RS-102AT-Q351
Industrial Rack Mount Computers

Features

- Intel Core 2 Duo / Core 2 Quad CPU
- Up to 4GB DDR2-677 Memory
- Two Swappable 3.5" SATA HDD
- 2 x Gigabit Ethernet
- 1 x PCI Expansion Slot

2x Gigabit

1x RS-232

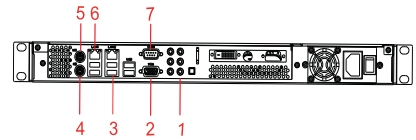
6x USB 2.0

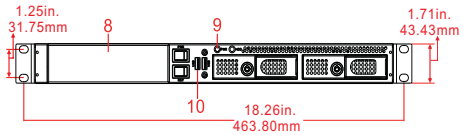
RS-102AT-Q351

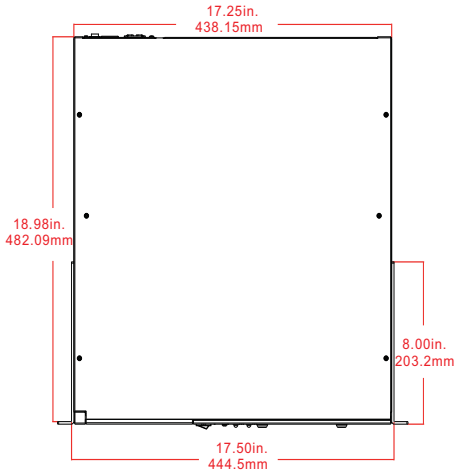
Specifications	RS-102AT-Q351
System	
CPU	Core 2 Duo / Core 2 Quad
Chipset	Intel Q35 + ICH9 / ICH9DO
Memory	Up to 4GB DR2-667
Video Controller	Q35 Integrated GMA3100
Video Interface	VGA
Storage Option	Up to 2 x 3.5" SATA HDD
Compact Flash	N/A
Keyboard/Mouse	2 x PS/2 Connectors
Audio	N/A
Watchdog Timer	Programmable 1 - 255 sec
Expansion Slot	1 x PCI Slot
I/O Communication	
USB Port	6 x USB 2.0
Serial Port	1 x RS-232
IEEE 1394	2 x IEEE1394B (optional)
LAN	Dual Gigabit LAN
Parallel	N/A
OS SUPPORT	
OS Support	Windows XP Pro
Power/Thermal Specs.	
Power Requirement (Max)	110VAC /3A, 220VAC/1.5A
Power Consumption (Max)	295 W
Heat Dissipation	1010 BTU/hr
Physical Information	
Mounting	Rack Mount
Net Weight	45 Lbs / 20 Kg
Physical Dimension (WxHxD)	19.00 x 1.71 x 18.98 inch 482.6 x 43.4 x 482.1 mm
Environmental	
Operating Temp	0° - 50° C (32° - 122° F)
Storage Temp	-20° - 60° C (-4° - 140° F)
Relative Humidity	0% - 95% (non-condensing)
Rating	N/A
Certification	N/A

Line Drawing

1 = Audios
2 = VGA
3 = USB 2.0
4 = PS2/Mouse
5 = PS2/Keyboard
6 = RJ45 Ethernet
7 = RS-232
8 = DVD/CD ROM
9 = LED
10 = USB







RS-202AT-Q351
Industrial Rack Mount Computers

Features

- Intel Core 2 Duo / Core 2 Quad processor
- Up to 4GB DDR2-677 memory
- Four Swappable 3.5" SATA HDD
- 2 x Gigabit Ethernet
- 3 x PCI Expansion slots

2x Gigabit

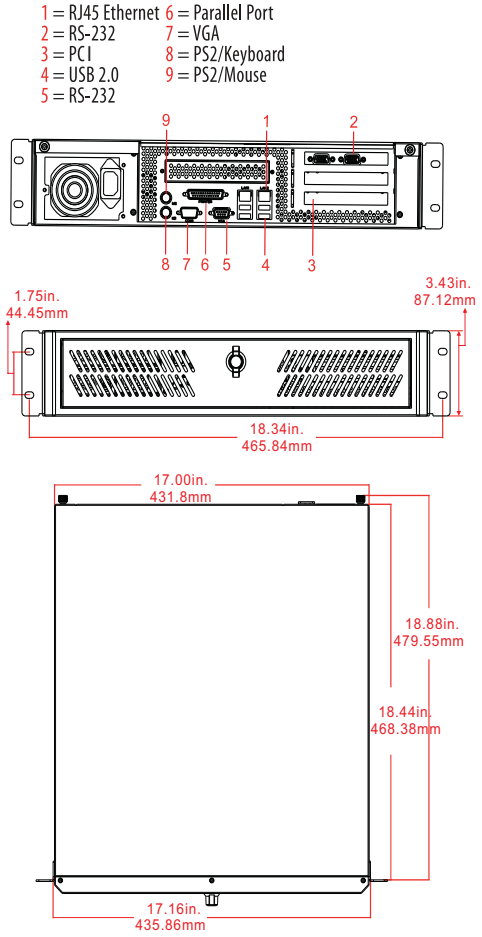
1x RS-232

6x USB 2.0

RS-202AT-Q351

Specifications	RS-202AT-Q351
System	
CPU	Core 2 Duo / Core 2 Quad
Chipset	Intel Q35 + ICH9 / ICH9DO
Memory	Up to 4GB DR2-667
Video Controller	Q35 Integrated GMA3100
Video Interface	VGA
Storage Option	Up to 4 x 3.5" SATA HDD
Compact Flash	N/A
Keyboard/Mouse	2 x PS/2 Connectors
Audio	Line in, Line Out, MIC-In
Watchdog Timer	Programmable 1 - 255 sec
Expansion Slot	3 x PCI Slots
I/O Communication	
USB Port	6 x USB 2.0
Serial Port	1 x RS-232
IEEE 1394	2 x IEEE1394B (optional)
LAN	Dual Gigabit LAN
Parallel	1 x Port
OS SUPPORT	
OS Support	Windows XP Pro
Power/Thermal Specs.	
Power Requirement (Max)	110VAC /3A, 220VAC/1.5A
Power Consumption (Max)	295 W
Heat Dissipation	1010 BTU/hr
Physical Information	
Mounting	Rack Mount
Net Weight	50 Lbs / 22 Kg
Physical Dimension (WxHxD)	19.00 x 3.43 x 18.88 inch 482.6 x 87.1 x 479.6 mm
Environmental	
Operating Temp	0° - 50° C (32° - 122° F)
Storage Temp	-20° - 60° C (-4° - 140° F)
Relative Humidity	0% - 95% (non-condensing)
Rating	N/A
Certification	N/A

Line Drawing



RS-300AT-Q351
Industrial Rack Mount Computers

Features

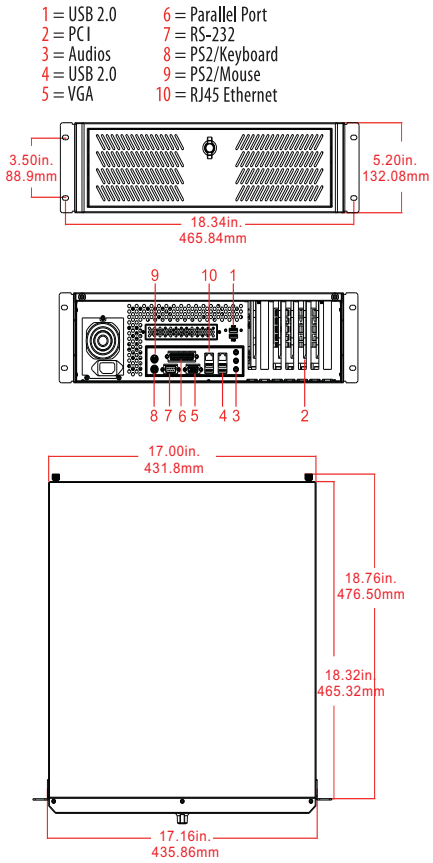
- Intel Core 2 Duo / Core 2 Quad CPU
- Up to 8GB DDR2-677
- Four Swappable 3.5" SATA HDD
- 2 x Gigabit Ethernet
- One 3.5" accessibly drive bay for FDD
- 5 x PCI Expansion slots, One PCIe x16, One PCIe x 1

2x Gigabit | 6x USB 2.0 | 1x RS-232

RS-300AT-Q351

Specifications	RS-300AT-Q351
System	
CPU	Core 2 Duo / Core 2 Quad
Chipset	Intel Q35 + ICH9 / ICH9DO
Memory	Up to 8GB DR2-667
Video Controller	Q35 Integrated GMA3100
Video Interface	VGA
Storage Option	Up to 4 x 3.5" SATA HDD
Compact Flash	N/A
Keyboard/Mouse	2 x PS/2 Connectors
Audio	Line in, Line Out, MIC-In
Watchdog Timer	Programmable 1 - 255 sec
Expansion Slot	5 x PCI, One PCIe x 16, One PCIe x 1
I/O Communication	
USB Port	6 x USB 2.0
Serial Port	1 x RS-232
IEEE 1394	2 x IEEE1394B (optional)
LAN	Dual Gigabit LAN
Parallel	1 x Port
OS SUPPORT	
OS Support	Windows XP Pro
Power/Thermal Specs.	
Power Requirement (Max)	110VAC /3A, 220VAC/1.5A
Power Consumption (Max)	295 W
Heat Dissipation	1010 BTU/hr
Physical Information	
Mounting	Rack Mount
Net Weight	52 Lbs / 23 Kg
Physical Dimension (WxHxD)	19.00 x 5.20 x 18.76 inch 482.6 x 132.1 x 476.5 mm
Environmental	
Operating Temp	0° - 50° C (32° - 122° F)
Storage Temp	-20° - 60° C (-4° - 140° F)
Relative Humidity	0% - 95% (non-condensing)
Rating	N/A
Certification	N/A

Line Drawing

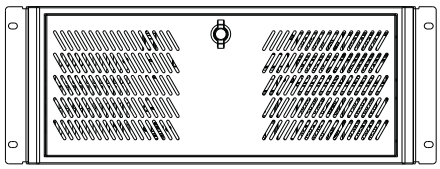


RS-407AT-Q351
Industrial Rack Mount Computers

Features

- Intel Core 2 Duo / Core 2 Quad CPU
- Up to 8GB DDR2-677
- Four Swappable 3.5" SATA HDD
- 2 x Gigabit Ethernet
- One 3.5" accessibly drive bay for FDD
- 5 x PCI Expansion slots, One PCIe x16, One PCIe x 1

2x Gigabit 6x USB 2.0 1x RS-232

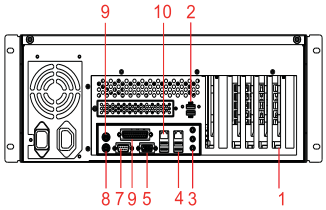


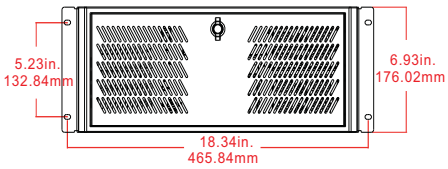
RS-407AT-Q351

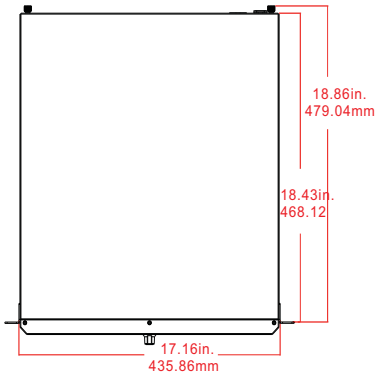
Specifications	RS-407AT-Q351
System	
CPU	Core 2 Duo / Core 2 Quad
Chipset	Intel Q35 + ICH9 / ICH9DO
Memory	Up to 8GB DR2-667
Video Controller	Q35 Integrated GMA3100
Video Interface	VGA
Storage Option	Up to 2 x 2.5" SATA HDD
Compact Flash	N/A
Keyboard/Mouse	2 x PS/2 Connectors
Audio	Line in, Line Out, MIC-In
Watchdog Timer	Programmable 1 - 255 sec
Expansion Slot	5 x PCI, One PCIe x 16, One PCIe x 1
I/O Communication	
USB Port	6 x USB 2.0
Serial Port	1 x RS-232
IEEE 1394	2 x IEEE1394B (optional)
LAN	Dual Gigabit LAN
Parallel	Yes
OS SUPPORT	
OS Support	Windows XP Pro
Power/Thermal Specs.	
Power Requirement (Max)	110VAC /3A, 220VAC/1.5A
Power Consumption (Max)	295 W
Heat Dissipation	1010 BTU/hr
Physical Information	
Mounting	Rack Mount
Net Weight	55 Lbs / 25 Kg
Physical Dimension (WxHxD)	19.00 x 6.93 x 18.86 inch 482.6 x 176.1 x 479.1 mm
Environmental	
Operating Temp	0° - 50° C (32° - 122° F)
Storage Temp	-20° - 60° C (-4° - 140° F)
Relative Humidity	0% - 95% (non-condensing)
Rating	N/A
Certification	N/A

Line Drawing

1 = PCI
2 = USB 2.0
3 = Audios
4 = USB 2.0
5 = VGA
6 = Parallel Port
7 = RS-232
8 = PS2/Keyboard
9 = PS2/Mouse
10 = RJ45 Ethernet







Ordering Information

RS-102AT-Q351

CPU	2.13 GHz Core 2 Duo
Memory	2GB DR2-667
CD-ROM	CD-RW

RS-102AT-Q351-001

Power Supply	110/220 VAC Input
Storage	One 160GB 3.5" SATA HDD

RS-202AT-Q351

CPU	2.13 GHz Core 2 Duo
Memory	2GB DR2-667
CD-ROM	Slim CD-RW

RS-202AT-Q351-001

Power Supply	110/220 VAC Input
Storage	One 160GB 3.5" SATA HDD

RS-300AT-Q351

CPU	2.13 GHz Core 2 Duo
Memory	2GB DR2-667
CD-ROM	Slim CD-RW

RS-300AT-Q351-001

Power Supply	110/220 VAC Input
Storage	One 160GB 3.5" SATA HDD

RS-407AT-Q351

CPU	2.13 GHz Core 2 Duo
Memory	2GB DR2-667
CD-ROM	Slim CD-RW

RS-407AT-Q351-001

Power Supply	110/220 VAC Input
Storage	One 160GB 3.5" SATA HDD

RS-500AT-Q351
Industrial Rack Mount Computers

Features

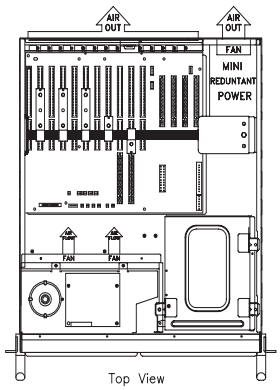
- Intel Core 2 Duo / Core 2 Quad CPU
- Up to 8GB DDR2-677 Memory
- Three 5.25" drive bay
- 2 x Gigabit Ethernet
- One 3.5" accessibly drive bay for FDD
- 5 x PCI Expansion slots, One PCIe x16, One PCIe x 1

2x Gigabit 6x USB 2.0 1x RS-232

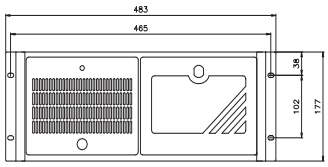
RS-500AT-Q351

Specifications	RS-500AT-Q351
System	
CPU	Core 2 Duo / Core 2 Quad
Chipset	Intel Q35 + ICH9 / ICH9DO
Memory	Up to 8GB DR2-667
Video Controller	Q35 Integrated GMA3100
Video Interface	VGA
Storage Option	SATA CD-ROM, HDD
Compact Flash	N/A
Keyboard/Mouse	2 x PS/2 Connectors
Audio	Line in, Line Out, MIC-In
Watchdog Timer	Programmable 1 - 255 sec
Expansion Slot	5 x PCI, One PCIe x 16, One PCIe x 1
I/O Communication	
USB Port	6 x USB 2.0
Serial Port	1 x RS-232 (multiple RS-232 option available)
IEEE 1394	N/A
LAN	Dual Gigabit LAN
Parallel	1 x Port
OS SUPPORT	
OS Support	Windows XP Pro
Power/Thermal Specs.	
Power Requirement (Max)	110VAC /3A, 220VAC/1.5A
Power Consumption (Max)	295 W
Heat Dissipation	1010 BTU/hr
Physical Information	
Mounting	Rack Mount
Net Weight	
Physical Dimension (WxHxD)	20.08 x 19.02 x 4.61 inches 510.0 x 483.0 x 117.0 mm
Environmental	
Operating Temp	0° - 50° C (32° - 122° F)
Storage Temp	-20° - 60° C (-4° - 140° F)
Relative Humidity	0% - 95% (non-condensing)
Rating	N/A
Certification	N/A

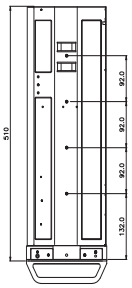
Line Drawing



Top View



Front out-side view



Right-side View

Thermal Management

Heat Dissipation in Electrical Enclosures

The accumulation of heat in an enclosure is potentially damaging to electrical and electronic devices. Overheating can shorten the life expectancy of costly electrical components or lead to catastrophic failure. It is therefore important that system designers are aware of the temperature implications of their designs prior to implementation and where necessary take steps to reduce heat buildup inside the enclosure.

Enclosure Materials

The following discussion applies to enclosures that are gasketed, unventilated, and constructed of painted steel. Paint color has little effect on enclosure temperature rise, except when exposed to sun. Higher temperature rises can be expected with aluminum and stainless steel enclosures due to their material's less efficient radiant heat transfer. Non-metallic enclosures have similar heat transfer characteristics to those constructed of painted steel, so the graph can be used directly despite the difference in material.

Enclosure Heat Input

For any temperature rise calculation, the heat generated within the enclosure must be known.This information can be obtained from the supplier of the components mounted in the enclosure. Heat input values are usually given in watts, but may also appear in BTU/hour.

BTU/hour can be converted to watts by dividing the value by 3.413 (for example, 341 BTU/hour = 100 watts).

It is not possible to approximate the heat input for a particular application based on enclosure size. Heat input varies from application to application for all enclosure sizes.The system designer must obtain estimates of heat input from the information that is available. Since these are only estimates, inclusion of a safety factor might be prudent.

Enclosure Surface Area

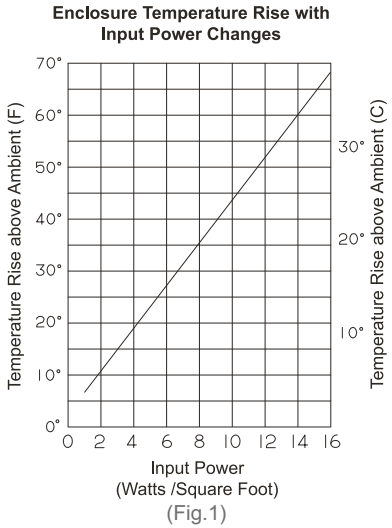
The physical size of the enclosure is the primary factor in determining its ability to dissipate heat.The larger the surface area of the enclosure, the lower the temperature rise due to the heat generated within it.

To determine the surface area of an enclosure in square feet, use the following equation:

Surface Area = 2[(AxB) + (AxC) + (BxC)] ÷ 144 where the enclosure size is AxBxC This equation includes all six surfaces of the enclosure. If any surface is not available for transferring heat (for example, an enclosure surface mounted against a wall), it should not be included in the calculation.

Enclosure Temperature Rise (ΔT)

The temperature rise illustrated by the curve in the graph below is the temperature difference between the air inside a non-ventilated and non-cooled enclosure and the air outside the enclosure (or ambient air temperature).This value is described in the graph as a function of input power in watts per square foot. In order to predict the temperature inside the enclosure, the temperature rise indicated in the graph must be added to the ambient temperature where the enclosure is located.



(Fig.1)

The enclosure temperature rise is not dependent on the ambient temperature; rather, the temperature rise for a given enclosure and heat input are constant. For example, if the graph indicates a temperature rise of 30° F, the interior of the enclosure will be 30° F warmer than the temperature in the surrounding area. If the temperature in the surrounding area reaches a maximum of 100° F then the enclosure interior will reach a maximum of 130° F.

Since temperatures in an environment often vary widely, temperatures within enclosures will also vary. In general, industrial environments are warmer in the summer than in the winter.Therefore, when calculating the warmest enclosure temperature, use the maximum ambient temperature that is attained in a given environment.

Safety Margins

The graph provides only an approximation of temperature rise. Actual temperature rise will vary due to enclosure layout, internal fan use, air movement in the vicinity of the enclosure, and other factors. Safety margins should be used in critical situations. A safety margin of 25% is recommended.

NOTE: Research has shown for every 18°F (10°C) rise above normal room temperature 72°- 75°F (22° - 24°C), the life expectancy of your electronics is cut in half.

Thermal Management
Heat Dissipation in Electrical Enclosures

Circulating Fans

The use of circulating fans in an enclosure will improve heat dissipation by as much as 10%. Circulating fans are most commonly employed to eliminate hot spots inside an enclosure. However, the temperature in the vicinity of a critical component can be much higher if it is producing a significant portion of the heat in the enclosure or if it is located near a large heat producing device such as a transformer or power supply. An internal circulating fan eliminates the resulting hot spots by mixing the air inside the enclosure.

Frequently, electrical devices in the enclosure are equipped with their own fans. In these instances, the addition of a fan to the enclosure will have a reduced effect. Where fans are not present on devices in the enclosure and overheating is a concern, circulating fans are recommended.

Glossary

BTU/hour = British Thermal Units/hour. One BTU is the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit.
Watts = Voltage x current.The thermal (heat) load in the enclosure
is measured in watts. One watt = 3.413 Btu/hour.
CFM = Cubic feet per minute (ft3/min.)
ΔT = Change in temperature.
°F = Degrees Fahrenheit
°C = Degrees Celsius

Heat Disspation Formula

Watts(dissipation) = .316 x CFM x ΔT(°F)

Determining Air Velocity Requirement for Heat Dissipation

1. Determine input power in watts per square feet by dividing the heat dissipated in the enclosure (in watts) by the enclosure surface area (in square feet).

2. Locate on the graph (see Fig. 1) the appropriate input power on the horizontal axis and draw a line vertically until it intersects the temperature rise curve.

3. Read horizontally to determine the enclosure temperature rise.

4. Calculate the cfm required using the following formula. Watts(dissipation) = .316 x CFM x ΔT(°F)

Example:
What is the temperature rise that can be expected from a 48x36x16 enclosure with 300 watts of heat dissipated within it?

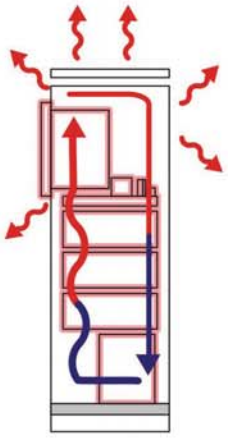
Solution:
Surface Area = 2[(48x36) + (48x16) + (36x16)]
÷ 144 = 42 square feet/

Input Power = 300÷42= 7.1 Watts/Square Foot

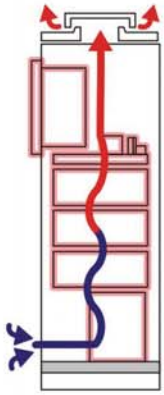
From Curve:Temperature Rise = 30° F (16.7°C)

CFM required = 7.1/(,316 x 30) = .75

Static Heat Dissipation

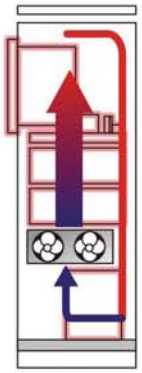


Heat dissipation by radiation and convection

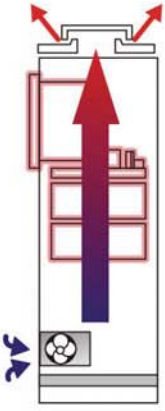


Heat dissipation by specially positioned enclosure ventilation slots

Dynamic Heat Dissipation



Forced air circulation via fans in sealed cabinets



Airflow through cabinet via fans (negative/positive pressure)