MT2 LABVIEW LIBRARY
USER MANUAL

Rel. 01.02.0001
(Product code MT2 Library)

CONCEIVING
PLANNING
DEVELOPMENT
IN SCIENTIFIC
ELECTRONICS

This manual in English is the original version.

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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 MT2 LABVIEW LIBRARY.
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

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Revision/ Date	Change description	Author
01.02.0001 June, 2015	Update document layout	Bottaccioli M.

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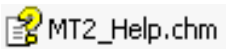
MT2 LabVIEW LIBRARY

LabVIEW development tool gives the feasibility of MT2 device remote control. This control can be achieved through the use of the eleven functions implemented in *LabVIEW 7.1* and included in the library MT2_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: *MT2_Low_Level_Communication.llb* contains the six functions through which is possible to manage the connection with the MT2 card.
MT2_Application.llb contains the other five functions realized through the use of the previous ones: these higher level functions allow the assignment of the commands recognized by the device. Use *MT2_Application.llb* for application development, while *MT2_Low_Level_Communication* for maximize performances.

	Function	Properties
MT2_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.
	SetBitMode.vi	Sets the values of two more output configured as open collector (valid only for USB versions).
	GetBitMode.vi	Reads the values of two more output configured as open collector (valid only for USB versions).
MT2_Application.llb	*Close_dialogue.VI*	Ends the communication with the MT2 card.
	Read.vi	Sent a request to the device and read its answer.
	Send_Command.vi	Imparts the commands implemented on the device.
	Start_dialogue.vi	Starts dialogue session with the MT2 card.
	Return_Info.vi	Drafts the serial number list of connected devices.

MT2_Library is provided with a help file, *MT2_Help.chm*.
The help explains deeper the functions in the library.



MT2_Help.chm, information of which are available in *LabVIEW* too, gives structural description of all the eleven 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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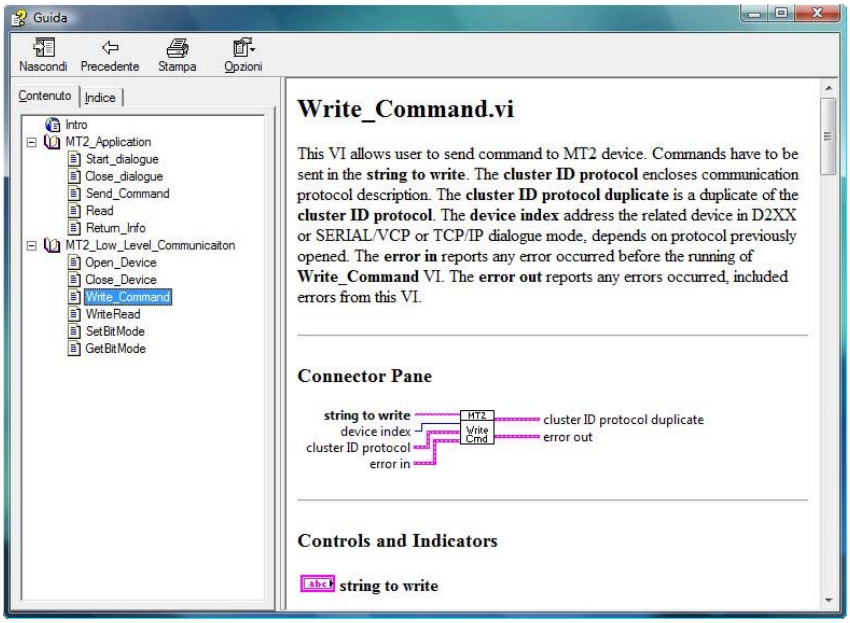

Figure 1: *LabVIEW* functions help.

INSTALLATION

Run *Installer_MT2_Library.exe* to install all files of MT2_Library. By default, all these files will be placed in the folder *C:\IPSES_Lib\MT2* and its subfolder. Between these files you can find what figure 2 shows. To avoid any problem in the functions, do not move *MT2_Help.chm, FTD2XX.dll, MT2Application.dll* and *MT2LowLevel.dll* from directory *C:\IPSES_Lib\MT2*.

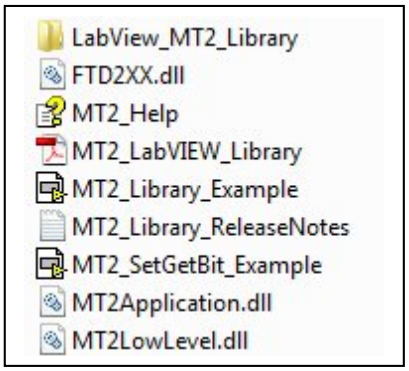

Figure 2: installed files.

NI-VISA is a single library of functions you use to communicate with GPIB, serial, VXI, and computer-based instruments in *LabVIEW*. You no longer need to use separate I/O palettes to program an instrument. For example, some instruments ship with a choice for the type of interface. If the *LabVIEW* instrument driver was written with functions from the GPIB palette, those instrument driver VIs would not work for the instrument with the serial port interface. VISA solves this problem

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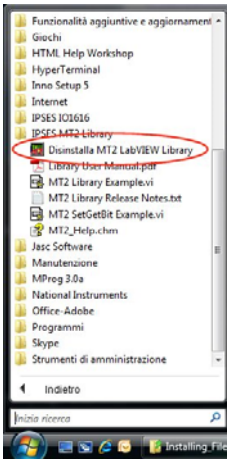
by providing a single set of functions that work for any type of interface. Therefore, VISA is used as the I/O language in all *LabVIEW* instrument drivers. It is possible to install NI-VISA 4.20 automatically during the MT2_Library installation procedure or manually, running the *setup.exe* from *{CD drive}:\Software\VISA RunTime 4.20*.

REMOVAL

To correctly remove MT2_Library, follow the instructions listed below.



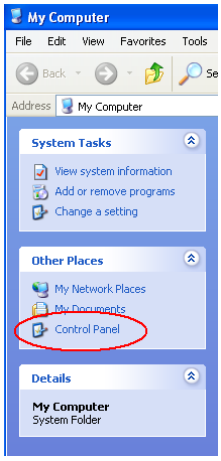
1) From Start menu, click “All Programs” item and then “IPSES MT2 Library” icon.

2) Click “Uninstall MT2 LabVIEW Library” icon.

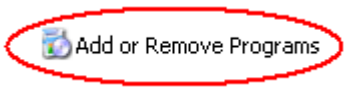
3) Follow the instructions displayed.

4) Delete the folder *C:\IPSES_Lib\MT2*.

Alternatively you can follow the next procedure:



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



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

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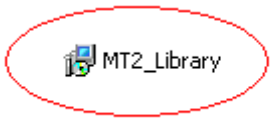
3) From program installed list select “MT2_Library” and proceed removal with “Change/Remove”.



4) Follow the instructions displayed.
5) Delete the folder *C:\IPSES_Lib\MT2*.

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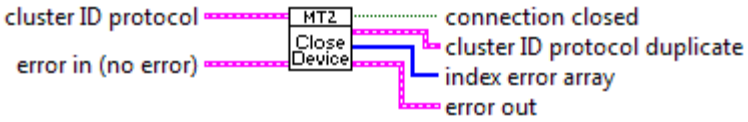
Close_Device.vi

This VI allows user to disconnect connection from MT2 devices. The connection description is enclosed in the **cluster ID protocol** and it is automatically detected. The **error in** reports any error occurred before the running of **Close_Device** VI. The **connection closed** is a true boolean value when the VI runs without error. The **cluster ID protocol duplicate** reports only the failed closure ID while the **index error array** lists the corresponding devices indexes. The **error out** reports any errors occurred, included errors from this VI.

Connector Pane



Controls and Indicators

error in (no error)

The **error in** cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in case of errors from other VIs.
The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

- **status**
  The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.
- **code**
  The **code** input identifies the error or warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.
- **source**
  The **source** string describes the origin of the error or warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

cluster ID protocol

The **cluster ID protocol** encloses the currently used communication protocol.

- **Handle Array**
  The **Handle Array** contains connection identificators of every successfully opened devices connected via D2XX library.
  - **Handle**
    The **Handle** contains identification of connection via D2XX library.
- **VISA Resource Array**
  The **VISA Resource Array** is the COM port addresses collection used in SERIAL and USB VCP connection mode.
  - **VISA resource name**
    The **VISA resource name** specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.
- **TCP/IP ID Array**
  The **TCP/IP ID Array** contains the references of every sucessfully opened devices connected via ethernet.
  - **connection ID**
    The **connection ID** is a network connection reference number to identify uniquely the TCP connection you want to close.

connection closed

The **connection closed** refers about correct ending of the connection.

error out

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The **error out** cluster passes error or warning information out of a VI to be used by other VIs.
The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

status
The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

code
The **code** input identifies the error or warning.
The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

source
The **source** string describes the origin of the error or warning.
The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

cluster ID protocol duplicate
The **cluster ID protocol duplicate** encloses the copy of currently used communication protocol.

duplicate Handle Array
The **duplicate Handle Array** contains connection identificators of every successfully opened devices connected via D2XX library.

Handle
The **Handle** contains identification of connection via D2XX library.

duplicate VISA Resource Array
The **duplicate VISA Resource Array** is the COM port addresses collection used in SERIAL and USB VCP connection mode.

VISA resource name
The **VISA resource name** specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.

duplicate TCP/IP ID Array
The **duplicate TCP/IP ID Array** contains the references of every sucessfully opened devices connected via ethernet.

connection ID
The **connection ID** is a network connection reference number to identify uniquely the TCP connection you want to close.

index error array
The **index error array** lists all the array indexes of the failed devices.

index error device
The **index error device** reports the array index of the failed device.

Error code

Code	Description
-210	Impossible to close MT2 USB D2XX device [i[2]]
-211	Impossible to close MT2 SERIAL or USB VCP device [i[3]]

[2] It is the index list of USB protocol devices related to the index error array.
[3] It is the index list of SERIAL / USB VCP protocol devices related to the index error array.

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-212	Impossible to close MT2 TCP/IP device [i[4]]
-213	Multiple protocol error

[4] It is the index list of TCP/IP protocol devices related to the index error array.

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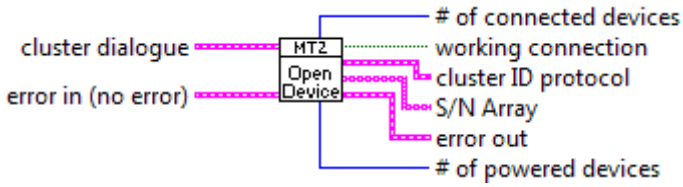
Open_Device.vi

This VI allows user to open connection to MT2 device, chosen by the **dialogue protocol** in the **cluster dialogue**. The VISA Resource Array assigns the communication COM ports for both SERIAL and USB VCP dialogue mode, while the TCP/IP Address Array assigns the fields (address, port and password) to open communication via ethernet. The **cluster ID protocol** encloses communication protocol description. The **error in** reports any error occurred before the running of Open_Device VI. The **# of connected devices** reports how many devices are simoltaneously connected, while the **# of powered devices** reports how many devices are supplied by USB ports. For ethernet connection the last one is not available. The **working connection** is a true boolean value when the VI runs without error. The **error out** reports any errors occurred, included errors from this VI.

Connector Pane



Controls and Indicators

error in (no error)

The **error in** cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in case of errors from other VIs.
The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

- **status**
  The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.
- **code**
  The **code** input identifies the error or warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.
- **source**
  The **source** string describes the origin of the error or warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

cluster dialogue

The **cluster dialogue** encloses the protocol for the session and the defined VISA and TCP/IP cluster arrays.

- **dialogue protocol**
  The **dialogue protocol** relates about the chosen standard of communication.
- **VISA Resource Array**
  The VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.
  - **VISA resource name**
    The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.
- **TCP/IP Address Array**
  The TCP/IP Address Array is the array of TCP/IP data collection (address, port and password) to allows MT2 connection via ethernet.
  - **TCP/IP Address Cluster**
    - **TCP/IP address**
      The TCP/IP address, with its xxx.xxx.xxx.xxx format, is required to allow connection to MT2 device via ethernet.

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U16 TCP/IP Port
The TCP/IP Port specifies the communication port over ethernet. Default value, 23, is the Telnet port.

abc TCP/IP password
The TCP/IP password requires password to allows connection to MT2 device via ethernet.

error out
The error out cluster passes error or warning information out of a VI to be used by other VIs.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

TF status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

I32 code
The code input identifies the error or warning.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

abc source
The source string describes the origin of the error or warning.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

TF working connection
The working connection refers about correct working of the connection.

cluster ID protocol
The cluster ID protocol encloses the currently used communication protocol.

U32 Handle Array
The Handle Array contains connection identificators of every successfully opened devices connected via D2XX library.

U32 Handle
The Handle contains identification of connection via D2XX library.

I/O VISA Resource Array
The VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.

I/O VISA resource name
The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.

TCP/IP ID Array
The TCP/IP ID Array contains the references of every sucessfully opened devices connected via ethernet.

connection ID
The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

abc S/N Array
The S/N Array lists the S/N of each device opened.

abc S/N string
The string reports the S/N code.

U32 # of connected devices
The # of connected devices relates about the effective number of successfully connected devices, both VCP that in D2XX mode.

U32 # of powered devices
The # of powered devices relates about the number of electrically connected devices both VCP that in D2XX mode.

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Error code

Code	Description
-219	Invalid protocol dialogue
220	Warning: no device found
-220	Error to connect MT2 USB D2XX device
-221	Error to connect MT2 USB D2XX device
-222	Error to open MT2 USB D2XX device
-223	Error to set D2XX baud rate
-224	Error to set D2XX data characteristics
-225	Error to set D2XX flow control
-226	Error to set D2XX time out
-227	Timeout TCP/IP connection in Open_Device.vi
-228	TCP/IP password incorrect in Open_Device.vi

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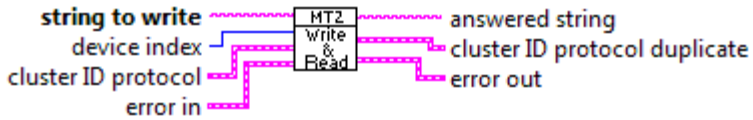
Write&Read.vi

This VI allows user to send request to MT2 device. Questions have to be defined in **string to write** to obtain answers in **answered string**. The **cluster ID protocol** encloses communication protocol description. The **device index** address the related device D2XX or SERIAL/VCP or TCP/IP mode, depends on working protocol previously opened. The **cluster ID protocol duplicate** is a duplicate of the **cluster ID protocol**. The **error in** reports any error occurred before the running of Write&Read VI. The **error out** reports any errors occurred, included errors from this VI.

Connector Pane



Controls and Indicators

string to write
The **string to write** contains strings to be passed to MT2 device.

error in
The **error in** cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in case of errors from other VIs.
The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

- **status**
  The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.
- **code**
  The **code** input identifies the error or warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.
- **source**
  The **source** string describes the origin of the error or warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

cluster ID protocol
The **cluster ID protocol** encloses the currently used communication protocol.

- **Handle Array**
  The **Handle Array** contains connection identificators of every successfully opened devices connected via D2XX library.
  - **Handle**
    The **Handle** contains identification of connection via D2XX library.
- **VISA Resource Array**
  The **VISA Resource Array** is the COM port addresses collection used in SERIAL and USB VCP connection mode.
  - **VISA resource name**
    The **VISA resource name** specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.
- **TCP/IP ID Array**
  The **TCP/IP ID Array** contains the references of every sucessfully opened devices connected via ethernet.
  - **connection ID**
    The **connection ID** is a network connection reference number to identify uniquely the TCP connection you want to close.

device index

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The device index allows to select an ID from the cluster ID protocol.

answered string
The answered string contains strings from MT2 device.

error out
The error out cluster passes error or warning information out of a VI to be used by other VIs.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

- **status**
  The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
  The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.
- **code**
  The code input identifies the error or warning.
  The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.
- **source**
  The source string describes the origin of the error or warning.
  The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

cluster ID protocol duplicate
The cluster ID protocol duplicate encloses the copy of currently used communication protocol.

- **duplicate Handle Array**
  The duplicate Handle Array contains connection identificators of every successfully opened devices connected via D2XX library.
  - **Handle**
    The Handle contains identification of connection via D2XX library.
- **duplicate VISA Resource Array**
  The duplicate VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.
  - **VISA resource name**
    The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.
- **duplicate TCP/IP ID Array**
  The duplicate TCP/IP ID Array contains the references of every sucessfully opened devices connected via ethernet.
  - **connection ID**
    The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

Error code

Code	Description
-230	Write error to MT2 USB D2XX
-231	Read error from MT2 USB D2XX
-232	Device index out of range
-233	Device not found, empty ID array
-234	ID protocols' conflict

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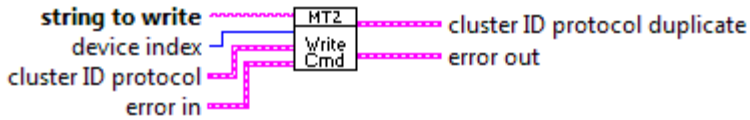
Write_Command.vi

This VI allows user to send command to MT2 device. Commands have to be sent in the **string to write**. The **cluster ID protocol** encloses communication protocol description. The **cluster ID protocol duplicate** is a duplicate of the **cluster ID protocol**. The **device index** address the related device in D2XX or SERIAL/VCP or TCP/IP dialogue mode, depends on protocol previously opened. The **error in** reports any error occurred before the running of **Write_Command** VI. The **error out** reports any errors occurred, included errors from this VI.

Connector Pane



Controls and Indicators

string to write
The **string to write** contains strings to be passed to MT2 device.

error in
The **error in** cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in case of errors from other VIs.
The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

- **status**
  The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.
- **code**
  The **code** input identifies the error or warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.
- **source**
  The **source** string describes the origin of the error or warning.
  The pop-up option **Explain Error** (or Explain Warning) gives further information about the error displayed.

device index
The **device index** allows to select an ID from the **cluster ID protocol**.

cluster ID protocol
The **cluster ID protocol** encloses the currently used communication protocol.

- **Handle Array**
  The **Handle Array** contains connection identificators of every successfully opened devices connected via D2XX library.
  - **Handle**
    The **Handle** contains identification of connection via D2XX library.
- **VISA Resource Array**
  The **VISA Resource Array** is the COM port addresses collection used in SERIAL and USB VCP connection mode.
  - **VISA resource name**
    The **VISA resource name** specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.
- **TCP/IP ID Array**
  The **TCP/IP ID Array** contains the references of every sucessfully opened devices connected via ethernet.

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connection ID
The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

error out
The error out cluster passes error or warning information out of a VI to be used by other VIs.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

code
The code input identifies the error or warning.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

source
The source string describes the origin of the error or warning.
The pop-up option Explain Error (or Explain Warning) gives further information about the error displayed.

cluster ID protocol duplicate
The cluster ID protocol duplicate encloses the copy of currently used communication protocol.

duplicate Handle Array
The duplicate Handle Array contains connection identificators of every successfully opened devices connected via D2XX library.

Handle
The Handle contains identification of connection via D2XX library.

duplicate VISA Resource Array
The duplicate VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.

VISA resource name
The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.

duplicate TCP/IP ID Array
The duplicate TCP/IP ID Array contains the references of every sucessfully opened devices connected via ethernet.

connection ID
The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

Error code

Code	Description
-230	Write error to MT2 USB D2XX
-232	Device index out of range
-233	Device not found, empty ID array
-234	ID protocols' conflict

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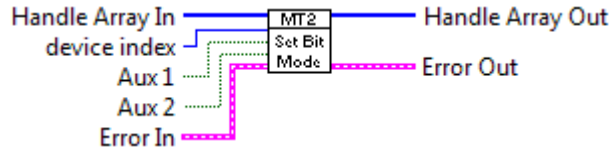
SetBitMode.vi

This VI allows user to set the value of FTDI chip's data bus. This function is available only in USB D2XX mode. The Handle Array In encloses the description of every successfully opened devices, while the device index address the related device. This array is passed to the Handle Array Out. The Aux 1 and Aux 2 select the boolean value of the respective outputs of the selected device. The error in reports any error occurred before the running of SetBitMode VI. The error out reports any error occurred, included errors from this VI.

Connector Pane



Controls and Indicators

Error In

The error in cluster can accept error information wired from the VIs previously called. Use this input to connect the error cluster coming from the previous subVI.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

- **status**
  The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
  The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.
- **code**
  The code input identifies the error or warning.
  The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.
- **source**
  The source string describes the origin of the error or warning.
  The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

Aux 1

The Aux 1 control sets the boolean status of FTDI chip's data bus Aux 1 pin .

Aux 2

The Aux 2 control sets the boolean status of FTDI chip's data bus Aux 2 pin .

Handle Array In

The Handle Array In contains connection identificators of every successfully opened devices connected via D2XX library.

- **Handle In**
  The Handle In contains identification of connection via D2XX library.

device index

The device index allows to select an ID from the cluster ID protocol.

Error Out

The error out cluster gives error information wired from current VI. Use this output to connect the error cluster of following subVI.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

- **status**
  The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
  The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.
- **code**
  The code input identifies the error or warning.

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The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

abc source
The source string describes the origin of the error or warning.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

U32 Handle Array Out
The Handle Array Out contains connection identificators of every successfully opened devices connected via D2XX library.

U32 Handle Out
The Handle Out contains identification of connection via D2XX library.

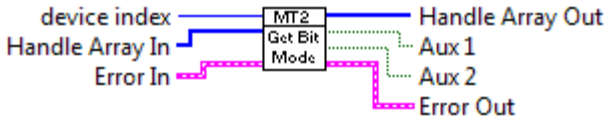
Error code

Code	Description
xx[5]	Set Bit Bang mode error

GetBitMode.vi

This VI allows user to read the istantaneous value of FTDI chip's data bus. This function is available only in USB D2XX mode. The Handle Array In encloses the description of every successfully opened devices, while the device index address the related device. This array is passed to the Handle Array Out. The Aux 1 and Aux 2 report the boolean value of the respective outputs of the selected device. The error in reports any error occurred before the running of GetBitMode VI. The error out reports any error occurred, included errors from this VI.

Connector Pane



Controls and Indicators

Error In
The error in cluster can accept error information wired from the VIs previously called. Use this input to connect the error cluster coming from the previous subVI.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

TF status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

I32 code
The code input identifies the error or warning.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

abc source
The source string describes the origin of the error or warning.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

[5] The error code is generated from the FT_SetBitMode DLL. For further information, please refers to "D2XX Programmer's Guide" on FTDI's web site (www.ftdichip.com).

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Handle Array In
The Handle Array In contains connection identificators of every successfully opened devices connected via D2XX library.

Handle In
The Handle In contains identification of connection via D2XX library.

device index
The device index allows to select an ID from the cluster ID protocol.

Error Out
The error out cluster gives error information wired from current VI. Use this output to connect the error cluster of following subVI.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

code
The code input identifies the error or warning.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

source
The source string describes the origin of the error or warning.
The pop-up option Explain Error (or Explain Warning) gives more information about the displayed error.

Aux 1
The Aux 1 reports the boolean value of FTDI chip's Aux 1 output of the selected device.

Aux 2
The Aux 2 reports the boolean value of FTDI chip's Aux 2 output of the selected device.

Handle Array Out
The Handle Array Out contains connection identificators of every successfully opened devices connected via D2XX library.

Handle Out
The Handle contains identification of connection via D2XX library.

Error code

Code	Description
xx[6]	Get Bit Bang mode error

[6] The error code is generated from the FT_SetBitMode DLL. For further information, please refers to "D2XX Programmer's Guide" on FTDI's web site (www.ftdichip.com).

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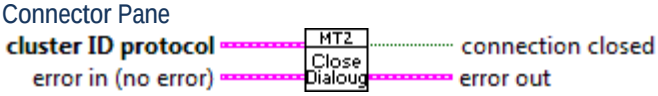
Close_dialogue.vi

This VI allows user to disconnect from the MT2 device. The **cluster ID protocol** includes connection protocol information. The **error in** reports any error occurred before the running of the **Close_dialogue** VI. The **connection closed** is a true boolean value when the VI runs without error. The **error out** reports any errors occurred, included errors from this VI.

Connector Pane



Controls and Indicators

error in (no error)

The **error in** cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in case of errors from other VIs.

- **status**
  The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
- **code**
  The **code** input identifies the error or warning.
- **source**
  The **source** string describes the origin of the error or warning.

cluster ID protocol

The **cluster ID protocol** encloses the currently used communication protocol.

- **Handle Array**
  The **Handle Array** contains connection identificators of every successfully opened devices connected via D2XX library.
  - **Handle**
    The **Handle** contains identification of connection via D2XX library.
- **VISA Resource Array**
  The **VISA Resource Array** is the COM port addresses collection used in SERIAL and USB VCP connection mode.
  - **VISA resource name**
    The **VISA resource name** specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.
- **TCP/IP ID Array**
  The **TCP/IP ID Array** contains the references of every sucessfully opened devices connected via ethernet.
  - **connection ID**
    The **connection ID** is a network connection reference number to identify uniquely the TCP connection you want to close.

error out

The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

- **status**
  The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
- **code**
  The **code** input identifies the error or warning.
- **source**
  The **source** string describes the origin of the error or warning.

connection closed

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The connection closed refers about correct ending of the connection.

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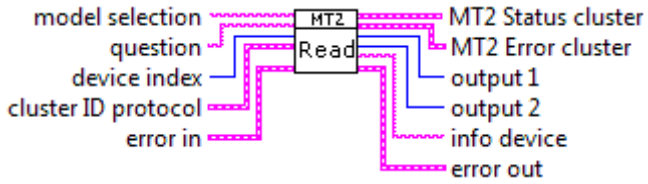
Read.vi

This VI allows user to send requests to MT2 devices. The question parameter contains a list of allowed request. The MT2 device model can be selected from model selection list. The MT2 Error cluster, the MT2 Status cluster, the ouput 1, the ouput 2 and the info device are variables containing answers to requests sent about respectively: device status; X,Y axes setting-out (output 1 and output 2) and information about connected device. The cluster ID protocol encloses communication protocol description, while the device index address the related device in the opportune mode, depends on device model previously selected. The error in reports any error occurred before the running of Read VI. The error out reports any errors occurred, included errors from this VI (i.e. illegal question).

Connector Pane



Controls and Indicators

model selection
The model selection contains the list of MT2 models. Each model has its own dialogue standard.

question
The question contains allowed request to the device.

error in
The error in cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in case of errors from other VIs.

status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

code
The code input identifies the error or warning.

source
The source string describes the origin of the error or warning.

cluster ID protocol
The cluster ID protocol encloses the currently used communication protocol.

Handle Array
The Handle Array contains connection identificators of every successfully opened devices connected via D2XX library.

Handle
The Handle contains identification of connection via D2XX library.

VISA Resource Array
The VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.

VISA resource name
The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.

TCP/IP ID Array
The TCP/IP ID Array contains the references of every sucessfully opened devices connected via ethernet.

connection ID

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The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

U32 device index
The device index allows to select an ID from the cluster ID protocol.

error out
The error out cluster passes error or warning information out of a VI to be used by other VIs.

- TF status
  The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
- I32 code
  The code input identifies the error or warning.
- abc source
  The source string describes the origin of the error or warning.

MT2 Status cluster
The MT2 Status cluster is a collection of boolean values that represents the status of the device.

- TF BIT 0
  The BIT 0 in case of MT2_ETH, MT2_MS_ETH, MT2_ETH_WEB and MT2_MS_ETH_WEB means movement along X axis: otherwise, it means a known position has been reached after a home position command.
- TF BIT 1
  The BIT 1 in case of MT2_ETH, MT2_MS_ETH, MT2_ETH_WEB and MT2_MS_ETH_WEB means movement along Y axis: otherwise, it means movement along X or Y axis.
- TF BIT 2
  The BIT 2 in case of MT2_ETH, MT2_MS_ETH, MT2_ETH_WEB and MT2_MS_ETH_WEB means during a negative movements that limit switch has been reached along X axis: otherwise, it means that limit switch has been reached along X axis.
- TF BIT 3
  The BIT 3 in case of MT2_ETH, MT2_MS_ETH, MT2_ETH_WEB and MT2_MS_ETH_WEB means during a positive movements that limit switch has been reached along X axis: otherwise, it means that limit switch has been reached along Y axis.
- TF BIT 4
  The BIT 4 in case of MT2_ETH, MT2_MS_ETH, MT2_ETH_WEB and MT2_MS_ETH_WEB means during a negative movements that limit switch has been reached along Y axis: otherwise, it means that auxiliary output has been set out.
- TF BIT 5
  The BIT 5 in case of MT2_ETH, MT2_MS_ETH, MT2_ETH_WEB and MT2_MS_ETH_WEB means during a positive movements that limit switch has been reached along Y axis: otherwise, it means X axis position is known.
- TF BIT 6
  The BIT 6 in case of MT2_ETH, MT2_MS_ETH, MT2_ETH_WEB and MT2_MS_ETH_WEB relates about auxiliary output: otherwise, it means Y axis position known.
- TF BIT 7
  The BIT 7 relates about an error.

I32 output 1
The output 1 gives information on X axis question.

I32 output 2
The output 2 gives information on Y axis question.

abc info device

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The info device gives information about MT2 device release.

MT2 Error cluster
The MT2 Error clusteris a collection of boolean values that represents the errors genereated by the device.

- Boolean array[0]
  Command not acknowledged.
- Boolean array[1]
  Illegal command (i.e. an absolute movement request when the positions are unknown or during a running).
- Boolean array[2]
  Out of range parameter (i. e. the set speed is out of the fixed ranges).
- Boolean array[3]
  Time out or error during home position search.
- Boolean array[4]
  Invalid number stored in non-volatile memory.
- Boolean array[5]
  Invalid checksum of the stored data in non-volatile memory.
- Boolean array[6]
  For Ethernet models: buffer overflow. For the other devices, reached the X axis home position during backward movement when the negative run is disabled with the appropriate jumper.
- Boolean array[7]
  For Ethernet models: internal error. For the other devices, reached the Y axis home position during backward movement when the negative run is disabled with the appropriate jumper.

Error code

Code	Description
-260	Unknown request
-261	No answer from device
-262	Invalid protocol for the selected model

Send_Command.vi

This VI allows user to send command to MT2 devices. The command variable contains a list of allowed commands to MT2 devices. The model selection permits to choose a model from the list of MT2 devices. The string, the par X and the par Y variables allow to set parameters such as: password and TCP address, X and Y axes setting-out. The cluster ID protocol contains communication protocol description, while the device index address the related device in the opportune mode, depends on device model previously selected. The error in reports any error occurred before the running of Send_Command VI. The error out reports any errors occurred, included error from this VI.

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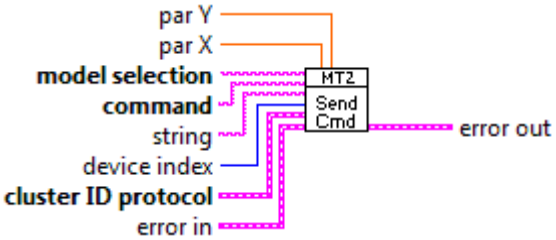
Connector Pane



Controls and Indicators

model selection
The model selection contains the list of MT2 models. Each model has its own dialogue standard.

command
The command contains allowed commands to the device.

error in
The error in cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in the case of errors from other VIs.

- **status**
  The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.
- **code**
  The code input identifies the error or warning.
- **source**
  The source string describes the origin of the error or warning.

par X
The par X receives parameters to be used to command X axis and port number to establish TCP/IP connection.

par Y
The par Y receives parameters to be used to command Y axis.

string
The string receives password and address characters to establish TCP/IP connection.

cluster ID protocol
The cluster ID protocol encloses the currently used communication protocol.

- **Handle Array**
  The Handle Array contains connection identificators of every successfully opened devices connected via D2XX library.
  - **Handle**
    The Handle contains identification of connection via D2XX library.
- **VISA Resource Array**
  The VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.
  - **VISA resource name**
    The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.
- **TCP/IP ID Array**
  The TCP/IP ID Array contains the references of every sucessfully opened devices connected via ethernet.
  - **connection ID**

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The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

U32 device index
The device index allows to select an ID from the cluster ID protocol.

error out
The error out cluster passes error or warning information out of a VI to be used by other VIs.

TF status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

I32 code
The code input identifies the error or warning.

abc source
The source string describes the origin of the error or warning.

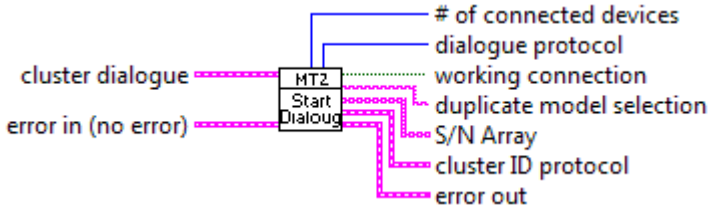
Error code

Code	Description
-270	Unknown command
-271	Invalid parameter
-272	Invalid protocol for the selected model
-273	Illegal TCP/IP address
-274	Illegal port parameter
-275	Password illegal number of characters

Start_dialogue.vi

This VI allows user to start dialogue with the chosen MT2 model from a list in the model selection. In case of model selection with TCP/IP protocol dialogue the parameters connection (address, port and password) has to be passed through TCP/IP Address Array field, while in case of SERIAL or USB VCP model selection the COM port has to be passed through the VISA Rresource Array. The working connection returns true value if the procedure is successfully finished. The dialogue protocol indicates the numeric protocol value for the selected model. The duplicate model selection reports the choosen model selected for the connection. The cluster ID protocol encloses communication protocol description. The S/N Array lists the serial number of each device successfully opened, while the # of connected device reports the dimension of these list. The error in reports any error occurred before the running of Start_dialogue VI. The error out reports any errors occurred, included errors from this VI.

Connector Pane



Controls and Indicators

error in (no error)
The error in cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in the event of errors from other VIs.

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status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

code
The code input identifies the error or warning.

source
The source string describes the origin of the error or warning.

cluster dialogue
The cluster dialogue encloses the protocol for the session and the defined VISA and TCP/IP cluster arrays.

model selection
The model selection contains the list of MT2 models. Each model has its own dialogue standard.

VISA Resource Array
The VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.

VISA resource name
The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.

TCP/IP Address Array
The TCP/IP Address Array is the array of TCP/IP data collection (address, port and password) to allows MT2 connection via ethernet.

TCP/IP Address Cluster

TCP/IP address
The TCP/IP address, with its xxx.xxx.xxx.xxx format, is required to allow connection to MT2 device via ethernet.

TCP/IP Port
The TCP/IP Port specifies the communication port over ethernet. Default value, 23, is the Telnet port.

TCP/IP password
The TCP/IP password requires password to allows connection to MT2 device via ethernet.

error out
The error out cluster passes error or warning information out of a VI to be used by other VIs.

status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

code
The code input identifies the error or warning.

source
The source string describes the origin of the error or warning.

working connection
The working connection refers about the correct working of connection.

dialogue protocol
The dialogue protocol relates about the model standard of communication.

cluster ID protocol
The cluster ID protocol encloses the currently used communication protocol.

Handle Array
The Handle Array contains connection identificators of every successfully opened devices connected via D2XX library.

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Handle
The Handle contains identification of connection via D2XX library.

VISA Resource Array
The VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.

VISA resource name
The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.

TCP/IP ID Array
The TCP/IP ID Array contains the references of every sucessfully opened devices connected via ethernet.

connection ID
The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

S/N Array
The S/N Array lists the S/N of each device opened.

S/N string
The string reports the S/N code.

duplicate model selection
The duplicate model selction reports the chosen model selected for the connection.

# of connected devices
The # of connected devices relates about the effective number of successfully connected devices, both VCP that in D2XX mode.

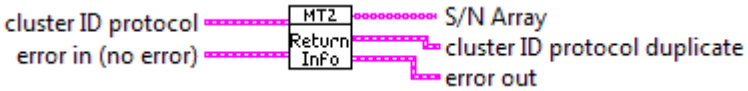
Error code

Code	Description
-280	Impossible connection to the chosen device

Return_Info.vi

This VI returns to user the S/N list of connected device in S/N array. The cluster ID protocol encloses communication protocol description and its sensing is automatically done. The cluster ID protocol duplicate is a duplicate of the cluster ID protocol. The error in reports any error occurred before the running of Return_Info. The error out reports any errors occurred, included errors from this VI.

Connector Pane



Controls and Indicators

error in (no error)
The error in cluster can accept error information wired from VIs previously called. Use this information to select functionalities to be bypassed in case of errors from other VIs.

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status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

code
The code input identifies the error or warning.

source
The source string describes the origin of the error or warning.

cluster ID protocol
The cluster ID protocol encloses the currently used communication protocol.

Handle Array
The Handle Array contains connection identificators of every successfully opened devices connected via D2XX library.

Handle
The Handle contains identification of connection via D2XX library.

VISA Resource Array
The VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.

VISA resource name
The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.

TCP/IP ID Array
The TCP/IP ID Array contains the references of every sucessfully opened devices connected via ethernet.

connection ID
The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

S/N Array
The S/N Array lists the S/N of each device opened.

S/N string
The string reports the S/N code.

error out
The error out cluster passes error or warning information out of a VI to be used by other VIs.

status
The status boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

code
The code input identifies the error or warning.

source
The source string describes the origin of the error or warning.

cluster ID protocol duplicate
The cluster ID protocol duplicate encloses the copy of currently used communication protocol.

duplicate Handle Array
The duplicate Handle Array contains connection identificators of every successfully opened devices connected via D2XX library.

Handle
The Handle contains identification of connection via D2XX library.

duplicate VISA Resource Array

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The duplicate VISA Resource Array is the COM port addresses collection used in SERIAL and USB VCP connection mode.

VISA resource name
The VISA resource name specifies the resource to be opened. This control also specifies session and class. It is to be used with the serial protocol.

duplicate TCP/IP ID Array
The duplicate TCP/IP ID Array contains the references of every sucessfully opened devices connected via ethernet.

connection ID
The connection ID is a network connection reference number to identify uniquely the TCP connection you want to close.

Error code

Code	Description
-290	Error on MT2USB D2XX device [x]
-291	Error on MT2 SERIAL or USB VCP device [x]
-292	Error on MT2 TCP/IP device [x]
-293	Multiple protocol error
-294	Empty ID array

REFERENCE STRING TABLES

The following tables list the allowed **model selection** and **question** strings for *model selection* and *question* inputs respectively, as shown in someone of the previous Vis.

Model selection table

The following table lists the allowed **model selection** strings:

Model selection string	Allowing
MT2	Yes
MT2_MS	Yes
MT2_ETH	Yes
MT2_MS_ETH	Yes
MT2_USB_VCP	Yes
MT2_MS_USB_VCP	Yes

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MT2_USB_D2XX	Yes
MT2_MS_USB_D2XX	Yes
MT2_ETH_WEB	No. Reserved for future use.
MT2_MS_ETH_WEB	No. Reserved for future use.

Question table

The following table lists the allowed question strings for each device:

Question	Serial version + USB VCP & D2XX version		Ethernet version		Ethernet WEB version	
		MS		MS		MS
GetStatus	√	√	√	√	√	√
GetPosition	√	√	√	√	√	√
InfoDevice	√	√	√	√		
GetXPowerMode	√					
GetYPowerMode	√					
GetXMode		√				
GetYMode		√				
GetXSpeed	√	√	√	√	√	√
GetYSpeed	√	√	√	√	√	√
GetNegativeMaxRunHome	√	√				
GetFWRangeHome	√	√				
GetBWRangeHome	√	√				
GetBrakingAction				√		√
GetMotorMode				√		√

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USING FUNCTIONS

Every VI in *LabVIEW* is constituted by a *Front Panel* and a *Block Diagram*. The *Front Panel* contains all elements linked together as described graphically in the *Block Diagram*. When *LabVIEW* is running, you can open MT2 library functions from the *Block Diagram*: select Window->Show Functions Palette (see figure 3).

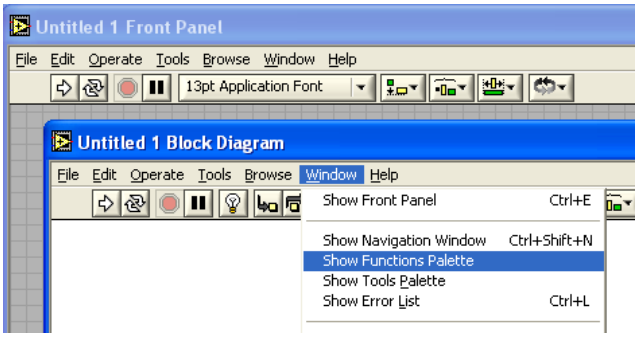

Figure 3: how to run *function palette*.

Click Select a VI.. button from the *Function Palette* and then insert the path *C:\IPSES_Lib*.

Figure 4: Select a VI.. button of *Function Palette*.

The folder *C:\IPSES_Lib\MT2\LabView_MT2_Library* contains *MT2_Low_Level_Communication.llb* and *MT2_Application.llb*. Copy and paste *LabView_MT2_Library* in the folder *National Instruments\LabVIEW 7.1\user.lib*: in this way, when you run *LabVIEW 7.1* (or *later*) you can utilize MT2_Library from user libraries palette.

Figura 5: how utilize MT2_Library from user libraries palette.

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Next figure 6 shows an example VI to connect MT2 device (from *C:\IPSES_Lib*\MT2 run *MT2_Library_Example.vi*).

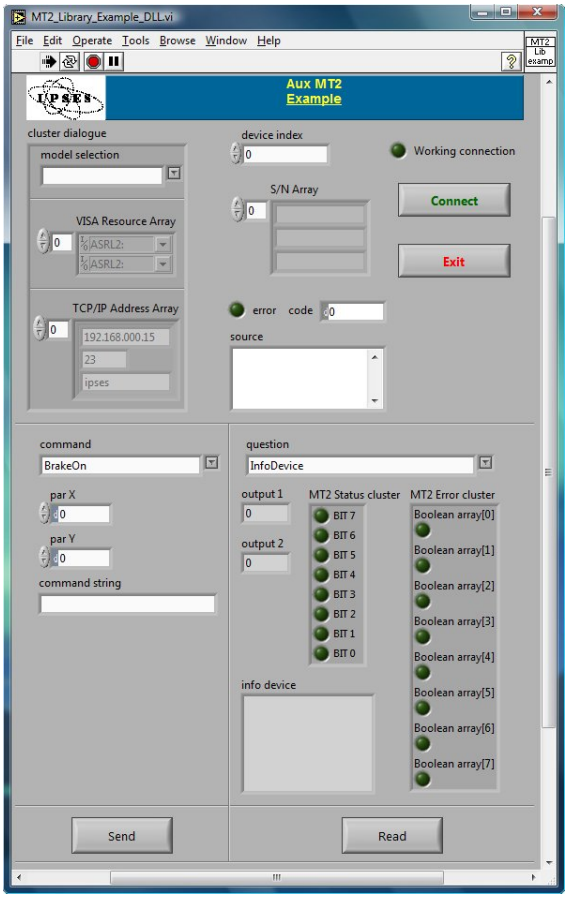

Figura 6: example VI *Front Panel*.

This example VI has been implemented with the use of the functions included in MT2 library: figure 7 displays its *Block Diagram*.

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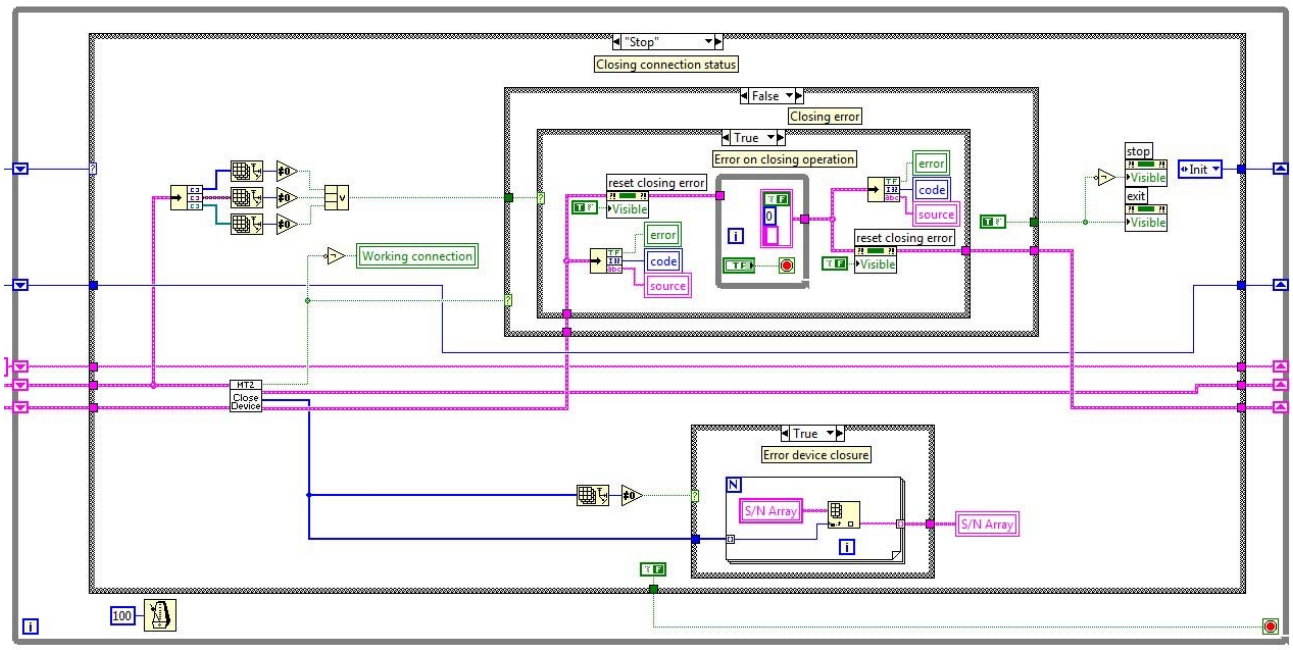

Figure 7: example VI *Block Diagram*.

The MT2_Library is also provided with MT2_SetGetBit_Example.vi (shown in Figure 8), implemented with the SetBitMode.vi and GetBitMode.vi functions, useable only for USB versions.

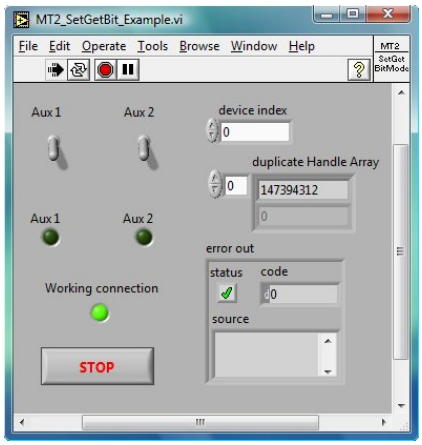

Figure 8: SetGetBit example VI front panel.

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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

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(Product code MT2 Library Rel. 01.02.0001)

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