



OPERATOR'S MANUAL

3091A – Outdoor Unit (ODU)

MAN-3091A Rev. A

2015 West Chestnut Street
Alhambra, California 91803
(626) 293-3400
Fax: (626) 293-3428
www.emcore.com

Disclaimer

Every attempt has been made to make this material complete, accurate and up-to-date. Users are cautioned that EMCORE, reserves the right to make changes without notice and shall not be held responsible for any damages, including consequential, caused by reliance on the material presented, including, but not limited to, typographical, arithmetical, or listing errors.

© Copyright 2004. EMCORE Corporation
EMCORE, and the EMCORE logo are trademarks of EMCORE Corporation.

1. WARNINGS, CAUTIONS, LIABILITY, WARRANTY AND GENERAL NOTES

Safety Considerations

When installing or using this product, observe all safety precautions during handling and operation. Failure to comply with the following general safety precautions and with specific precautions described elsewhere in this manual violates the safety standards of the design, manufacture, and intended use of this product. Ortel assumes no liability for the customer's failure to comply with these precautions.



The fiberoptic laser transmitter used in EMCORES 3091A ODU System contains a class IIIb laser product as defined by the U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration. This laser product complies with 21 CFR, Chapter I, Subchapter J of the DHEW standards under the Radiation Control for Health and Safety Act of 1968. The laser module certification label is located immediately adjacent to the optical output connector and also shows the required DANGER warning logotype.

The laser operates at nominally 1310 nm or 1550 nm (depending on the model) with less than 30 mW optical output. The typical optical output for this product is less than 10 mW. The protective laser plug-in module housing prevents a user from being exposed to hazardous optical output levels. Since there is no human access to the laser output during system operation, no special operator precautions are necessary when fiber is connected to the transmitter and receiver. During installation, service, or maintenance, the service technician is warned to not look directly into the fiber connector or the fiber, which is connected to the fiber connector before it is connected to the fiberoptic receiver. The light emitted from the fiberoptic connector or any fiber connected to the connector is invisible and may be harmful to the human eye. Use either an infrared (IR) viewer or fluorescent screen for optical output verification. All handling precautions as outlined by Federal agencies or other authorities of class IIIb lasers must be observed.

Do not attempt to modify or to service the laser diode module. Return it to Ortel for service and repair. Contact the Ortel Customer Service Department for a return authorization and further instructions.

Electrostatic Sensitivity

Observe electrostatic precautionary procedures. Semiconductor laser transmitters and receivers provide highly reliable performance when operated in conformity with their intended design. However, a semiconductor laser may be damaged by an electrostatic charge inadvertently imposed by careless handling.

Static electricity can be conducted to the laser chip from the center pin of the RF input connector, and through the DC connector pins. When unpacking and otherwise handling the transmitter, follow ESD precautionary procedures including use of grounded wrist straps, grounded workbench surfaces, and grounded floor mats.

Exposure to electrostatic charge is greatly reduced after the transmitter has been installed in an operational circuit.

Service

Do not attempt to modify or service any part of the system other than in accordance with procedures outlined in this Operation Manual. If the system does not meet its warranted specifications, or if a problem is encountered that requires service, return the apparently faulty plug-in or assembly to Ortel for evaluation in accordance with Ortel's warranty policy.

When returning a plug-in or assembly for service, include the following information: Owner, Model Number, Serial Number, Return Authorization Number (obtained in advance from Ortel's Customer Service Dept.), service required and/or description of the problem encountered.

Warranty

Ortel warrants to the original purchaser all standard products sold by Ortel to be free of defects in material and workmanship for one (1) year from date of shipment from Ortel. During the warranty period, Ortel's obligation, at our option, is limited to repair or replacement of any product that Ortel proves to be defective. This warranty does not apply to any product that has been subject to alteration, abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation, or handling.

This warranty is the only warranty made by Ortel and is in lieu of all other warranties, expressed or implied, except as to title, and can be amended only by a written instrument signed by an officer of Ortel. Ortel sales agents or representatives are not authorized to make commitments on warranty returns.

Limitations of Liabilities

Ortel's liability on any claim of any kind, including negligence, for any loss or damage arising from, connected with, or resulting from the purchase order, contract, or quotation, or from the performance or breach thereof, or from the design, manufacture, sale, delivery, installation, inspection, operation or use of any equipment covered by or furnished under this contract, shall in no case exceed the purchase price of the device which gives rise to the claim.

EXCEPT AS EXPRESSLY PROVIDED HEREIN, ORTEL MAKES NO WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY GOODS, PARTS AND SERVICES PROVIDED IN CONNECTION WITH THIS AGREEMENT INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. ORTEL SHALL NOT BE LIABLE FOR ANY OTHER DAMAGE INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE GOODS, PARTS AND SERVICE.

Ortel will not be responsible for loss of output or reduced output of opto-electronic devices if the customer performs chip mounting, ribbon bonding, wire bonding, fiber coupling, fiber connectorization, or similar operations. These processes are critical and may damage the device or may affect the device's output or the fiber output.

Ortel test reports or data indicating mean-time-to-failure, mean-time-between-failure, or other reliability data are design guides and are not intended to imply that individual products or samples of products will achieve the same results. These numbers are to be used as management and engineering tools, and are not necessarily indicative of expected field operation. These numbers assume a mature design, good parts, and no degradation of reliability due to manufacturing procedures and processes.

Ortel is not liable for normal laser output degradation or fiber coupling efficiency degradation over the life of the device.

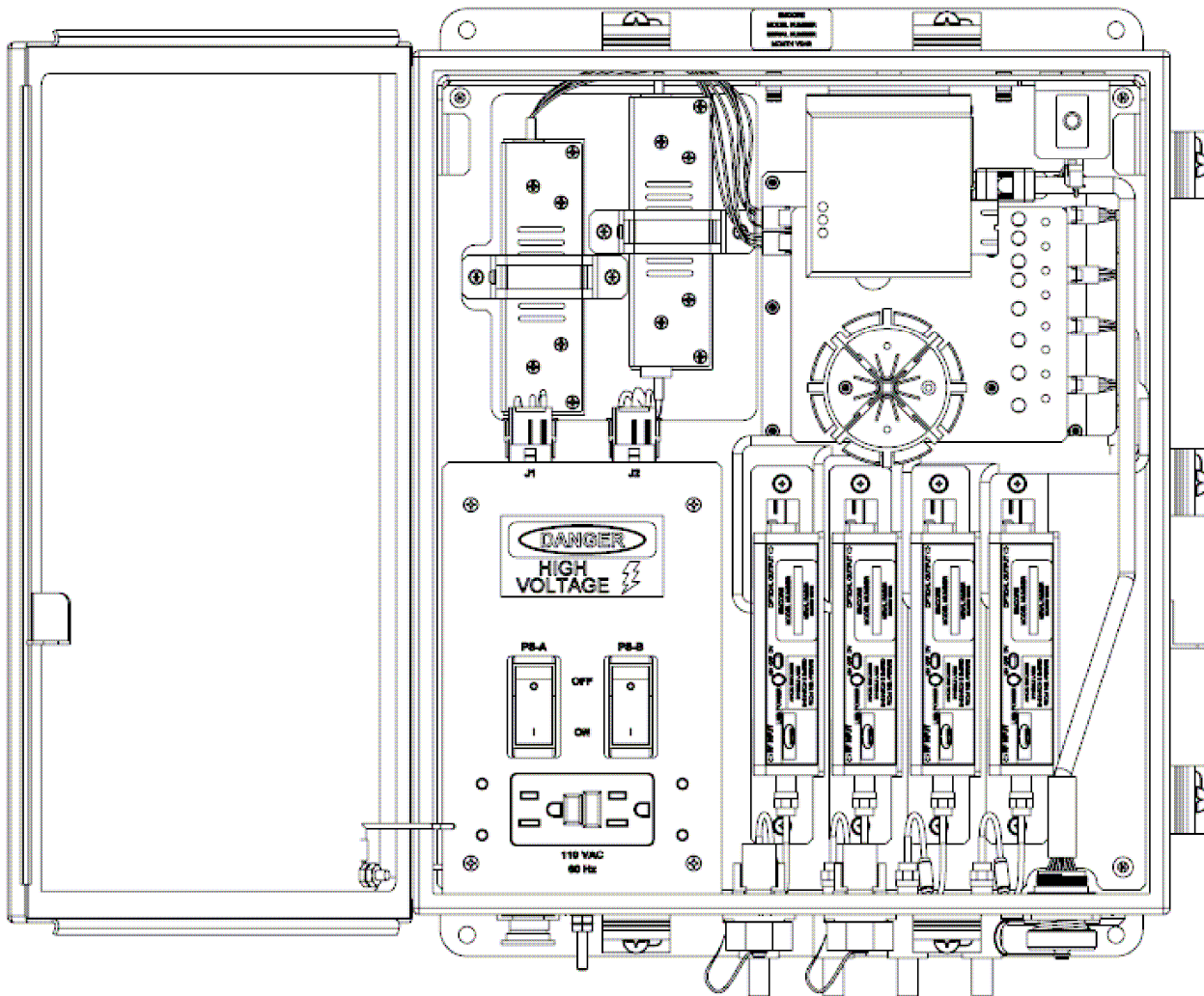
SCOPE

This document describes the primary procedures and information needed to install the EMCORE 3091A Outdoor Unit (ODU). Additional detailed product specification be found in the Product Marketing Datasheet, available at www.emcore.com.

MECHANICAL INSTALLATION

The 3091A ODU products family is NEMA 4 RATED wall mountable powered with a Redundant Power Supply, as shown below.

These power supplies provides enough current to drive up to four 2991 transmitter (Tx) plus LNBs and/or receiver (Rx) modules as well as the various options for Ethernet, SNMP or Serial. The Tx, Rx, Power Supplies, SNMP and Serial options may be inserted or removed while the power supplies are turned on, although it is advisable to have the RF connectors disconnected during installation and removal.



OPTICAL CONSIDERATIONS

Optical Fiber

EMCORE 2991 Tx and Rx are designed for singlemode fiber at 1310 or 1550 nm, depending on the model. While many styles exist for the outer jackets and cables, the fundamental glass portion of the fiber is consistently 125 microns in total, with the inner 8-10 microns being the core that actually contains the light. As can be imagined with such a small core, cleanliness and care of the bare fiber and ends is critical.

Also critical is the bend radius. Like many types of RF cables, when an optical fiber is bent tighter than a roughly 1 inch (25 mm) radius, the light may escape, thus decreasing the RF gain of the link. Bends much tighter than 1 inch also may permanently damage some fibers. Thus when storing or installing fiberoptic cable it should be wound and bent in loose coils or turns. On the convenient side, optical fiber is immune to all electrical cross-talk and ground loops, therefore optical cables can be installed next to power and communication lines with no concern of signal degradation.

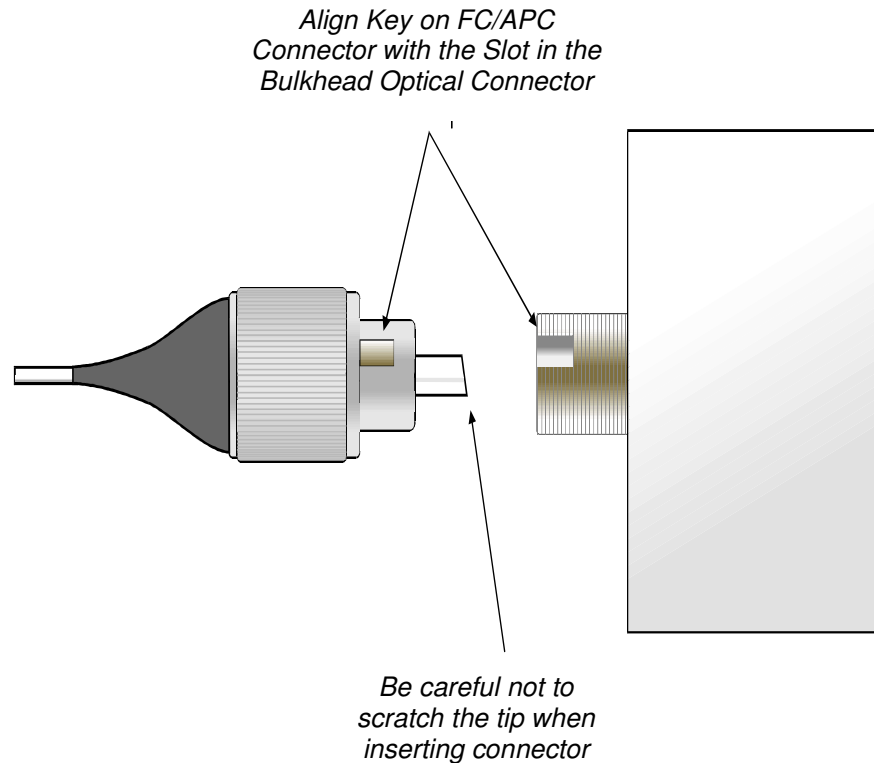
Finally, the fiber itself must be singlemode, not multimode. If a 2991 Tx and Rx are used with multimode fiber, then the RF gain, distortion, noise, bandwidth, and overall performance stability may suffer.

Optical Connector Styles

There are many optical connectors on the market. For high performance and high frequency RF applications, the connector must be for singlemode fiber and be repeatable, low loss and have a low optical return loss. The 3091A ODU units are provided with either an FC-APC or an SC-APC connector. The first 2 letters indicate the mechanical housing style. The SC style uses a push-pull mechanism to mate, while the FC uses a threaded sleeve and an alignment key. This FC key can be tricky to align, so take care that it has actually slid into the mating notch prior to screwing down the housing, otherwise it may appear OK even though the key was out of the notch.

The last letters ("APC") indicate the polish geometry and quality on the connector tip. "APC" stands for Angled Physical Contact. An 8 degree angle and a glass-to-glass contact characteristic of the APC reduces optical reflections to less than -60 dB, which can noticeably improve RF distortion and noise, especially for longer lengths of fiber. Other polish geometries, such as PC, SPC and UPC, have no 8-degree angle, so if mated directly to an APC will increase system RF losses by more than 20 dB. If your location uses both PC and APC connectors, it helps to label them because the outer housings of both styles look similar.

Non-APC connectors may be used for connections separate from the 3091A ODU units themselves, although at the risk of some degradation of performance. The 3091A ODU Tx includes an optical isolator that shields the laser itself from otherwise destabilizing reflections and a proprietary circuit that reduces double-back scattering noise in the fiber (a phenomenon somewhat similar to RF VSWR), so many applications do use non-APC connectors in the optical train with perfectly satisfactory results. If in doubt, installing APC down the entire length of fiber will give the best possible dynamic range.

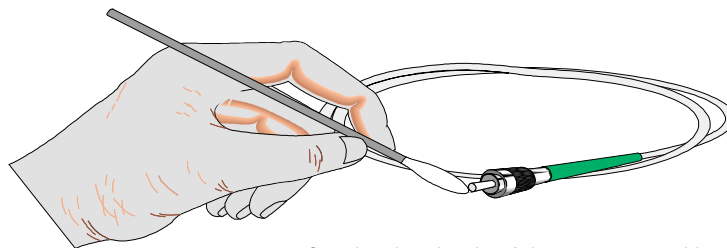


Cleaning Optical Connectors

CAUTION: Take care when working with fiber that may be carrying light. Looking directly into the connector or fiber may damage your eye.

Fiberoptic connectors on cable that come pre-terminated should have been cleaned and capped, so usually the installer can simply remove the cap and make the connection without cleaning. If in doubt, you may want to clean the connector before installation. Once the connection is made, there is no need to periodically clean the connector as long as it remains connected. The optical connectors of the Tx and Rx are recessed, hence generally stay clean with no manual cleaning required, although it is recommended to keep them covered when not in use.

When handling connectors, remember that the light comes from an aperture only 9 microns in diameter, so grease from you finger or small scratch can easily create loss and reflections. To clean, moisten a cotton swab with alcohol and gently wipe the tip of the connector several times. Allow to air dry.



Gently wipe the tip of the connector with a cotton swab soaked in alcohol. Air dry.

Model & Options

3091A-aa-bbbb-cc-dd-e-f

for example **3091A**-P1-FFFF-NN-NN-S-N

Power Input, external connector (aa) (J1 – J2)

Option	Description
P1	1 AC input driving 2 power supplies. (J1) Single Duplex Outlet (GFI AC power plug—North American Standard)
P2	2 AC input independently driving 2 power supplies. (J2) Single Duplex Outlet (GFI AC power plug—North American Standard)
D1	1 DC input. (J1)
C1	Conduit, 1-inch EMT for AC entry (J1)
C2	Conduit, 1-inch EMT for DC entry (J1)

RF external connector (bbbb) (J3 – J6)

Option	Description
F	F-type, 75 Ohm
B	BNC, 50 Ohm
C	Conduit interface, 2-inch EMT (J3)
E	Empty

Discrete external connector (cc) (J11)

Option	Description
DM	Discrete Monitor (16-wire, male)
CO	Conduit interface, 1-inch EMT
GR	Feedthru grommet
NN	None

Monitor external connector (dd) (J7, J8, J9, J10)

Option	Description
RJ	RJ 45 plug (J7)
R2	RJ 45 plug, qty 2 (J7, J8)
R3	RJ 45 plug, qty 3 (J7, J8, J9)
R4	RJ 45 plug, qty 4 (J7, J8, J9, J10)
CO	Conduit interface, 1-inch EMT
GR	Feedthru grommet
NN	None

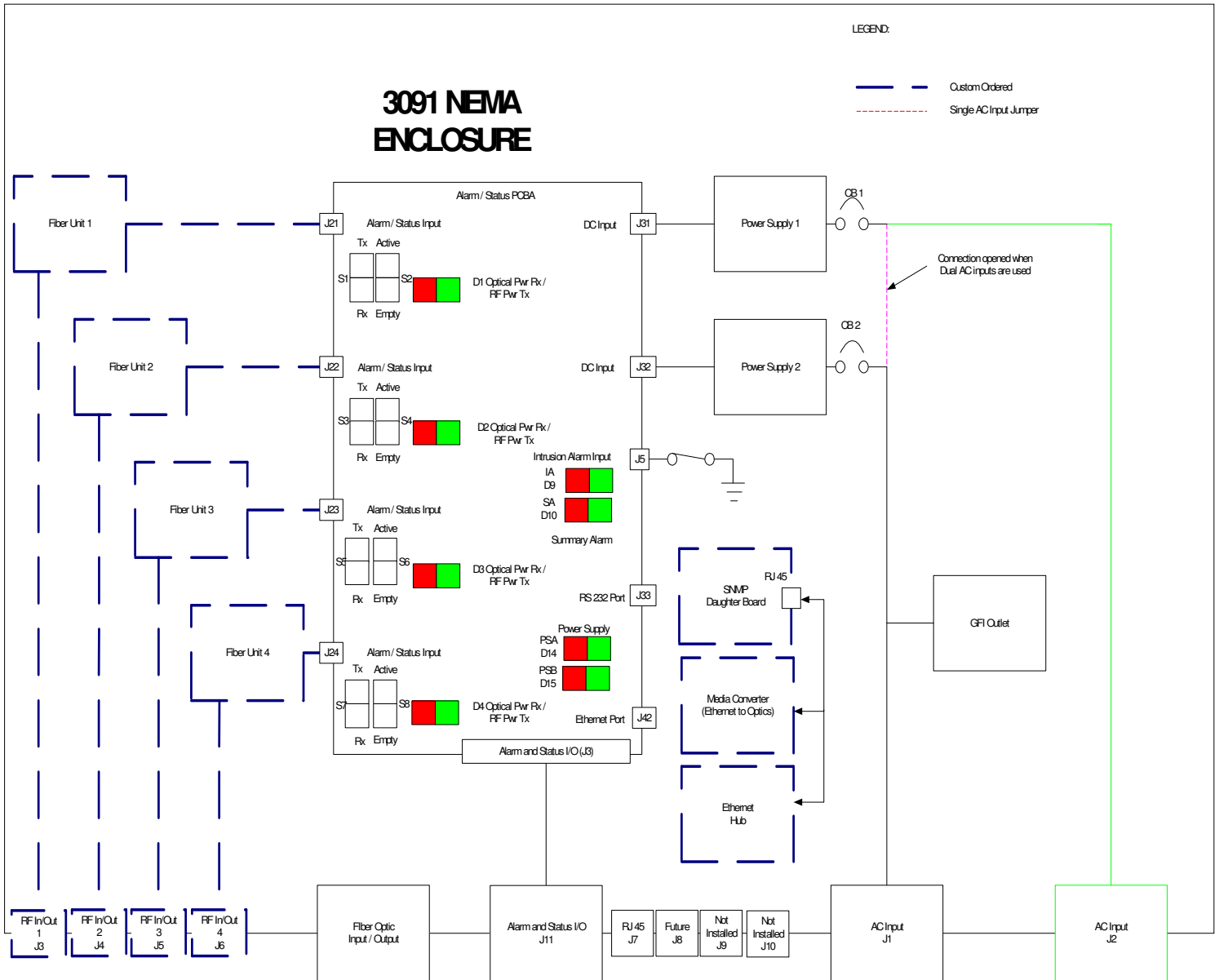
SNMP Ethernet interface card (e)

S	SNMP interface card
N	none

Misc. Options (e)

N	none (1 year warranty, standard labels)
2	2 year warranty
3	3 year warranty

Block Diagram



Environmental

- Ambient outside air temperature: -30 to 50°C
- Storage temperature: -40°C to +85°C
- Start Up Temperature: 0°C min
- Humidity, non-condensing: 5 to 95%
- Absolute Maximum Rating (damage may occur beyond these limits) < -30°C and > +70°C
- NEMA 4

Electrical

External Power Input (J1 & J2)

AC Power

Connector Style: 3 pin, Receptacle male

Cable mating connector: 3 pin, female

Compatible with 0.5 inch cable diameters and styles.

Pin 1 is Hot, Pin 2 is Neutral and Pin 3 is Ground.

Parameters	Symbol	Conditions	Min	Typ	Max	Unit
AC Voltage			95	--	240	VAC
AC Current			--	--	2	Amps

Circuit Breaker Switch: 5 amp trigger

Internal mechanical cable clamp if conduit options.

GFCI receptacle outlet

GFCI Outlet

Single AC input (J1) the GFCI outlet will be connected directly to the AC input.

This connection will be prior to being split to the two power supplies.

Dual AC input (J1 and J2) the GFCI outlet will be connected directly to the AC input associated with J1.

Conduit

The entry for J1 will use a 1-inch emt conduit.

DC Power

Connector Style: 2 pin, Receptacle male

Cable mating connector: 2 pin, female

Compatible with 0.5 inch cable diameters and styles.

Pin 1 is +24 VDC and Pin 2 is Ground.

Parameters	Symbol	Conditions	Min	Typ	Max	Unit
DC Voltage			23	--	25	VDC
DC Current			--	--	5	Amps

Circuit Breaker Switch: 5 amp trigger

Internal mechanical cable clamp if conduit options.

Conduit

The entry for J1 will use a 1-inch emt conduit.

Grounding

External Earth Ground

The 3091A will have a 10-32 Ground stud.

Prior to installing the ground stud the paint will be removed from the 3091A so that there is a clean metal-to-metal contact available.

Internal Earth Ground

All grounds will be connected to this common ground point.

The wire used to connect the ground will be a Green 16 AWG TFFN

PCBA - Internal Power Input (P31 & P32)

DC Power

Connector Style: 4 pin, Receptacle male

Pins 1 and 2 is +24 VDC, Pin 3 and 4 is Ground.

Parameters	Symbol	Conditions	Min	Typ	Max	Unit
DC Voltage			23	24	25	VAC
DC Current			--	--	5	Amps

DC Power Cable Interface

DC Power Supply	PCBA P31 – P32 4-Pin Female Pin No.	Function
+24 VDC	1	+24 VDC
+24 VDC	2	+24 VDC
Ground	3	Ground
Ground	4	Ground

DC to Tx / Rx Units, PCBA(J21 to J24)

Connector Style: 3-Pin, Receptacle male

- Pin 1: DC input
- Pin 2: Tx RF Lvl Mon, Rx Op Pwr Mon
- Pin 3: Ground

2991T/R Cable Interface

2991 T/R 5-Pin Male Pin No.	PCBA J21 – J24 3-Pin Female Pin No.	Function
Yellow	2	Tx RF Lvl Mon, Rx Op Pwr Mon
Red	1	DC input (+24V)
Black	3	Ground

PCBA - DC for accessories, PCB connector (TB33)

Pin No.	Function	Notes
1	DC Power	Nominally 24 volts. 1.5 Amps.
2	Ground	

PCBA – ETHERNET connector (J42) – Used only when SNMP option is installed

Pin No.	Function
1	Tx Data (+) In
2	Tx Data (-) In
3	No Connection
4	No Connection
5	Rx Data (+) In
6	Rx Data (-) In
7	No Connection
8	No Connection
9	Link (-) In
10	Link (+) In
11	Data (-) In
12	Data (+) In

Discrete Controls and Monitors

3091A J7 (16 Pin Molex) Pin No.	Function
1	Ground
2	Summary Alarm "A" Relay
3	Summary Alarm "B" Relay
4	Power Supply "A" Relay - Com
5	Power Supply "A" Relay
6	Power Supply "B" Relay - Com
7	Power Supply "B" Relay
8	Unit 1 Relay In
9	Unit 1 Relay Out
10	Unit 2 Relay In
11	Unit 2 Relay Out
12	Unit 3 Relay In
13	Unit 3 Relay Out
14	Unit 4 Relay In
15	Unit 4 Relay Out
16	Ground

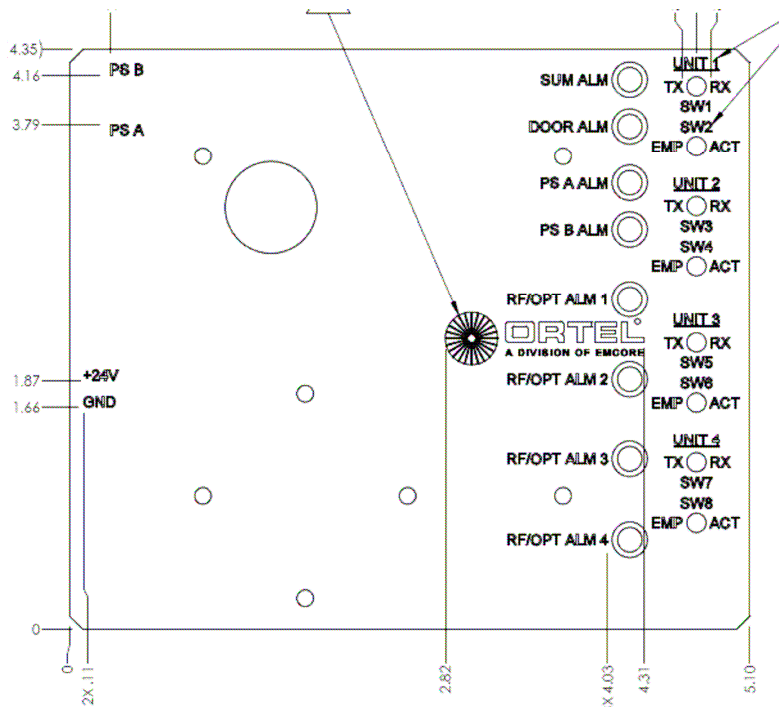
- Relays are all normally closed. Relays open for alarm condition or lack of power.
- Relays can pass 2 Amps.

PCBA - SWITCH, SLIDE, SPDT

- **Unit 1**
 - Tx / Rx Switch 1
 - Active / Empty Switch 2
- **Unit 2**
 - Tx / Rx Switch 3
 - Active / Empty Switch 4
- **Unit 3**
 - Tx / Rx Switch 5
 - Active / Empty Switch 6
- **Unit 4**
 - Tx / Rx Switch 7
 - Active / Empty Switch 8

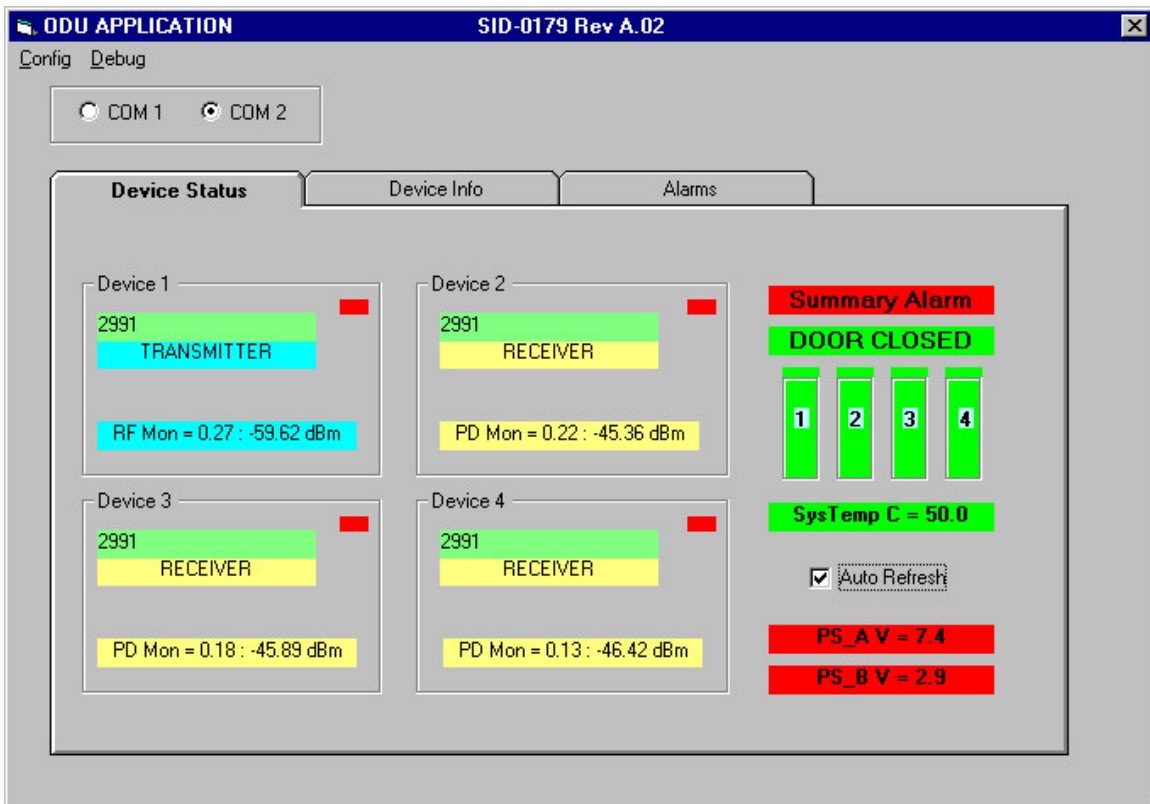
PCBA - LEDs

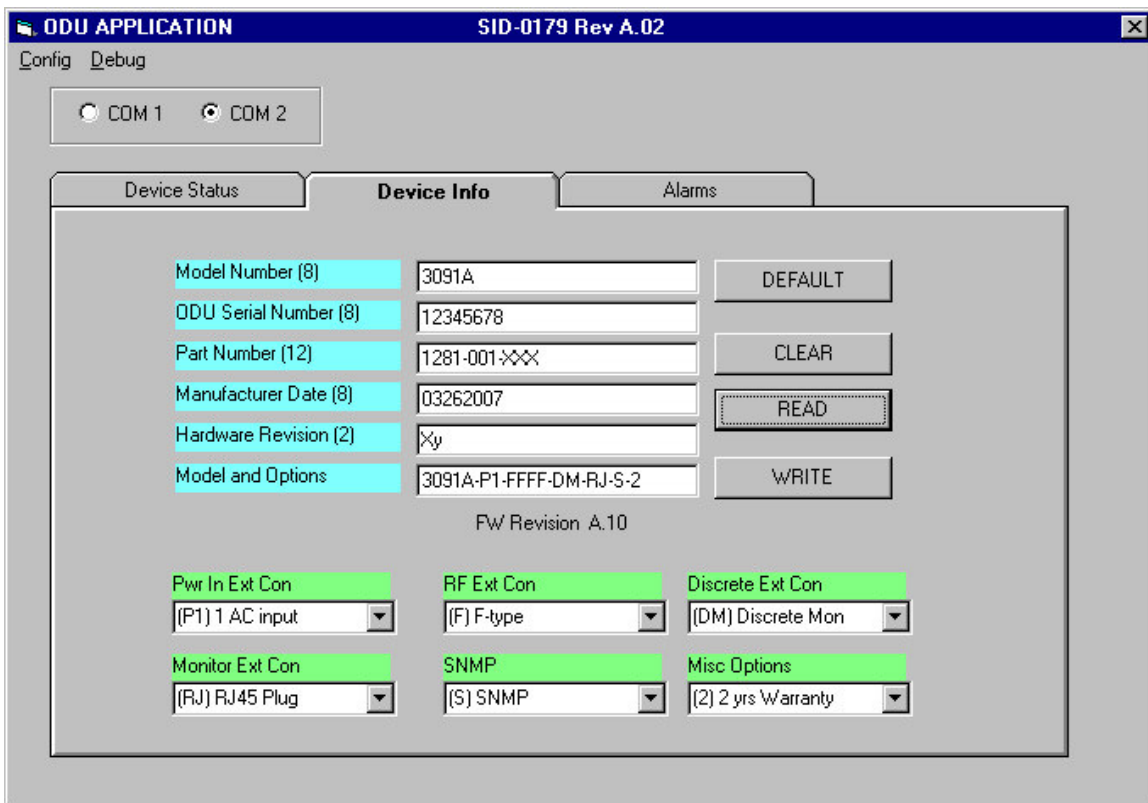
Name	Label	Unit	Green	Red	Off
P1	DC Pwr	Rx	<4.00 vdc to <2.75 vdc	> 4.25 vdc	empty
	RF/Opt Pwr	Tx	<2.25 vdc to 1.25 vdc	<2.5 vdc	empty
P2	DC Pwr	Rx	<4.00 vdc to <2.75 vdc	> 4.25 vdc	empty
	RF/Opt Pwr	Tx	<2.25 vdc to 1.25 vdc	<2.5 vdc	empty
P3	DC Pwr	Rx	<4.00 vdc to <2.75 vdc	> 4.25 vdc	empty
	RF/Opt Pwr	Tx	<2.25 vdc to 1.25 vdc	<2.5 vdc	empty
P4	DC Pwr	Rx	<4.00 vdc to <2.75 vdc	> 4.25 vdc	empty
	RF/Opt Pwr	Tx	<2.25 vdc to 1.25 vdc	<2.5 vdc	empty
SA	Summary Alarm		All OK		na
DO	Door Open		CLOSED	OPEN	na
PSA	Pwr Sply A		Dc >23 vdc or < 25 vdc	Dc <23 vdc or > 25 vdc	na
PSB	Pwr Sply B		Dc >23 vdc or < 25v	Dc <23 vdc or >25 vdc	na



PCBA - Serial, RS-232 (J33)

Pin No.	Function
1	Gnd
2	Tx
3	Rx
4	NC
5	Gnd
6	NC
7	NC
8	NC
9	NC





ODU APPLICATION SID-0179 Rev A.02

Config Debug

COM 1 COM 2

Device Status Device Info **Alarms**

	En	LA	LW	HW	HA	HY
Board Temperature (C)	<input checked="" type="checkbox"/>	-10	Disabled	Disabled	70	Disabled
Power Supply A (V)	<input checked="" type="checkbox"/>	22.2	Disabled	Disabled	24.2	Disabled
Power Supply B (V)	<input checked="" type="checkbox"/>	22.2	Disabled	Disabled	24.2	Disabled
Unit 1 RF Mon (V)	<input checked="" type="checkbox"/>	0.10	0.10	0.10	0.20	Disabled
Unit 2 PD Mon (V)	<input checked="" type="checkbox"/>	0.80	0.90	1.10	1.20	Disabled
Unit 3 PD Mon (V)	<input checked="" type="checkbox"/>	0.40	0.40	0.50	0.60	Disabled
Unit 4 PD Mon (V)	<input checked="" type="checkbox"/>	0.20	0.20	0.20	0.20	Disabled

(1) LOAD (2) SAVE (3) CLEAR (4) READ

RS-232 Monitoring System

A RS232 interface with monitoring software is a standard feature of the 3091A.

This software monitors the Transmitters, Receivers, Power Supplies, Internal Operating Temperature and Intrusion of the 3091A.

This is shown in the above display screens for Device Status, Device Info and Alarms

PCBA – Programming Connector (Internal Use) (J34)

PCBA – Door Sensor Interface J5

Connector Style: 2 pin

Pin No.	Function
1	+5 VDC
2	Alarm In

Optical Fiber Interface

The fiber optic interface will accept a 1-inch emt conduit.

The two options will be for either a seal-tight or grip-tight connector.