



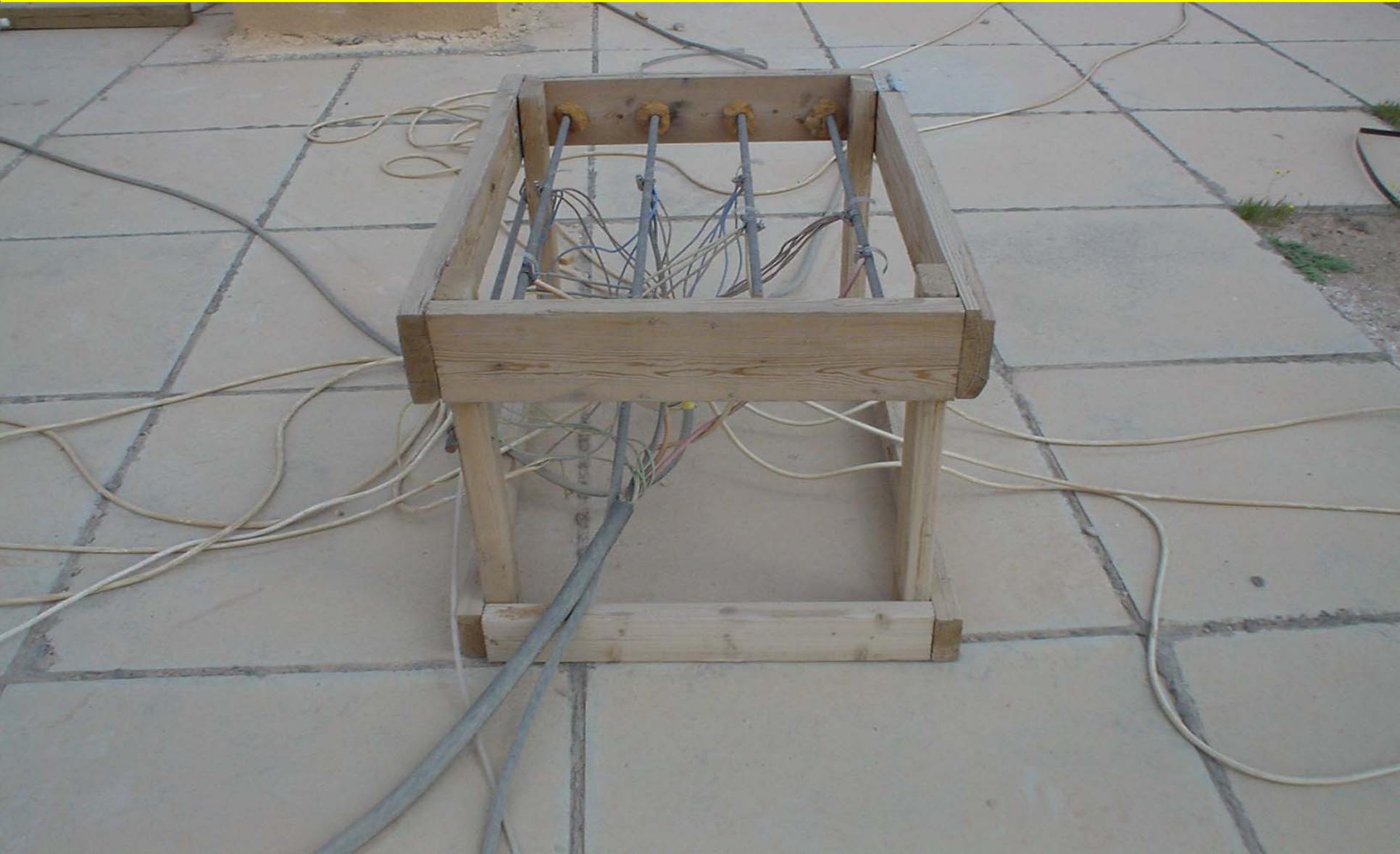
**PROGRAM MANAGER
EXPEDITIONARY POWER SYSTEMS
MARINE CORPS SYSTEMS COMMAND**

**Mobile Electric Power
Distribution – Replacement
(MEPDIS-R)
and Related Systems**

**MSgt Fred McCue
Project Officer - Mobile Power Team
fred.mccue@usmc.mil**



Somewhere in Iraq....





Agenda

- **Overview of projects**
 - **MEPDIS-R**
 - **Field Wiring Harness**
 - **Tent Lights**
 - **Field Food Service Buss Duct**
- **Future roadmap**
- **Questions**



Current USMC MEPDIS



- **Fielded in early 1980's / Fabricated by FPI**
- **3 size panels**
 - 15 kW – TAMCN B595
 - 30 kW – TAMCN B600
 - 100 KW – TAMCN B605
- **Single power inputs**
- **60 & 400 Hz compatible**
- **10 wire sets issued with system**
- **Amphenol© military connectors**





Field Wiring Harness



Used for Tent lighting and general electrical hook-ups

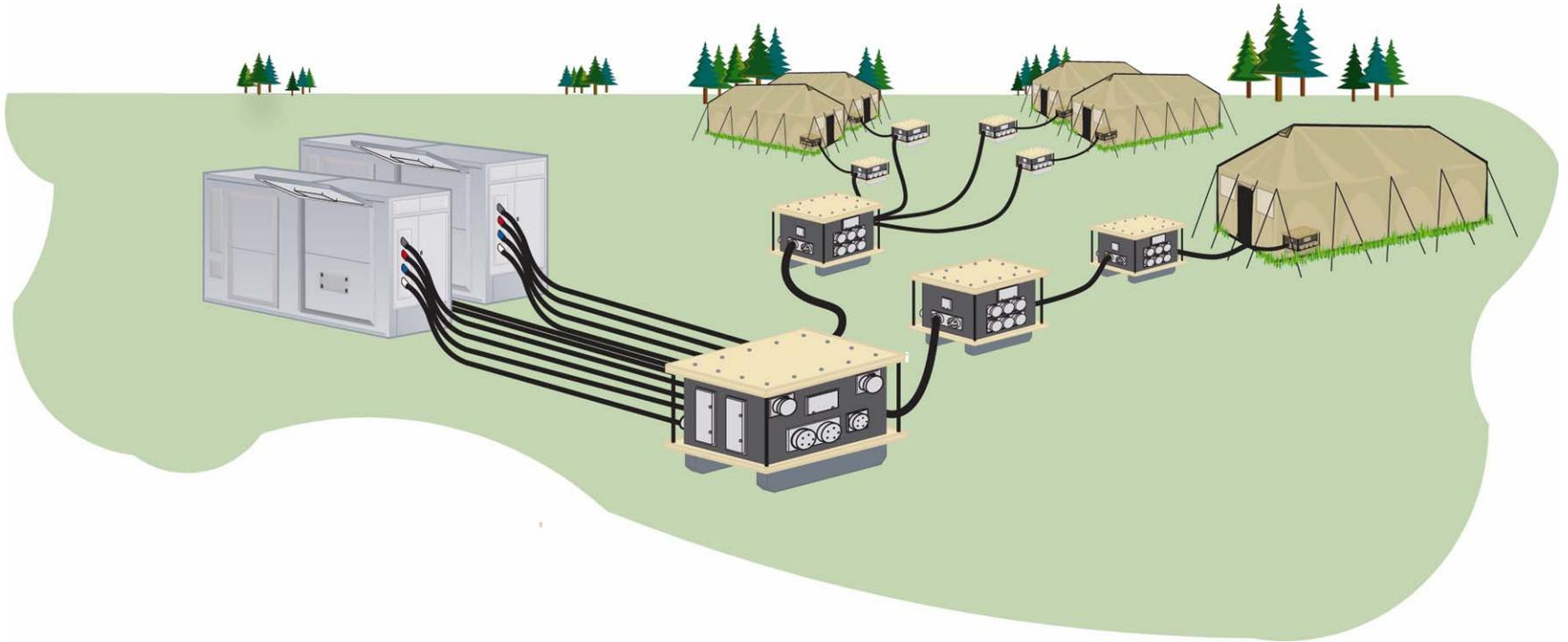
12 different wire assemblies + light bulbs

Weight: 764 lbs. / Cube: 32 ft³

TAMCN: B0608



MEPDIS-R



**MEPDIS-R will replace current MEPDIS (B0595, B0600, B0605)
and Field Wiring Harness (B0608)**

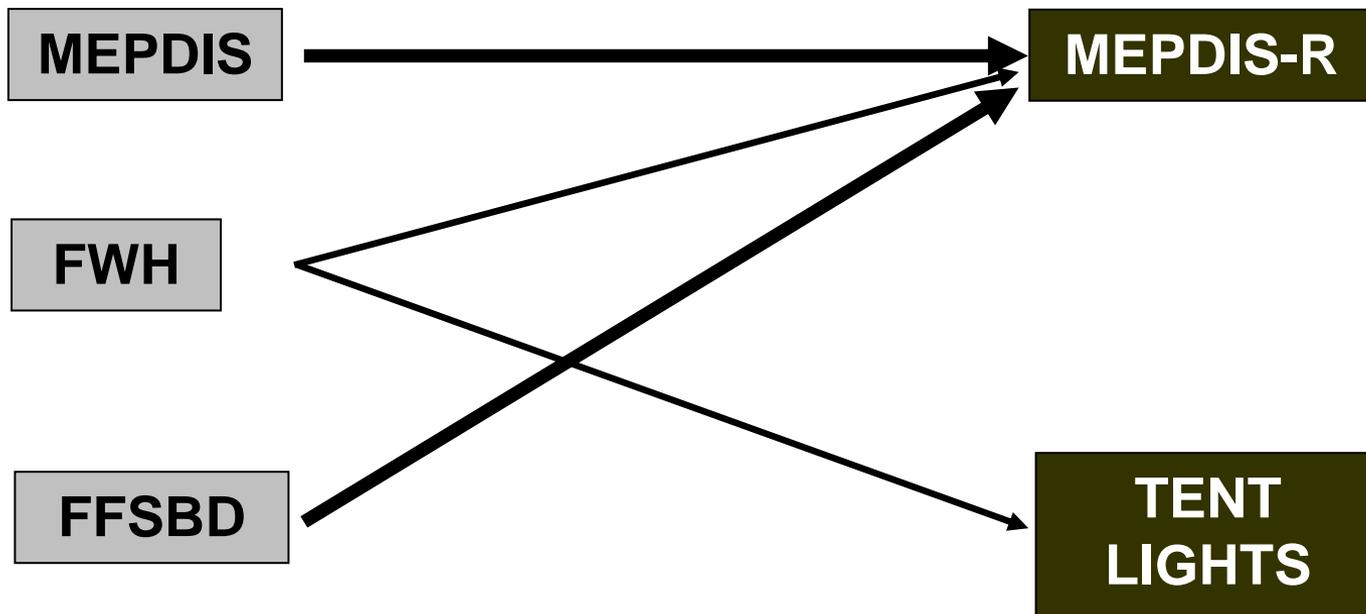


MEPDIS-R

- **Replaces functionality of MEPDIS and the Field Wiring Harness (FWH) when used with new tent lights.**
- **System composed of six different types of power distribution panels, each with associated cables and accessories.**
- **Compatible with MEPDIS and existing equipment**
- **Based on commercial components and technology**



System Roadmap



Note that MEPDIS, FWH, and FFSBD are interoperable with MEPDIS-R and will remain in service for the near future.

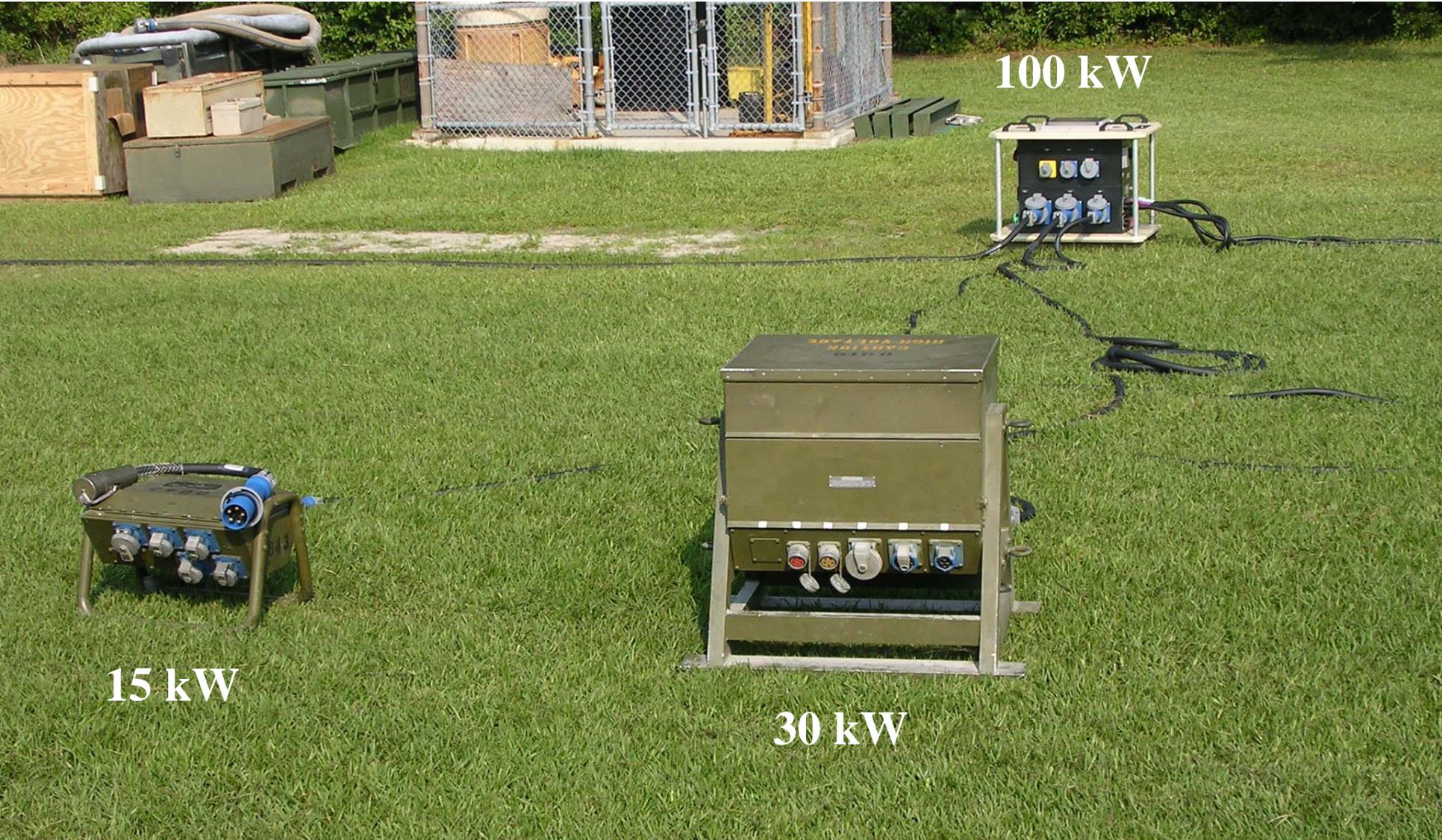


MEPDIS-R Evaluation

- **Competed to industry based on performance specifications and established interfaces – 2005**
- **Lex Products selected – 2005**
- **System extensively tested – 2005/06**
 - **Environmental testing (Aberdeen)**
 - **Electrical performance testing (Aberdeen, MET)**
 - **Durability testing (Aberdeen)**
 - **Field user evaluation (CLNC)**



MEPDIS-R Compatibility (LUE)



100 kW

15 kW

30 kW



MEPDIS-R Power Panels

5 kW Indoor



5 kW
Outdoor



15 kW



30 kW



100 kW



300 kW



5 Kilowatt Power Panels

5 Kilowatt Outdoor Non-GFCI Protected Power Panel

- **Input:**
 - 5 wire, 3-phase, 30 amp IEC 309 Pin & Sleeve
- **Output:**
 - 6 each: 3 wire, 1-phase, 20 amps IEC 309
 - 3 each: 3 wire, 1-phase, 30 amps IEC 309
- **Cords:**
 - 6 each: cord sets, 50 ft. each in length with 4 each, 5-15R receptacles
- **Connectors:**
 - (3) HBL330P4W 30A 1 \emptyset 2P 3W 120 VAC IEC309 Pin & Sleeve Plugs



5 Kilowatt Indoor GFCI Protected Power Panel

- **Input:**
 - 5 wire, 3-phase, 30 amp IEC 309 Pin & Sleeve
- **Output:**
 - 9 each: 3 wire, 1-phase, 120 VAC 20A GFCI Duplex Receptacles
- **Cords:**
 - 6 each: cord sets, 50 ft. each in length with 4 each, 15R receptacles





15/30 Kilowatt Power Panels

15 Kilowatt Power Panel

- **Input:**
 - Circuit Breaker Protection
 - 2 each: 5 wire, 3-phase, 60 amp IEC 309 Pin & Sleeve
- **Output:**
 - 4 each: 5 wire, 3-phase, 30 amp IEC 309 Pin & Sleeve
 - 4 each: 3 wire, 1-phase, 20 amp IEC 309 Pin & Sleeve
 - 1 each: 3 wire, 1-phase, 120 VAC 20A GFCI Duplex Receptacle



30 Kilowatt Power Panel

- **Input:**
 - Circuit Breaker Protection
 - 2 each: 5 wire, 3-phase, 100 amp IEC 309 Pin & Sleeve
- **Output:**
 - 4 each: 5 wire, 3-phase, 60 amp IEC 309 Pin & Sleeve
 - 2 each: 5 wire, 3-phase, 30 amp IEC 309 Pin & Sleeve
 - 2 each: 5 wire, 3-phase, 20 amp IEC 309 Pin & Sleeve
 - 2 each: 3 wire, 1-phase, 20 amp IEC 309 Pin & Sleeve
 - 1 each: 3 wire, 1-phase, 120 VAC 20A GFCI Duplex Receptacle





100 Kilowatt Power Panel

•Input:

- 400 Amp Switch Protection, 2 each,
- Cam Style, 5 wire

•Output:

- 1 each: Cam Type, 200 Amp, 5 wire connection
- 4 each: 5 wire, 3-phase, 100 amp IEC 309 Pin & Sleeve
- 2 each: 5 wire, 3-phase, 60 amp IEC 309 Pin & Sleeve
- 2 each: 5 wire, 3-phase, 30 amp IEC 309 Pin & Sleeve
- 2 each: 5 wire, 3-phase, 20 amp IEC 309 Pin & Sleeve
- 2 each: 3 wire, 1-phase, 20 amp IEC 309 Pin & Sleeve
- 1 each: 3 wire, 1-phase, 120 VAC 20A GFCI Duplex Receptacle





300 Kilowatt Power Panel

•Input:

- 400 Switch Protection
- 3 each Cam Style, 5 wire

•Output:

- 2 each: Cam Style, 400 Amp, 5 wire connection
- 2 each: 5 wire, 3-phase, 100 amp IEC 309 Pin & Sleeve
- 1 each: 3 wire, 1-phase, 120 VAC 20A GFCI Duplex Receptacle





MEPDIS-R Cabling



**50' 60A INPUT CABLE
PIGTAIL 15KW
NSN: 6150-01-529-7368**



**50' 100A INPUT CABLE
PIGTAIL 30KW
NSN: 6150-01-529-8803**



**50' 30A CABLE JUMP
15KW-5KW
NSN: 6150-01-529-8428**



**50' 100A CABLE JUMP
100KW-30KW
NSN: 6150-01-529-8806**



**5KW OUTDOOR CORD
SET ONLY
NSN: 6150-01-530-7352**



**5KW INDOOR CORD SET
ONLY
NSN: 6150-01-530-1960**



MEPDIS-R Cabling



**50' 60A CABLE JUMP
30KW-15KW
NSN: 6150-01-529-7674**



**25' 400A (5) Wire Feeder Set
NSN: 6150-01-529-7900**



**Y-cable with 50 foot extension
NSN: 6150-01-540-3519**



**Adapter, 100A
Commercial - Mil Std
NSN: 6150-01-529-8424**



**Adapter, 100A Mil Std -
Commercial
NSN: 6150-01-529-7698**



**Adapter, 60A Mil Std -
Commercial
NSN: 6150-01-529-8063**



USMC Future Direction

- **USMC is moving away from Military Style connectors:**
 - High Cost
 - Long Lead time
 - Cables for backward compatibility are part of MEPDIS-R family
- **Commercial Connectors:**
 - Fully meet electrical and environmental requirements
 - Readily available from industrial supply stores worldwide
 - Much cheaper than current Mil Connectors
 - Rapid assembly and repair
 - Waterproof connection for wet locations
 - Separate Ground from Neutral, 3-wire 1-phase, 5-wire 3-phase
- **Industry standards based on voltage and current**
 - IEC 309 is standard being followed
 - Recently renamed to IEC 60309



AC Connectors

- **AC connectors are of two types**
 - **Large power**
 - **Single Pole**
 - **Small power**
 - **Multi Pole (3 to 5 wire)**
 - **Less than 125 AMPS**
 - **Pin & Sleeve Connectors**



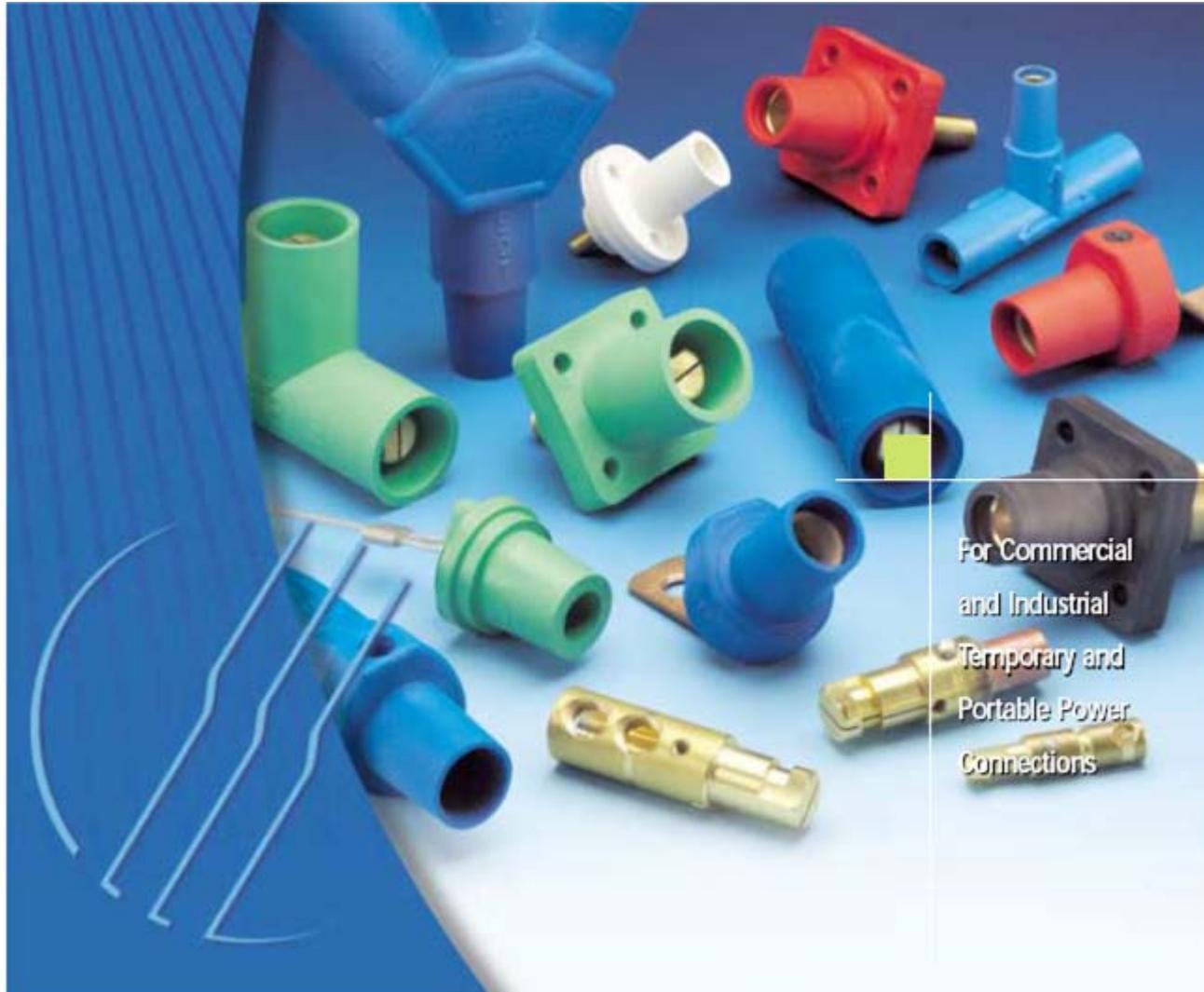
IEC “P” & “S” Features



- Provides maximum protection from abuse and environment
- Heavy-wall molding resists impact, heat, flame and chemicals
- Superior performance in low-to-high ambient temperatures (-40°C to 60°C)
- Excellent UV stability for outdoor performance (UL 1682)
- V-O flammability rating
- Fully insulated
- Color coded by voltage for easy identification



Cam Loc Connectors



For Commercial
and Industrial
Temporary and
Portable Power
Connections



Cam Loc Type 16 Connectors

- These are single conductor connectors
- Come in two sizes
 - 2-0 cables
 - 4-0 to 1-0 cables

The connector must be twisted 180 degrees upon insertion, or they can overheat



Cam Loc Benefits & Features

- **Inter-mateable and compatible with competitive cam-type products – can be retrofitted to existing locations and power distribution systems**
- **Locking and reinforcing ring won't melt, break, or crack**
- **Shatter and crack-proof – high durometer thermoplastic elastomer (TPE) or neoprene rubber**
- **Color coded insulating sleeves – fast and easy phase ID**
- **Prevents arching or burning – no movement of contact surfaces**
- **Self-compensating for wear – slit and cam in male contact provides spring action for longer usage**
- **Quick connect/disconnect – twist and pull provided by double cam male and cam-button in female**
- **High conductivity, positive, vibration proof connection**
- **Meet most NEC requirements, are UL listed, NEMA 3R rated (rainproof) for outdoor use**



Form Factors





Tent Lights



- **New tent systems will include florescent tent lights (C3409) as part of the tent. Lights are available to retrofit older tents.**
- **Power distribution systems (5 kW indoor) will power the tent lights, and will provide the power outlets inside the tent.**



Field Food Service Buss Duct

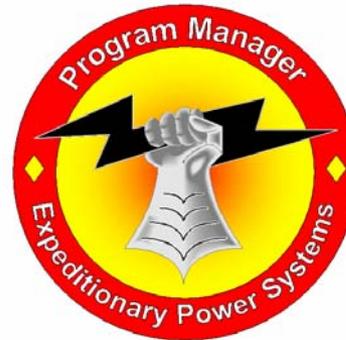


- **FFSBD (C0200) is a 300 KW power distribution panel that allows paralleling of up to three 60 kW or 100 kW generators**
- **Fielded as part of the Field Food Service Kitchen (FFSK)**
- **Will remain in service, but new purchases will be of MEPDIS-R 300 kW panel (B0032)**



PROGRAM MANAGER EXPEDITIONARY POWER SYSTEMS MARINE CORPS SYSTEMS COMMAND

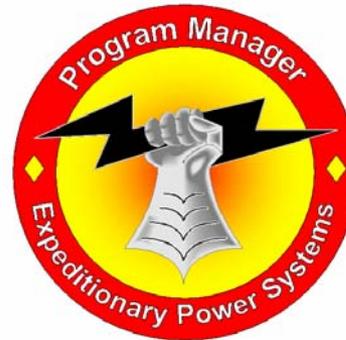
Questions ?





PROGRAM MANAGER EXPEDITIONARY POWER SYSTEMS MARINE CORPS SYSTEMS COMMAND

Backup Slides



Making the Right Connection is as Easy as Matching Colors and Telling Time!

Leviton's pin and sleeve devices are easy to use. Matching amperage and voltage requirements is literally as easy as matching colors and telling time.

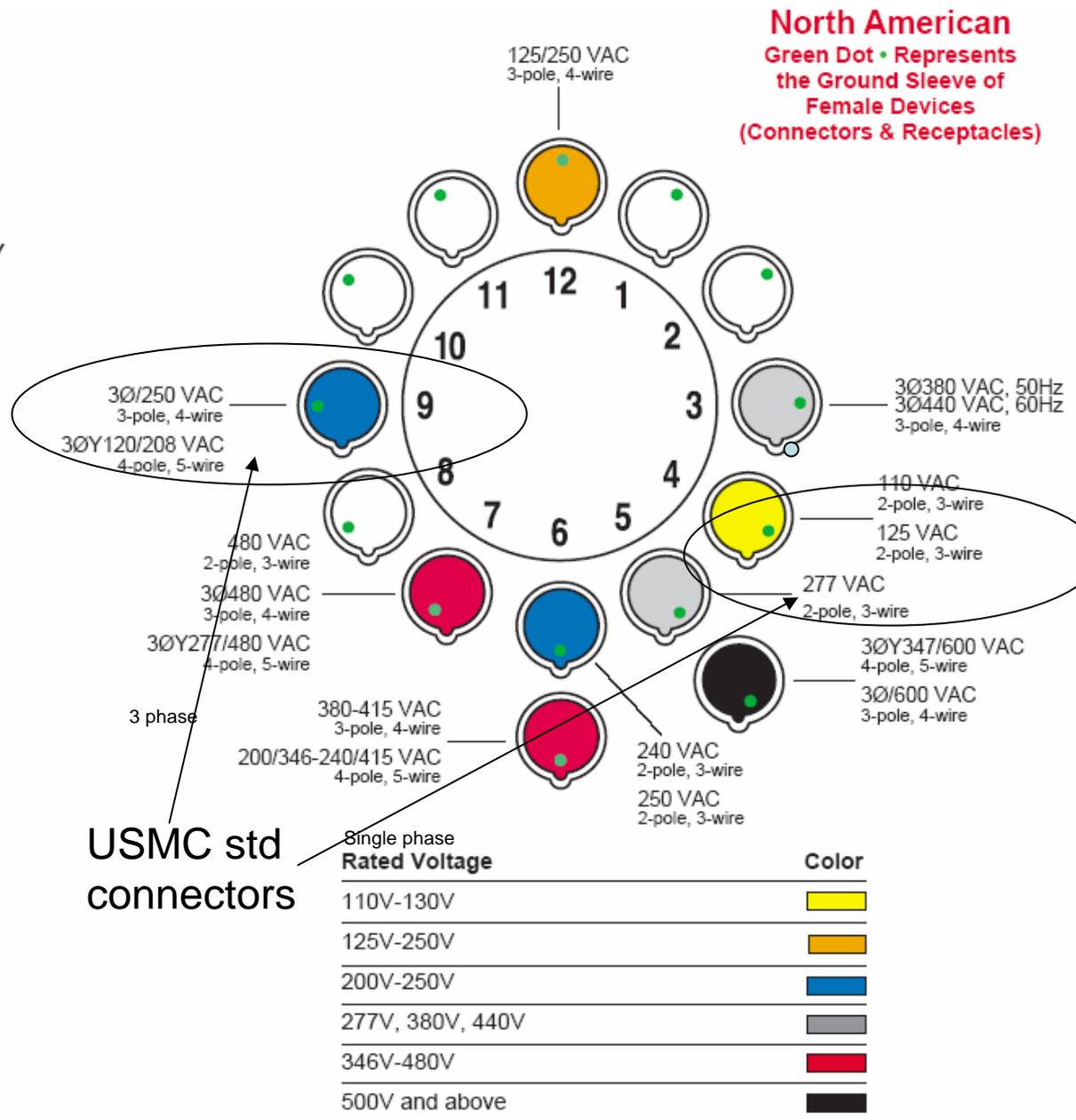
The amperage rating is related to the size of the device; devices of the same amperage are the same size.

The voltage rating is related to the location of the ground sleeve on the female device and the number of conductors. This location is based on a clock face with the key-way at the 6 o'clock position.

The ground sleeve is positioned at a specific hour location, depending on the device's voltage rating.

The clock position for plugs and inlets is a mirror image of the position for matching connectors and receptacles.

For quick visual identification, voltage ratings are also color-coded and the housings of interconnecting units are always the same color. All 125VAC devices are yellow; 250VAC are blue, etc. Matching up interconnecting devices is as easy as matching colors.





Key Design Elements

IEC 309-1 & 309-2



Pin & Contact Carrier 60 & 100 Amp

- Protects pins & contacts, holding them firmly in place
- Pin Carrier and Contact Carrier constructed of glass fiber reinforced nylon for maximum impact resistance and maximum protection of pins and contacts
- Superior arc-tracking resistance
- Excellent heat-resistance and flame-resistance
- Chamfered wire entry makes wiring easier



Gasket/Grommet

- Prevents moisture, dust, and contaminants from entering housing or pin/contact carrier
- Solid Chloroprene for positive seal and excellent chemical/corrosion-resistance
- Onion skin design on grommet provides precise watertight fit, eliminating the need to choose from multiple grommets that may not fit the cable jacket precisely



Spring Loaded Cover, Cover Arm, & Locking Rings

- Rings lock plug to connector
- Spring loaded cover closes automatically
- "Performance grade" Stainless Steel cover spring for superior corrosion-resistance and long life
- Excellent UV stability for outdoor use
- V-0 flammability rating
- Interior arm design in 60 and 100 amp helps eliminate breakage



Receptacle



Inlet



Plug



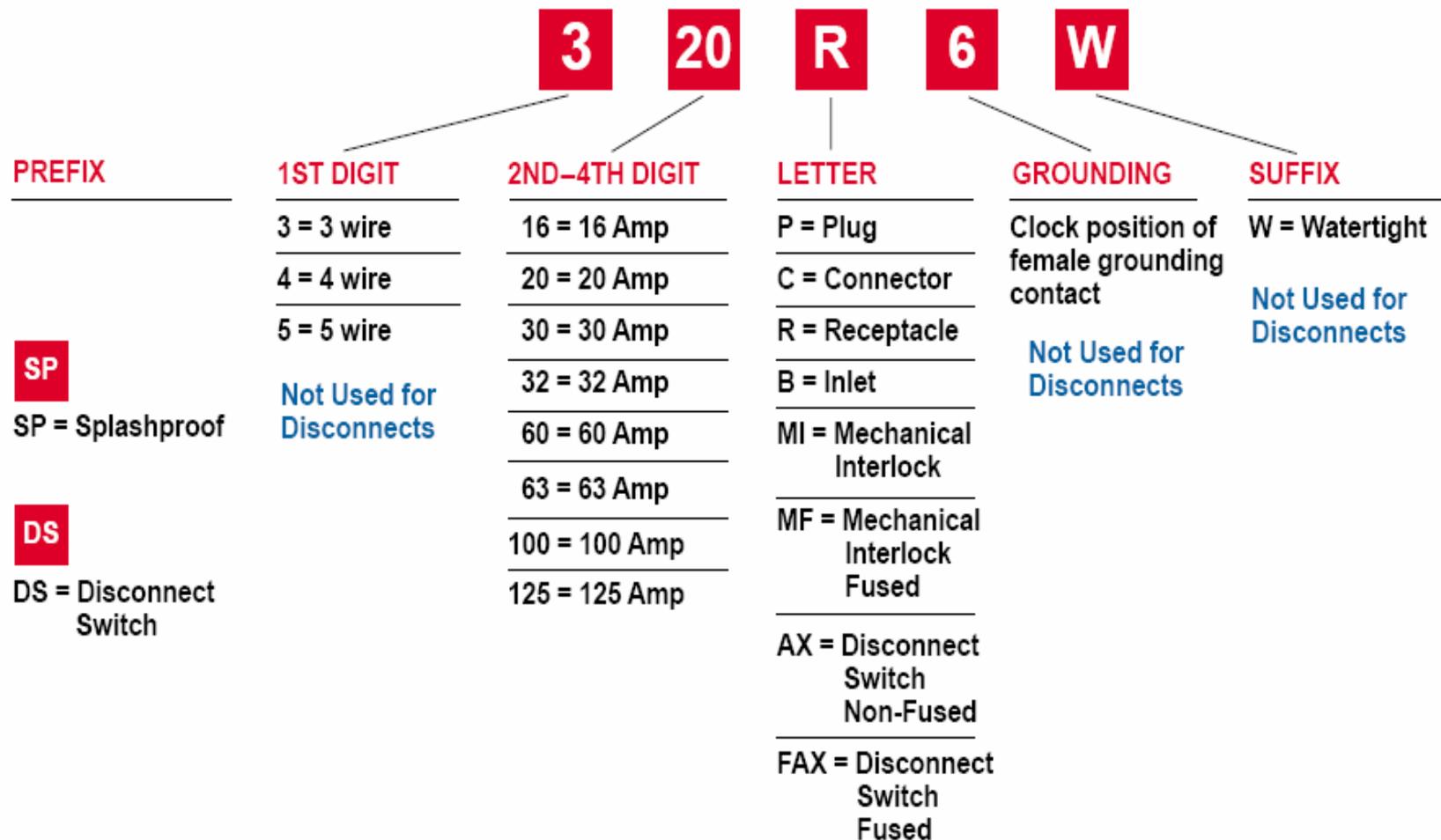
Connector

<u>TYPE</u>	<u>Current Rating</u>	<u>Color</u>	<u>Receptacle Part #</u>	<u>Inlet Part #</u>	<u>Plug Part #</u>	<u>Connector Part #</u>
1Phase 3 wire 100-130V						
1P 3W	15	Yellow	316R4W	316B4W	316P4W	316C4W
1P 3W	20	Yellow	320R4W	320B4W	320P4W	320C4W
1P 3W	30	Yellow	330R4W	330B4W	330P4W	330C4W
3 Phase 5 wire 120/208 V						
3P-5W	20	Blue	520R9W	520B9W	520P9W	520C9W
3P-5W	30	Blue	530R9W	530B9W	530P9W	530C9W
3P-5W	60	Blue	560R9W	560B9W	560P9W	560C9W
3P-5W	100	Blue	5100R9W	5100B9W	5100P9W	5100C9W

Catalog Numbering System

Leviton's catalog numbering system is easy to use. Each letter or number provides a description of the product. Simply follow the six-part code below, made up of letters and numbers. Each catalog number contains the number of conductors, amperage rating, device type, clock position of the ground sleeve, and environmental rating.

For example, the catalog number below refers to a 3-wire, 20 amp receptacle with a grounding sleeve located at the 6 o'clock position and an environmental classification of watertight.





Cam Type Specs

Leviton Catalog #: **16D31-R**

Description: Female, Plug, Detachable, Double Set Screw, 2-2/0 AWG, 300 Amp Max., 16 Series Taper Nose, Commercial Grade, ECT Cam-Type Connector - Red

16 SERIES - TAPER NOSE
Double Set Screw
Plug Connector



2 - 2/0 AWG **DETACHABLE**

300 AMP

600 VOLT

FEMALE



RED

Product Features:

Gender: Female

Style: Detachable

Connection Type: Double Set Screw

Cable Range: 2-2/0 AWG

Max Amperage: 300 Amp

Max Voltage: 600 Volt

Color: Red

Standards And Certifications: **UL/CSA**

Warranty: NA

Series: 16

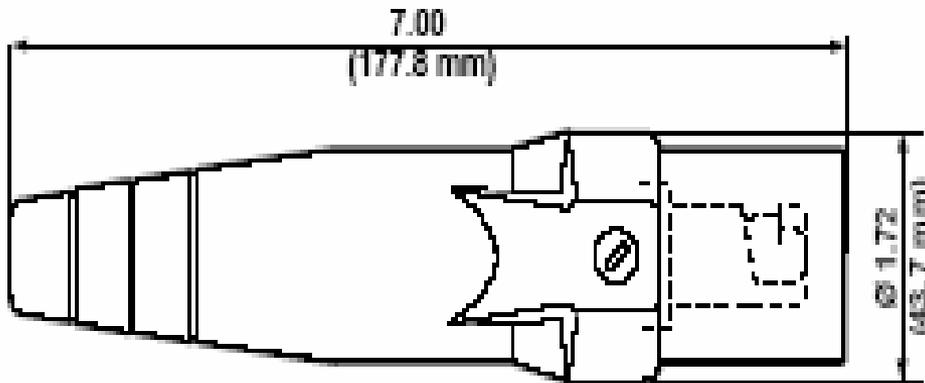
Component: Complete

Contact Cat. No.: 16D31-C

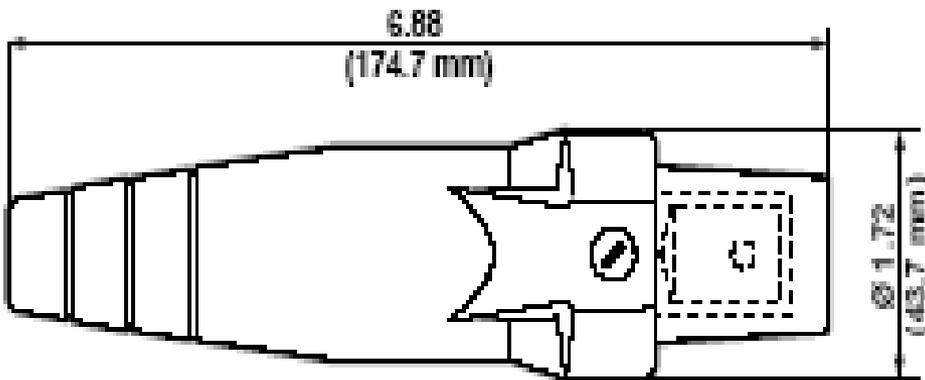
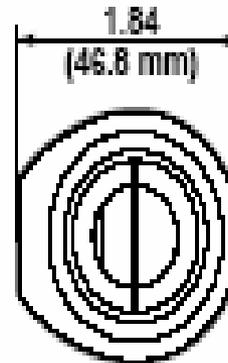
Insulator Cat. No.: 16SDF-22R



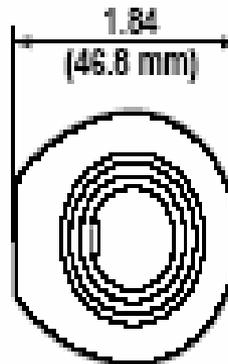
Male and Female Designs



MALE DETACHABLE PLUG—CRIMPED
Cat. No. 18D28



FEMALE DETACHABLE PLUG—CRIMPED
Cat. No. 18D37





DC Connectors

- **Types of DC power distribution connectors**
 - **High Power Cam Loc**
 - Same as AC
 - Different Color Code
 - **Medium power - NATO Slave**
 - **Low Power**
 - 5-40 VDC, up to 30 Amps
 - Efforts still in progress to continue defining models / classes
- **PM EPS is working to standardize for commonality across future items to be fielded**



NATO Connector - Medium

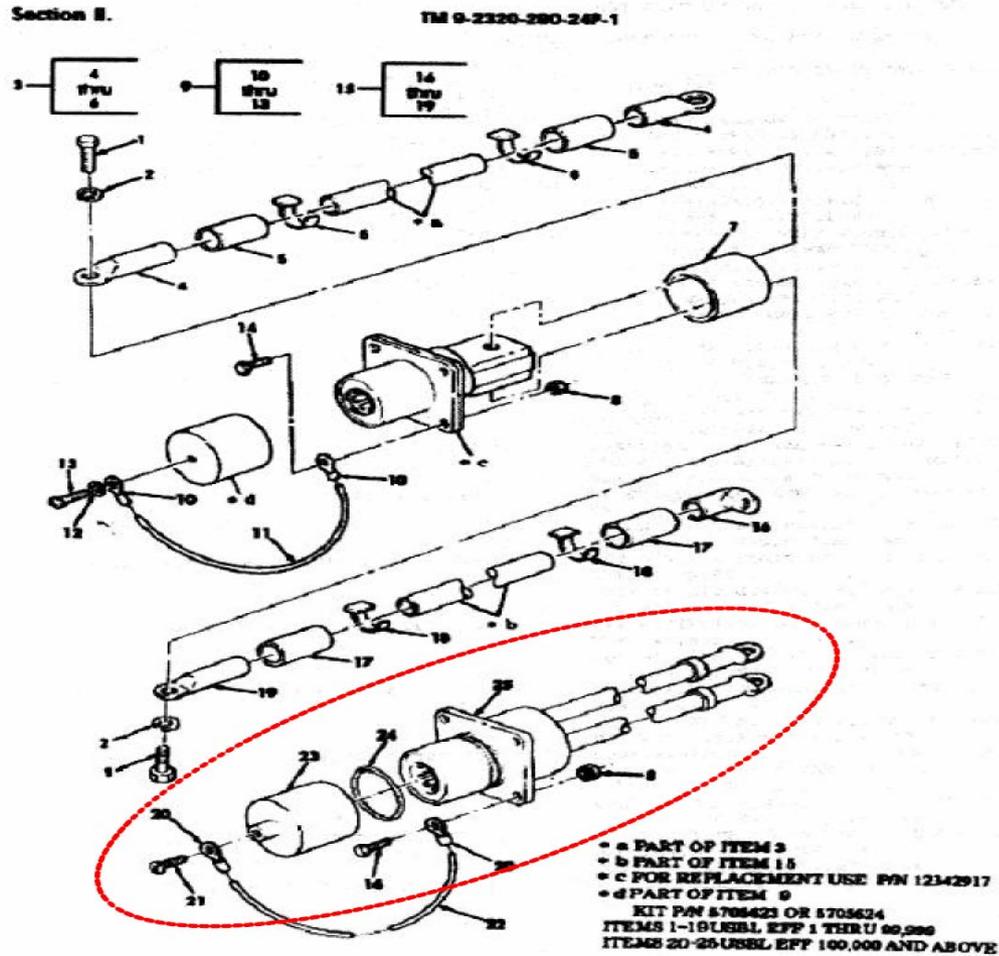


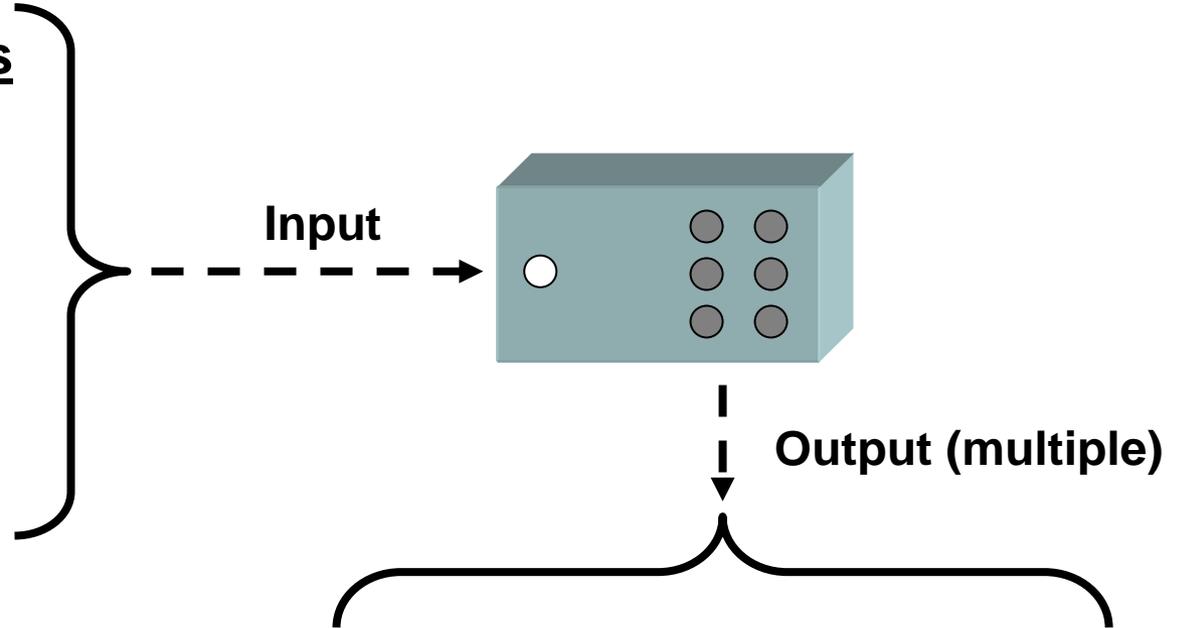
Figure 23. Close-up Assembly of NATO Connector - Medium



DC Power - Low

Possible Power Sources

- Vehicle Power
- Solar Power Adaptors
- Batteries
- Fuel Cells
- Power Supplies
- DC generator



Possible Power Consumers

- Radios
- Sensors
- Computers
- Battery Chargers
- Personal items



Cabling

- **Moving to standardize on SEOOW Cable**
 - **S – 600 Volt Thermoset service cord**
 - **E – Elastomer compound**
 - **O – Oil resistant inner conductor insulation**
 - **O – Oil resistant outer jacket**
 - **W – Outdoor, harsh, industrial environment**
- **Balance between the weight concerns and performance needs**
- **Suitable for full spectrum environmental profile**
- **Description sheet provided on conference CD**



Sample Cabling Specification

PART NUMBER: 22329
DESCRIPTION: 10/3 STRANDED TYPE SEOWW SUBMERSIBLE FLEXIBLE POWER CABLE
CONSTRUCTION: This cable consists of three bare copper insulated conductors cabled with fillers and an overall jacket.
APPROVALS: UL Standard 62, CSA 22.2 No. 49, NEC Article 400.
APPLICATION: 600V Portable Oil and Water Resistant Submersible Outdoor Flexible Power Cable

Construction Parameters:

Conductor	10 AWG Bare Copper
Stranding	104/30
Insulation Material	105C TPE
Insulation Thickness	0.046" Nom.
Insulated Conductor Diameter	0.210" Nom.
Number of Conductors	3
Lay Length	3.50" Nom.
Filler Type	Polypropylene
Separator/Wrap	Paper Tissue
Jacket Material	105C TPE
Jacket Thickness	0.100" Nom.
Overall Cable Diameter	0.655" Nom.
Approximate Cable Weight	265.9 Lbs/1M' Nom.
Flame Rating	UL/CSA Horizontal Flame Test

Electrical Properties:

Temperature Rating	-50°C to 105°C
Operating Voltage	600 V RMS Max.
DC Resistance per Conductor @ 20°C	0.99 Ohms/1M' Nom.
Max Ampacity per Conductor (Per NEC Table 400-5a)	30 amps/cond (Assume two current carrying conductors) (Note: Because of 105C temperature rating, higher current can be used under engineering supervision)



MEPDIS-R Nomenclature

TAMCN	NOMENCLATURE
B0027	5 kW Indoor MEPDIS-R panel
B0028	5 kW Outdoor MEPDIS-R panel
B0029	15 kW MEPDIS-R panel
B0030	30 kW MEPDIS-R panel
B0031	100 kW MEPDIS-R panel
B0032	300 kW MEPDIS-R panel

Panels include input and output cables, cable reels, and other items.



MEPDIS-R Cable Reels



Large and Small model



Stackable (anti-slip lugs welded)



Fielding Plan

- **MEPDIS-R panels are not a one-to-one replacement for MEPDIS panels.**
- **Allowances appear by MEPDIS-R panel TAMCN.**
- **Unit allowances determined by capability.**
- **Plan is to field to individual units, vice MEF IIP.**
- **MEPDIS and Field Wiring Harness (FWH) will remain in service for near future.**



Fielding Schedule

		3RD QTR FY07 FIELDING					
MEF	UNIT	5 KW O	5 KW I	15 KW	30 KW	100 KW	300 KW
I MEF	7TH ESB	50	25	12	8	4	2
I MEF	9TH COMM	30	15	7	8	8	2
BIC	MPS-1	80	40	16	28	8	4
		4TH QTR FY07 FIELDING					
		5 KW O	5 KW I	15 KW	30 KW	100 KW	300 KW
III MEF	9TH ESB	50	25	12	8	4	2
III MEF	7TH COMM	20	10	5	8	4	2
IV MEF	6TH ESB	50	25	12	8	4	2
IV MEF	6TH COMM	30	15	7	8	8	2



Fielding Schedule

		1ST QTR FY08 FIELDING					
		5 KW O	5 KW I	15 KW	30 KW	100 KW	300 KW
II MEF	8TH ESB	50	25	12	8	4	2
II MEF	8TH COMM	30	15	7	8	4	2
II MEF	MWSS 271	32	16	8	6	4	2
II MEF	MWSS 272	32	16	8	6	4	2
II MEF	MWSS 273	32	16	8	6	4	2
II MEF	MWSS 274	32	16	8	6	4	2
I MEF	MWSS 371	32	16	8	6	4	2
I MEF	MWSS 372	32	16	8	6	4	2
I MEF	MWSS 373	32	16	8	6	4	2
I MEF	MWSS 374	32	16	8	6	4	2
III MEF	MWSS 171	32	16	8	6	4	2
III MEF	MWSS 172	32	16	8	6	4	2
IV MEF	MWSS 471	32	16	8	6	4	2
IV MEF	MWSS 472	32	16	8	6	4	2
IV MEF	MWSS 473	32	16	8	6	4	2



Fielding Schedule

		2ND QTR FY08 FIELDING					
		5 KW O	5 KW I	15 KW	30 KW	100 KW	300 KW
I MEF	1ST CEB	20	10	5	4	2	0
II MEF	2ND CEB	20	10	5	4	2	0
III MEF	3RD CAB	40	20	10	4	2	0
IV MEF	4TH CEB	20	10	5	4	2	0



Fielding Issues

- **MEPDIS-R is a significant improvement over MEPDIS and is fully compatible with it.**
- **7th ESBn & 9th CommBn will receive MEPDIS-R in June 2007**
- **MWSSs will receive MEPDIS-R ~ Oct 2007.**
- **1st CEB will receive MEPDIS-R ~ Feb 2008.**
- **All shipments will be direct to unit, not IIP,**
- **Retain MEPDIS until no longer serviceable.**
- **NET to be conducted by Talmadge Jackson, FSR.**



IF NOTHING ELSE, REMEMBER THIS:

- **MEPDIS-R will complement MEPDIS.**
- **Retain MEPDIS until no longer serviceable.**
- **Call the Project Officer or FSR if you need help.**