

# ALDEN

CONNECT OUTSIDE THE BOX



The Amphenol Alden Products Company  
Industrial Ethernet Family of Products

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## Industrial Ethernet Family of Products

### Ethernet Migrates Out of the Office Environment to the Factory Floor and Beyond

From the factory automation floor to the commercial airplane floor, Ethernet is the network communication protocol of choice. Ethernet is the most widely accepted international networking standard used today for its high speed, reliability, wide spread acceptance and cost. More and more

Ethernet finds

applications into non-office, harsh environments.

Currently most global Fieldbus Networks have incorporated an Ethernet protocol into their communication topology. This Ethernet layer is a compliment to the existing network. The addition of Ethernet ports on Factory Automation devices such as PLC's, I/O's, HMI's, Switches, Hubs, Routers, Machine Controllers, etc., demand rugged interconnect solutions.

Harsh Environment Ethernet leverages existing Ethernet data communication standards while providing the required mechanical and environmental

protection to secure critical data transmission and collection from exposure to dust, noise, vibration, temperature extremes, chemical exposure, weather, debris, wash-downs and moisture.

The Amphenol Alden Products Company offers a wide variety of harsh environment physical layer solutions for the varied challenging Ethernet applications utilizing off the shelf components to maintain the cost efficiency of the Ethernet protocol. The Pulse-Plus,

D-coded M12 quick

couple system, and the Pulse-Net, RJ45 IP65 & IP67 based system, protect critical data communication against temperature and moisture extremes, dust, vibration, EMI noise and chemical exposure.

Both product families incorporate the Pulse-Lok quick couple technology, a unique auto-latch coupler that makes mating as easy as push and click. Other lack luster connector latching mechanisms used extensively



in these environments are grossly obsolete. Threaded or bayonet type couplers do not provide visual and audible confirmation for positive mating inherent in the Pulse-Lok coupler. In these pages you will find a broad offering of Harsh



Environment Ethernet Solutions from Amphenol Alden including:

1. Pulse Plus 4-Pin D-Coded Quick Couple Industrial Ethernet Receptacle & Plug Kits
2. Pulse Net RJ45 Receptacle & Plug Kits
3. Pulse Net RJ45 Cable Assemblies
4. Pulse Net RJ45 Accessories
5. Application & Assembly Information

If you do not see the solution you need, call (508) 427-7000 for technical assistance.

## Amphenol Alden Pulse-Plus 4-Pin D-coded Pin/Socket

### Industrial Ethernet Connectors with Limited Space Requirements Eliminate Threading in a Snap

Time is money. Whether you are changing over your line, performing routine maintenance, or installing thousands of Ethernet connections, untold hours and dollars are lost daily due to the inefficient, time consuming and frustrating design of threaded connectors. Our Pulse-Plus product family offers an automatic, thread less alternative to the traditional threaded M12 connector, while maintaining backwards compatibility.

#### Product Features:

- Easy to Use
- Pulse-Lok Quick Coupler
- Positive Mating Confirmation
- Visual, Audible & Tactile Mating Confirmation
- Reduce Installation Fatigue
- Reduce Installation Time & Money
- IP65 & IP67
- IEC 61-76-2-101 D-Coded Industrial Ethernet Key Configuration approved by ODVA Ethernet/IP, IAONA, & Profinet
- Backwards Compatible to standard M12 Plugs or Pulse Plus Plugs



#### Mechanical:

- 4 Contacts
- Insert Key Code: D-Code per IEC 61076-2-101

#### Material:

- Housing: Zamac
- Insert: Nylon
- Contact: Copper Alloy & Brass
- Contact Plating: Gold over Nickel
- O-Ring/Interfacial Seal: Silicon/Viton
- Wire / Contact Size: 22/24 AWG Stranded; 24 AWG Solid

#### Environmental:

- IP65 & IP67
- Temperature Range: -25C to +85C (-13F to 185F)

#### Electrical:

- TIA/EIA Category 5e
- Operating Current: 4 AMP
- Operating Voltage: 250 V

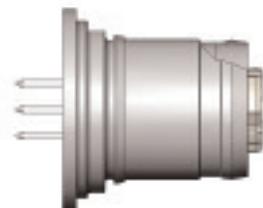
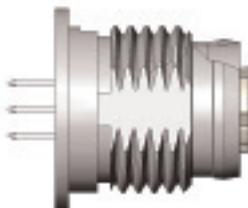


**Pulse Plus Eliminates Threading in a Snap!**

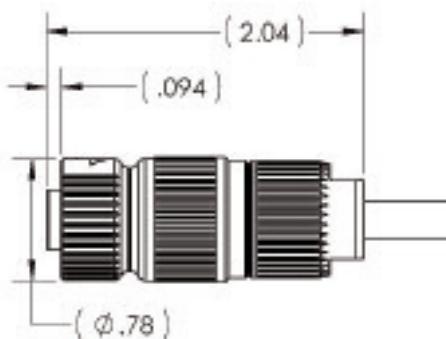
## Amphenol Alden Pulse-Plus 4-Pin D-coded Pin/Socket



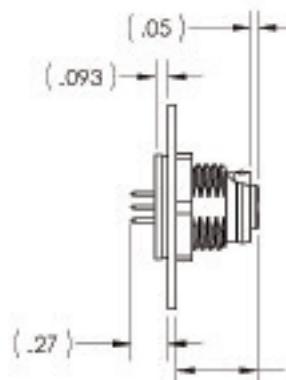
Industrial Ethernet Connectors with Limited Space Requirements Eliminate threading in a Snap



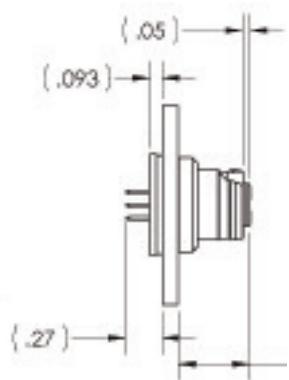
Pulse Plus Plug Style



Panel Mount Thread Style



Panel Mount Snap Style



Packaging Options	Field Installable Plug Kit	Panel Mount Receptacle Thread	Panel Mount Receptacle Snap
Individual Package	370000	375000	375002
Bulk Package	370001	375001	375003

Cable assemblies available in standard and custom lengths.

Pulse Plus Plug Face

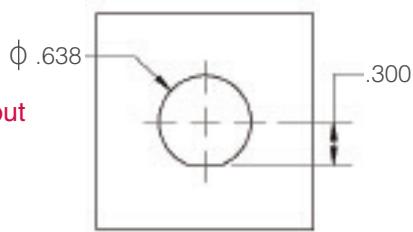


Pulse Plus Receptacle Face



Pin	Assignment	ODVA Ethernet/IP	PNO ProfiNet
Pin 1	Tx+	White-Orange	Yellow
Pin 2	Rx+	White-Green	White
Pin 4	Tx-	Orange	Orange
Pin 3	Rx-	Green	Blue

Panel Cut-out



Please go to [www.aldenproducts.com/pulseplus/instructions.pdf](http://www.aldenproducts.com/pulseplus/instructions.pdf) for complete assembly instructions.

## Amphenol Alden Pulse-Net PL-1300 Product Series Industrial RJ45 Ethernet Connectors

Amphenol Alden Products' Pulse Net is the connector of choice to protect critical data transmissions and collection. Standard jack and plug Category 5e and Category 6 components are packaged in a cost effective, harsh environment interconnect system that provides audible, tactile, and visual mating confirmation with mechanical cable strain relief plug protection. Sealing caps are also available to maintain IP ratings in a non-mated application. Receptacle and Plug Kits are packaged individual or bulk.

### Easy to Use

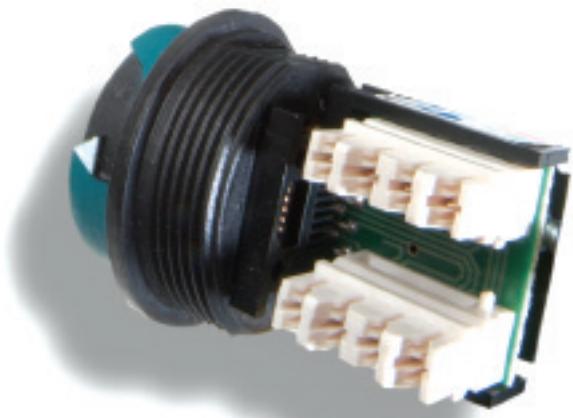
- Pulse-Lok®, Quick-Lok Mating Action
- Positive Mating Feedback Confirms Continuity

### Performance Engineered for Harsh Environments

- Blind Mate with Polarized Key
- Environmentally Sealed to IP-67
- Stands up to Mechanical Stress
- Optional EMI/RFI Shielding

### Modular Design

- Accepts a Variety of Standard RJ-45 Components
- Compatible with a Variety of Standard Cable Types
- Cable Assemblies Available in Standard and Custom Lengths



For product specifications please visit  
[www.aldenproducts.com/1300.pdf](http://www.aldenproducts.com/1300.pdf).

For complete assembly instructions please visit  
[www.aldenproducts.com](http://www.aldenproducts.com)

## Pulse Net Receptacle Assemblies – Available in Front or Rear Mount Configuration

Pulse Net Receptacle Kits are available in a variety of termination styles, TIA categories, shielded or non-shielded or supplied without a jack for customer defined keystone profile RJ45 jacks. Additionally, each of the termination styles can be supplied with either a Rear or Front Mounted Pulse Net receptacle housing. For further versatility, there are two different mounting hardware options, hex or spanner nuts. All styles can be supplied in bulk packaged or individually packaged in increments of 1.

### Category 5e Termination styles include:

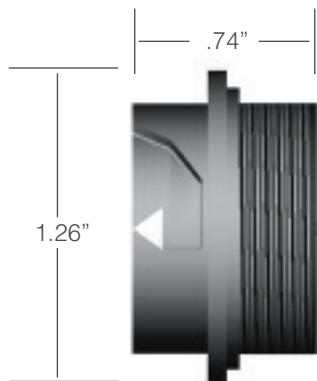
- 110 Punchdown Shielded and Non-Shielded, Right Angle and Straight
- Toolless Jack-Shielded and Non-Shielded
- In Line Coupler Shielded and Non-Shielded
- PCB Mount Straight Shielded & Non-Shielded (rear mount only)
- Customer supplied, keystone compliant

### Category 6 Termination styles include:

- 110 Punchdown Shielded and Non Shielded

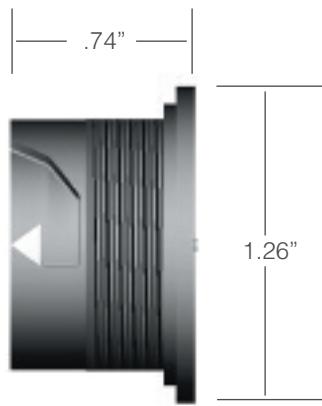
All versions feature the spring activated, Pulse Lok quick coupling technology with visual, audible and tactile mating confirmation. Receptacle sealing caps are available to maintain IP rating in non-mated conditions.

#### Receptacle Housing (Front Panel Mount)



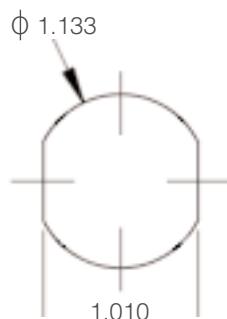
Panel-Mount Range = up to .185"

#### Receptacle Housing (Rear Panel Mount)



Panel-Mount Range = up to .185"

#### Receptacle Panel Cut-out



## Pulse-Net Receptacle Assemblies – Available in Front or Rear Mount Configuration

### Rear Mount, Black with Hex Nut

Termination Style	RJ45 Shielding	TIA Category	Individual	Bulk**
110 punchdown right angle	Non-shielded	Cat 5e	360001	360002
110 punchdown right angle	Shielded	Cat 5e	360003	360004
110 punchdown straight	Non-shielded	Cat 5e	360005	360006
110 punchdown straight	Shielded	Cat 5e	360007	360008
110 punchdown straight	Non-shielded	Cat 6	360089	360090
110 punchdown straight	Shielded	Cat 6	360091	360092
In line coupler right angle *	Non-shielded	Cat 3	360009	360010
In line coupler straight *	Non-shielded	Cat 5e	360011	360012
In line coupler straight *	Shielded	Cat 5e	360013	360014
Customer Supplied	N/A	N/A	360015	360016
PCB mount straight *	Non-shielded	Cat 5	360017	360018
PCB mount straight *	Shielded	Cat 5	360019	360020
Toolless straight	Non-shielded	Cat 5e	360021	360022
Toolless straight	Shielded	Cat 5e	360023	360024

### Front Mount, Black with Hex Nut

Termination Style	RJ45 Shielding	TIA Category	Individual	Bulk**
110 punchdown right angle	Non-shielded	Cat 5e	360025	360026
110 punchdown right angle	Shielded	Cat 5e	360027	360028
110 punchdown straight	Non-shielded	Cat 5e	360029	360030
110 punchdown straight	Shielded	Cat 5e	360031	360032
110 punchdown straight	Non-shielded	Cat 6	360093	360094
110 punchdown straight	Shielded	Cat 6	360095	360096
In line coupler right angle *	Non-shielded	Cat 3	360033	360034
In line coupler straight *	Non-shielded	Cat 5e	360035	360036
In line coupler straight *	Shielded	Cat 5e	360037	360038
Customer Supplied	N/A	N/A	360039	360040
Toolless straight	Non-shielded	Cat 5	360041	360042
Toolless straight	Shielded	Cat 5	360043	360044

\* Indicates RJ45 will be shipped assembled in the Pulse-Net receptacle housing. All other styles will not be assembled in housing for ease of termination at application.

\*\* Bulk packaged in increments of 1 after minimum line item order satisfaction.

Note: Additional colors and spanner nuts are available for all styles and terminations. Please contact Amphenol Alden Products directly.



Pulse Net Receptacle,  
110 Punchdown,  
Straight,  
Non-shielded



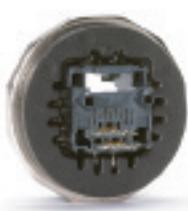
Pulse Net Receptacle,  
110 Punchdown,  
Right Angle,  
Non-shielded



Pulse Net Receptacle,  
In-line Coupler,  
Straight,  
Non-shielded



Pulse Net Receptacle,  
Toolless,  
Straight,  
Non-shielded



Pulse Net Receptacle,  
PC Mount,  
Straight,  
Non-shielded



Pulse Net Receptacle, 110  
Punchdown, Straight,  
Shielded



Pulse Net Receptacle,  
110 Punchdown,  
Right Angle,  
Shielded

PHOTO NOT  
CURRENTLY  
AVAILABLE



Pulse Net Receptacle,  
In-line Coupler,  
Straight,  
Shielded



Pulse Net Receptacle,  
Toolless,  
Straight,  
Shielded

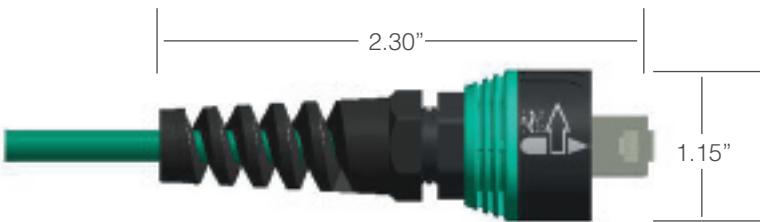
Pulse Net Receptacle,  
PC Mount,  
Straight,  
Shielded

## Pulse-Net Plug Assemblies – Available in Solid or Stranded Wire

Pulse Net field installable plug kits are available for custom cable length applications using a standard RJ45 crimping tool. The plug kits are available for use with stranded or solid cable in both shielded and non-shielded applications. They comply with TIA Category 5e and Category 6 standards. Two different strain reliefs are available for application specific cable management.

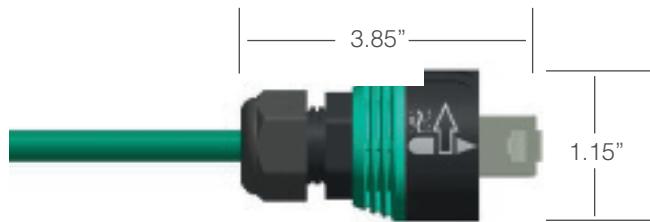
All versions feature the spring activated, Pulse Lok quick coupling technology with visual, audible and tactile mating confirmation. Plug sealing caps are available to maintain IP rating in non mated conditions.

Plug Housing (with flex nut strain relief)



Assembled Kit, Cable Diameter Range = .160" to .310"

Plug Housing (with dome nut strain relief)



Assembled Kit, Cable Diameter Range = .160" to .310"

### RJ45 Non-Shielded, Black

Wire Type	Strain Relif Type	TIA Category	Individual	Bulk
Stranded	Customer Supplied	Cat 5e	361025	361027
Stranded	Dome	Cat 5e	361001	361003
Stranded	Flex	Cat 5e	361005	361007
Stranded	Dome	Cat 6	361033	361035
Stranded	Flex	Cat 6	361037	361039
Solid	Customer Supplied	Cat 5e	361026	361028
Solid	Dome	Cat 5e	361002	361004
Solid	Flex	Cat 5e	361006	361008
Solid	Dome	Cat 6	361034	361036
Solid	Flex	Cat 6	361038	361040
Customer Supplied	Dome	N/A	361009	361010
Customer Supplied	Flex	N/A	361011	361012

### RJ45 Shielded, Black

Wire Type	Strain Relif Type	TIA Category	Individual	Bulk
Stranded	Customer Supplied	Cat 5e	361029	361031
Stranded	Dome	Cat 5e	361013	361015
Stranded	Flex	Cat 5e	361017	361019
Solid	Customer Supplied	Cat 5e	361030	361032
Solid	Dome	Cat 5e	361014	361016
Solid	Flex	Cat 5e	361018	361020
Customer Supplied	Dome	N/A	361021	361022
Customer Supplied	Flex	N/A	361023	361024

\* Indicates RJ45 will be shipped assembled in the Pulse-Net receptacle housing. All other styles will not be assembled in housing for ease of termination at application.

\*\* Bulk packaged in increments of 1 after minimum line item order satisfaction.

Note: Additional colors and spanner nuts are available for all styles and terminations. Please contact Amphenol Alden Products directly.

## Pulse Net Cable Assemblies – Available in Standard or Custom Lengths

Pulse Net Cable Assemblies are available in 6', 10', 15', and 20' lengths in several configurations; double ended Pulse Net to Pulse Net; Pulse Net to Standard RJ45, and Pulse Net to open. Please contact Amphenol Alden Technical Assistance at (508) 427-7000 to configure a custom length or connector configuration. All cable assemblies use the industrial, double jacketed Industrial Ethernet cable.

### Description....

Description	Cable	Shld	Str rel	Lgth	P/N
Pulse-Net CA IP67-IP67	Solid	NS	PT	6	107751- 1
Pulse-Net CA IP67-IP67	Solid	NS	PT	10	107751- 2
Pulse-Net CA IP67-IP67	Solid	NS	PT	15	107751- 3
Pulse-Net CA IP67-IP67	Solid	NS	PT	20	107751- 4
Pulse-Net CA IP67-IP67	Stranded	NS	PT	6	107751- 5
Pulse-Net CA IP67-IP67	Stranded	NS	PT	10	107751- 6
Pulse-Net CA IP67-IP67	Stranded	NS	PT	15	107751- 7
Pulse-Net CA IP67-IP67	Stranded	NS	PT	20	107751- 8
Pulse-Net CA IP67-IP67	Solid	S	PT	6	107751- 9
Pulse-Net CA IP67-IP67	Solid	S	PT	10	107751- 10
Pulse-Net CA IP67-IP67	Solid	S	PT	15	107751- 11
Pulse-Net CA IP67-IP67	Solid	S	PT	20	107751- 12
Pulse-Net CA IP67-IP67	Stranded	S	PT	6	107751- 13
Pulse-Net CA IP67-IP67	Stranded	S	PT	10	107751- 14
Pulse-Net CA IP67-IP67	Stranded	S	PT	15	107751- 15
Pulse-Net CA IP67-IP67	Stranded	S	PT	20	107751- 16
Pulse-Net CA IP67-IP67	Solid	NS	DM	6	107751- 17
Pulse-Net CA IP67-IP67	Solid	NS	DM	10	107751- 18
Pulse-Net CA IP67-IP67	Solid	NS	DM	15	107751- 19
Pulse-Net CA IP67-IP67	Solid	NS	DM	20	107751- 20
Pulse-Net CA IP67-IP67	Stranded	NS	DM	6	107751- 21
Pulse-Net CA IP67-IP67	Stranded	NS	DM	10	107751- 22
Pulse-Net CA IP67-IP67	Stranded	NS	DM	15	107751- 23
Pulse-Net CA IP67-IP67	Stranded	NS	DM	20	107751- 24
Pulse-Net CA IP67-IP67	Solid	S	DM	6	107751- 25
Pulse-Net CA IP67-IP67	Solid	S	DM	10	107751- 26
Pulse-Net CA IP67-IP67	Solid	S	DM	15	107751- 27
Pulse-Net CA IP67-IP67	Solid	S	DM	20	107751- 28
Pulse-Net CA IP67-IP67	Stranded	S	DM	6	107751- 29
Pulse-Net CA IP67-IP67	Stranded	S	DM	10	107751- 30
Pulse-Net CA IP67-IP67	Stranded	S	DM	15	107751- 31
Pulse-Net CA IP67-IP67	Stranded	S	DM	20	107751- 32

### Description....

Description	Cable	Shld	Str rel	Lgth	P/N
Pulse-Net CA IP67-RJ45	Solid	NS	PT	6	107752- 1
Pulse-Net CA IP67-RJ45	Solid	NS	PT	10	107752- 2
Pulse-Net CA IP67-RJ45	Solid	NS	PT	15	107752- 3
Pulse-Net CA IP67-RJ45	Solid	NS	PT	20	107752- 4
Pulse-Net CA IP67-RJ45	Stranded	NS	PT	6	107752- 5
Pulse-Net CA IP67-RJ45	Stranded	NS	PT	10	107752- 6
Pulse-Net CA IP67-RJ45	Stranded	NS	PT	15	107752- 7
Pulse-Net CA IP67-RJ45	Stranded	NS	PT	20	107752- 8
Pulse-Net CA IP67-RJ45	Solid	S	PT	6	107752- 9
Pulse-Net CA IP67-RJ45	Solid	S	PT	10	107752- 10
Pulse-Net CA IP67-RJ45	Solid	S	PT	15	107752- 11
Pulse-Net CA IP67-RJ45	Solid	S	PT	20	107752- 12
Pulse-Net CA IP67-RJ45	Stranded	S	PT	6	107752- 13
Pulse-Net CA IP67-RJ45	Stranded	S	PT	10	107752- 14
Pulse-Net CA IP67-RJ45	Stranded	S	PT	15	107752- 15
Pulse-Net CA IP67-RJ45	Stranded	S	PT	20	107752- 16
Pulse-Net CA IP67-RJ45	Solid	NS	DM	6	107752- 17
Pulse-Net CA IP67-RJ45	Solid	NS	DM	10	107752- 18
Pulse-Net CA IP67-RJ45	Solid	NS	DM	15	107752- 19
Pulse-Net CA IP67-RJ45	Solid	NS	DM	20	107752- 20
Pulse-Net CA IP67-RJ45	Stranded	NS	DM	6	107752- 21
Pulse-Net CA IP67-RJ45	Stranded	NS	DM	10	107752- 22
Pulse-Net CA IP67-RJ45	Stranded	NS	DM	15	107752- 23
Pulse-Net CA IP67-RJ45	Stranded	NS	DM	20	107752- 24
Pulse-Net CA IP67-RJ45	Solid	S	DM	6	107752- 25
Pulse-Net CA IP67-RJ45	Solid	S	DM	10	107752- 26
Pulse-Net CA IP67-RJ45	Solid	S	DM	15	107752- 27
Pulse-Net CA IP67-RJ45	Solid	S	DM	20	107752- 28
Pulse-Net CA IP67-RJ45	Stranded	S	DM	6	107752- 29
Pulse-Net CA IP67-RJ45	Stranded	S	DM	10	107752- 30
Pulse-Net CA IP67-RJ45	Stranded	S	DM	15	107752- 31
Pulse-Net CA IP67-RJ45	Stranded	S	DM	20	107752- 32

### Description....

Description	Cable	Shld	Str rel	Lgth	P/N
Pulse-Net CA IP67 Single	Solid	NS	PT	6	107753- 1
Pulse-Net CA IP67 Single	Solid	NS	PT	10	107753- 2
Pulse-Net CA IP67 Single	Solid	NS	PT	15	107753- 3
Pulse-Net CA IP67 Single	Solid	NS	PT	20	107753- 4
Pulse-Net CA IP67 Single	Stranded	NS	PT	6	107753- 5
Pulse-Net CA IP67 Single	Stranded	NS	PT	10	107753- 6
Pulse-Net CA IP67 Single	Stranded	NS	PT	15	107753- 7
Pulse-Net CA IP67 Single	Stranded	NS	PT	20	107753- 8
Pulse-Net CA IP67 Single	Solid	S	PT	6	107753- 9
Pulse-Net CA IP67 Single	Solid	S	PT	10	107753- 10
Pulse-Net CA IP67 Single	Solid	S	PT	15	107753- 11
Pulse-Net CA IP67 Single	Solid	S	PT	20	107753- 12
Pulse-Net CA IP67 Single	Stranded	S	PT	6	107753- 13
Pulse-Net CA IP67 Single	Stranded	S	PT	10	107753- 14
Pulse-Net CA IP67 Single	Stranded	S	PT	15	107753- 15
Pulse-Net CA IP67 Single	Stranded	S	PT	20	107753- 16

Description	Cable	Shld	Str rel	Lgth	P/N
Pulse-Net CA IP67 Single	Solid	NS	DM	6	107753- 17
Pulse-Net CA IP67 Single	Solid	NS	DM	10	107753- 18
Pulse-Net CA IP67 Single	Solid	NS	DM	15	107753- 19
Pulse-Net CA IP67 Single	Solid	NS	DM	20	107753- 20
Pulse-Net CA IP67 Single	Stranded	NS	DM	6	107753- 21
Pulse-Net CA IP67 Single	Stranded	NS	DM	10	107753- 22
Pulse-Net CA IP67 Single	Stranded	NS	DM	15	107753- 23
Pulse-Net CA IP67 Single	Stranded	NS	DM	20	107753- 24
Pulse-Net CA IP67 Single	Solid	S	DM	6	107753- 25
Pulse-Net CA IP67 Single	Solid	S	DM	10	107753- 26
Pulse-Net CA IP67 Single	Solid	S	DM	15	107753- 27
Pulse-Net CA IP67 Single	Solid	S	DM	20	107753- 28
Pulse-Net CA IP67 Single	Stranded	S	DM	6	107753- 29
Pulse-Net CA IP67 Single	Stranded	S	DM	10	107753- 30
Pulse-Net CA IP67 Single	Stranded	S	DM	15	107753- 31
Pulse-Net CA IP67 Single	Stranded	S	DM	20	107753- 32

## Industrial Ethernet Accessories

Tethered Sealing caps are available for both the Pulse Net plug and receptacle to maintain the IP ratings during a non-mated condition.



### Sealing Covers, Black

Description	Part Number
Receptacle, front mount sealing cover, with tether	107832-01
Receptacle sealing cover, without tether	107448-01
Plug sealing cover, with tether	107304-01
Plug sealing cover, without tether	107288-01

\* Bulk packaged in increments of 1 after minimum line item order satisfaction.

Note: Additional colors available. Please contact Amphenol Alden Products directly.

**Front Mount Receptacle Sealing Cap**



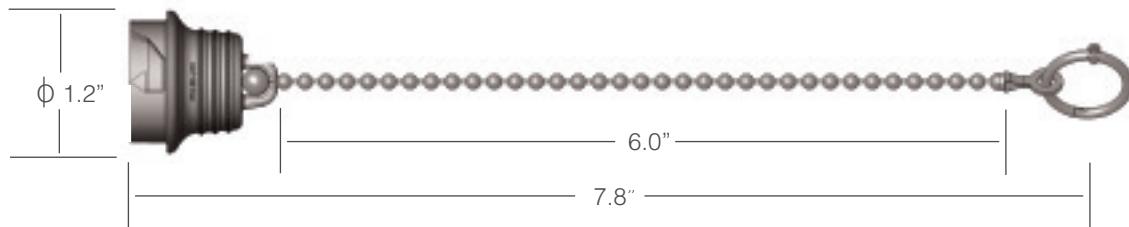
To install, slide last bead on chain through slot of mounting ring. Install first gasket onto housing, then the mounting ring, then the second gasket. Put housing through panel and tighten nut.

**Rear Mount Receptacle Sealing Cap**



To install, slide last bead on chain through slot of mounting ring. Place mounting ring between the panel and panel nut and tighten nut.

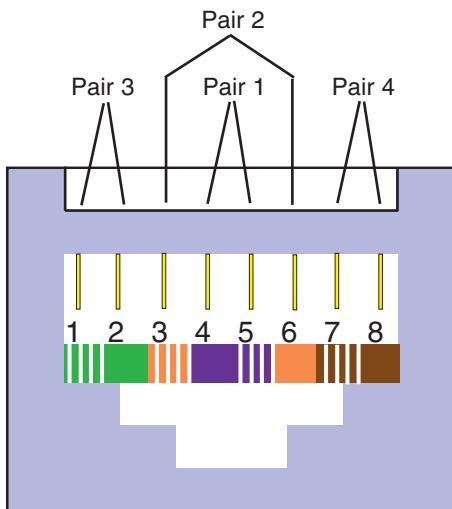
**PlugSealing Cap**



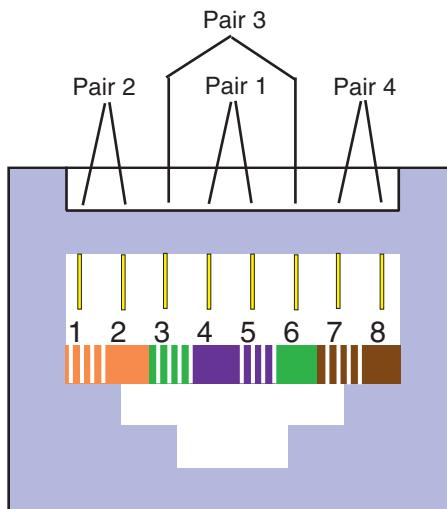
To install onto a cable assembly; open wire clip, place cable between the halves and close clip.

## EIA/TIA 568A and 568B Standards

The cable color code is the 568B standard on each end of a straight-through 10/100 BaseT cable. If a crossover cable is required, use the 568A standard on one end and 568B on the other.



T568A



T568B

Crossover Cable	
RJ-45 PIN	RJ-45 PIN
1 Rx+	3 Tx+
2 Rx-	6 Tx-
3 Tx+	1 Rx+
6 Tx-	2 Rx-

Pin	Pin
568A Male	568B Male

Straight Through Cable	
RJ-45 PIN	RJ-45 PIN
1 Tx+	1 Rx+
2 Tx-	2 Rx-
3 Rx+	3 Tx+
6 Rx-	6 Tx--

This table provides comparative channel performance data at 100 MHz and other frequency values of interest for the TIA category 5, 5e, and 6 and ISO class D, E, and F performance standards.

### Industry Standards Performance Comparison, Worst-case Channel Performance @ 100 MHz

Parameter	Category 5 Class D with additional requirements TSB95 & FDAM 2	Category 5e (568-A-5)	Proposed Category 6 Class E (Performance @ 250 MHz shown in parentheses)	Proposed Category 7 Class F (Performance 600 MHz shown in parentheses)
Specific frequency range	1-100 MHz	1-100 MHz	1-250 MHz	1-600 MHz
Attenuation	24 dB	24 dB	21.7 dB (36 dB)	20.8 dB (54.1 dB)
NEXT	27.1 dB	30.1 dB	39.9 dB (33.1 dB)	62.1 dB (51 dB)
Power-sum NEXT	N/A*	27.1 dB	37.1 dB (30.2 dB)	59.1 dB (48 dB)
ACR	3.1 dB	6.1 dB	18.2 dB (-2.9 dB)	41.3 dB (-3.1 dB)
Power-sum ACR	N/A	3.1 dB	15.4 dB (-5.8 dB)	38.3 dB (-6.1 dB)
ELFEXT	17 dB (new requirement)	17.4 dB	23.2 dB (15.3 dB)	ffs ***
Power-sum ELFEXT	14.4 dB (new requirement)	14.4 dB	20.2 dB (12.3 dB)	ffs ***
Return Loss	8 dB* (new requirement)	10 dB	12 dB (8 dB)	14.1 dB (8.7 dB)
Propagation delay	548 nsec	548 nsec	548 nsec (546 nsec)	504 nsec (501 nsec)
Delay skew	50 nsec	50 nsec	50 nsec	20 nsec

Note: Industry channel-performance requirements for Category 6 and Category 7 are currently under development. \* Class D return-loss requirement at 100 MHz is 10 dB. Class D power-sum NEXT loss is 24.1 dB at 100 MHz. \*\* Positive ACR at 600 MHz is accomplished with the typical Class F implementation with interconnect environment and without transition point. \*\*\* ffs-The parameters are marked for future study by the ISO standards group, and anticipated performance requirements are under development.



# NEMA Types and Ingress Protection Categories

NEMA Type	Intended Use
1	Indoor use, primarily for protection against (hand) contact with enclosed equipment
2	Indoor use, primarily to provide a degree of protection against limited amounts of falling dirt
3	Outdoor use, primarily to provide a degree of protection against windblown dust, rain, sleet; undamaged by ice formation on enclosure
3R	Outdoor use, primarily to provide a degree of protection against falling rain and sleet; undamaged by ice formation on enclosure
4	Indoor use, primarily to provide a degree of protection against windblown dust, rain, splashing water, hose directed water; undamaged by ice formation on enclosure
4X	Indoor and outdoor use, primarily to provide a degree of protection against corrosion, windblown dust, rain, splashing water, hose directed water; undamaged by ice formation on enclosure
6	Indoor or outdoor use where occasional temporary submersion is encountered
7	Indoor use in hazardous locations classified as Class I, Groups A, B, C or D
9	Indoor use in hazardous locations classified as Class II, Groups E, F, or G per NEC
12	Indoor use to provide a degree of protection against dust, falling dirt, and dripping non-corrosive liquids
13	Indoor use to provide a degree of protection against dust, spraying water, oil, and non-corrosive liquids



IP	Protection of Persons	Protection of Equipment	IP	Protection of Equipment
0	No protection	No protection	0	No protection
1	Protected against contact with large areas of the body (back of hand)	Protected against objects over 50 mm in diameter	1	Protected against vertically falling water drops
2	Protected against contact with fingers	Protected against solid objects over 12 mm in diameter	2	Protected against falling water drops when enclosure is tilted up to 15°
3	Protected against tools and wires over 2.5 mm in diameter	Protected against solid objects over 2.5 mm in diameter	3	Protected against spraying water up to 60° from vertical
4	Protected against tools and wires over 1.0 mm in diameter	Protected against solid objects over 1.0 mm in diameter	4	Protected against splashing water (limited ingress permitted)
5	Protected against tools and wires over 1.0 mm in diameter	Protected against dust (limited ingress, no harmful deposit)	5	Protected against low pressure water jets in all directions (limited ingress permitted)
6	Protected against tools and wires over 1.0 mm in diameter	Totally protected against dust	6	Protected against strong jets of water
			7	Protected against the effects of temporary immersion in water
			8	Protected against the effects of long periods of immersion in water

Amphenol Alden Products Company  
117 North Main Street  
Brockton, Massachusetts 023010  
Tel: 508.427.7000 Fax: 508.583.0164  
[www.aldenproducts.com](http://www.aldenproducts.com)

For more information about these  
Industrial Ethernet products, please contact:  
Sharon Ann Thomas  
717-877-5201  
or email [sharon.thomas@aldenproducts.com](mailto:sharon.thomas@aldenproducts.com)