![MERGING logo]

USB Sync Board

User Manual

Please read the following information very carefully before attempting any installation. Failure to comply with the precise instructions may result in damage to your Merging hardware. Please read this entire section of the manual carefully before.

1 Important notice

1.1 STATIC DANGER NOTICE:

Please note that the USBSync board contains delicate electronic components that can be damaged or even destroyed when exposed to static electricity. Take all necessary precautions not to discharge static electricity when touching any of the USBSync components.

1.2 INFORMATION FOR THE USER:

USBSync and its daughter card comply with the following specifications:

EMC Emissions
EN 55022: 1994 /A1: 1995 /A2: 1997 Class A ITE emissions requirements (EU)
FCC 47 CFR Part 15 Class A emissions requirements (USA)

EMC Immunity
EN 50082-1: 1992 EMC residential, commercial and light industrial generic immunity standard.

FCC Notice
This product has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.
These limits are designed for providing reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiates radio frequency energy and, if not installed and used in accordance with the instructions contained in this manual, may cause harmful interference to radio and television communications. However, there is no guarantee that interference will not occur in a particular installation.

NOTE: Connecting this device to peripheral devices that do not comply with CLASS A requirements or using an unshielded peripheral data cable could also result in harmful interference to radio or television reception. The user is cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. To ensure that the use of this product does not contribute to interference, it is necessary to use shielded I/O cables.

CE Notice
Such a marking is indicative that this system's devices meet the following applicable technical standards:

•   EN 55022 – "Information Technology Equipment - Radio disturbance characteristics Limits and methods of measurement"
•   EN 50082-1: 1992 – "Electromagnetic compatibility – Generic immunity standard Part 1: Residential, commercial, and light industry"

This product is classified for use in a typical Class A commercial environment, and is not designed or intended for use in other EMC environments. The user of this product is obliged for proper use and installation of the product and for taking all steps necessary to remove sources of interference to telecommunications or other devices.

2 USBSync Board warranty information

This product is warranted to be free of defects in materials and workmanship for a period of one year from the date of purchase. Merging Technologies, Inc. extends this Limited Warranty to the original purchaser.
In the event of a defect or failure to confirm to this Limited warranty, Merging Technologies, Inc. will repair or replace the product without charge within sixty (60) days. In order to make a claim under this limited warranty, the purchaser must notify Merging Technologies, Inc. or their representative in writing, of the product failure.
In this limited warranty the customer must upon Merging Technologies, Inc. request, return the product to the place of purchase, or other local designation, for the necessary repairs to be performed. If the consumer is not satisfied with the repair, Merging Technologies, Inc. will have the option to either attempt a further repair, or refund the purchase price.
This warranty does not cover: (1) Products which have been subject to misuse, abuse, accident, physical damage, neglect, exposure to fire, water or excessive changes in the climate or temperature, or operation outside maximum rating. (2) Products on which warranty stickers or product serial numbers have been removed altered or rendered illegible. (3) The cost of installations, removal or reinstallation. (4) Damages caused to any other products.

3 Table of contents

4 Introduction

This document presents and describes the Merging Technologies USB based synchronization solution. This is a PCI form factor board that is intended to be plugged into a PCI slot.

5 USBSync Board features overview

The Merging Technologies USBSync board is designed to bring synchronization capabilities to PC software through a USB connection.
Here is a quick summary of features:
- USB v2.0 Full speed compliant
- Video reference input
- LTC input and output
- RS422 connection (machine and controller)
- MIDI connection
- Bi-phase input and output

6 USBSync board specifications
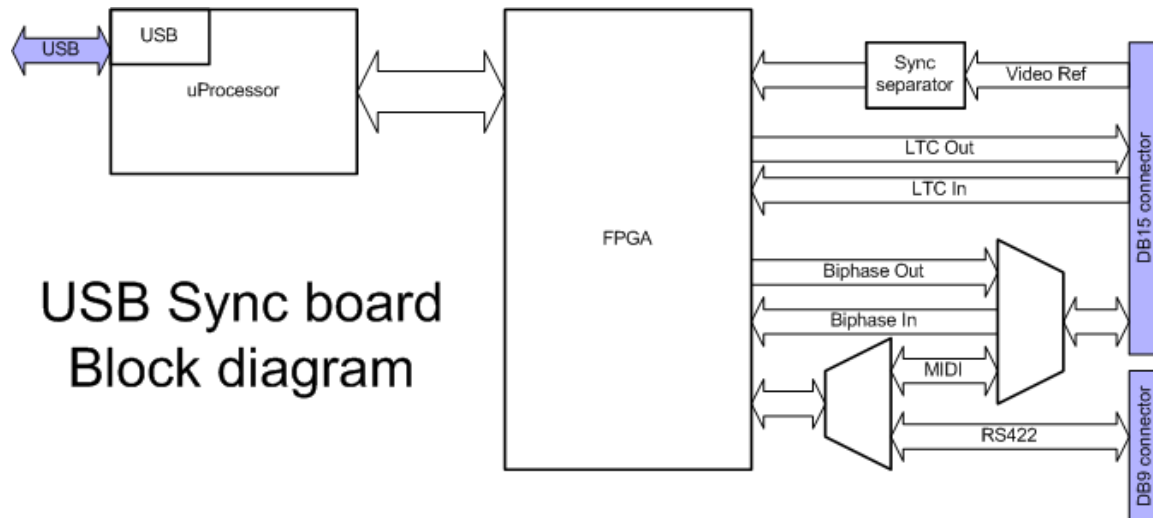
6.1 Block diagram

Figure 1 - Block diagram of USB Sync board

6.2 Connectors and jumpers

The connectors and jumpers implemented on the USBSync board are as follow:

- J2: DB9 connector, for RS422 communication
- J3: USB connector type B, not soldered on production boards
- J4: DB15 connector, for breakout cable
- J5: USB connector, for internal connection to motherboard
- JP2: Erase flash, do not short this jumper
- JP5: Atmel microprocessor manual reset
- JP6: 56 Ohm pull-up on bi-phase phase A positive pin
- JP7: 56 Ohm pull-down on bi-phase phase A negative pin
- JP8: 56 Ohm pull-up on bi-phase phase B positive pin
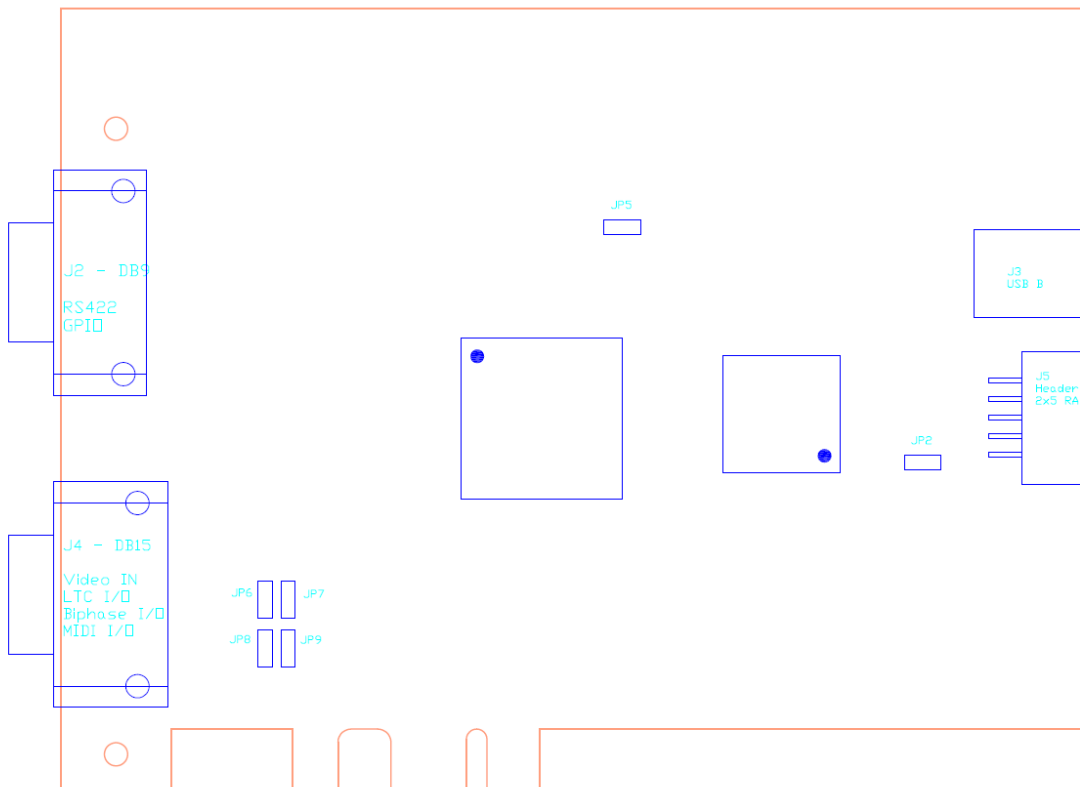- JP9: 56 Ohm pull-down on bi-phase phase B negative pin

Figure 2 - Connectors and jumpers layout

![AMERGING logo]

6.3 Bracket view

The following picture shows a view of the PCI bracket with the DB9 and DB15 connectors to the external world.
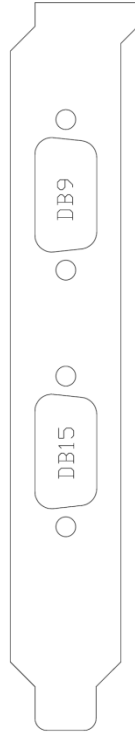

Figure 3 - USB Sync board bracket with the two connectors

7 Breakout cable pin-out description

The following picture describes the physical implementation of the signals on the DB15 male plug of the breakout cable.
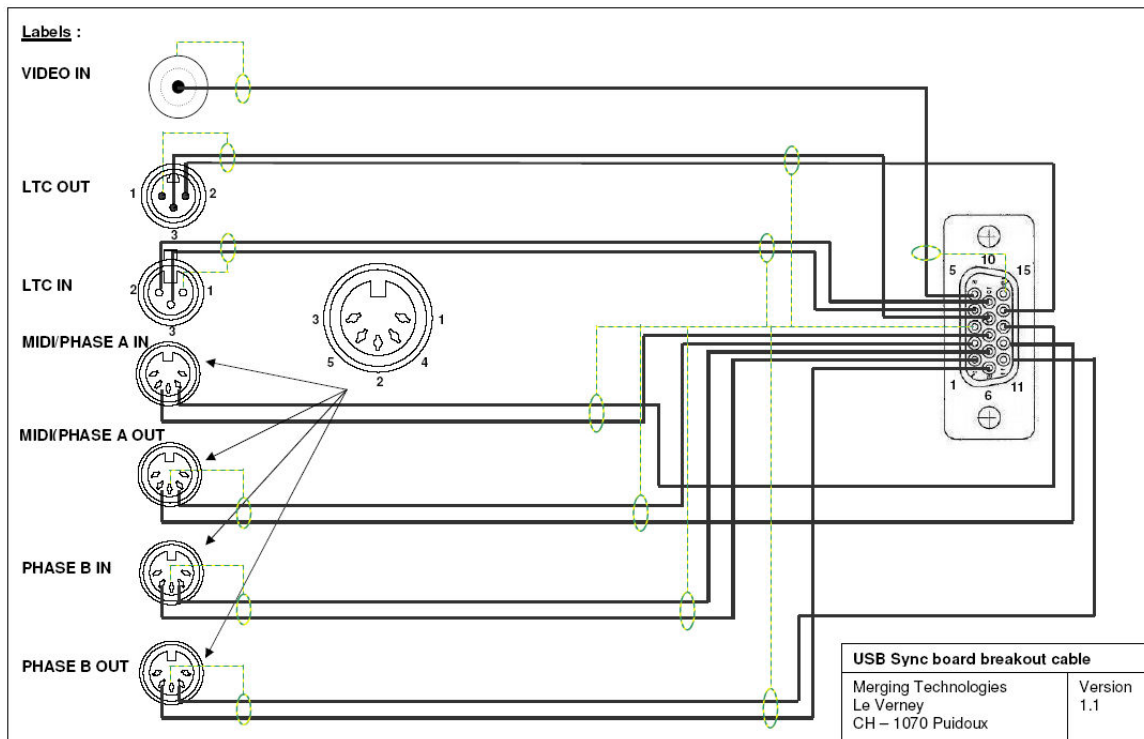

Figure 4 - Breakout cable pin-out

8 Video reference input

This input accepts a composite PAL/NTSC or Tri-level HDTV video signal that can be used by the USB Sync board to generate LTC or Bi-phase signals synchronous to a reference video signal. This BNC input should be used for the main "house sync" or "black-burst" reference video signal. A 75 Ohm termination can be applied on the input signal via a software configuration.

9 LTC In and Out

LTC IN is a symmetrical input signal. It accepts an external SMPTE/EBU timecode signal between 0.2 and 5 Vp-p.

LTC OUT is a symmetrical output signal. The signal generated has a maximum output level of 3.3 Vp-p.

10 RS422 communication

The DB9 connector present on the bracket of the board is a standard RS422 port. A software control enables the switch between the "To machine" and "From controller" function of the port.
The signals assigned to the pins of the DB9 differ depending on the chosen mode.
In "To machine" configuration:

- Pin 3: RX+
- pin 8: RX+
- pin 7: TX+
- pin 2: TX-

In "From controller" configuration:

- pin 3: TX+
- pin 8: TX-
- pin 7: RX+
- pin 2: RX-

11 Bi-phase

11.1 Input

The Bi-phase input offers the capability to receive position/speed indications from another device.
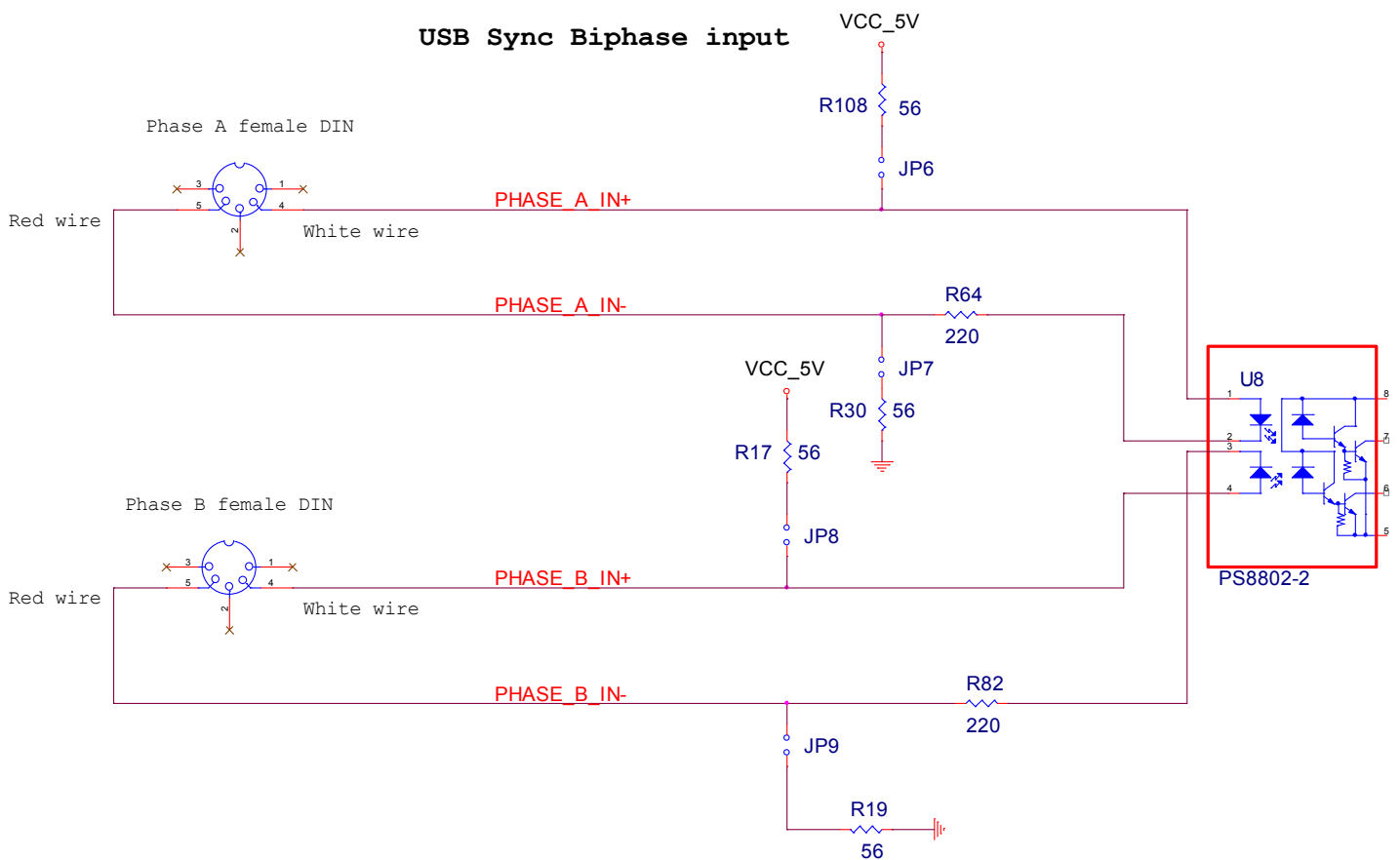

Figure 5 - Bi-phase input schematics

11.2 Output

The Bi-phase output permits to control devices that accept bi-phase signals on their input, this can typically be a 35mm projector.
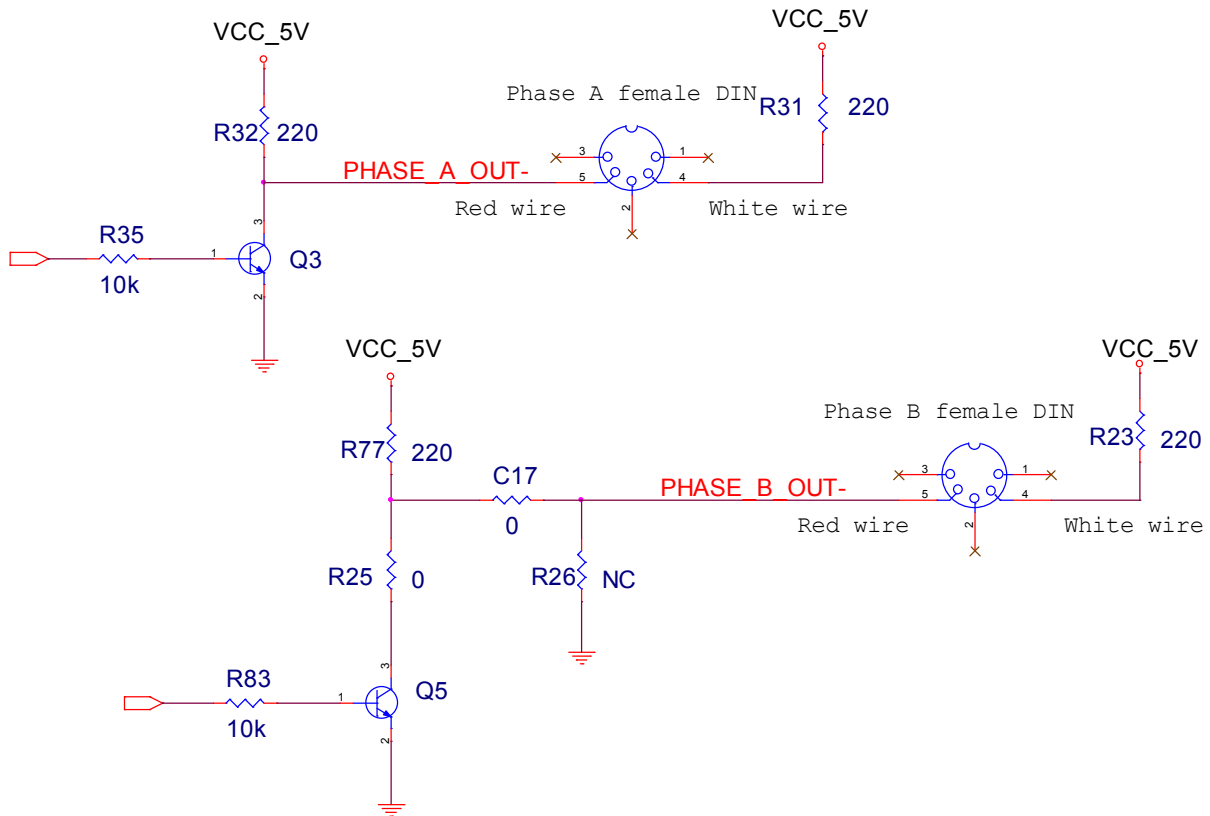
USB Sync Biphase output

Figure 6 - Bi-phase output schematics

11.3 Configuration

The Bi-phase configuration panel (depending on the application) offers the possibility to select the following settings:
- Pulse/frame: number of Bi-phase pulses per video frame [1-100]
- Min speed: minimum speed of the device, expressed in a ratio of nominal speed [1/30-1/2]
- Max speed: fastest speed allowed for the device, expressed as a multiplier of nominal speed [1-30]
- PAccn: acceleration between slowest speed and nominal speed [1(slowest acceleration)-20(fastest acceleration)]
- Accn: acceleration between nominal speed and maximum speed [1(slowest acceleration)-20(fastest acceleration)]
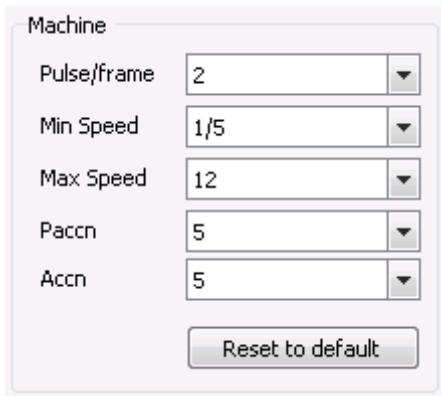
Figure 7 - Bi-phase configuration

11.4 Watchdog capability

Watchdog functionality has been implemented on the Bi-phase output of the board. This means that it is ensured that the Bi-phase stream stops properly (with an appropriate deceleration) if the software or operation system crashes or freezes. This is a kind of emergency stop that ensures that the device driven by the Bi-phase pulses is not damaged if something runs out of control.

12 MIDI port

MIDI communication between the USB Sync board and an external device is available through two DIN female connectors. The pin-out of the connectors matches standard MIDI connections.
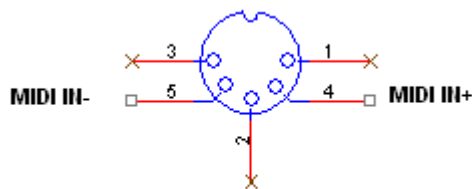
12.1 Input

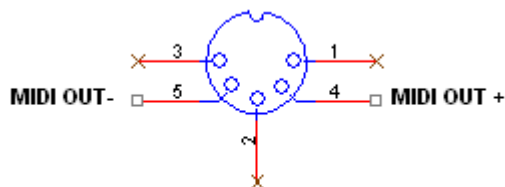**Figure 8 - MIDI input connector pin-out**

12.2 Ouput

Figure 9 - MIDI output connector pin-out

13 Control Panel

A control panel is available in the MS Windows start menu, as well as in the general control panel folder. The first tab of this application enables the user to select the configuration of each board present in the system. The configurations available are "LTC/Bi-Phase/Video+RS422" or "LTC/Video+Midi". The first one does not offer the Midi capability as it is exclusive with RS422 and Biphase, for the same reason, the second configuration does not provide Bi-phase or RS422 support.
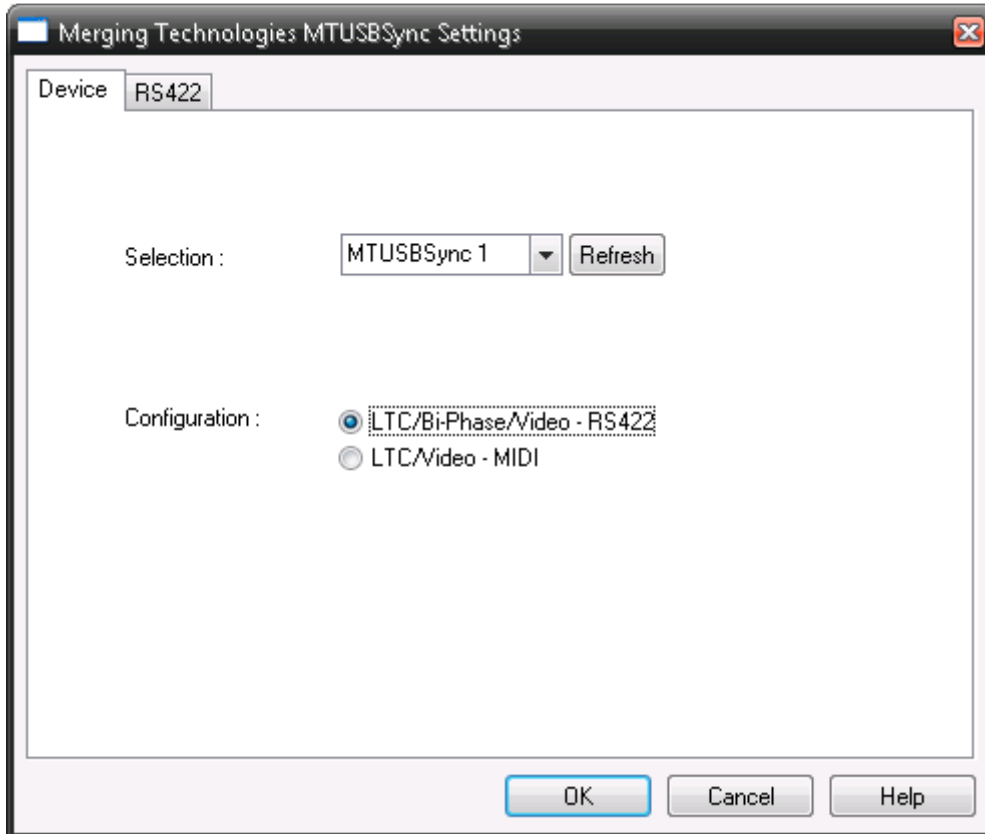

Figure 10 - Device configuration

The second tab of the control panel allows the user to select whether the RS422 port of the board is configured as "Machine control"(Master) or "Remote control"(Slave). These settings are saved in a per board basis.
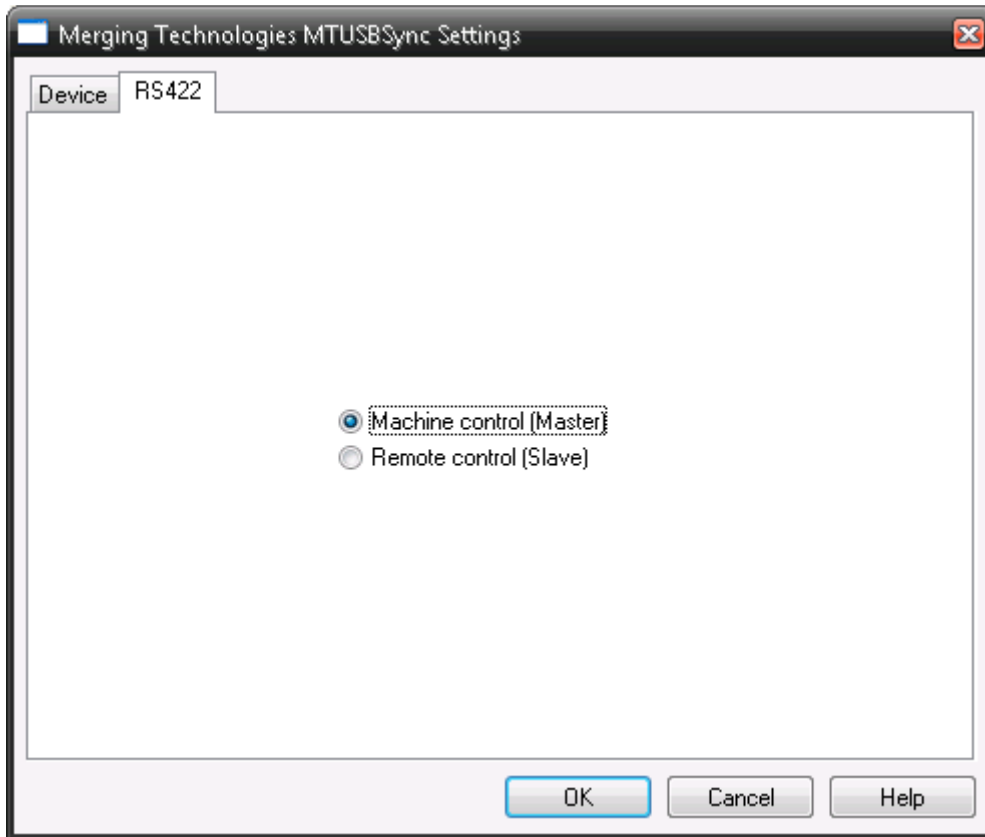

Figure 11 - RS422 settings

14 Drivers installation

Merging Technologies provides the users with an installer for the drivers of the board; please check at www.merging.com for the latest version. When installing, follow the instructions on screen. If a previous version of the drivers has already been installed, the new version will overwrite the files, there is no need to first uninstall the previous version. If a board is present in the system when installing, MS Windows might ask the user several times for confirmation, this is the normal behavior as the USB Sync board is seen as several devices by the system.

15 Some examples

15.1 Biphase input setup when connected to a generator with open-collector outputs

To be able to read the biphase output from an open-collector generator, the connection and jumpers setup suggested is the following:
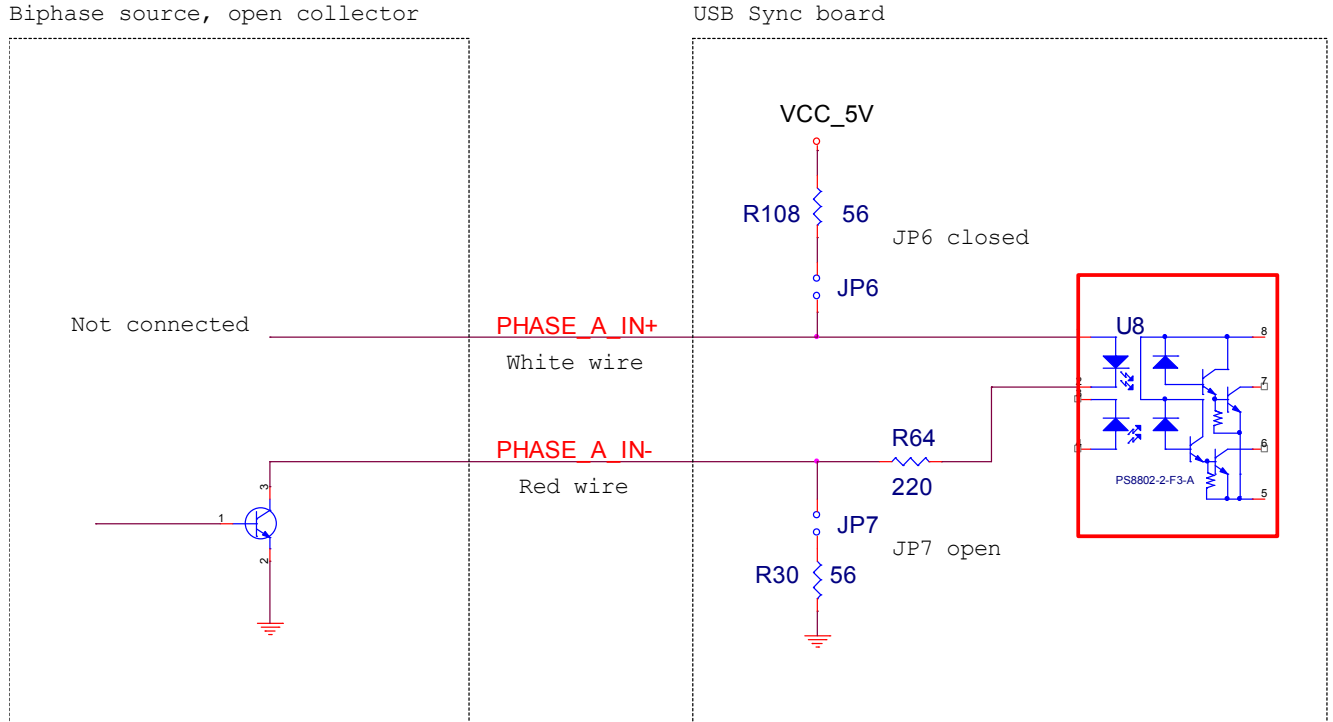

Figure 12 - Open collector output

The PHASE_A_IN+ needs to be left unconnected and PHASE_A_IN- connected to the output of the generator. Jumper JP6 has to be shorted and JP7 is to be left open. The same schematic has to be applied on the "Phase B" signal (JP8 shorted and JP9 open).

15.2 Setup to chase incoming Biphase at 24 frames per second, using Pyramix with a project at 25 frames per second

This example shows how to configure a Pyramix system to chase an incoming biphase signal at 24 frames per second, the Pyramix being configured with 25 frames per seconds.

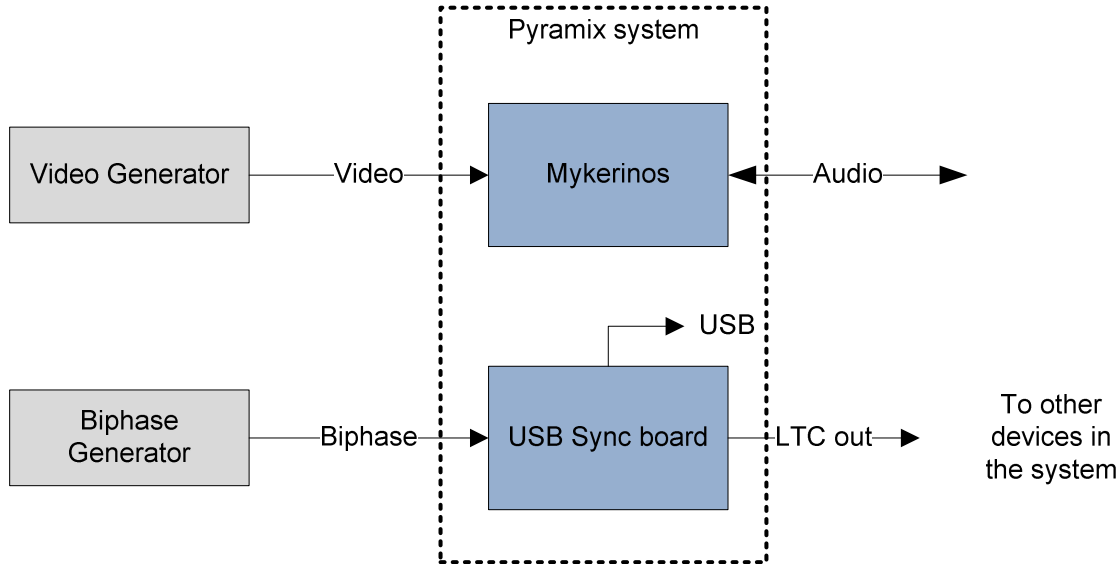A typical setup would look like this:

Figure 13 - Setup

The only required connections are the video input signal to the Mykerinos board and the biphase input to the USB Sync board.

In Pyramix, the user has to instantiate a new machine using the "Add" in the "Remote Control / Machine" section of the general settings. Enter a name for the machine and select "USBSync" as driver.
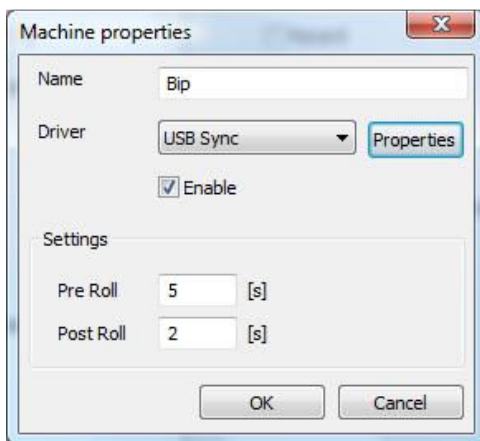

Figure 14 - Machine properties

The properties of this machine have to be edited. First select the device to be used, and select "Bi-phase In - External" as mode. The LTC field should be set to "25 Frm/s" and the Bi-Phase field to "24 Frm/s". Select the "Pulse/frame" value according to the device that is connected to the Biphase input of the USB Sync board (a minimum of 4 pulses per frame is required in this mode).
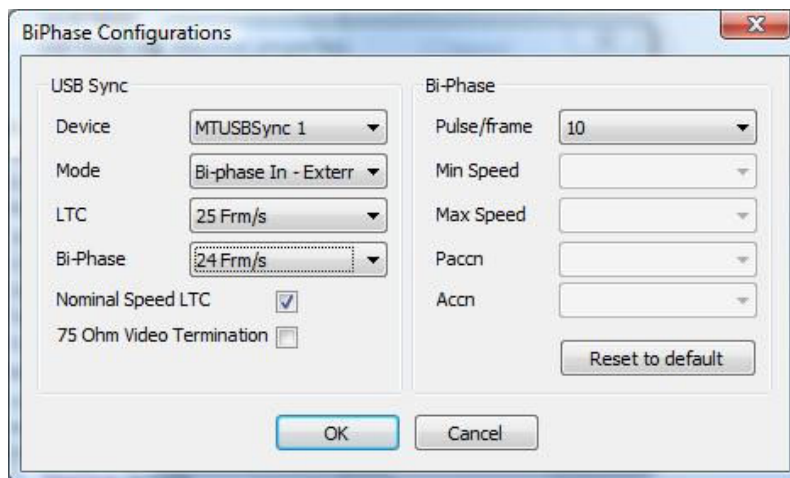

Figure 15 - Configuration of the machine

Set Pyramix to have the Audio sync source set to "Video" and the TC sync to source to "Video" as well. Set the "TC Frame Rate" to "25 Frm/s" and select the "Video Format" according to the video signal that is fed into the Mykerinos board (for example "SD - PAL").

The Transport windows of Pyramix should be set up as follow:
  o The TC master of the "Internal" machine should be set to the USB Sync machine newly created
  o The TC Master of the USB Sync machine should be set to "Internal"
  o The "Ctrl" button of the USB Sync machine should be active, to receive all keyboard inputs from the user
  o The "Chase" button of the Internal machine should be active for Pyramix to chase the incoming Biphase signal

Figure 16 - Transport section of Pyramix

15.3 Setup to generate Biphase at 24 frames per second when using a project at 25 frames per second

This example shows how to configure a Pyramix system to generate a Biphase signal at 24 frames per second, to drive a film projector, when the Pyramix is configured with 25 frames per seconds.
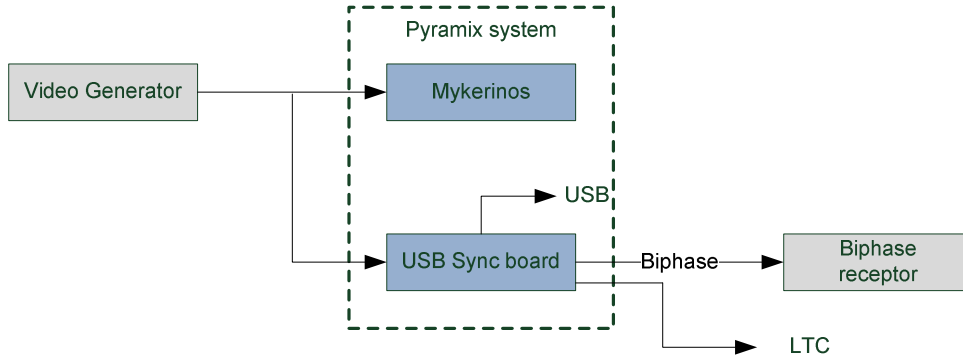
A typical setup would look like this:

Figure 17 – Setup

The Video input connection to the USB Sync board is **mandatory** for this setup.

In Pyramix, the user has to instantiate a new machine, using the "USBSync" driver. The properties of the newly created machine have to be edited; the mode should be set to "Biphase Out - Video"; the LTC frame rate is "25 frm/s" and Biphase frame rate has to be set to "24 frm/s". The other parameters have to be set according to the device connected to the Biphase output.

In the Transport windows of Pyramix, the TC Master of the USB Sync machine should be set to "Internal", so that is would follow Pyramix. The "Chase" button should also be activated, now the Biphase output of the system follows Pyramix's cursor, with 24 frames per seconds.

16 Contacting Merging Technologies

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For all documentation inquiries or suggestions for improvement: www.merging.com