

Maretron NMEA 2000®

Cables & Connectors

About NMEA 2000® Cables and Connectors

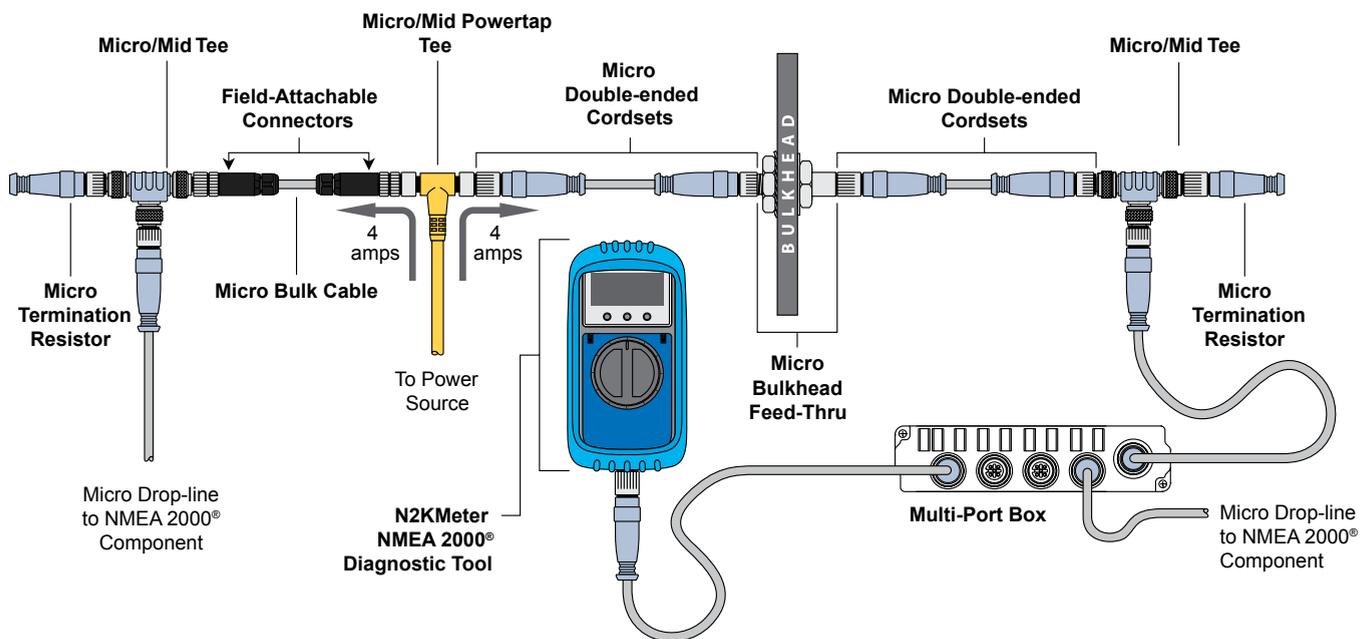
The NMEA 2000® standard goes beyond defining message content and includes requirements for the cabling used to interconnect electronic components (referred to as the physical interface). The following catalog pages contain the NMEA 2000® approved network interconnect components used to build an operational network.

About Micro, Mid and Mini Cable Systems

There are three types of NMEA 2000® cabling systems, Micro, Mid and Mini. The Micro/Mid cable system is generally used for smaller networks requiring less power (i.e., less than 4 amps per network leg) while the Mini cable system is used for larger networks (i.e., more than 4 amps but less than 8 amps per leg).

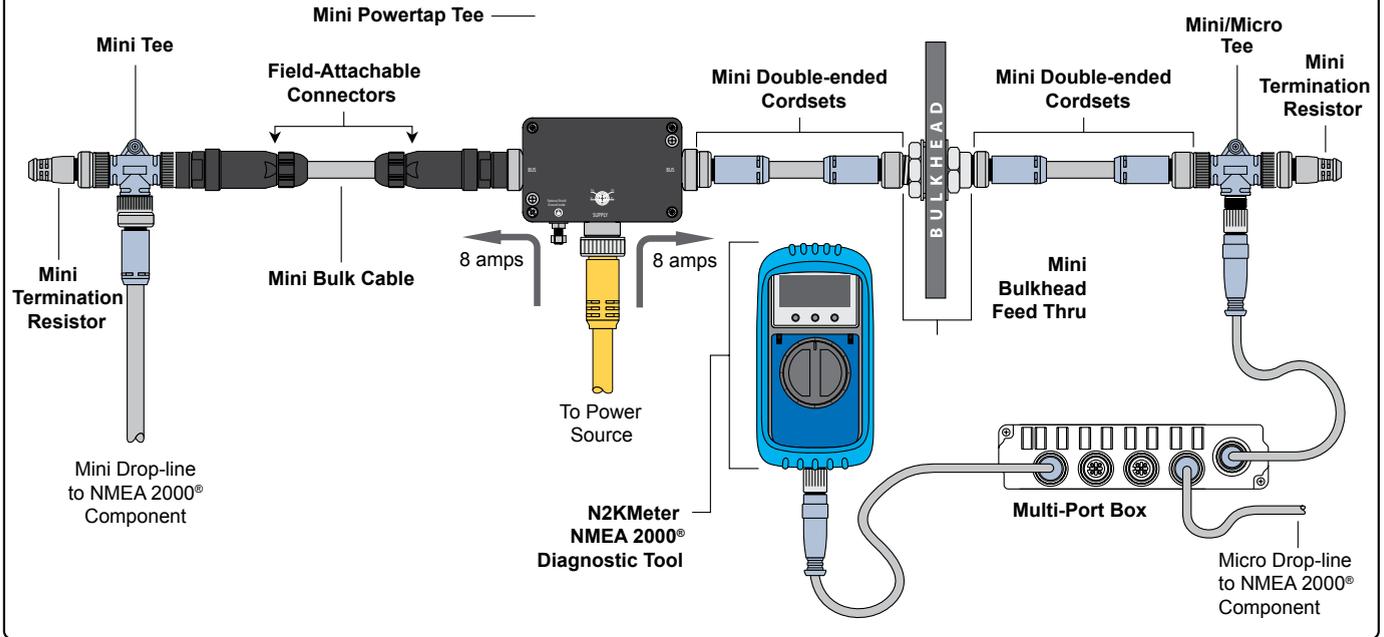
Micro/Mid NMEA 2000® Network Example

(Up to 4 amps per leg)



Mini NMEA 2000® Network Example

(Up to 8 amps per leg)



Maretron NMEA 2000® Cable Features

- Simple trunk and drop line topology interconnects all NMEA 2000® equipment
- Drop line topology allows powered component removal or re-connection while rest of network remains operational
- Cable includes power and ground for powering equipment drawing less than 1 amp/device
- Connectors include keys and keyways for simple error free connections
- Screw thread connectors reduce chances of accidental disconnects of essential equipment
- Waterproof connection system prevents corroded intermittent connections and continues to operate even while submerged in the bilge
- Three independent cable shields (power pair, signal pair, and overall cable) protects system from external noise sources such as high power radio transmitters and radar units
- Nickel plated brass connector ends ideally suited to harsh marine environment
- Phosphor bronze contact base material with gold over nickel plate for reliable connections
- Overmolded cable connector ends provide strain relief
- Simple easy to use diagnostic components enable trained and untrained personnel to diagnose and troubleshoot network installations

Micro Bulk Cable



Micro bulk cable is primarily used as drop cable, but it can also be used at the trunk line depending on network power requirements. Bulk cable with field-attachable connectors allows for maximum flexibility as cables can be made on the job to exact lengths.

- Meets and exceeds NMEA 2000® specifications for the highest reliability
- Trunk or drop cable for use with Micro connectors
- Used with field-attachable connectors to build exact length cables at the job site

Micro/Mid Field-Attachable Connectors (Straight – Male/Female)



Field-attachable connectors allow you to make field connections to bulk cable (see diagram). The color-coded screw terminals match the individual wire colors found within the bulk cable for error-free field installation.

- Color-coded screw terminals make for error-free field installation
- Rugged housing material designed to withstand harsh marine environments

Micro/Mid Field-Attachable Connectors (90° Male/Female)

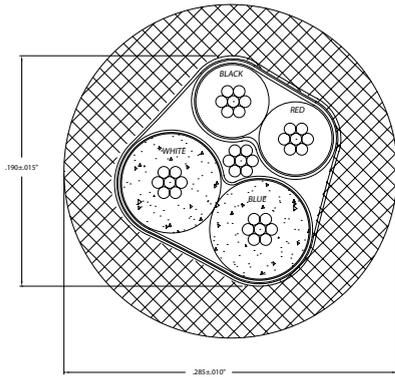


Like the straight Micro/Mid Field-attachable Connectors, the 90° field attachable connectors allow you to make field connections to bulk cable. The 90° connectors are particularly well suited for tight spaces like the back of displays where there is limited space for a straight connector.

- Useful in tight spaces or where sharp corners need to be made
- Waterproof rated to IP67

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Micro Bulk Cable



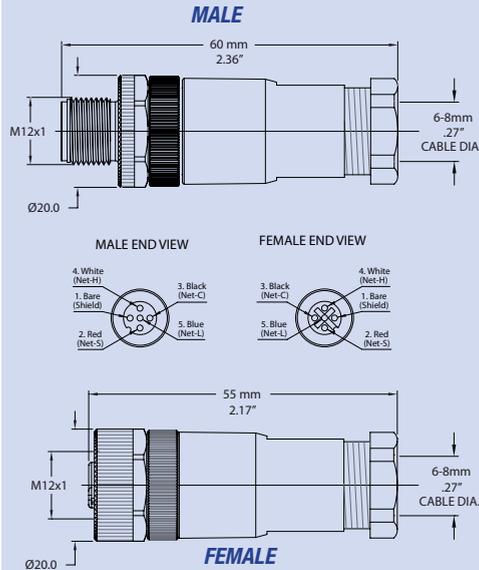
Specifications

OVERALL	
Outer Jacket Mat/Color:	PVC/Gray
Insulation Material:	PE (data wires), SRPVC (power wires)
Construction:	4x22 AWG, 22 AWG Drain
Shielding (3 Levels):	FOIL (overall), FOIL (power pair), FOIL (data pair)
POWER PAIR	
Wire:	2X22 AWG
Resistance/Conductor:	18.1 Ohms/1000ft
Max Amperage:	6 Amps
Color Code:	Red/Black
DATA PAIR	
Wire:	2X22 (AWG)
Characteristic Impedance:	120 Ohms ± 10%
Capacitance:	11.33pF/FT ± 10%
Color Code:	White/Blue
APPROVALS	
UL:	PLTC 75°C Sunlight Resistant E90625, AWM 80°C 300V
CSA:	CMX-OUTDOOR-CMG LL54185 75°C, AWM I/II A/B 80C 300V FT4
NMEA:	NMEA 2000® Approved
IEC:	IEC-61162-3

Products

PART NUMBER	DESCRIPTION
CG1	Micro Bulk Cable (Per Meter)
CG1-100	Micro Bulk Cable (Per 100 Meter Spool-Gray)

Micro/Mid Field-Attachable Connectors (Straight)



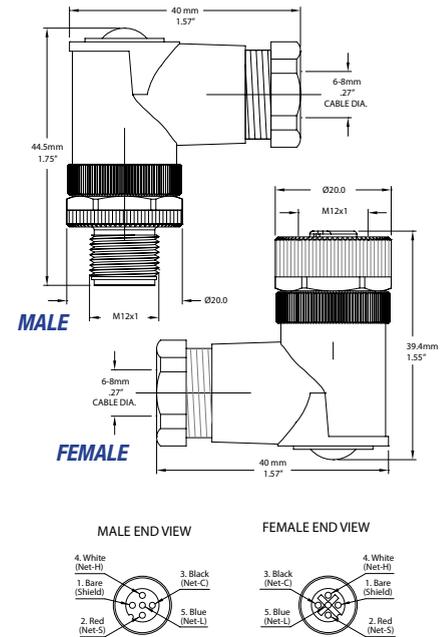
Specifications

MECHANICAL	
Housing Mat/Plating:	Nylon/Black
Contact Mat/Plating:	Brass/Gold – FA-CF-ST
Coupling Nut Mat/Plating:	Brass/Optaloy – FA-CM-ST
Maximum Wire Size:	18 AWG
Cable Grip Range:	6-8 mm
ELECTRICAL	
Rated Current:	4.0 Amps
Rated Voltage:	30 V AC/ 36 V DC
ENVIRONMENTAL	
Protection Class:	IEC IP67
Temperature Range:	-40°C TO 85°C (-40°F to 185°F)
APPROVALS	
NMEA:	NMEA 2000® Approved
IEC:	IEC-61162-3

Products

PART NUMBER	DESCRIPTION
FA-CF-ST	Micro/Mid Field Attachable Connector (Straight Female)
FA-CM-ST	Micro/Mid Field Attachable Connector (Straight Male)

Micro/Mid Field-Attachable Connectors (90°)



Specifications

MECHANICAL	
Housing Mat/Plating:	Nylon/Black
Contact Mat/Plating:	Brass/Optaloy
Coupling Nut Mat/Plating:	Brass/Nickel
Maximum Wire Size:	18 AWG
Cable Grip Range:	6-8 mm
ELECTRICAL	
Rated Current:	4.0 Amps
Rated Voltage:	30 V AC/ 36 V DC
ENVIRONMENTAL	
Protection Class:	IEC IP67
Temperature Range:	-40°C TO 85°C (-40°F to 185°F)
APPROVALS	
NMEA:	NMEA 2000® Approved
IEC:	IEC-61162-3

Products

PART NUMBER	DESCRIPTION
FA-CF-90	Micro/Mid Field Attachable Connector (90° Female)
FA-CM-90	Micro/Mid Field Attachable Connector (90° Male)

Micro Double-Ended Cordsets



Double-ended cordsets are used for trunk or drop lines and make for a secure connection and simple timesaving installation. The connectors are keyed for error-free connection and they are waterproof for continued operation even while submerged in the bilge.

- Rugged, IP68 rated connectors for continued connection integrity in marine environments
- Various cable lengths to match installation requirements

Micro Tee



A Tee is used to tap into the trunk line for adding a drop connection. The standard tee is also available with a cap for a protected diagnostic connection. Tees can be mated with all other devices on the network of the same connector style.

- Gold contacts for greatest reliability
- Keyed connectors for error-free connections

Micro/Mid Powertap Tee

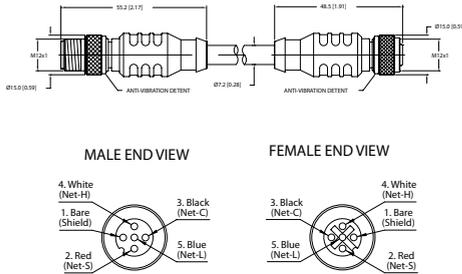


A Powertap Tee is connected to a network backbone just like any Tee but rather than connecting a device their purpose is to provide “bus” power. Maretron Powertap Tee uniquely provides two power inputs permitting doubled power provision for devices.

- Yellow cable indicates power and can't be confused with gray network cable
- Two cable lengths to match installation requirements

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Micro Double-Ended Cordsets



Specifications

MECHANICAL

Contact Carrier Mat/Color: Thermoplastic PUR/Blue-Gray
 Molded Body Mat/Color: Thermoplastic PUR/Blue-Gray
 Contact Mat/Plating: Brass/Gold
 Coupling Nut Mat/Plating: Brass/Nickel
 Connector Outside Diameter: 0.59"

ELECTRICAL

Current Rating: 4.0 Amps
 Voltage Rating: 250 V

CABLE

Outer Jacket Mat/Color: PVC/Gray
 Conductor Insulation Material: HDPE (data pair), SRPVC (power pair)
 Number of Conductors: 4X22 AWG, 22 AWG Drain Wire
 Shielding (3-Levels): FOIL (Overall), FOIL (Power Pair), FOIL (Data Pair)

ENVIRONMENTAL

Protection Class: IEC IP68, NEMA 1,3,4,6P
 Temperature Rating: -40°C to 80°C to (-40°F to 176°F)

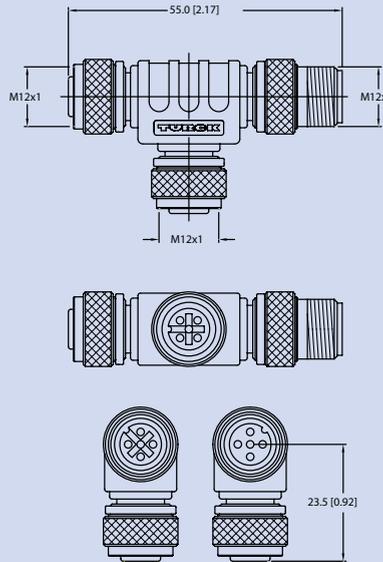
APPROVALS

(Cable) UL: PLTC 75°C Sunlight Resistant E90625, AWM 80°C 300V
 (Cable) CSA: CMX-OUTDOOR-CMG LL54185 75°C, AWM VII A/B 80C 300V FT4
 NMEA: NMEA 2000® Approved
 IEC: IEC 61162-3

Products

PART NUMBER	DESCRIPTION
CM-CG1-CF-00.5	Micro Double-Ended Cordset - M to F - 0.5M (gray)
CM-CG1-CF-01.0	Micro Double-Ended Cordset - M to F - 1M (gray)
CM-CG1-CF-02.0	Micro Double-Ended Cordset - M to F - 2M (gray)
CM-CG1-CF-03.0	Micro Double-Ended Cordset - M to F - 3M (gray)
CM-CG1-CF-04.0	Micro Double-Ended Cordset - M to F - 4M (gray)
CM-CG1-CF-05.0	Micro Double-Ended Cordset - M to F - 5M (gray)
CM-CG1-CF-06.0	Micro Double-Ended Cordset - M to F - 6M (gray)
CM-CG1-CF-07.0	Micro Double-Ended Cordset - M to F - 7M (gray)
CM-CG1-CF-08.0	Micro Double-Ended Cordset - M to F - 8M (gray)
CM-CG1-CF-09.0	Micro Double-Ended Cordset - M to F - 9M (gray)
CM-CG1-CF-10.0	Micro Double-Ended Cordset - M to F - 10M (gray)

Micro Tee



Specifications

MECHANICAL

Molded Body Mat/Color: Thermoplastic PUR/Blue
 Contact Carrier Mat/Color: PA 6 (Nylon)/Black
 Contact Mat/Plating: Brass/Gold
 Coupling Nut Mat/Plating: Brass/Nickel

ELECTRICAL

Rated Current: 4.0 Amps
 Rated Voltage: 60 V

ENVIRONMENTAL

Protection Class: IEC IP67, NEMA 1,3,4,6
 Operating Temperature: -40°C TO 80°C (-40°F to 176°F)

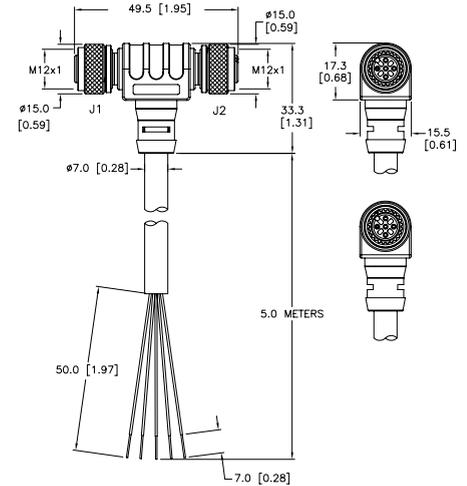
APPROVALS

NMEA: NMEA 2000® Approved
 IEC: IEC 61162-3

Products

PART NUMBER	DESCRIPTION
CM-CF-CF	Micro Tee

Micro/Mid Powertap Tees



Color	Name	Usage	Connector
Blue	NET-C	Ground	J1
Brown	NET-S	Power	J1
Gray	SHIELD	Drain	J1 & J2
Black	NET-C	Ground	J2
White	NET-S	Power	J2

Specifications

MECHANICAL

Molded Body Mat/Color: Thermoplastic PUR/Yellow
 Contact Carrier Mat/Color: Thermoplastic PUR/Black
 Contact Mat/Plating: Brass/Gold
 Coupling Nut Mat/Plating: Brass/Nickel
 Cable Jacket Mat/Color: PVC/ Yellow
 Conductor Insulation Mat: PVC
 Number of Conductors: 5x22 AWG

ELECTRICAL

Voltage Rating: 250 V
 Max Amperage: 4.0 Amps

ENVIRONMENTAL

Protection Class: IEC IP67, NEMA 1,3,4,6P
 Operating Temperature: -40°C to 105°C (-40°F to 221°F)

APPROVALS

NMEA: NMEA 2000® Approved
 IEC: IEC 61162-3

Products

PART NUMBER	DESCRIPTION
CF-SPWR05-CF	Micro/Mid Powertap Tee - FM (left)/ 5 Meter 4 Wire Power drop (bottom)/FM (right)

Micro Termination Resistors



Two termination resistors are required on every NMEA 2000 network, one on each end of the trunk line. Normally, a male termination is used since male pins tend to point back to the power source. In cases where the gender is reversed, a female terminator may be required. The inline terminator is used where the network is terminated at a product, for example a GPS or weather station at the top of a mast.

- Screw terminal connector for positive connections
- Termination resistors are used to terminate both ends of the trunk line

Micro Bulkhead Feed-Thru



The Bulkhead Feed-Thru allows ease of installation through panels or bulkheads and establishes future connection points in a network installation. The bulkhead feed-thru also maintains the integrity of watertight bulkheads by providing a waterproof seal and connection.

- Features rugged keyways for positive alignment of connections
- Waterproof rated to IP67

Multiport Box (Micro-Mid Male Homerun / Micro-Mid Female Drops)

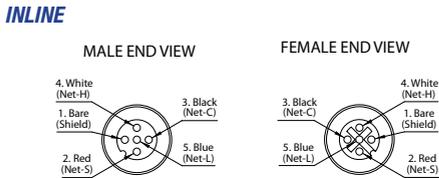
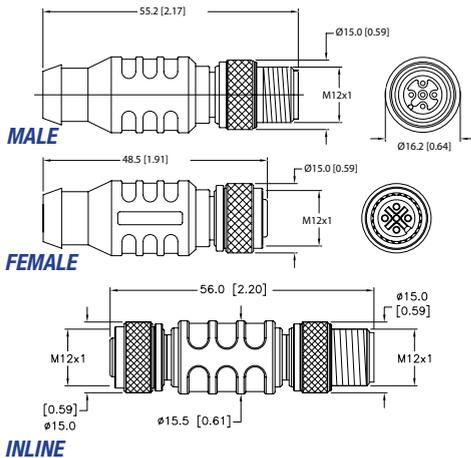


Multiport boxes allow several drop cables to be consolidated and connected back to the trunk, which eliminates the need to have numerous tees connected near a single point. Multiport boxes connect back to the trunk through a double-ended cordset and Tee.

- Ideal for consolidating many connections; for example behind dashboards
- Requires the purchase of an additional double-ended cordset for connection back to the trunk

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Micro Termination Resistors



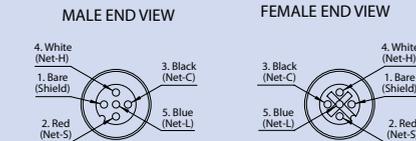
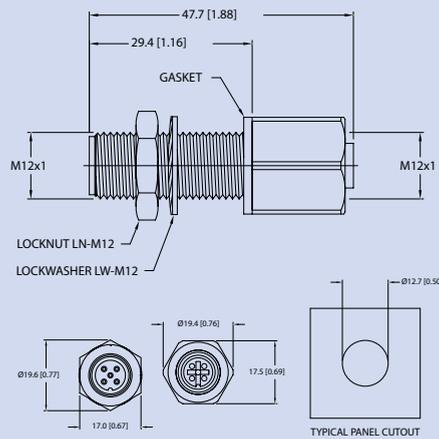
Specifications

MECHANICAL	
Molded Body Mat/Color:	Thermoplastic PUR/Blue-Gray – TR-CM, TR-CF
Contact Carrier Mat/Color:	Thermoplastic PUR/Black – IT-CM-CF
Contact Mat/Plating:	Thermoplastic PUR/Blue-Gray – TR-CM, TR-CF
Contact Mat/Plating:	Thermoplastic PUR/Black – IT-CM-CF
Brass/Gold	
Coupling Nut Mat/Plating:	Brass/Nickel
ELECTRICAL	
Rated Voltage:	10-30 V DC
Internal Resistor:	120 Ohms (1/2 W) – TR-CM, TR-CF
	121 Ohms (1/4 W) – IT-CM-CF
ENVIRONMENTAL	
Protection Class:	IEC IP68, NEMA 1,3,4,6P
APPROVALS	
NMEA:	NMEA 2000 [®] APPROVED
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
TR-CM	Micro Termination Resistor (Male)
TR-CF	Micro Termination Resistor (Female)
IT-CM-CF	Micro Inline Terminator

Micro Bulkhead Feed-Thru



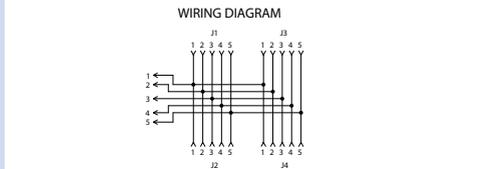
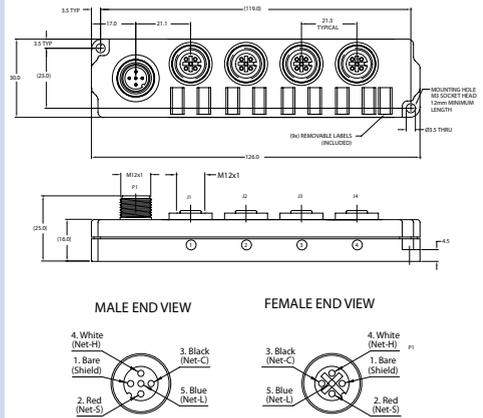
Specifications

MECHANICAL	
Contact Carrier Mat/Color:	PA 6 (Nylon)/Blue-Gray
Contact Mat/Plating:	Brass/Gold
Housing Mat/Plating:	Brass/Nickel
Gasket Material:	Nitrile (Buna N)
Accommodates Wall (thick):	.40" (1.0 mm) to .875" (22.2 mm)
ELECTRICAL	
Voltage Rating:	250 V
Max Amperage:	4.0 Amps
Number of Conductors:	5x22 AWG
ENVIRONMENTAL	
Protection Class:	IEC IP67, NEMA 1,3,4,6
Temperature Range:	-40°C to 105°C (-40°F to 221°F)
APPROVALS	
NMEA:	NMEA 2000 [®] APPROVED
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
BHF-CM-CF	Micro Bulkhead Feed-Thru

Multiport Box (Micro-Mid Male Homerun / Micro-Mid Female Drops)



Specifications

MECHANICAL	
Housing Mat/Color:	Nylon/Blue-Gray
Receptacle Mat/Plating:	Brass/Nickel
Contact Carrier Mat/Color:	Nylon/Black
Contact Mat/Plating:	Brass/Gold
ELECTRICAL	
Operating Voltage:	250 V
Operating Current:	4.0 Amps
ENVIRONMENTAL	
Protection Class:	IP67 – when receptacles are covered
Operating Temperature:	-30°C to 80°C (-22°F to 176°F)
APPROVALS	
NMEA:	NMEA 2000 [®] Approved
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
CM-CF-4	Multiport Box (Micro-Mid Male Homerun / Micro-Mid Female Drops)

Mid Bulk Cable (Gray/Blue)



Mid bulk cable is primarily used as drop cable, but it can also be used at the trunk line depending on network power requirements. Bulk cable with field-attachable connectors allows for maximum flexibility as cables can be made on the job to exact lengths.

- Meets and exceeds NMEA 2000® specifications for the highest reliability
- Used with field-attachable connectors to build exact length cables at the job site
- Optimized for voltage drop sensitive networks (long runs) because power pair wires have half the resistance of Micro cable

Mid Double-Ended Cordsets (Gray)



Double-ended cordsets are used for trunk or drop lines and make for a secure connection and simple timesaving installation. The connectors are keyed for error-free connection and are waterproof for continued operation even while submerged in the bilge.

- Rugged, IP68 rated connectors for continued connection integrity in marine environments
- Various cable lengths to match installation requirements
- Optimized for voltage drop sensitive networks (long runs) because power pair wires have half the resistance of Micro cable

Mid Double-Ended Cordsets (Blue)

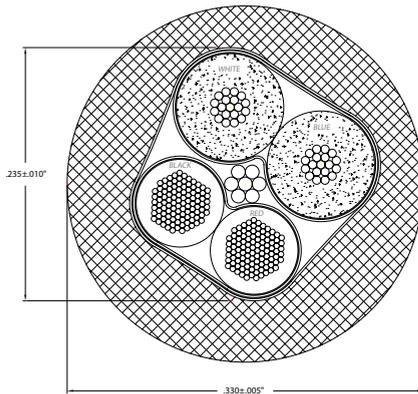


Double-ended cordsets are used for trunk or drop lines and make for a secure connection and simple timesaving installation. The connectors are keyed for error-free connection and are waterproof for continued operation even while submerged in the bilge.

- Rugged, IP68 rated connectors for continued connection integrity in marine environments
- Various cable lengths to match installation requirements
- Optimized for voltage drop sensitive networks (long runs) because power pair wires have half the resistance of Micro cable

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Mid Bulk Cable (Gray/Blue)



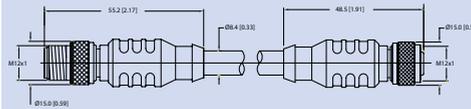
Specifications

OVERALL	
Outer Jacket Mat/Color:	PVC/Gray – DG1 PVC/Blue – DB1
Insulation Material:	PE (data wires), PVC (power wires)
Construction:	2x16 AWG, 2x20 AWG, 20 AWG Drain Wire
Shielding (3 Levels):	Foil (overall), Foil (power pair), Foil (data pair)
POWER PAIR	
Wire:	2x16 AWG
Resistance/Conductor:	4.1 Ohms/1000 ft max
Max Amperage:	14 Amps
Color Code:	Red/Black
DATA PAIR	
Wire:	2x20 (AWG)
Characteristic Impedance:	120 Ohms ± 10%
Capacitance:	10.75 pF/ft
Color Code:	White/Blue
APPROVALS	
UL:	PLTC 75°C Sunlight Resistant E90625, AWM 80°C 300V
CSA:	CMX-OUTDOOR-CMG LL54185 75°C, AWM I/II A/B 80C 300V FT4
NMEA:	NMEA 2000® Approved
IEC:	IEC-61162-3

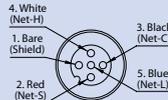
Products

PART NUMBER	DESCRIPTION
DG1	Mid Bulk Cable (Per Meter-Gray)
DG1-100	Mid Bulk Cable (Per 100 Meter Spool-Gray)
DB1	Mid Bulk Cable (Per Meter-Blue)
DB1-100	Mid Bulk Cable (Per 100 Meter Spool-Blue)

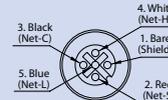
Mid Double-Ended Cordsets (Gray)



MALE END VIEW



FEMALE END VIEW



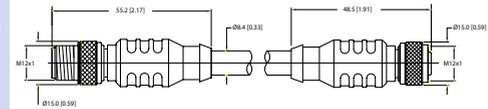
Specifications

MECHANICAL	
Contact Carrier Mat/Color:	Thermoplastic PUR/Blue-Gray
Molded Body Mat/Color:	Thermoplastic PUR/Blue-Gray
Contact Mat/Plating:	Brass/Gold
Coupling Nut Mat/Plating:	Brass/Nickel
Connector Outside Diameter:	0.59"
ELECTRICAL	
Current Rating:	4.0 Amps
Voltage Rating:	250 V
CABLE	
Outer Jacket Mat/Color:	PVC/Gray
Conductor:	PE (data pair), PVC (power pair)
Insulation Material:	2x16 AWG, Data 2x20 AWG, 20 AWG Drain Wire
Number of Conductors:	Alum/Polyester Foil (Overall), Foil (Power Pair), Foil (Data Pair)
Shielding (3 Levels):	
ENVIRONMENTAL	
Protection Class:	IEC IP68, NEMA 1,3,4,6P
Temperature Rating:	-40°C to 80°C to (-40°F to 176°F)
APPROVALS	
(Cable) UL:	PLTC 75°C Sunlight Resistant E90625, AWM 80°C 300V
(Cable) CSA:	CMX-OUTDOOR-CMG LL54185 75°C, AWM I/II A/B 80C 300V FT4
NMEA:	NMEA 2000® Approved
IEC:	IEC 61162-3

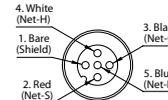
Products

PART NUMBER	DESCRIPTION
DM-DG1-DF-00.5	Mid Double-Ended Cordset - M to F - 0.5M (gray)
DM-DG1-DF-01.0	Mid Double-Ended Cordset - M to F - 1M (gray)
DM-DG1-DF-02.0	Mid Double-Ended Cordset - M to F - 2M (gray)
DM-DG1-DF-03.0	Mid Double-Ended Cordset - M to F - 3M (gray)
DM-DG1-DF-04.0	Mid Double-Ended Cordset - M to F - 4M (gray)
DM-DG1-DF-05.0	Mid Double-Ended Cordset - M to F - 5M (gray)
DM-DG1-DF-06.0	Mid Double-Ended Cordset - M to F - 6M (gray)
DM-DG1-DF-07.0	Mid Double-Ended Cordset - M to F - 7M (gray)
DM-DG1-DF-08.0	Mid Double-Ended Cordset - M to F - 8M (gray)
DM-DG1-DF-09.0	Mid Double-Ended Cordset - M to F - 9M (gray)
DM-DG1-DF-10.0	Mid Double-Ended Cordset - M to F - 10M (gray)

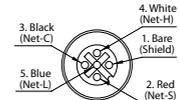
Mid Double-Ended Cordsets (Blue)



MALE END VIEW



FEMALE END VIEW



Specifications

MECHANICAL	
Contact Carrier Mat/Color:	Thermoplastic PUR/Blue-Gray
Molded Body Mat/Color:	Thermoplastic PUR/Blue-Gray
Contact Mat/Plating:	Brass/Gold
Coupling Nut Mat/Plating:	Brass/Nickel
Connector Outside Diameter:	0.59"
ELECTRICAL	
Current Rating:	4.0 Amps
Voltage Rating:	250 V
CABLE	
Outer Jacket Mat/Color:	PVC/Blue
Conductor:	PE (data pair), PVC (power pair)
Insulation Material:	2x16 AWG, 2x20 AWG, 20 AWG Drain Wire
Number of Conductors:	Alum/Polyester Foil (Overall), Foil (Power Pair), Foil (Data Pair)
Shielding (3 Levels):	
ENVIRONMENTAL	
Protection Class:	IEC IP68, NEMA 1,3,4,6P
Temperature Rating:	-40°C to 80°C to (-40°F to 176°F)
APPROVALS	
(Cable) UL:	PLTC 75°C Sunlight Resistant E90625, AWM 80°C 300V
(Cable) CSA:	CMX-OUTDOOR-CMG LL54185 75°C, AWM I/II A/B 80C 300V FT4
NMEA:	NMEA 2000® Approved
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
DM-DB1-DF-00.5	Mid Double-Ended Cordset - M to F - 0.5M (blue)
DM-DB1-DF-01.0	Mid Double-Ended Cordset - M to F - 1M (blue)
DM-DB1-DF-02.0	Mid Double-Ended Cordset - M to F - 2M (blue)
DM-DB1-DF-03.0	Mid Double-Ended Cordset - M to F - 3M (blue)
DM-DB1-DF-04.0	Mid Double-Ended Cordset - M to F - 4M (blue)
DM-DB1-DF-05.0	Mid Double-Ended Cordset - M to F - 5M (blue)
DM-DB1-DF-06.0	Mid Double-Ended Cordset - M to F - 6M (blue)
DM-DB1-DF-07.0	Mid Double-Ended Cordset - M to F - 7M (blue)
DM-DB1-DF-08.0	Mid Double-Ended Cordset - M to F - 8M (blue)
DM-DB1-DF-09.0	Mid Double-Ended Cordset - M to F - 9M (blue)
DM-DB1-DF-10.0	Mid Double-Ended Cordset - M to F - 10M (blue)

Mini Bulk Cable (Gray/Blue)



Mini bulk cable is primarily used as trunk cable, but it can also be used as drop lines. Bulk cable with field-attachable connectors allows for maximum flexibility as cables can be made on the job to exact lengths.

Mini Field-Attachable Connector (Male/Female)



Field-attachable connectors allow you to make field connections to bulk cable. The color-coded screw terminals match the individual wire colors found within the bulk cables for error-free field installation.

Mini Double-Ended Cordset (Gray)



Double-ended cordsets are used for trunk or drop lines and make for a secure connection and simple timesaving installation. The connectors are keyed for error-free connection and are waterproof for continued operation even while submerged in the bilge.

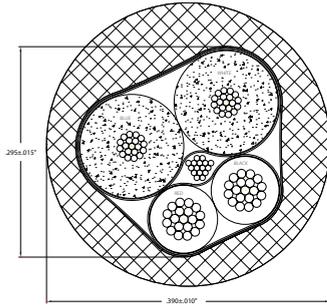
- Meets and exceeds NMEA 2000® specifications for the highest reliability
- Trunk or drop cable for use with Mini connectors
- Used with field-attachable connectors to build exact length cables at the job site

- Color-coded screw terminators make for error-free field installation
- Rugged housing material designed to withstand harsh marine environments

- Rugged, IP68 rated connectors for continued connection integrity in marine environment
- Various cable lengths to match installation requirements

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Mini Bulk Cable (Gray/Blue)



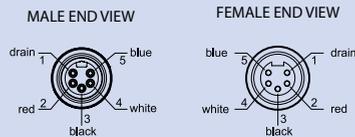
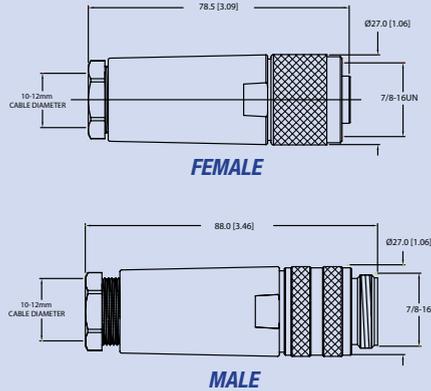
Specifications

OVERALL	
Outer Jacket Mat/Color:	PVC/Blue – NB1 PVC/Gray – NG1
Insulation Material:	PE (data), PVC (power)
Construction:	2x15 AWG, 2x18 AWG, 18 AWG Drain Wire
Shielding (3 Levels):	Foil (overall), Foil (power pair), Foil (data pair)
POWER PAIR	
Wire:	2x15 AWG
Resistance/Conductor:	3.44 Ohms/1000 ft max
Max Amperage:	16 Amps – NB1 14 Amps – NG1
Color Code:	Red/Black
DATA PAIR	
Wire:	2x18 (AWG)
Characteristic Impedance:	120 Ohms ± 10%
Capacitance:	12 pF/1000 ft Max
Color Code:	White/Blue
APPROVALS	
UL:	PLTC 75°C Sunlight Resistant E90625, AWM 80°C 300V
CSA:	CMX-OUTDOOR-CMG LL54185 75°C, AWM VII A/B 80C 300V FT4
NMEA:	NMEA 2000® APPROVED
IEC:	IEC-61162-3

Products

PART NUMBER	DESCRIPTION
NG1	Mini Bulk Cable (Per Meter-Gray)
NG1-100	Mini Bulk Cable (Per 100 Meter Spool-Gray)
NB1	Mini Bulk Cable (Per Meter-Blue)
NB1-100	Mini Bulk Cable (Per 100 Meter Spool-Blue)

Mini Field-Attachable Connector (Male/Female)



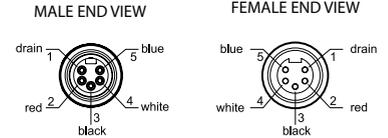
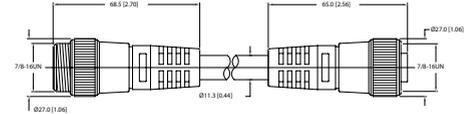
Specifications

MECHANICAL	
Housing Mat/Color:	Glass Filled Nylon/Black
Contact Mat/Plating:	Brass/Gold
Coupling Nut Material:	Anodized Aluminum
Maximum Wire Size:	16 AWG
Termination Method:	Screw Terminal
ELECTRICAL	
Rated Current:	9.0 Amps
Rated Voltage:	250 Volts
ENVIRONMENTAL	
Protection Class:	IEC IP67
Temperature Range:	-40°C TO 85°C (-40°F to 185°F)
APPROVALS	
NMEA:	NMEA 2000® Approved
IEC:	IEC-61162-3

Products

PART NUMBER	DESCRIPTION
FA-NF-ST	Mini Field Attachable Connector (Female)
FA-NM-ST	Mini Field Attachable Connector (Male)

Mini Double-Ended Cordset (Gray)



Specifications

MECHANICAL	
Contact Carrier Mat/Color:	Thermoplastic PUR/Blue-Gray
Molded Head Mat/Color:	Thermoplastic PUR/Blue-Gray
Contact Mat/Plating:	Brass/Gold
Coupling Nut Mat/Plating:	Brass/Nickel
Connector Outside Diameter:	1.06"
ELECTRICAL	
Current Rating:	9.0 Amps
Voltage Rating:	300 V
CABLE	
Outer Jacket Mat/Color:	PVC/Gray
Conductor Insulation Material:	PE (data pair), PVC (power pair)
Number of Conductors:	Power 2x15 AWG, 2x18 AWG, 18 AWG Drain Wire
Shielding (3-Levels):	Braid (Overall), Foil (Power Pair), Foil (Data Pair)
ENVIRONMENTAL	
Protection Class:	IEC IP68, NEMA 1,3,4,6P
Temperature Rating:	-40°C to 80°C (-40°F to 176°F)
APPROVALS	
(Cable) UL:	PLTC 75°C Sunlight Resistant E90625, AWM 80°C 300V
(Cable) CSA:	CMX-OUTDOOR-CMG LL54185 75°C, AWM VII A/B 80C 300V FT4
NMEA:	NMEA 2000® Approved
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
NM-NG1-NF-00.5	Mini Double-Ended Cordset - M to F - 0.5M (gray)
NM-NG1-NF-01.0	Mini Double-Ended Cordset - M to F - 1M (gray)
NM-NG1-NF-02.0	Mini Double-Ended Cordset - M to F - 2M (gray)
NM-NG1-NF-03.0	Mini Double-Ended Cordset - M to F - 3M (gray)
NM-NG1-NF-04.0	Mini Double-Ended Cordset - M to F - 4M (gray)
NM-NG1-NF-05.0	Mini Double-Ended Cordset - M to F - 5M (gray)
NM-NG1-NF-06.0	Mini Double-Ended Cordset - M to F - 6M (gray)
NM-NG1-NF-07.0	Mini Double-Ended Cordset - M to F - 7M (gray)
NM-NG1-NF-08.0	Mini Double-Ended Cordset - M to F - 8M (gray)
NM-NG1-NF-09.0	Mini Double-Ended Cordset - M to F - 9M (gray)
NM-NG1-NF-10.0	Mini Double-Ended Cordset - M to F - 10M (gray)

Mini Double-Ended Cordset (Blue)



Double-ended cordsets are used for trunk or drop lines and make for a secure connection and simple timesaving installation. The connectors are keyed for error-free connection and are waterproof for continued operation even while submerged in the bilge.

- Rugged, IP67 rated connectors for continued connection integrity in marine environment
- Various cable lengths to match installation requirements

Mini Tees



A Tee is used to tap into the trunk line for adding a drop connection. Two Mini Tees are available: 1) a Mini Tee with Mini connectors for the trunk and drop lines, and 2) a Mini/Micro Tee with Mini connectors for the trunk lines and a Micro connector for the drop line.

- Gold Contacts for greatest reliability
- Keyed connectors for error-free connections

Mini Powertap / Mini Power Cord

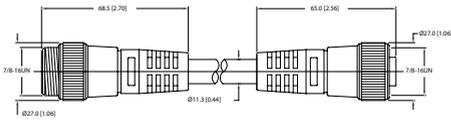


A Powertap is connected to a network backbone just like any Tee but rather than connecting a device, its purpose is to provide "bus" power. Typically a Powertap is placed as central as possible between total devices on backbone. Maretron Powertap uniquely provides two power inputs permitting doubled power provision for devices.

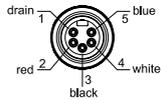
- Connects power supply to NMEA 2000® Trunk Line in convenient plug/play fashion
- Replaceable fuses to protect bus and connected components from excessive current

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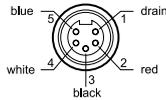
Mini Double-Ended Cordset (Blue)



MALE END VIEW



FEMALE END VIEW



Specifications

MECHANICAL

Contact Carrier Mat/Color:
Molded Body Mat/Color:
Contact Mat/Plating:
Coupling Nut Mat/Plating:
Connector Outside Diameter:

Thermoplastic PUR/Blue-Gray
Thermoplastic PUR/Blue-Gray
Brass/Gold
Brass/Nickel
1.06"

ELECTRICAL

Current Rating:
Voltage Rating:

9.0 Amps
300 V

CABLE

Outer Jacket Mat/Color:
Conductor Insulation Material:
Number of Conductors:
Shielding (3-Levels):

PVC/Blue
PE (data pair), PVC (power pair)
2x15 AWG, 2x18 AWG, 18 AWG Drain Wire
Braid (Overall), Foil (Power Pair),
Foil (Data Pair)

ENVIRONMENTAL

Protection Class:
Temperature Rating:

IEC IP67, NEMA 1,3,4,6P
-40°C to 80°C (-40°F to 176°F)

APPROVALS

(Cable) UL:

PLTC 75°C Sunlight Resistant E90625,
AWM 80°C 300V

(Cable) CSA:

CMX-OUTDOOR-CMG LL54185 75°C,
AWM I/II A/B 80C 300V FT4

NMEA:

NMEA 2000® Approved

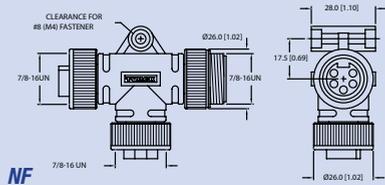
IEC:

IEC 61162-3

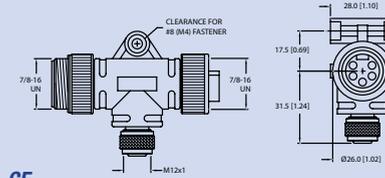
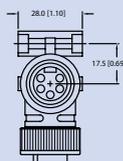
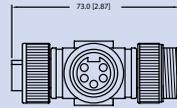
Products

PART NUMBER	DESCRIPTION
NM-NB1-NF-00.5	Mini Double-Ended Cordset - M to F - 0.5M (blue)
NM-NB1-NF-01.0	Mini Double-Ended Cordset - M to F - 1M (blue)
NM-NB1-NF-02.0	Mini Double-Ended Cordset - M to F - 2M (blue)
NM-NB1-NF-03.0	Mini Double-Ended Cordset - M to F - 3M (blue)
NM-NB1-NF-04.0	Mini Double-Ended Cordset - M to F - 4M (blue)
NM-NB1-NF-05.0	Mini Double-Ended Cordset - M to F - 5M (blue)
NM-NB1-NF-06.0	Mini Double-Ended Cordset - M to F - 6M (blue)
NM-NB1-NF-07.0	Mini Double-Ended Cordset - M to F - 7M (blue)
NM-NB1-NF-08.0	Mini Double-Ended Cordset - M to F - 8M (blue)
NM-NB1-NF-09.0	Mini Double-Ended Cordset - M to F - 9M (blue)
NM-NB1-NF-10.0	Mini Double-Ended Cordset - M to F - 10M (blue)

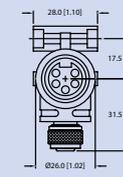
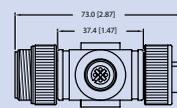
Mini Tees



NF



CF



Specifications

MECHANICAL

Molded Body Mat/Color:
Contact Carrier Mat/Color:
Contact Mat/Plating:
Coupling Nut Mat/Plating:

Thermoplastic PUR/Blue-Gray
Thermoplastic PUR/Blue-Gray
Brass/Gold
Brass/Nickel

ELECTRICAL

Rated Current:

9.0 Amps – **NM-NF-NF**
4.0 Amps (Micro) 9.0 Amps (Mini) – **NM-CF-NF**
600 V – **NM-NF-NF**
250 V – **NM-CF-NF**

Rated Voltage:

ENVIRONMENTAL

Protection Class:
Temperature Range:

IEC IP67, NEMA 1,3,4,6P
-40°C to 80°C (-40°F to 176°F)

APPROVALS

NMEA:

NMEA 2000® APPROVED

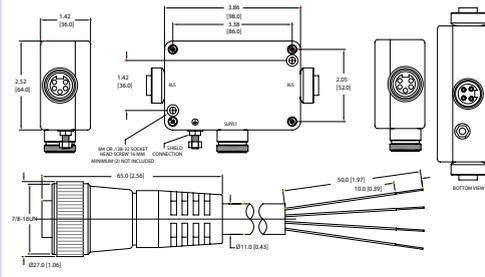
IEC:

IEC 61162-3

Products

PART NUMBER	DESCRIPTION
NM-NF-NF	Mini Tee
NM-CF-NF	Mini/Micro Tee

Mini Powertap / Mini Power Cord



Color	Name	Usage	Connector
Black	NET-C	Ground	V-1 & V-2
White	NET-S	Power	V+1 & V+2
Green	NET-C	Ground	V-1 & V-2
Red	NET-S	Power	V+1 & V+2

Specifications

ELECTRICAL

Operating Voltage:
Protection Circuit:

25 V min
Slo-Blo Fuse: 8 Amps, 250 V
Metric Fuse Block: 5x20 mm
Trip Time: 4 sec Min to 100 sec max
Type: MBR 3045PT
Max: Reverse Voltage VRWM=45 V
Max: Average Fwd Cur IFRM=30 Amps
Peak Surge Cur I=8.3 sec., IFSM=200 Amps
Max VI = 0.65 V @ 125°C and IF=20 Amps
16 AWG 8 Amps (Mini 5-Pin)
16 AWG 8 Amps (Mini 4-Pin)

Bus Line Minimum Conductor:
Supply Line Minimum Conductor:

ENVIRONMENTAL

Temperature Range:
Storage Temperature:

-40°C to 70°C (-40°F to 158°F)
-40°C to 85°C (-40°F to 185°F)

APPROVALS

NMEA:

NMEA 2000® APPROVED

IEC:

IEC 61162-3

MECHANICAL

Molded Body Mat/Color:
Outer Jacket Mat/Color:
Contact Carrier Mat/Color:
Contact Mat/Plating:
Coupling Nut Mat/Plating:
Conductor Insulation Mat:

NM4P-01, NM4P-05

Thermoplastic PUR/Yellow
PVC/Yellow
Thermoplastic PUR/Yellow
Brass/Gold
Brass/Nickel
PVC

ELECTRICAL

Conductors:
Current Rating:
Voltage Rating:

4x16 AWG
9.0 Amps
600 V

ENVIRONMENTAL

Protection Class:
Temperature Range:

IEC IP67, NEMA 1,3,4,6P
-40°C to 105°C (-40°F to 221°F)

APPROVALS

NMEA:

NMEA 2000® APPROVED

IEC:

IEC 61162-3

Products

PART NUMBER	DESCRIPTION
NF-NM4P-NF	Mini Powertap - Female-Female with Fuses
NM4P-01	Mini Power Cord - Female to Pigtail - 1 Meter
NM4P-05	Mini Power Cord - Female to Pigtail - 5 Meter

MINI

Mini Termination Resistor (Male/Female)



Termination Resistors are required on a NMEA 2000® network and are placed at each end of a network trunk cable. Like the double-ended cordsets, the termination resistors are waterproof and continue to function even while submerged in the bilge.

- Diagnostic versions indicate correct polarity at a glance to ensure power connections have been made properly
- Screw connector for positive connection
- Termination resistors are used to terminate both ends of the trunk line

Mini 90° Male to Female Connector



The Mini Elbow is used in spots where it is impossible to bend a cordset around tight corners. The elbow easily connects to a tee or double-ended cordsets making 90 [degree] turns practical at the end or anywhere along the line.

- Mounting hole for secure fastening of cabling system
- Waterproof seals for reliable connections
- Nickel plated brass ideally suited for harsh marine environment

Mini Male to Micro Female Reducer

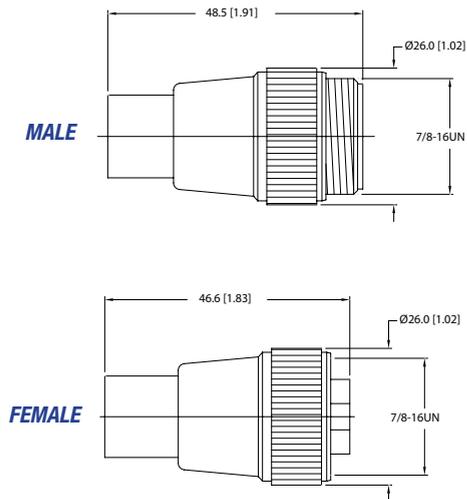


The reducer is used to change from a Mini cable to Micro or Mid cable. For example, one end of the network might be terminated at the top of the mast but it may not be desirable to run a Mini trunk cable up the mast. In this case, you can switch over to Micro or Mid cable at the base of the mast using the reducer and continue up the mast with Micro or Mid cable.

- Corrosion resistant Nickel plated Brass
- Weatherproof to IP67
- Reduces Mini Backbone to Micro/ Mid Cable

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Mini Termination Resistor (Male/Female)



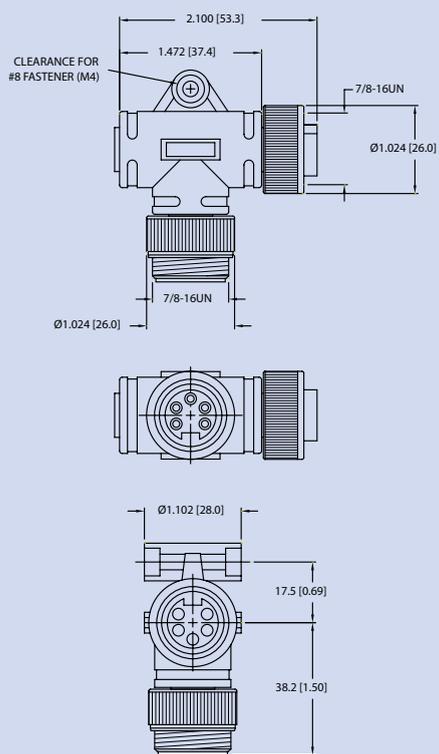
Specifications

MECHANICAL Molded Body Mat/Color:	Thermoplastic PUR/Blue-Gray – TR-NM, TR-NF
Contact Carrier Mat/Color:	Thermoplastic PUR/Clear –
Contact Mat/Plating:	TR-LNM, TR-LNF
Coupling Nut Mat/Plating:	Thermoplastic PUR/Blue-Gray Brass/Gold Brass/Nickel
ELECTRICAL Rated Voltage:	300 V DC
Internal Resistor:	120 Ohms (1/2 W)
Voltage Monitoring: (Bus Power)	Green: Correct Polarity Red: Reversed Polarity – TR-LNM, TR-LNF
ENVIRONMENTAL Protection Class:	IEC IP67, NEMA 1,3,4,6, 13
Temperature Rating:	-40°C to 80°C (-40°F to 176°F)
APPROVALS NMEA:	NMEA 2000® Approved
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
TR-NM	Mini Termination Resistor (Male)
TR-NF	Mini Termination Resistor (Female)
TRL-NM	Mini Termination Resistor with LED (Male)
TRL-NF	Mini Termination Resistor with LED (Female)

Mini 90° Male to Female Connector



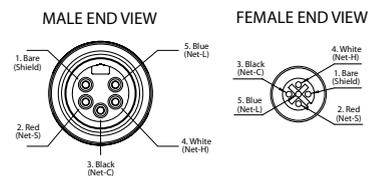
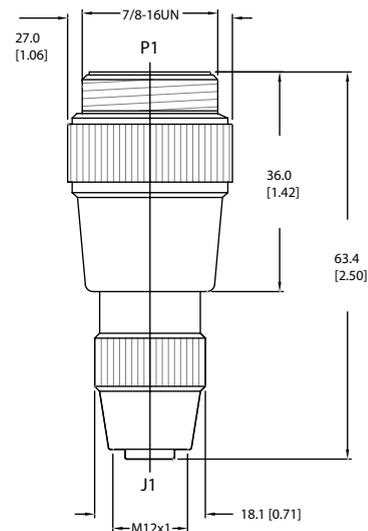
Specifications

MECHANICAL Molded Body Mat/Color:	Thermoplastic PUR/Blue
Contact Carrier Mat/Color:	Thermoplastic PUR/Blue
Contact Mat/Plating:	Brass/Gold
Coupling Nut Mat/Plating:	Brass/Nickel
ELECTRICAL Rated Current:	9.0 Amps
Rated Voltage:	600 V
ENVIRONMENTAL Protection Class:	IEC IP67, NEMA 1,3,4,6 P
Temperature Range:	-40°C TO 80°C (-40°F to 176°F)
APPROVALS NMEA:	NMEA 2000® Approved
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
ELB-NM-NF	Mini 90° Male to Female Connector

Mini Male to Micro Female Reducer



Specifications

MECHANICAL Contact Mat/Plating:	Brass/Gold
Coupling Nut Mat/Plating:	Brass/Nickel
ELECTRICAL Rated Current:	4.0 Amps
Rated Voltage:	250 V
ENVIRONMENTAL Protection Class:	IEC IP67, NEMA 1,3,4
Temperature Range:	-40°C TO 75°C (-40°F to 167°F)
APPROVALS NMEA:	NMEA 2000® APPROVED
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
NM-CF	Mini Male to Micro Female Reducer

Mini Gender Changers (Male/Male)(Female/Female)



Maretron cables have a male connector on one end and a female connector on the other end. Normally, the male connector points back towards the network power supply, but on some occasions, this gets reversed and a gender changer can be used to get back to the desired connector type.

- Waterproof seals for reliable connections
- Easily swap connector gender to get back to desired connector type

Mini Bulkhead Feed-Thru



The Bulkhead Feed-Thru allows ease of installation through panels or bulkheads and establishes future connection points in a network installation. The bulkhead feed-thru also maintains the integrity of watertight bulkheads by providing a waterproof seal and connection.

- Features rugged keyways for positive alignment of connections
- Waterproof rated to IP67

N2KMeter

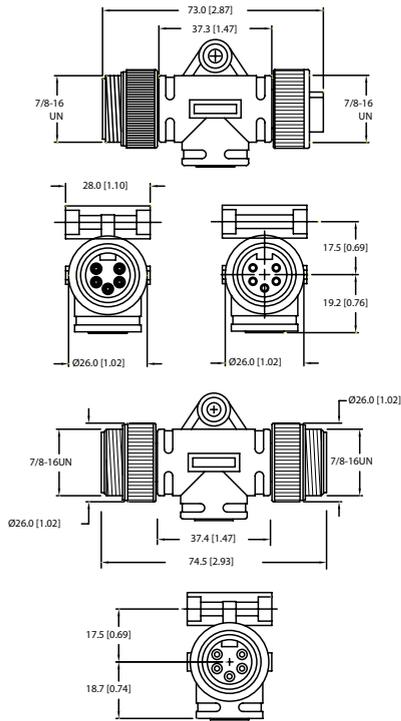


The N2KMeter enables trained and untrained personnel to diagnose and trouble-shoot network installations quickly and easily. Completely passive on the network, the meter analyzes both data and power lines on the network. In seconds, both network-wide and device-specific traffic as well as power monitoring information is captured and displayed on a simple user interface.

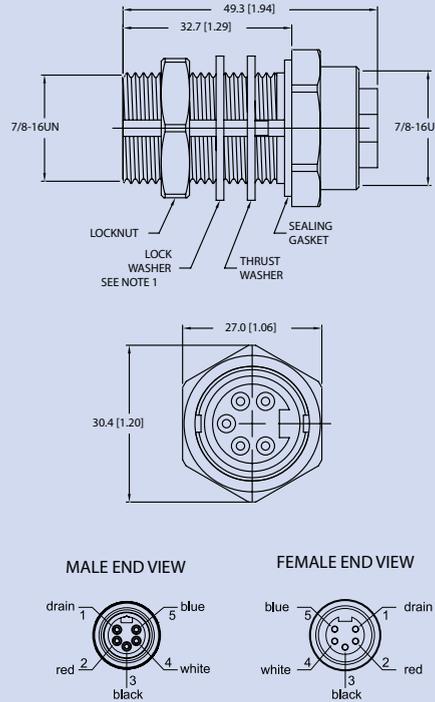
- Diagnostic tool for NMEA 2000® networks
- Evaluates physical layer device functions on a network
- Data at boat can be locked in and then evaluated later on bench

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Mini Gender Changers



Mini Bulkhead Feed-Thru



Specifications

MECHANICAL	Thermoplastic PUR/Blue-Gray
Molded Body Mat/Color:	Thermoplastic PUR/Blue-Gray
Contact Carrier Mat/Color:	Brass/Gold
Contact Mat/Plating:	Brass/Nickel
Coupling Nut Mat/Plating:	
ELECTRICAL	9.0 Amps
Rated Current:	600 V
Rated Voltage:	
ENVIRONMENTAL	IEC IP67, NEMA 1,3,4,6P – NM-NM
Protection Class:	IEC IP67, NEMA 1,3,4,13 – NF-NF
Temperature Range:	-40°C to 70°C (-40°F to 158°F) – NM-NM
	-40°C to 55°C (-40°F to 131°F) – NF-NF
APPROVALS	NMEA: NMEA 2000® Approved
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
NM-NM	Mini Gender Changer (Male/Male)
NF-NF	Mini Gender Changer (Female/Female)

Specifications

MECHANICAL	Thermoplastic PUR/Blue-Gray
Contact Carrier Mat/Color:	Brass/Nickel
Housing Mat/Plating:	Brass/Gold
Contact Mat/Plating:	Nitrile (Buna N)
Gasket Material:	.040" (1.0 mm) to .875" (22.2 mm)
Accommodates Wall (thick):	
ELECTRICAL	600 V
Voltage Rating:	9.0 Amps
Max Amperage:	5x22 AWG
Number of Conductors:	
ENVIRONMENTAL	IEC IP67
Protection Class:	-40°C to 105°C (-40°F to 221°F)
Temperature Range:	
APPROVALS	NMEA: NMEA 2000® Approved
IEC:	IEC 61162-3

Products

PART NUMBER	DESCRIPTION
BHF-NM-NF	Mini Bulkhead Feed-Thru

N2KMeter

Electrician Mode (Simple)

1. Plug in and set N2KMeter rotary switch to "autosearch"

2. Identify network health
- Happy face = healthy 😊
 - Neutral face = nominal 😐
 - Sad face = faulty 😞

3. Scroll through faults. Refer to user manual to link these faults to most likely network problems or freeze and lock settings for review back at the shop by an NMEA 2000® expert.



Expert Mode (Advanced)

1. Scroll through NMEA 2000® parameters for each active NMEA 2000® node (mac id)

- Communication errors (rate, cumulative #)
- Bandwidth (% of full usage)
- Power supply and shield voltages
- Data bit quality (dominant, recessive, +, -, differential voltage, cmv)

2. Check values (both numeric and icons)

- Happy face = within spec 😊
- Neutral face = very close to limit 😐
- Sad face = out of limit 😞

3. Refer to user manual to link these faults to most likely network problems

Specifications

MECHANICAL	Network 7 - 30v DC < 90MA
Power Supply:	Batteries 2 X AA Alkaline Batteries
	6 Hours Of Operation Approx.
	1 Year Data Retention
Connectors:	Micro Connector
Band Rates:	125k, 250k and 500k (Auto-detect)
Bandwidth Accuracy:	Bus Power±100mw, Bus Signal±20mw
Bandwidth Range:	Bus Power 0 to 25v with over/under
	Range Indication Bus signal -5 To 10v
	with over/under range indication
Bandwidth Sample Rate:	Bus Power 1 Khz Bus Signal Ideal
	Sample Pts:250ns
Signal Error Threshold:	NMEA 2000® Spec for Network Power
Bus Load Measurement:	Detects Bus Idle In Real Time
Bus Message Rate Measurement:	Detects 100% of Individual Can
	Frames in Real Time
Error Rate Measurement:	Detects 100% of Individual Error
	Frames in Real Time
APPROVALS	NMEA: NMEA 2000® Approved

Products

PART NUMBER	DESCRIPTION
N2KMETER-01	Diagnostic Meter w/1m Micro Cordset

Maretron NMEA 2000® Network Installation Guide

Installing an NMEA 2000® Network

Installing an NMEA 2000® network consists of inter-connecting NMEA 2000® electronic devices using plug-and-play cables and connectors. The following pages provide a brief description of how to setup a NMEA 2000® network using five basic steps:

1. Cable and Connector Network Basics
2. Installing Terminators
3. Supplying Power
4. Grounding the Network
5. Checking the Network

Please note that this installation guide contains a brief description of the basic concepts of installing an NMEA 2000® network and Maretron suggests that you consult a trained professional for any installation. You can learn more about installing NMEA 2000® networks by contacting the National Marine Electronics Association (NMEA) at www.nmea.org and consulting the following documents:

- NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices
- NMEA Installation Standards

1. Cable and Connector Network Basics

1.1 Network Topology

The NMEA 2000® cable system uses a trunk (sometimes referred to as the backbone) and drop line topology as shown in Figure 1.

The NMEA 2000® cable system includes five wires within a single waterproof cable: two signal wires, power and ground wires, and a drain wire. The drain wire shields the signal, power, and ground wires from external Radio Frequency Interference (RFI) and helps reduce RFI emission from the cable.

You can connect devices using one of three cable options:

Mini - This is commonly used for the trunk line on the network because of its greater current carrying capacity (8 amps) as

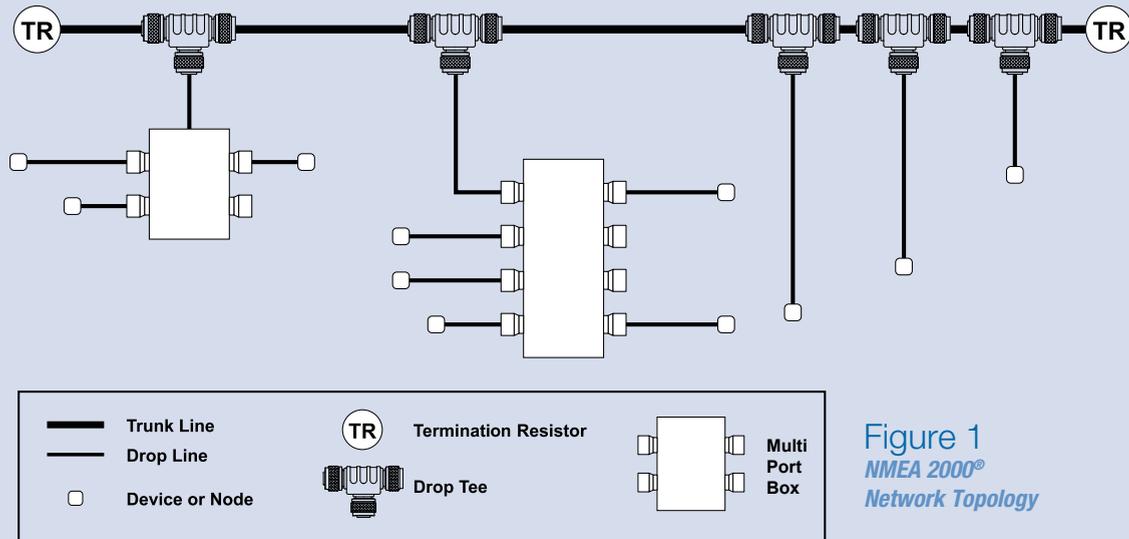


Figure 1
NMEA 2000®
Network Topology

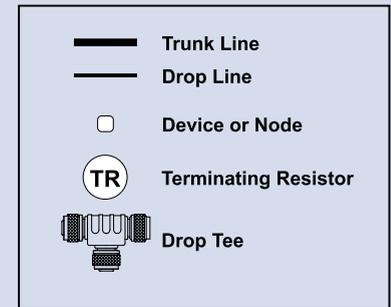
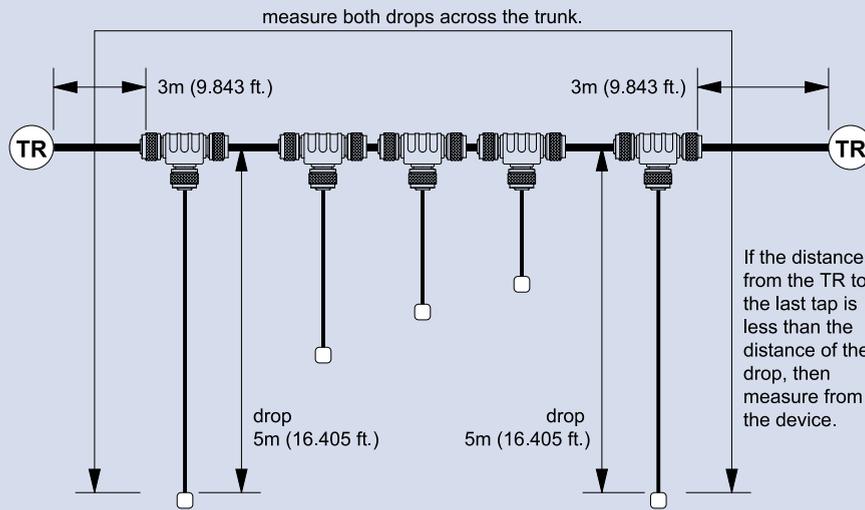


Figure 2
Maximum Cable Length Determination

opposed to Micro cable (4 amps). Mini cable has an outside diameter in the range from 0.41 to 0.49 inches. Its maximum installed bend radius is 7x the cable diameter. You can also use this type of cable for drop lines.

Mid - This is commonly used for smaller networks as either the network trunk line or as drop lines. Mid cable and connectors are rated to 4 amps just like the Micro cable, however the larger diameter power conductors within the Mid cable provides for less voltage drop over Micro cable, especially for long runs. The diameter of the Mid cable is 0.33 inches.

Micro - This cable type is typically used as the drop line connecting devices to the main trunk line with an outside diameter in the range from 0.24 to 0.28 inches. Micro cable has a smaller diameter and is more flexible than mini cable with an installation bend radius of 7x the cable diameter. Smaller networks use this type of cable for both the trunk and drop lines.

You construct the trunk line using double-ended cordsets connected between tees or taps. One end of the cordset has a male connector with male pins while the other end of the cordset has a female connector and female receptacles. The connectors are keyed so they can only connect to each other in one way. As an alternative to double-ended

cordsets, you can make your own trunk line using bulk cable and field-attachable connectors. If you decide to add equipment later, you can simply disconnect a cordset from a tee, add another tee directly to the existing tee, re-connect the cordset and add the new component to the system using a drop cable. Alternatively, you could cut the trunk line, add two field-attachable connectors and insert a new tee. Trunk lines can also be run up to watertight bulkheads and connected to a waterproof bulkhead feed-thru connector to maintain the integrity of watertight compartments.

To drop off the trunk line, you connect a device using a tee connector. Daisy chaining of devices is not allowed, as it is a requirement to be able to remove a component from the network without affecting any other device. This allows you to remove a device for servicing while the rest of the network remains operational. Multi port boxes are also available where instruments tend to be clustered, around the helm for example.

1.2 Maximum Cable Distance

The cable distance between any two points in the cable system must not exceed 200 meters (656 feet) for the Mini cable or 100 meters (328 feet) for the Micro and Mid cable.

For most cases, the maximum distance should be measured

between termination resistors. However, if the distance from a trunk line tee to the farthest device connected to the trunk line is greater than the distance from the tee to the nearest terminating resistor (TR), then you MUST include the drop line length as part of the cable length in your maximum cable distance calculation. Figure 2 shows an example where both 5 meter drops must be included in the maximum cable distance since the drops are longer than the distance from the tee to termination resistor.

1.3 Cumulative Drop Line Length

The cumulative drop line length refers to the sum of all drop lines, Mini, Mid or Micro cable in the cabling system. This sum cannot exceed 78 meters (256 feet). Figure 3 shows an example using four drop tees and two multiport drops to attach 11 devices to the trunk line. The cumulative drop line length is 37 meters (122 feet) and no single device is more than 6 meters (20 feet) from the trunk line.

1.4 Maximum Drop Line Length

The maximum cable distance from any device on a branching drop line to the trunk line is 6 meters (20 feet).

1.5 Maximum Number of Devices

A maximum of 50 physical devices shall be connected to the network, and the disconnection of any device shall not interrupt any other device on the network.

1.6 NMEA 2000® Cable

The Mini, Mid and Micro cables contain five wires: One twisted pair (red and black) for 12VDC power, one twisted pair (blue and white) for signal and a drain wire (bare).

The following table shows the color, name, and usage for each wire contained within the cable.

Color	Name	Usage
White	NET-H	Signal
Blue	NET-L	Signal
Bare	SHIELD	Drain
Black	NET-C	Ground
Red	NET-S	Power

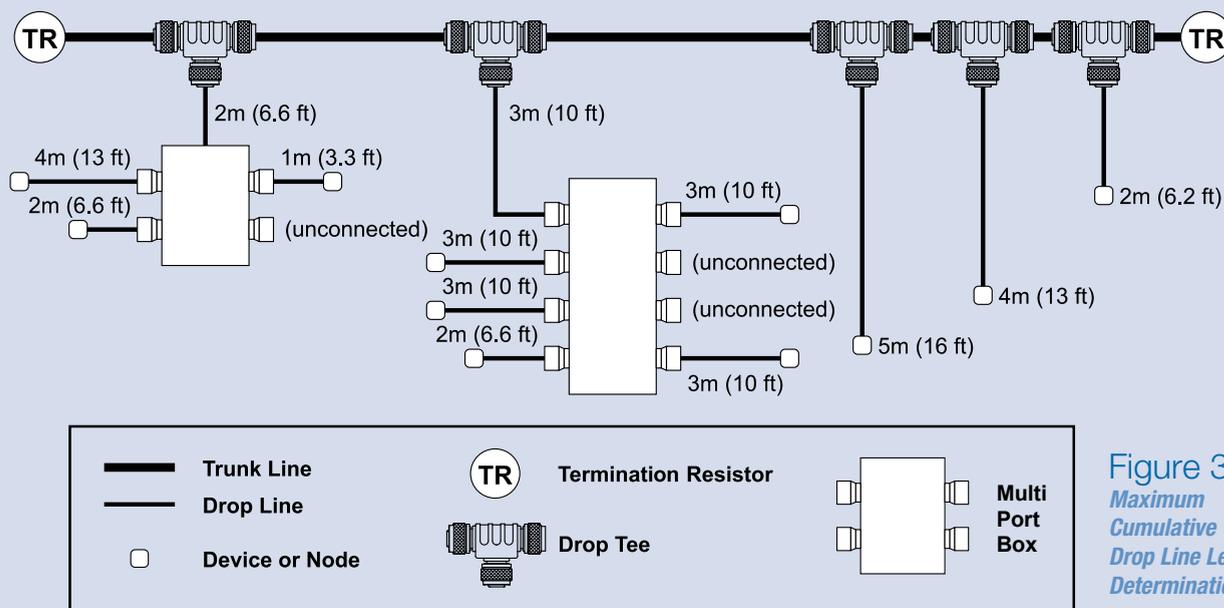
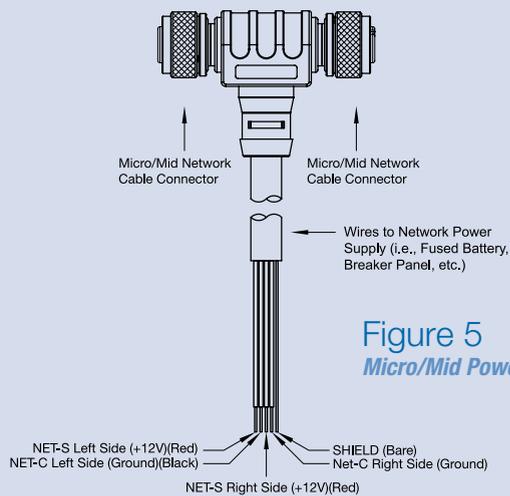
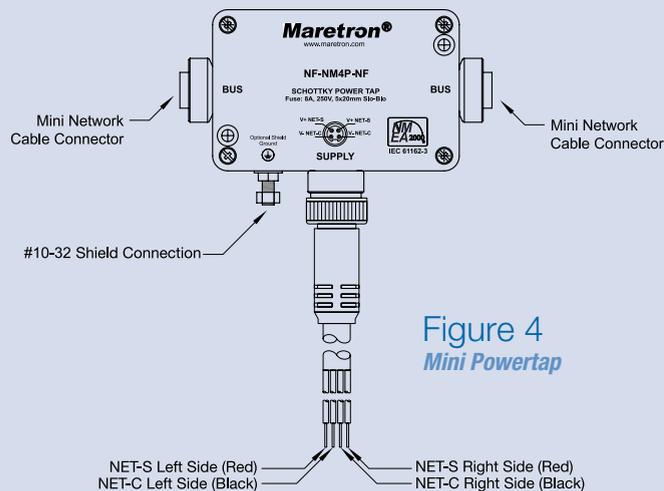
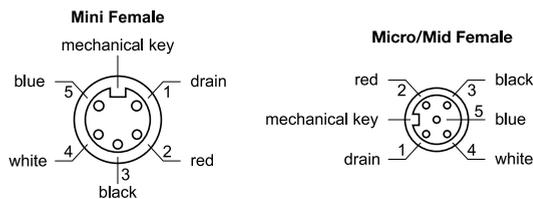


Figure 3
Maximum
Cumulative
Drop Line Length
Determination



1.7 NMEA 2000® Connectors

Connectors attach cables to devices or other components of the NMEA 2000® cable system. This allows the network to be completely “plug-and-play”. Connections can be made with pre-molded cordsets or with field-attachable connectors. The following diagram shows the pins found within Mini connector and the Micro and Mid connector and the corresponding wire colors for those pins.



2. Installing Terminators

Termination resistors are attached to each end of the trunk cable to reduce reflections of the communication signals on the network. If you do not use termination resistors as described, the network will not operate properly. Termination resistors are typically connected directly to the last tee on the trunk line although they can be connected to a cordset extending from the last tee on a trunk line. Inline terminators are also available and they are used to terminate the network at the last product.

3. Supplying Power

NMEA 2000® networks can use a power supply originating from a single-point connection to the vessel’s 12 volt battery or one or more isolated power supplies distributed along the network, but not a combination of battery and power supply connections. For the purpose of this installation guide, we will focus on the power source being a single-point connection to the vessel’s battery. Over current protection should be provided and should be sized in accordance with ABYC E-11, AC and DC ELECTRICAL SYSTEMS ON BOATS, taking into consideration the smallest gauge of cable being used for the backbone or drop cables. The NET-S wire is connected to the positive side of the battery while NET-C is connected to the negative side of the battery.

3.1 Mini Power Connection

Power is supplied to a Mini trunk line via a Powertap that is shown in Figure 4. Note that the Mini power cable does not have a shield wire as this connection is made to the screw terminal on the Powertap itself.

3.2 Mini Power Capability

Although Mini cable is rated to 8 amps, the cable system can support a total load of more than 8 amps. For example, 16 amps of power could be supplied to the middle of the trunk where 8 amps is supplied to both sides of the power tap. The

Powertap can handle large loads as long as no more than 8 amps is drawn through any single segment of the trunk line. However, cable resistance may limit your application to less than 8 amps.

3.3 Micro/Mid Power Connection

Like the Mini power connection, power is supplied to a Micro/Mid trunk line via a Powertap, which is shown in Figure 5.

3.4 Micro/Mid Power Capability

Micro/Mid cable is rated to 4 amps but like Mini cable, strategic placement of the power source could support higher current. For example, 8 amps of power could be supplied to the middle of the trunk where 4 amps is supplied to both sides of the power tap. It can handle large loads as long as no more than 4 amps is drawn through any single segment of the trunk line. However, cable resistance may limit your application to less than 4 amps

3.5 End-Powered Network

End-powered networks are typically seen on smaller vessels with only a few NMEA 2000® devices. Figure 6 shows an end-powered network.

3.6 Middle-Powered Network

A middle-powered network is typically found on larger vessels and is any network where the power is connected to the network at some location other than at the end. This

network consists of two legs, one leg extending in each direction from the power insertion point. Figure 7 shows a middle-powered network.

3.7 Maximum Power Supply Voltage Drop

The NMEA 2000® network is designed to work properly as long as there is no more than a 1.5 volt difference in the power supply voltage between any two devices on the network. Therefore, you should perform an estimate of the voltage drop across a network using the following equation:

$$\text{Voltage Drop} = 0.1 \times \text{Network Loads} \times \text{Network Length} \times \text{Cable Resistance} / 100$$

Where: Network Loads is sum of Load Equivalent Numbers (LEN) for all devices (see device nameplate)
 Network Length is in meters
 Cable resistance is in ohms/100 meters
 (see pages 1 and 9 specifications)

Power supply voltage drop estimates resulting in less than 1.5 volts across the entire network require no further analysis. Likewise, estimates ranging between 1.5 and 3.0 volts require no further analysis as long as a mid-powered network is used. Occasionally, estimated power supply voltage drops will occur outside these limits and will require further consideration through detailed calculations by certified technicians.

4. Ground the Network

The NMEA 2000® network should be grounded at ONE

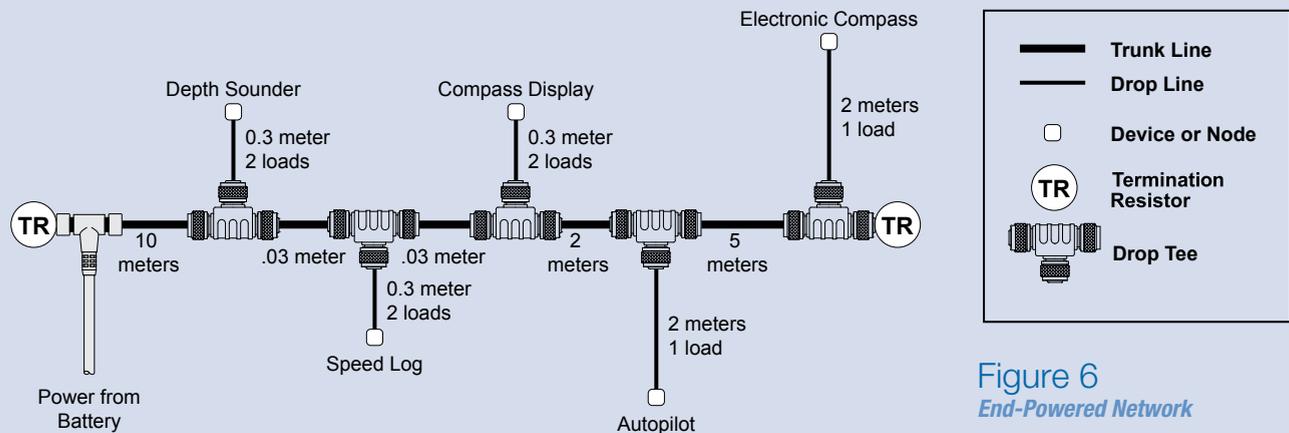


Figure 6
End-Powered Network

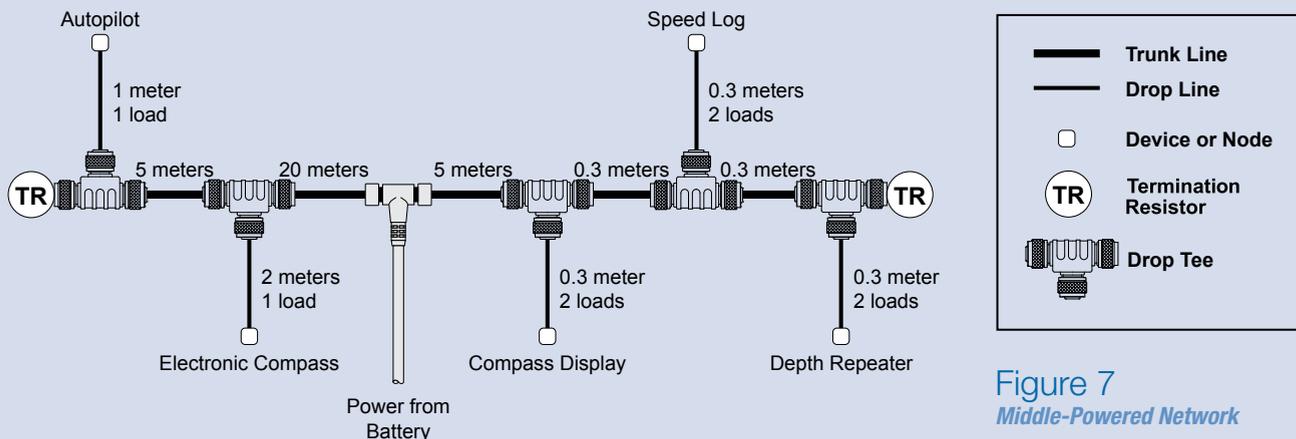


Figure 7
Middle-Powered Network

location. Grounding at more than one location may produce ground loops, which can cause problems with communications on the network. In addition to the ground wire, connect the drain or SHIELD wire at the supply ground location and NO other place.

5. Checking Your Network

Verify that the network has been correctly designed and installed by reviewing the following checklist:

- Number of devices does not exceed 50
- Maximum Mini cable distance between any two devices does not exceed 200 meters (656 feet)
- Maximum Micro/Mid cable distance between any two devices does not exceed 100 meters (328 feet)
- Maximum cumulative drop line length does not exceed 78 meters (256 feet)
- No drop should be greater than 6 meters (20 feet)
- Termination resistors are installed on both ends of the trunk
- The network is grounded at a single location
- The SHIELD wire is connected to a single point, the supply ground

If you are having difficulties with the network make sure to check the following most common network problems:

- More or less than two terminating resistors
- Loose connections, make sure that all connectors are securely fastened
- Excessive trunk line length-especially with Micro cable
- Excessive drop line cable length
- Improper shield and ground connection at the power supply
- Shorts and opens in field-attachable connectors
- Failure to perform power distribution calculations for new installations and when adding new devices
- Using a typical device current rather than maximum current for power distribution calculations

In order to insure the proper installation and configuration of an NMEA 2000® network, it is a good idea to have available at least one N2KMeter. The N2KMeter greatly simplifies network diagnostics and can detect many fault conditions including:

- Opens and shorts
- Incorrect topology
- Bad nodes
- Bad termination
- Improper shield connection
- Intermittent problems
- Excessive scan rate
- Common mode voltage



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