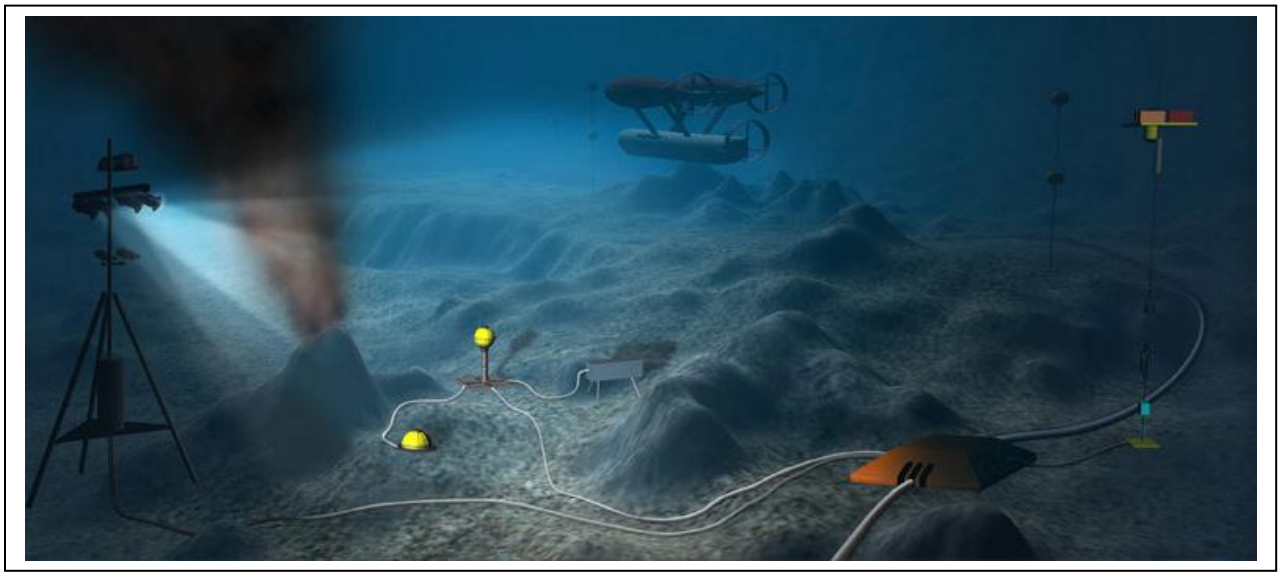
Regional Scale Nodes
Medium Power Junction Box
Interface Control Document
Version 1-02



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Document Control Sheet

Version	Release Date	Description	By
1-00	5/25/2010	Initial Version	J. Tilley
1-01	11/20/2011	Minor Updates	J. Tilley
1-02	7/25/2012	Updated connector pinout, other minor changes and cleanup	J. Tilley

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1. Introduction

The Region Scale Nodes (RSN) cabled ocean observatory off the coast of Washington and Oregon is part of the NSF funded Ocean Observatories Initiative (OOI). The nearly 800 kilometers of RSN cable will create a large-aperture natural laboratory for conducting a wide range of long-term and innovative experiments within the ocean volume using real-time control over the entire cabled system.

1.1. Purpose

This Interface Control Document (ICD) defines the relationship between the Medium Power Junction Box (MP-JBox) and components connected to its Instrument Ports and Input and Expansion Ports.

1.2. Overview of RSN and MP-JBox

To better understand the system as a whole, a high level pictorial overview of a simplified RSN network and where the MP-JBox fits into the system can be seen in Figure 1.

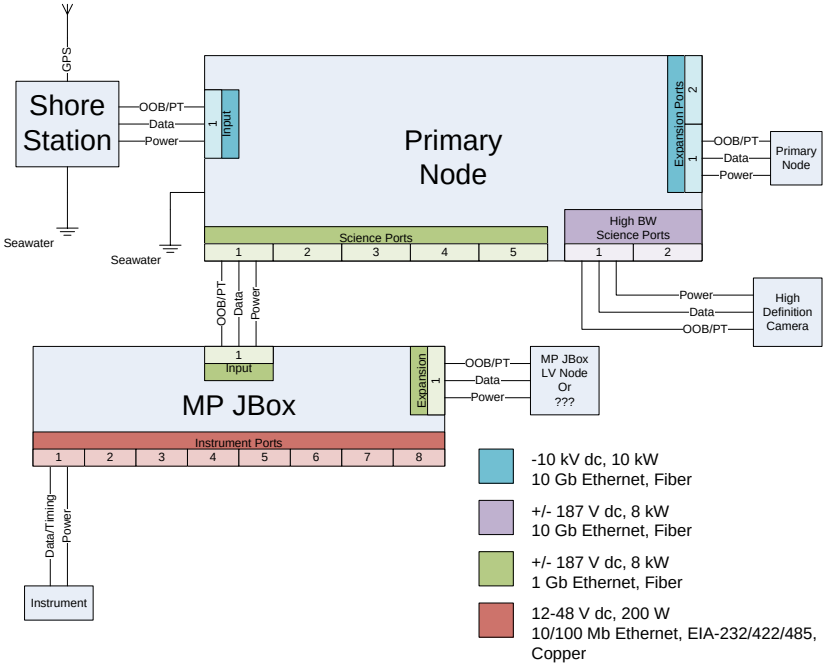

Figure 1 Simplified RSN Network

1.3. Definitions

1.3.1. Acronyms

- CTS – Clear To Send, Hardware Flow Control for EIA-232
- DGND – Data Ground
- NC – No Connection
- PGND – Power Ground
- PPS – Pulse Per Second
- RTS – Request To Send, Hardware Flow Control for EIA-232
- TOD – Time of Day

2. Medium Power Junction Box Connectors

The MP-JBox interface consists of 10 ports of 3 different types. A representative connector layout can be seen in Figure 2. These different interfaces provide for connecting to the higher power primary infrastructure as well as providing an access point for lower power instruments.

Quantity	Connection Name	Connection Type	Connector Model
1	SP-1GE-A	Output / Expansion Port	DMS-086-01
1	SP-1GE-B	Input Port	DMS-086-01
8	IP-HP	Instrument Port, High Power	MHDXL-12-FCR

Table 1 Connector Types

In addition to the interface connectors, there are two additional ports exposed on the MP-JBox end cap. The first is a single conductor interface for connecting to the remote seawater electrode which is used for leakage current testing. The second is a vacuum / purge port that is used when the MP-JBox is assembled for deployment.

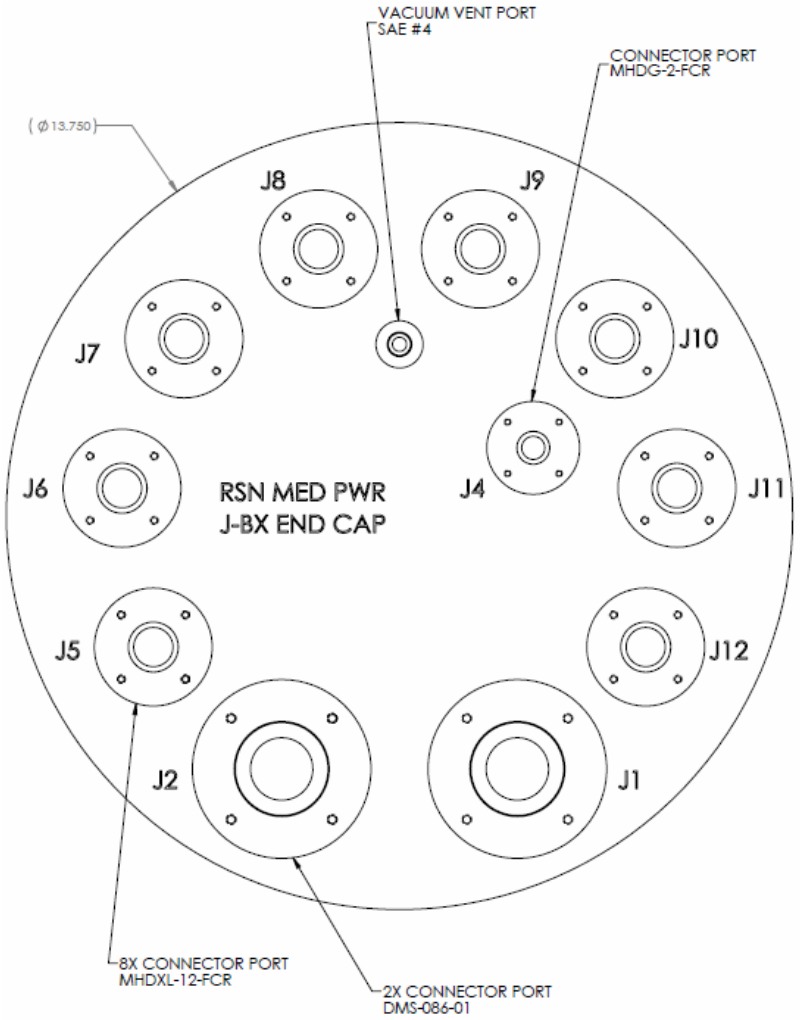

Figure 2 MP JBox Endcap [DWG# 4812-64630]

2.1. Input Port (J1)

The input port to the MP-JBox receives a high power / bandwidth link from upstream devices (Primary Nodes, daisy chained Secondary Infrastructure). The link is comprised of an electro-optical cable providing 375V dc and a 1 Gigabit Ethernet fiber optic link. In addition, there is a lower bandwidth Out-Of-Band / Precision Timing (OOB/PT) fiber optic link.

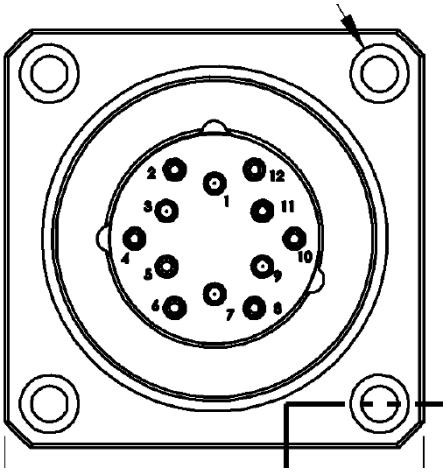

Figure 3 Teledyne ODI DMS-086-01

Pin	Signal	Notes
1	GbE Rx	Input to MPJBox
2	V+	Power High-side (+187VDC w.r.t Seawater)
3	GbE Tx	Output from MPJBox
4	V+	Power High-side (+187VDC w.r.t Seawater)
5	V+	Power High-side (+187VDC w.r.t Seawater)
6	V+	Power High-side (+187VDC w.r.t Seawater)
7	OOB Rx	Input to MPJBox
8	V-	Power Low-side (-187VDC w.r.t Seawater)
9	OOB Tx	Output from MPJBox
10	V-	Power Low-side (-187VDC w.r.t Seawater)
11	V-	Power Low-side (-187VDC w.r.t Seawater)
12	V-	Power Low-side (-187VDC w.r.t Seawater)

Table 2 Input Port Pinout

2.2. Expansion Port (J2)

The expansion port on the MP-JBox allows for the connection of a downstream Secondary Infrastructure device (LV Node, MP-JBox). The link is comprised of an electro-optical cable providing 375V dc and a 1 Gigabit Ethernet fiber optic link. In addition, there is a lower bandwidth Out-Of-Band / Precision Timing (OOB/PT) fiber optic link.

Pin	Signal	Notes
1	GbE Tx	Output to Secondary Node
2	V+	Power High-side (+187VDC w.r.t Seawater)
3	GbE Rx	Input from Secondary Node
4	V+	Power High-side (+187VDC w.r.t Seawater)
5	V+	Power High-side (+187VDC w.r.t Seawater)
6	V+	Power High-side (+187VDC w.r.t Seawater)
7	OOB Tx	Output to Secondary Node
8	V-	Power Low-side (-187VDC w.r.t Seawater)
9	OOB Rx	Input from Secondary Node
10	V-	Power Low-side (-187VDC w.r.t Seawater)
11	V-	Power Low-side (-187VDC w.r.t Seawater)
12	V-	Power Low-side (-187VDC w.r.t Seawater)

Table 3 Expansion Port Pinout

The voltage output from the expansion port is unregulated and is subject to limitations from cable line losses and upstream power loads. This additionally affects the ultimate power that may be drawn from the expansion port, which is nominally 8kW.

2.3. Instrument Ports, High Power (J5-12)

The eight Instrument Ports, High Power (IP-HP) are the connection point for instrumentation to the MP-JBox. These ports are highly configurable and support a wide range of power and data interface options. All instrument port connectors will be the Teledyne Impulse MHDXL-12-FCR, comprised of a Titanium Grade 5 (Ti6Al4V) body. The pinout of the MHDXL-12-FCR can be seen in the following figure.

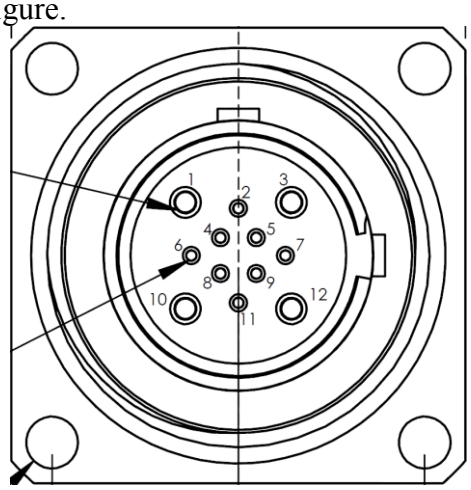

Figure 4 Teledyne Impulse MHDXL-12-FCR

The IP-HP supports the following data interfaces: 10/100BaseT, EIA-232, EIA-422 and EIA-485. These interfaces are configured inside the MP-JBox prior to deployment. Pin naming assumes the MP-JBox is the originating device (Tx is Output from MP_JBox, Rx is Input to MP-JBox).

	1	2	3	4	5	6	7	8	9	10	11	12
Enet	PGND	PPS+	DGND	TX-	RX-	TOD-	TOD+	RX+	TX+	24/48V	PPS-	12V
232	PGND	PPS+	DGND	TX	CTS	TOD-	TOD+	RX	RTS	24/48V	PPS-	12V
422	PGND	PPS+	DGND	TX-	RX-	TOD-	TOD+	RX+	TX+	24/48V	PPS-	12V
485HD	PGND	PPS+	DGND	DATA-	-	TOD-	TOD+	-	DATA+	24/48V	PPS-	12V
485FD	PGND	PPS+	DGND	TX-	RX-	TOD-	TOD+	RX+	TX+	24/48V	PPS-	12V

Table 4 Instrument Port Pinout

3. Power

The nominal power capacity for each IP-HP is 200W, with a steady state current limit of 8.5A. This interface can be configured for regulated 12, 24, or 48V dc. . Only pin 10 or 12 will be connected depending on the voltage selected. The remaining pin will be unconnected inside the MP-JBox.

Any of the IP-HPs may optionally be configured as an IP-LP with a nominal power rating of 50W at 12, 24 & 48V dc. This will allow for lower powered instruments to us a better matched power supply.

Instrument power shall be delivered via the provided power and return conductors in the instrument cable. No return path thru seawater shall be used. No DC connection to the instruments pressure case shall be made.

The combined power output available at a given MP-JBox is subject to limitations from cable line losses and upstream power loads.

4. Timing

4.1. 1PPS

The MP-JBox provides a 1PPS signal for instrument timing synchronization via an EIA-485 link. The rising edge of the 1PPS is the synchronization point, and is accurate to within 10µs of UTC-USNO. The width of the 1PPS pulse is 20µs.
Optionally, a 3.3V logic level 1PPS con be configured prior to deployment and will be output in place of the PPS+ signal on the connector.

4.2. Time of Day String

In order to provide an absolute time reference, a Time of Day string is provided via an EIA-485 link. The TOD port settings are 9600 8-N-1 (9600 baud, 8 data bits, No parity bits, 1 stop bit). The string occurs approximately 20µs after the rising edge of the 1PPS. Thus, the data within the TOD string corresponds to the immediately preceding 1PPS rising edge.
The TOD string is formatted as a NMEA $GPZDA string:

$GPZDA,HHMMSS.SS,DD,MM,YYYY,XX,YY*CC<CR><LF>

HHMMSS.SS	UTC Time Hours, Minutes, Seconds
DD	Day
MM	Month
YYYY	Year
XX	Local Zone Hours
YY	Local Zone Minutes
***CC**	Checksum
<CR>	Carriage Return
<LF>	Line Feed