INNOVA

Innova LINK series
Ethernet Board
USER MANUAL

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Table of contents

Document Revision Index	
Revision	**Comments**
0	Original Issue

1 General

1.1 Scope of document

This document provides detailed information required for system integration of the INNOVA Ethernet boards. These boards are part of the Innova LINK series of products for transfer of electrical signals over optic fibre. The information aims to provide a clear understanding of the features of the device as well as the operation limits and interface requirements.

1.2 Definitions

1.2.1 Abbreviations

ESD	Electro Static Discharge
PCB	Printed Circuit Board
MUX	Multiplexer
SFP	Small Form-factor Pluggable (electrical to optical converter module)
WDM	Wave Division Multiplexing
CWDM	Coarse Wave Division Multiplexing

1.3 ESD precautions

The unit contains components that are sensitive to the high voltages that can be generated by the human body due to static charges. To prevent ESD damage, the unit should be stored in anti static packing and be handled in an environment protected from static electricity. Use grounded wrist band while handling the unit.

2 General description

The Ethernet boards are members of the Innova LINK family of products for providing an optical link to a remote Ethernet system. The units are designed to transfer Ethernet signals. During signal transmission only the physical layer is affected, higher level layers are not affected. Thus signals from systems utilising Ethernet physical layer but proprietary higher level layers will communicate through these boards. Available communications speeds are 100 Mbps and 1 Gbps, set by jumper. 10 Mbps can only be transferred provided a 10/100 or 10/1000 Mbps Ethernet switch is connected between the 10 Mbps device and the Innova Ehternet board. The Ethernet switch will then handle the speed difference between the 10 Mbps Ethernet and the 100/1000 Mbps input of the Innova Ethernet board.

The transmission line consists of 2 boards. At the remote end (analogous to the source end for a video system), the input board is used to convert the Ethernet signals to optical signals. At the local end the output board converts the optical signals back to electrical Ethernet. The 2 boards are identical functionally. They only differ in the physical layout. The pictures below show the 2 boards.

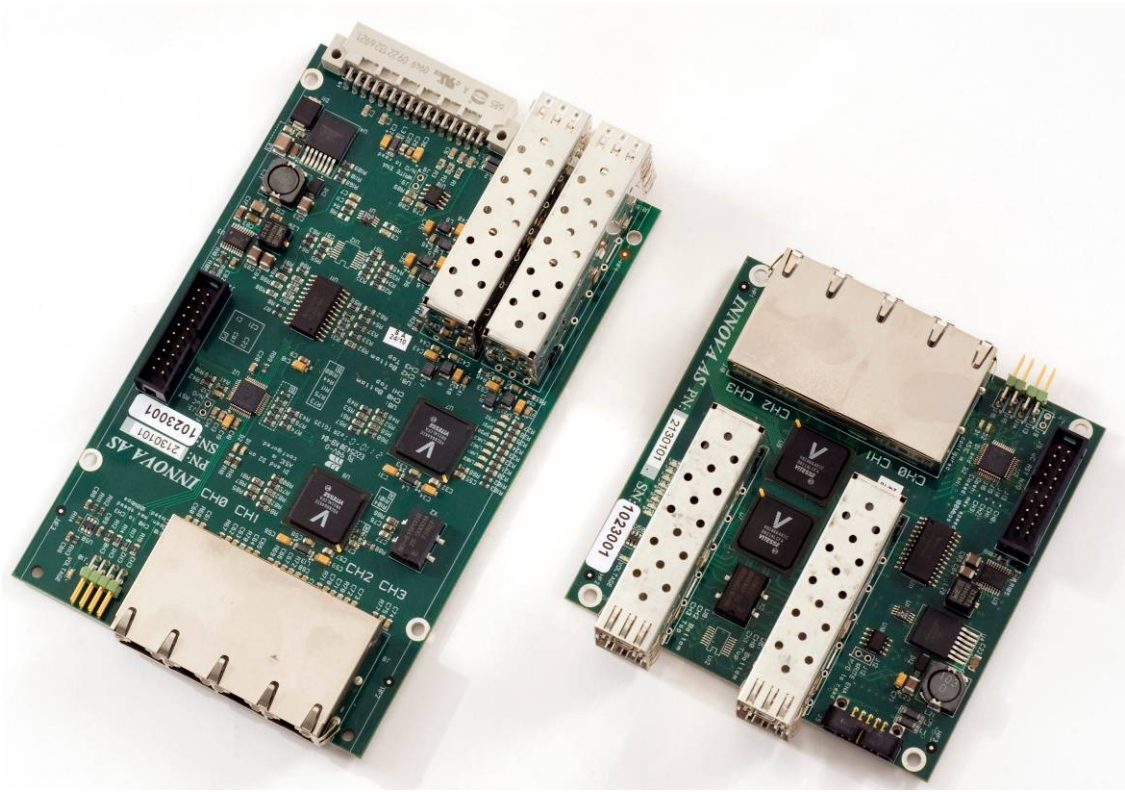

Figure 1, Ethernet output and input board.

Each board has facilities to transfer up to 4 separate Ethernets. The board uses 1 SPF for each Ethernet, it is only necessary to install SFP's for the used Ethernet ports. 2 optical fibres (one in each direction) or 2 wavelengths in a WDM system are required for each Ethernet. A board set up for 4 Ethernets will thus require 8 optical fibres or 8 wavelengths in a WDM system.

3 Features

Power supply: 6 - 12VDC

4 Ethernets

100 Mbps or 1 Gbps (set by jumpers individually for each channel)

Only the Ethernet physical layer is affected, no higher level layers are affected

Diagnostics interface (requires an Analogue Video board in the system)

Size of input board: 100 * 100 mm

Size of output board: 100 * 160 mm (Euro card)

4 Functional description

4.1 General

The units are designed to transfer Ethernet signals at the physical layer. At the remote end, the input board is used to convert the Ethernet signals to optical signals. At the local end the output board converts the optical signals back to electrical Ethernet.

Only the physical layer is affected during signal conversion, higher level layers are not affected. This ensures that signals from systems utilising Ethernet physical layer but proprietary higher level layers will communicate through these boards. This includes multi beam echo sounders from Kongsberg Maritime and Reson.

Available communications speeds are 100 Mbps and 1 Gbps. Speed is set by jumpers, 1 for each Ethernet. Note that the jumper settings has only effect during power-up, to change the speed the board must be re-started for the new setting to take effect. 10 Mbps can only be transferred provided a 10/100 or 10/1000 Mbps Ethernet switch is connected between the 10 Mbps net and the Innova Ehternet board. The Ethernet switch will then handle the speed difference between the 10 Mbps Ethernet and the 100/1000 Mbps input of the Innova Ethernet board.

The units utilise standard SFP's for the fibre optic interface. This allows for easy customisation of the fibre optic link characteristics, including wavelengths and optic budget. Each Ethernet is converted to optic signals independent of the 3 other Ethernets. Each Ethernet has a dedicated SPF for the optical signals. Only the used Ethernets on the board need to have SFP's installed. Single mode fibre is typically used with these boards. Multi mode fibre can also be supported, but at drastically reduced optical distance (typically less than 1 km).

4.2 SFP's

SFP's are bi-directional devices and care must be taken to ensure the correct optical port (Rx or Tx) is used. See the figure below for the physical outline of an SFP.

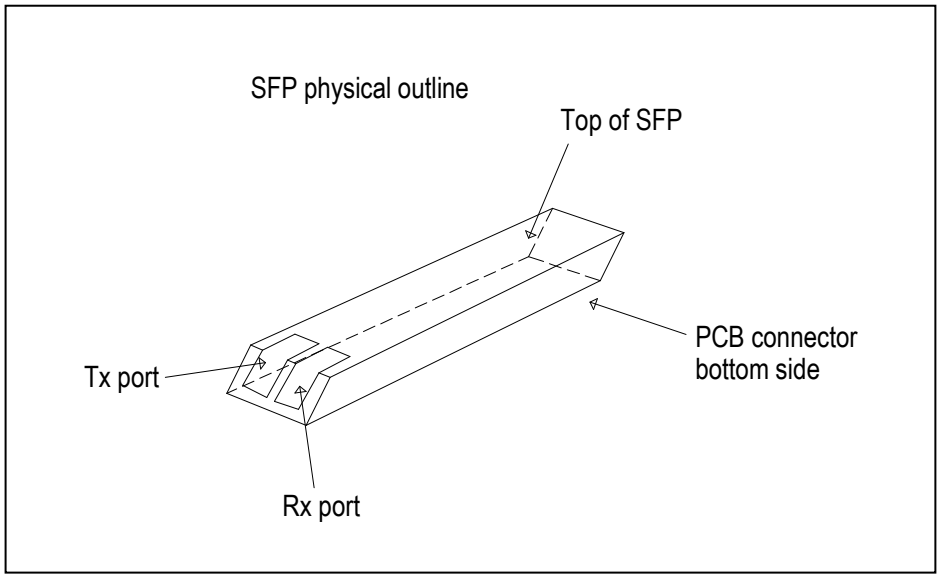

Figure 2, SFP module.

Ethernet 1 is the lower SFP in SFP cage U6, Ethernet 2 the upper SFP in SFP cage U6. Similarly Ethernet 3 is the lower and Ethernet 4 the upper SFP in SFP cage U8. The SFP's in the lower cage positions enter the cage upside-down.

4.3 LED's

The table below describes the function of the onboard LED's.

LED	Function
LINK1, SPD1	LED is lit while there is a link on the fibre optic side of Ethernet 1. Blinking when there is activity on the line.
LINK2, SPD2	LED is lit while there is a link on the fibre optic side of Ethernet 2. Blinking when there is activity on the line.
LINK3, SPD3	LED is lit while there is a link on the fibre optic side of Ethernet 3. Blinking when there is activity on the line.
LINK4, SPD4	LED is lit while there is a link on the fibre optic side of Ethernet 4. Blinking when there is activity on the line.

Ethernet connector right LED: is lit when a 1 Gb Ethernet link is established. It is blinking when there is traffic on the line.

Ethernet connector left LED: is lit when a 100 MB or 1 Gb Ethernet link is established. It is blinking when there is traffic on the line.

4.4 Diagnostics

A diagnostic port is available on the mother board connector. Diagnostics data is read by the analogue video board and made available on serial ports on the output side. Thus the analogue video board is required to access the diagnostics data.

The diagnostics data contains information about the board (PN, SN, HW and SW revisions) as well as SFP data for all the boards connected to an analogue video board.

5 Connections

5.1 Connectors

5.1.1 Input board

Mother board	Nicomatic CMM 222C10M16
Ethernet	RJ45
Optic (to / from SFP)	2 * LC

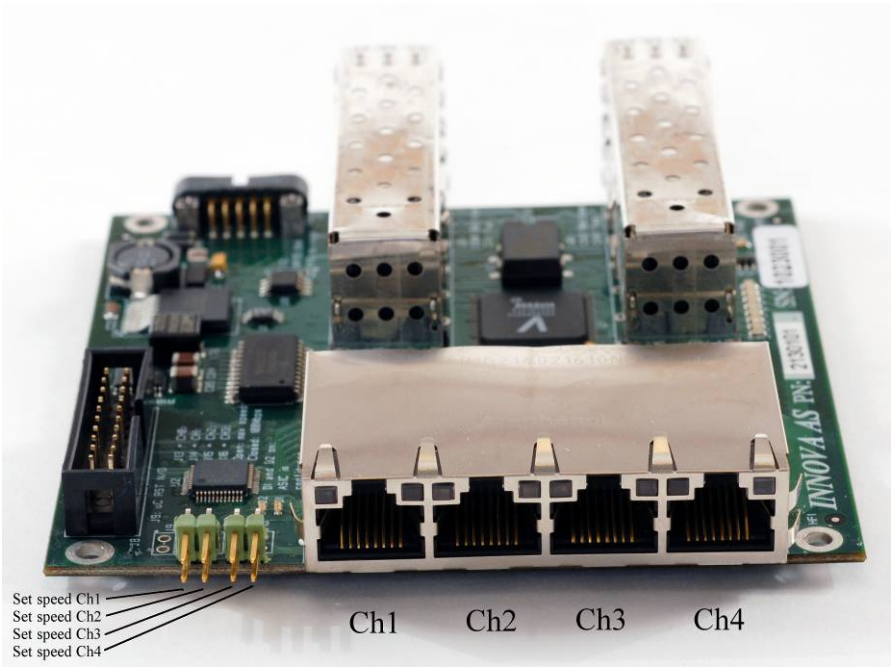

Figure 3, Input front board layout.

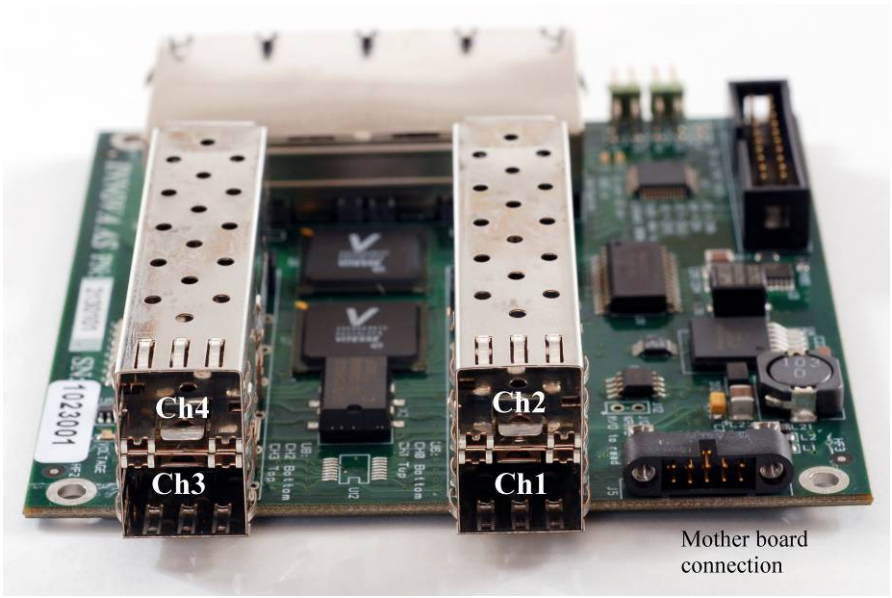

Figure 4, Input back board layout.

5.1.2 Output board

Mother board	DIN B/2
Ethernet	RJ45
Optic (to / from SFP)	2 * LC

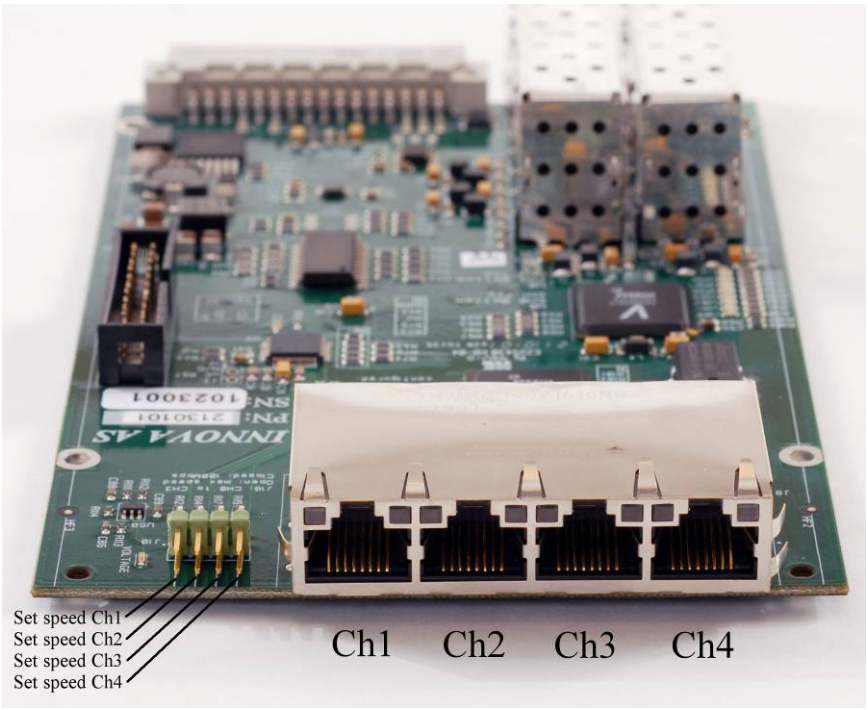

Figure 5, Output front board layout.

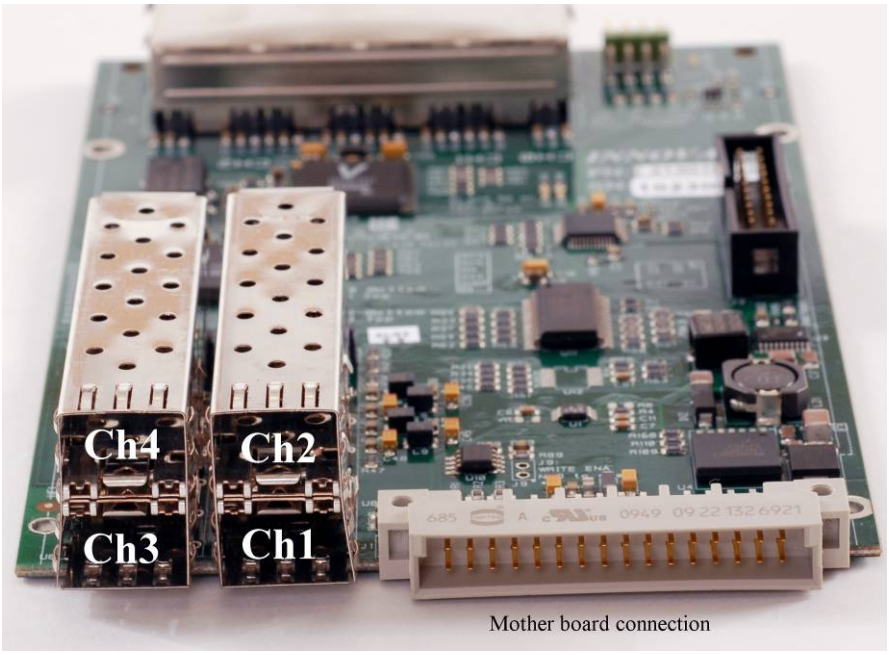

Figure 6, Output Back board layout.

5.2 Power

The unit requires 6 - 12VDC power connected to the mother board connector.

5.3 Diagnostics

The diagnostics data are available on the mother board connector on the analogue video output board. This board has 2 RS232 ports, one for diagnostics for the input boards and one for diagnostics for the outputs boards.

5.4 Summary of connector pin configurations

5.4.1 Mother board connections

In a system with several boards it is natural to use the mother boards (back plane) to connect power to the boards. This also connects the diagnostics bus between the boards. But in a system with a single board or very few boards the preferred solution may be to wire up power etc. to the board(s) directly without the mother board. The pin out of the mother boards connectors are given in the tables below.

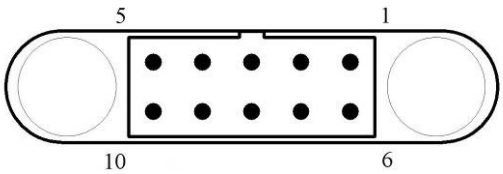

Figure 7, Input board back plane connector pin configuration.

Input board, mother board connector J5	
Pin #	**Function**
1	0V
2	0V
3	A0
4	A1
5	A2
6	SCL
7	SDA
8	3V3
9	Vin
10	Vin

Output board, mother board connector J1

Pin #	Function
a1	0V
a2	0V
a3	0V
a4	0V
a5	0V
a6	0V
a7	NC
a8	NC
a9	NC
a10	NC
a11	NC
a12	NC
a13	NC
a14	RST
a15	SCL
a16	SDA
b1	Vin
b2	Vin
b3	3V3
b4	3V3
b5	3V3 SFP
b6	3V3 SFP
b7	NC
b8	NC
b9	NC
b10	NC
b11	NC
b12	NC
b13	NC
b14	A0
b15	A1
b16	A2

5.4.2 Signal connections

Ethernet connectors are according to the standard for 100 Mbps / 1 Gbps. The board will handle both straight and crossed signals. When viewing into the connector block Ethernet 1 is the left RJ45, Ethernet 4 is the right.

6 Physical layout

The units must be mounted inside a suitable enclosure to protect it against dust and moisture. To comply with EMC regulation a metal enclosure will be required and suitable filtering of power and signals must be applied.

6.1 Input board

Size	100x100x27mm (LxWxH).
Mounting	By 4 holes for M3 bolts, 1 in each corner 3.5mm from the edges with the connections and 5.5mm from the 2 other edges.
Housing	None

6.2 Output board

Size	160x100x26mm (LxWxH).
Mounting	Rail mounting in DIN sub-rack.
Housing	None

7 Configuration instructions

Jumper switch settings for setting Ethernet speed is according to the table below.

Jumper **Input board**	**Jumper** **Output board**	**Function**
J13	J4	Insert to set Ethernet 1 to 100Mbps. Open = 1 Gbps.
J14	J5	Insert to set Ethernet 2 to 100Mbps. Open = 1 Gbps.
J15	J6	Insert to set Ethernet 3 to 100Mbps. Open = 1 Gbps.
J16	J7	Insert to set Ethernet 4 to 100Mbps. Open = 1 Gbps.

8 Specifications

Power supply voltage: 6 - 12 VDC

Maximum number of separate Ethernets: 4

Supported speeds: 100 Mbps / 1 Gbps

Data rate between boards over the optic link: 1.25 Gbps

Power consumption will vary slightly with operating conditions and SFP type used. The table below gives typical values with 26 dB SFP and 1 Gbps speed.

Number of active Ethernets (SFP's installed only for used channels)	**Current consumption @ 12 V**
1	330 mA
2	430 mA
3	550 mA
4	660 mA

9 Appendix 1, PN numbers including related products

Description	PN
LINK Motherboard Input	2100101
LINK Motherboard connector Input	2101101
LINK Motherboard Output	2100301
AV 6 ch Input	2110101
Ext 2 ch AV Input	2111101
Ext 12 ch RS232 Input	2112101
Ext 12 ch RS-422/485 FD Input	2113101
Ext 12 ch RS-422/485 HD Input	2114101
AV 6 ch PR Input	2110201
Ext 2 ch AV PR Input	2111201
Ext 12 ch RS232 PR Input	2112201
Ext 12 ch RS-422/485 FD PR Input	2113201
Ext 12 ch RS-422/485 HD PR Input	2114201
AV 6 ch Output	2110301
Ext 2 ch AV Output	2111301
Ext 12 ch RS232 Output	2112301
Ext 12 ch RS-422/485 FD Output	2113301
Ext 12 ch RS-422/485 HD Output	2114301
DV HD-SDI 4 ch Input	2120101
DV HD-SDI 4 ch PR Input	2120201
DV HD-SDI 4 ch Output	2120301
Ethernet Base-T 4 ch Input	2130101
Ethernet Base-T 4 ch PR Input	2130201
Ethernet Base-T 4 ch Ouput	2130301
PECL Bi-dir 2ch Input	2140101
PECL, Bi-dir 2ch PR Input	2140201
PECL Bi-dir 2ch Output	2140301