Duet Module Interface Specification

for

Hitachi CP-X505W

TABLE OF CONTENTS

Revision History

Date	Initials	Version	Comments
08-05-2008	KN	V1.0.0	Initial release
14-06-2008	KN	V1.0.1	Fixed IP connection problem
19-06-2008	KN	V1.0.2	Support Displays Component Commands Fixed Cycle Power bug Reduced memory use Support network Port 9715

Control Life Pty Ltd License Agreement

By using the software included with this End-User License Agreement ("EULA"), you ("Licensee") agree to be bound by, and Control Life Pty Ltd shall be entitled to enforce, this Control Life Pty Ltd License Agreement ("Agreement"). IF YOU DO NOT AGREE, DO NOT USE THE SOFTWARE, YOU MAY RETURN IT TO Control Life Pty Ltd FOR A FULL REFUND.

1. LICENSE GRANT. Control Life Pty Ltd grants to Licensee the non-exclusive right to use the Control Life Pty Ltd Software in the manner described in this License. This license does not grant Licensee the right to create derivative works of the Control Life Pty Ltd Software. The Control Life Pty Ltd Software consists of programming and development software, product documentation, sample applications, tools and utilities, and miscellaneous technical information. The Control Life Pty Ltd Software is subject to restriction on distribution described in this License Agreement. YOU MAY NOT SUBLICENSE, RENT OR LEASE THE Control Life Pty Ltd SOFTWARE. You may only use the Control Life Pty Ltd Software for its intended purpose. You may not reverse engineer, decompile, or disassemble the Control Life Pty Ltd Software.

2. INTELLECTUAL PROPERTY. The Control Life Pty Ltd Software is owned, by Control Life Pty Ltd and is protected by Australian copyright laws, patent laws, international treaty provisions, and/or state of NSW trade secret laws. Licensee may make copies of the Control Life Pty Ltd Software solely for backup or archival purposes. Licensee may not copy any written materials accompanying the Control Life Pty Ltd Software. The Software is licensed, not sold.

3. TERMINATION. CONTROL LIFE PTY LTD RESERVES THE RIGHT, IN ITS SOLE DISCRETION, TO TERMINATE THIS LICENSE FOR ANY REASON AND UPON WRITTEN NOTICE TO LICENSEE. In the event that Control Life Pty Ltd terminates this License, then Licensee shall return all copies of the Control Life Pty Ltd Software to Control Life Pty Ltd and certify in writing that all copies have been destroyed.

4. PRE_RELEASE CODE. Portions of the Control Life Pty Ltd Software may, from time to time, as identified in the Control Life Pty Ltd Software, include PRE-RELEASE CODE and such code may not be at the level of performance, compatibility, and functionality of final code. THE PRE-RELEASE CODE may not operate correctly and may be substantially modified prior to final release or certain features may not be generally released. Control Life Pty Ltd is not obligated to make or support any PRE_RELEASE CODE. ALL PRE-RELEASE CODE IS PROVIDED "AS IS" WITH NO WARRANTIES.

5. LIMITED WARRANTY. Control Life Pty Ltd warrants that the Control Life Pty Ltd Software will perform substantially in accordance with any accompanying written materials for a period of 90 days from the date of receipt. CONTROL LIFE PTY LTD DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH REGARD TO THE Control Life Pty Ltd SOFTWARE. THE LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS.

6. LICENSEE REMEDIES. Control Life Pty Ltd's entire liability and your exclusive remedy shall be repair or replacement of the Control Life Pty Ltd Software that does not meet Control Life Pty Ltd's Limited Warranty and which is returned to Control Life Pty Ltd. The Limited Warranty is void if failure of the Control Life Pty Ltd Software has resulted from accident, abuse, or misapplication. Any replacement Control Life Pty Ltd Software will be warranted for the remainder of the original warranty period or 30 days, whichever is longer. Outside of Australia, these remedies may not be available.

7. NO LIABILITY FOR CONSEQUENTIAL DAMAGES. IN NO EVENT SHALL CONTROL LIFE PTY LTD BE LIABLE FOR ANY DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, OR ANY OTHER PECUNIARY LOSS) ARISING OUT OF THE USE OR THE INABILITY TO USE THIS Control Life Pty Ltd PRODUCT, EVEN IF CONTROL LIFE PTY LTD HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BECAUSE SOME STATES/COUNTRIES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

This Agreement is governed by the laws of the State of NSW and Australia, and all disputes will be resolved in the courts of Australia.

Introduction

This is a reference manual to describe the interface provided between an AMX NetLinx system and a Hitachi CP-X505W**.** The Sony Hitachi CP-X505W supports an IP protocol. The interface was tested using version 1.26 of the firmware. This module was written using NetLinx Studio version 2.7 build 2.7.0.210.

The Hitachi CP-X505W supports an RS-232 serial protocol. The required communication settings are a baud rate of 19200, 8 data bits, 1 stop bit, even parity, and handshaking off**.** The wiring diagram for this cable is as follows:

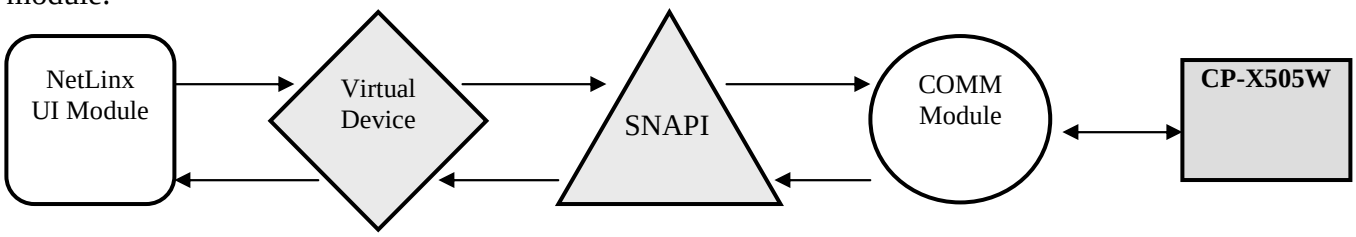
AMX NXI	AMX NI (Female DB9)	Sony VPL-FX52 (Male DB9)
(Gnd) 1	(Gnd) 5	(Gnd) 5
(Rx) 2	(Rx) 2	(Tx) 3
(Tx) 3	(Tx) 3	(Rx) 2

The Comm. module must be informed of the IP address of the device it is to connect to. The IP address must be set using the 'PROPERTY-' command. Module will attempt to connect to the specified IP address periodically until a connection is made or a new IP address is submitted using the 'PROPERTY-' command. Please see the Programming Notes section for additional information.

Overview

The COMM module translates between the standard interface described below and the video projector IP protocol. It parses the buffer for responses from the video projector, sends strings to control the video projector, and receives commands from the UI module or telnet sessions.

The following diagram gives a graphical view of the interface between the interface code and the Duet module.



Some functionality in the device interface may not be implemented in the API interface. In cases where device functions are desired but not API-supported, the PASSTHRU command may be used to send any and all device-protocol commands to the device. See the PASSTHRU command and the Adding Functions to Modules section for more information.

Implementation

To interface to the AMX Sony VPL-FX52/FX52L module, the programmer must perform the following steps:

1. Define the device ID for the video projector that will be controlled.
2. Define the virtual device ID that the Hitachi CP-X505W COMM module will use to communicate with the main program and User Interface. Virtual devices use device numbers 31000 - 32000.
3. The Hitachi CP-X505W module must be included in the program with a DEFINE_MODULE command. This command starts execution of the module and passes in the following key information: the device ID of the video projector to be controlled, and the virtual device ID for communicating to the main program.

An example of how to do this is shown below.

```
DEFINE_DEVICE
dvVProj  = 0:3:0
vdvVProj = 41001:1:0
dvTP     = 10001:45:0

DEFINE_COMBINE(vdvVProj,dvTP)

DEFINE_MODULE 'CL_Hitachi_CP-X505W_Projector_Comm_dr1_0_2' mVProjDev1(vdvVProj,
dvVProj)
```

Upon initialization the AMX Comm module will communicate with the video projector and information will be exchanged.

Channels

The UI module controls the video projector via channel events (NetLinx commands *pulse, on, and off*) sent to the COMM module. The channels supported by the COMM module are listed below. These channels are associated with the virtual device(s) and are independent of the channels associated with the touch panel device.

Note: An '*' indicates an extension to the standard API.

Channel	Description
9	PULSE: Cycle Lamp Power
24	ON: Volume ramp up
25	ON: Volume ramp down
26	PULSE: Cycle Volume Mute
27	PULSE: Set Lamp Power On
28	PULSE: Set Lamp Power Off
31	PULSE: Select VIDEO input
*33	PULSE: Select SVIDEO input
*35	PULSE: Select COMPONENT input
*37	PULSE: Select RGB1 input
*38	PULSE: Select RGB2 input
*39	PULSE: Select DVI input
*75	PULSE: Data transmit to Device – provides feedback only
*76	PULSE: Data receive from Device – provides feedback only
142	PULSE: Cycle Aspect Ratio
196	PULSE: Cycle Input Source
210	PULSE: Cycle Picture Mute
211	ON: Set Picture Mute On – provides feedback also OFF: Set Picture Mute Off
213	PULSE: Cycle Picture Freeze
214	ON: Set Picture Freeze On – provides feedback also OFF: Set Picture Freeze Off
251	ON: Device is Online – provides feedback only OFF: Device is not Online
252	ON: Data is Initialized – provides feedback only OFF: Data is not Initialized
253	ON: Projector Warming On – provides feedback only OFF: Projector Warming Off
254	ON: Projector Cooling On – provides feedback only OFF: Projector Cooling Off
255	ON: Set Lamp Power On – used for feedback also OFF: Set Lamp Power Off

Table 1 – Virtual Device Channel Events

Command Control

The UI module controls the video projector via command events (NetLinx command *send_command*) sent to the COMM module. The commands supported by the COMM module are listed below.

Note: An '*' indicates an extension to the standard API.

Command	Description
?ACTIVEWINDOW	Query active window ?ACTIVEWINDOW
?ASPECT	Query aspect ratio ?ASPECT
ASPECT-<aspectRatio>	Set aspect ratio <aspectRatio> : ANAMORPHIC WIDESCREEN NORMAL ASPECT-NORMAL
?ASPECTRATIOCOUNT	Query for count of valid Aspect Ratios ?ASPECTRATIOCOUNT
?ASPECTRATIOPROPERTIES	Query for all Aspect Ratio properties ?ASPECTRATIOPROPERTIES
?ASPECTRATIOPROPERTY-<index>	Query for specific Aspect Ratio properties ?ASPECTRATIOPROPERTY-<index>
?ASPECTRATIOSELECT	Query for currently selected Aspect Ratio ?ASPECTRATIOSELECT
ASPECTRATIOSELECT-<index>	Set aspect ratio <index> : 1 = NORMAL (RGB and DVI signal only) 2 = 4:3 3 = 16:9 4 = 14:9 (Not applicable for RGB signal) 5 = SMALL ASPECTRATIOSELECT-1
?COOLDOWN	Get the length of time, in seconds, that the cooling mode is set to. ?COOLDOWN
COOLDOWN-<time>	Set the length of time, in seconds, that the cooling mode should take. **Note**: The default is 120. **Note:** A device not stating the warmup and cooldown cannot be set less than the manufacturers default value. <time> : 120..300 = number of seconds COOLDOWN-130

COUNTERNOTIFY-<state>	Sets the cool down and warm up counter notifications on or off. **Note**: By default, this is set to off at initial startup. Also, in order to work this command must be called before Power On/Off commands. <state> : 0 = Off 1 = On COUNTERNOTIFY-0
?DEBUG	Request the state of the debug feature. ?DEBUG
DEBUG-<value>	Set the state of debugging messages in the UI module and the Comm. Module. <value> : 1 = set only error messages on 2 = set error and warning messages on 3 = set error, warning & debug messages on 4 = set all messages on DEBUG-1
?FWVERSION	Get the device's firmware version. ?FWVERSION
?INPUT	Get the currently selected input source. ?INPUT
INPUT-<source>,<number>	Set the current video input source. <source> : VIDEO SVIDEO RGB DVI COMPONENT <number> : 1 = input number – available for all types 2 = input number – for RGB input 2 only INPUT-VIDEO,1 INPUT-RGB,2
?INPUTCOUNT	Query input source count. ?INPUTCOUNT
?INPUTPROPERTY-<index>	Query input properties for single input. ?INPUTPROPERTY
?INPUTPROPERTIES	Query input properties for all inputs. ?INPUTPROPERTIES
?INPUTSELECT	Queries the integer value of the current input. ?INPUTSELECT

INPUTSELECT-<index>	Sets the current video input source by its integer value. <source> : 1 = RGB1 2 = VIDEO 3 = SVIDEO 4 = DVI 5 = RGB2 6 = COMPONENT INPUTSELECT-1 (selects RGB1)
?LAMPTIME	Get the elapsed time, in hours, for the projector's lamp. ?LAMPTIME
LAMPTIME-0	Set lamp time to zero (lamp time be set to zero only) LAMPTIME-0
PASSBACK-<state>	Enable or disable response reporting from the device. When enabled device responses will be sent as strings to the virtual device. **Note**: By default, this is set to off at startup. <state> : 0 = Off (default) 1 = On PASSBACK-0
PASSTHRU-<string>	Allows user the capability of sending commands directly to whatever unit is attached without processing by the Duet module. User must be aware of the protocol implemented by the unit to use this command. This gives the user access to features that may not be directly supported by the module. For more information, see the "**Adding Functions to Modules**" section below. <string> : string to send to unit
?PROPERTY-<key>	Get the value of a property <key>. If the value is not initialized, an empty string is returned. **Note:** <key> values are case sensitive. <key> : IP_ADDRESS ?PROPERTY-IP_ADDRESS

PROPERTY-<key>,<value>	Set the value of property <key> to <value>. It will take effect and open the TCP port immediately. **Note:** <key> values are case sensitive. <key> : IP_ADDRESS <value> : string representing the IP address Format <addr>:<port> Addr = IP address Port = either 23 or 9715 If Port is omitted, the module will assume port 23 is used. Note: Authentication of network control port should be disabled from the projector. PROPERTY-IP_ADDRESS,169.254.164.236 PROPERTY-IP_ADDRESS,192.168.1.254:9715
REINIT	Re-initializes the communication link and data. **Note**: This command deletes any messages waiting to go out to the device. REINIT
?VERSION	Query for the current version number of the Duet module. ?VERSION
?VIDEOTYPE	Query Video Type, only works for S-video and Video inputs ?VIDEOTYPE
VIDEOTYPE-<Type>	Set video type, Only work for s-video and video Type : AUTO NTSC PAL SECAM VIDEOTYPE-AUTO
?VPROJPRESET	Query for projector preset ?VPROJPRESET
VPROJPRESET-<index>	Recall projector preset <index> : 1..4 VPROJPRESET-1
?WARMUP	Get the length of time, in seconds, that the warming mode is set to. ?WARMUP
WARMUP-<time>	Set the length of time, in seconds, that the warming mode should take. **Note**: The default is 10. <time> : 10..300 = number of seconds WARMUP-20

Table 2 – Send Command Definitions

Command Feedback

The COMM module provides feedback to the User Interface module for video projector changes via command events. The commands supported are listed below.

PLEASE NOTE: Feedback is only provided when there is a state change. If no state change resulted from the command sent in, then no feedback will be returned.

Command	Description
ACTIVEWINDOW-<window>	Reports the active window. Active window is always MAIN ACTIVEWINDOW-MAIN
ASPECTRATIOCOUNT-<count>	Returns the integer number of valid aspect ratios ASPECTRATIOCOUNT-5
ASPECT-<ratio>	Reports Aspect Ratio <ratio> : ANAMORPHIC WIDESCREEN NORMAL ASPECT-NORMAL
ASPECTPROPERTY- <index>, <display name>, <value>	Returns aspect properties for a single input. <index> : 1..5 <display name> : NORMAL 4:3 16:9 14:9 SMALL <value> : NORMAL 4:3 16:9 14:9 SMALL ASPECTPROPERTY-1,NORMAL,NORMAL
ASPECTPROPERTIES- <index>, <display name>, <value>[;<index>, <display name>, <value>]	Returns the aspect properties for all inputs. <index> : 1..5 <display name> : NORMAL 4:3 16:9 14:9 SMALL <value> : NORMAL 4:3 16:9 14:9 SMALL ASPECTPROPERTY-1,NORMAL,NORMAL;2,4:3,4:3;…

ASPECTRATIOSELECT-<index>	RETURNS the currently selected Aspect Ratio <index> : 1 = NORMAL (RGB and DVI signal only) 2 = 4:3 3 = 16:9 4 = 14:9 (Not applicable for RGB signal) 5 = SMALL ASPECTRATIOSELECT-1
COOLING-<time>	Reports the number of seconds until the cooling mode is finished. **Note**: The Default is 120. <time> : 120..300 = number of seconds COOLING-130
DEBUG-<value>	Returns the state of debugging messages in the UI module and the Comm. module. <value> : 1 = set only error messages on 2 = set error and warning messages on 3 = set error, warning and info messages on 4 = set all messages on DEBUG-1
FWVERSION-<version>	Returns the device's firmware version. <version> : x.yy = firmware version number FWVERSION-1.26
INPUT-<source>,<number>	Returns the current audio/video input source. <source> : VIDEO SVIDEO RGB DVI COMPONENT <number> : 1 = input number - available for all types INPUT-RGB,1
INPUTCOUNT	Returns the input source count. INPUTCOUNT-6

INPUTPROPERTY- <index>, <input group>, <device label>, <signal type>, <AV Type>	Returns input properties for a single input. <index> : 1..6 <input group> : (will be the same as index) <device label> : RGB1 VIDEO S-VIDEO M1-D RGB2 COMPONENT (Y CB/PB CR/PR) <signal type> : RGB COMPOSITE S VIDEO DVI-D RGB COMPONENT <AV Type> : ALL INPUTPROPERTY-1,1,RGB1,RGB,ALL
INPUTPROPERTIES- <index>, <input group>, <device label>, <signal type>, <AV Type> [;<index>, <input group>, <device label>, <signal type>, <AV Type>]	Returns the input properties for all inputs. <index> : 1..6 <input group> : (will be the same as index) <device label> : RGB1 VIDEO S-VIDEO M1-D RGB2 COMPONENT (Y CB/PB CR/PR) <signal type> : RGB COMPOSITE S VIDEO DVI-D RGB COMPONENT <AV Type> : ALL INPUTPROPERTIES-1,1,RGB1,RGB,ALL; 2,2,VIDEO,COMPOSITE,ALL;3,3,S-VIDEO,SVIDEO,ALL;…
INPUTSELECT-<index>	Returns the current video input source by its integer value. <source> : 1 = RGB1 2 = VIDEO 3 = SVIDEO 4 = DVI 5 = RGB2 6 = COMPONENT INPUTSELECT-1

VIDEOTYPE-<type>	Reports Video Type, only works for S-Video and Video inputs Type : AUTO NTSC PAL SECAM VIDEOTYPE-AUTO
VPROJPRESET-<index>	Reports projector preset <index> : 1..4 VPROJPRESET-1
WARMUP-<time>	Set the length of time, in seconds, that the warming mode should take. **Note**: The default is 10. <time> : 10..300 = number of seconds WARMUP-20

Table 3 - Command Feedback Definitions

Device Notes

- In order for the device to communicate the current status, a device must be plugged in and operating properly to one of the input channels (ex HDMI, Video, etc); and the projector must be powered on rather than in standby. That is**, the input channel must be receiving a signal in order to be able to alter and/or report any of the following:**
    - **Projector Preset (Dynamic, Standard)**
    - **Display Adjustment (Contrast, Brightness, Color, Sharpness, Hue)**

  If the device is not receiving signal at the time the module is first downloaded to the NetLinx master, Data Initialized will be false, and no feedback will appear on the Touch Panel. However, the user should still be able to select an Input Source. Please note that if there was no signal before selecting an appropriate Input Source, it will be up to 30 seconds before current feedback appears on the Touch Panel. After the first time, the Touch Panel should work normally.
- If a change is made directly to the device (like power on or off, source select, display adjustment, etc), the projector does not send out a response. Therefore, any changes made directly to the device (instead of by using the Touch Panel) will not be displayed from the module. The only exceptions are the power status and input status.
- If the IP address is changed (and the master is reinitialized) sometime after the initial program upload, the changes will not take effect until after the heartbeat. The device will be offline until then. Once the heartbeat is activated, sends the initial command, and the projector accepts it, then the module will come back to an Online status.
- Please be aware that this module was build and tested ONLY on the CP-X505W, and has not yet been verified for other Hitachi projector models.
- A few notes about communicating to this device:
    - The current IP address for the projector is located in the Information menu which is accessible from the projector by pressing Menu on the remote. The IP address on the projector can be changed in the configuration web site that is housed on the projector.
    - Information about the projector can be viewed and configured via the configuration web site that is housed on the projector. Once the network connection is setup, you can access the web pages from your computer using “http://xxx.xxx.xxx.xxx” (the IP address of the projector). The user name is “Administrator”. The default password should be blank.]
    - The Authentication of the network control port should be disabled.

Programming Notes

At startup and when the ‘REINIT’ command is used, all values are set to default values. If these values are not initialized during the startup or re-initialization sequence, then they remain set to their default values and may be returned if a query/get command is sent.

Adding Functions to Modules

Commands to the device

This module supplies a mechanism to allow additional device features to be added to software using the module. This is the ‘PASSTHRU-‘ command, which allows protocol strings to be passed through the module. The device-specific protocol must be known in order to use this feature.

As an example, suppose that a module for a projector has not implemented the 'white balance adjustment' feature. The command that the projector protocol requires is 03H, 10H, 05H, 14H, followed by a checksum. The documentation for the ‘PASSTHRU-‘ command specifies that the module will automatically generate the checksum. In this case, the following string should be sent from the UI code to implement 'white balance adjustment'.

```
send_command vdvDevice, "'PASSTHRU-',$03,$10,$05,$14"
```

The reason to use ‘PASSTHRU-‘ instead of sending a protocol string directly to the device port is that the device may require command queuing, calculation of checksums, or other internal processing, which would not be done if the string was sent directly. Because of this, it is best to filter all communication TO the device through the module. (The module documentation will indicate any processing that will be automatically done to the ‘PASSTHRU-‘ command like checksum calculation.)

Responses from the device

The module will automatically interpret replies from the device and pass these on to the application code according to the documented API. Some device replies may not be passed on to the application code. To see all replies from the device unfiltered by the module, enable PASSBACK and use a DATA_EVENT with a string handler in the UI code. Again, the device-specific protocol must be known in order to interpret these responses. Even when PASSBACK is enabled, the module will still interpret device responses according to the standard API.