Matrox Odyssey Xpro

Camera Interface Application Note

DALSA P2-2x-06k40 January 21, 2004

Basics about the camera

Camera Descriptions

- Effective resolution: up to 6144 pixels/line @ 12.3k line per second.
- Camera Link BASE interface (two 8-bit taps).
- External and internal sync.
- External or internal exposure control.
- 40 MHz pixel clock rate.

Mode of operations as per Matrox Imaging (in parentheses as per camera manufacturer)

Interface Mode

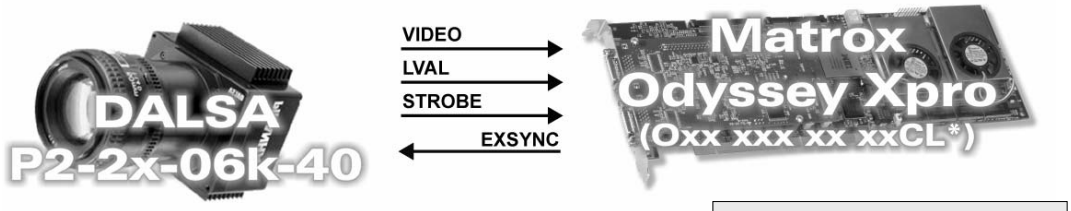
- Fixed line scan rate (Smart EXSYNC or Free Run mode)
- Variable line scan rate (Smart EXSYNC mode)
- Fixed line scan rate with frame trigger (Smart EXSYNC mode)
- Variable line scan rate with frame trigger (Smart EXSYNC mode)
- Fixed line scan rate with variable frame size (Smart EXSYNC mode)
- Variable line scan rate with variable frame size (Smart EXSYNC mode)

Basics about the interface modes

Camera Interface Briefs

Mode 1: Fixed line scan rate

- Up to 6144 pixels/line.
- Camera Link BASE interface (two 8-bit taps).
- DCF configured for 1000 lines per virtual frame.
- Matrox Odyssey Xpro sending periodic EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Odyssey Xpro receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: P22x06k40_6144_8bit2tapsFLS.DCF



*Matrox Odyssey Xpro main board with Camera Link grab module

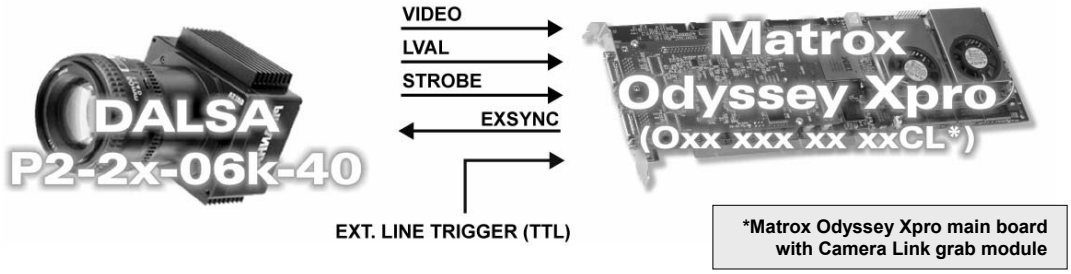
Matrox Odyssey Xpro
Camera Interface Application Note
DALSA P2-2x-06k40 January 21, 2004

Basics about the interface modes

Camera Interface Briefs (continued)

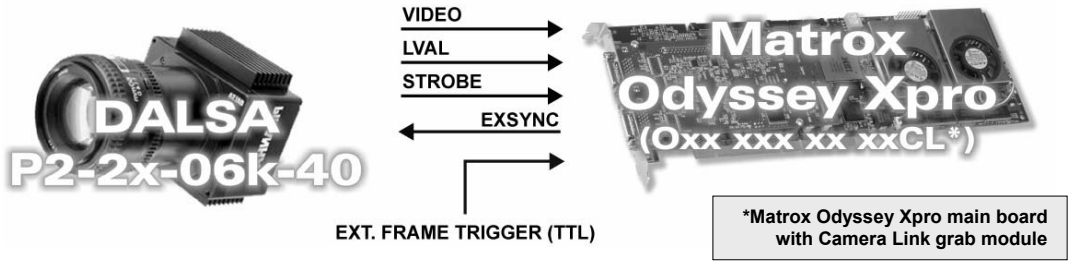
Mode 2: Variable line scan rate

- Up to 6144 pixels/line.
- Camera Link BASE interface (two 8-bit taps).
- DCF configured for 1000 lines per virtual frame.
- Matrox Odyssey Xpro receiving external TTL line trigger signal.
- Matrox Odyssey Xpro sending EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Odyssey Xpro receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: P22x06k40_6144_8bit2tapsVLS.DCF



Mode 3: Fixed line scan rate with frame trigger

- Up to 6144 pixels/line.
- Camera Link BASE interface (two 8-bit taps).
- DCF configured for 1000 lines per virtual frame.
- Matrox Odyssey Xpro receiving external TTL frame (virtual) trigger signal.
- Matrox Odyssey Xpro sending periodic EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Odyssey Xpro receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: P22x06k40_6144_8bit2tapsFLSFT.DCF



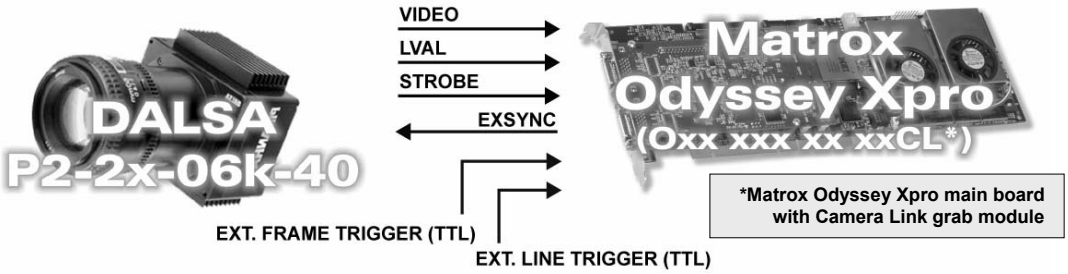
Matrox Odyssey Xpro
Camera Interface Application Note
DALSA P2-2x-06k40 January 21, 2004

Basics about the interface modes

Camera Interface Briefs (continued)

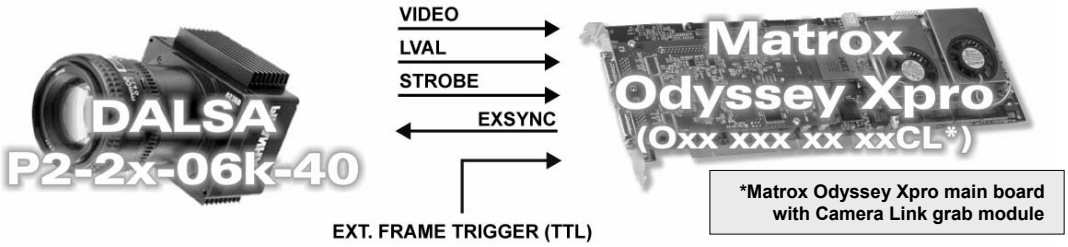
Mode 4: Variable line scan rate with frame trigger

- Up to 6144 pixels/line.
- Camera Link BASE interface (two 8-bit taps).
- DCF configured for 1000 lines per virtual frame.
- Matrox Odyssey Xpro receiving external TTL frame (virtual) and line trigger signals.
- Matrox Odyssey Xpro sending EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Odyssey Xpro receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: P22x06k40_6144_8bit2tapsVLSFT.DCF



Mode 5: Fixed line scan rate with variable frame size

- Up to 6144 pixels/line.
- Camera Link BASE interface (two 8-bit taps).
- DCF configured for 1000 lines per virtual frame.
- Matrox Odyssey Xpro receiving external TTL frame (virtual) trigger signal.
- Matrox Odyssey Xpro sending periodic EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Odyssey Xpro receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: P22x06k40_6144_8bit2tapsFLSVF.DCF



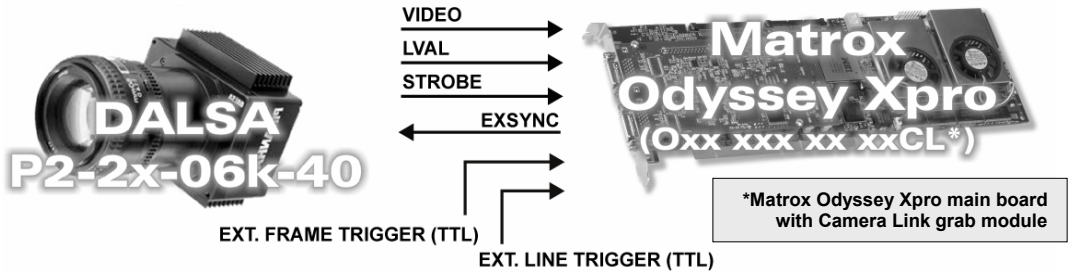
Matrox Odyssey Xpro
Camera Interface Application Note
DALSA P2-2x-06k40 January 21, 2004

Basics about the interface modes

Camera Interface Briefs (continued)

Mode 6: Variable line scan rate with variable frame size

- Up to 6144 pixels/line.
- Camera Link BASE interface (two 8-bit taps).
- DCF configured for 1000 lines per virtual frame.
- Matrox Odyssey Xpro receiving external TTL frame (virtual) and line trigger signals.
- Matrox Odyssey Xpro sending EXPOSURE1 (EXSYNC) signal to camera.
- Matrox Odyssey Xpro receiving HSYNC (LVAL), PIXEL CLOCK (STROBE @ 40 MHz) and video data from camera.
- DCF used: P22x06k40_6144_8bit2tapsVLSVF.DCF



Specifics about the interface modes

Camera Interface Details

Mode 1: Fixed line scan rate

- **Line rate:** The frequency of the periodic EXPOSURE1 (EXSYNC) signal determines the camera's line rate. The EXPOSURE1 (EXSYNC) signal period is set in the DCF to **330 µs** which translates into a **3.03 kHz** line rate. The maximum line rate for this camera equals **12.3 kHz**.
- **Exposure time:** For **Smart EXSYNC** mode the exposure time is the inactive (high level) period between the rising and falling edges of the EXPOSURE1 (EXSYNC) signal. The default exposure time for this DCF equals **250 µs**. Maximum/minimum exposure time per line for this DCF is **420 ms** and **25 ns** respectively. The exposure time can be modified in the DCF using Matrox Intellicam, ONL imCamControl() or imDigControl() function, or with the MIL MdigControl() function. Consult the respective manual for more information.
- **Inverted tap output:** The camera's tap output configuration features mirrored taps of which one tap will need to be inverted. Matrox Odyssey Xpro supports hardware tap inversion, which has been enabled in the DCF.

Specifics about the interface modes

Camera Interface Details (continued)

Mode 1: Fixed line scan rate

- **Camera communication:** This DCF will work with **Free Run** and **Smart EXSYNC** modes. Set the mode (as shown in table below) via the Camera Link communication. Refer to the camera manual for additional information.

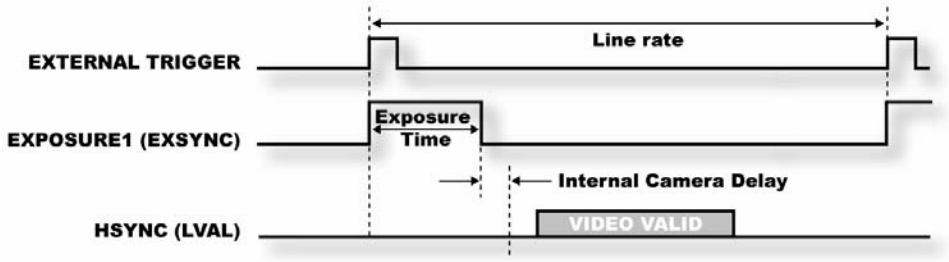
Command	Short Form	Parameter	Description
Set_exposure_mode	sem	1 or 2	Free Run
Set_exposure_mode	sem	4	Smart EXSYNC mode

Mode 2: Variable line scan rate

- **Line rate**: The line rate is controlled by the frequency of the external TTL line trigger signal. The line trigger signal period must be larger than the total duration of the exposure time (high level duration of the timer), the internal delay of the camera (**1.50 µs**) and the line read out (**76.8 µs**).
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Inverted tap output:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Set the mode (as shown in table below) via the Camera Link communication. Refer to the camera manual for additional information.

Command	Short Form	Parameter	Description
Set_exposure_mode	sem	4	Smart EXSYNC mode

- **Timing diagram:**



Mode 3: Fixed line scan rate with frame trigger

- **Line/frame rate**: The line rate is fixed and controlled by the period of EXPOSURE1 (EXSYNC) signal. The virtual frame rate is variable and controlled by the period of the external frame trigger signal, however the external trigger period must always be greater than the total time of the number of lines captured. The number of lines per virtual frame (maximum of 1000 for this DCF) is fixed and controlled by the vertical timing of the DCF. Capture of the lines will start with the rising edge of the frame trigger signal.
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.

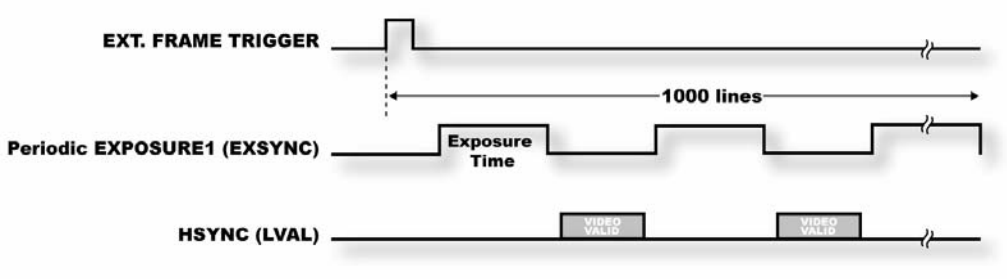
Continued…

Specifics about the interface modes

Camera Interface Details (continued)

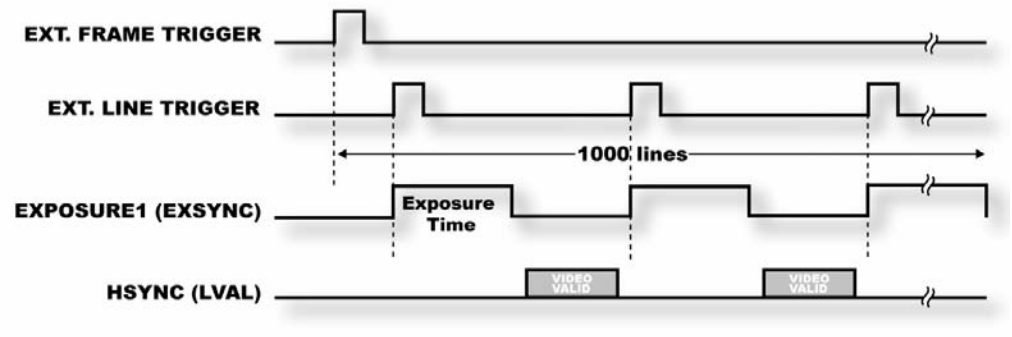
Mode 3: Fixed line scan rate with frame trigger

- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Inverted tap output:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Refer to Mode 2: Variable line scan rate.
- **Timing diagram:**



Mode 4: Variable line scan rate with frame trigger

- **Line/frame rate**: The line rate is controlled by the frequency of the external TTL line trigger signal. The line trigger signal period must be larger than the total duration of the exposure time (high level duration of the timer), the internal delay of the camera (**1.50 µs**) and the line read out (**76.8 µs**). The virtual frame rate is variable and controlled by the period of the external frame trigger signal, however the external trigger period must always be greater than the total time of the number of lines captured. The number of lines per virtual frame (maximum of 1000 for this DCF) is fixed and controlled by the vertical timing of the DCF. Capture of the lines will start with the rising edge of the frame trigger signal.
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Inverted tap output:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Refer to Mode 2: Variable line scan rate.
- **Timing diagram:**

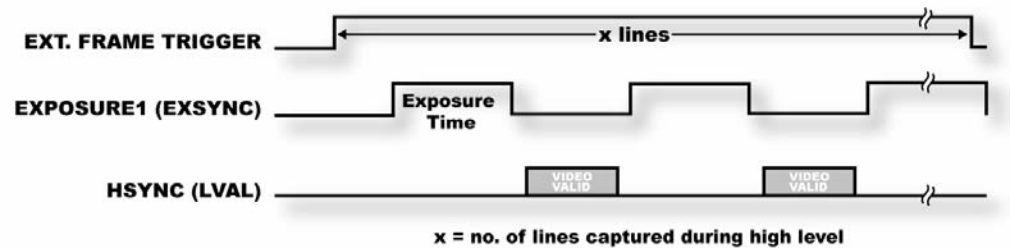


Specifics about the interface modes

Camera Interface Details (continued)

Mode 5: Fixed line scan rate with variable frame size

- **Line/frame rate**: The line rate is fixed and controlled by the period of EXPOSURE1 (EXSYNC) signal. The number of lines per virtual frame (maximum of 1000 for this DCF) is variable and controlled by the frame trigger signal. Matrox Odyssey captures lines during the high level of the frame trigger signal. To modify the maximum amount of lines captured, change the active vertical timing period in the DCF. Capture of the lines will start with the rising edge of the frame trigger signal.
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Inverted tap output:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Refer to Mode 2: Variable line scan rate.
- **Timing diagram:**



Mode 6: Variable line scan rate with variable frame size

- **Line/frame rate**: The line rate is variable and controlled by the external line trigger frequency. The number of lines per virtual frame (maximum of 1000 for this DCF) is variable and controlled by the frame trigger signal. Matrox Odyssey captures lines during the high level of the frame trigger signal. To modify the maximum amount of lines captured, change the active vertical timing period in the DCF. Capture of the lines will start with the rising edge of the frame trigger signal.
- **Exposure time:** Refer to Mode 1: Fixed line scan rate.
- **Inverted tap output:** Refer to Mode 1: Fixed line scan rate.
- **Camera communication:** Refer to Mode 2: Variable line scan rate.

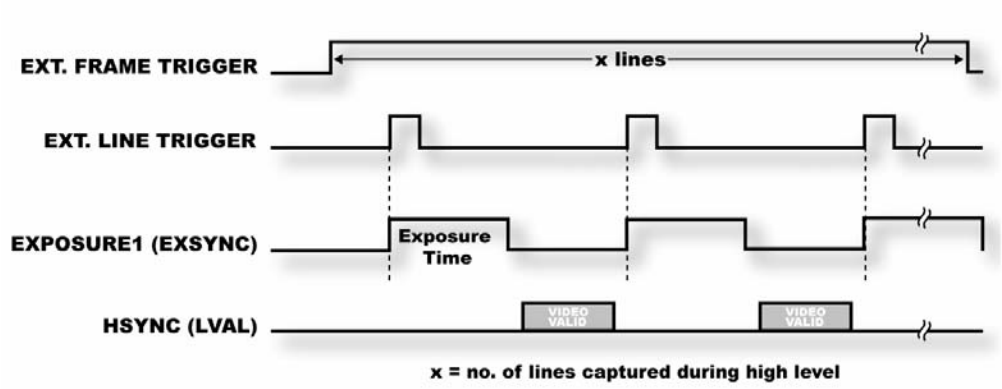
Continued…

Specifics about the interface modes

Camera Interface Details (continued)

Mode 6: Variable line scan rate with variable frame size

- **Timing diagram:**



Cabling details for the interface modes

Cabling Requirements

Mode 1: Fixed line scan rate

- **Cable and Connection:** Standard Camera Link cable.

Mode 2: Variable line scan rate

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External line trigger should be connected to the OPTO TRIG input of the 9-pin connector (pins 7 and 2) on the External I/O adapter bracket:

EXTERNAL I/O BRACKET (9-pin connector)			External Trigger Source
Pin Name	**Pin no.**		**Pin Name**
OPTO_AUX_IN0 +	07	←	LINE TRIGGER (TTL FORMAT)
OPTO_AUX_IN0 -	02	←	LINE TRIGGER (GROUND)

Mode 3: Fixed line scan rate with frame trigger

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External line trigger should be connected to the OPTO TRIG input of the 9-pin connector (pins 4 and 5) on the External I/O adapter bracket:

EXTERNAL I/O BRACKET (9-pin connector)			External Trigger Source
Pin Name	**Pin no.**		**Pin Name**
OPTO_AUX_IN1 +	04	←	FRAME TRIGGER (TTL FORMAT)
OPTO_AUX_IN1 -	05	←	FRAME TRIGGER (GROUND)

Matrox Odyssey Xpro
Camera Interface Application Note
DALSA P2-2x-06k40 January 21, 2004

Cabling details for the interface modes

Cabling Requirements

Mode 4: Variable line scan rate with frame trigger

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External frame and line triggers should be connected to the OPTO TRIG inputs of the 9-pin connector on the External I/O adapter bracket:

EXTERNAL I/O BRACKET (9-pin connector)			External Trigger Sources
Pin name	**Pin no.**		**Pin name**
OPTO_AUX_IN1 +	04	←	FRAME TRIGGER (TTL FORMAT)
OPTO_AUX_IN1 -	05	←	FRAME TRIGGER (GROUND)
OPTO_AUX_IN0 +	07	←	LINE TRIGGER (TTL FORMAT)
OPTO_AUX_IN0 -	02	←	LINE TRIGGER (GROUND)

Mode 5: Fixed line scan rate with variable frame size

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External trigger should be connected to the OPTO TRIG input (pins 4 and 5) of the 9-pin connector on the External I/O adapter bracket:

EXTERNAL I/O BRACKET (9-pin connector)			External Trigger Sources
Pin name	**Pin no.**		**Pin name**
OPTO_AUX_IN1 +	04	←	FRAME TRIGGER (TTL FORMAT)
OPTO_AUX_IN1 -	05	←	FRAME TRIGGER (GROUND)

Mode 6: Variable line scan rate with variable frame size

- **Cable and Connection:** Standard Camera Link.
- **External trigger:** External frame and line triggers should be connected to the OPTO TRIG inputs of the 9-pin connector on the External I/O adapter bracket:

EXTERNAL I/O BRACKET (9-pin connector)			External Trigger Sources
Pin name	**Pin no.**		**Pin name**
OPTO_AUX_IN1 +	04	←	FRAME TRIGGER (TTL FORMAT)
OPTO_AUX_IN1 -	05	←	FRAME TRIGGER (GROUND)
OPTO_AUX_IN0 +	07	←	LINE TRIGGER (TTL FORMAT)
OPTO_AUX_IN0 -	02	←	LINE TRIGGER (GROUND)

The DCFs mentioned in this application note are also attached (embedded) to this PDF file – use the Adobe Reader's View File Attachment to access the DCF files. The information furnished by Matrox Electronics System, Ltd. is believed to be accurate and reliable. Please verify all interface connections with camera documentation or manual. Contact your local sales representative or Matrox Sales office or Matrox Imaging Applications at 514-822-6061 for assistance. © Matrox Electronic Systems Ltd, 2004-2011.

Matrox Electronic Systems Ltd.
1055 St. Regis Blvd.
Dorval, Quebec H9P 2T4
Canada
Tel: (514) 685-2630
Fax: (514) 822-6273