DNR-MIL-4
4-Slot, Military-Grade I/O Chassis

10 YEAR AVAILABILITY GUARANTEE • **EXTENDED 3 · 5 · UP TO 10 YEARS WARRANTY** • **CYBERSECURITY READY**

- Military/Rugged 38999 connectivity
- 100% COTS solution
- Supported by over 90 standard DNR-series I/O boards
- 5g vibration, 100g shock, sealed to IP66
- Dual GigE ports (control and diagnostic)
- Designed for MIL-STD-461/810/1275 compliance
- TSN Deterministic Ethernet
- PowerDNA, UEIPAC, UEIMODBUS, UEISIM and UEIOPCUA configurations
- No rotary cooling devices
- Extensive software support including Windows, Linux, VxWorks, QNX, RTX and more
- Fully compatible with UEI's new Cyber Security products

The new DNR-MIL-4 provides 4 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, UEISIM, or UEIOPC .

General Description

The DNR-MIL-4 is the latest deployment of UEI's popular RACKtangle® architecture. Based on UEI's popular DNR-MIL, it offers slots for four I/O boards. Designed for use in the toughest environments, the DNR-MIL-4 is ideal for military ground vehicle and aerospace deployments, as well as a huge assortment of commercial applications. All connectivity is through ROHS compliant 38999 connectors.

The DNR-MIL-4 is available with UEI's three primary CPU options— the 8347 PowerPC, the Arm-based SoloX, and the quad-core Zynq UltraScale. For use in PowerDNA/slaved mode, the 8347 version is recommended. For embedded applications, the SoloX or Zynq may be preferred, depending on the specifics of the application. The SoloX and Zynq CPU series also support TSN Ethernet timing protocols. Please see the UEIPAC datasheet for specifics on the various CPUs.

Electronically, the DNR-MIL-4 is identical to the standard DNR Series RACKtangle, except for hold-up and protection circuitry on the power supply inputs to meet MIL-STD-1275/704. This means the DNR-MIL-4 uses standard DNR-series boards (e.g., DNR-AI-217 or DNR-1553-553). With over 90 unique I/O boards and 4 slots available, there's sure to be a configuration matching your application.

The new DNR-MIL-4 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 9.5" W x 7.1" D x 4.3" H chassis, weighing less than 10 pounds and typically consuming less than 30 W. Heat transfer from the internal electronics to the external chassis is designed such that no fans or rotary cooling is required. All internal printed circuit boards are conformal coated to ensure the highest reliability.

The DNR-MIL-4 is available in different deployment options, including: PowerDNA, UEIPAC, UEIMODBUS , UEISIM and UEIOPCUA.

PowerDNA: DNR-MIL-4

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: C, C++, Python and JAVA

- All popular application packages, including MATLAB, Simulink, LabVIEW, and more

UEIPAC 400R-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-4. In this mode, the DNR-MIL-4 can run fully standalone, or may be linked to a host via the Ethernet, 1553, serial, or any method you can program.

UEISIM 400R-MIL

Simulink users will appreciate the ability to build models in Simulink, compile them in Embedded Coder and then deploy them 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 400R-MIL

Users needing a compact, rugged Modbus TCP I/O slave will appreciate UEIMODBUS. The rugged, IP66/NEMA6 sealed DNR-MIL-4 allows you to deploy your I/O system in the field, without any additional enclosure and protection.

UEIOPCUA 400R-MIL

The rugged UEIOPC 400R-MIL acts as a standalone OPC-UA server (not dependent on Windows), supporting the OPC-UA Historian functionality. System configuration is made easy by an intuitive, easy-to-use web/HTML interface.

The DNR-MIL-4 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-4 is an ideal solution. We also have 6 and 12 slot variants.

Technical Specifications

DNR-MIL-4 (Power DNA mode)

Computer Interface	MIL Series Ruggedized Chassis
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. IEEE-1588/PTP 2. DNR-SYNC-1G series cables and boards provide both clock and trigger sync signals 3. 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 max, CAT5/6 cable
Ethernet data transfer rate	20 MB/s
Analog data transfer rate	>6 MS/s. Capable of sustained transfer in any RACKtangle configuration
DMAP/VMAP real-time I/O mode	Update >1,000 I/O channels at 4 kHz, guaranteed
Physical Dimensions / Weight	
4 I/O slots	9.5" W x 7.1" D x 4.3" H, 10 lbs. including I/O boards
Environmental	
Electrical Isolation	350 Vrms
Temperature (operating)	-40 °C to 70 °C
Temperature (storage)	-40 °C to 70 °C
Humidity	0 to 95%, non-condensing
Vibration *(IEC 60068-2-64)* *(IEC 60068-2-6)*	MIL-STD-810 G plus the IEC standards below 10–500 Hz, 5 g (rms), broadband random 10–500 Hz, 5 g, sinusoidal
Shock (IEC 60068-2-27)	MIL-STD-810G plus the IEC standards below 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.
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	100,000 hours

UEIPAC 400R-MIL

Computer Interface	MIL Series Ruggedized Chassis
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. IEEE-1588/PTP 2. DNR-SYNC-1G series cables 3. DNR-IRIG-650 board IRIG time sync
TSN support	
Zynq CPU series	Redundant (FRER)
ARM SoloX CPU series	Supported
8347 CPU series	Not supported
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	Linux RT or VxWorks 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, ARM based SoloX or Zynq UltraScale Quad Core
Memory	Options dependent on CPU selection
FLASH memory	Options dependent on CPU selection
Solid state hard drive	Options dependent on CPU selection
USB drive interface	Standard USB 2.0 port
Physical Dimensions / Weight	
4 I/O slots	9.5" W x 7.1" D x 4.3" H, 10 lbs. including I/O boards
Environmental	
Electrical isolation	350 Vrms
Temperature (operating/storage)	-40 °C to 70 °C
Humidity	0 to 95%, non-condensing
Vibration *(IEC 60068-2-64)* *(IEC 60068-2-6)*	MIL-STD-810G plus the IEC standards below 10–500 Hz, 5 g (rms), broadband random 10–500 Hz, 5 g, sinusoidal
Shock (IEC 60068-2-27)	MIL-STD-810G plus the IEC standards below 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.
Power Requirements	
Voltage	9–36 VDC (115/220 VAC adaptor available)
Power	12 Watts (not including I/O boards)
Power quality requirement	Designed to meet MIL-STD-704/1275
Reliability	
MTBF	100,000 hours

*The SSD devices used are not manufactured 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-4 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. For keying, order:

DNA-38999-KEY   Clocked/keyed I/O connectors (N, A keys)

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 top and third I/O slots map to pins 1-62 on the upper an lower 128 pin 38999 respectively. The second and fourth I/O slots map 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. Also, as some I/O slots may not be utilized in a given application, 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-12862-05:   5 ft male 128-pin 38999 to 2x DB-62M

DNA-CBL-12837-05:   5 ft male 128-pin 38999 to 2x DB-37F

DNA-CBL-6237M-05: 5 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
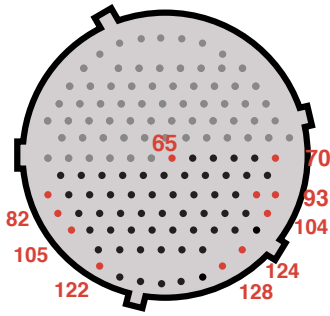
Pin #	I/O slot	Board Pin
1	1	1
2	1	2
3	1	3
4	1	4
5	1	5
6	1	6
7	1	7
8	1	8
9	1	9
10	1	10
11	1	11
12	1	12
13	1	13
14	1	14
15	1	15
16	1	16
17	1	17
18	1	18
19	1	19
20	1	20
21	1	21
22	1	22
23	1	23

Pin #	I/O slot	Board Pin
24	1	24
25	1	25
26	1	26
27	1	27
28	1	28
29	1	29
30	1	30
31	1	31
32	1	32
33	1	33
34	1	34
35	1	35
36	1	36
37	1	37
38*	1	38
39	1	39
40	1	40
41	1	41
42	1	42
43	1	43
44	1	44
45	1	45
46	1	46

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

Pin #	I/O slot	Board Pin
88	2	24
89	2	25
90	2	26
91	2	27
92	2	28
93	2	29
94	2	30
95	2	31
96	2	32
97	2	33
98	2	34
99	2	35
100	2	36
101	2	37
102	2	38
103	2	39
104	2	40
105	2	41
106	2	42
107	2	43
108	2	44
109	2	45
110	2	46
111	2	47
112	2	48
113	2	49
114	2	50
115	2	51
116	2	52
117	2	53
118	2	54
119	2	55
120	2	56
121	2	57
122	2	58
123	2	59
124	2	60
125	2	61
126	2	62
127	2	n/a
128	2	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
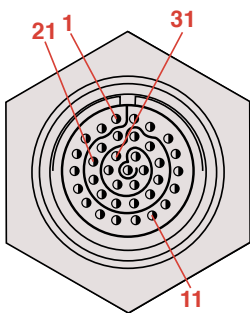
Pin number	Pin designation
1	LAN0 TX+ / DA+
2	LAN0 RX+ / DB+
3	LAN0 nc / DC-
4	LAN0 nc / DD+
5	Shield
6	Lan1 TX+ / DA+
7	LAN1 RX+ / DB+
8	LAN1 nc / DC-
9	LAN1 nc / DD+
10	Shield
11	Misc In
12	USB1 P+
13	USB1 D+

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
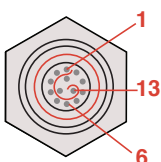
Pin #	Pin Designation
1	GND
2	GND
3	GND
4	Vcc (9-36 VDC)
5	Vcc (9-36 VDC)
6	Vcc (9-36 VDC)
7	Sync In2 / reset
8	Sync In0
9	Sync In1
10	Sync Gnd
11	Sync Out1
12	Sync +5V
13	Sync Out0