

## CM-ATR-3U/PENTAHEX-HP Series

Ultra High Power VPX Military Chassis



**FIVE HEAT EXCHANGERS**  
DIRECT & REVERSE AIRFLOW

**MULTI SLOT HEAT PIPES**  
INTEGRATED IN CARD-CAGE

**100G GEN 4 BACKPLANES**  
PCIe GEN 4 100GBASE-KR4 SPEED PERFORMANCE

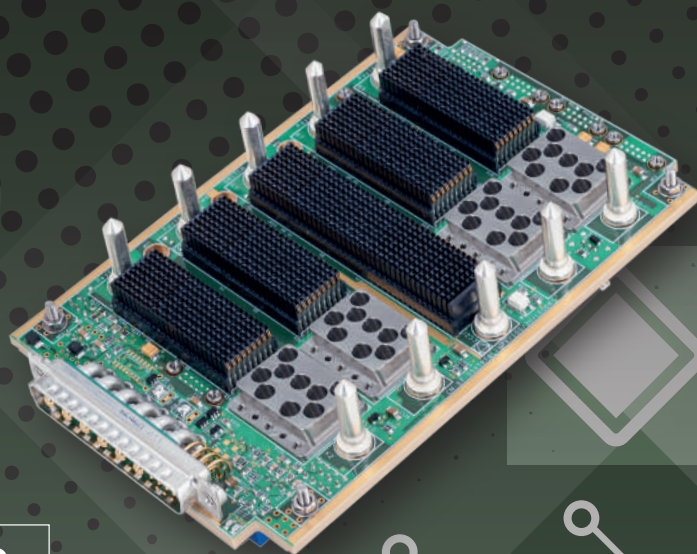
**INTERNAL AIR RECIRCULATION**  
OVERHEAD FORCED DRY-AIR



## SEALED FIVE HEAT EXCHANGER + MULTI SLOT HEAT PIPES 3U ENCLOSURE

- » Designed expressly for Gen-4 ultra high wattage military VPX systems
- » Progressive, 3, 5, 7 & 9 slot versions for 1" pitch conduction-cooled 3U modules
- » Dry air contaminant-free SWaP applications up to 750 watts payload dissipation
- » No risk, hermetically sealed externally integrated heat pipes (12, 16, 20 & 28)
- » Accepts latest generation FPGA, SBC, DSP, GPU payloads up to 150 watts per slot
- » Five forced-air heat exchangers in sidewalls, top cover, bottom cover & rear panel
- » 1075W PSU with MIL-STD-461G EMI/EMC Lab matched filter installed
- » High airflow dual redundant military PX3 rear fan pack (200-400 CFM)
- » Top and bottom internal forced-air recirculation for reduced payload hot spots
- » Optionally delivered fully wired with Backplane & I/O automatically tested

**SCALABLE TO SYSTEM REQUIREMENTS  
EXTREME PERFORMANCE APPLICATIONS  
SUITED FOR GEN 4/5 VPX PROGRAMS**



9

7

5

3



**PENTAHX-HP**

+ MULTI INTEGRATED SLOT HEAT PIPES



**↑ 750W**  
PAYLOAD POWER DISSIPATION



PENTAHEX-HP 3U CHASSIS

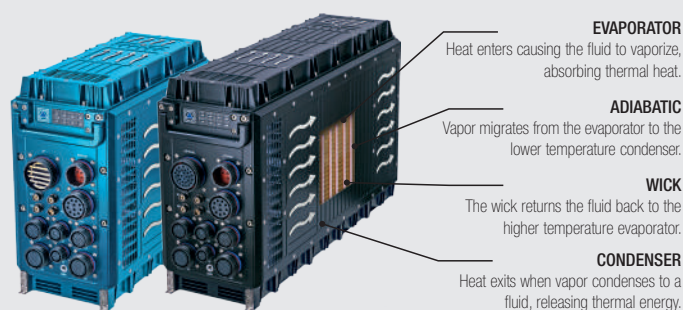
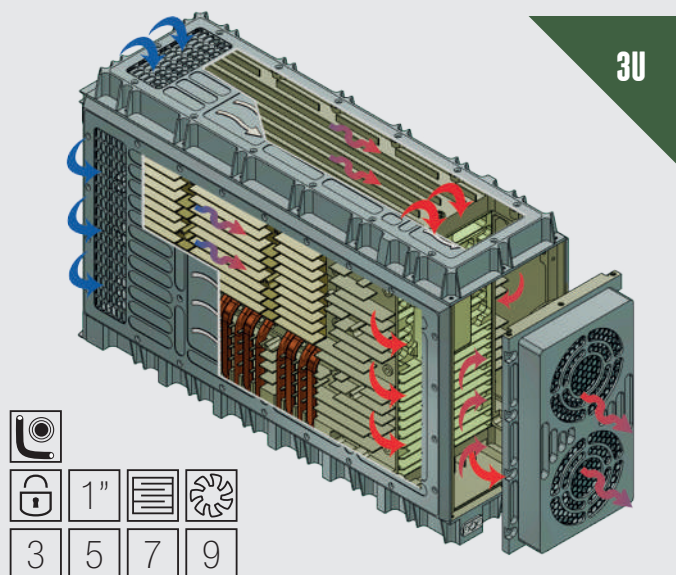
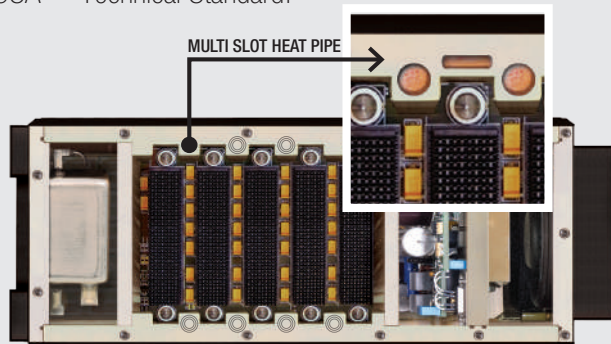


## Five Heat Exchangers + Multi Slot Heat Pipes - Contaminant-free suitable for extremely high wattage VPX applications with 1" pitch 3U eurocards

Our COTS PENTAHEX *Five Heat Exchangers + Multi Slot Heat Pipes* chassis series have been designed for latest generation SWaP military systems that require extreme power dissipation. Extensive implementation of phase transition heat pipes greatly extend payload MTBF. These chassis are ideal for operation in hostile or harmful air environments.

### AVAILABILITY

CM 3U PENTAHEX-HP enclosures are available in 3, 5, 7 & 9 slot versions, supporting Gen-3/4 military VPX backplanes fitted with VITA 46.30 MULTIGIG-RT3 connectors and high power military Power Supply Unit developed in alignment with the SOSA™ Technical Standard.



### LAYOUT & DESIGN

Internal layout is divided into 4 independent metallic partitions: I/O section at the front, card-cage, PSU section, and 2 exhaust PX3 fans at the rear. This isolates card-cage, improves EMI/EMC and reduces PSU heat and electrical noise on system electronics.

### DISSIPATION & COOLING

Payload heat is conducted to multi-integrated slot heat pipes fitted in heat exchanger sidewalls. Top, bottom and rear panel heat exchangers are also incorporated. Internal cross-flow fans in card-cage top and bottom areas recirculate dry air across cards, minimizing hot-spots and dissipating heat homogeneously.

### RECOMMENDED PAYLOAD POWER RATINGS

(SELF DISSIPATING @ 55°C AMBIENT: NO EXTERNAL AIRFLOW OR COLD PLATE PROVIDED)

CM-ATR-3U/PENTAHEX9-HP (9 SLOT) ≤ 750 watts

CM-ATR-3U/PENTAHEX7-HP (7 SLOT) ≤ 650 watts

CM-ATR-3U/PENTAHEX5-HP (5 SLOT) ≤ 550 watts

CM-ATR-3U/PENTAHEX3-HP (3 SLOT) ≤ 420 watts



# EXTENDED AIR INTAKES



PENTAHEX-HP - FRONT TO BACK LOADED 3U CHASSIS



## Enclosure Specifications

	CM-ATR-3U/ PENTAHEX3-HP	CM-ATR-3U/ PENTAHEX5-HP	CM-ATR-3U/ PENTAHEX7-HP	CM-ATR-3U/ PENTAHEX9-HP
<b>SLOTS   HEAT PIPES</b>	3   12-HP	5   16-HP	7   20-HP	9   28-HP
<b>WIDTH</b>	155 mm	155 mm	155 mm	155 mm
<b>HEIGHT</b>	280 mm	280 mm	280 mm	280 mm
<b>DEPTH</b>	310 mm	361 mm	412 mm	463 mm
<b>WEIGHT</b>	6.2 Kg	7.4 Kg	8.2 Kg	9.0 Kg
<b>CGTR THERMAL RES.</b>	$\Delta T/W = 0.071^{\circ}\text{C}$	$\Delta T/W = 0.054^{\circ}\text{C}$	$\Delta T/W = 0.046^{\circ}\text{C}$	$\Delta T/W = 0.04^{\circ}\text{C}$
<b>PSU INPUT (<math>\pm 30\%</math>)</b>	28 VDC, 48 VDC, 72 VDC, 270 VDC - MIL-STD-704F & MIL-STD-1275E			
<b>PSU OUTPUT (SOSA™)</b>	S-575W : +12 VDC @ 42A, +3.3 VDC @ 23A   S-1075W : +12 VDC @ 84A, +3.3 VDC @ 23A			
<b>EMI/EMC FILTER</b>	Dual-stage MIL-STD-461G Lab Certified DC in-line input filter (fitted as standard)			
<b>VPX BACKPLANE</b>	3U 1" pitch (3, 5, 7 & 9 slot) - MULTIGIG RT 3 - PCIe 16 Gbaud & 100 GBASE-KR4 (25.78125 Gbaud)			
<b>INTERNAL FAN</b>	40.5 CFM	54 CFM	67.5 CFM	81 CFM
<b>REAR FAN</b>	200 CFM (2 x 100 CFM) Rotron PX3 Standard   400 CFM (2 x 200 CFM) Rotron PX3 Optional			
<b>MIL-STD-461G/810H</b>	CE101, CE102, RE101, RE102, CS101, CS114, CS116, RS101, RS103 / 501.4, 502.4, 507.4, 508.5, 509.4, 515.5, 516.5			
<b>I/O SUPPORTED</b>	VITA 46   65   66   67   68 - check with factory for high speed I/O customized solutions HDMI/DVI/DP   USB 2.0 & 3.0   SATA 600   1-100GbE   Optical   RF   Serial/Discrete   GPIO   SAS   PCIe   1553   etc			
<b>TEMPERATURE/CSS</b>	-40 °C to +85 °C Operating, -55 °C to 100 °C Storage   Chassis Supervisory System fitted as standard			
<b>MTBF</b>	25° GB 86,000 Hours, 65° AIC 28,000 Hours			
<b>MOUNTING TRAY</b>	CM-TR-3U/PENTAHEX3-HP	CM-TR-3U/PENTAHEX5-HP	CM-TR-3U/PENTAHEX7-HP	CM-TR-3U/PENTAHEX9-HP

### PENTAHEX-HP MILITARY PSU

High performance military PSU designed for CM 3U VPX chassis applications. 3-slot and 5-slot chassis versions install the S-575W PSU model. 7 and 9 slot chassis versions fit the larger PSU S-1075W delivering double output power in +12VDC.

	Vin Options		DC Options		Chassis Model PENTAHEX -HP
	28VDC	OTHER	+3.3VDC	+12VDC	
S-575W	•	•	23A	42A	3-SLOT   5-SLOT
S-1075W	•	•	23A	84A	7-SLOT   9-SLOT

### PART NUMBER EXAMPLE:

**CM-ATR-3U/PENTAHEX9-HP/VPX-G4/28VDC/S-1075W/UDP/HETC/HEBC/F115-400/BLU**

- 9 slot, 3U Avionics Enclosure, Gen-4 VPX Backplane 1" pitch.
- Sealed Five Heat Exchanger Enclosure + 28 Heat Pipes.
- 28VDC Power Supply Unit with 1075W (+12VDC @ 84A, +3.3VDC @ 23A).
- Integrated Chassis Supervisory System (standard).
- Custom - User Defined Front Panel.
- Heat Exchanger Top Cover (standard).
- Heat Exchanger Bottom Cover (standard + 50mm wiring clearance).
- 2x Rotron PX3 military AC fans (200 CFM) + EMI shielded finger-guard (Standard).
- Enclosure color: Dark Blue.



# MIL PSUs

## 84A<sup>+12VDC</sup>

## Military Chassis Features

*providing quality power and control to your valuable payload*



PENTAHEX-HP 3<sup>GEN</sup> military PSUs provide very high power to +12VDC backplane main rail and moderate power to auxiliary +3.3VDC. The PSU series has been developed in alignment with the SOSA™ Technical Standard, incorporating a 30 Amp in-rush current limiter, extended hold-up capacitor bank, input protection against permanent over voltage, transient protection against spike voltages up to 400V @ 0.5ms, DC power fail monitor, 30 Amp on-board in-line EMI/EMC filter, reverse polarity input protection, private PSU for Chassis Supervisory System, rear fans fuse and EMI filter, backplane DC remote voltage sensing and output voltage trim-up, galvanically isolated DC/DC converters with time delay fuses, DC/DC converter over voltage, over current and thermal protection, full military parts and power connectors, etc.

### PSU MILITARY COMPLIANCE

PENTAHEX-HP high performance PSUs comply with MIL-STD-704F and MIL-STD-1275E operational steady state input voltage range, ripple, surges, spikes and transients, etc. All military DC input voltages are supported.

### PSU DC OUTPUTS

The CM SOSA™ PSUs are oversized, delivering up to 84 Amps in the +12VDC main rail and 23 Amps the +3.3VDC auxiliary rail. Power outputs comply with VITA 65 specifications.

### PSU INPUT PROTECTION

The S-575W and S-1075W DC PSU versions fit a front end device to withstand sustained input voltage up to 150VDC without damage. A CM dual stage in-line MIL-STD-461G filter is fitted on chassis front panel to increase system protection and overall EMI/EMC performance.

### CARD-CAGE RECIRCULATION FANS

This series installs two packs of internal air recirculation fans. One pack is fitted within the chassis top cover. A second pack is located beneath the backplane and provides reverse airflow against the bottom cover heat exchanger. All fans are wired in redundant configuration to ensure minimum airflow in the event of failure.

### CHASSIS SUPERVISORY SYSTEM

A Chassis Supervisory System (CSS) is fitted as standard in PENTAHEX-HP backplanes. This unit provides indispensable services to protect enclosed card-cage electronics. The CSS fits two independent Temperature Supervisory Units, two voltage-in-range monitoring devices, a fan and heater manager, a remote chassis controller, etc.

### PSU HOLD UP CAPACITORS

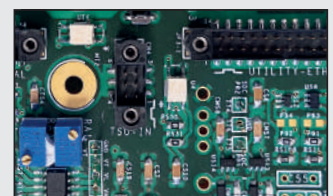
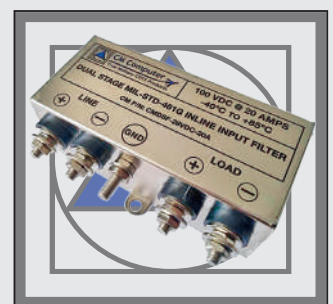
PENTAHEX-HP PSU modules incorporate a large capacitor bank of 88,000µF to comply with MIL-STD-704F hold-up requirements. This ensures uninterrupted operation during short power input failures. A reverse current blocking device avoids discharging the PSU capacitors across the platform DC power rail.

### USER FREE I/O WIRING SPACE

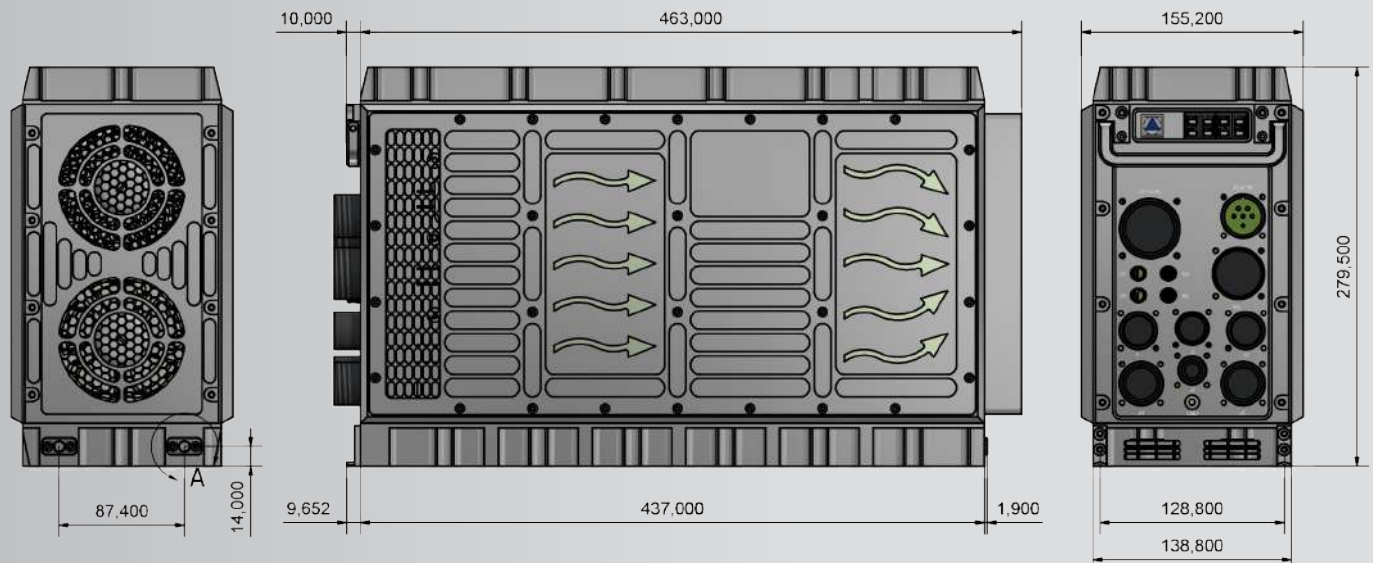
PENTAHEX-HP chassis have a bottom cover user free cavity of 50mm dedicated to user I/O wiring. A space of 48mm behind the front panel houses chassis connectors and I/O cables.

### REAR FAN DC/AC CONVERTER UNIT

Chassis AC PX3 fans are powered by a military DC/AC inverter box installed on the PSU heat sink. The inverter supplies 115VAC @ 400Hz to the dual rear fan pack.



# Enclosure Dimensions



## 9 SLOT CM-ATR-3U/PENTAHEX9-HP

Contact CM for drawing information concerning 3-5-7 slot models of this chassis series.

All chassis sizes share the same width and height dimensions. Chassis depth changes according to number of slots.

PENTAHEX-HP chassis front panel user free area is 107mm x 150mm.

\*Specifications given in this product datasheet concern to 28VDC chassis versions.

# Ordering Information

## CHASSIS GENERIC PART NUMBER:

CM-ATR-3U /CT /B /I /W /FP /F /G /C

### /CT Enclosure Cooling Technique

PENTAHEX(3-5-7-9)-HP: Sealed five Heat Exchangers + Heat Pipes 3U Enclosure

### /B Backplane Type

VPX-G3: VITA 65 Gen3 Military VPX Backplane (3-5-6-7-9 Slot 1" Pitch) with RT2  
VPX-G4: VITA 65 Gen4 Military VPX Backplane (3-5-6-7-9 Slot 1" Pitch) with RT3

### /I PSU Input Power Voltage

28VDC: 28 VDC Input  
48VDC: 48 VDC Input  
72VDC: 72 VDC Input  
270VDC: 270 VDC Input

### /W Power Supply Unit Watts

S-575W: 28 VDC (+3.3VDC @ 23A, +12 VDC @ 42A)\*  
S-1075W: 28 VDC (+3.3VDC @ 23A, +12 VDC @ 84A)\*

All PSUs = All PSUs except 28 VDC input | 28 VDC = 28 VDC input only  
\* Power supply has been developed in alignment with the SOSA™ Technical Standard

### /FP Front Panel Layout

CMP: Standard CM front panel fitted with MIL-DTL-38999 connectors  
UDP: User-defined front panel layout (requires customer drawing)

### /F Rear-Mounted Fan Assembly

F115-400: 2x100 CFM PX3 Military fans (standard for PENTAHEX).

F200-400: 2x200 CFM 200 VAC 3PH @ 400Hz PX3 Military (optional for PENTAHEX).  
- Full military Rotron PX3 AC fans. Operating range: -54°C to +125°C

### /G Fan Finger Guards

EMIG: Optional EMI shielding finger guards with honeycomb filter  
ANF: Optional finger guards with acoustic noise filter

### /C Chassis Color

B: Black, G: Navy Grey, E: Army Dark Earth, W: White, R: Red, PT: Platinum,  
YW: Yellow, GN: Green, BLU: Dark Blue, CR: Chromate MIL-C-5541 or O: Other

## PART NUMBER EXAMPLE:

CM-ATR-3U/PENTAHEX5-HP/VPX-3/28VDC/S-575W/UDP/F115-400/B

- 5 slot, 3U Avionics Enclosure, Gen-3 VPX Backplane 1" pitch.
- Sealed Five Heat Exchanger Enclosure + 16 Heat Pipes.
- 28VDC Power Supply Unit with 575W (+12VDC @ 42A, +3.3VDC @ 23A).
- Integrated Chassis Supervisory System (standard).
- Custom - User Defined Front Panel.
- Heat Exchanger Top Cover (standard).
- Heat Exchanger Bottom Cover (standard + 50mm wiring clearance).
- 2x Rotron PX3 military AC fans (200 CFM)
- EMI shielded finger-guard (Standard).
- Enclosure color: Black.

## MOUNTING TRAY GENERIC PART NUMBER:

CM-TR-3U /PENTAHEX(3-5-7-9)-HP

The Mounting Tray for the CM-ATR-3U/HES-FBL3-HP enclosure incorporates two hold-down devices & four mounting platforms for installing shock absorbers and a set of chassis stainless steel hook plates.

LEARN MORE: [WWW.CMCOMPUTER.COM](http://WWW.CMCOMPUTER.COM)

OR CALL : +34 954 253 116 | +34 954 253 119

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2  
3  
4



5-SLOT ↑100W  
7-SLOT ↑130W  
12-SLOT ↑180W  
PAYLOAD POWER DISSIPATION

1



5-SLOT ↑80W  
PAYLOAD POWER DISSIPATION

5  
6  
7



5-SLOT ↑120W  
7-SLOT ↑160W  
12-SLOT ↑180W  
PAYLOAD POWER DISSIPATION

5-SLOT ↑200W  
7-SLOT ↑300W  
12-SLOT ↑400W  
PAYLOAD POWER DISSIPATION

13  
14  
15



12

**S** SEALED

**6U**  
0.8" PITCH

**3U**  
1" PITCH

NATURAL AIR CONVECTION, LOW COST & WEIGHT, SILENT NO EXTERNAL FANS, INTERNAL FORCED-AIR

CONTAMINANT FREE, NATURAL AIR CONVECTION, LOW COST & WEIGHT, SILENT NO EXTERNAL FANS, INTERNAL FORCED-AIR, SUPPORTS CONDUCTION & AIR-COOLED MODULES

SEF

**6U**  
0.8" PITCH

INCREASED NATURAL FREE-AIR CONVECTION, LOW COST & WEIGHT, DRY AIR CONTAMINANT FREE APPLICATIONS, SILENT NO EXTERNAL FANS, INTERNAL FORCED-AIR RECIRCULATION, SUPPORTS CONDUCTION & AIR-COOLED MODULES

**SEF** SEALED WITH EXTENDED FINS

**6U**  
0.8" PITCH

HES

INCREASED NATURAL FREE-AIR CONVECTION + 18/20 HEAT PIPES, ALL BOARD FORMATS, SILENT NO EXTERNAL FANS, INTERNAL FORCED-AIR RECIRCULATION, CONTAMINANT FREE

INCREASED AIR CONVECTION + 18 HEAT PIPES, SILENT NO EXTERNAL FANS, INTERNAL FORCED-AIR

0.8" PITCH  
**6U**

SEF-18HP

1" PITCH  
**3U**

**SEF-HP**

SEALED WITH EXTENDED FINS + 18 HEAT PIPES

VPX CONDUCTION-COOLED APPLICATIONS, FOUR FORCED-AIR HEAT EXCHANGERS, LOW AIRFLOW RESISTANCE, DRY-AIR CONTAMINANT FREE, HIGH AIRFLOW REAR EXHAUST FANS, IMPROVED INTERNAL FORCED-AIR RECIRCULATION

1" PITCH  
**6U**

HES

**HES**

SEALED WITH FOUR HEAT EXCHANGERS

**HES-FBL-HP**

H  
W  
P

**SIXHEX**

VPX CONDUCTION-COOLED APPLICATIONS, SIX FORCED-AIR HEAT EXCHANGERS, LOW AIRFLOW RESISTANCE, DRY-AIR CONTAMINANT FREE, HIGH AIRFLOW REAR EXHAUST FANS, EXTREME INTERNAL FORCED-AIR RECIRCULATION

1" PITCH  
**6U**

SIXHEX

29  
30



5-SLOT ↑500W  
7-SLOT ↑600W  
PAYLOAD POWER DISSIPATION

SIXHEX-20HP

34  
35



5-SLOT ↑600W  
7-SLOT ↑700W  
PAYLOAD POWER DISSIPATION

**COTS**  
VME, CPCI & VPX READY



**CM Computer**  
True Military COTS Products

**46** MODELS

**CM CHASSIS PRODUCT LINE**



# MILITARY AIR CHASSIS

5-SLOT ↑250W  
PAYLOAD POWER DISSIPATION

3-SLOT ↑200W  
5-SLOT ↑250W  
7-SLOT ↑270W  
9-SLOT ↑300W  
PAYLOAD POWER DISSIPATION  
**HES-FBL**

18  
19  
20  
21

3-SLOT ↑320W  
5-SLOT ↑400W  
7-SLOT ↑450W  
9-SLOT ↑500W  
PAYLOAD POWER DISSIPATION  
**HES-FBL-HP**

22  
23  
24  
25

5-SLOT ↑450W  
7-SLOT ↑500W  
12-SLOT ↑600W  
PAYLOAD POWER DISSIPATION

26  
27  
28



3U  
1" PITCH

WIDE RANGE OF APPLICATIONS  
HEAT EXCHANGERS

LES, FOUR FORCED-AIR HEAT  
E, MEDIUM SIZE AND WEIGHT,  
RANGE OF APPLICATIONS

NGERS

ES + WITH OR  
WITHOUT HEAT  
PIPES

SEALED WITH SIX HEAT  
EXCHANGERS

ICATIONS, SIX  
+ 20 HEAT  
RESISTANCE,  
L FORCED-AIR  
MINANT FREE

1" PITCH  
6U

## SIXHEX-HP

SEALED WITH SIX  
HEAT EXCHANGERS  
+ 16 OR 20 HEAT PIPES

## SEVENHEX-CHP

SEALED WITH SEVEN HEAT  
EXCHANGERS + 32, 36 OR  
46 CROSS HEAT PIPES

VPX CONDUCTION-COOLED APPLICATIONS, FIVE  
FORCED-AIR HEAT EXCHANGERS + HEAT PIPES,  
VERY HIGH DISSIPATION CAPACITY, MILITARY  
REAR FANS & INTERNAL FORCED-AIR  
RECIRCULATION, DRY-AIR CONTAMINANT FREE

1" PITCH  
3U

PENTAHEX-HP

## PENTAHEX-HP

SEALED FIVE HEAT  
EXCHANGERS + HEAT PIPES

## FAC

OPEN FLOWTHROUGH  
AIR COOLED

OPEN, NON-SEALED APPLICATIONS, HIGH COOLING EFFICIENCY, SUPPORTS  
CONDUCTION & AIR-COOLED MODULES, LOW COST & WEIGHT, LOW AIRFLOW  
RESISTANCE

0.8" PITCH  
6U

FAC

1" PITCH  
3U

OPEN, NON-SEALED, SUPPORTS CONDUCTION &  
AIR-COOLED MODULES, LOW COST & WEIGHT

46

5-SLOT ↑400W  
7-SLOT ↑450W  
12-SLOT ↑700W  
PAYLOAD POWER DISSIPATION

43  
44  
45

5-SLOT ↑300W  
PAYLOAD POWER DISSIPATION



36  
37  
38  
39