



CM Computer
True Military COTS Products



CM-ATR-6U/SEVENHEX-CHP Series

Ultra High Power VPX Military Chassis



SEVEN HEAT EXCHANGERS
DIRECT & REVERSE AIRFLOW

CROSS FLOW HEAT PIPES
INTEGRATED IN CARD-CAGE

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

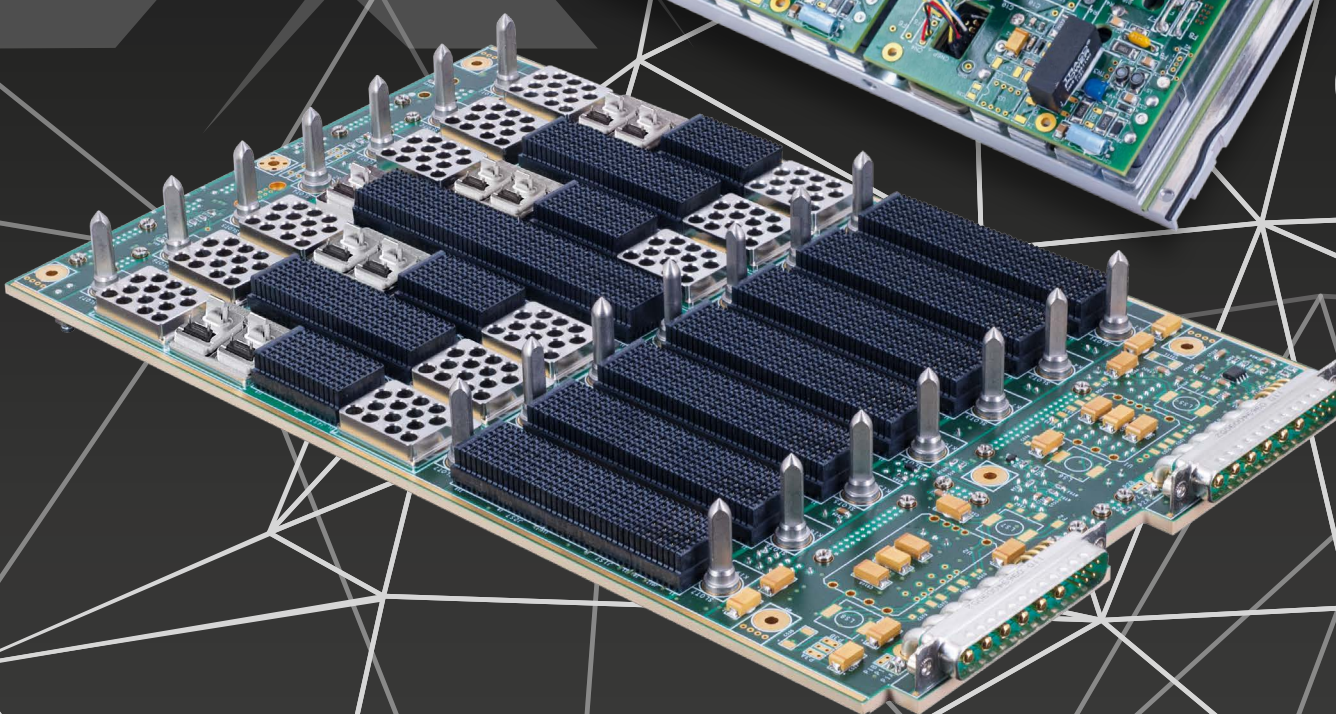
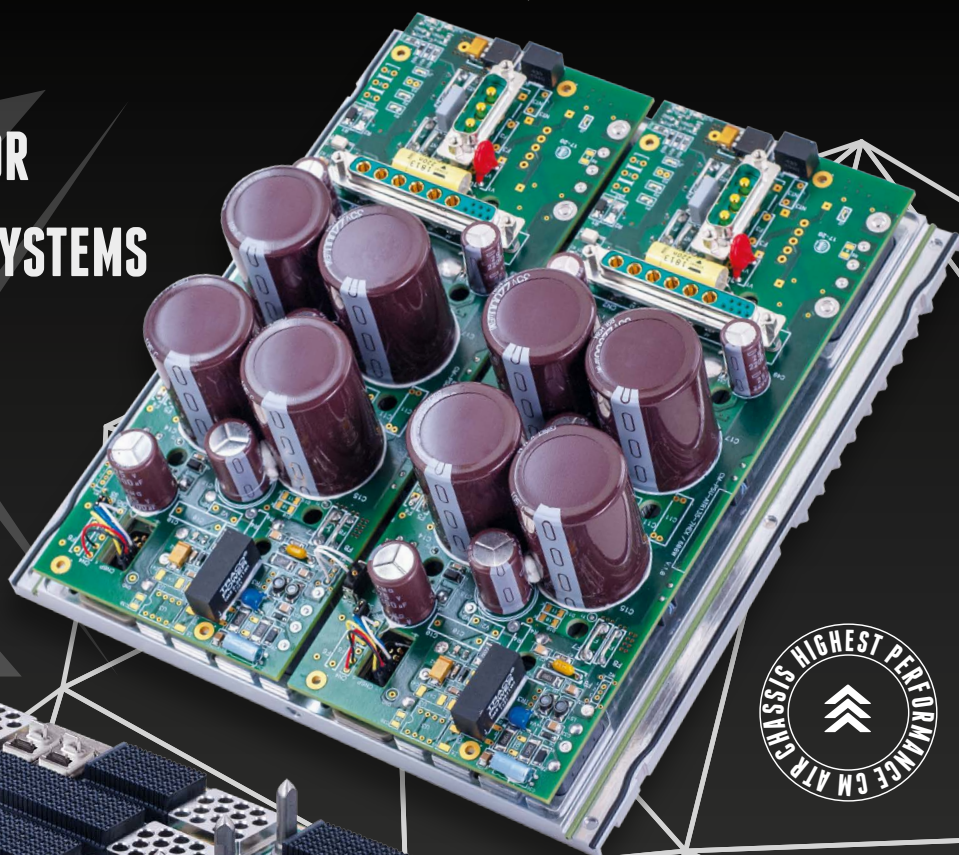
INTERNAL AIR RECIRCULATION
OVERHEAD FORCED DRY-AIR

SOSA
System-on-a-chip Architecture

SEALED 7 HEAT EXCHANGERS + 32/36/46 CROSS HEAT PIPES ENCLOSURE

- » Designed expressly for Gen-4 ultra high wattage conduction cooled military VPX
- » Dry air contaminant-free applications up to 1200 watts payload dissipation
- » Progressive 5, 7 & 12 slot versions for 1" pitch VPX 6U modules
- » Cross-flow heat pipes integrated in card-cage for lower card-rail Delta-T
- » Five forced-air heat exchanger in sidewalls, top cover, bottom cover & rear panel
- » Two internal sidewall heat exchangers with reverse airflow
- » Extensive dry-air internal recirculation for reduced payload hot spots
- » No risk, hermetically sealed externally integrated heat pipes (32, 36, 46 - Ø8mm)
- » Accepts latest generation FPGA, SBC, DSP, GPU, etc payloads up to 200 watts per slot
- » High airflow dual redundant military PX3 rear fan pack (200-560CFM)

XTREME PERFORMANCE FOR CUTTING EDGE MILITARY SYSTEMS



SEVENHEX-CHP

SEVENHEX + 32/36/46 HEAT PIPES

↑ 1200W

PAYLOAD POWER DISSIPATION



SEVENHEX-CHP 6U CHASSIS



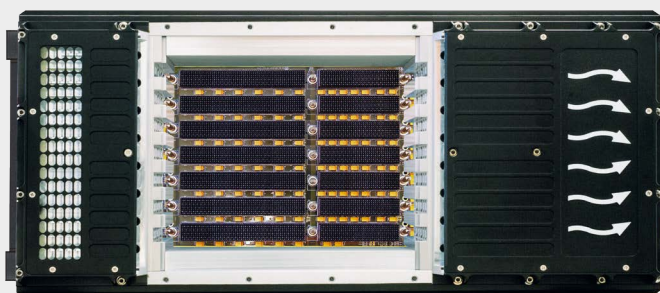
Seven Heat Exchangers + Cross Heat Pipes Chassis

suitable for ultra high wattage 6U VPX applications that demand extreme cooling capability

CM's SevenHex + 32/36/46 Heat Pipes chassis series is a cross-flow hybrid thermal performance solution for the most demanding military embedded systems. Integrates seven oversized compact heat exchangers. Extensive implementation of phase transition heat pipes greatly extend payload MTBF. These chassis are ideal for hostile or harmful air environments.

AVAILABILITY

The 6U CM SevenHex Cross Heat Pipe series is available in 5, 7 & 12 slot versions, supporting our latest 1" pitch Gen-4 military VPX Backplanes fitted with VITA 46.30 MULTIGIG-RT3 connectors and high power military Power Supply Units.



EVAPORATOR

Heat enters causing the fluid to vaporize, absorbing thermal heat.

ADIABATIC

Vapor migrates from the evaporator to the lower temperature condenser.

WICK

The wick returns the fluid back to the higher temperature evaporator.

CONDENSER

Heat exits when vapor condenses to a fluid, releasing thermal energy.

LAYOUT & DESIGN

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

DISSIPATION & COOLING

Heat within the enclosure is conducted to hollow sidewalls, top cover, bottom cover and rear panel forced-air heat exchangers. All enclosure versions incorporate 20 horizontal heat pipes on sidewalls and two sets of vertical heat pipes fitted on top cover. Heat pipes are in direct contact with card-cage slots providing express thermal paths to the exterior. Two internal heat exchangers and recirculation fans ensure dry air is forced across payload modules, minimizing hot-spots & dissipating heat homogeneously.

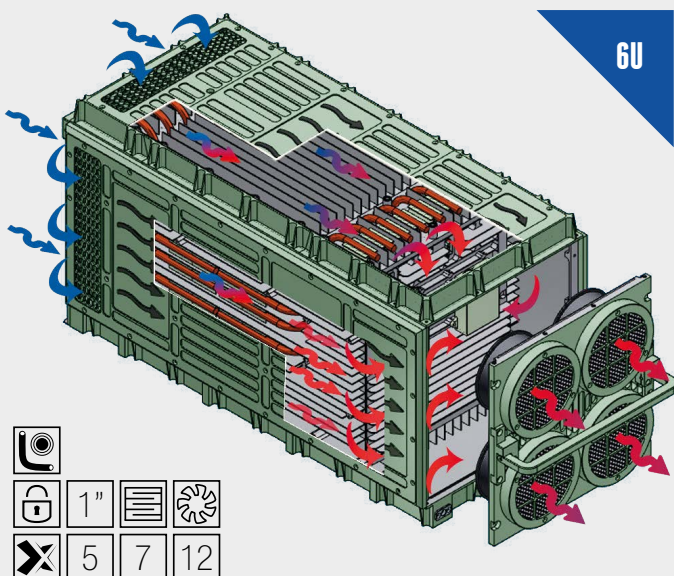
RECOMMENDED PAYLOAD POWER RATINGS

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

CM-ATR-145/SEVENHEX-46HP (12 SLOT) ≤ 1200 watts

CM-ATR-135/SEVENHEX-36HP (7 SLOT) ≤ 1000 watts

CM-ATR-125/SEVENHEX-32HP (5 SLOT) ≤ 750 watts



EXTENDED AIR INTAKES



Enclosure Specifications

	CM-ATR-125/ SEVENHEX-32CHP	CM-ATR-135/ SEVENHEX-36CHP	CM-ATR-145/ SEVENHEX-46CHP
SLOTS	5	7	12
WIDTH	214.2 mm	265 mm	392 mm
HEIGHT	303 mm	303 mm	303 mm
DEPTH	578 mm	578 mm	578 mm
WEIGHT	21 Kg	25 Kg	32 Kg
HEAT PIPES $\varnothing 8\text{mm}$	20 horizontal + 12 vertical	20 horizontal + 16 vertical	20 horizontal + 26 vertical
CGTR THERMAL RES.	$\Delta T/W = 0.040^{\circ}\text{C}$ (CIA = 200 CFM)	$\Delta T/W = 0.030^{\circ}\text{C}$ (CIA = 400 CFM)	$\Delta T/W = 0.025^{\circ}\text{C}$ (CIA = 400 CFM)
MAX. PSU POWER	600W (+12 @ 42A, +3.3 @ 23A)	1200W (+12 @ 84A, +3.3 @ 46A)	1200W (+12 @ 84A, +3.3 @ 46A)
V-INPUT ($\pm 30\%$)	28 VDC, 48 VDC, 270 VDC, 90-132 VAC RMS & 180-264 VAC RMS @ 47-880 Hz, 3-Phase 200 VAC @ 47-880 Hz		
VPX BACKPLANE	6U 1" pitch (5, 7 & 12 slot) - MULTIGIG RT 3 - PCIe 16 Gbaud & 100 GBASE-KR4 (25.78125 Gbaud)		
BACKPLANE EXTRAS	DC rail voltage-in-range supervisor, 16 panel LEDs, dual TSU, +5VDC/-12VDC power converter sockets, cold-start heaters		
INTERNAL FAN	4 x 27.5 (110 CFM)	6 x 27.5 (165 CFM)	10 x 27.5 (275 CFM)
REAR FAN	200/280 CFM (2 x PX3)	400/560 CFM (4 x PX3)	400/560 CFM (4 x PX3)
PANEL USER AREA	157 mm x 164 mm	157 mm x 215 mm	157 mm x 342 mm
I/O SUPPORTED	VITA 46 65 66 67 - check with factory for high speed I/O readily available solutions HDMI/DVI/DP USB 2.0 & 3.0 SATA up to 100GbE up to 100G Optical RF Serial GPIO SAS PCIe 1553 etc		
TEMPERATURE SPECS	-40°C to +85°C Operating, -55°C to 100°C Storage		
MTBF (Hours)	25° GB 82,000 65° AIC 27,000	25° GB 80,000 65° AIC 26,000	25° GB 63,000 65° AIC 20,000
MOUNTING TRAY	CM-TR-125/SEVENHEX-CHP	CM-TR-135/SEVENHEX-CHP	CM-TR-145/SEVENHEX-CHP
MIL-STD-461G/810G	CE101, CE102, RE101, RE102, CS101, CS114, CS116, RS101, RS103 / 501.4, 502.4, 507.4, 508.5, 509.4, 515.5, 516.5		

ORDERING INFORMATION

CM-ATR-S5 /SEVENHEX-CHP /VPX /I /C

/S5 COTS Enclosure Size/Model

CM-ATR-125: 5 Slot 6U Enclosure (1" pitch - 1 x 600W)

CM-ATR-135: 7 Slot 6U Enclosure (1" pitch - 2 x 600W)

CM-ATR-145: 12 Slot 6U Enclosure (1" pitch - 2 x 600W)

/I PSU Input Power Voltage

28VDC: 28VDC | 48VDC: 48VDC | 270VDC: 270VDC | 90-264VAC: Autorange 90-264VAC @ 47-880Hz | 200VAC-3Ph: 200VAC 3 Phase @ 47-880Hz

/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, O: Other (user-defined)

PART NUMBER EXAMPLE:

CM-ATR-135/SEVENHEX-36CHP/VPX-G4/28VDC/1200W/DTSU/UDP/HETC/HEBC/CCS/F28/EMIG/B

- 7 slot, 6U Military Enclosure, Seven Heat Exchangers + 36 Heat Pipes.
- Gen 4 VPX Backplane for 6U 1" boards.
- 28VDC Power Supply Unit 1200W (+12VDC @ 84A, +3.3VDC @ 46A).
- Dual Temperature Supervisory Unit (chassis temperature and fan speed control).
- User defined front panel with 63mm I/O wiring clearance.
- Heat Exchanger Top Cover. Heat Exchanger Bottom Cover with clearance 60mm.
- Conduction-cooled card-cage slots.
- 4 Rotron AC PX3 military fans with 2 electronics DC/AC converter box (400 CFM).
- EMI shielded finger guards & Enclosure color: Black.

DUAL PSUs

84A^{+12VDC}



Military Chassis Features

providing high speed and quality power to your valuable payload



The SevenHex series install one or two 600W military Power Supply modules (according to chassis size) that operate on a load sharing basis. This is intended to satisfy the full range of military applications regardless of card-cage power needs. Over-sized power capacity increases PSU MTBF while allowing ample reserve for system upgrades.

PSU INPUT VOLTAGE

Chassis PSU comply with MIL-STD-704F and MIL-STD-1275E. It accepts all American and European military-standard AC or DC input voltages for worldwide operation.

PSU DC OUTPUTS

PSU supplies the +12VDC main rail and the +3.3VDC auxiliary rail per VITA 65 specifications. Backplane DC remote voltage sensing and output voltage trim-up is implemented as standard.

PSU PROTECTION

The 600W DC PSU fits a Power Fail Monitor, MIL-STD-461G dual stage in-line filter (20A matched), VICOR Filter Input Attenuator Module (FIAM), inrush current limiting to 30A, transient protection, galvanic isolated DC/DC converters, time-delay fuses and DC/DC converters remote shutdown. The FIAM front end modules protect DC/DC converters against reverse polarity.

Single-phase AC PSU modules are individually fitted with a MIL-STD-461G 6A in-line dual stage filter and VICOR military Filter Autoranging Rectifier Module (FARM).

200VAC 3-Phase PSU models incorporate a 3-Phase 3 amp in-line filter and rectifier stage prior to DC/DC converters.

All PSU DC outputs are protected against over voltage, short-circuits and thermal shutdown.

PSU HOLD UP CAPACITORS

Each PSU module incorporates a capacitor bank of 87,500µF (176,000µF in dual PSU chassis). This oversized hold-up capacity provides safe payload operation during short power failures.

DUAL TEMPERATURE SUPERVISORY UNIT

The main Temperature Supervisory Unit (TSU) protects payload electronics against extreme climatic conditions, switching power supplies OFF (Standby) when the internal temperature is under or over the user defined limits. A secondary TSU is dedicated to regulate the rotation speed of the chassis rear cooling fans.

CHASSIS REMOTE PSU CONTROL

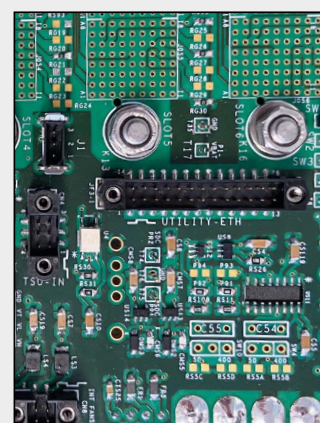
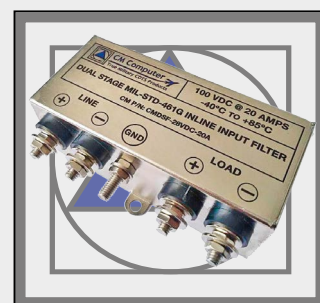
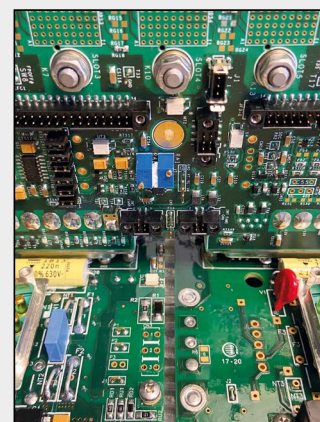
PSU converters may be set to 'standby' (no DC outputs) via an external remote control signal. Other features include delayed system shutdown, TSU override via operator 'battle short' switch, etc.

USER FREE I/O WIRING SPACE

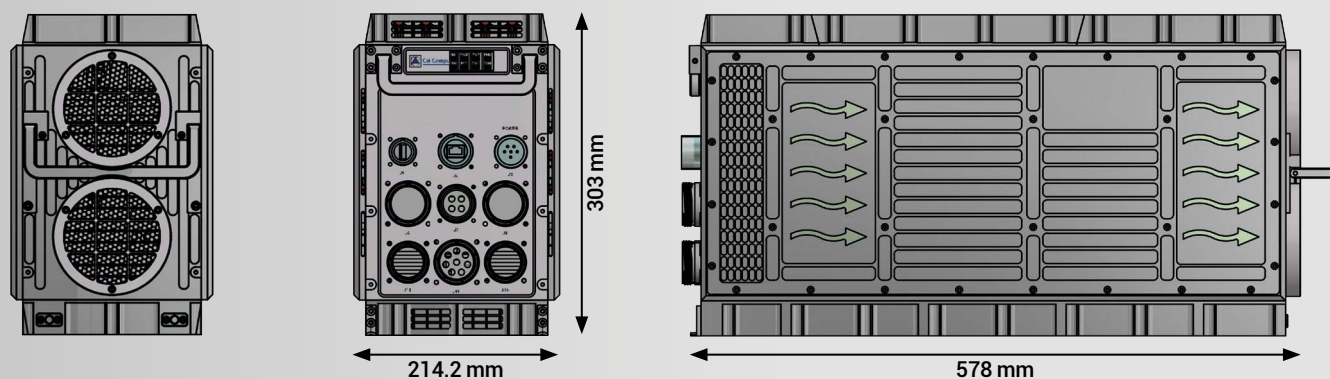
SevenHex chassis have a bottom cover user free cavity of 60 mm dedicated for I/O wiring. A free cavity of 63 mm behind the front panel is reserved for panel connectors and user I/O wiring.

REAR FAN DC/AC MODULES

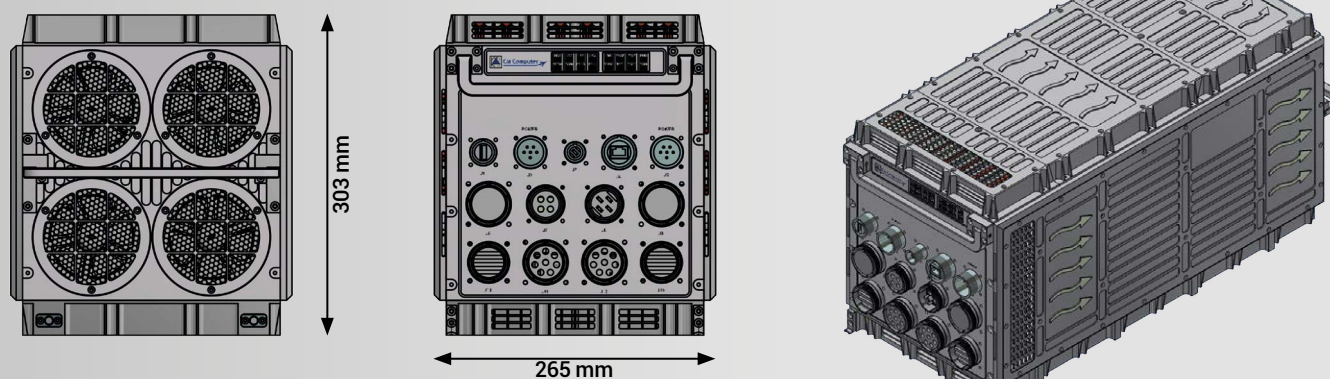
28VDC chassis install DC/AC inverters on the PSU heat sink. Each inverter powers a pair of PX3 AC rear fans. Standard PX3 deliver 100CFM each. 3-Phase fans deliver 140CFM each.



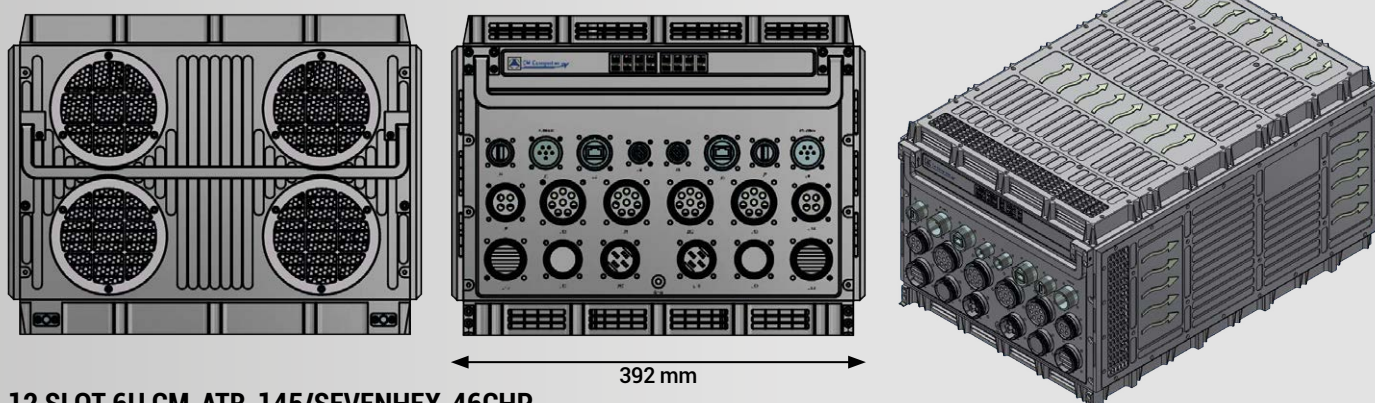
Enclosure Dimensions



5 SLOT 6U CM-ATR-125/SEVENHEX-32CHP



7 SLOT 6U CM-ATR-135/SEVENHEX-36CHP



12 SLOT 6U CM-ATR-145/SEVENHEX-46CHP

Panel LED 1	Name/Function	Panel LED 2	Name/Function
ON (GREEN)	POWER ON - PSU DC output OK, within voltage tolerances	UDF1 (TBD)	USER DEFINED LED FUNCTION 1
SYSF (RED)	SYSTEM-FAIL - Payload Built-In-Test not successful	UDF2 (TBD)	USER DEFINED LED FUNCTION 2
PWF (RED)	POWER FAIL MONITOR - External voltage below minimum	UDF3 (TBD)	USER DEFINED LED FUNCTION 3
RUN (GREEN)	DATA TRANSFER - Backplane bus/data traffic activity	UDF4 (TBD)	USER DEFINED LED FUNCTION 4
TSPW (YELLOW)	POWER SUPPLY MODULE 1 - TSU Power ON	TSPW (YELLOW)	POWER SUPPLY MODULE 2 - TSU Power ON
TSDI (YELLOW)	TSU DISABLE - Remote 'Battle-Short' switch ON	FSDI (BLUE)	FAN SPEED DISABLE - Rear fan STOPPED (-55°C to 10°C)
TSLO (RED)	LOW TEMP FAIL - System temperature below Low threshold	FSLO (GREEN)	FAN SPEED LOW - Rear fan rotation MEDIUM (10°C to 50°C)
TSHI (RED)	HIGH TEMP FAIL - System temperature above High threshold	FSHI (YELLOW)	FAN SPEED HIGH - Rear fan rotation MAXIMUM (50°C to 90°C)

Panel LED indicators inform on PSU power input/output status, rear fans speed, payload electronics self test pass/fail, low and high range temperature compliance, system in standby mode, etc. This information serves during operation in the field, maintenance and software development.

LEARN MORE: WWW.CMCOMPUTER.COM
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