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LYYN Hawk Board  
LYYN Hawk Integration Kit  
Manual  
2011-03-09

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# I. The Hawk board at a glance

## I.1. Description

The Hawk board products are real-time visibility enhancers intended for applications in CCTV and underwater surveillance and monitoring. The LYYN plug-n-play products improve visibility in real-time video, reducing the effects of fog, snow, rain, dust, turbid waters as well as lowlight.

The **Hawk board** product comes with

- Hawk PCB board
- Control panel with short ribbon cable
- Connector card
- Long ribbon cable with connectors
- Power connector mating contact

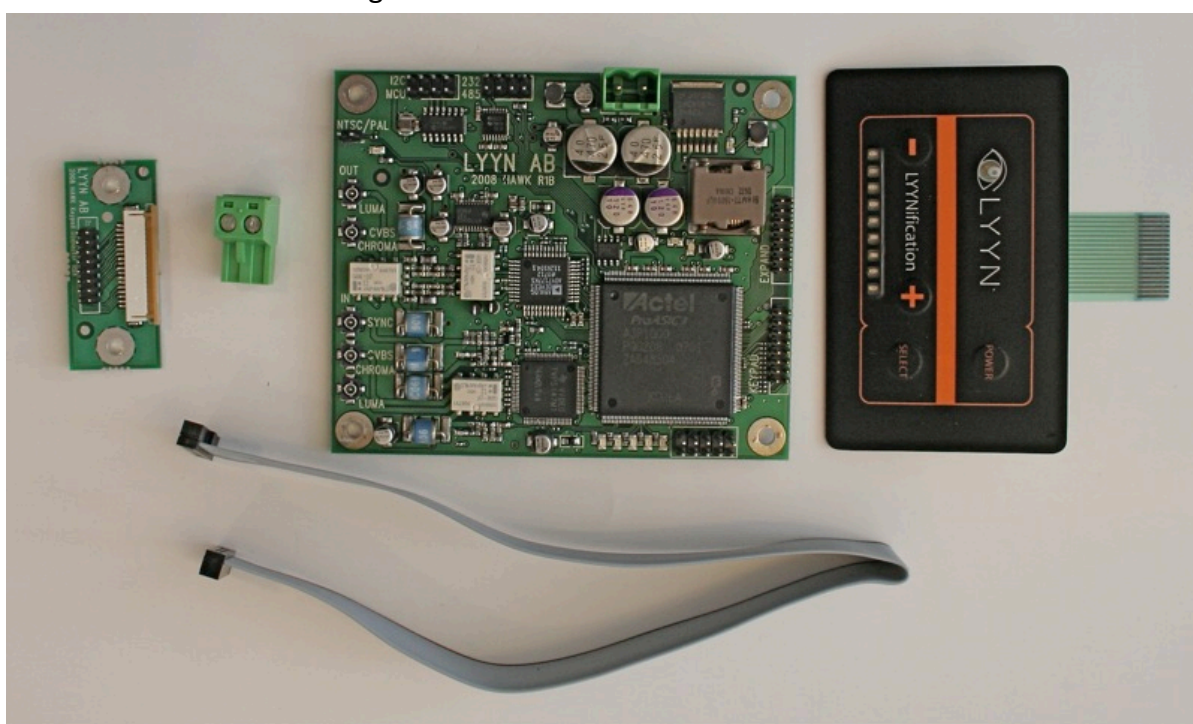


Figure 1. The Hawk board

In addition, the **Hawk Integration Kit** includes

- BNC card
- Cable assembly to connect BNC card and Hawk PCB

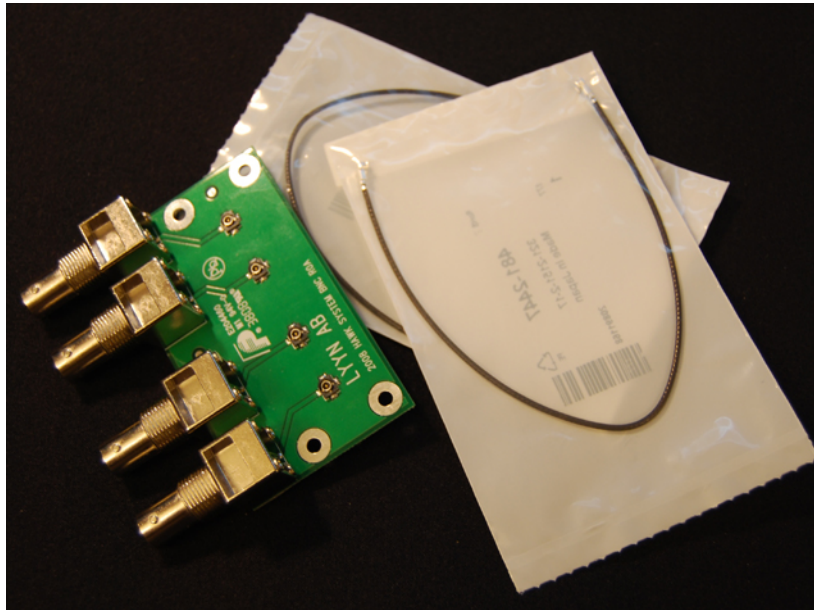


Figure 2. Additional material in Hawk Integration Kit

## 1.2. Hawk features

- Input
  - PAL or NTSC video, autosensing
  - S-Video or composite video
  - External sync input, so called
- Output
  - PAL or NTSC. The video output standard is the same as the input
  - S-Video or composite video
  - Selectable video passthrough
- Control
  - Degree of lynnification™. Either with included control panel or programmatically over RS-232 or RS-485.
  - Size and position of lynnification window
  - Contrast, brightness, sharpness, hue and saturation of output video
  - Video synchronization, *external* or based on video signal input
  - *TBC functionality, controllable output video delay*

Features in *italics* are not available in all versions of the Hawk PCB.

The video processing algorithms in the Hawk board products optimize the video to *reveal* information and features not visible in the original video. The lynnification process is optimized to improve visibility and human image interpretation, which may adversely affect the aesthetic appearance of the image.

The lynnification process cannot recreate information that is not present in the original video signal. If the source video is highly compressed, e.g. MP4/MPEG-2/H.264, a significant amount of the information, in the original video image captured by the imaging sensor, which is required by the LYNN algorithms, will have been removed. The use of compression algorithms can thus limit the perceived usefulness of the Hawk.

The degree of enhancement achievable through lynnification depends on the input image quality. When the input video has low levels of visual disturbance the Hawk will make the image slightly clearer, similar to replacing poor optics with better. At larger degrees of lynnification the Hawk may amplify previously invisible image noise or somewhat exaggerate some colors in the input video to make objects and details more visible.

### I.3. Documentation and intellectual property

This document is the complete Hawk product documentation. The description and specifications of this product are subject to future change without notice.

This document is intended for users capable of performing basic PC, TCP/IP network and video equipment operations.

Analysis, reverse engineering, decompiling and disassembling of the software, hardware or manuals that accompany this product, and all other related products including miscellaneous supplemental items, is prohibited

### I.4. Support information

**Address** LYYN AB  
IDEON Science Park, Scheelevägen 17  
S-223 70 Lund  
Sweden

**Contact** [www.lyyn.com/support](http://www.lyyn.com/support), [support@lyyn.com](mailto:support@lyyn.com)

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## 2. Revision histories

### 2.1. Documentation revisions

Manual revision	Comment/Changes
R1.0 2008-03-28	First complete draft
R1.1 2008-04-16	First release to customers
R1.2 2008-05-08	Minor corrections
R1.3 2008-05-19	Minor corrections
R1.4 2008-05-20	Minor corrections and correct RS485 info, i.e. RS485 not implemented
R1.5 2008-09-23	Current version. Released for HW 1C with RS485 support and new panel button functionality
R1.6 2008-10-06	Updated revision history due to new SW revisions
R1.7 2008-10-22	Added missing information about flow control for RS232/RS485 connections
R2.0 2008-10-30	Revised HW and SW revision information, merged manual versions for the HW branches
R3.0 2009-02-19	Revised document structure. Added information related to new product(s)
R3.1 2009-03-09	Changed formatting and made small corrections
R3.2 2009-06-18	Added missing commands in command reference
R4.0 2010-06-08	Added documentation about inverse lynnification selection window
R4.1 2010-08-30	Revised outline of document and command table
R4.2 2010-11-23	Added info on REST command
2011-03-09	Updates after latest software revisions

### 2.2. Hardware & Software revisions

There are 2 hardware versions of the Hawk board

- **R1B hardware.** This is the original Hawk hardware **without RS-485 support.**
- **R1C and R1D hardware.** Improved Hawk hardware version **with RS-485 support.**

	FPGA version	PIC version
Current SW for R1B hardware	2009-02-11	2009-02-11
Current SW for R1C hardware	2009-02-05	2009-02-11
Current SW for R1D hardware	2011-02-17 or 2011-03-06	2010-12-13



# 3. Controlling the Hawk board

## 3.1. Overview

The Hawk board can be controlled with

The membrane keypad panel

or

Serial communication via RS-232 or RS-485

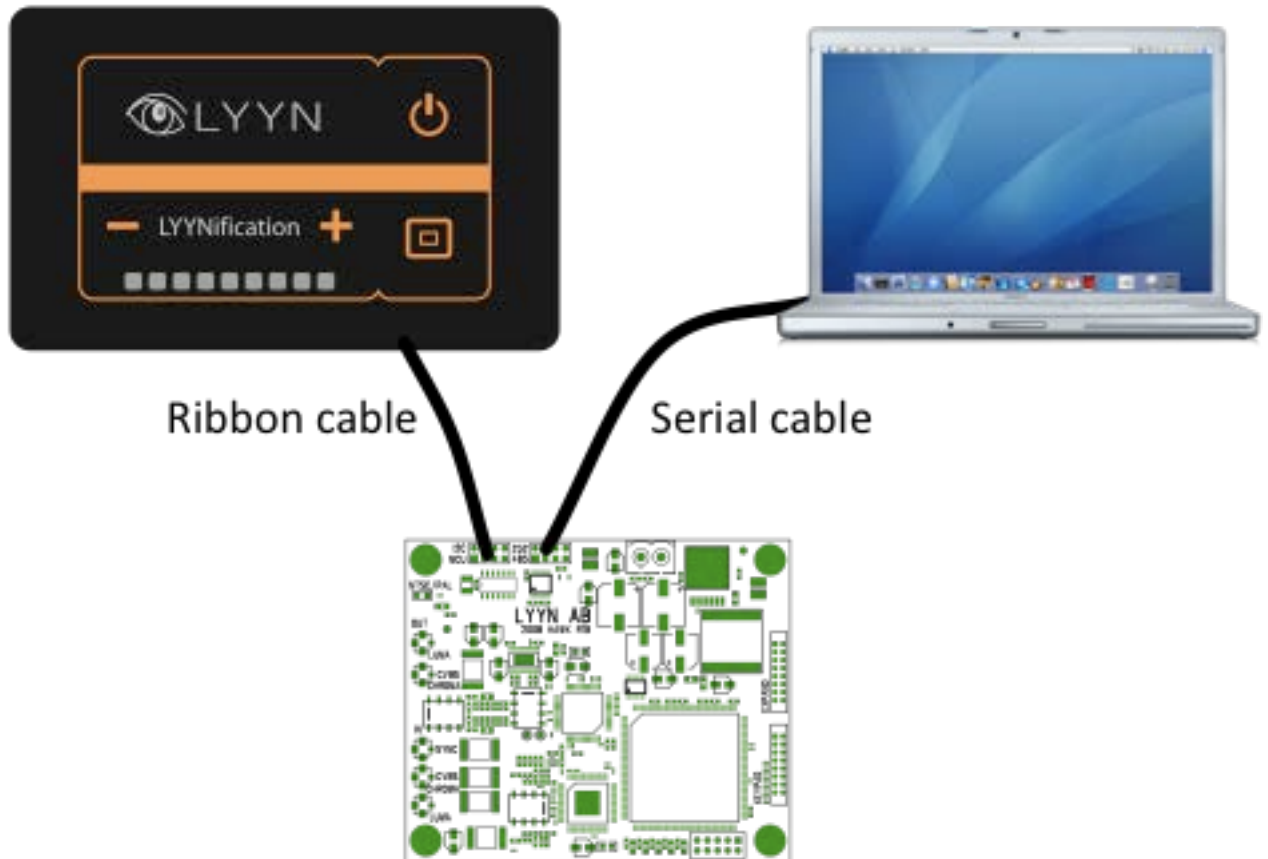


Figure 3. Controlling the Hawk board

Many modern PCs do not have an RS232 port, in which case a USB to serial converter will be required. The applications/commands mentioned below are only suggestions.

Table 1. Operating systems and communications & control alternatives

Operating system	Recommended application	Communication parameter settings
Windows XP	Putty	9600 bps
Windows Vista	<a href="http://www.chiark.greenend.org.uk/~sgtatham/putty/">http://www.chiark.greenend.org.uk/~sgtatham/putty/</a>	8 data bits, 1 stop bit
Mac OS X	QuickTerm, CoolTerm	No parity or flow control ASCII text based communication protocol. At least 100 ms recommended delay between commands. <b>Do not use local echo.</b>

The Hawk board sends a carriage-return line-feed combination after the response text; your communication program might show an empty line after a command response.

There is no prioritization between keypad and serial port, i.e. the latest command overrides previous ones. All settings are retained when the power is turned off. **Note:** factory default settings are used the first time the unit is powered up.

## 3.2. Important notes

### **The DC power input is not polarity protected.**

Please take care to check the polarity of your power source before connecting it to the Hawk board.

The Hawk can switch between composite and S-video, it cannot convert PAL to NTSC or vice-versa. The first time a Hawk board is powered, and after a REST command, it selects composite NTSC output.

## 3.3. Keypad functionality

A thin “membrane” keypad panel is supplied with the Hawk board. It can be mounted on a flat surface with the adhesive backing. If the application requires a watertight seal we recommend extra sealant. The panel is connected to the HAWK BOARD with a flat cable (included) and there are 4 buttons on the panel.

### 3.4. Keypad introduced mid 2010

A new keypad was introduced in mid 2010. The physical size, the symbols and the placement of LED indicators have been changed.

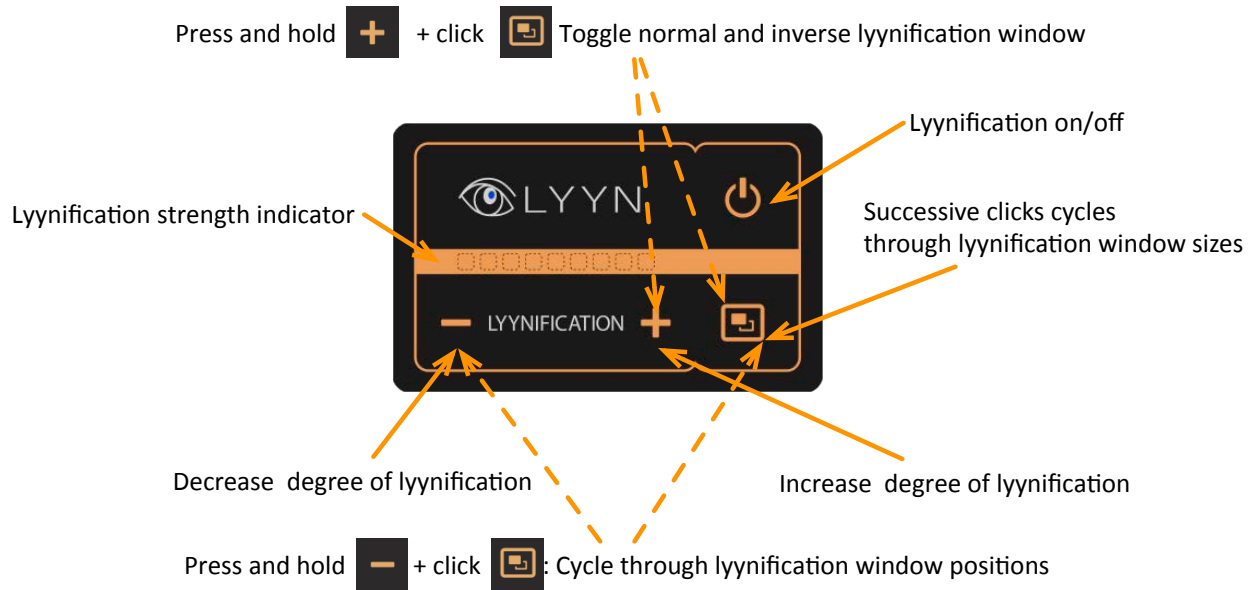


Figure 4. Keypad (mid 2010) functionality

Table 2. Keypad (mid 2010) functionality

Button	Function
	Lynnification on/off. Lynnification OFF = analog bypass
	Successive clicks cycle through lynnification window sizes
	Click to decrease degree of lynnification
	Click to increase degree of lynnification
Press and hold  + click	Cycle through lynnification window positions
Press and hold  + click	Switch between normal and inverse selection rectangle. Available from SW rev 20100607

### 3.5. Original keypad

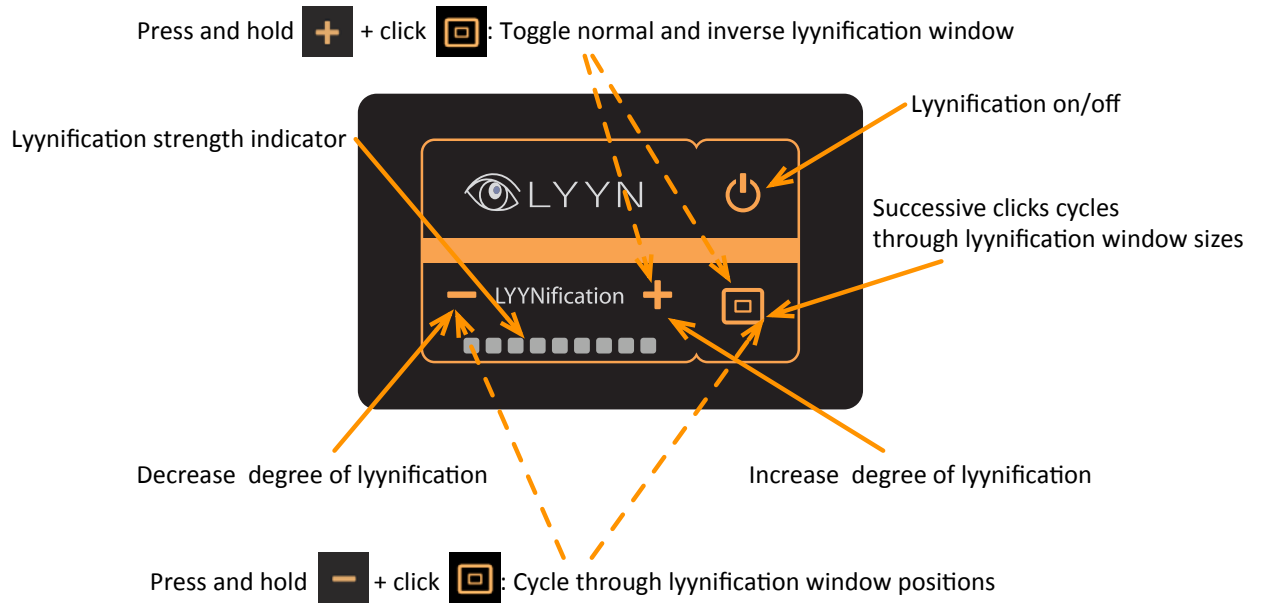


Figure 5. Keypad functionality

Table 3. Keypad functionality

Button	Function
<b>⏻</b>	Lynnification on/off. Lynnification OFF = analog bypass
<b>□</b>	Successive clicks cycle through lynnification window sizes
<b>-</b>	Click to decrease degree of lynnification
<b>+</b>	Click to increase degree of lynnification
Press and hold <b>-</b> + click <b>□</b>	Cycle through lynnification window positions
Press and hold <b>+</b> + click <b>□</b>	Switch between normal and inverse selection rectangle. Available from SW rev 20100607

### 3.6. Definition of the position and size of the lynnification window

The numerical values of the POSN setting corresponds to the positions illustrated below. Positions 0 (zero) and 5 are both located at the center.

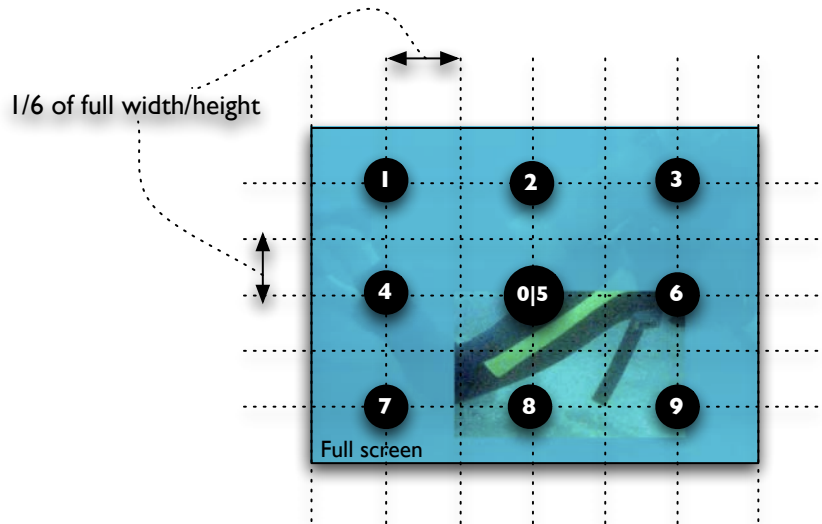


Figure 6. Position setting

The numerical values of the SIZE setting corresponds to the following percentages of the full screen.

Table 4. SIZE and POSN values

Setting	Width	Height	Area
0	100 %	100 %	100 %
1	90 %	90 %	81 %
2	80 %	80 %	64 %
3	70 %	70 %	49 %
4	60 %	60 %	36 %
5	50 %	50 %	25 %
6	40 %	40 %	16 %
7	30 %	30 %	9 %
8	20 %	20 %	4 %
9	10 %	10 %	1 %

Some example of size and position settings are illustrated below

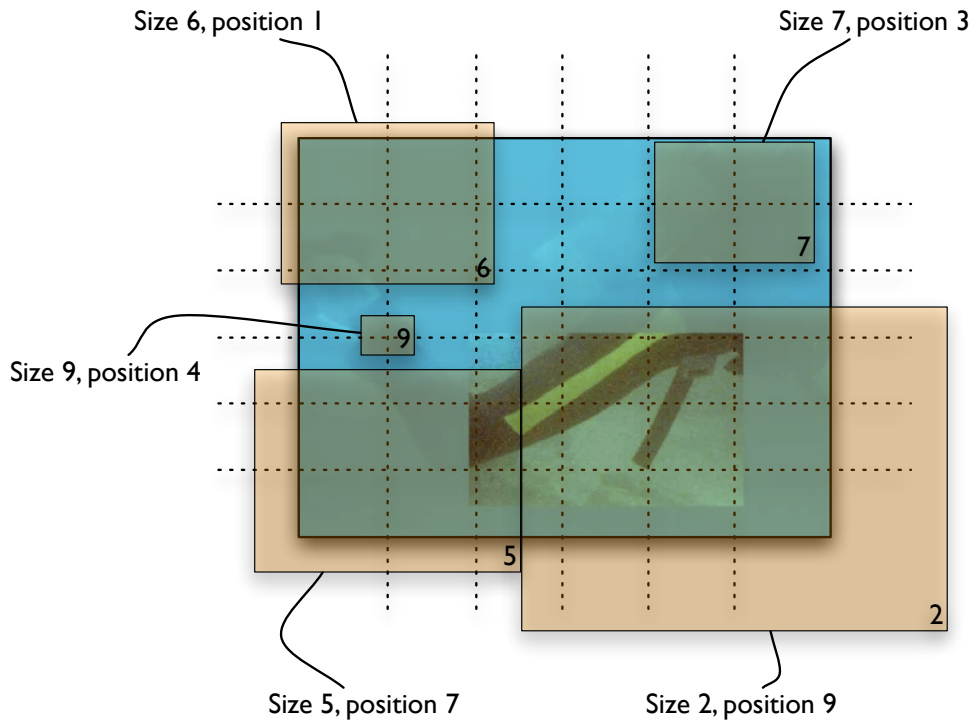


Figure 7. Position & size of a selected image area

### 3.7. Inverted lynnification window

Hawk boards with SW versions from 20100607 for both FPGA and PIC have an inverted window possibility. The inverted state is set with 2-button keypad functionality or with the command INVE.

An inverted lynnification window means that the image area outside a specific rectangle is processed. The inverted window settings are typically useful for in-pipe video images.

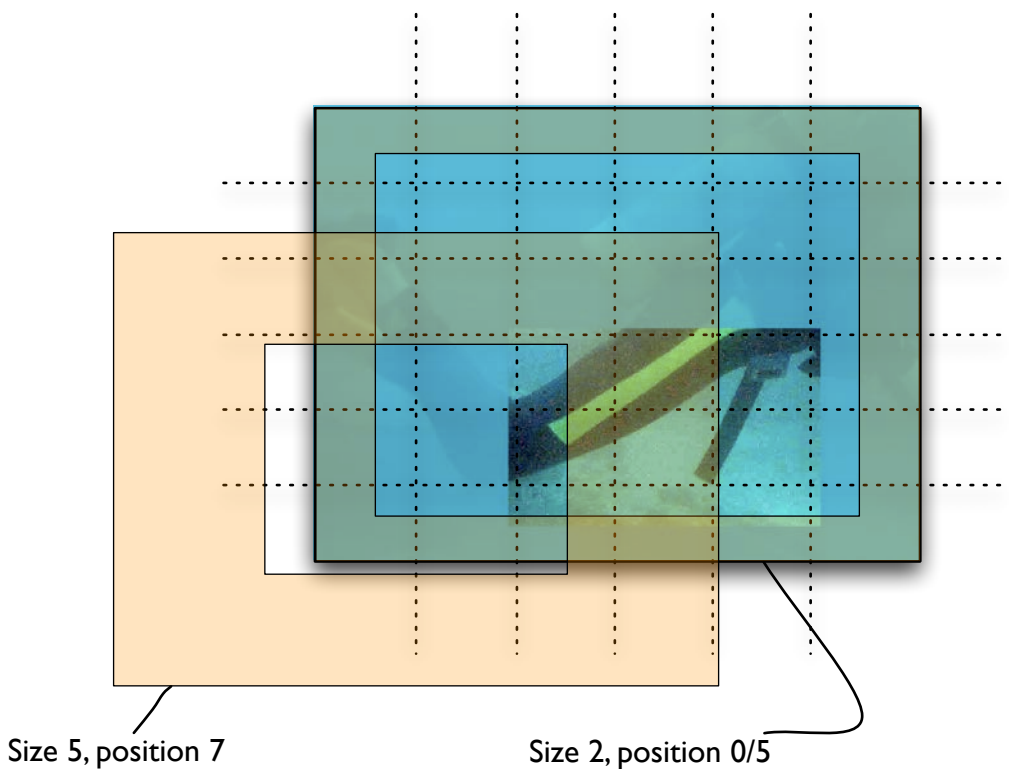


Figure 8. Position & size of an inverted lynnification window

## 4. Serial control commands

### 4.1. Command summary

Each command consists of a 4-character command name followed by a question mark (?), 1-3 digits or nothing. A question mark indicates a query concerning the current value of the specified command; digits indicate the setting of a command. A command is terminated/sent by pressing the Return/Enter key denoted <cr> below.

#### 4.1.1. Serial port responses

- There is no prompt character.
- The response to a parameter change command is a LFCR followed by parameter value followed by a LFCR.
- The response to a query command is a LFCR followed by parameter value followed by a LFCR.
- The normal power up serial port output is `LYYN . . . Mem OK`
- The serial port output after a REST command or at initial power up is `LYYN . . . Mem OK`

### 4.2. Serial examples

Table 5. Serial examples

Command	Meaning and/or expected response
LYYN3<cr>	Set the degree of lynnification to 3 for the selected channel
BRIG?<cr>	Retrieve the current brightness setting for the selected channel
SERN?	Retrieves current serial numbers

### 4.3. Saved settings

All settings are automatically saved when the power is turned off, i.e. the last values used are retained. This applies to settings made via the serial port and using the control panel.

Note: factory default settings are used the first time the unit is powered up..

### 4.4. Control panel command/setting vs. serial command/settings

There is no difference in priority between a setting made with the control panel and one made via a serial interface. The lynnification display LEDs, for example, will thus reflect the most recent value of the degree of lynnification regardless of whether it was set via the control panel or the serial port.

### 4.5. Default values and ranges of parameter settings

Table 6. Default values and ranges

Setting/command	Default	Comment	Range
Color standard	NTSC	Controlled by jumper setting internally. Only applicable at first power-on and after reset.	N.A
BRIG	128	128 = no modification	0 – 255
BYPA	0	lynnification on	0 – 1
CHUE	128	128 = no modification of color hue	0 – 255
CONT	128	128 = no modification of contrast	0 – 255
LYYN	0	Zero lynnification	0 – 9
OUTP	0	Auto switching	0 - 2
POSN	0	Center position of lynnification window	0 - 9
SATU	128	Color saturation	0 – 255

SHRP	0	0 = no modification of sharpness	0 – 3
SIZE	0	Size of lynnification window = full screen	0 – 9
SYNC	0	Synchronized by incoming video signal, maximum delay approx. 140 $\mu$ s	0 - 1
TEST	0	Test image shown if there is no input signal	0 - 2
TOPL	4	This has been found to be a suitable value	0 – 30

## 4.6. Troubleshooting

Test image visible: If a test image is visible on the output you have either lost your input signal or the input signal quality has been severely degraded.

Dark/black image visible: This might depend on the use of an external sync signal. Use of a TBC might correct the problem.

Black & white image visible: Check that you are using the right combination of composite or S-video connections.

Symptom	Remedy
The test image is shown	If a test image is shown at the output there is no input signal, or the quality of the input signal is too low to be lynnified.
The output image is dark or black	This may be due to the use of an external sync signal. Using a TBC may correct the problem.
The output image is in black & white	Check that you are using the right combination of composite or S-video connections.

Please point your browser at <http://www.lynn.com/support> for more troubleshooting tips.

The Hawk has professional grade components with high tolerance to different video sources and signal. However, a number of factors may affect its performance.

- The signal loss in a long cable, or a bad connection, may reduce the signal so the color burst is lost or too weak to be interpreted correctly.
- Low-quality video signals or low-quality sync signaling will result in degradation of the Hawk output or loss of the output video.
- In a large system setup, i.e. multiple sources and one viewing station, it is advantageous if a common time base is used.



# 5. Kit illustrations

## 5.1. Main board

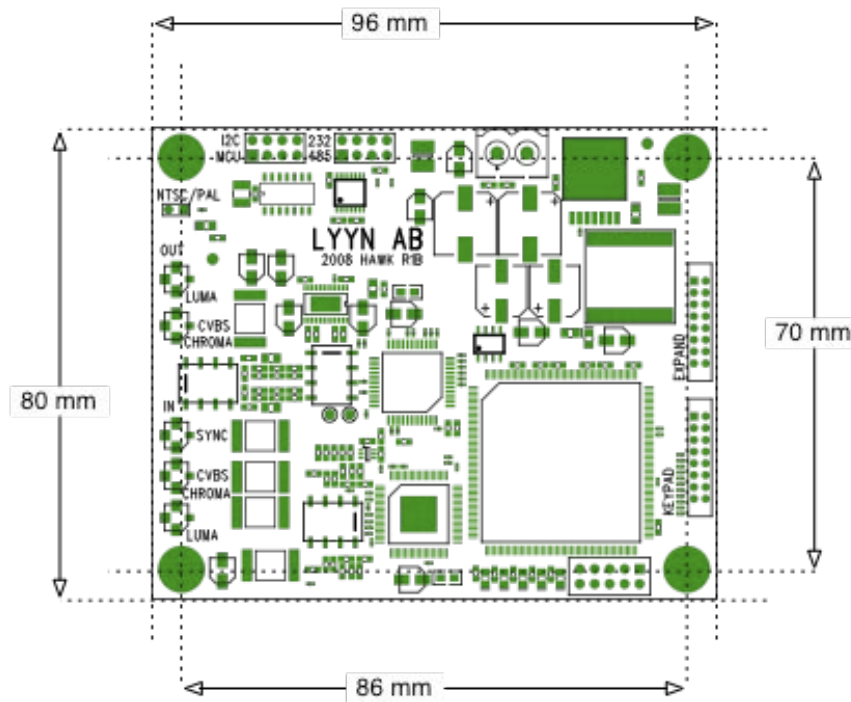


Figure 9. Hawk board illustration (not to scale)

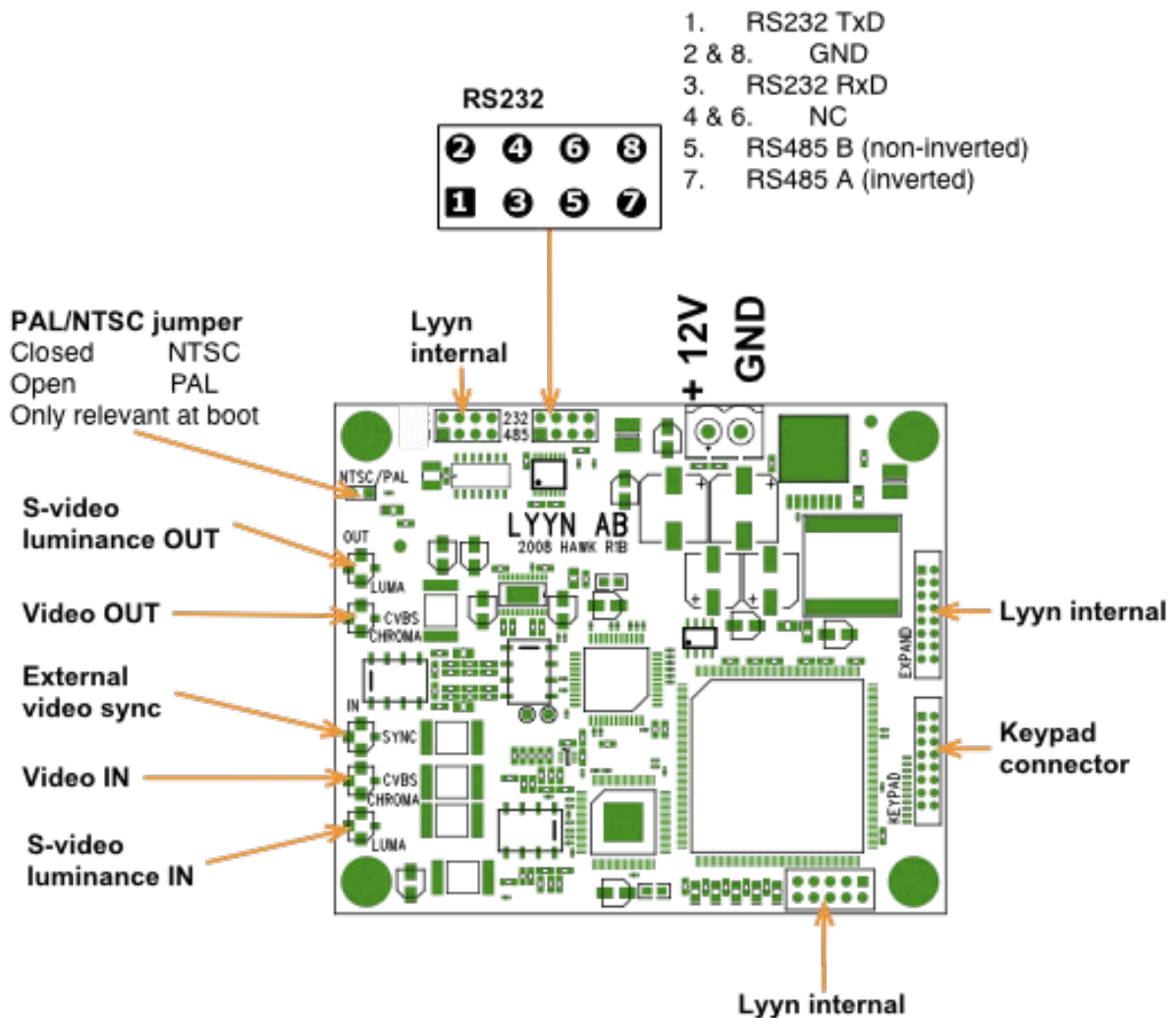


Figure 10. Hawk board layout (not to scale)

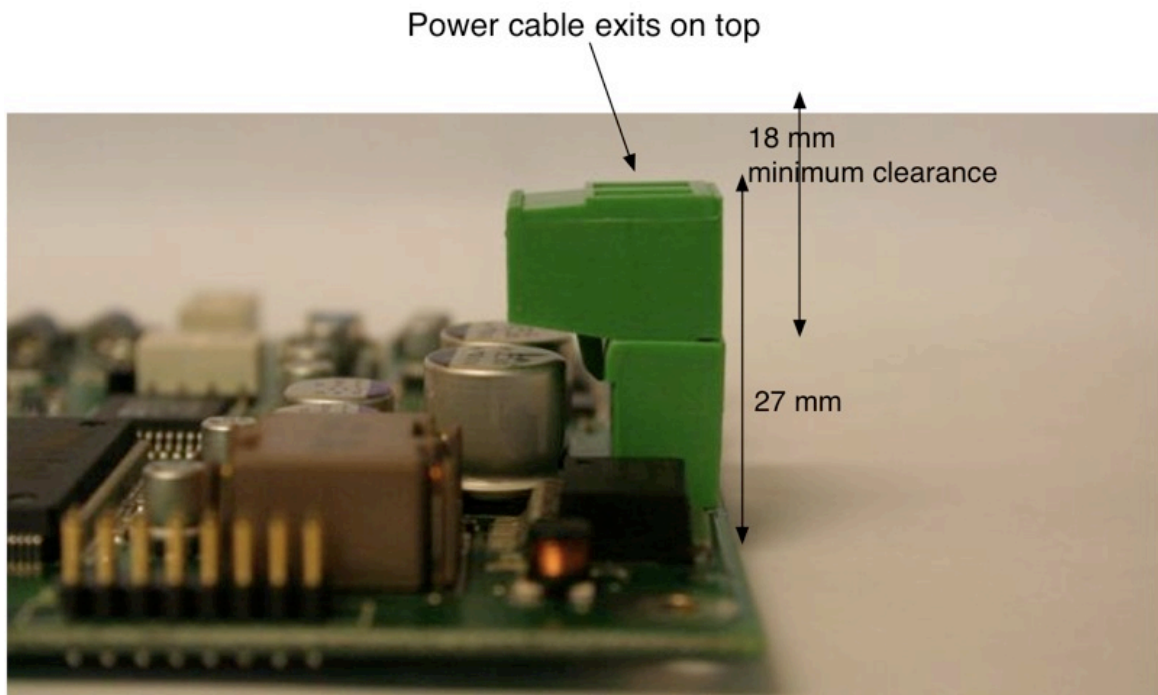


Figure 11. Detail of power supply connector

## 5.2. Main board ribbon cable connection

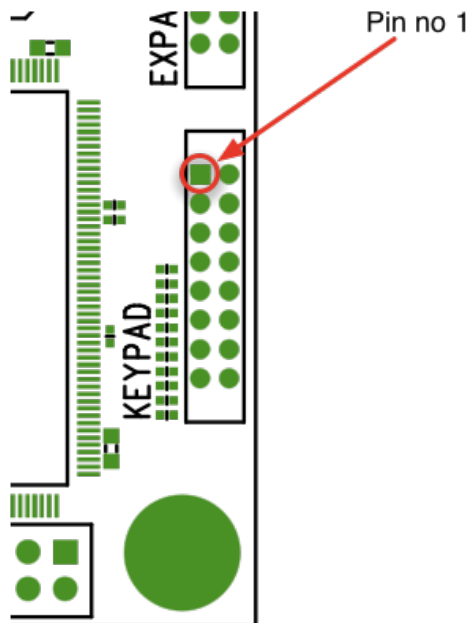


Figure 12. Location of PIN no 1 on keypad connector

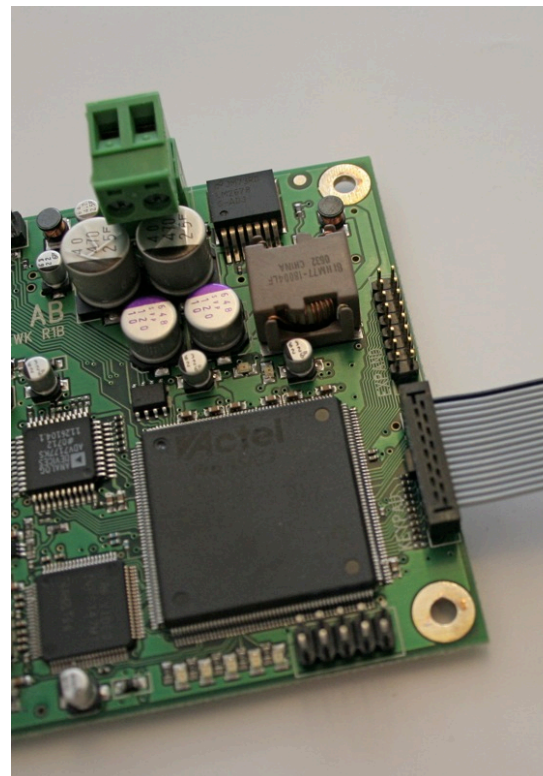
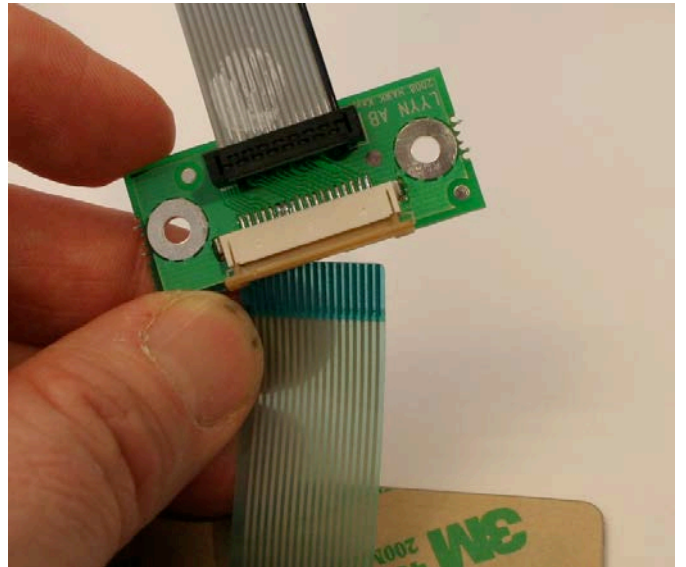
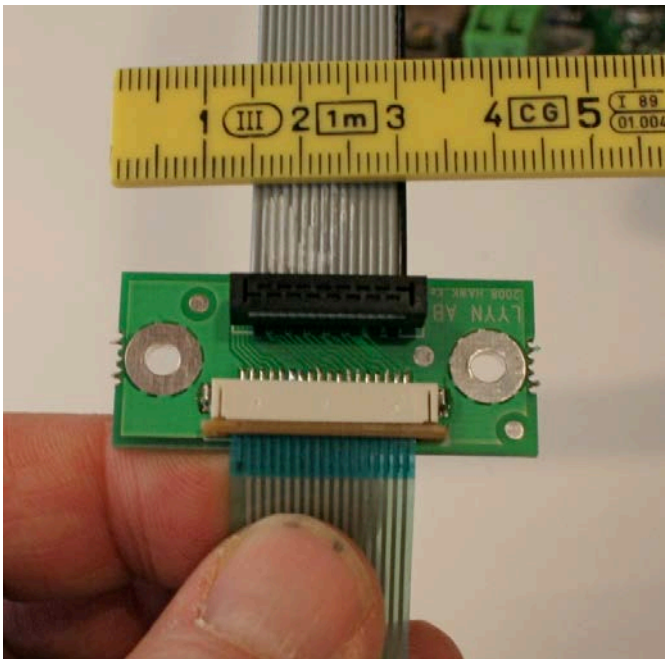
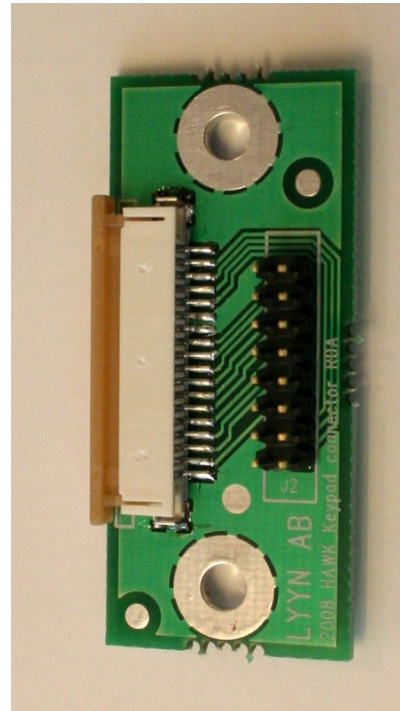
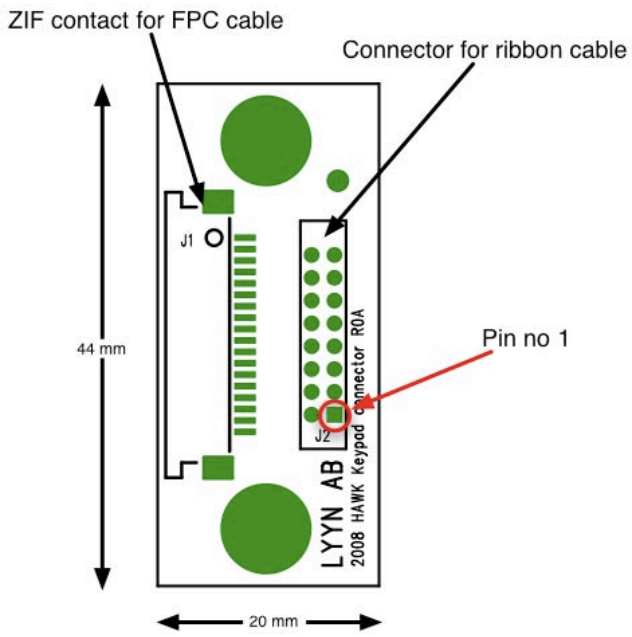


Figure 13. Hawk board with attached ribbon cable

The length of the illustrated ribbon cable, between connector board and main board is 300 mm (12 inches). The cable edge marked with black should be positioned towards pin 1 (see above and kit illustrations).

### 5.3. Connector board



### 5.4. Control panel

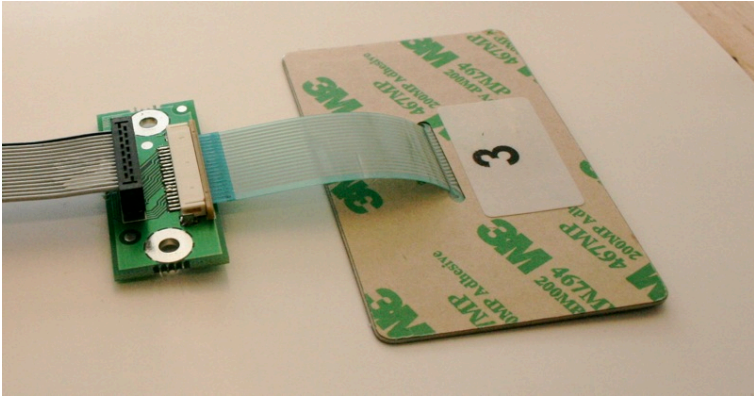


Figure 14. Control panel, FPC cable and ribbon cable “bottom”

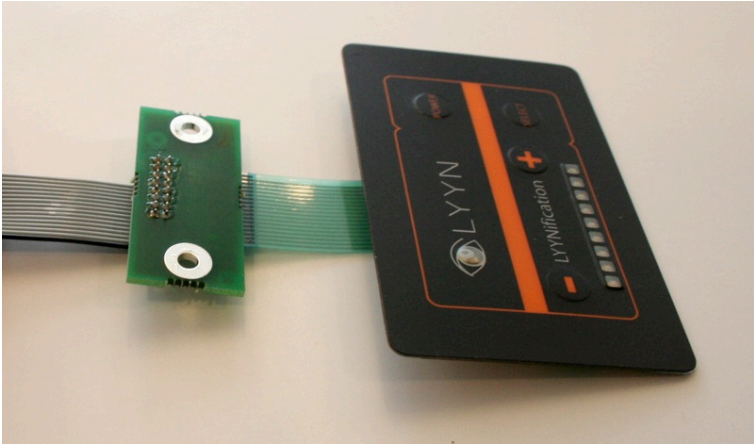


Figure 15. Control panel, FPC cable and ribbon cable “top”

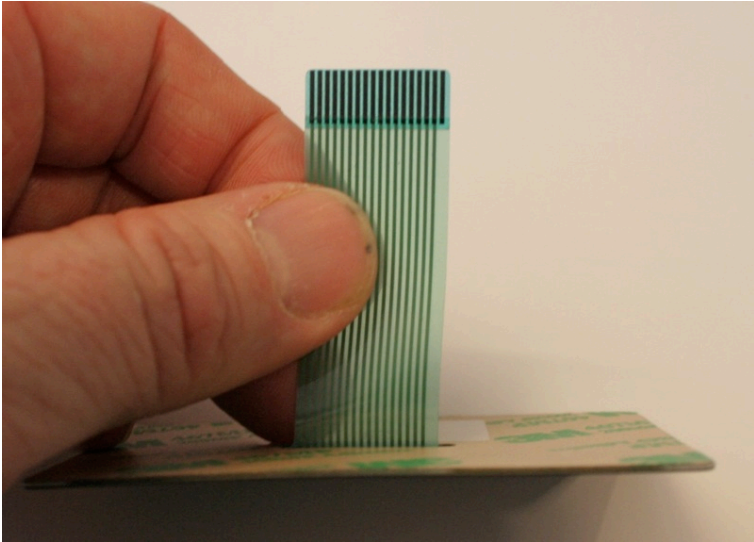


Figure 16. FPC cable on control panel

The length of the FPC cable that connects the connector board and the control panel is 50 mm.

# 5.5. Assembly

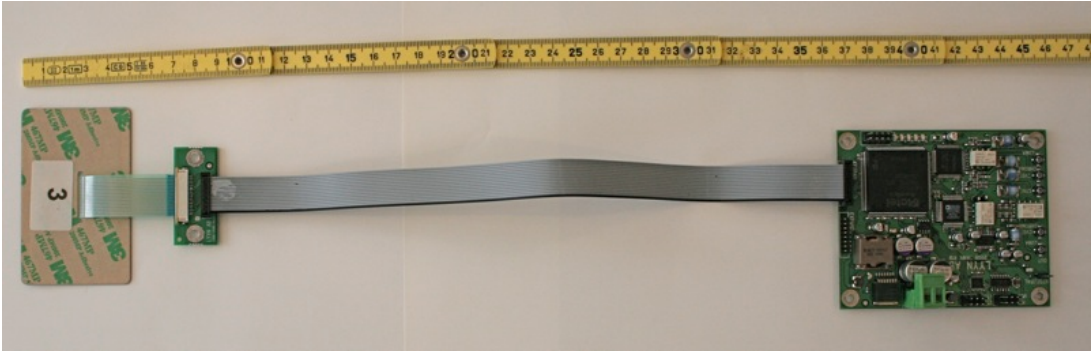


Figure 17. Assembled kit with length indication

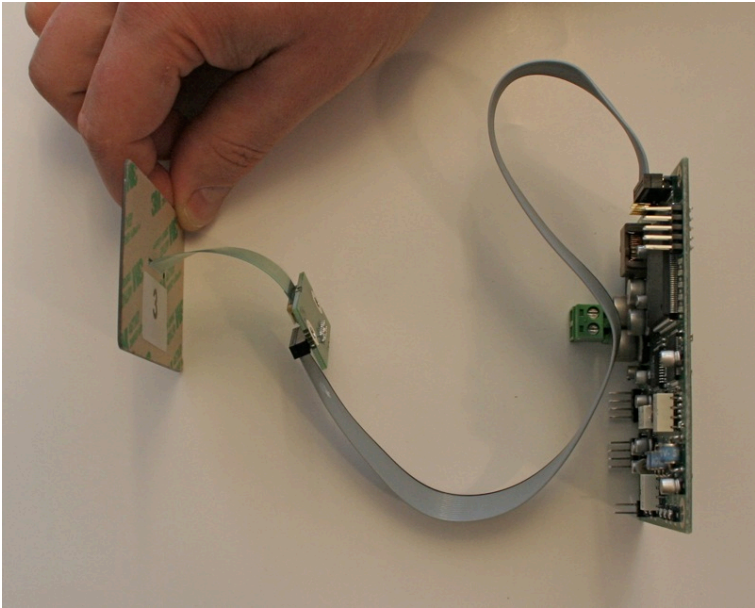


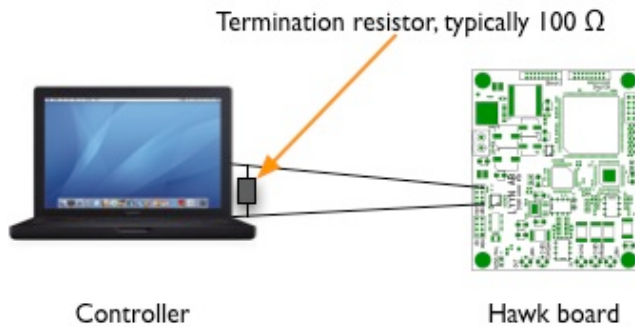
Figure 18. "Folded" assembled kit

## 6. Miscellaneous

### 6.1. RS485

RS485 support is only available from HW revision 1C and FPGA SW revisions dated later than 20080923 (inclusive). Use the SERN command to check your board revision.

The following illustration shows a typical RS485 setup.



#### Requirements

HW revision: 1C or later

FPGA revision: 20080916 or later

PIC revision: 20080923 or later

#### Constraints

Only 1 (one) Hawk board per bus since the Hawk boards cannot be addressed.

The Hawk board does not work in multi-drop setups due to the use of echo in terminal communications.

#### Termination

The Hawk board includes a termination resistance => no external resistor is needed if the end unit is a Hawk.

*RS485 connection*

## 6.2. Video signal cables

What	Use for	Manufacturer info	Where can I buy it
Micro coax contact for video cable mounting	Make your own video cable	H.FL coaxial connector series HiRose 331-0506-2 00 <a href="http://www.hirose-connectors.com/connectors/H204ProductList.aspx?c1=H.FL&amp;c3=3">http://www.hirose-connectors.com/connectors/H204ProductList.aspx?c1=H.FL&amp;c3=3</a>	
PCB mounted micro coax contact	Make your own PCB with micro coax	HiRose 331-0521-6 01 <a href="http://www.hirose-connectors.com/connectors/H204ProductList.aspx?c1=H.FL&amp;c3=3">http://www.hirose-connectors.com/connectors/H204ProductList.aspx?c1=H.FL&amp;c3=3</a> <a href="http://www.farnell.com">www.farnell.com</a>	<a href="http://www.digikey.com">www.digikey.com</a> <a href="http://www.farnell.com">www.farnell.com</a> Farnell part no 3908100
Cable assembly	Adapt to your cabling needs	HiRose unknown Hirose part no	<a href="http://www.digikey.com">www.digikey.com</a> DigiKey part no H5018-ND or H5019-ND <a href="http://www.farnell.com">www.farnell.com</a> Farnell part no 3908124

**HiRose** product info [http://www.hirose.co.jp/cataloge\\_hp/e33105047.pdf](http://www.hirose.co.jp/cataloge_hp/e33105047.pdf), [http://www.hirose-connectors.com/products/H.FL\\_5.htm](http://www.hirose-connectors.com/products/H.FL_5.htm)

**Farnell** sells directly in Australia, Denmark, Ireland, Philippines, Spain, Austria, Finland, Israel, Poland, Sweden, Belgium, France, Italy, Portugal, Switzerland, Brazil, Germany, Malaysia, Romania, Thailand, Bulgaria, Hong Kong, The Netherlands, Russia, United Kingdom, China, Hungary, New Zealand, Singapore, United States, Czech Republic, India, Norway, Slovak Republic. Other countries may be possible.

**DigiKey** ships product to over 140 countries worldwide

No doubt there are many other vendors of HiRose contacts. At Lynn we have bought equipment from both DigiKey and Farnell.

Impedance notes: There exists some confusion regarding contact and cabling impedance on the manufacturers and supplier web-sites. Please note that the cabling is, and should, be 75Ω.

## 6.3. Video synchronization

The Hawk board has 3 video synchronization modes

1. Internal synchronization whereby the output video signal follows (= is synchronized to) the input video signal with a 140  $\mu$ s delay.
2. External synchronization whereby the output video signal follows (= is synchronized to) an synchronization signal at the external sync connector.
3. Controlled delay whereby the output video signal follows (= is synchronized to) the input video signal with a 140  $\mu$ s + a controllable number of microseconds delay.

The lynnification process is a computationally intensive process and unavoidably introduces a delay of 140  $\mu$ s (microseconds).

Controlled delay is not available on some combinations of hardware and software. See Figure 1.

### 6.3.1. SYDH & SYDL commands

The range of synchronization time delay is 0 – 20 000 microseconds thus requiring a two-byte representation. The value is given by the following expression

$$\text{SYDH}\mathbf{X} * 256 + \text{SYDL}\mathbf{Y} \mu\text{s}$$

The table below exemplifies two cases

Table 7. SYDH & SYDL examples

Time delay	Commands	Explanation
1537	SYDL1	Integer remainder of 1537/16 (1537 modulo 256) = 1
	SYDH6	Integer result of 1537/256 = 6
12049	SYDL17	Integer remainder of 12049/16 (12049 modulo 256) = 17
	SYDH47	Integer result of 12049/256 = 47

### 6.3.2. Internal sync

Sending the SYNC0 command to the selected channel sets internal synchronization. The SYDH & SYDL commands have no effect if the channel is set to internal synchronization. The total delay for internal sync mode is

$$140 \mu\text{s}$$

### 6.3.3. External sync

The Hawk board does not, by itself, support line-sync. An external sync signal must be supplied.

Sending the SYNC1 command to the board sets external synchronization. The SYND command can be used in combination with external sync thus adding a controllable additional delay to the output. The total delay for external sync mode is

$$140 + 1 \text{ full frame (40 ms for PAL and 33 ms for NTSC)} + \text{SYDH}\mathbf{X} * 256 + \text{SYDL}\mathbf{Y} \mu\text{s}$$

### 6.3.4. Controlled delay (TBC functionality)

Sending the SYNC2 command to the board sets controlled delay synchronization. The SYDH and SYDL commands can be used in combination with “controlled delay sync” thus adding a controllable delay to the output. The total delay for “controlled delay sync” mode is

$$140 + \text{SYDH}\mathbf{X} * 256 + \text{SYDL}\mathbf{Y} \mu\text{s}$$



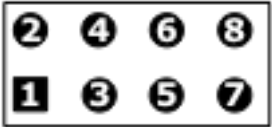
### 6.3.5. External sync waveform requirements

The Hawk board accepts a so-called VD sync signal, sometimes also called a vertical blanking, vertical sync etc. A VD signal could be a pulse with the repeat rate of 20/16.7ms ( 50/60 Hz) a pulse width of  $\approx 10 \mu\text{s}$  at 1 Vpp. A vertical blanking sync pulse from a composite video signal is perfect.

## 7. Specifications

Table 8. Specifications

<b>Video input</b>	<b>Color standard</b>	PAL 625-line standard 25 fps or NTSC 525-line standard 30 fps. Auto sensing of format. Analog Bypass when unit is powerless. Analog Bypass is also selectable through control port.
	<b>Video signal</b>	<p><b>Physical connectors:</b> Hirose H.FL-R-SMT CL331-0521-6-(01 or 10)</p> <p>Connectors used for either:</p> <p>2 connectors for Y/C (S-video), Y: 1 Vpp 75 <math>\Omega</math>, C: 0.5 Vpp 75 <math>\Omega</math></p> <p>1 connector for composite Video, 1 Vpp 75 <math>\Omega</math></p>
<b>Video output</b>	<b>Color standard</b>	PAL 625-line standard 25 fps or NTSC 525-line standard 30 fps. The video output color standard is the same as the input.
	<b>Video signal</b>	<p><b>Physical connectors:</b> Hirose H.FL-R-SMT CL331-0521-6-(01 or 10)</p> <p>Connectors used for either:</p> <p>2 connectors for Y/C (S-video), Y: 1 Vpp 75 <math>\Omega</math>, C: 0.5 Vpp 75 <math>\Omega</math></p> <p>1 connector for composite Video, 1 Vpp 75 <math>\Omega</math></p>
	<b>Adjustments</b>	Configurable color level, brightness, contrast and sharpness through control port. Output format selectable through control port, either CVBS, Y/C or automatic. Automatic (= follows input signal) is default.
	<b>Test output</b>	A video test image is normally generated if video input is lost. The output is maintained in the format of the last received valid video input or last output format setting. Default test video output, when no in signal has been present on the video input since power up, set by jumper on PCB (see illustration).
<b>Sync Input</b>		<p><b>Physical connector:</b> Hirose H.FL-R-SMT CL331-0521-6-(01 or 10).</p> <p>Sync Input, 0.5 Vpp 75 <math>\Omega</math>. The sync connector is used if an external sync is needed, typically for systems with an external clock.</p>

<p><b>Control Port</b></p>	<p>All adjustments are carried out by way of the control ports. There is one control port that interfaces with the supplied control panel and another control port with an RS232/485 interface. The two control ports are connectable with standard 2 row 2.54 mm pin pitch flat cable connectors complying to DIN41651/MIL-C-83509 standard, PCB to flat cable connector. Selection between RS232 or RS485 protocol specification on the RS control port is automatic and both RS232 and RS485 inputs and outputs are active at the same time.</p> <p>Communication parameters</p> <p>9600 bps, 8 bits, 1 stop bit, no parity, no flow control. ASCII text based communication protocol.. At least 100 ms recommended delay between commands</p> <p>RS232 / RS485 pinout</p> <p>Dual pin header connector pitch 2 mm</p> <ol style="list-style-type: none"> <li>1. RS232 TxD</li> <li>2 &amp; 8. GND</li> <li>3. RS232 RxD</li> <li>4 &amp; 6. NC</li> <li>5. RS485 B (non-inverted)</li> <li>7. RS485 A (inverted)</li> </ol> <p>RS485 is implemented in hardware from HW revision 1C and in software from PIC revision 20080923 + FPGA rev 20080916</p> 
<p><b>Power</b></p>	<p>Nominal input voltage:</p> <p>12 V DC, 200 mA. <b>Not polarity protected</b></p> <p>Lower limit value for normal operation 8 V DC. Absolute, not recommended, maximum 28 V DC.</p> <p>Connector, two pole cable screw plinth, 2.54 mm pitch.</p>
<p><b>Operating conditions</b></p>	<p>Temperature: 0 — 50 °C (32 — 122 °F)</p> <p>Humidity: 0 — 80% RH (non condensing)</p>
<p><b>Dimensions and weight</b></p>	<p>Weight: approx. 150 g</p> <p>Board size = 96*80 mm</p> <p>M3 mounting holes, Ø = 3.5 mm, 86*70 mm</p> <p>Height: 30 mm</p>

# 8. Notices and warranty

## NOTICES AND TERMS OF WARRANTY – LYYN PRODUCTS



Date: 10 February 2009

### 1. Validity and scope

The warranty is effective and valid for twelve months commencing at the time of purchase from LYYN or an authorised LYYN agent or distributor (the "Warranty Period"). LYYN shall hereunder remedy any defect or nonconformity (hereinafter termed defect(s)) resulting from faulty manufacture, design, materials or workmanship provided that the product has not been subjected to misuse, abuse or non-LYYN authorized alterations, modifications and/or repair. **This warranty is in lieu of all other warranties of merchantability and fitness for any particular purpose. The below shall be the sole remedy of the Customer for any defects or breach of warranty.**

### 2. Warranty Repair Service

LYYN undertakes to repair all defects appearing in the purchased LYYN product and reported to LYYN during the Warranty Period to which these Terms of Warranty apply. All and any warranty claim shall include a dated bill of purchase or corresponding document evidencing the vendor and the time of he purchase by the party making the warranty claim. LYYN shall ensure that the handling time be held as short as possible and that every reasonable effort is made to have the problem resolved within a reasonable time of receiving contact from the Customer informing LYYN of a problem and delivery of the warranty object. LYYN and its affiliates will maintain a sufficient stock of all parts required to service the warranty object during the Warranty Period.

Warranty repair shall be carried out at the place where the product or system is located unless LYYN deems it appropriate that the defective part or object as such is returned to LYYN for repair or replacement. Terms for shipping and freight are specified under paragraph 5 below.

LYYN will respond to any reported warranty claim and will undertake to implement a repair in its best and most cost effective way available, reasonable and possible. If the warranty claim is shown to be an actual failure of the LYYN unit, which can be proved to be caused by faulty manufacture, design, materials or workmanship, then the cost of repair will be borne by LYYN.

On the other hand, if the problem provoking the warranty claim is shown not to be caused by faulty manufacture, design, materials or workmanship, then the Customer is liable and the repair will be made against a purchase order for such repair and all costs associated with the matter shall be borne by the Customer. LYYN will undertake such non-warranty repair under the above conditions against a Customer purchase order as per LYYN valid pricing and conditions at the time of the repair. LYYN will also charge any and all travel, living costs and freight at cost.

### 3. Exceptions

The warranty shall not include defects resulting from:

- (a) Acts of violence or deliberate damage,
- (b) Incorrect maintenance or handling,
- (c) Repair of, or alterations to the service object carried out by other than those authorized by LYYN,
- (d) Omission to report in writing damages to LYYN within 2 weeks,
- (e) Fire, explosion, flood, mechanical, chemical, or molten metal damage and/or similar events,
- (f) Excessive wear or damage caused by Customer use.

LYYN will undertake repair of defects resulting from the above (a)-(f) only against a Customer purchase order as per LYYN valid pricing and conditions at the time of the repair. LYYN will charge any and all travel, living costs and freight at cost.

### 4. Safety Information

Always protect your LYYN product against static electricity. An electrostatic discharge may damage components of this product. Do not directly touch any of the connectors or component surfaces. Static electricity can be generated on clothing and on people. Before handling the product, discharge static electricity from your body by touching a grounded metal surface. Do not disassemble. Do not operate at other than the specified voltage. Operation at other than the rated voltages may result in fire or malfunction. Failure to follow these user guidelines qualifies as misuse.

### 5. Freight

Packing and shipping the service object is the responsibility of the Customer for the freight to LYYN. LYYN carries this responsibility for the return of the service object to the Customer. All shipping and associated costs are at the cost and risk to the Customer unless it can be shown that the repair was due to a problem caused by faulty manufacture, design, materials or workmanship on the part of LYYN, with the exceptions stated above.

### 6. Responsibility for the service performed

LYYN warrants its repair work for three months, or for the duration of the initial warranty period, whichever is the longest. Any repair performed as a result of faulty service is subject to the same rules as for any other warranty repair under this warranty. Faulty service or warranty repair is to be reported immediately to LYYN.

### 7. Discharge of Liability

LYYN assumes no responsibility or liability for personal injuries even if it can be proven that the injury was caused by negligence in connection with the performance of LYYN' service or warranty undertakings. LYYN will not, in any case, be liable for damage to Customers or any third party's property, real or moveable estate, machinery, or instrument of any kind, which applies also to cases of practical application of any LYYN product. **LYYN is explicitly not liable in contract, tort or otherwise for incidental, consequential, special or indirect damages, including without limitation, lost business profits, arising out of the use of, or inability to use, the LYYN product.**

### 8. Fees

Fees for services provided by LYYN under this warranty and not covered by the warranty are as per quotation/invoice issued for each occasion based on the LYYN price list applicable at the time. Changes to the LYYN price lists become effective as issued by LYYN.

### 9. Payment

Fees for repair services not covered by the warranty are to be paid in arrears as per the terms of the respective LYYN invoice.

### 10. Grounds of exemption from liability (force majeure)

The following circumstances shall be deemed as grounds for exception from liability: labour disputes and all other circumstances beyond the control of the parties, such as fire, war, mobilization or unforeseen military call-up of corresponding scope, requisition, seizure, currency or exchange restrictions, uprising, riots, general shortage of goods, as well as faulty, or delayed deliveries from sub-contractors owing to circumstances listed immediately above.

It is incumbent on the party desiring to refer to circumstances as specified in the above paragraph to so inform the other party, in writing, indicating the occurrence in question, as well as to inform the other party of the discontinuance of such circumstances.

### 11. Disputes and governing law

Swedish law shall govern the warranty and these Terms of Warranty. Any dispute, controversy or claim arising out of, or in connection with, the agreement to which these Terms of Warranty apply, or the breach, termination or invalidity thereof, shall be finally settled by arbitration in accordance with the Arbitration Rules of the Arbitration Institute of the Stockholm Chamber of Commerce. The arbitral tribunal shall be composed of three arbitrators and the seat of the arbitration shall be Malmö, Sweden. If nothing to the contrary is specified in any written and by LYYN signed agreement, the terms and regulations of LYYN' General Conditions shall apply.

### 12. Cautions

The products may not be used in environments requiring a high degree of reliability and safety. LYYN products are intended to be visual aids only and shall at no time replace the responsibility of the Customer or user to ensure the security of personnel, equipment or machinery. The product is not to be used in manned vehicles, nuclear or other power generating facilities, medical devices or life support systems, or any other inherently dangerous application, when failure to perform can reasonably be expected to result in a significant injury to the user or to equipment in, or for which the LYYN product is used. The product is not intended for use with such systems. The analysis, reverse engineering, decompiling and disassembling of the software, hardware or manuals that accompany the LYYN product, and all other related products including miscellaneous supplemental items, are prohibited. The description and specifications of this product are subject to future change without notice. Every effort has been made to ensure that the description of the LYYN product and manuals are as complete as possible. If the reader is aware of any questionable points, errors or omissions, please contact LYYN immediately.

*LYYN and its logo are registered trademarks of LYYN AB. HAWK and T38 are acquired and claimed trademarks of LYYN AB. Other product names and related items are trademarks or registered trademarks of their respective companies.*

POST AND VISITING ADDRESS

**LYYN AB, Ideon Science Park, Scheelevägen 17, S-223 70 Lund, Sweden**

PHONE NO: +46 46 286 57 90; E-MAIL: [info@lyyn.com](mailto:info@lyyn.com); WEBSITE: [www.lyyn.com](http://www.lyyn.com)

## 9. Regulatory notices

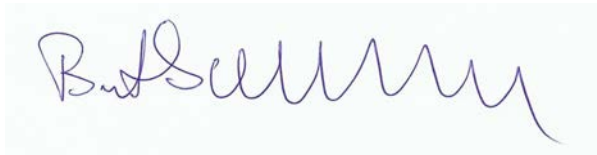
**Manufacturer's Name** LYYN AB  
**Manufacturer's Address** Ideon Science Park  
SE-223 70 Lund  
Sweden

Declares that the Hawk is designed and manufactured in compliance with the corresponding directives/standards

Declares that the Hawk Board and Hawk Integration Kit are designed and manufactured in compliance with the corresponding directives/standards

<b>Generic Standards</b>	<b>Harmonized Standards</b>
89/336/EEC EMC Directive	EN 55022
	EN 55024
	EN 55013
	EN 55020

Lund, Sweden, March 2011

A handwritten signature in blue ink, appearing to read 'Bengt Sahlberg', is written on a light blue rectangular background.

Bengt Sahlberg, Managing Director

## 10. Control reference

### 10.1. BRIG

<b>Explanation</b>	Gets or sets brightness of output video
<b>Syntax</b>	BRIGx<cr> where x ? = get current setting x = 0 - 255
<b>Default</b>	128
<b>Reply</b>	BRIG = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes    |    Use with keypad    No

### 10.2. BYPA

<b>Explanation</b>	Gets or sets analog bypass of video signal
<b>Syntax</b>	BYPAx<cr> where x ? = get current setting 0 = LYYN processing 1 = analog bypass
<b>Default</b>	0
<b>Reply</b>	BYPA = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes    |    Use with keypad    Yes

### 10.3. CHUE

<b>Explanation</b>	Gets or sets color hue of output video
<b>Syntax</b>	HUEx<cr> where x ? = get current setting x = 0 - 255
<b>Default</b>	128
<b>Reply</b>	CHUE = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes    |    Use with keypad    No

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## 10.4. CONT

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<b>Explanation</b>	Gets or sets contrast of output video
<b>Syntax</b>	CONTx<cr> where x ? = get current setting x = 0 - 255
<b>Default</b>	128
<b>Reply</b>	CONT = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes    |    Use with keypad    No

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## 10.5. INVE

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<b>Explanation</b>	Toggles between a standard or inverted lynnification window
<b>Syntax</b>	INVEx<cr> where x ? = get current setting 0 = Standard window 1 = Inverted window
<b>Default</b>	0
<b>Reply</b>	INVE = integer
<b>Version comment</b>	Available from version 20100607 on HW rev D

Use with RS-232/RS-485    Yes    |    Use with keypad    Yes

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## 10.6. LYNN

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<b>Explanation</b>	Gets or sets the degree of lynnification
<b>Syntax</b>	LYNNx<cr> where x ? = get current setting 0 - 9 = degree of lynnification 0 = no lynnification, 9 = max lynnification
<b>Default</b>	0
<b>Reply</b>	LYNN = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes    |    Use with keypad    Yes

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## 10.7. OUTP

<b>Explanation</b>	Gets or sets behavior of output video signal
<b>Syntax</b>	OUTPx<cr> where x ? = get current setting 0 = Auto switching output 1 = Always Y/C output 2 = Always CVBS output
<b>Default</b>	0
<b>Reply</b>	OUTP = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes    |    Use with keypad    No

## 10.8. POSN

<b>Explanation</b>	Gets or sets position of lynnification window
<b>Syntax</b>	POSNx<cr> where x ? = get current setting 0 - 9 = set center position of the lynnification window
<b>Default</b>	0
<b>Reply</b>	POSN = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes    |    Use with keypad    Yes

## 10.9. REST

<b>Explanation</b>	Reset settings to factory defaults.
<b>Syntax</b>	REST<cr>
<b>Default</b>	N.A
<b>Reply</b>	Hawk unit x reset
<b>Version comment</b>	Reset settings to factory defaults. A Hawk board reset must be followed by power-cycling the card. The Hawk system will reset without power cycling.

Use with RS-232/RS-485    Yes    |    Use with keypad    No



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## 10.10. RVID

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<b>Explanation</b>	Gets the current input video standard
<b>Syntax</b>	RVID?<cr> 0 = No input video 1 = NTSC 2 = PAL
<b>Default</b>	N.A
<b>Reply</b>	
<b>Version comment</b>	Hawk board version info R1B: FPGA 20090211, PIC 20090211 R1C or R1D: FPGA 20090205, PIC 20090211 or later

Use with RS-232/RS-485

Yes

Use with keypad

No

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## 10.11. SATU

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<b>Explanation</b>	Gets or sets color saturation of output video
<b>Syntax</b>	SATUx<cr> where x ? = get current setting 0 - 255
<b>Default</b>	128
<b>Reply</b>	SATU = integer
<b>Version comment</b>	

Use with RS-232/RS-485

Yes

Use with keypad

No

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## 10.12. SERN

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<b>Explanation</b>	Gets hardware serial numbers and software versions of system
<b>Syntax</b>	SERN?<cr>
<b>Default</b>	N.A
<b>Reply</b>	Several lines of serial no info
<b>Version comment</b>	

Use with RS-232/RS-485

Yes

Use with keypad

No

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### 10.13. SHRP

<b>Explanation</b>	Gets or sets sharpness of output video
<b>Syntax</b>	SHRPx<cr> where x ? = get current setting 0 - 3 = set sharpness
<b>Default</b>	0
<b>Reply</b>	SHRP = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes

Use with keypad    No

### 10.14. SIZE

<b>Explanation</b>	Gets or sets size of lynnification window
<b>Syntax</b>	SIZEx<cr> where x ? = get current setting 0 - 9 = set size of lynnification window 0 = full screen, 9 = smallest lynnification window
<b>Default</b>	0
<b>Reply</b>	SIZE = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes

Use with keypad    Yes

### 10.15. SYDH

<b>Explanation</b>	Gets or sets high byte of processing delay.
<b>Syntax</b>	SYDHx<cr>where x ? = get current setting 0 – 78 = set delay in x * 256 $\mu$ s (microseconds).
<b>Default</b>	N.A
<b>Reply</b>	SYDH = integer
<b>Version comment</b>	Hawk board version info R1B: FPGA 20090211, PIC 20090211 R1C or R1D: FPGA 20090205, PIC 20090211 or later

Use with RS-232/RS-485    Yes

Use with keypad    No

## 10.16. SYDL

<b>Explanation</b>	Gets or sets low byte of processing delay.
<b>Syntax</b>	SYDLx<cr> where x ? = get current setting 0 – 255 = set delay in x $\mu$ s (microseconds).
<b>Default</b>	N.A
<b>Reply</b>	SYDL = integer
<b>Version comment</b>	Hawk board version info R1B: FPGA 20090211, PIC 20090211 R1C or R1D: FPGA 20090205, PIC 20090211 or later

Use with RS-232/RS-485    Yes

Use with keypad    No

## 10.17. SYNC

<b>Explanation</b>	Gets or sets synchronization mode.
<b>Syntax</b>	SYNCx<cr>where x ? = get current setting 0 = Normal mode. Synchronized/follows incoming video. The delay approximately 140 $\mu$ s 1 = External sync mode. Synchronized to signal at external sync input. The delay is 1 frame + delay set with SYND command. 2 = Controlled delay (TBC) mode. Should be used in combination with SYND, SYDH and SYDL commands. The delay is 140 $\mu$ s + delay set with SYND command. Sync modes 1 and 2 can be used in combination with the SYND, SYDH and SYDL commands.
<b>Default</b>	0
<b>Reply</b>	SYNC = integer
<b>Version comment</b>	Hawk board version info SYNC0 and SYNC1 on all versions SYNC2 on the following versions R1B: FPGA 20090211, PIC 20090211 R1C or R1D: FPGA 20090205, PIC 20090211 or later

Use with RS-232/RS-485    Yes

Use with keypad    No

## 10.18. TEST

<b>Explanation</b>	Gets or sets test image behavior.
<b>Syntax</b>	TESTx<cr> where x ? = get current setting 0 = display test image if no signal at input 1 = never display test image 2 = always display test image
<b>Default</b>	0
<b>Reply</b>	TEST = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes

**|** Use with keypad    No

## 10.19. TOPL

<b>Explanation</b>	Gets or sets exclusion of video lines for lynnification. Changes of the TOPL parameter only affects the current color standard (PAL/NTSC)
<b>Syntax</b>	TOPLx<cr> where x ? = get current setting 0 - 31 = a value defining the number of video lines excluded from lynnification
<b>Default</b>	4
<b>Reply</b>	TOPL = integer
<b>Version comment</b>	

Use with RS-232/RS-485    Yes

**|** Use with keypad    No