



# Fast Digital Integrator FDI2056

## Getting started with the FDI2056 in PDI5025 emulation mode

Version 1.0

(Revision 1.2)

May 2014

## REVISION HISTORY

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v. 1.0 r. 1.0	October 2012	First release
v. 1.0 r. 1.1	October 2012	Gain Setting Considerations paragraph added Setting up a rotary encoder paragraph added Contact information paragraph added
v. 1.0 r. 1.2	May 2014	Fix front page graphics Explanation to wrongly defined gain magnification removed.

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# GETTING STARTED

## 1-Introduction

When powered on, the Fast Digital Integrator FDI2056 will check if its working mode is set to native (Ethernet VXI / SCPI compliant) mode or PDI5025 emulation mode. During the whole start-up operation, the instrument shows “INIT” on its display.

When set in PDI5025 emulation mode, the default communication channel is the serial port. After having checked the various integration channels present in the system, the emulator tries to connect to the USB-to-Serial adapter provided with the unit. If no interface is plugged in on the front panel, the instrument will report “!COM” on its display.



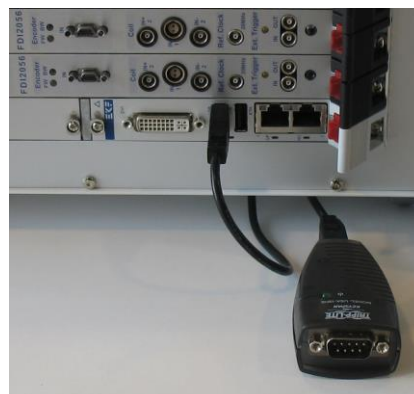
### CAUTION

⇒ Failing to plug in the USB Serial Adapter before turning the instrument on will prevent the unit from functioning properly.

Once properly started, the emulator will report the alias and current gain on all integration channels (i.e. “A 10” on first channel, “B 10” on the second and so on).

## 2-First steps

- 1) Plug the USB Serial Adapter into one of the two USB ports located on the front panel of the FDI2056.



- 2) Connect the FDI2056 to your host computer by using a null modem adapter or a null modem cable.

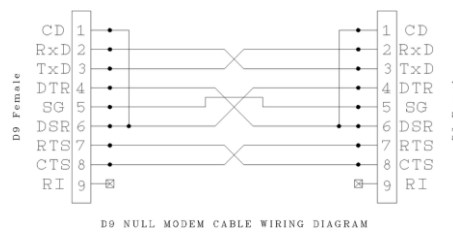


Figure 1 Null modem cabling (Wikipedia)

- 3) Turn the FDI2056 on.

Once powered, the FDI2056 display will report "INIT" during the whole boot process which can take up to 1 minute. Once booted, the FDI2056 will perform a self-test and then will display the channel alias and current gain on each integration channel. During this process, the instrument will ignore any commands issued by the host computer.

- 4) On your host computer, launch a terminal application and configure it to communicate using the following parameters :

<b>Port</b>	Select the communication port on which the FDI2056 is connected
<b>Baud rate</b>	9600 bps
<b>Data size</b>	8 bits
<b>Parity</b>	none
<b>Stop bit</b>	1
<b>Flow control</b>	None

The communication speed is set by default to 9600 bits/second, because this is the highest speed available to communicate without problem with the PDI5025. However, using the FDI2056, this value can be changed to a higher value. A procedure to change various emulation parameters is given in the next chapter.

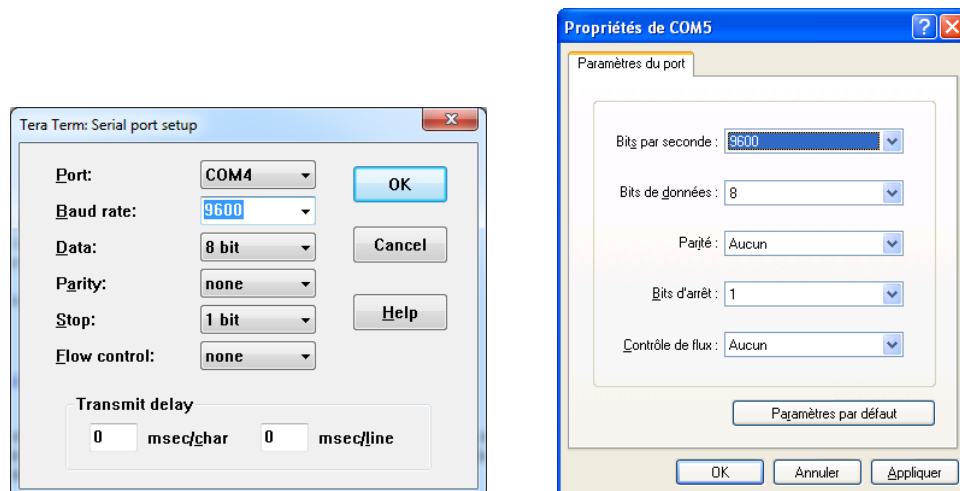


Figure 2 Configuration dialog box for Teraterm and Hyperterminal

Windows 7 does not include the HyperTerminal any more. You may either buy the official HyperTerminal application on Hilgraeve's website<sup>1</sup> or download Teraterm<sup>2</sup> which is freeware.

<sup>1</sup> <http://www.hilgraeve.com/hyperterminal/>

<sup>2</sup> <http://tssh2.sourceforge.jp/>

### 5) Test if the communication parameter is set properly

In the terminal windows, type the command “VER↵”, the answer will be:

```
PDI5025 Version 3.0  
(C) METROLAB SA Geneva.
```


You are now ready to send any commands to your system.

## 3-Configuring the emulator

As described in the user manual, it is possible to configure some emulation parameters such as:

- the communication channel and its data rate,
- the sampling and time trigger rate,
- the gain conversion table and
- the encoder pins polarity and functionality.

All these parameters are located in the Windows registry of the industrial computer embedded in the instrument. To set these parameters, you must establish a remote desktop connection.

To find the Remote Desktop Connection shortcut, click the Start button , click **All Programs** or **Programs**, and then click **Accessories**. To quickly open Remote Desktop Connection, open the Start menu, and then type `mstsc` in the Search box.

Once started, you must provide the **host name**, the **user name** and the **password**.

**Host name**      FDI2056-00xx

xx is the serial number of the instrument which can be found on the rear panel of the instrument.

**User name** FDI2056Admin

**Password** The password can be found in the companion document in the envelope containing the certificate of calibration. If lost or unavailable, please send an email to [info@metrolab.com](mailto:info@metrolab.com) and specify your serial number.



## CAUTION

⇒ You may change the default password at your convenience, but, if you decide to do so, please keep it in a safe place. Moreover, when a unit is sent to Metrolab's facility for recalibration, it is of utmost importance to notify us of any password change, as we may proceed to software and/or hardware upgrade when a unit is sent back.

If the unit fails to answer using the host name, you may, using the serial communication port, issue the command "EMU,Ipconfig? ←". The unit will then provide all information relative to its current IP configuration, as shown in the following example:

Host Name: FDI2056-0002  
Domain Name: D-METROLAB.com  
DNS Servers: 192.168.3.21  
Node Type: Mixed node  
DHCP scope name: (none)  
Routing: disabled  
ARP Proxy: disabled  
DNS: disabled

Interface Index: 3  
IP Address: 0.0.0.0  
Subnet Mask: 0.0.0.0  
BroadCast: 1.0.0.0 (1)  
Reassembly size: 65535  
Type and State: Primary IP Address Address is on disconnected interface


Interface Index: 2

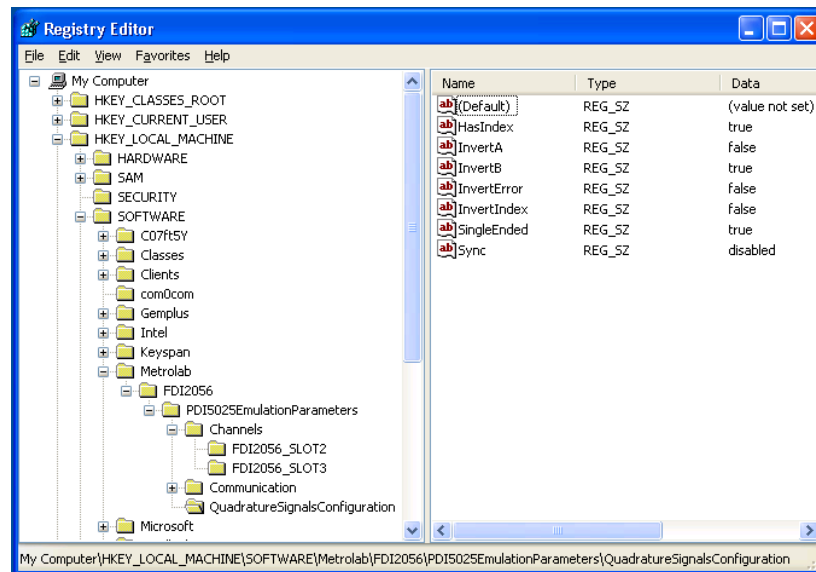


IP Address: 192.168.3.76  
Subnet Mask: 255.255.255.0  
BroadCast: 1.0.0.0 (1)  
Reassembly size: 65535  
Type and State: Primary IP Address      Dynamic IP Address

Interface Index: 1  
IP Address: 127.0.0.1  
Subnet Mask: 255.0.0.0  
BroadCast: 1.0.0.0 (1)  
Reassembly size: 65535  
Type and State: Primary IP Address

Please note: if you use the IP address (For example: 192.168.3.76, as found on previous page) it is possible to reach the FDI2056 directly, without providing the host name.

Once connected, you may change the parameters using the registry editor. To launch the registry editor, click the Start button , click Run, and type REGEDIT. Click OK. Select the *HKEY\_LOCAL\_MACHINE*<sup>3</sup>\SOFTWARE\Metrolab\FDI2056 key. You are now ready to change the parameters.



## 4-Setting up a rotary encoder

Every FDI 2056 integrator channel is equipped with a micro-D connector. The pins are defined as follow:

Pin n°	Cable color	Function
1	Black	$\bar{B}$
2	Brown	B
3	Red	$\bar{A}$
4	Orange	A

<sup>3</sup> HKEY\_LOCAL\_MACHINE is often shorten to HKLM.

5	Yellow	5 [Volts] or 3.3 [Volts] (Factory default 5 [Volts]) A re-armable fuse safely prevents the system from providing more than 0.750 [Amps].
6	Green	Ground
7	Blue	Error Input
8	Violet	$\overline{\text{Index}}$
9	Grey	Index

The shell is connected to the chassis ground.

The “PDI5025 Micro-D to LEMO adapter” is connected as follow:

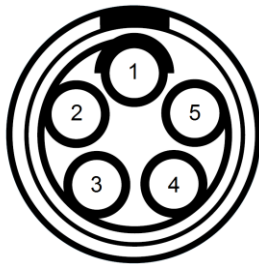


Figure 3 LEMO 0B Adapter, Front View

Pin n°	Function
1	Ground
2	A
3	B
4	Index
5	+5 [Volts]

The shell is connected to the chassis ground.

When using a single-ended encoder, all signals must be connected to the active high version of the signals (A, B, Index). When using differential signals, you must use the various pairs provided, which are then fed to a differential to single ended driver. The output polarity of the driver follows the polarity of the active high signal (i.e., if A goes high and  $\overline{A}$  goes low, the output of the driver will go high).

#### 4-1 VOLTAGE SELECTION

A jumper, located on the daughter board of each of the FDI2056 integrator channels, can be changed to provide either 3.3 Volts or 5 Volts on pin 5 of the

micro-D connector. To change this jumper you must be extremely cautious and proceed following the instruction notice below:

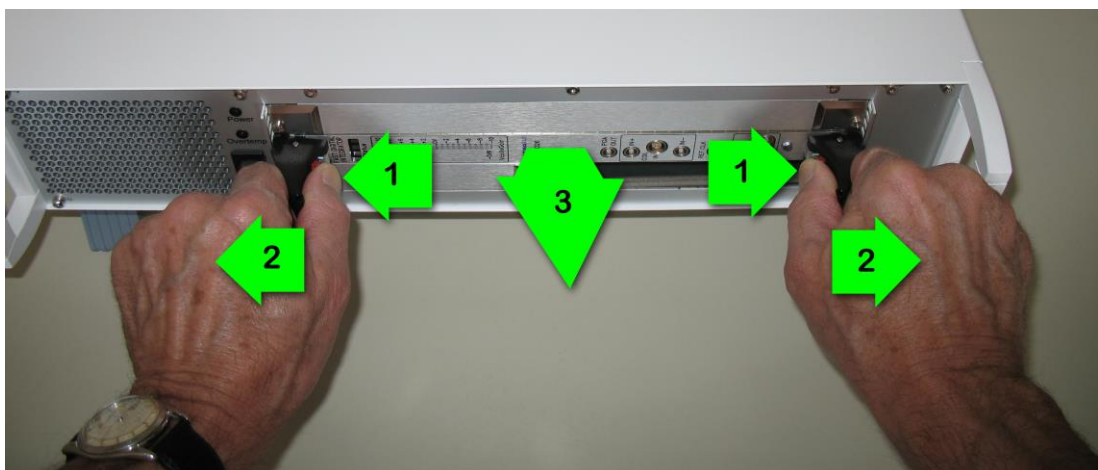
## NOTICE

### ! CAUTION

- ⇒ Switch the system off.
- ⇒ Handle the FDI2056 channel card with caution to avoid damage due to electrostatic discharge. Ground yourself before handling the card; the best is to use a grounded wrist-strap during installation.
- ⇒ To provide additional assurance that the card does not vibrate loose, for example during shipping, the screws behind the extractor lever are tightened. Using a cross-type screwdriver, gently loosen the two screws located on each end of the board.



- ⇒ 1. Press the red lock levers with your thumbs; 2. Push the black extractor levers outward to extract the card; and 3. Gently pull the card out of the slot. Be careful; see the note in red below.



- ⇒ **WARNING:** The FDI2056 channel card has components on the underside that just barely clear the faceplate of adjacent cards. Exercise extreme caution in order not to damage the card when you slide it into the crate. Slide it out slowly, and lift it slightly to keep the components from snagging. On a multiple

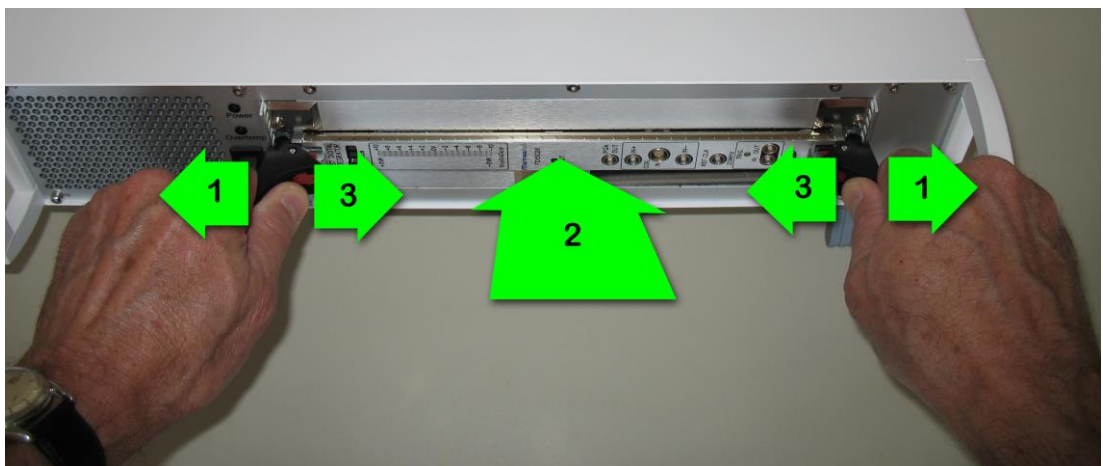
channels system, proceed by removing the channel which is located the furthest away from the CPU board, i.e., the highest slot number.



⇒ Change the jumper depicted below according to your voltage needs.



⇒ When inserting the card back : 1. Push the levers outward; 2. Push the card in until the black plastic extractor levers touch the crate; and 3. Push the levers inward until you hear both locks click. On a multiple channels system, proceed by reinserting the channel which is the nearest to the CPU board, i.e. the lowest slot number.











⇒ Tighten the screws behind the extractor lever.

## 4-2 CONFIGURING THE DECODER

When using the FDI2056 in its PDI5025 emulation mode, only the first decoder is used, it is the nearer to the CPU board. If present, others channels are triggered synchronously using an internal signal extracted from the decoder.

The decoding state machine must be configured such as when you rotate your motor in your defined forward direction the FW led present on the front panel is lit. To perform this configuration, you must first establish a remote desktop connection to the FDI2056. Then, using the registry editor, you must configure the right polarity of your signals. The configuration can be made by modifying the parameters located under the sub-key *QuadratureSignalConfiguration* located at *HKLM\Software\Metrolab\FDI2056\PDI5025EmulationParameters\*

 <b>QuadratureSignalConfiguration</b>			
	HasIndex	Boolean	true false
<p>When set to true, indicates to the system that the encoder connected to the system provides an Index signal. This information is used to define the way the decoder will behave when an index search is performed.</p> <p>With index: the decoder waits until the index is found and sets its internal counter to zero.</p> <p>Without index: the decoder is set to zero immediately after the reception of the IND command.</p>			
	InvertA	Boolean	true false
<p>All InvertX parameters indicate whether the input signal is used in its direct form or in its inverted version. This way, the direction detected by the bi-phase decoder can be configured. The configured version of the signals A, B and Index are then directly used to create a 90° index which must be positive.</p>			
	InvertB	Boolean	true false
	InvertError	Boolean	true false
	InvertIndex	Boolean	true false
	SingleEnded	Boolean	true false
	Sync	Edge enumeration	disabled rising falling both

The SYNC and ERROR signals share the same connector pin. When enabled, the SYNC input takes precedence over the ERROR function.

Once configured, the PDI5025 emulator must be restarted.

## ***5-Using the internal communication pipe***

Among all the parameters available in the registry (See section 2), the sub-keys found under *Communication* allow you to select the communication port, the baud rate, etc. By correctly setting the *Port* key, you may, if you intend to install your own application onboard, use a software pipe.

The idea is that rather than using a physical COM port to send the commands to the emulator, two virtual ports are present in the system. Each character sent to one port is then directly sent to the other and vice-versa. The pair present in the system is COM3, COM4, i.e., each character sent to COM3 will be available on COM4 and vice-versa.

Setting the key `<...>\PDI5025EmulationParameters\Communication\Port` to COM3 allows you to launch the terminal and communicate to the emulator using COM4. Please notice that when using the internal pipe, any communication parameters are ignored.

## 6-Gain Setting Considerations

The PDI5025 has a resolution of  $10^{-8}$  [Weber] and a maximum gain of 1000. All returned results are expressed as integer numbers.

The FDI2056 has a resolution which depends on the settings but which is at least 100 times better than the PDI5025 resolution. Its maximum gain is 100.

When the FDI2056 is used in its PDI 5025 emulation mode, the gain over 100 is digitally magnified.

To be compatible with the PDI data format, the results are scaled up using a factor of  $10^8$ . However, if the user wants to fully benefit from the FDI2056 improved performance, he may change the default scaling factor using the new command **FCT**.

### 6-1 THE FCT COMMAND

The **FCT** command lets the user decide which scaling factor will be applied to all returned results. By default, when the emulator starts (and to conform to the original PDI design), this factor is set to a value of  $10^8$ .

If the command “FCT,? $\leftarrow$ ” is issued from the host computer just after the emulator starts, the instrument will return 100000000.00000, which is its default value, as stated before.

Followed by any floating point value, the same command can be used to set the scaling factor. For example, if the command “FCT,1E12 $\leftarrow$ ” is issued, all results will be multiples of  $10^{-12}$  [Weber]. The “FCT,? $\leftarrow$ ” command gives back the set value.



*When the scaling factor is set, keep in mind that the final result must stand in a 64-bit integer.*



## ***7-Contact Information***

If you encounter any difficulties in configuring or using the PDI5025 emulator, please do not hesitate to contact us by email at [info@metrolab.com](mailto:info@metrolab.com)