The SEL-3355-2 Computer uses a high-performance x86-64 architecture processor to support modern operating systems like Microsoft Windows and Linux. The extremely rugged SEL hardware of the SEL-3355-2 enables you to use your choice of computer operating system and software in very harsh environments not suitable for general purpose computers.

Integrate the SEL-3355-2 in computing applications that demand high performance, reliability, and low maintenance in extreme, harsh environments. The SEL-3355-2 offers a mean time between failure (MTBF) of at least ten times that of typical industrial computers by eliminating all moving parts, including rotating hard drives and fans; using high-quality solid-state drives; and using error-correcting memory technology. By eliminating vent holes, the SEL-3355-2 significantly reduces dust buildup and foreign contaminants. Dual modular, hot-swappable, ac/dc power supplies eliminate the need for external inverters and enhance system reliability, availability, and serviceability. You can install software from SEL and third-party software vendors to customize the SEL-3355-2 for your specific applications. Every SEL-3355-2 comes with the unprecedented ten-year, worldwide SEL warranty.

Major Features and Benefits

The SEL-3355-2 provides a rugged, easy-to-use computing platform for substation, industrial, or other harsh environments.

➤ **x86-64 Architecture.** The SEL-3355-2 uses the Intel Xeon E3 microprocessor architecture to deliver very high performance and broad operating system and software compatibility. Multiple processor cores and Intel Hyper-Threading Technology enable you to run multiple time-critical applications simultaneously. Choose between 2.0 GHz and 2.8 GHz quad-core CPU options.

➤ **Operating System Choices.** The SEL-3355-2 may be purchased as hardware only, or it may be purchased with a variety of modern Microsoft Windows operating systems to provide added flexibility and functionality along with enhanced security features.

➤ **Form Factor.** The SEL-3355-2 is built on a 19” rack-mount chassis, designed for substation and industrial control applications. The system includes rear-panel I/O connectors for linking to networks, peripherals, storage, video, audio, alarm, and serial I/O—all with protection against electrical shock and surge.
➤ **Power Supply.** The SEL-3355-2 supports two load-sharing, hot-swappable power supply modules, enabling you to power the SEL-3355-2 from two independent power sources for maximum availability and without needing to use inverters.

➤ **Mass Storage.** The SEL-3355-2 supports four 2.5-inch SATA drives, which are hot-swappable and accessible after removing the front drive-bay panel. High-performance, industrial-rated, solid-state drives (SSD) are available as ordering options.

➤ **RAID.** The integrated SATA controller supports Redundant Array of Independent Disks (RAID) configurations to maximize data availability and improve storage volume performance.

➤ **Display Interfaces.** DVI, DisplayPort, or HDMI video connections enable you to connect as many as three simultaneous, independent, high-definition displays.

➤ **Audio Interface.** Analog HD audio inputs and outputs enable connection to amplified speakers, microphone, and audio sources for clear audible user feedback, audio capture and analysis, and voice recognition. Digital audio can be streamed through the digital display interfaces for simple integration and high-definition surround-sound.

➤ **USB Connectivity.** The SEL-3355-2 has four rear-panel and two front-panel USB ports for connection to a local keyboard, mouse, and any USB peripherals. Each port is individually current-limited, protecting the system from external short circuits, and enabling high-power devices such as USB hard drives to be powered from any USB port.

➤ **PCIe Expansion.** The SEL-3355-2 supports as many as four standard PCIe form-factor expansion cards and one 32-bit PCI card, enabling you to customize the system I/O to meet your application needs. Choose from a selection of SEL PCIe expansion cards or install your own custom, third-party expansion card.

➤ **Ethernet.** Two 10/100/1000 Mbps Ethernet port connections on the rear panel support high-speed network connectivity and enable connections to independent networks or redundant paired network connections. Network interface cards such as the SEL-3390E4 Quad-Gigabit Ethernet Card can be added to the SEL-3355-2 for additional network connectivity.

➤ **Serial I/O.** Two standard EIA-232 serial ports enable connection to adjacent electronic devices such as automation controllers, communications radios, and modems. As many as four SEL-3390S8 Serial Expansion Cards can be added to the SEL-3355-2 for applications that require many serial I/O connections and IRIG time synchronization and distribution.

➤ **System Monitoring and Watchdog.** An embedded controller works in unison with the SEL SysMon software to provide an extra level of computer system reliability and to detect failures in the application software or operating system. The system logs any abnormal conditions, enables the system alarm to alert operators of a problem, and, if necessary, can perform a self-restart to return to a normal operating state.

➤ **Alarm Contact Output.** SEL SysMon software controls the alarm contact output to signal in case of system health problems or malfunctions. The Form C contact supports both normally open and normally closed alarm operation.

➤ **Remote Management.** The SEL-3355-2 supports remote access over Ethernet by using Windows Remote Desktop or Intel vPro Active Management Technology (AMT), enabling full access to system video, keyboard, mouse, and storage.
Functional Overview

Figure 1  Functional Diagram in Utility Substation Applications

Watchdog Functionality
An embedded controller provides an extra level of computer system reliability. One function of the embedded controller is to restart the computer if there is an operating system problem or a problem with specific software services running on the operating system.

SEL System Monitor
SEL System Monitor software monitors system performance and component health. Alerts for alarm conditions are issued on configurable thresholds. Example thresholds include CPU usage, free disk space, and available system memory.

Ethernet
Ethernet connections allow the SEL-3355-2 to connect to as many as ten separate, high-speed Ethernet networks via two built-in gigabit Ethernet ports, plus eight additional ports by using two SEL-3390E4 PCIe network interface cards. Aggregate several ports for increased performance or redundancy or separate local area networks (LANs) for control, data, or engineering access.

Time
The SEL-3390S8 serial expansion card accepts IRIG-B time-code input for precise time input and distribution to connected devices.

EIA-232/EIA-485/EIA-422 Ports
The SEL-3355-2 computing platform comes standard with two built-in EIA-232 DB-9 ports and, optionally, as many as 24 rear-panel EIA-232/422/485 ports with RJ45 format connectors by using the SEL-3390S8 PCIe serial expansion card. Serial expansion communications ports are software selectable to function as standard EIA-232/422/485 ports with +5 V power.

Alarm Output
An alarm contact output on the rear panel can be used to signal internal errors and operating system malfunctions.

Programmable LEDs
Program three front-panel bicolor LEDs for use with your custom applications.

Out-of-Band Management
Intel vPro Active Management Technology (AMT) provides out-of-band management for security, configuration, and monitoring.
Applications

Virtualization for HMI and Other Applications

Create your own virtualization appliance by leveraging Intel Virtualization Technology (VT-x) to allow one hardware platform to function as multiple “virtual” platforms. Isolate your computing activity onto separate virtual machines to maintain productivity and realize improved manageability and reduced downtime. For example, run a virtualized OS specifically for your HMI or other essential but noncritical applications. Should your HMI require that the system be restarted, simply restart the virtual machine and avoid an outage for your other critical processes. Similarly, multiple SEL-3355-2 computing platforms may be virtualized and entire operating systems transparently migrated from one physical SEL-3355-2 to another for hardware upgrades, security or software updates, or testing purposes.

Control System Applications

Use the SEL-3355-2 for process control applications, including as an HMI or for protocol conversion and high-speed control when working with other SEL products and solutions.

Security Applications

Improve security with a single sign on (SSO), enabled through using the SEL-3355-2 as a local Lightweight Directory Access Protocol (LDAP) server. Centrally manage user accounts and group memberships with Microsoft Active Directory or with your choice of back-end database support.

Event Collection Applications
Front- and Rear-Panel Diagrams

**Figure 7** SEL-3355-2 Front Panel

1. **LAMP TEST** Button. Press and hold to test front-panel LEDs. Can be programmed to be an on/off or reset button.
2. **ENABLED** and **ALARM** LEDs provide operational status. A green ENABLED LED indicates normal operation. The ALARM LED illuminates red when a nonoptimal system condition exists.
3. **ETHERNET** Status Indicators. Link (LNK) indicates that the port is connected, and activity (ACT) indicates when data are being transmitted and received.
4. **SERIAL** Status indicators. Transmit (TX) and receive (RX) LEDs indicate activity on serial ports.
5. **PINHOLE** Button. Provides reset and power functions; requires a pushpin to prevent accidental use.
6. **HDD** Activity Indicator. Illuminates when SATA drives are accessed.
7. **AUXILIARY** Status Indicators. Three programmable, bicolor LEDs for your custom application.
8. **USB** Ports. Two easily accessible ports to connect USB 3.1 peripherals.
9. **SATA** Drive Bay. Removable cover plate enables easy access to SATA drives from the front panel.
10. **DVI-D**. Connect digital monitors by using native DVI or an HDMI adapter.
11. **ETH1** and **ETH2**. Onboard independent Gigabit Ethernet interfaces.
12. **USB** Ports. Connect as many as four USB 3.1 peripherals at the rear panel.
13. **AUDIO** Ports. Line Input (blue), Line Output (green), and Microphone Input (pink).
15. **DISPLAYPORT**. Connect new digital monitors supporting the DisplayPort interface.
16. **ALARM**. The Form C alarm contact output can be wired either normally closed or normally open.
17. **PCI** Expansion Slots. Install SEL or third-party PCI or PCI Express expansion cards for additional network, serial, or other application-specific I/O.
18. **Earth Ground** Terminal Screw. The earth ground connection for the SEL-3355-2.
19. **POWER** Supply Modules. The rated input voltage is clearly marked on the chassis near the terminals.

**Figure 8** SEL-3355-2 Rear Panel
Product Dimensions

Figure 9  SEL-3355-2 Dimensions for Rack- and Panel-Mount Models
## Specifications

### Compliance

- Designed and manufactured under an ISO 9001 certified quality management system
- 47 CFR 15B, Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

- UL Recognized to U.S. and Canadian safety standards (File E220228; NRAQ)
- CE Mark
- RCM Mark
- RoHS Compliant

### General

#### Supported Operating Systems

- Microsoft Windows 7
- Microsoft Windows 8/8.1
- Microsoft Windows 10*
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2016*
- Microsoft Windows Server 2019*
- CentOS Linux 6
- CentOS Linux 7
- Red Hat Enterprise Linux 6
- Red Hat Enterprise Linux 7
- VMware ESXi 5.x and 6.0

* Orderable as a factory-installed option.

#### CPU

- Intel Xeon E3-1505L Quad-Core
  - Speed: 2.0 GHz base, 2.8 GHz turbo
  - Cache: 1 MB L2, 8 MB L3

- Intel Xeon E3-1505M Quad-Core
  - Speed: 2.8 GHz base, 3.7 GHz turbo
  - Cache: 1 MB L2, 8 MB L3

#### RAM

- 4–32 GB DDR4 ECC PC4-17000 (2133 MHz)

### Chipset

- Intel CM236 Chipset

### Mass Storage

- Internal Drive Bay: Supports 2.5 inch SATA drives, four industrial-grade drives, two consumer-grade drives
- Intel CM236 SATA Controller provides standard AHCI and Intel RST RAID modes
- SATA II 3.0 Gb/s
- RAID level 0, 1, 5, 10
- Hot-Swap Support

#### Optional SATA Drives

- Industrial-Grade SLC SSD 30–250 GB
  - 10-year warranty
- Industrial-Grade mLC SSD 120–480 GB
  - 5-year warranty
- Consumer-Grade MLC SSD 240–1920 GB
  - 3-year warranty

### Video

- Intel P530 Graphics Controller
  - Three Independent Displays:
    - DVI-D (digital only) maximum resolution 1920 x 1200 @ 60 Hz
    - DisplayPort 1.2 maximum resolution 4096 x 2304 @ 60 Hz
    - Cable length <10 m

### Audio

- TSI (IDT) 92HD91 HD Audio Codec
  - 3 Analog 3.5 mm TRS Jacks:
    - Line input
    - Line/headphone output
    - Microphone input
  - Cable length <2 m

- Intel Display Audio
  - Digital Audio Outputs: DVI-D1, DVI-D2, DisplayPort

### USB

- 4 Rear-Panel Ports, 2 Front-Panel Ports
- USB 3.1 Compliant
  - 2000 mA Maximum Current Each
  - Cable Length <2 m
- 2 Internal Ports on 1 Main Board Header
- USB 2.0 Compliant

#### Expansion Cards

- 5 Half-Length, Full-Height PCI Expansion Card
- 2 PCIe x4 (Revision 2.0) Slots:
  - 1 32-bit 5 V PCI

### Ethernet

- 2 Rear-Panel 1 Gb Copper RJ45 Ports
  - ETH1: Intel WGI219LM, 10/100/1000 Mbps RJ45 copper
  - ETH2: Intel WGI210IT, 10/100/1000 Mbps RJ45 copper

- Optional SEL-3390E4 PCIe x1 Expansion Cards:
  - As many as 8 additional 10/100/1000 Mbps ports, copper or LC fiber SFP

### Serial Ports

- Standard Ports: 2 EIA-232 ports, DB-9 connectors
  - 300 to 115200 bps

- Optional SEL-3390S8 PCIe x1 Expansion Cards:
  - As many as 24 additional EIA-232/422/485 ports, RJ45 connectors 300 to 921600 bps
  - (Meets EIA/TIA-562 Specifications)

### Time-Code Input/Output

- Main Board (Input Only)
  - Connector: COM1 DB-9 serial port
  - Time-Code: Demodulated IRIG-B TTL compatible
SEL-3390S8 Expansion Card (Input/Output)

- **Connector:** RJ45 serial port
- **Time-Code:** Demodulated IRIG-B TTL compatible

**Note:** Output generated from either IRIG-B input or SEL-3355-2 clock.

- **Real-Time Clock/Calendar**
  - **Battery Type:** IEC No. BR2335 Lithium
  - **Battery Life:** 10 years with power
  - 2 years without power

- **BIOS**
  - AMI UEFI

- **Trusted Platform Module**
  - Infineon SLB 9670VQ2.0 TPM 2.0

- **Intel Active Management Technology**
  - Intel AMT v11, accessible through ETH1

- **Power Supply**
  - See Table 1 for additional burden information.

  **SEL-9331 160 W LV Power Supply**
  - **Voltage Rating:** 48 Vdc
  - **Voltage Range:** 38–58 Vdc
  - **Maximum Constant Burden:** 178 W
  - **Maximum Peak Burden:** 225 W
  - **DC Ripple:** <15% rated voltage
  - **Peak Inrush:** 20 A
  - **Insulation:** 3600 Vdc
  - **Input Isolated From Chassis Ground:** Yes

  **SEL-9331 160 W HV Power Supply**
  - **Voltage Ratings:** 125/250 Vdc or 120/220/240 Vac; 50/60 Hz
  - **DC Range:** 100–300 Vdc
  - **Maximum DC Dropout:** 88 Vdc
  - **AC Range:** 85–264 Vac
  - **Frequency Range:** 45–65 Hz
  - **Maximum Constant Burden:** 188 W, 194 VA
  - **Maximum Peak Burden:** 240 W, 248 VA
  - **DC Ripple:** <15% Rated Voltage
  - **Peak Inrush:** 20 A
  - **Insulation:** 3600 Vdc
  - **Power Factor:** >0.9 (at full load)
  - **Input Isolated From Chassis Ground:** Yes

**Fuse Ratings**

- **LV Power Supply Fuse**
  - **Rating:** 15 A
  - **Maximum Rated Voltage:** 500 Vdc, 500 Vac
  - **Breaking Capacity:** 20 kA at 500 Vdc
  - **Type:** Time-lag T

- **HV Power Supply Fuse**
  - **Rating:** 5 A
  - **Maximum Rated Voltage:** 250 Vdc, 277 Vac
  - **Breaking Capacity:** 1500 A at 277 Vac
  - **Type:** Time-lag T

- **Heater Fuses F2, F3:**
  - 5 A, 125 V slow blow
  - 125 Vdc/50 A break rating

Fuses are not serviceable.

**Alarm Output Contact**

- **Per IEC 255-0:20:1974, using the simplified method of assessment**
  - **Output Type:** Relay, Form C, break-before-make
  - **Power Supply Burden:** <1 W maximum
  - **Mechanical Life:** 2000000 operations
  - **Operational Voltage:** 250 Vac/Vdc
  - **Make:** 30 A at 250 Vdc
  - **Carry:** 6 A continuous at 70°C
  - **1 s Rating:** 50 A
  - **MOV Protection:** 270 Vac/360 Vdc, 75 J
  - **Insulation Voltage:** 300 Vac/Vdc
  - **Pickup Time:** <8 ms
  - **Dropout Time:** <8 ms
  - **Breaking Capacity (10000 operations):**
    - 24 V 0.75 A L/R = 40 ms
    - 48 V 0.50 A L/R = 40 ms
    - 125 V 0.30 A L/R = 40 ms
    - 250 V 0.20 A L/R = 40 ms
  - **Cyclic Capacity (2.5 cycles/second):**
    - 24 V 0.75 A L/R = 40 ms
    - 48 V 0.50 A L/R = 40 ms
    - 125 V 0.30 A L/R = 40 ms
    - 250 V 0.20 A L/R = 40 ms

**Terminal Connections**

- **Compression Screw Terminal**

- **Power Wiring**
  - **Insulation:** 300 V min.
  - **Size:** 12–18 AWG

- **Alarm Wiring**
  - **Insulation:** 300 V min.
  - **Size:** 12–18 AWG

- **Tightening Torque**
  - **Minimum:** 0.6 Nm (5 in-lb)
  - **Maximum:** 0.8 Nm (7 in-lb)

- **Crimp Ferrule Recommended**
Mounting Ear Tightening Torque
- Minimum: 0.18 Nm (1.6 in-lb)
- Maximum: 0.25 Nm (2.2 in-lb)

Grounding Screw
- Insulation: 300 V min.
- Size: 12 AWG, length <3 m

Ground Wiring
- Tightening Torque:
  - Minimum: 0.9 Nm (8 in-lb)
  - Maximum: 1.4 Nm (12 in-lb)
  - Ring Terminal Recommended

Serial Port
- Tightening Torque:
  - Minimum: 0.6 Nm (5 in-lb)
  - Maximum: 0.8 Nm (7 in-lb)

Video Port
- Tightening Torque:
  - Minimum: 0.6 Nm (5 in-lb)
  - Maximum: 0.8 Nm (7 in-lb)

Temperature Range
- Operating
  - With E3-1505L CPU: –40° to +75°C (~–40° to +167°F)
  - With E3-1505M CPU: –40° to +60°C (~–40° to +140°F)
  - Note: UL ambient 40°C. See Safety Information in the SEL-3355-2 Instruction Manual for additional restrictions.
- Storage
  - –40° to +85°C (~–40° to +185°F)

Relative Humidity
- 5% to 95% noncondensing

Maximum Altitude
- 5000 m

Atmospheric Pressure
- 80–110 kPa

Overvoltage Category
- Category II

Insulation Class
- 1

Pollution Degree
- 2

Weight
- 9.072 kg (20 lb) maximum

Product Standards
- Communications Equipment in Utility Substations: IEC 61850-3:2013
- Industrial Environment: IEC 61000-6-2:2005
- IEC 60100-6-4:2006
- Electrical Equipment for Measurement, Control, and Laboratory Use: IEC 61010-1-2013
- IEC 61010-1-2016
- UL 61010-1-2017
- Measuring Relays and Protection Equipment: IEC 60255-26:2013
- IEC 60255-27:2013

Electromagnetic Compatibility Emissions
- Conducted and Radiated Emissions:
  - CISPR 11:2009 + A1:2010
  - CISPR 22:2008
  - CISPR 32:2015
  - IEC 61000-6-4:2006
  - IEC 61850-3:2013
  - FCC 15.107:2014
  - Severity Level: Class A
- Harmonic Current: IEC 61000-3-2:2014
  - Severity Level: Class A
- Voltage Flicker: IEC 61000-3-3:2013

Electromagnetic Compatibility Immunity
- Conducted RF: IEC 61000-4-6:2013
  - Severity Level: 10 Vrms
- Electrostatic Discharge:
  - IEEE C37.90.3-2001
  - Severity Level:
    - 2, 4, 6, 8 kV contact discharge
    - 2, 4, 8, 15 kV air discharge
- Fast Transient/Burst:
  - IEC 61000-4-4:2012
  - Severity Level: Class A
  - 4 kV, 5 kHz on power supply and outputs
  - 2 kV, 5 kHz on communications lines
- Magnetic Field:
  - IEC 61000-4-8:2009
  - Severity Level:
    - 100 A/m for 3 s
    - 100 A/m for 1 m
- Power Supply:
  - IEC 61000-4-11:2004
  - Severity Level:
    - 1000 A/m for 3 s
  - IEEE C37.90.2-2004
  - 100 A/m for 1 m
- Radiated Radio Frequency:
  - IEC 61000-4-3:2006 + A1:2010
  - Severity Level: 10 V/m
  - IEEE C37.90.2-2004
- Surge Withstand Capability:
  - Severity Level:
    - Power supply and outputs
    - 2.5 kV peak common mode
    - 1.0 kV peak differential mode
    - Communications ports
    - 1.0 kV peak common mode
  - IEEE C37.90.1-2012
- Surge Immunity:
  - IEC 61000-4-5:2005
  - Severity Level:
    - 1 kV line-to-line
    - 2 kV line-to-earth
    - 2 kV communications ports
Environmental

Change of Temperature: IEC 60068-2-14:2009
Severity Level: 5 cycles, 1°C per minute ramp
-40°C to +60°C (E3-1505M CPU)
-40°C to +75°C (E3-1505L CPU)

Cold, Operational: IEC 60068-2-1:2007
Severity Level: 16 hours at −40°C

Cold, Storage: IEC 60068-2-1:2007
Severity Level: 16 hours at −40°C

Damp Heat, Cyclic: IEC 60068-2-30:2005
Severity Level:
12 + 12-hour cycle
25°C to 55°C, 6 cycles, >93% r.h.

Severity Level:
40°C, 240 hours, >93% r.h.

Dry Heat, Operational: IEC 60255-1:2009
IEC 61850-3:2013
IEC 60068-2-2:2007
Severity Level:
16 hours at 60°C (E3-1505M CPU)
16 hours at 75°C (E3-1505L CPU)

Dry Heat, Storage: IEC 60255-1:2009
IEC 61850-3:2013
IEC 60068-2-2:2007
Severity Level: 16 hours at 85°C

Free Fall: IEEE 1613-2009
Severity Level: 100 mm

Vibration: IEC 60255-21-1:1988
Severity Level:
Endurance Class 2
Response Class 2
IEC 60255-21-2:1988
Severity Level:
Shock Withstand, Bump Class 1
Shock Response Class 2
IEC 60255-21-3:1993
Severity Level:
Quake Response Class 2

Safety

Severity Level: IP30

Dielectric Strength: IEC 60255-27:2013
IEEE C37.90-2005
Severity Level:
3600 Vdc on power supply
2500 Vac on contact output
1500 Vac Ethernet ports
Type tested for one minute

Impulse: IEC 60255-27:2013
IEEE C37.90-2005
Severity Level:
5 kV common mode, power supply, contact outputs
1.5 kV Ethernet ports
### Table 1  System Power Consumption

<table>
<thead>
<tr>
<th>Component</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base System (E3-1505L CPU, 1 PSU, 4GB RAM, 1 SATA Drive):</td>
<td>25 W</td>
<td>35 W</td>
<td>50 W</td>
</tr>
<tr>
<td>Additional Consumption From Optional Components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3-1505M CPU:</td>
<td>+2 W</td>
<td>+5 W</td>
<td>+13 W</td>
</tr>
<tr>
<td>2nd Power Supply:</td>
<td>+10 W</td>
<td>+10 W</td>
<td>+13 W</td>
</tr>
<tr>
<td>8–32 GB RAM Configuration:</td>
<td>+2 W</td>
<td>+2 W</td>
<td>+3 W</td>
</tr>
<tr>
<td>Additional SATA Drives, Each:</td>
<td>+1 W</td>
<td>+2 W</td>
<td>+3 W</td>
</tr>
<tr>
<td>SEL-3390E4 Ethernet Card</td>
<td>+6 W</td>
<td>+8 W</td>
<td>+10 W</td>
</tr>
<tr>
<td>SEL-3390S8 Serial Card</td>
<td>+4 W</td>
<td>+5 W</td>
<td>+7 W</td>
</tr>
<tr>
<td>Chipset Heater(^b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cold startup (&lt;5°C [41°F]):</td>
<td>N/A</td>
<td>N/A</td>
<td>+90 W</td>
</tr>
<tr>
<td>continuous operation (0°C [32°F]):</td>
<td>0 W</td>
<td>+5 W</td>
<td>+10 W</td>
</tr>
<tr>
<td>continuous operation (–40°C [–40°F]):</td>
<td>0 W</td>
<td>+20 W</td>
<td>+40 W</td>
</tr>
</tbody>
</table>

---

\(^a\) Minimum: 0% load on all components; minimum power consumption started and idle.
Typical: 25%–50% load on all components; good indication of most application loads.
Maximum: 100% load on all components; generally cannot be reached in normal applications.
\(^b\) Chipset heaters operate at low temperatures to keep the CPU and PCH within specified operating limits.

### Table 2  Peripheral Connection Rated Current Output

<table>
<thead>
<tr>
<th>Connection</th>
<th>Current Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVI-D</td>
<td>0.2 A, +5 Vdc, 1 W total for both</td>
</tr>
<tr>
<td>DisplayPort</td>
<td>0.6 A, +3.3 Vdc, 2 W</td>
</tr>
<tr>
<td>COM 1 and COM 2</td>
<td>0.5 A, +5 Vdc, 2.5 W each</td>
</tr>
<tr>
<td>USB Ports</td>
<td>2 A, +5 Vdc, 10 W each, 25 W all ports combined</td>
</tr>
</tbody>
</table>