formula). The parameter n (in hexadecimal form) has to be between 0x200 and 0x7FFF. This command can be executed only with all axis blocked.
SV?	Gives the velocity previous set.
W	Requests the current position. The answer is (x,y,z), where x, y and z are the absolute co-ordinates in whole steps, half-steps, 1/4 of steps or 1/8 of steps (depending on the configuretion of the C parameter). If the position is unknown, the answer is # character.
?	Requests the current firmware version and the serial number of the instrument. The answer will be an ASCII string similar to "*MT3USBMS – vxx.x.xxxxx – S/Nyyyyyy*", in which *vxx.xx.xxxx* represents the firmware version of the device and *yyyyyy* is the serial number.
M	Stores the speed settings and the working mode currently set in the non-volatile memory.
Axx	Sets the limit-detector polarity. First character is referred to negative limit-detector (0 = low polarity, 1 = high), while the second to positive one (same logic).
A?	Gives which kind of polarity the limit-detectors are (0=low, 1=high).
N0	Disabled the possibility to go over the limit-detectors.
N1	Enabled the possibility to go over the limit-detectors.
N?	Gives information about the possibility to go over the imit-detection (1=enabled, 0=disabled).

The velocity resolution is different in the allowed ranges; in following table the values to obtain the different periods, resolution and the number of ignored bit (the least significant ones which get not to change periods) are reported:

T [us]	n (hex)	Resolution [us]	ignored bit
420 – 824	200 – 3FF	2	2
832 – 1644	400 – 7FF	4	3
1660 – 3280	800 – FFF	20	4
3300 – 6560	1000 – 1FFF	40	5
6640 – 13040	2000 – 3FFF	80	6
13200 – 26200	4000 – 7FFF	160	7

Table 1.

The formula below must be used to obtain the desired value ('T' is in microseconds):

$$n = (T - 18.2) / 0.8$$

For example, to obtain a period of nearly 3300us (303Hz), it shall be used

$$n = (3300 - 18.2) / 0.8 = 4096 = 1000 \text{ in hexadecimal}$$

As it can see from the table, this period shall have a resolution of 40 us, id est the period can vary from (3300 + 40/2) us to (3300 – 40/2) us; this is due to the fact that the least significant bit are to be ignored (in other words, the values 1000..101F will not be able to vary the period, because of only last five bits are varying).

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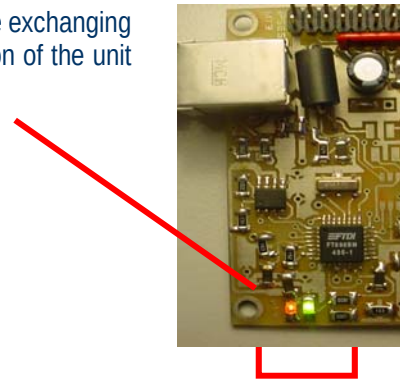
During the execution of a **home** command, after the motor reaches home and signal "End-of-run" triggers, the motor moves forward for a short distance and then goes back to home position. That's intended to avoid false triggers of the "End-of-run" signal and to achieve better home positioning.

Two **LEDS**, one red and the other green, indicate, respectively, the exchanging of data between the unit and the PC an the established connection of the unit with the PC.



All the **positions** and the **movements** are in whole, half, 1/4 and 1/8 of steps (depending on the configuretion of the **C** parameter).

The status request message ("U") forces the device to return two bytes (4 hex characters) representing the actual status of the unit. It follows the convention if the following tables:

bit 15	Error
bit 14	Known X axis position
bit 13	Known Y axis position
bit 12	Known Z axis position
bit 11	Breaking action status
bit 10	Positive limit-detection axis X reached
bit 9	Positive limit-detection axis Y reached
bit 8	Positive limit-detection axis Z reached

bit 7	Negative limit-detection axis X reached
bit 6	Negative limit-detection axis Y reached
bit 5	Negative limit-detection axis Z reached
bit 4	X axis running
bit 3	Y axis running
bit 2	Z axis running
bit 1	Reserved (read as '0' value)
bit 0	Reserved (read as '0' value)

If the **error bit** is high (i. e. if it answers with a **code like** 8001), then another error code is added after a comma (for example 8001,02); more than one error code can be active.

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Possible codes are:

bit 7	Reached the X limit detector before wanted value is reached and End-of limit function is enabled.
bit 6	Reached the Y limit detector before wanted value is reached and End-of limit function is enabled.
bit 5	Reached the Z limit detector before wanted value is reached and End-of limit function is enabled.
bit 4	Invalid number stored in non-volatile memory.
bit 3	Time out or error during home position search.
bit 2	Out of range parameter (i. e. the set speed is out of the fixed ranges).
bit 1	Illegal command (i.e. an absolute movement request when the positions are unknown or during a movement).
bit 0	Command not acknowledged.

All the errors are reset after the state request command.

The *Home Position* power-on request (command "L?") gives a number between 0 and 7 whose meaning is explained in the table below:

7	Power-on *Home Position* of the three axes
6	Power-on *Home Position* of X and Y axes
5	Power-on *Home Position* of X and Z axes
4	Power-on *Home Position* of X axis
3	Power-on *Home Position* of Y and Z axes
2	Power-on *Home Position* of Y axis
1	Power-on *Home Position* of Z axis
0	No power-on *Home Position*

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MT3USBMS CONFIGURATION INSTRUCTIONS

Through the six **sense resistors** it is possible to set the nominal current of the connected motors (it is possible to obtain different currents for the axis):

0,68Ω (½ W): over 700mA
0,75Ω (½ W): from 640 up to 700mA
0,82Ω (½ W): from 580 up to 640mA
0,91Ω (½ W): from 525 up to 580mA
1,0Ω (½ W): from 460 up to 525mA
1,2Ω (¼ W): from 375 up to 460mA
1,5Ω (¼ W): from 305 up to 375mA
1,8Ω (¼ W): from 250 up to 305mA
2,2Ω (¼ W): from 205 up to 250mA
2,7Ω (¼ W): from 170 up to 205mA
3,3Ω (¼ W): from 140 up to 170mA

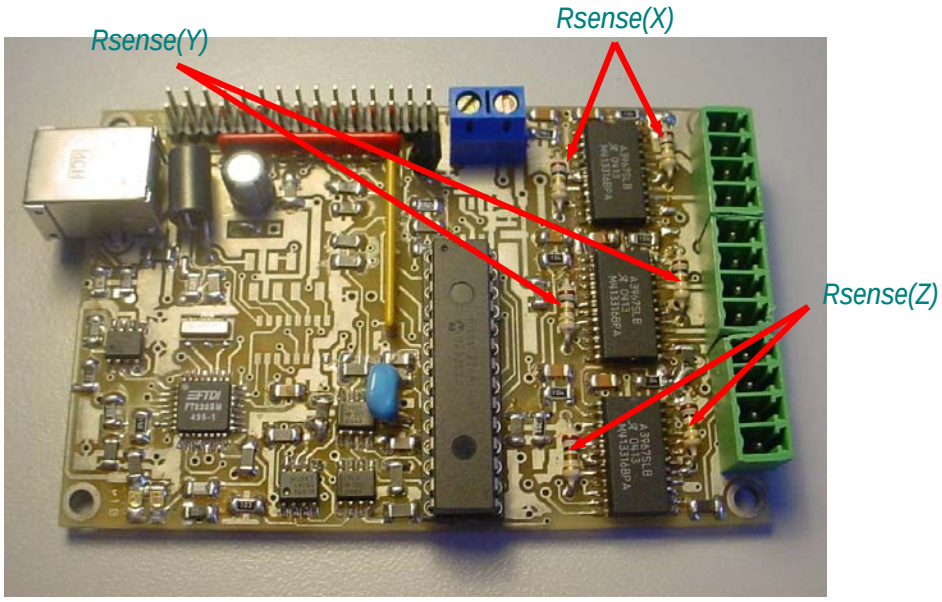

Figure 1: sense resistors.

It is suggested to use resistors with tolerance less than 2%. For current values less than 140 mA it can be used the following formula:

$$R_{sense} = 0{,}5 / I_{nom}$$

Together with the device six 1,2Ω (¼ W) resistors will be sent.

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MT3USBMS CONNECTION INSTRUCTIONS

The device needs a supply for the control logic and for the motors that can be between 4.5V and 30V (picture 2).

Moreover, it is possible, when necessary, to connect a limit/home detector to the card, one for each motor (see picture 2).

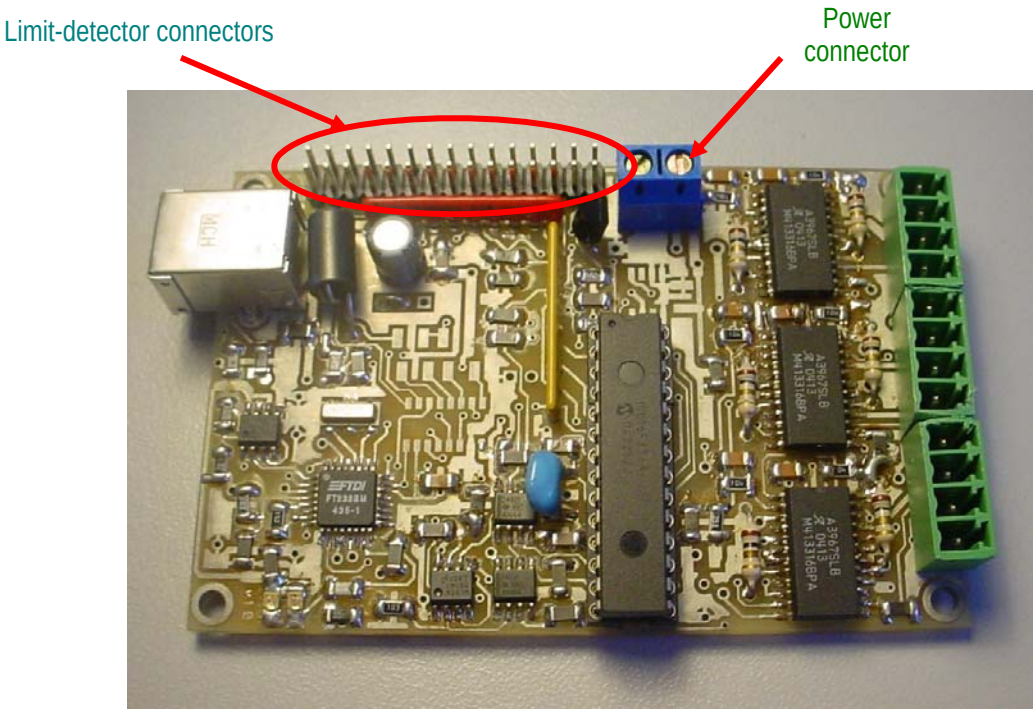

Figure 2: power supply and limit-detectors connectors.

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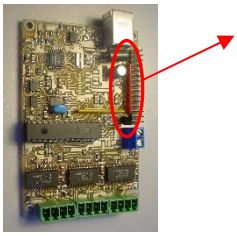
CONNECTIONS

USB: "B" type connector to interface with a PC.

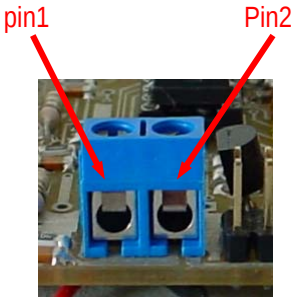
Limit detector connectors:



pin1 pin2 pin3 pin4 pin5 pin6 pin7 pin8 pin9 pin10 pin11 pin12 pin13 pin14 pin15

pin16 pin17 pin18 pin19 pin20 pin21 pin22 pin23 pin24 pin25 pin26 pin27 pin28 pin29 pin30

Function	X Axis	Y Axis	Z Axis
Positive power supply out (5Vdc, without current limitation) to supply a possible external detection logic for negative run detection.	pin 1	pin 6	pin 11
Positive power supply out for infrared LED for negative run detection (for optical limit detection).	pin 2	pin 7	pin 12
Input of the limit detection sensor for negative run.	pin 3	pin 8	pin 13
GND	pin 4	pin 9	pin 14
Negative power supply out for infrared LED for negative run detection (for optical limit detection).	pin 5	pin 10	pin 15
Positive power supply out (5Vdc, without current limitation) to supply a possible external detection logic for positive run detection.	pin 16	pin 21	pin 26
Positive power supply out for infrared LED for positive run detection (for optical limit detection).	pin 17	pin 22	pin 27
Input of the limit detection sensor for positive run.	pin 18	pin 23	pin 28
GND	pin 19	pin 24	pin 29
Negative power supply out for infrared LED for positive run detection (for optical limit detection).	pin 20	pin 25	pin 30



Power supply connector: *pin1 (+)*: positive supply.
pin2 (-) : GND.

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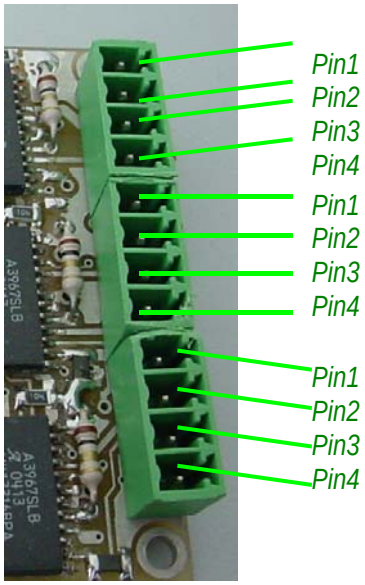
axis X:
pin1: Phase A+.
pin2: Phase B+.
pin3: Phase B-.
pin4: Phase A-.

axis Y:
pin1: Phase A+.
pin2: Phase B+.
pin3: Phase B-.
pin4: Phase A-.

axis Z:
pin1: Phase A+.
pin2: Phase B+.
pin3: Phase B-.
pin4: Phase A-.



WARNING!

Do not connect or disconnect motor or power leads with power applied!

It is suggested to link the device with the USB cable only after power supply has been applied.

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LIMIT SWITCH EXAMPLES

The next figure 3 shows the implementation of 5 pin on MT3USBMS limit-detectors connectors for displacements along axis.

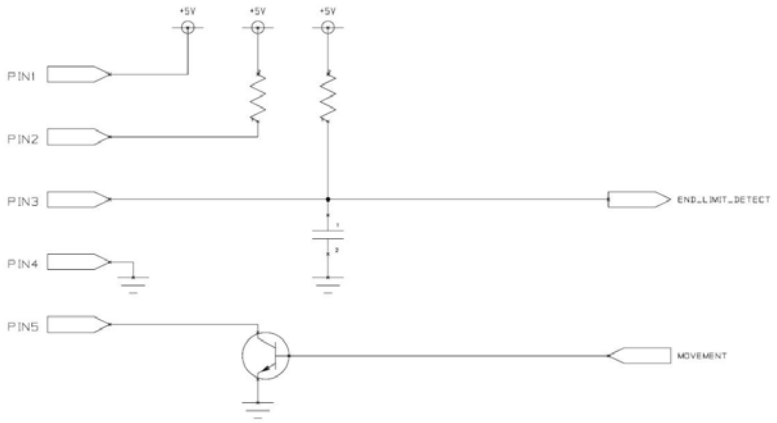

Figure 3: implementation scheme of J15 and J17 connectors.

During motors running, MT3USBMS read end-of-limit reached when connector change their electric potential.
In case of mechanics limit switches connection must be done as it can see in picture 4.

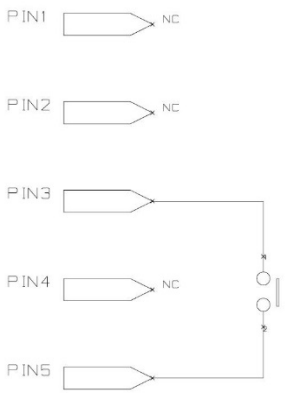

Figure 4: mechanics limit switches commutation.

The “End-of-run“ signal can be received by optical sensors. The following figure 5 shows the functioning of optical sensors. The LED lights an element with a beam, for example a *phototransistor*; than this enlightened element changes its electrical

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properties. The *phototransistor* gives a conductive path; but it does not if the beam is interrupted by the interposition of an opaque object.

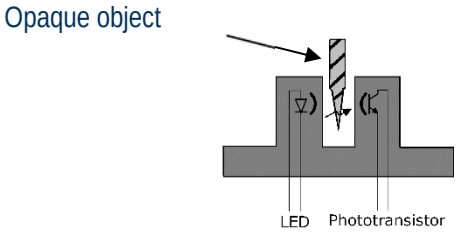

Figure 5: optical limit switch.

The next figure 6 indicates the links with connector when a *phototransistor* output sensor is used.

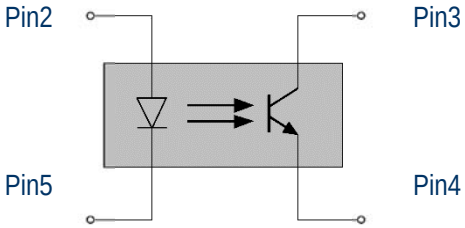

Figure 6: *phototransistor* output sensor; links between pins are shown for X axis negative "End-of-run" detector (for the other switches pins of previous picture are used).

Better reliability in home position reading performances is achievable with electronic logic equipped optical sensors. In figure 7 the scheme of electronic logic equipped with optical sensors is shown: the beam interruption by the interposition of an opaque object is detected by a power supplied system control *pin1* (for X axis).

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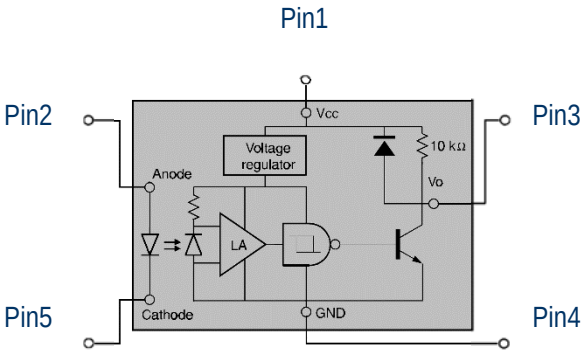

Figure 7: electronic logic equipped optical sensors; links between pins are shown for X axis negative “End-of-run” detector (for the other switches pins of previous picture are used).

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MOTOR CONNECTION (8 LEAD MOTORS)

The MT3USBMS cards can control both two bipolar and two unipolar stepper motors, i.e. 8 and 4 lead motors, and 6 lead center tapped motors. Here the possible different motor connections are showed.

Series connection

A series motor configuretion would typically be used in application where a higher torque at lower speeds is required. Because this configuretion has the most inductance, the performance will start to degrade at higher speeds.

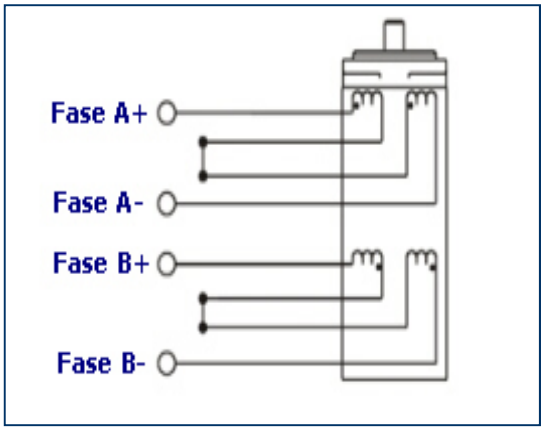

Figure 8:series connection.

Parallel connection

An 8 lead motor in a parallel configuretion offers a more stable, but lower torque at lower speeds. But because of the lower inductance, there will be higher torque at higher speeds.

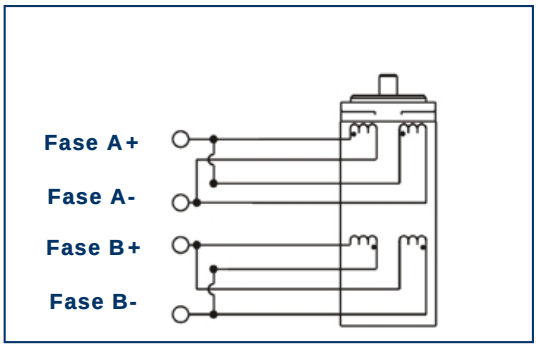

Figure 9:parallel connection.

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MOTOR CONNECTION (6 LEAD MOTORS)

Half coil configuretion

This configuretion uses 50% of the motor phase windings. This gives lower inductance, hence, lower torque output. Like the parallel connection of 8 lead motor, the torque output will be more stable at higher speeds. This configuretion is also referred to as half copper.

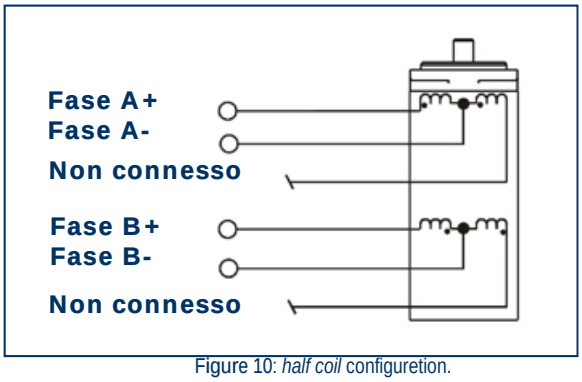

Figure 10: *half coil* configuretion.

Full coil configuretion

The full coil configuretion on a 6 lead motor should be used in applications where higher torque at lower speeds is desired. This configuretion is also referred to as full copper.

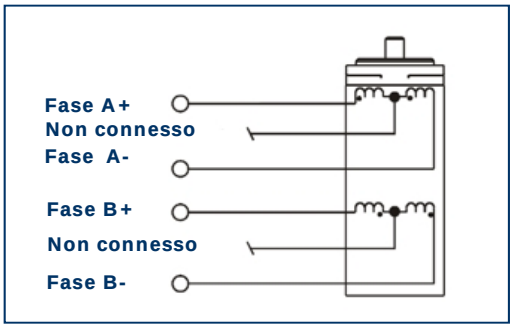

Figure 11: *full coil* configuretion.

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MOTOR CONNECTION (4 LEAD MOTORS)

4 lead motors

4 lead motors are the least flexible but easiest to wire. Speed and torque will depend on winding inductance

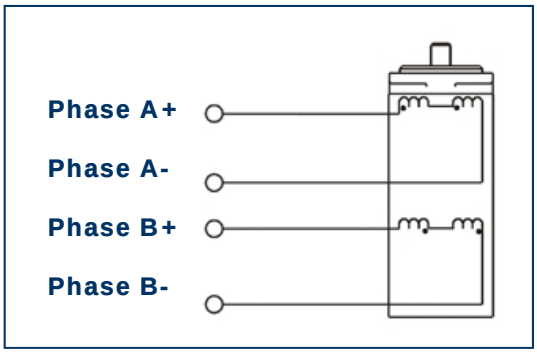
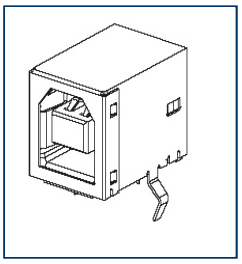


Figure 12: 4 lead motors.

NOTE

The physical direction of the motor with respect to the direction input will depend upon the connection of the motor windings. To switch the direction of the motor with respect to the direction input, switch the wires on either phase A or phase B outputs.



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TECHNICAL FEATURES

Power supply: The logic is self-supplied directly from the USB port of the computer.

Motor power supply: from 4,5 up to 30Vdc

Output current: max 0,75A/phase (0,85A of peak)

Interface: USB 2.0 (B connector type)

Board dimensions: 60 x 90 x 15 mm (2,36 x 3,55 x 0,59 inch)

Motor movement: programmable from whole step up to 1/8 of step

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OTHER AVAILABLE MODELS

IPSES can realize customized versions of this device to answer to any clients' demand.
Particularly, it is possible to have this instrument in any size (so as to easily integrate it in any mechanical system) and with customized communication protocol.

DEMO SOFTWARE

MT3_Control is a demo software which allows MT3 device remote control testing. Virtual control panel displayed has intuitive functionalities which make you easy understand how it works.

INSALLATION

To install the software on your PC, execute "Installer_MT3.exe" and follow instructions displayed. Default destination folder of the executable file "MT3_Demo.exe" is "C:\Program Files\MT3_Demo".

EXECUTION

Execute "MT3_Demo.exe". Virtual control panel is displayed as showed in figure 13:

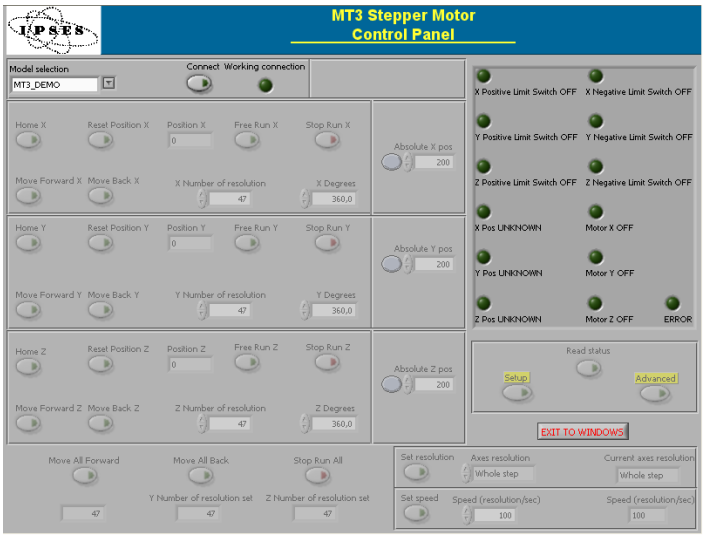

Figure 13: virtual control panel.

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CONNECTION TO MT3 DEVICE

To start dialogue with MT3 device you have to choose the relevant option in the field Model selection. Connect starts connection (working status is showed by the fictitious LED Working connection). Through Info device, MT3 gives information about its firmware version and *serial number*.

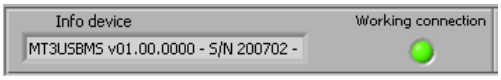

Figura 14: communications from the device in Info device when connection is working.

Possible error events are displayed. Figure 15, for example, shows what happens in case of impossibility to connect to MT3 device.

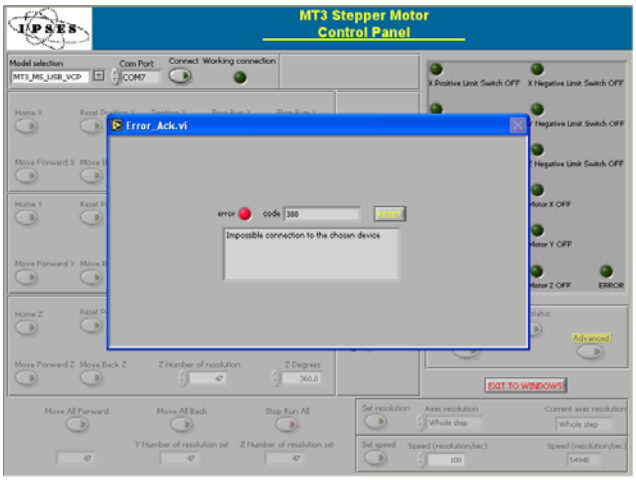

Figure 15: error event example.

Click on RESET to re-enable application functionalities.

FUNCTIONALITIES

All controls are enabled when connection works. Setup window, see figure 16, holds the controls to set limit switch polarity and the stop of the motor when end-of-run signal is reached. User must declare in X step/revolution ratio how many steps are necessary for the rotor revolution; similarly for Y and Z axes.

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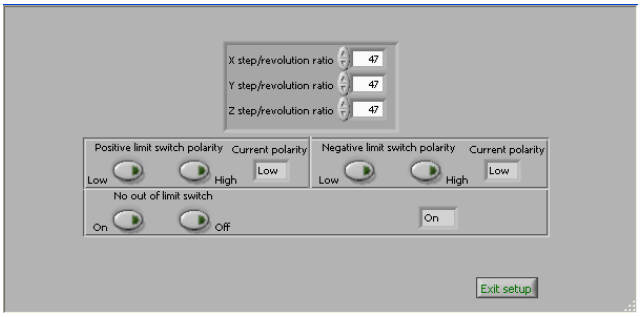

Figure 16: Setup window.

Select Exit setup to proceed after configuration defined.
Virtual control panel is structured to make you easy understand implemented functions. The area on the right, shown in figure 17, is conceived to monitoring MT3 device status. The stylized LEDs refer about device status: when a LED lights up, the condition described by the label on its side happens (in this case OFF becomes ON).

Figure 17:device status.

The remaining portion of the virtual panel hosts motor controls: Home X moves the X axis to home position. Reset position makes the actual position equivalent to zero displacement (Position X axis, displacement along X, is zero). Free Run X allows perpetual motion of the X axis. Stop Run X arrests X motor. X Number of resolution defines the positive (Move Forward X) or negative (Move Back X) displacement.

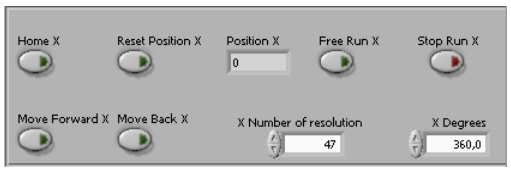

Figure 18: X motor controls.

Absolute X pos, figure 19, causes a displacement relative to zero position.

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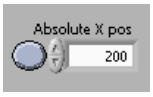

Figure 19: absolute displacement control.

There are analogue controls for Y and Z motor controls.
The lower side of the virtual panel contains the controls to set resolution and speed of X,Y and Z axes (see figure 20).

Figure 20: controls to set allowed resolution and speed.

In figure 21, Setup presents again the window of figure 15, Advanced runs homonym subroutine, that is shown in figure 22, Read status refreshes device status.

Figure 21: Setup, Advanced and Read status controls..

Figure 22: subroutine Advanced.

Thanks to Advanced subroutine, user can appreciate lower level dialogue to MT3 device. Chosen instruction in command and associated parameter par X, par Y and par Z are communicated to the device when Run Send is set. Run read

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allows answer in info device, output 1, output 2 and output 3, to interrogations selected in question. Possible error events are displayed. Click on RESET to re-enable subroutine functionality.
Possible error conditions when device is working are displayed as shoen in the following figure 23.

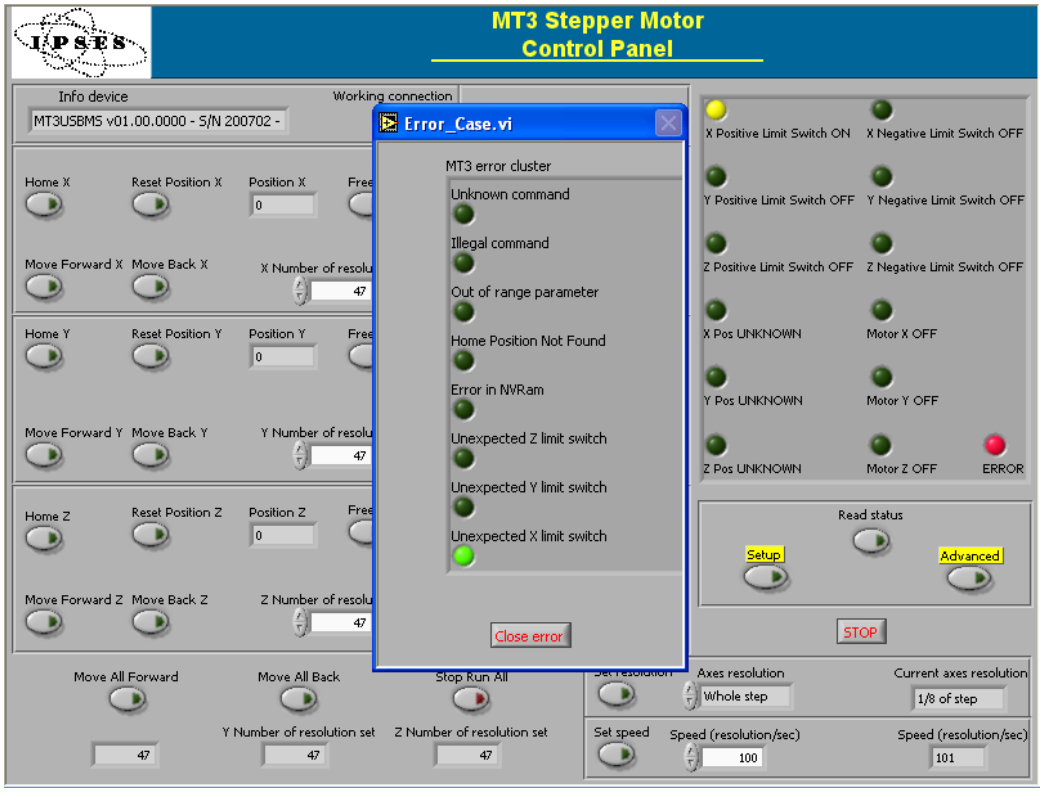

Figura 23: Possible error conditions when device is working.

To procede, chose Close error.

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DEMONSTRATION MODALITY: MT3 DEMO

Even if none connection to MT3 device is available, fictitious connection can be started choosing MT3_DEMO in **Model selection** in order to enable output selectors and commands not accessible without connection: in demonstration modality, coherently, none device status information is given.

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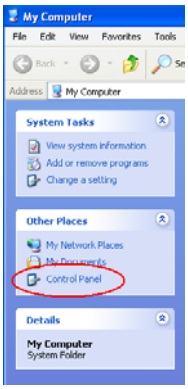
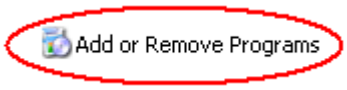
REMOVAL

To correctly remove the software, follow the instructions listed below.

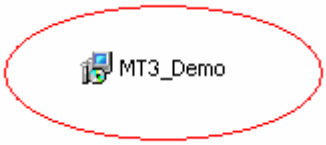


1) From Desktop, click “My Computer” icon and choose “Control Panel”.



2) Click “Add or Remove Programs” from the resource list displayed.

3) From program installed list select “MT3_Demo” and proceed removal with “Change/Remove”.



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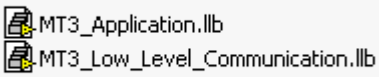
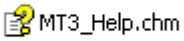
LABVIEW LIBRARY

LabVIEW development tool gives the feasibility of MT3 device remote control. This control can be achieved through the use of the eight functions implemented in *LabVIEW 7.1* and included in the library MT3_Library: thanks to these functions you do not have to know the details of the communication protocol and the application development is quick and easy.
The functions have two development levels: *MT3_Low_Level_Communication.llb* contains the four functions through which is possible to manage the connection with the MT3 card.
MT3_Application.llb contains the other four functions realized through the use of the previous ones: these higher level functions allow the assignment of the commands recognized by the device. Use *MT3_Application.llb* for application development, while *MT3_Low_Level_Communication* for maximize performances.



	Function	Properties
MT3_Low_Level_Communication.llb	*Close_Device.vi*	Closes the connection established with one of the available protocols.
	Open_Device.vi	Opens the connection with one of the available protocols.
	Write&Read.vi	Sends and receives ASCII characters.
	Write_Command.vi	Sends ASCII characters.
MT3_Application.llb	*Close_dialogue.VI*	Ends the communication with the MT3 card.
	Read.vi	Interprets characters sent by the device.
	Send_Command.vi	Imparts the commands implemented on the device.
	Start_dialogue.vi	Starts dialogue session with the MT3 card.

MT3_Library is provided with a help file, *MT3_Help.chm*.
The help explains deeper the functions in the library.
MT3_Help.chm, information of which are available in *LabVIEW* too, gives structural description of all the eight functions. Graphical representations are realized, so that the user may easily understand how they work in the tool in which they were build. Next figure displays the help of the library.



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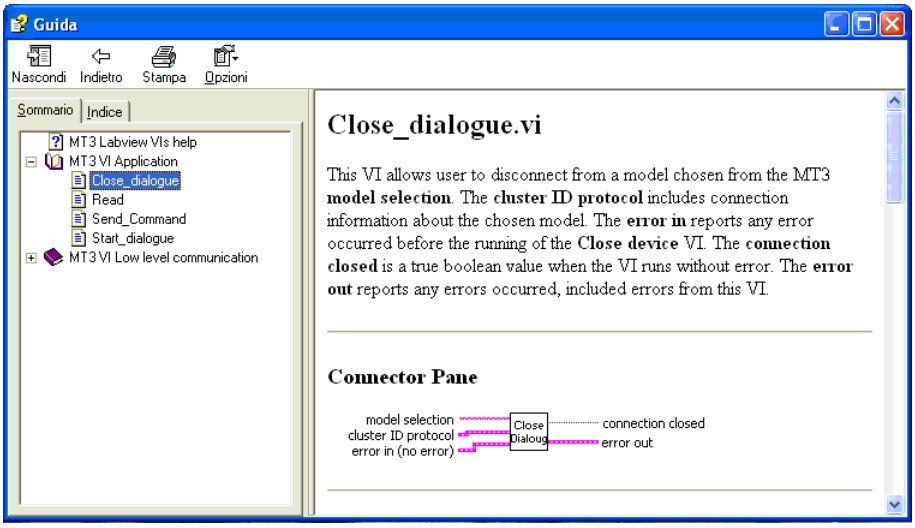

Figure 24: *LabView* functions help.

MT3_Library is available on demand.

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Our pool consists of highly competent professionals whose experience in this field is extremely strong. Thanks to constant updating and technical development, IPSES is a leading company, combining the dynamism of a young group into the competence and reliability of a qualified staff.

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SUPPORT INFORMATION

The customer is at liberty to contact the relevant engineer at IPSES S.r.l. directly.

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Fax	:	(+39) 02 700403170
Email	:	support@ipses.com

PROBLEM REPORT

The next page is a standard template used for reporting system problems. It can be copied and send as a fax. Alternative bugs may be reported by emails, in this case please insure that the mail contains similar information listed in the *Engineering Problem Report* form.

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ENGINEERING PROBLEM REPORT

Problem describer

Name			**IPSES s.r.l.** **Via Suor Lazzarotto, 10** **Cesate (MI)** **Italy** **Fax (+39) 02 700403170** **e-mail *support@ipses.com***
Company			
Date	Tel.	Fax	

Product

Name	Version	Serial No.

Report Type (bug, change request or technical problem)

Major bug	☐	Urgency:	
Minor bug	☐	High	☐
Change request	☐	Medium	☐
Technical problem	☐	Low	☐

Problem Description

Reproduction of Problem

IPSES s.r.l. Action notes

Received by	Date	Report No.	Action

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(Product code MT3-U-MS-07 Rel. 01.00.0003)

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