

SEALED SIX HEAT EXCHANGERS + 20 HEAT PIPES 1" PITCH ATR ENCLOSURE

- » Designed expressly for very high wattage conduction cooled VPX applications
- » No risk, hermetically sealed externally integrated heat pipes
- » Accepts payloads up to 175 watts per slot
- » 10°C less payload ΔT with respect to SIXHEX series
- » Forced-air heat exchanger sidewalls, top cover & rear panel
- » Available in 5 or 7 slot versions for conduction-cooled modules
- » Two internal reverse forced-airflow heat exchangers
- » Extensive variety of military power supply options
- » Very high airflow military PX3 rear fans
- » Extreme internal forced-air recirculation
- » Dry air contaminant-free applications



SIXHEX-20HP-1"

SIXHEX + 20 HEAT PIPES

↑ **700W**
PAYLOAD POWER DISSIPATION



SIXHEX-20HP 6U ATR CHASSIS



Six Heat Exchangers + 20 Heat Pipes 1" 6U ATR - Contaminant-free suitable for very high wattage VPX applications with 0.8, 0.85 & 1" pitch 6U eurocards

Our flagship *Six Heat Exchangers + 20 Heat Pipes* enclosure has been designed for latest generation 5 and 7 slot conduction-cooled VPX systems that require the most extreme power dissipation and extended 1" pitch slot size. CM SIXHEX-20HP-1" hybrid chassis incorporates all available CM cooling mechanisms within a single package. Ideal for advanced systems operating in hostile air environments that integrate high power payload modules up to 175 watts.

CM ATR SIXHEX-20HP 1" Pitch Specifications

	CM-ATR-125/SIXHEX-20HP	CM-ATR-135/SIXHEX-20HP
SLOTS WEIGHT	5 Slots 10.2 Kg	7 Slots 14.2 Kg
DIMENSIONS	W 203 mm H 259 mm D 510 mm	W 254 mm H 259 mm D 510 mm
CGTR THERMAL RES.	$\Delta T/W = 0.050^{\circ}\text{C}$ (CIA = 200 CFM)	$\Delta T/W = 0.043^{\circ}\text{C}$ (CIA = 200 CFM)
MAX. PSU POWER	825 watts (28 VDC 675 watts)	825 watts (28 VDC 675 watts)
STD BACKPLANE	VME64X or cPCI or VPX or Hybrid VME64X/VPX 6U 1" pitch backplanes	
INTERNAL FAN	110 CFM	110 CFM
REAR FAN	200/280 CFM (2 x PX3)	200/280 CFM (2 x PX3)
FRONT PANEL AREA	161 mm x 170 mm	212 mm x 170 mm
CM FRONT PANEL I/O	6 Power Pins (23 Amp) & 504 I/O Pins (5 Amp)	6 Power Pins (23 Amp) & 798 I/O Pins (5 Amp)
MOUNTING TRAY	CM-TR-125/SIXHEX	CM-TR-135/SIXHEX
<i>Board Format, PSU Input Voltages, MTBF & Operating Temperature are as per the 6U SIXHEX 0.8" pitch series</i>		

COMPLEMENTARY INFORMATION

- CM ATR Features • CM ATR Backplanes • CM ATR PSU

PART NUMBER EXAMPLE:

CM-ATR-135/SIXHEX-20HP/VPX/90-265VAC/C-825W/TSU/UDP/
HTC/SBC/CCS/F115-400/EMIG/E

RECOMMENDED PAYLOAD POWER RATINGS

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

CM-ATR-135/SIXHEX-20HP (7 SLOT)

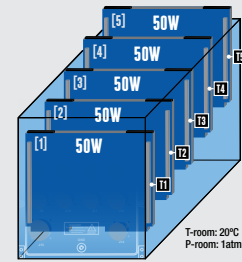
≤ 700 watts

CM-ATR-125/SIXHEX-20HP (5 SLOT)

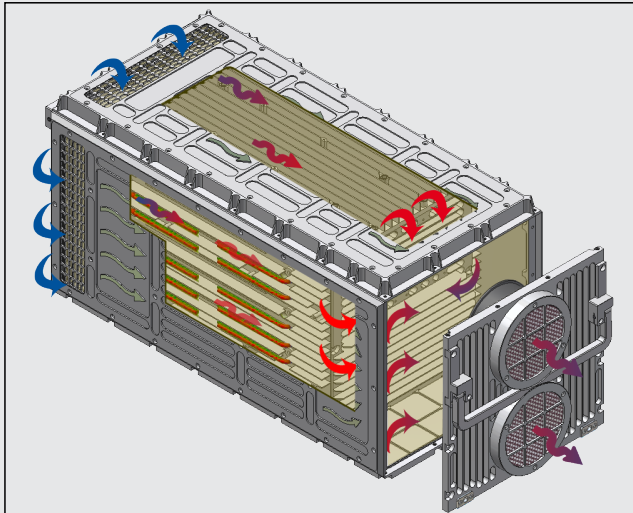
≤ 600 watts



CM ATR CHASSIS THERMAL TESTING



6U SIXHEX-20HP Military ATR Chassis Performance designed for high wattage, 1" pitch - sealed applications



VERSIONS

	CGTR	CPTR
CM-ATR-125/SIXHEX-20HP:	0.050°C/W	0.0596°C/W
CM-ATR-135/SIXHEX-20HP:	0.043°C/W	0.0497°C/W

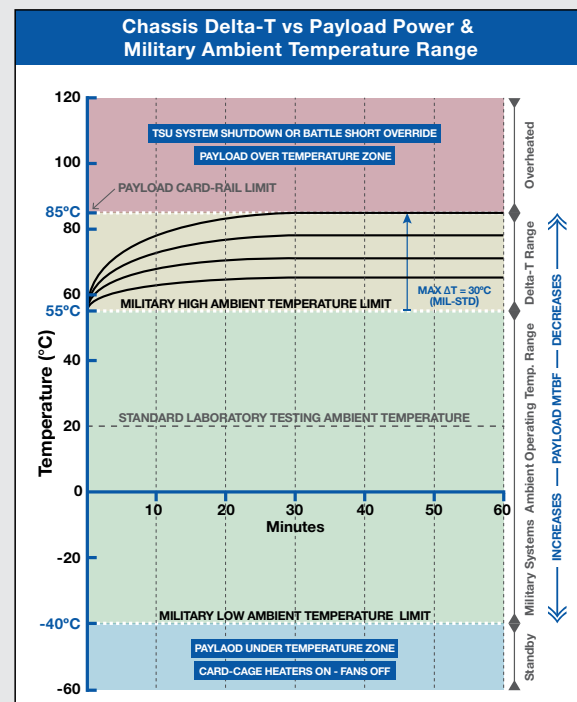
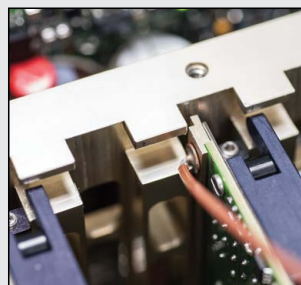
CAPABILITIES

- Contaminant-free enclosure
- Available in 1/2 ATR, 3/4 ATR versions
- VPX ready (1.0" Pitch)
- Accepts Conduction & Air-cooled 6U Modules
- Flexible Top & Bottom I/O wiring
- In-line EMI/EMC MIL-STD-461F Filter
- Up to 600 watts Total Payload Power @ 30°C Delta-T*
- Integrated Temperature Supervisory Unit (TSU)
- 6 Integrated Heat Exchangers + 20 Heat Pipes
- Integrated Rear fan guards
- Maintenance free operation
- Front panel user indicators
- Stand alone low weight ATR
- Internal card-cage airflow recirculation
- Independent Fan & Power Supply input voltage
- Military Operating Temperature (-40°C | +85°C)
- Customizable to specific requirements
- Low Profile Mounting Tray with quick release
- Manufactured with US MIL components

MAXIMUM MILITARY SYSTEM DELTA-T

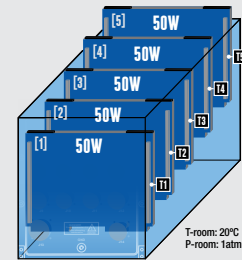
Maximum conduction-cooled payload card-rail temperature is typically 85°C. To comply with MIL-STD-810, systems must be operational up to 55°C ambient (worst case scenario).

In theory, this restricts payload maximum ΔT to 85°C - 55°C ($\Delta T_{max} = 30^\circ C$). Temperatures in excess of 85°C dramatically increase the risk of module failure and reduce component MTBF. Military limits may be relaxed for systems serving in 'indoor environments' (e.g. to 40°C ambient). Under these conditions ΔT margin can be increased to 85°C - 40°C = 45°C ΔT_{max} .

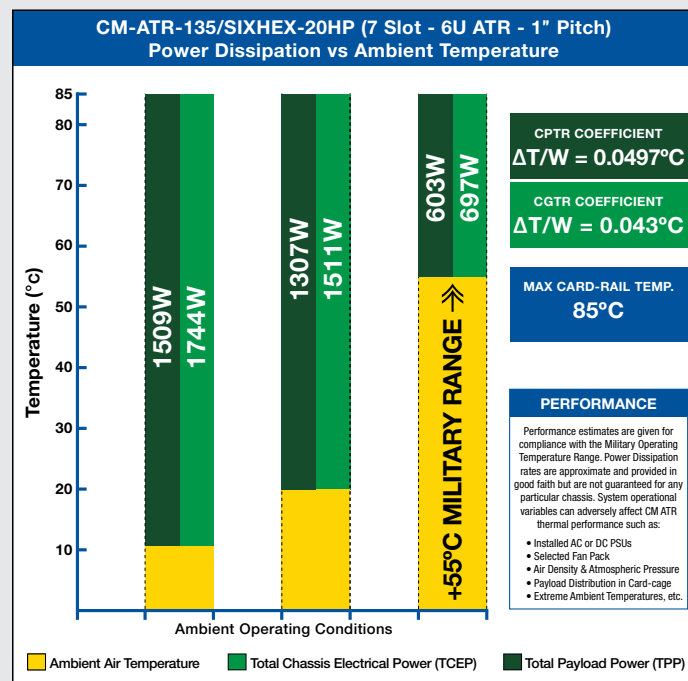
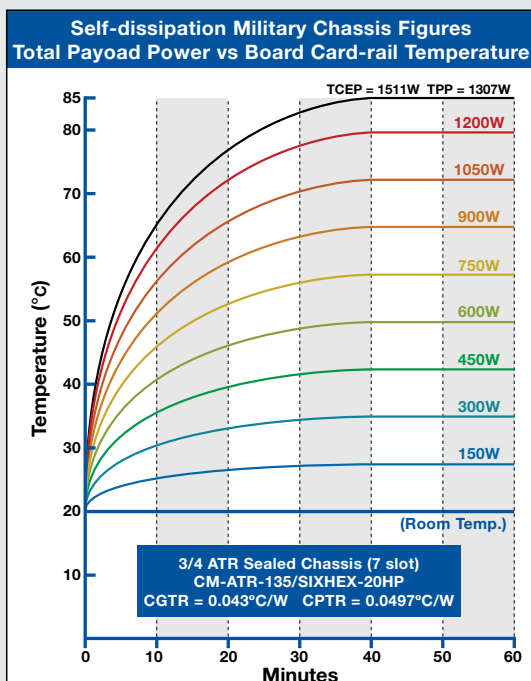
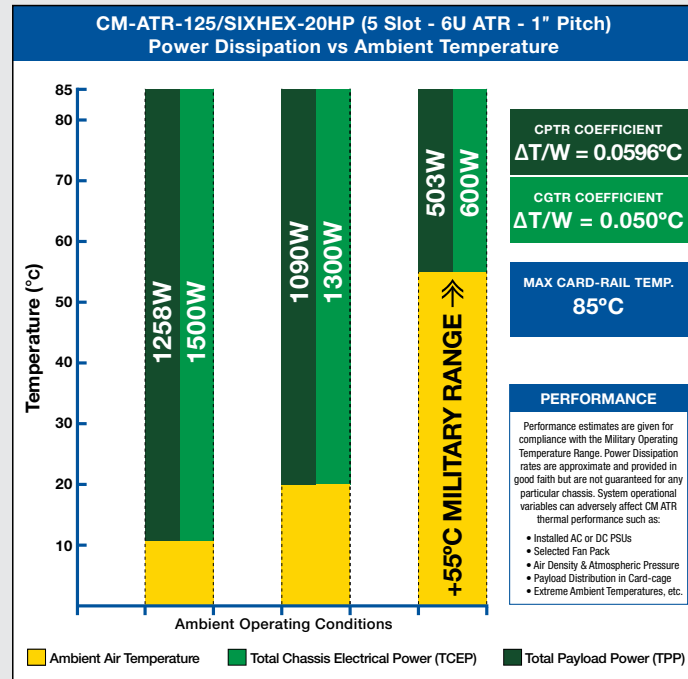
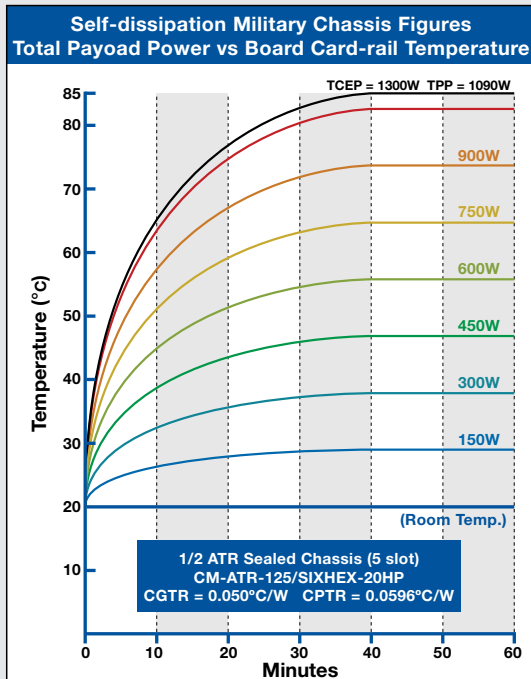




CM ATR CHASSIS THERMAL TESTING



6U SIXHEX-20HP Military ATR Chassis Performance designed for high wattage, 1" pitch - sealed applications





CM ATR ORDERING INFORMATION



6U Military ATR Chassis Ordering high performance military aerospace enclosure part number configuration

CHASSIS GENERIC PART NUMBER:

CM-ATR-S5 /CT /B /I /W /3.3 /D1 /D2 /R /S /FP /TC /BC /CS /F /G /C

/S5 COTS Enclosure Size/Model

CM-ATR-25: 5 Slot 6U Enclosure (0.8" pitch - 1/2 ATR type)

CM-ATR-125: 5 Slot 6U Enclosure (1" pitch - 1/2 ATR type)

CM-ATR-35: 7 Slot 6U Enclosure (0.8" pitch - 3/4 ATR type)

CM-ATR-135: 7 Slot 6U Enclosure (1" pitch - 3/4 ATR type)

CM-ATR-45: 12 Slot 6U Enclosure (0.8" pitch - 1 ATR type)

/CT Enclosure Cooling Technique

S: Standard Sealed (0.8" pitch)

SEF: Sealed with Extended Fins (0.8" pitch)

SEF-HP: Sealed with Extended Fins + 18/20 Heat Pipes (0.8" pitch)

HES: Sealed with 4 Heat Exchangers (0.8" and 1" pitch versions)

SIXHEX: Sealed with 6 Heat Exchangers (0.8" and 1" pitch versions)

SIXHEX-HP: Sealed with 6 Heat Exchangers and integrated Heat Pipes (0.8" pitch with 16HP and 1" pitch with 20HP versions)

FAC: Flowthrough Air Cooled Enclosure (open, non-sealed) (0.8" pitch)

/B Backplane Type (slot pitch according to chassis model)

VME64x: Military VME64x Backplane

cPCI: Military Compact PCI Backplane

VPX: VITA 46 Military VPX Backplane

VME64x/VPX: Hybrid VME64x mixed with VPX Military Backplane

VME64x/cPCI: Hybrid VME64x mixed with cPCI Military Backplane

Note: Hybrid dual bus backplanes are available for a limited set of chassis only

/I PSU Input Power Voltage

28VDC: 28 VDC Input

48VDC: 48 VDC Input

72VDC: 72 VDC Input

270VDC: 270 VDC Input

90-264VAC: Autorange 90-264 VAC @ 47-880 Hz Input

200VAC-3PH: 200 VAC 3 Phase @ 47-880 Hz Input

/W Power Supply Unit Watts

All PSUs = All PSUs except 28 VDC input | 28 VDC = 28 VDC input only

PSUs for CM-ATR-25 (5 slot)

Models: /S or /SEF or /SEF-HP or /HES (0.8") or /FAC

300W: 28 VDC (+5 VDC @ 20A, +3.3 VDC @ 5A, ±12 VDC @ 8A)

400W: All PSUs (+5 VDC @ 20A, +3.3 VDC @ 5A, ±12 VDC @ 12A)

Models: /S or /SEF or /SEF-HP or /HES or /SIXHEX or /SIXHEX-HP

A-475W: 28 VDC (+5 VDC @ 40A, +3.3 VDC @ 22A, ±12 VDC @ 8A)

A-575W: All PSUs (+5 VDC @ 40A, +3.3 VDC @ 22A, ±12 VDC @ 12A)

B-450W: 28 VDC (+5 VDC @ 20A, +3.3 VDC @ 45A, ±12 VDC @ 8A)

B-550W: All PSUs (+5 VDC @ 20A, +3.3 VDC @ 45A, ±12 VDC @ 12A)

C-475W: 28 VDC (+5 VDC @ 20A, +3.3 VDC @ 22A, +12 VDC @ 16A, -12 VDC @ 8A)

C-575W: All PSUs (+5 VDC @ 20A, +3.3 VDC @ 22A, +12 VDC @ 21A, -12 VDC @ 12A)

MOUNTING TRAY GENERIC PART NUMBER:

CM-TR-S5 /CT

PSUs for CM-ATR-(1)35 (7 slot) & CM-ATR-125 (5 Slot 1" Pitch)

Models: /S or /SEF or /SEF-HP or /HES (0.8") or /FAC

400W: 28 VDC (+5 VDC @ 40A, +3.3 VDC @ 5A, ±12 VDC @ 8A)

500W: All PSUs (+5 VDC @ 40A, +3.3 VDC @ 5A, ±12 VDC @ 12A)

Models: /S or /SEF or /SEF-HP or /HES or /SIXHEX or /SIXHEX-HP

A-475W: 28 VDC (+5 VDC @ 40A, +3.3 VDC @ 22A, ±12 VDC @ 8A)

A-575W: All PSUs (+5 VDC @ 40A, +3.3 VDC @ 22A, ±12 VDC @ 12A)

A-675W: 28 VDC (+5 VDC @ 80A, +3.3 VDC @ 22A, ±12 VDC @ 8A)

A-775W: All PSUs (+5 VDC @ 80A, +3.3 VDC @ 22A, ±12 VDC @ 12A)

B-450W: 28 VDC (+5 VDC @ 20A, +3.3 VDC @ 45A, ±12 VDC @ 8A)

B-550W: All PSUs (+5 VDC @ 20A, +3.3 VDC @ 45A, ±12 VDC @ 12A)

B-564W: 28 VDC (+5 VDC @ 20A, +3.3 VDC @ 80A, ±12 VDC @ 8A)

B-664W: All PSUs (+5 VDC @ 20A, +3.3 VDC @ 80A, ±12 VDC @ 12A)

C-475W: 28 VDC (+5 VDC @ 20A, +3.3 VDC @ 22A, +12 VDC @ 16A, -12 VDC @ 8A)

C-575W: All PSUs (+5 VDC @ 20A, +3.3 VDC @ 22A, +12 VDC @ 21A, -12 VDC @ 12A)

C-775W: 28 VDC (+5 VDC @ 20A, +3.3 VDC @ 22A, +12 VDC @ 41A, -12 VDC @ 8A)

C-825W: All PSUs (+5 VDC @ 20A, +3.3 VDC @ 22A, +12 VDC @ 41A, -12 VDC @ 12A)

D-550W: 28 VDC (+5 VDC @ 40A, +3.3 VDC @ 45A, ±12 VDC @ 8A)

D-650W: All PSUs (+5 VDC @ 40A, +3.3 VDC @ 45A, ±12 VDC @ 12A)

E-550W: 28 VDC (+5 VDC @ 20A, +3.3 VDC @ 45A, +12 VDC @ 16A, -12 VDC @ 8A)

E-650W: All PSUs (+5 VDC @ 20A, +3.3 VDC @ 45A, +12 VDC @ 21A, -12 VDC @ 12A)

F-575W: 28 VDC (+5 VDC @ 40A, +3.3 VDC @ 22A, +12 VDC @ 16A, -12 VDC @ 8A)

F-675W: All PSUs (+5 VDC @ 40A, +3.3 VDC @ 22A, +12 VDC @ 21A, -12 VDC @ 12A)

Dual-redundant PSUs for /HES or /SIXHEX or /SIXHEX-HP models

R2x500W: (+5 VDC @ 25A, +3.3 VDC @ 23A, ±12 VDC @ 12A)

PSU for CM-ATR-45 (12 slot)

Models: /S or /SEF or /SEF-HP or /HES (0.8") or /FAC

950W: 28 VDC (+5 VDC @ 80A, +3.3 VDC @ 45A, ±12 VDC @ 16A)

1050W: All PSUs (+5 VDC @ 80A, +3.3 VDC @ 45A, ±12 VDC @ 21A)

Models: /HES or /SIXHEX or /SIXHEX-HP

A-950W: 28 VDC (+5 VDC @ 80A, +3.3 VDC @ 45A, ±12 VDC @ 16A)

A-1050W: All PSUs (+5 VDC @ 80A, +3.3 VDC @ 45A, ±12 VDC @ 21A)

B-950W: 28 VDC (+5 VDC @ 40A, +3.3 VDC @ 45A, +12 VDC @ 33A, -12 VDC @ 16A)

B-1100W: All PSUs (+5 VDC @ 40A, +3.3 VDC @ 45A, +12 VDC @ 41A, -12 VDC @ 20A)

B-1065W: 28 VDC (+5 VDC @ 80A, +3.3 VDC @ 80A, ±12 VDC @ 16A)

B-1165W: All PSUs (+5 VDC @ 80A, +3.3 VDC @ 80A, ±12 VDC @ 21A)

C-864W: 28 VDC (+5 VDC @ 40A, +3.3 VDC @ 80A, ±12 VDC @ 16A)

C-964W: All PSUs (+5 VDC @ 40A, +3.3 VDC @ 80A, ±12 VDC @ 20A)

C-1225W: 28 VDC (+5 VDC @ 80A, +3.3 VDC @ 160A, ±12 VDC @ 16A)

C-1425W: All PSUs (+5 VDC @ 80A, +3.3 VDC @ 160A, ±12 VDC @ 21A)

D-1350W: 28 VDC (+5 VDC @ 160A, +3.3 VDC @ 80A, ±12 VDC @ 16A)

D-1550W: All PSUs (+5 VDC @ 160A, +3.3 VDC @ 80A, ±12 VDC @ 21A)

Dual-redundant PSUs for /HES or /SIXHEX or /SIXHEX-HP models

R2x725W: (+5 VDC @ 20A, +3.3 VDC @ 23A, ±12 VDC @ 12A, ±28 VDC @ 9A)

R2x675W: (+5 VDC @ 60A, +3.3 VDC @ 23A, ±12 VDC @ 12A)

R2x625W: (+5 VDC @ 20A, +3.3 VDC @ 68A, ±12 VDC @ 12A)

R2x710W: (+5 VDC @ 20A, +3.3 VDC @ 23A, +12 VDC @ 32A, -12 VDC @ 12A)



/3.3 DC/DC AUX0 fitted for 3.3VDC (CM-ATR-25 & CM-ATR-35)

3.3-75W: 3.3VDC @ 22A (in lieu of default 3.3 VDC @ 5A)

Optional DC/DC AUX0 converter on Backplane fitted for 3.3VDC. Option suited for 1st generation PSU models 300W/400W/500W. Note: If /3.3-75W is not selected, DC/DC power socket AUX0 remains free to the user.

/D1 DC/DC AUX1 (CM-ATR-35 & CM-ATR-45)

/D2 DC/DC AUX2 (CM-ATR-45)

D1: 100W Optional DC/DC Converter on Backplane. User-defined output 1
D2: 100W Optional DC/DC Converter on Backplane. User-defined output 2

Backplane auxiliary DC/DC converter output options: +2VDC 50W, -2VDC 50W, +3.3VDC 75W, -3.3VDC 75W, +5VDC 100W, -5VDC 100W, +12VDC 100W, -12VDC 100W, +15VDC 100W, -15VDC 100W, +28VDC 100W, -28VDC 100W, +48VDC 100W, -48VDC 100W.

Ordering Examples: 48-100W » 48VDC @ 2A / -5-100W » -5VDC @ 20A / 2-50W » 2VDC @ 25A / ±15-100W » ±15VDC @ 6A

/R Redundant PSU (Plug-in for VMEbus systems only)

RPSU for CM-ATR-35 (7 slot) & CM-ATR-45 (12 slot)

RA-475W: 28 VDC (+5 VDC @ 40A, +3.3 VDC @ 22A, ±12 VDC @ 8A)

RB-575W: All PSUs (+5 VDC @ 40A, +3.3 VDC @ 22A, ±12 VDC @ 12A)

/S Temperature Supervisory Unit

TSU: Optionally installed in backplane (for /S or /SEF or /FAC models)

Note: TSU is fitted as standard in /SEF-HP, /HES, /SIXHEX & /SIXHEX-HP models

/FP Front Panel Layout

CMP: Standard CM front panel fitted with MIL-DTL-38999 connectors

UDP: User-defined front panel layout (requires customer drawing)

/TC Chassis Top Cover

STC: Standard top cover (wiring clearance 20mm)

FTC: Finned top cover (wiring clearance 20mm)*

HTC: High profile top cover (wiring clearance 35mm)

HETC: Heat Exchanger top cover (wiring clearance 20mm)**

EHETC: Extended Heat Exchanger top cover (wiring clearance 35mm)

* FTC chassis top cover is standard on /SEF & /SEF-HP models

** HETC chassis top cover is standard on /HES, /SIXHEX & /SIXHEX-HP models

/BC Chassis Bottom Cover

SBC: Standard bottom cover (wiring clearance below backplane 25mm)

HBC: High profile bottom cover (wiring clearance below backplane 50mm)*

* 50mm bottom clearance is standard on /HES-1", /SIXHEX & /SIXHEX-HP models

/CS Chassis Card-Cage Slot

MCS: Mixed Card-cage slots (mixed conduction-cooled & air-cooled boards)

CCS: Conduction-cooled Card-cage slots (conduction-cooled boards only)*

* CCS card-cage is standard on /HES-1", /SIXHEX-1" & /SIXHEX-HP-1" models

/F Rear-Mounted Fan Assembly

Fans for CM-ATR-(1)25 (5 slot) & CM-ATR-(1)35 (7 slot)

Models: /FAC

F115-400: 1x65 CFM 115 VAC @ 400Hz Rotron PX2 Military fan

F200-400: 1x120 CFM 200 VAC 3PH @ 400Hz Rotron PX2 fan

F28: 1x65 CFM 28 VDC Rotron PX2 Military fan (through DC/AC converter)

Models: /HES (0.8")

F115-400: 2x65 CFM 115 VAC @ 400Hz Rotron PX2 Military fans

F200-400: 2x120 CFM 200 VAC 3PH @ 400Hz Rotron PX2 fans

F28: 2x65 CFM 28 VDC Rotron PX2 Military fans (through DC/AC converter)

Models: /HES (1") /SIXHEX or /SIXHEX-HP

F115-400: 2x100 CFM 115 VAC @ 400Hz Rotron PX3 Military fans

F200-400: 2x140 CFM 200 VAC 3PH @ 400Hz Rotron PX3 fans

F28: 2x100 CFM 28 VDC Rotron PX3 Military fans

F115-60: 2x100 CFM 115 VAC @ 60Hz Rugged fans

F220-50: 2x100 CFM 220 VAC @ 50Hz Rugged fans

Fans for CM-ATR-45 (12 slot)

Models: /FAC

F115-400: 2x100 CFM 115 VAC @ 400Hz Rotron PX3 Military fans

F200-400: 2x140 CFM 200 VAC 3PH @ 400Hz Rotron PX3 fans

F28: 2x100 CFM 28 VDC Rotron PX3 Military fans

Models: /HES

F115-400: 4x65 CFM 115 VAC @ 400Hz Rotron PX2 Military fans

F200-400: 4x120 CFM 200 VAC 3PH @ 400Hz Rotron PX2 fans

F28: 4x65 CFM 28 VDC Rotron PX2 Military fans (through DC/AC converter)

Models: /SIXHEX or /SIXHEX-HP

F115-400: 4x100 CFM 115 VAC @ 400Hz Rotron PX3 Military fans

F200-400: 4x140 CFM 200 VAC 3PH @ 400Hz Rotron PX3 fans

F28: 4x100 CFM 28 VDC Rotron PX3 Military fans

F115-60: 4x100 CFM 115 VAC @ 60Hz Rugged fans

F220-50: 4x100 CFM 220 VAC @ 50Hz Rugged fans

VAP: Vehicle Air-Plenum according to system specs (external forced air source)

- No rear fan required for /S, /SEF & /SEF-HP models, omit option from part number

- Rugged fans are fitted with aluminum housing. Operating range: -10°C to +70°C

- Full military Rotron PX2 & PX3 AC fans. Operating range: -54°C to +125°C

- Note: Fan input voltage can be selected independently of main PSU voltage

/G Fan Finger Guards

STDG: Standard Rotron PX2/PX3 finger guards

EMIG: Optional EMI shielding finger guards with honeycomb filter

GNF: Optional finger guards with acoustic noise filter (-5dB)

/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-45/HES/VME64x/90-264VAC/A-1050W/15-100W/-15-100W/UDP/HTC/HBC/MCS/F200-400/EMIG/B

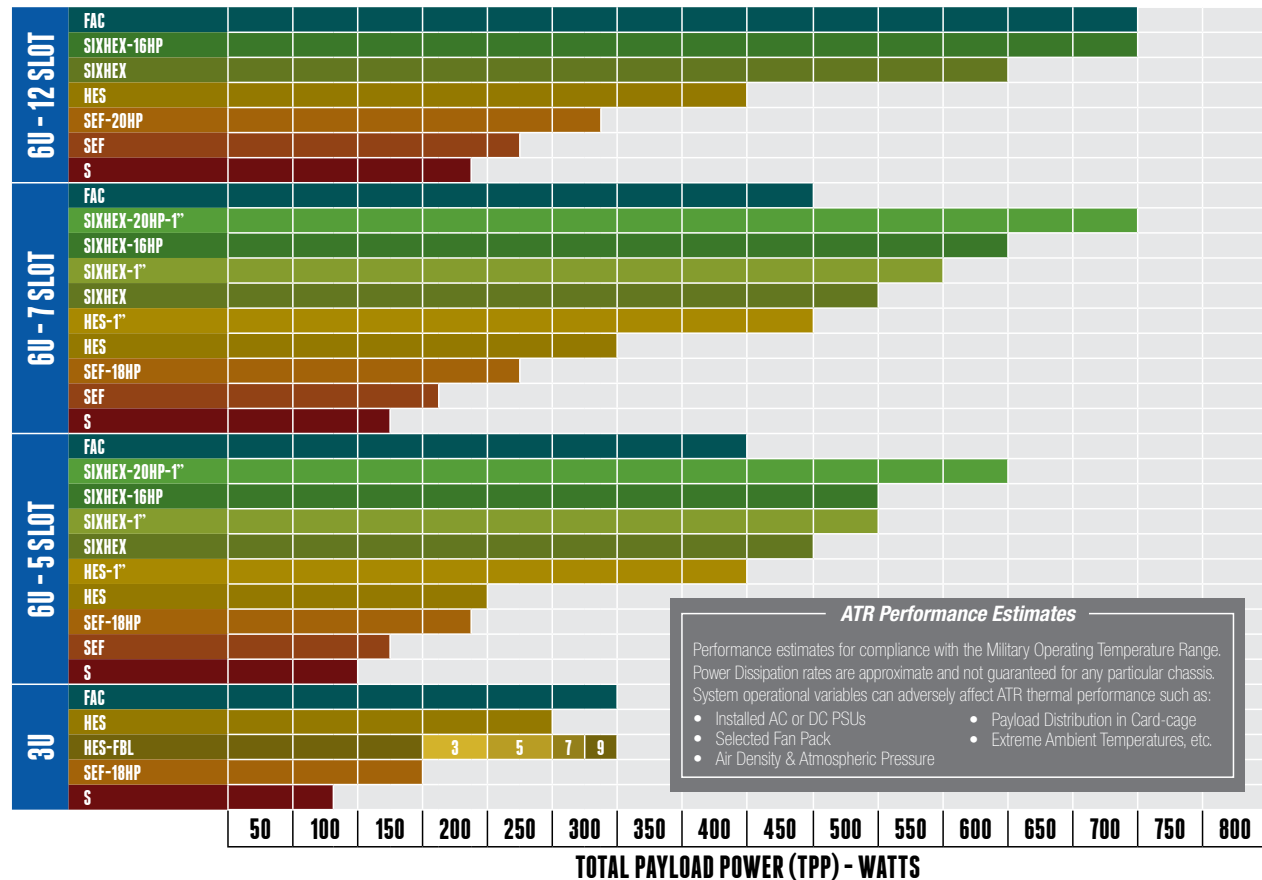
- 12 slot, Heat Exchanger Sidewalls. 6U Avionics Enclosure.
- 12 slot VME64x backplane for 6U boards (0.8" pitch).
- Auto-range 90-264VAC @ 47-880Hz Input Power Supply.
- A-1050W power supply (+5VDC @ 80A, +3.3VDC @ 45A, ±12VDC @ 21A).
- (±)15VDC @ 6.6A DC/DC AUX1 & AUX2 user output on backplane.
- Temperature Supervisory Unit fitted as standard.
- User-defined front panel layout.
- High profile Top & Bottom cover. Universal Card-cage Slots.
- 4x Rotron PX2 military fan 115VAC @ 400Hz (260 CFM total).
- EMI shielded finger guards. Enclosure color: Black.



CM ATR CHASSIS THERMAL TESTING

CM ATR Chassis Selection Chart

based on system total payload power dissipation



Glossary of Technical Terms

establishing new chassis engineering terminology

LT	: Chassis Linear Thermal Test (Linear Test)
PT	: Chassis Peak Slot Thermal Test (Peak Test)
MT	: Chassis Mixed Linear & Peak Slot Thermal Test (Mixed Test)
LT-AV	: Linear Test Payload Average Temperature
PT-AV	: Peak Test Payload Average Temperature
MT-T1	: Mixed Test Slot 1 Payload Temperature
MT-AV	: Mixed Test Payload Average Temperature (excluding Slot 1)
ΔT	: Chassis Payload Delta-T with respect to Ambient Temperature
TPP	: Total Payload Power
TCEP	: Total Chassis Electrical Power
CPTR	: Chassis Payload Thermal Resistance
CGTR	: Chassis Global Thermal Resistance

CHMPF	: Chassis Half MTBF Power Factor
CPMDC	: Chassis Payload MTBF Degradation Coefficient
CIA	: Chassis Installed Airflow
CEA	: Chassis Effective Airflow
ADDT	: Ambient Airflow Delta-T
CSAOP	: Chassis Stable Airflow Operating Point
CIARC	: Chassis Impedance Airflow Reduction Coefficient
MFARC	: Multiple Fan Airflow Reduction Coefficient
OARC	: Overall Airflow Reduction Coefficient
SCIDPC	: Sealed Chassis Indirect Delta-T Power Coefficient
PEADT	: Payload to Exhaust Airflow Delta-T
CCAAT	: Chassis Cooling Airflow Average Temperature