United Electronic Industries / **AMETEK®**

DNR-MIL
12- Slot, Military-Grade I/O Rack

- Military/Rugged 38999 connectivity
- 100% COTS solution
- Supported by over 90 standard DNR-series I/O boards
- 5 g vibration, 100 g shock, sealed to IP66
- Dual GigE ports (control and diagnostic)
- Designed for MIL-STD-461/810/1275 compliance
- Extensive built-in system diagnostics
- PowerDNA, UEIPAC, UEIMODBUS, UEISIM and UEIOPCUA configurations
- No rotary cooling devices
- Extensive software support including Windows, Linux, VxWorks, QNX, RTX and more
- VxWorks support available in embedded or hosted configurations

The DNR-MIL provides 12 I/O slots and uses standard DNR-series I/O boards (e.g. DNR-AI-217). It is available in the standard PowerDNR configuration or as a UEIPAC or UEISIM .

GENERAL DESCRIPTION

he DNR-MIL is the latest deployment of UEI's popular RACKtangle® architecture. Though the original RACKtangles are quite rugged, the DNR-MIL series takes ruggedness to the extreme. Designed for use in the toughest environments, the new DNR-MIL is an ideal solution for military and aerospace deployments. The form factor is also ideal for a huge assortment of commercial applications including use on oil drilling platforms and refineries, heavy machinery, outdoor test stands and any other I/O application that will be exposed to the elements. All connectivity is through ROHS compliant 38999 connectors. Keyed connectors are available as an option.

Electronically, the DNR-MIL is identical to the standard DNR Series RACKtangle except for power supply hold-up and protection circuitry. (This power supply conditioning is required in order to meet MIL-STD-1275.) The DNR-MIL uses our standard DNR-series board (e.g. DNR-AI-217 or DNR-1553-553). With over 50 unique I/O boards and 12 slots available there's sure to be a configuration perfectly matching your application.

The new DNR-MIL is designed to meet the most commonly required elements of MIL-STD-461 and -810 and is sealed to at least IP66/NEMA6 standards. All this is housed in a compact 17.5" W x 8.125" D x 7.0" H chassis, weighing less than 22 pounds and typically consuming less than 40 W. In addition, no rotary cooling fans are used in the design which maximizes MTBF and mechanical reliability. All internal printed circuit boards are conformal coated to ensure the highest reliability.

The DNR-MIL is available in four different deployment options. In PowerDNA, UEIPAC, UEISIM and UEIMODBUS.

POWERDNA: DNR-MIL
In PowerDNA mode, the RACKtangle operates as a slave I/O device, running under the control of a host PC. All application code in this mode is created and run on the host. PowerDNR mode offers almost unprecedented software support including:

- All popular operating systems, including Windows, Linux, VxWorks, QNX, RTX and InTime
- All popular programming languages, including VB, VB.NET, C, C#, C++ and JAVA
- All popular application packages, including MATLAB, Simulink, LabVIEW and more

UEIPAC 1200-MIL
When deployed as a UEIPAC, the standard firmware running on a RACKtangle is replaced by either a Linux or VxWorks operating system. The user then writes the Linux/VxWorks application that runs on the DNR-MIL. In this mode the DNR-MIL can run fully stand-alone, or may be linked to a SCADA host via the Ethernet.

UEISIM 1200-MIL
Simulink users will appreciate the ability to use Simulink coder to compile and deploy their models on the UEISIM hardware. It's an ideal platform for testing models on actual hardware. Once the model is proven, it can be deployed using the exact same hardware.

UEIMODBUS 1200-MIL
Users needing a compact, rugged Modbus TCP I/O slave will appreciate UEIMODBUS. The rugged, IP66/NEMA6 sealed DNR-MIL allows you to deploy your I/O system inlthe field, without any additional enclosure and protection.

The DNR-MIL platform is 100% COTS and supported by UEI's family of over 90 compatible analog, digital and interface I/O boards, including analog inputs up to 24-bits, thermocouples, RTDs, ICP/IEPE, ARINC-429/453/708, MIL-STD-1553, CAN, RVDT/LVDT, synchro/resolver, RS-232/422/485, strain gauge, quadrature encoder, high-voltage analog outputs (up to 115 VDC) with high drive analog output (up to 200 mA), function generator outputs and more.

Whether your application is on a ship or boat, in an aircraft, in a rocket, on an outdoor test cell, on an oil platform or simply going to be left outside and exposed to the elements, the DNR-MIL is an ideal solution. Of course, if you need fewer I/O, you should consider the 4-slot 6.2" W x 8.7" D x 7.1" H DNA-MIL Cube, which offers many of the same features and options, with slots for up to 4 I/O boards in a much smaller chassis.

TECHNICAL SPECIFICATIONS

DNR-MIL-6 (Power DNA mode)

Computer Interface	PPCx-1G series GigE RACKtangles
Primary Ethernet port	10/100/1000Base-T, 38999 connector
Diagnostic port	10/100/1000Base-T, 38999 connector
Configuration/serial port	RS-232, 38999 connector
Synchronization options	1. DNR-SYNC-1G series cables and boards provide both clock and trigger sync signals; 2. DNR-IRIG-650 board provides IRIG and GPS time synchronization

I/O Board Support	
Series supported	All DNR-series boards

Processor/system	
CPU	Freescale 8347, 400 MHz, 32-bit
Memory (RAM)	256 MB
Memory (Flash)	32 MB

Host Communications	
Distance from host	100 meters maximum, CAT5 cable
Ethernet data transfer rate	20 MB/s
Analog data transfer rate	>6 MS/s. Capable of sustained transfer in any RACKtangle configuration
DMAP I/O mode	Update >1,000 I/O channels at 4 kHz, guaranteed

Physical Dimensions/Weight	
12 I/O slots	17.5" W x 8.1" D x 7.0" H, 22 lbs.

Environmental	
Electrical Isolation	350 Vrms
Temperature (operating)	-40 °C to 70 °C
Temperature (storage)	-40 °C to 85 °C
Humidity	0 to 95%, non-condensing
Vibration	MIL-STD-810 G plus the IEC standards below
(IEC 60068-2-64)	10–500 Hz, 5 g (rms), broadband random
(IEC 60068-2-6)	10–500 Hz, 5 g, sinusoidal
Shock	MIL-STD-810 G plus the IEC standards below
(IEC 60068-2-27)	100 g, 3 ms half sine, 18 shocks at 6 orientations; 30 g, 11 ms half sine, 18 shocks at 6 orientations
Altitude	70,000 feet, maximum
EMI/RFI	Designed to meet MIL-STD-461
Sealing	Default unit sealed to IP 66 or better. Pressure relief valves support continuous altitude changes of 5000 fpm. Units can be configured with bottom weep holes if desired.

Power Requirements	
Voltage	9–36 VDC (115/220 VAC adaptor available)
Power	12 W (not including I/O boards)
Power Quality requirement	Designed to meet MIL-STD 704/1275

Reliability	
MTBF	130,000 hours

UEIPAC 1200-MIL

Computer Interface	PPCx-1G series GigE RACKtangles
Primary Ethernet port	10/100/1000Base-T, 38999 connector
Diagnostic port*	10/100/1000Base-T, 38999 connector *Alternatively can be teamed/bonded with primary port.
Configuration/serial port	RS-232, 38999 connector
USB port	USB 2.0 fully supported
Synchronization options	1. DNR-SYNC-1G series cables and boards provide both clock and trigger sync signals 2. DNR-IRIG-650 board provides IRIG and GPS time synchronization 3. PTP client provides software implementation of IEEE-1588

I/O Board Support	
Series supported	All DNR-series boards

Software / Operating System	
Embedded OS	Linux kernel 5.4.x (VxWorks Available)
Real-time support	Xenomai RTOS support
Development language	C/C++, Eclipse IDE support
Development environments	Linux PC or Cygwin Windows environment
EPICS CAS interface	Yes
SNMP library	Yes
OS royalties	None

Processor/system	
CPU	Freescale 8347, 400 MHz, 32-bit
Memory	256 MB (128 MB available for application software)
FLASH memory	32 MB (16 MB available for user applications)
Solid state hard drive	Up to 64 GByte
USB drive interface	Standard USB 2.0 port

Physical Dimensions/Weight	
12 I/O slots	17.5" W x 8.1" D x 7.0" H, 22 lbs.

Environmental	
Electrical isolation	350 Vrms
Temperature (operating)	-40 °C to 70 °C
Temperature (storage)	-40 °C to 85 °C
Humidity	0 to 95%, non-condensing
Vibration	MIL-STD-810G plus the IEC standards below
(IEC 60068-2-64)	10–500 Hz, 5 g (rms), broadband random
(IEC 60068-2-6)	10–500 Hz, 5 g, sinusoidal
Shock	MIL-STD-810G plus the IEC standards below
(IEC 60068-2-27)	100 g, 3 ms half sine, 18 shocks at 6 orientations 30 g, 11 ms half sine, 18 shocks at 6 orientations
Altitude	70,000 feet, maximum
EMI/RFI	Designed to meet MIL-STD-461

Power Requirements	
Voltage	9–36 VDC (115/220 VAC adaptor available)
Power	12 W (not including I/O boards)
Power quality requirement	Designed to meet MIL-STD-704/1275

Reliability	
MTBF	130,000 hours

TECHNICAL SPECIFICATIONS

UEIMODBUS 1200-MIL

Computer Interface	PPCx-1G series GigE RACKtangles
Primary Ethernet Port	10/100/1000Base-T, 38999 connector
Diagnostic Port	10/100/1000Base-T, 38999 connector
Daisy Chain Output	n/a
Optional Interface	n/a
Configuration/Serial Port	RS-232, 38999 connector
USB Port	USB 2.0 fully supported
Synchronization	DNR-SYNC-1G series cables and boards provide both clock and trigger sync signals
I/O Board Support	
Series supported	All DNR-series boards
Software Requirements	
MATLAB	Version 2007b or greater
Simulink	Version 7.0 or greater
Real-Time Workshop	Version 7.0 or greater
Software/Operating System	
Embedded OS	Linux, kernel 2.6.x, Xenomai RTOS support
Development Language	C
Development Environments	Simulink / RTW with Cygwin environment on a Windows PC
Processor/System	
CPU	Freescale 8347 or 8347E, 400 MHz, 32-bit
Memory	256 MB (128 MB available for application software)
USB drive interface	Standard USB 2.0 port
Physical Dimensions/Weight	
12 I/O slots	17.5" H x 8.1" D x 7.0" H , 22 lbs.
Environmental	
Electrical Isolation	350 Vrms
Temperature (operating)	-40 °C to 70 °C
Temperature (storage)	-40 °C to 85 °C
Humidity	0 to 95%, non-condensing
Vibration	MIL-STD-810G plus the IEC standards below
(IEC 60068-2-64)	10–500 Hz, 5 g (rms), broadband random
(IEC 60068-2-6)	10–500 Hz, 5 g, sinusoidal
Shock	MIL-STD-810G plus the IEC standards below
(IEC 60068-2-27)	100 g, 3 ms half sine, 18 shocks at;6 orientations 30 g, 11 ms half sine, 18 shocks at 6 orientations
Altitude	70,000 feet, maximum
EMI/RFI	Designed to meet MIL-STD-461
Power Requirements	
Voltage	9 – 36 VDC (115/220 VAC adaptor available)
Power	12 W (not including I/O boards)
Power Quality Requirement	12 W (not including I/O boards)
Reliability	
MTBF	>100,000 hours

*The SD cards and SSD devices used are not built by UEI. As we do not control the source, we cannot offer our 10-year availability guarantee on these devices.

CABLES, CONNECTORS & SCREW TERMINAL PANELS

CONNECTORS

All connections to the DNR-MIL are made through standard, COTS, nickel plated 38999 connectors. I/O board connections are made through 128-pin connectors where each I/O board utilizes up to 62 of the 128 pins. The Ethernet, USB, diagnostic Serial, Sync, and hardware reset connections are via 37-pin connectors. Power supply and an auxiliary synch bus connections are through a 13-pin connector. Optional keying is available on the 128 pin, I/O connectors. To add the keyed connectors add the following to your order.

DNA-38999-KEY: Clocked/keyed I/O connectors (N, A, B, C, D, and E key)

CABLES

Though most customers will design custom cables for their deployed systems, customers working on prototypes and/or those building "one off" systems may desire the ability to connect to the DNR-MIL-4 using more traditional, commercial connections (e.g. RJ-45 for the Ethernet ports).

For these customers, UEI offers a complete array of cables and screw terminal panels that will provide direct access to all signals routed in and out of the chassis.

LAN/Power Cables

■ **DNA-CBL-LAN-06 Communications cable**
6 foot cable connecting the 37-pin LAN/COM/USB port connector to standard commercial connectors. Ethernet ports come out to RJ-45, the serial port to a DB-9 and the USB ports to standard USB jacks.

■ **DNA-CBL-1315-03 Power supply cable**
Connects the 13-pin power/sync connector to a standard female DB-15 connector.

I/O board cables

Each 128 pin I/O 38999 connector provides the I/O connectivity for two I/O slots within the DNR-MIL-4. UEI I/O boards utilize either 37- or 62-pin D connectors and these connectors are mapped as follows.

The left I/O slot (even slot #) maps to pins 1–62 on the 128 pin 38999. The right I/O slot (even slot #) is mapped to pins 65–126 on the 38999. Note that the 37-pin based boards simply do not use pins 38–62. For this reason, most applications can standardize on 62-pin cables and screw terminal panels and simply ignore "no connection" pins. The exception to this is the STP boards that have been specifically designed for use with 37-pin boards (e.g. DNA-STP-207TC). For these boards 37-pin are also available. As some I/O slots may not be utilized, cables with a single 37-pin or 62-pin D connector are also available.

The following cables provide the same I/O connectivity as the standard, commercial DNA-CBL-37S and DNA-CBL-62 series cables.

■ **DNA-CBL-12862-5 5 ft male 128-pin 38999 to 2x DB-62M**
■ **DNA-CBL-12837-5 5 ft male 128-pin 38999 to 2x DB-37F**
■ **DNA-CBL-6237M-3 3 ft male RoHS 128-pin 38999 to 1x DB-37F and 1x DB-62M**
■ **DNA-CBL-62M-03 3 ft male 128-pin 38999 to 1x DB-62M**
■ **DNA-CBL-37M-03 3 ft male 128-pin 38999 to 1x DB-37F**

SCREW TERMINAL PANELS

■ **DNA-STP-37**
Standard 37-pin screw terminal panel, suitable for use with all 37-pin I/O boards and cables.
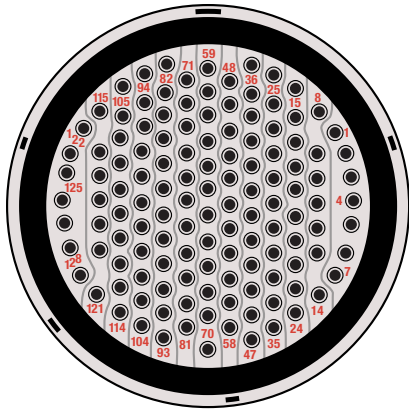
■ **DNA-STP-62**
Standard 62-pin screw terminal panel, suitable for use with all 62-pin I/O boards and cables.

■ **DNA-STP-3762**
Standard 37-pin screw terminal panel, providing both 37- and 62-pin connectors and suitable for use with any combination of I/O board.

38999 CONNECTOR PINOUTS

128-pin I/O—mating connector required: D38999/26FJ35PN

Pin #	I/O slot	Board Pin
1	2 / 4	1
2	2 / 4	2
3	2 / 4	3
4	2 / 4	4
5	2 / 4	5
6	2 / 4	6
7	2 / 4	7
8	2 / 4	8
9	2 / 4	9
10	2 / 4	10
11	2 / 4	11
12	2 / 4	12
13	2 / 4	13
14	2 / 4	14
15	2 / 4	15
16	2 / 4	16
17	2 / 4	17
18	2 / 4	18
19	2 / 4	19
20	2 / 4	20
21	2 / 4	21
22	2 / 4	22
23	2 / 4	23

Pin #	I/O slot	Board Pin
24	2 / 4	24
25	2 / 4	25
26	2 / 4	26
27	2 / 4	27
28	2 / 4	28
29	2 / 4	29
30	2 / 4	30
31	2 / 4	31
32	2 / 4	32
33	2 / 4	33
34	2 / 4	34
35	2 / 4	35
36	2 / 4	36
37	2 / 4	37
38*	2 / 4	38
39	2 / 4	39
40	2 / 4	40
41	2 / 4	41
42	2 / 4	42
43	2 / 4	43
44	2 / 4	44
45	2 / 4	45
46	2 / 4	46

Pin #	I/O slot	Board Pin
47	2 / 4	47
48	2 / 4	48
49	2 / 4	49
50	2 / 4	50
51	2 / 4	51
52	2 / 4	52
53	2 / 4	53
54	2 / 4	54
55	2 / 4	55
56	2 / 4	56
57	2 / 4	57
58	2 / 4	58
59	2 / 4	59
60	2 / 4	60
61	2 / 4	61
62	2 / 4	62
63	n/a	n/a
64	n/a	n/a
65	1 / 3	1
66	1 / 3	2
67	1 / 3	3
68	1 / 3	4
69	1 / 3	5
70	1 / 3	6
71	1 / 3	7
72	1 / 3	8
73	1 / 3	9
74	1 / 3	10
75	1 / 3	11
76	1 / 3	12
77	1 / 3	13
78	1 / 3	14
79	1 / 3	15
80	1 / 3	16
81	1 / 3	17
82	1 / 3	18
83	1 / 3	19
84	1 / 3	20
85	1 / 3	21
86	1 / 3	22
87	1 / 3	23

Pin #	I/O slot	Board Pin
88	1 / 3	24
89	1 / 3	25
90	1 / 3	26
91	1 / 3	27
92	1 / 3	28
93	1 / 3	29
94	1 / 3	30
95	1 / 3	31
96	1 / 3	32
97	1 / 3	33
98	1 / 3	34
99	1 / 3	35
100	1 / 3	36
101	1 / 3	37
102	1 / 3	38
103	1 / 3	39
104	1 / 3	40
105	1 / 3	41
106	1 / 3	42
107	1 / 3	43
108	1 / 3	44
109	1 / 3	45
110	1 / 3	46
111	1 / 3	47
112	1 / 3	48
113	1 / 3	49
114	1 / 3	50
115	1 / 3	51
116	1 / 3	52
117	1 / 3	53
118	1 / 3	54
119	1 / 3	55
120	1 / 3	56
121	1 / 3	57
122	1 / 3	58
123	1 / 3	59
124	1 / 3	60
125	1 / 3	61
126	1 / 3	62
127	-	n/a
128	-	n/a

Pins 38–62 are not applicable if I/O slot 1 contains a 37-pin board

## 37-pin LAN / COM port—mating connector required: D38999/26WD35PN
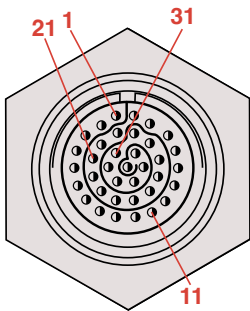
Pin number	Pin designation
1	LAN0 TX+ /DA+
2	LAN0 RX+ / DB+
3	LAN0 nc / DC-
4	LAN0 nc / DD+
5	Shield
6	Lan1 TX+ / DA+
7	LAN1 RX+ / DB+
8	LAN1 nc / DC-
9	LAN1 nc / DD+
10	Shield
11	Misc In
12	USB1 P+
13	USB1 D+

Pin number	Pin designation
14	USB2 P+
15	USB2 P-
16	USB2 D+
17	USB2 D-
18	LAN0 TX- / DA-
19	LAN0 nc / DC+
20	LAN0 RX- / DB-
21	LAN0 nc / DD-
22	LAN1 TX- / DA-
23	LAN1 nc / DC+
24	LAN1 RX- / DB-
25	LAN1 nc / DD-
26	Misc Out

Pin number	Pin designation
27	USB1 P-
28	USB1 D-
29	Sync Clock Out
30	Sync Trig Out
31	RS232 TX
32	RS232 RX
33	RS232 GND
34	Sync Clock In
35	Sync Trig In
36	Sync +5V
37	Sync Gnd

13-pin power connector—
mating connector required: D38999/26FB35PN
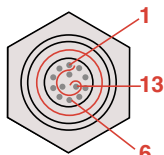
Pin #	Pin Designation
1	GND
2	GND
3	GND
4	Vcc (9-36 VDC)
5	Vcc (9-36 VDC)
6	Vcc (9-36 VDC)
7	Sync In2 / reset
8	Sync In0
9	Sync In1
10	Sync Gnd
11	Sync Out1
12	Sync +5V
13	Sync Out0