MEPNN Supplier Scouting Opportunity Synopsis

Section 1: General Information

Scouting Number	2025-212
Item to be Scouted	HVAC Controls - Alternates to IDEC
Days to be scouted	30
Response Due By	07/20/2025
Description	DEW Construction (GC), our trade partner (Thomas Mechanical, Inc.) and their 2nd tier HVAC controls integration contractor need assistance sourcing BABAA compliant HVAC controls components. This project is for the Burlington Vermont

Section 2: Technical Information

Type of supplier being sought	Manufacturer
Reason	BABA
Describe the manufacturing processes (elaborate to provide as much detail as possible)	Includes but is not limited to electronic/electrical assembly, PCB fabrication and assembly, software programming, and system integration.
Provide dimensions / size / tolerances / performance specifications for the item	- (230913 I&C for HVAC.pdf) See attached CSI Specification section #230913 Instrumentation and Control Devices for HVAC. - (230923 DDC System for HVAC.pdf) Selected system components will be required to interface with the selected Direct-Digital Control System for HVAC (CSI #230923). - (NIST Grant Award Letter to Burlington School District.pdf) Provides information on the project - Document with "Parts List" in the title lists the component, in which, a compliant alternative / compliant alternatives is/are needed - Additional documents provide specifications on the item(s), in which, a compliant alternative / compliant alternatives is/are needed
List required materials needed to make the product, including materials of product components	Unknown, this is not standard information listed in a product data submittal and has no bearing on the engineer of record's acceptance of this product. If information is necessary for sourcing, please refer to product data sheets provided.
Are there applicable certification requirements?	Yes
Certification(s) required	UL
Are there applicable regulations?	No
Are there any other stndards, requirements, etc.?	No
Additional Technical Comments	At this time, we do not know who will be providing the DDC system. AutomatedLogic is already in use by the Burlington School District and there is a specification requirement for this project stating, "The system shall be an extension of and integrated into, the building automation system at the Burlington Central School District." Systems utilizing either AutomatedLogic (client preferred) and KMC Controls have been proposed. However, neither system is fully BABAA compliant.

Section 4: Business Information

Estimated potential business volume	Please see attached Parts List. Quantity and unit prices are identified. This will be a one-time order for this project.

Estimated target price / unit cost information (if unavailable explain)	Please see attached Parts List. Quantity and unit prices are identified. This will be a one-time order for this project.
When is it needed by?	Immediately!!! Compliant HVAC controls are critical to the project schedule. Substantial Completion is 12 weeks away as of this submission dated 2025-06-11. No HVAC controls means no equipment startup, balancing, or commissioning.
Describe packaging requirements	Packaging is to be determined by the manufacturer such that equipment arrives undamaged.
Where will this item be shipped?	South Burlington, VT 05495

Additional Comments

Is there other information you would like to include?	Funding Agency: Department of Commerce, National Institute of Standards and Technology. Attached for reference is the grant award letter provided to Burlington High School for this project. DEW Construction, BABAA Contact: Michael Snyder, Cell: (802) 798-4976, Email: msnyder@dewconstruction.com

SECTION 23 0913

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control panels.

B. Control Valves:
   1. Ball valves with factory-mounted actuators.
   2. Electronic valve operators.

C. Dampers.

D. Damper Operators:
   1. Electric operators.
   2. Inlet vane operators.

E. Wall-, Surface-, and Duct-Mounted Sensors:
   1. Temperature sensors.
   2. Static air pressure sensors.

F. Thermostats:
   1. Room sensor with occupant override and adjustment.
   2. Freezestats.
   3. Line voltage thermostats.
   4. Room-mount thermostat accessories.
   5. Outdoor-reset thermostats.
   6. Airstream thermostats.

G. Energy Metering:
   1. Watt-hour revenue meters (with and without demand register).
   2. Watt or watt-hour transducers.

1.02 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating.

B. ANSI C12.1 - Electric Meters - Code for Electricity Metering.

C. ANSI C12.10 - Physical Aspects of Watthour Meters - Safety Standard.

D. ANSI C12.20 - American National Standard for Electricity Meters - 0.2 and 0.5 Accuracy Classes.

E. ANSI/FCI 70-2 - Control Valve Seat Leakage.

F. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks.

G. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Manufacturer's Instructions: Provide for all manufactured components.

E. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

F. Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

2.03 CONTROL VALVES

A. Ball Valves with Factory-Mounted Actuators:
   1. Manufacturers:
      a. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle.
      b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.
      c. KMC Controls: www.kmccontrols.com/#sle.
   2. Service: Use for hot water.
   3. Flow Characteristic: Include 2-way operation configured to fail normally open (NO).
   4. Replacements in Kind: Provide pressure-independent type.
   5. Rangeability: 500 to 1.
   6. ANSI Rating: Class 150.
   7. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
   8. Body Size:
      a. Under 2-1/2 inches:
         1) Connection: NPT.
         2) Materials:
            (a) Body: Brass.
            (b) Flanges: Ductile iron.
            (c) Ball: Chrome-plated brass.
            (d) Stem: Nickel-plated brass.
            (e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
            (f) Stem Seal: EPDM O-Rings.
            (g) Flow Control Disk: Thermoplastic synthetic-resin.
      b. 2-1/2 inches and Above:
         1) Connection Type: Flanged.
         2) Materials:
            (a) Body: Brass.
            (b) Flanges: Ductile iron.
            (c) Ball: 300 series stainless steel.
            (d) Stem: 300 series stainless steel.

(e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
(f) Stem Seal: EPDM O-Rings.
(g) Flow Control Disk: Thermoplastic synthetic-resin.

c. Service Temperature:
1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
2) Ambient Side: From minus 4 to 122 degrees F.

9. Actuator Requirements:
a. Assembly: Factory-mounted.
b. Input: 0 to 10 VDC configured for proportional control.
c. Accessories: Provide with valve position indicator and manual override.

B. Electronic Valve Actuators:
1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
2. Select operator for full shut-off at maximum pump differential pressure.

2.04 DAMPERS

A. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch.

B. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gage, 0.0299 inch, attached to minimum 1/2 inch shafts with set screws.

C. Blade Seals: Synthetic elastomeric, inflatable, mechanically attached, field replaceable.

D. Jamb Seals: Spring stainless steel.

E. Shaft Bearings: Oil impregnated sintered bronze.

F. Linkage Bearings: Oil impregnated sintered bronze.

2.05 DAMPER OPERATORS

A. General:
1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.
2. Provide spring return for two position control and for fail safe operation.
3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
4. Provide one operator for maximum 36 sq ft damper section.
5. See Section 25 3513 for field-mount damper actuators and operators.

B. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.

C. Electric Operators:
1. Spring return, adjustable stroke motor having oil immersed gear train.

D. Inlet Vane Operators:
1. High pressure with pilot positioners and sufficient force to move vanes when fan is started with vanes in closed position. Return vane operator to closed position on fan shutdown.

2.06 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

A. Temperature Sensors:

1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
4. Temperature Sensing Device: Compatible with project DDC controllers.
5. Performance Characteristics:
    a. Room Temperature Sensors:
        1) Construct for surface or wall box mounting.
        2) Provide the following:
            (a) Setpoint reset slide switch with an adjustable temperature range.
            (b) Individual heating/cooling setpoint slide switches.
            (c) Momentary override request push button for activation of after-hours operation.
            (d) Analog thermometer.

B. Static-Air Pressure Sensors:
1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
3. Accuracy: One percent of full scale with repeatability 0.3 percent.
4. Output: 0 to 5 vdc with power at 12 to 28 vdc.

2.07 THERMOSTATS

A. Electric Thermostats:
1. Manufacturers:
2. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
3. Service: Cooling only.
4. Covers: Locking with set point adjustment, with thermometer.

B. Freezestats:
1. Configuration: Vapor-filled capillary.
2. Probe Sensing Length: 20 feet.
3. Setpoint Adjust Control: Screw with manual reset switch.
4. Switch Type: SPDT, snap-action, form C in dust-protected enclosure.
5. Mounting: Locate on cooling coil intake side.
6. Field Interface: Connect load line-voltage to starter.
7. Electrical Rating: As indicated on drawings.

C. Line Voltage Thermostats:
1. Dead Band: Maximum 2 degrees F.
2. Cover: Locking with set point adjustment, with thermometer.
3. Rating: Motor load.

D. Room-Mounted Thermostat Accessories:
1. Thermostat Covers: Brushed aluminum.
2. Insulating Bases: For thermostats located on exterior walls.
3. Thermostat Guards: Metal mounted on separate base.

E. Outdoor Reset Thermostats:
1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
2. Scale range: Minus 10 to 70 degrees F.

F. Airstream Thermostats:

1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
2. Averaging service remote bulb element: 7.5 feet.

2.08 ENERGY METERING

A. kW Transducers: See Section 25 3616.

B. Power Metering and Sub-meterering:
   1. Digital Register:
      a. ANSI C12.1 and ANSI C12.20, accuracy class of 0.5 power usage (kWh) meter.
      b. Provide meter socket in accordance with ANSI C12.10.
      c. Current rating not to exceed two amperes, voltage not to exceed 500 V, V/A combinations not to exceed 100 V/A, life rating of one billion operations.
   2. Usage (kWH) and Demand (kW) Register:
      a. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135, BACnet MS/TP.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of [] with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches.

C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of .

3.03 MAINTENANCE

A. Provide service and maintenance of control system for one year from Date of Substantial Completion.

END OF SECTION

SECTION 23 0923

DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. System description.

B. Operator interface.

C. Controllers.

D. Power supplies and line filtering.

E. System software.

F. Controller software.

1.02 RELATED REQUIREMENTS

A. Section 23 0913 - Instrumentation and Control Devices for HVAC.

B. Section 23 0993 - Sequence of Operations for HVAC Controls.

C. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for each system component and software module.

C. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
   3. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   4. Indicate description and sequence of operation of operating, user, and application software.

D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.
   2. Include submittals data in final "Record Documents" form.

E. Operation and Maintenance Data:
   1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
   2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
   3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 70.

B. Designer Qualifications: Perform design of system using manufacturer's software under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer's warranty for field programmable micro-processor based units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Honeywell International, Inc: www.honeywell.com/#sle.

B. Johnson Controls, Inc: www.johnsoncontrols.com/#sle.

C. Schneider Electric: www.schneider-electric.us/#sle.

D. Distech Controls.

2.02 SYSTEM DESCRIPTION

A. The system shall be an extension of and integrated into, the building automation system at the Burlington CSD.

B. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.

C. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

D. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

E. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 0913.

F. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

G. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 OPERATOR INTERFACE

A. PC Based Work Station:

B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.

C. BACnet protocol to comply with ASHRAE Std 135.

D. Hardware:
   1. Laptop:
      a. Laptop(s) to be provided by DDC controls manufacturer.
      b. Quantity: One.
      c. Network Connection:
         1) Ethernet interface card.

2.04 CONTROLLERS

A. Building Controllers:
   1. General:
      a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.

b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
c. Share data between networked controllers.
d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
e. Utilize real-time clock for scheduling.
f. Continuously check processor status and memory circuits for abnormal operation.
g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
h. Communication with other network devices to be based on assigned protocol.

2. Communication:
a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
b. Perform routing when connected to a network of custom application and application specific controllers.
c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
a. Outdoors and/or in Wet Ambient Conditions:
1) Mount within waterproof enclosures.
2) Rated for operation at 40 to 150 degrees F.
b. Conditioned Space:
1) Mount within dustproof enclosures.
2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:
a. Diagnostic LEDs for power, communication, and processor.
b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:
a. Maintain operation at 90 to 110 percent of nominal voltage rating.
b. Perform orderly shutdown below 80 percent of nominal voltage.
c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

B. Custom Application Controller:
1. General:
a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
b. Share data between networked, microprocessor based controllers.
c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
d. Utilize real-time clock for scheduling.
e. Continuously check processor status and memory circuits for abnormal operation.
f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
g. Communication with other network devices to be based on assigned protocol.

2. Communication:

a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F.
4. Provisions for Serviceability:
   a. Diagnostic LED's for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

C. Application Specific Controllers:
1. General:
   a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
   b. Customized for operation within the confines of equipment served.
   c. Communication with other network devices to be based on assigned protocol.
2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F.
4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.

c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.

D. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
2. All Input/Output Points:
a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
3. Binary Inputs:
a. Allow monitoring of On/Off signals from remote devices.
b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
c. Sense dry contact closure with power provided only by the controller.
4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
5. Analog Inputs:
a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
b. Compatible with and field configurable to commonly available sensing devices.
6. Binary Outputs:
a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
b. Outputs provided with three position (On/Off/Auto) override switches.
c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
7. Analog Outputs:
a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
c. Drift to not exceed 0.4 percent of range per year.
8. Tri State Outputs:
a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
9. System Object Capacity:
a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.05 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:

1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
2. Limit connected loads to 80 percent of rated capacity.
3. Match DC power supply to current output and voltage requirements.
4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
7. Operational Ambient Conditions: 32 to 120 degrees F.
8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:
1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
2. Minimum surge protection attributes:
a. Dielectric strength of 1000 volts minimum.
b. Response time of 10 nanoseconds or less.
c. Transverse mode noise attenuation of 65 dB or greater.
d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.06 LOCAL AREA NETWORK (LAN)

A. Provide communication between control units over local area network (LAN).

B. LAN Capacity: Not less than 60 stations or nodes.

C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

D. LAN Data Speed: Minimum 19.2 Kb.

E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

F. Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.

G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.07 SYSTEM SOFTWARE

A. Operating System:
1. Concurrent, multi-tasking capability.
a. Common Software Applications Supported: Microsoft Excel.
2. System Graphics:
a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
b. Animation displayed by shifting image files based on object status.
c. Provide method for operator with password to perform the following:
1) Move between, change size, and change location of graphic displays.
2) Modify on-line.
3) Add, delete, or change dynamic objects consisting of:
(a) Analog and binary values.
(b) Dynamic text.

(c) Static text.
(d) Animation files.

3. Custom Graphics Generation Package:
   a. Create, modify, and save graphic files and visio format graphics in PCX formats.
   b. HTML graphics to support web browser compatible formats.
   c. Capture or convert graphics from AutoCAD.
4. Standard HVAC Graphics Library:
   a. HVAC Equipment:
   b. Ancillary Equipment:
   c. File Format Compatible with Graphics Generation Package Program.

B. Workstation System Applications:
1. Automatic System Database Save and Restore Functions:
   a. Current database copy of each Building Controller is automatically stored on hard disk.
   b. Automatic update occurs upon change in any system panel.
   c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
   a. Save database from any system panel.
   b. Clear a panel database.
   c. Initiate a download of a specified database to any system panel.
3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
4. On-line Help:
   a. Context-sensitive system assists operator in operation and editing.
   b. Available for all applications.
   c. Relevant screen data provided for particular screen display.
   d. Additional help available via hypertext.
5. Security:
   a. Operator log-on requires user name and password to view, edit, add, or delete data.
   b. System security selectable for each operator.
   c. System supervisor sets passwords and security levels for all other operators.
   d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
   e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
   f. All system security data stored in encrypted format.
6. System Diagnostics:
   a. Operations Automatically Monitored:
      1) Workstations.
      2) Printers.
      3) Modems.
      4) Network connections.
      5) Building management panels.
      6) Controllers.
   b. Device failure is annunciated to the operator.
7. Alarm Processing:
   a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
   b. Configurable Objects:
      1) Alarm limits.

2) Alarm limit differentials.
3) States.
4) Reactions for each object.

8. Alarm Messages:
   a. Descriptor: English language.
   b. Recognizable Features:
      1) Source.
      2) Location.
      3) Nature.
9. Configurable Alarm Reactions by Workstation and Time of Day:
   a. Logging.
   b. Printing.
   c. Starting programs.
   d. Displaying messages.
   e. Dialing out to remote locations.
   f. Paging.
   g. Providing audible annunciation.
   h. Displaying specific system graphics.
10. Custom Trend Logs:
   a. Definable for any data object in the system including interval, start time, and stop time.
   b. Trend Data:
      1) Sampled and stored on the building controller panel.
      2) Archivable on hard disk.
      3) Retrievable for use in reports, spreadsheets and standard database programs.
      4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
      5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
11. Alarm and Event Log:
   a. View all system alarms and change of states from any system location.
   b. Events listed chronologically.
   c. Operator with proper security acknowledges and clears alarms.
   d. Alarms not cleared by operator are archived to the workstation hard disk.
12. Object, Property Status and Control:
   a. Provide a method to view, edit if applicable, the status of any object and property in the system.
   b. Status Available by the Following Methods:
      1) Menu.
      2) Graphics.
      3) Custom Programs.
13. Reports and Logs:
   a. Reporting Package:
      1) Allows operator to select, modify, or create reports.
      2) Definable as to data content, format, interval, and date.
      3) Archivable to hard disk.
   b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
   c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
   d. Set to be printed on operator command or specific time(s).
14. Reports:

a. Standard:
    1) Objects with current values.
    2) Current alarms not locked out.
    3) Disabled and overridden objects, points and SNVTs.
    4) Objects in manual or automatic alarm lockout.
    5) Objects in alarm lockout currently in alarm.
    6) Logs:
        (a) Alarm History.
        (b) System messages.
        (c) System events.
        (d) Trends.
b. Custom:
    1) Daily.
    2) Weekly.
    3) Monthly.
    4) Annual.
    5) Time and date stamped.
    6) Title.
    7) Facility name.
c. Tenant Override:
    1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
    2) Annual report showing override usage on a monthly basis.
d. Electrical, Fuel, and Weather:
    1) Electrical Meter(s):
        (a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
        (b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.
    2) Fuel Meter(s):
        (a) Monthly showing daily natural gas consumption for each meter.
        (b) Annual summary showing monthly consumption for each meter.
    3) Weather:
        (a) Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.

C. Workstation Applications Editors:
1. Provide editing software for each system application at PC workstation.
2. Downloaded application is executed at controller panel.
3. Full screen editor for each application allows operator to view and change:
    a. Configuration.
    b. Name.
    c. Control parameters.
    d. Set-points.
4. Scheduling:
    a. Monthly calendar indicates schedules, holidays, and exceptions.
    b. Allows several related objects to be scheduled and copied to other objects or dates.
    c. Start and stop times adjustable from master schedule.
5. Custom Application Programming:
    a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.

b. Programming Features:
    1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
    2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
    3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
    4) Allows the development of independently, executing, program modules designed to enable and disable other modules.
    5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
    6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
    7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
    8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values cab be used in IF/THEN comparisons, calculations, programming statement logic, etc.
    9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

2.08 CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
    1. User access secured via user passwords and user names.
    2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
    3. User Log On/Log Off attempts are recorded.
    4. Automatic Log Off occurs following the last keystroke after a user defined delay time.

C. Object or Object Group Scheduling:
    1. Weekly Schedules Based on Separate, Daily Schedules:
        a. Include start, stop, optimal stop, and night economizer.
        b. 10 events maximum per schedule.
        c. Start/stop times adjustable for each group object.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
    1. Binary object is set to alarm based on the operator specified state.
    2. Analog object to have high/low alarm limits.
    3. All alarming is capable of being automatically and manually disabled.
    4. Alarm Reporting:
        a. Operator determines action to be taken for alarm event.
        b. Alarms to be routed to appropriate workstation.
        c. Reporting Options:

F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

G. Sequencing: Application software based upon specified sequences of operation in Section 23 0993.

H. PID Control Characteristics:
   1. Direct or reverse action.
   2. Anti-windup.
   3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
   4. User selectable controlled variable, set-point, and PED gains.

I. Staggered Start Application:
   1. Prevents all controlled equipment from simultaneously restarting after power outage.
   2. Order of equipment startup is user selectable.

J. Energy Calculations:
   1. Accumulated instantaneous power or flow rates are converted to energy use data.
   2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
   3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

K. Anti-Short Cycling:
   1. All binary output objects protected from short-cycling.
   2. Allows minimum on-time and off-time to be selected.

L. On-Off Control with Differential:
   1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
   2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

M. Run-Time Totalization:
   1. Totalize run-times for all binary input objects.
   2. Provides operator with capability to assign high run-time alarm.

PART 3 EXECUTION

3.01 INSTALLERS

A. Installer List:

3.02 EXAMINATION

A. Verify existing conditions before starting work.

3.03 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 0993.

C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of .

3.04 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide basic operator training for up to 10 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 4 hours dedicated instructor time. Provide training on site.

3.05 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to Owner.

3.06 MAINTENANCE

A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.

B. Provide two complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

C. Provide complete service of systems, including call backs. Make minimum of 3 complete normal inspections of approximately 3 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

END OF SECTION

RH Series Compact Power Relays

Key features

- SPDT through 4PDT, 10A contacts
- Compact power type relays
- Miniature power relays with a large capacity
- 10A contact capacity
- Compact size saves space

Part Number Selection

Contact	Model	Part Number: Blade Terminal	Part Number: PCB Terminal	Coil Voltage Code (Standard Stock in bold)
SPDT 	Standard	RH1B-U ☐	RH1V2-U ☐	AC6V, AC12V, **AC24V**, AC110V, **AC120V**, AC220V, **AC240V** DC6V, **DC12V**, **DC24V**, DC48V, DC110V
	With Indicator	RH1B-UL ☐	—	
	With Check Button	RH1B-UC ☐	—	
	With Indicator and Check Button	RH1B-ULC ☐	—	
	Top Bracket Mounting	RH1B-UT ☐	—	
	With Diode (DC coil only)	RH1B-UD ☐	RH1V2-UD ☐	DC6V, **DC12V**, **DC24V**, DC48V, DC110V
	With Indicator and Diode (DC coil only)	RH1B-ULD ☐	—	**DC12V**, **DC24V**, DC48V, DC110V
DPDT 	Standard	RH2B-U ☐	RH2V2-U ☐	AC6V, AC12V, **AC24V**, **AC110-120V**, **AC220-240V** DC6V, **DC12V**, **DC24V**, DC48V, DC100-110V
	With Indicator	RH2B-UL ☐	RH2V2-UL ☐	
	With Check Button	RH2B-UC ☐	—	
	With Indicator and Check Button	RH2B-ULC ☐	—	
	Top Bracket Mounting	RH2B-UT ☐	—	
	With Diode (DC coil only)	RH2B-UD ☐	RH2V2-UD ☐	DC6V, **DC12V**, **DC24V**, DC48V, DC100-110V
	With Indicator and Diode (DC coil only)	RH2B-ULD ☐	RH2V2-ULD ☐	
3PDT 	Standard	RH3B-U ☐	RH3V2-U ☐	AC6V, AC12V, **AC24V**, AC110V, **AC120V**, AC220V, **AC240V** DC6V, **DC12V**, **DC24V**, DC48V, DC110V
	With Indicator	RH3B-UL ☐	RH3V2-UL ☐	
	With Check Button	RH3B-UC ☐	—	
	With Indicator and Check Button	RH3B-ULC ☐	—	
	Top Bracket Mounting	RH3B-UT ☐	—	
	With Diode (DC coil only)	RH3B-UD ☐	—	DC6V, DC12V, DC24V, DC48V, DC110V
	With Indicator and Diode (DC coil only)	RH3B-ULD ☐	—	
4PDT 	Standard	RH4B-U ☐	RH4V2-U ☐	AC6V, AC12V, **AC24V**, AC110V, **AC120V**, AC220V, **AC240V** DC6V, **DC12V**, **DC24V**, DC48V, DC110V
	With Indicator	RH4B-UL ☐	RH4V2-UL ☐	
	With Check Button	RH4B-UC ☐	—	
	With Indicator and Check Button	RH4B-ULC ☐	—	
	Top Bracket Mounting	RH4B-UT ☐	—	
	With Diode (DC coil only)	RH4B-UD ☐	RH4V2-UD ☐	DC6V, DC12V, DC24V, DC48V, DC110V
	With Indicator and Diode (DC coil only)	RH4B-ULD ☐	—	

PCB terminal relays are designed to mount directly to a circuit board without any socket.

Ordering Information
When ordering, specify the Part No. and coil voltage code:
(example) **RH3B-U** (Part No.) **AC120V** (Coil Voltage Code)

Sockets (for Blade Terminal Models)

Relays	Standard DIN Rail Mount [1]	Finger-safe DIN Rail Mount [1]	Through Panel Mount	PCB Mount
RH1B	SH1B-05	SH1B-05C	SH1B-51	SH1B-62
RH2B	SH2B-05	SH2B-05C	SH2B-51	SH2B-62
RH3B	SH3B-05	SH3B-05C	SH3B-51	SH3B-62
RH4B	SH4B-05	SH4B-05C	SH4B-51	SH4B-62
				

1. DIN Rail mount socket comes with two horseshoe clips. Do not use unless you plan to insert pullover wire spring. Replacement horseshoe clip part number is Y778-011.

Hold Down Springs & Clips

Appearance	Item	Relay	For DIN Mount Socket	For Through Panel & PCB Mount Socket
	Pullover Wire Spring	RH1B	SY2S-02F1 [2]	SY4S-51F1
		RH2B	SY4S-02F1 [2]	
		RH3B	SH3B-05F1 [2]	
		RH4B	SH4B-02F1 [2]	
	Leaf Spring (side latch)	RH1B, RH2B, RH3B, RH4B	SFA-202 [3]	SFA-302 [3]
	Leaf Spring (top latch)	RH1B, RH2B, RH3B, RH4B	SFA-101 [3]	SFA-301 [3]

2. Must use horseshoe clip when mounting in DIN mount socket. Replacement horseshoe clip part number is Y778-011.
3. Two required per relay.

AC Coil Ratings

Voltage (V)	Rated Current (mA) ±15% at 20°C								Coil Resistance (Ω) ±10% at 20°C				Operation Characteristics (against rated values at 20°C)		
	AC 50Hz				AC 60Hz										
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	Max. Continuous Applied Voltage	Pickup Voltage	Dropout Voltage
6	170	240	330	387	150	200	280	330	330	9.4	6.4	5.4	110%	80% maximum	30% minimum
12	86	121	165	196	75	100	140	165	165	39.3	25.3	21.2			
24	42	60.5	81	98	37	50	70	83	83	153	103	84.5			
110	9.6	—	18.1	21.6	8.4	—	15.5	18.2	18.2	—	2,200	1,800			
110-120	—	9.4-10.8	—	—	—	8.0-9.2	—	—	—	—	—	—			
120	8.6	—	16.4	19.5	7.5	—	14.2	16.5	16.5	—	10,800	7,360			
220	4.7	—	8.8	10.7	4.1	—	7.7	9.1	9.1	—	10,800	7,360			
220-240	—	4.7-5.4	—	—	—	4.0-4.6	—		—	18,820	—	—			
240	4.9	—	8.2	9.8	4.3	—	7.1	8.3	8.3	—	12,100	9,120			

DC Coil Ratings

Voltage (V)	Rated Current (mA) ±15% at 20°C				Coil Resistance (Ω) ±10% at 20°C				Operation Characteristics (against rated values at 20°C)		
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	Max. Continuous Applied Voltage	Pickup Voltage	Dropout Voltage
6	128	150	240	250	47	40	25	24	110%	80% maximum	10% minimum
12	64	75	120	125	188	160	100	96			
24	32	36.9	60	62	750	650	400	388			
48	18	18.5	30	31	2,660	2,600	1,600	1,550			
100-110	—	8.2-9.0	—	—	—	12,250	—	—			
110	8	—	12.8	15	13,800	—	8,600	7,340			

Standard coil voltages are in **BOLD**.

Contact Ratings

Maximum Contact Capacity						
Model	Continuous Current	Allowable Contact Power		Rated Load		
		Resistive Load	Inductive Load	Voltage (V)	Res. Load	Ind. Load
SPDT	10A	1540VA 300W	990VA 210W	110 AC	10A	7A
				220 AC	7A	4.5A
				30 DC	10A	7A
DPDT 3PDT 4PDT	10A	1650VA 300W	1100VA 225W	110 AC	10A	7.5A
				220 AC	7.5A	5A
				30 DC	10A	7.5A

Note: Inductive load for the rated load — cos ø = 0.3, L/R = 7 ms

TÜV Ratings

Voltage	RH1	RH2	RH3	RH4
240V AC	10A	10A	7.5A	7.5A
30V DC	10A	10A	10A	10A

AC: cos ø = 1.0, DC: L/R = 0 ms

UL Ratings

Voltage	Resistive			General Use			Horsepower Rating		
	RH1 RH2	RH3	RH4	RH1 RH2	RH3	RH4	RH1 RH2	RH3	RH4
240V AC	10A	7.5A	7.5A	7A	6.5A	5A	1/3 HP	1/3 HP	—
120V AC	—	10A	10A	—	7.5A	7.5A	1/6 HP	1/6 HP	—
30V DC	10A	10A	—	7A	—	—	—	—	—
28V DC	—	—	10A	—	—	—	—	—	—

CSA Ratings

Voltage	Resistive				General Use				Horse-power Rating
	RH1	RH2	RH3	RH4	RH1	RH2	RH3	RH4	RH1, 2, 3
240V AC	10A	10A	—	7.5A	7A	7A	7A	5A	1/3 HP
120V AC	10A	10A	10A	10A	7.5A	7.5A	—	7.5A	1/6 HP
30V DC	10A	10A	10A	10A	7A	7.5A	—	—	—

Socket Specifications

	Sockets	Terminal	Electrical Rating	Wire Size	Torque
DIN Rail Mount Sockets	SH1B-05	(Coil) M3 screws (contact) M3.5 screws with captive wire clamp	250V, 10A	Maximum up to 2–#12AWG	5.5 - 9 in•lbs 9 - 11.5 in•lbs
	SH2B-05 SH3B-05 SH4B-05	M3.5 screws with captive wire clamp	300V, 10A	Maximum up to 2–#12AWG	9 - 11.5 in•lbs
Finger-safe DIN Rail Mount	SH1B-05C	(coil) M3 screws (contact) M3.5 screws with captive wire clamp, fingersafe	250V, 10A	Maximum up to 2–#12AWG	5.5 - 9 in•lbs 9 - 11.5 in•lbs
	SH2B-05C SH3B-05C SH4B-05C	M3.5 screws with captive wire clamp, fingersafe	300V, 10A	Maximum up to 2–#12AWG	9 - 11.5 in•lbs
Through Panel Mount Socket	SH1B-51 SH2B-51 SH3B-51 SH4B-51	Solder	300V, 10A	—	—
PCB Mount Socket	SH1B-62	PCB mount	250V, 10A	—	—
	SH2B-62 SH3B-62 SH4B-62	PCB mount	300V, 10A	—	—

Accessories

Item	Appearance	Use with	Part No.	Remarks
Aluminum DIN Rail (1 meter length)		All DIN rail sockets	BNDN1000	The BNDN1000 is designed to accommodate DIN mount sockets. Made of durable extruded aluminum, the BNDN1000 measures 0.413 (10.5mm) in height and 1.37 (35mm) in width (DIN standard). Standard length is 39" (1,000mm).
DIN Rail End Stop		DIN rail	BNL5	9.1 mm wide.
Replacement Hold-Down Spring Anchor		DIN mount sockets and hold down springs.	Y778-011	For use on DIN rail mount socket when using pullover wire hold down spring. 2 pieces included with each socket.

Specifications

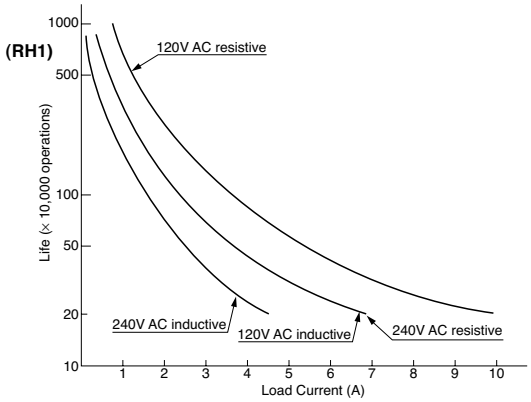
Contact Material		Silver cadmium oxide	
Contact Resistance [1]		50mΩ maximum	
Minimum Applicable Load		24V DC, 30 mA; 5V DC, 100 mA (reference value)	
Operating Time [2]	SPDT DPDT	20ms maximum	
	3PDT 4PDT	25ms maximum	
Release Time [2]	SPDT DPDT	20ms maximum	
	3PDT 4PDT	25ms maximum	
Power Consumption (approx.)	SPDT	AC: 1.1VA (50Hz), 1VA (60Hz)	DC: 0.8W
	DPDT	AC: 1.4VA (50Hz), 1.2VA (60Hz)	DC: 0.9W
	3PDT	AC: 2VA (50Hz), 1.7VA (60Hz)	DC: 1.5W
	4PDT	AC: 2.5VA (50Hz), 2VA (60Hz)	DC: 1.5W
Insulation Resistance		100MΩ minimum (500V DC megger)	
Dielectric Strength [3]	SPDT	Between live and dead parts: Between contact and coil: Between contacts of the same pole:	2,000V AC, 1 minute 2,000V AC, 1 minute 1,000V AC, 1 minute
	DPDT 3PDT 4PDT	Between live and dead parts: Between contact and coil: Between contacts of different poles: Between contacts of the same pole:	2,000V AC, 1 minute 2,000V AC, 1 minute 2,000V AC, 1 minute 1,000V AC, 1 minute
Operating Frequency		Electrical: Mechanical:	1,800 operations/hour maximum 18,000 operations/hour maximum
Vibration Resistance		Damage limits: Operating extremes:	10 to 55Hz, amplitude 0.5 mm 10 to 55Hz, amplitude 0.5 mm
Shock Resistance		Damage limits: Operating extremes:	1,000m/s^2 (100G) 200m/s^2 (20G - SPDT, DPDT) 100m/s^2 (10G - 3PDT, 4PDT)
Mechanical Life		50,000,000 operations minimum	
Electrical Life	DPDT	500,000 operations minimum (120V AC, 10A)	
	SPDT 3PDT 4PDT	200,000 operations minimum (120V AC, 10A)	
Operating Temperature [4]	SPDT	–25 to +50°C (no freezing)	
	DPDT 3PDT 4PDT	–25 to +40°C (no freezing)	
Operating Humidity		45 to 85% RH (no condensation)	
Weight (approx.)		SPDT: 24g, DPDT: 37g, 3PDT: 50g, 4PDT: 74g	

Note: Above values are initial values.
1. Measured using 5V DC, 1A voltage drop method
2. Measured at the rated voltage (at 20°C), excluding contact bouncing
   Release time of relays with diode: 40 ms maximum
3. Relays with indicator or diode: 1000V AC, 1 minute
4. For use under different temperature conditions, refer to Continuous Load Current vs. Operating Temperature Curve. The operating temperature range of relays with indicator or diode is –25 to +40°C.

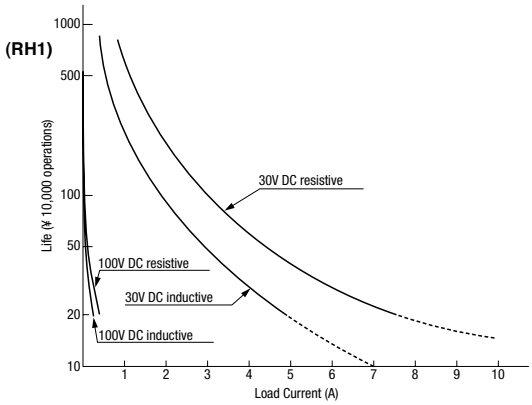
Characteristics (Reference Data)

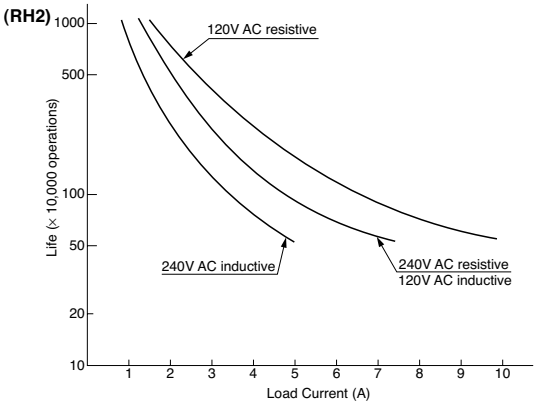
Electrical Life Curves

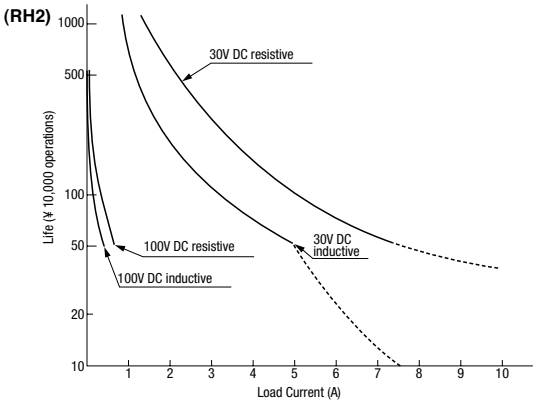
AC Load

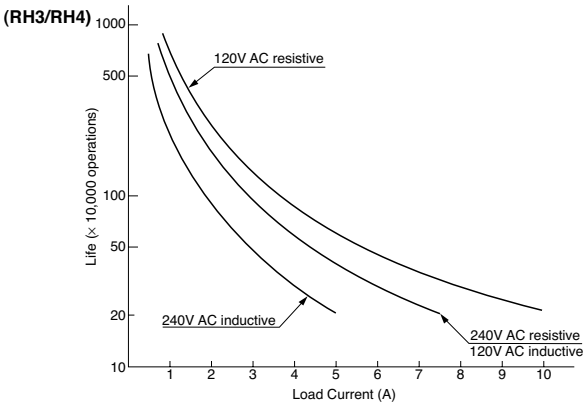


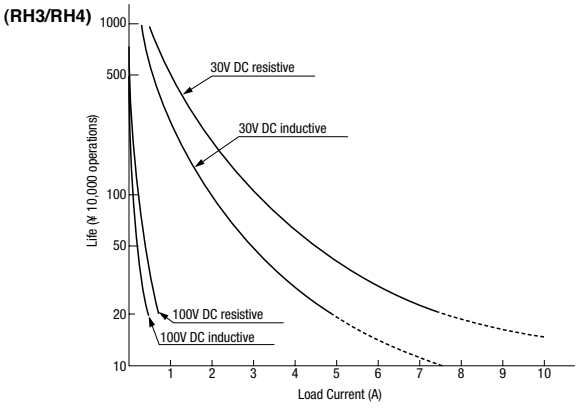
DC Load



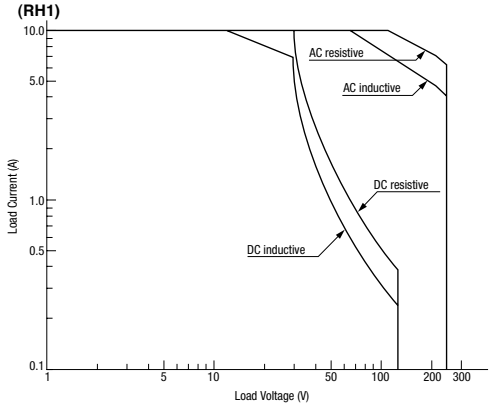


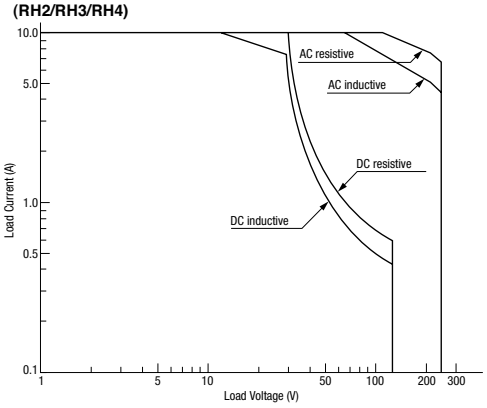






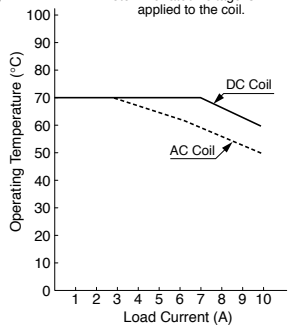
Maximum Switching Capacity



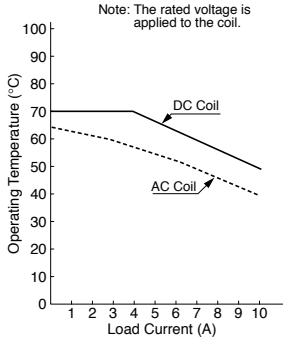


Continuous Load Current vs. Operating Temperature Curve (Basic Type, With Check Button, and Top Bracket Mounting Type)

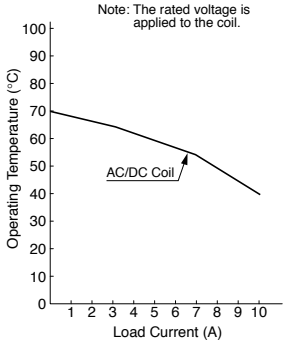
(RH1)



(RH2)



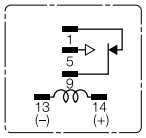
(RH3/RH4)



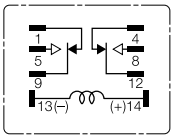
Internal Connection (View from Bottom)

Basic Type

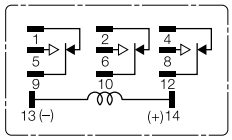
SPDT



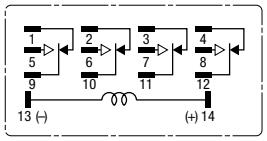
DPDT



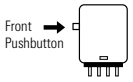
3PDT



4PDT

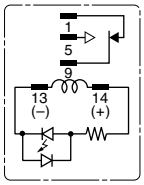
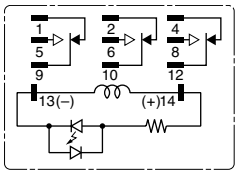
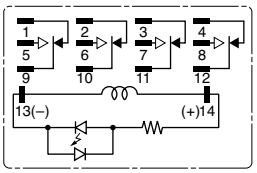
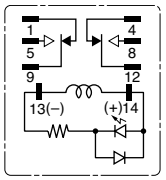
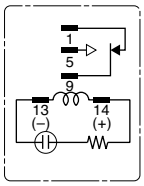
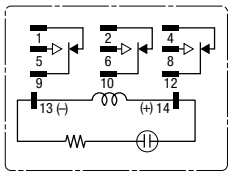
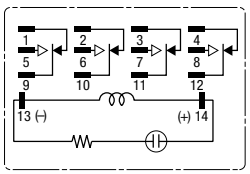
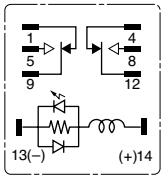


With Check Button



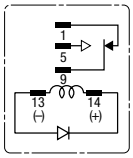
Contacts can be operated by pressing the check button.

With Indicator (-L type)

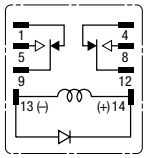
	SPDT	3PDT	4PDT		DPDT	
Below 100V AC/DC				Below 24V AC/DC		When the relay is energized, the indicator goes on. • Relay coils less than 100V DC do not contain a protection diode (except DPDT). • Relay coils below 100V use LED indicator, coils above 100V use neon lamp indicator. • LED color of DPDT model is green
100V AC/DC and over				24V AC/DC and over		

With Diode (-D type)

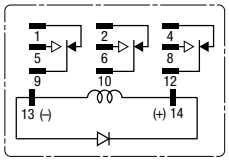
SPDT



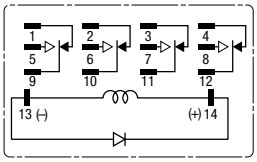
DPDT



3PDT



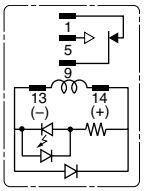
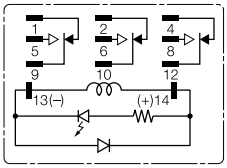
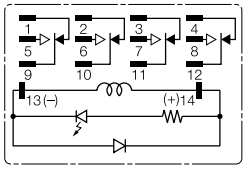
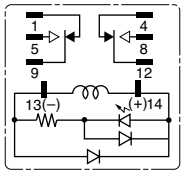
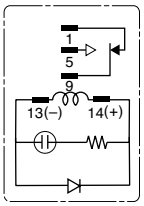
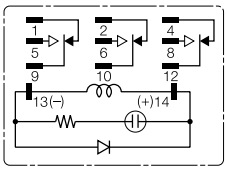
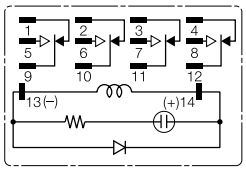
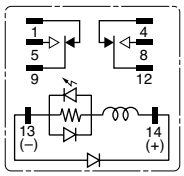
4PDT



Contains a diode to absorb the back emf generated when the coil is de-energized. The release time is slightly longer. Available for DC coil only.

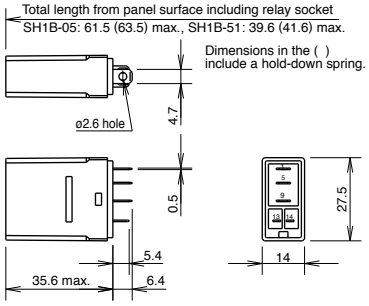
- Diode Characteristics
  Reverse withstand voltage: 1,000V
  Forward current: 1A

With Indicator LED & Diode (-LD type)

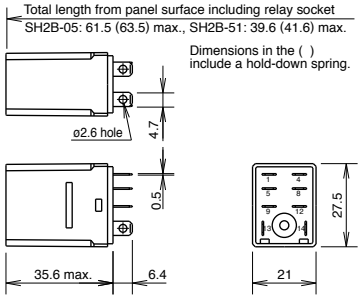
	SPDT	3PDT	4PDT		DPDT	
Below 100V DC				Below 24V AC/ DC		Contains an LED indicator and a surge absorber, and has the same height as the basic type. LED color of DPDT model is green.
100V DC and over				24V AC/ DC and over		

Dimensions (mm)

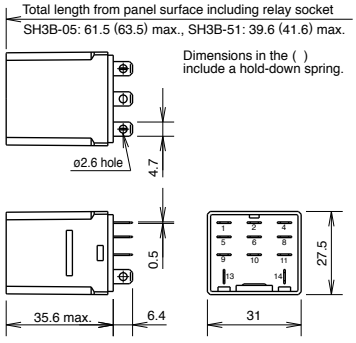
RH1B-U/RH1B-UL/RH1B-UD/RH1B-ULD



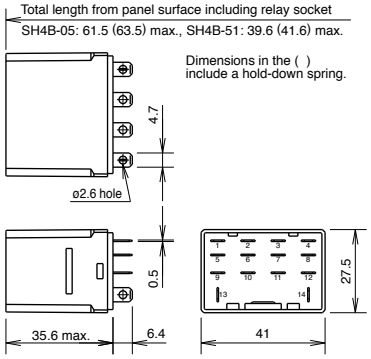
RH2B-U/RH2B-UL/RH2B-UD/RH2B-ULD



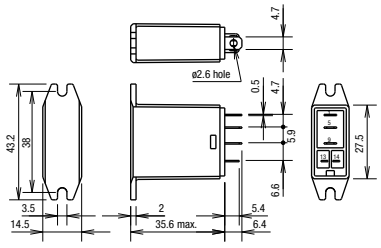
RH3B-U/RH3B-UL/RH3B-UD/RH3B-ULD



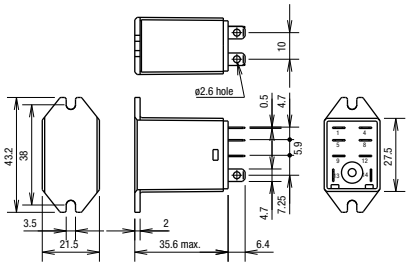
RH4B-U/RH4B-UL/RH4B-UD/RH4B-ULD



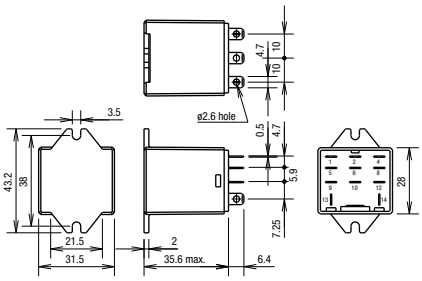
RH1B-UT



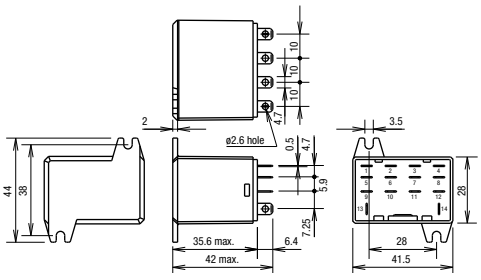
RH2B-UT



RH3B-UT

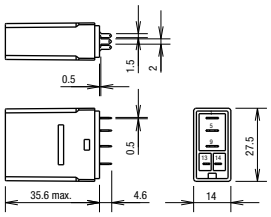


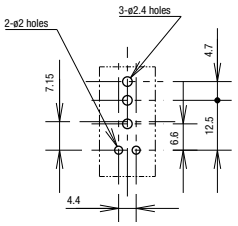
RH4B-UT



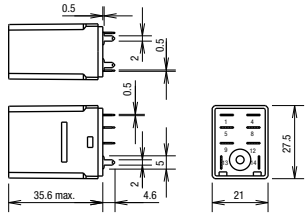
Dimensions con't (mm)

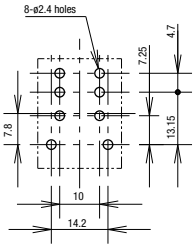
RH1V2-U/RH1V2-UD



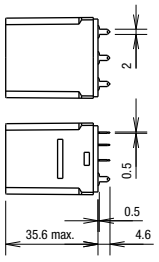


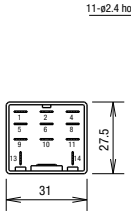
RH2V2-U/RH2V2-UL/RH2V2-UD

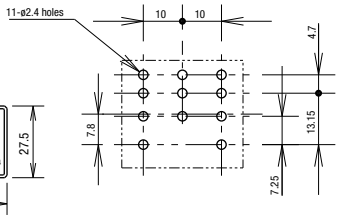




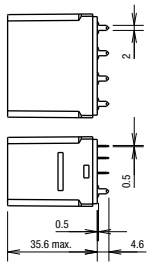
RH3V2-U/RH3V2-UL/RH3V2-D

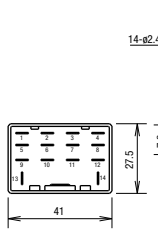


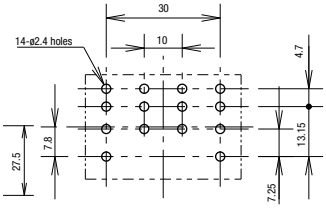




RH4V2-U/RH4V2-UL/RH4V2-UD

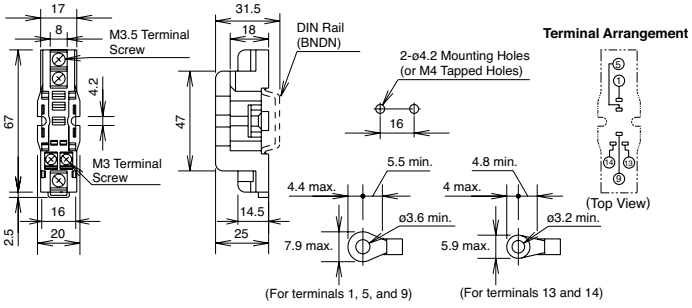




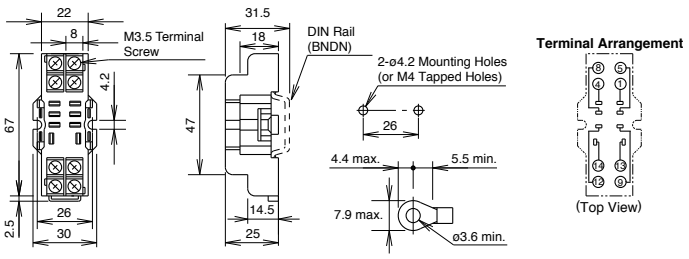


Standard DIN Rail Mount Sockets

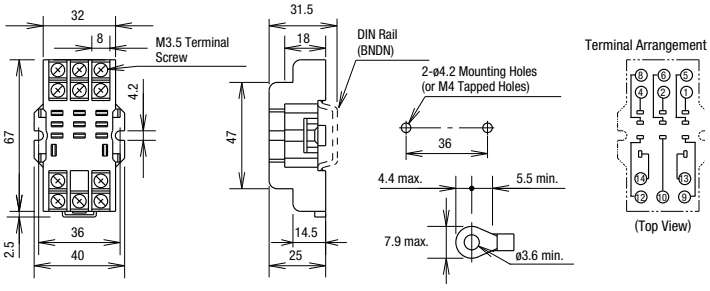
SH1B-05



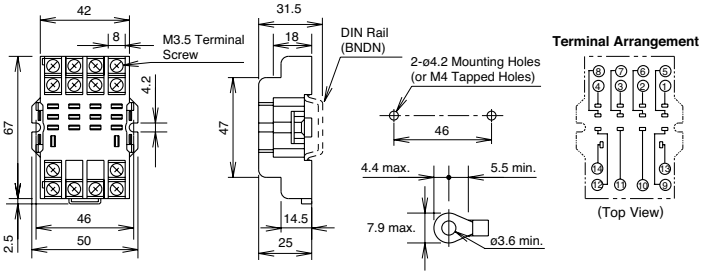
SH2B-05



SH3B-05



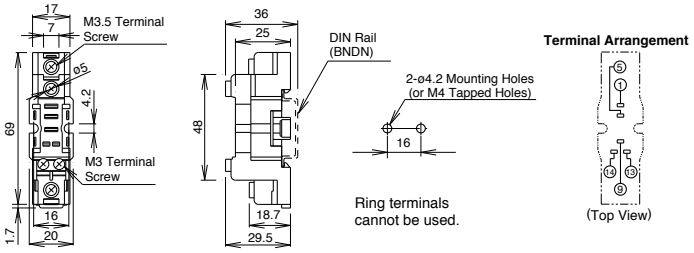
SH4B-05



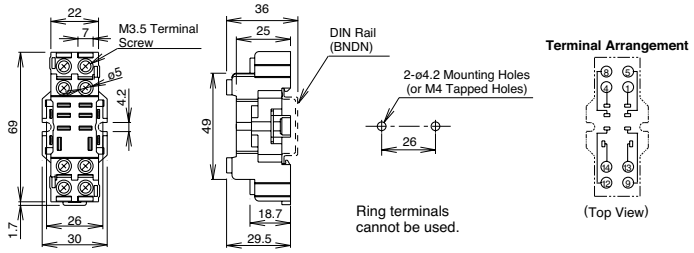
Dimensions con't (mm)

Finger-safe DIN Rail Mount Sockets

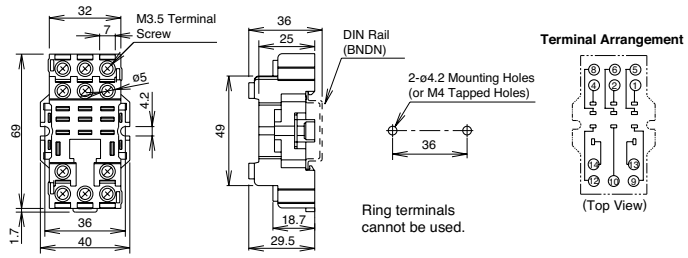
SH1B-05C



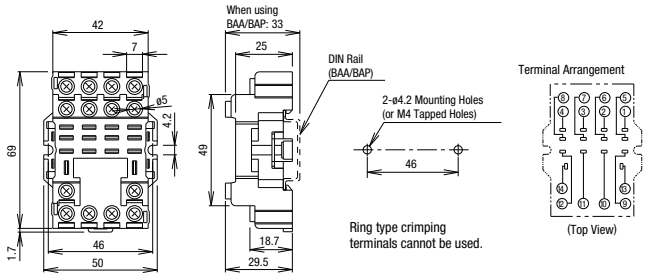
SH2B-05C



SH3B-05C

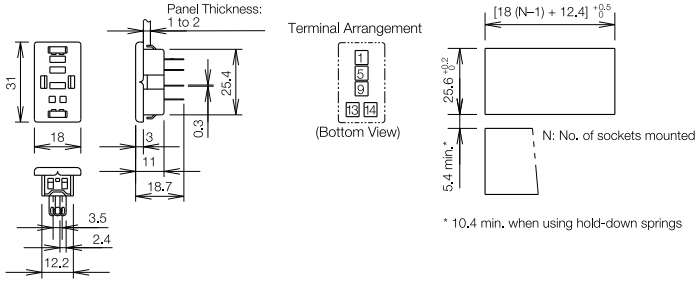


SH4B-05C

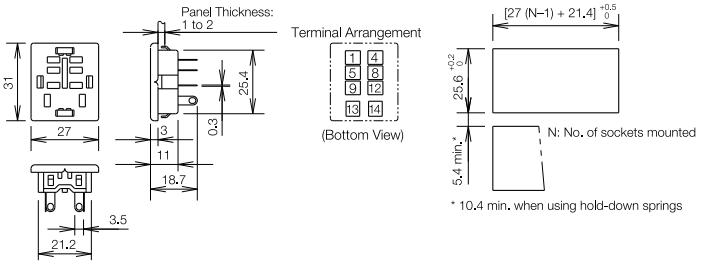


Through Panel Mount Socket

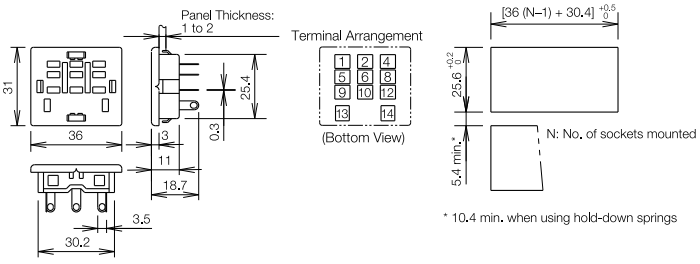
SH1B-51



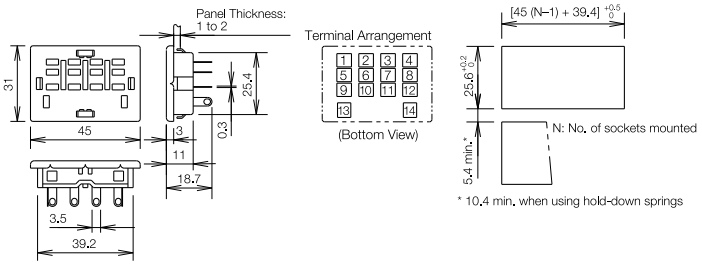
SH2B-51



SH3B-51



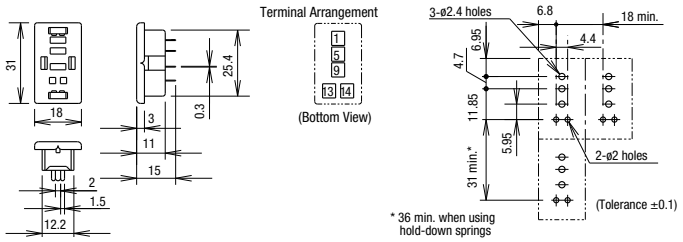
SH4B-51



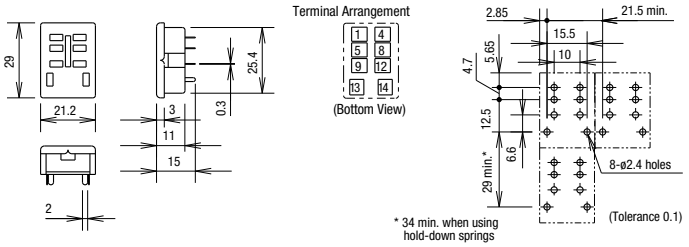
Dimensions con't (mm)

PCB Mount Sockets

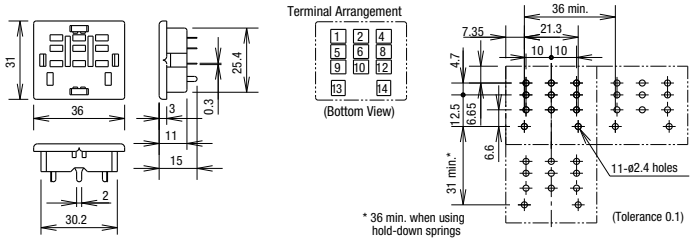
SH1B-62



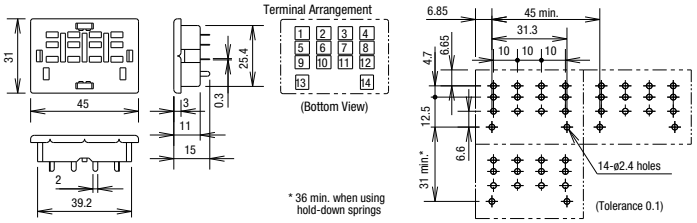
SH2B-62



SH3B-62



SH4B-62

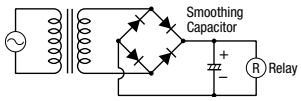


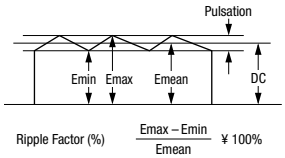
Operating Instructions

Driving Circuit for Relays

1. To ensure correct relay operation, apply rated voltage to the relay coil.

2. Input voltage for the DC coil:
   A complete DC voltage is best for the coil power to make sure of stable relay operation. When using a power supply containing a ripple voltage, suppress the ripple factor within 5%. When power is supplied through a rectification circuit, the relay operating characteristics, such as pickup voltage and dropout voltage, depend on the ripple factor. Connect a smoothing capacitor for better operating characteristics as shown below.



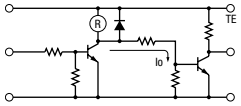


$$\text{Ripple Factor (\%)} = \frac{\text{Emax} - \text{Emin}}{\text{Emean}} \times 100\%$$

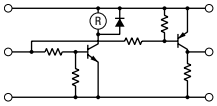
Emax = Maximum of pulsating current
Emin = Minimum of pulsating current
Emean = DC mean value

3. Leakage current while relay is off:
   When driving an element at the same time as the relay operation, special consideration is needed for the circuit design. As shown in the incorrect circuit below, leakage current (Io) flows through the relay coil while the relay is off. Leakage current causes coil release failure or adversely affects the vibration resistance and shock resistance. Design a circuit as shown in the correct example.

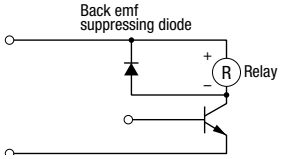
Incorrect



Correct



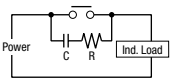
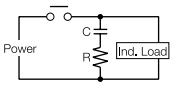
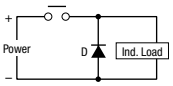
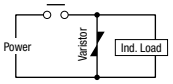
4. Surge suppression for transistor driving circuits:
   When the relay coil is turned off, a high-voltage pulse is generated, causing a transistor to deteriorate and sometimes to break. Be sure to connect a diode to suppress the back electromotive force. Then, the coil release time becomes slightly longer. To shorten the coil release time, connect a Zener diode between the collector and emitter of the transistor. Select a Zener diode with a Zener voltage slightly higher than the power voltage.



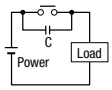
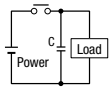
Protection for Relay Contacts

1. The contact ratings show maximum values. Make sure that these values are not exceeded. When an inrush current flows through the load, the contact may become welded. If this is the case, connect a contact protection circuit, such as a current limiting resistor.

2. Contact protection circuit:
   When switching an inductive load, arcing causes carbides to form on the contacts, resulting in increased contact resistance. In consideration of contact reliability, contact life, and noise suppression, use of a surge absorbing circuit is recommended. Note that the release time of the load becomes slightly longer. Check the operation using the actual load. Incorrect use of a contact protection circuit will adversely affect switching characteristics. Four typical examples of contact protection circuits are shown in the following table:

RC		This protection circuit can be used when the load impedance is smaller than the RC impedance in an AC load power circuit. • R: Resistor of approximately the same resistance value as the load • C:0.1 to 1 µF
		This protection circuit can be used for both AC and DC load power circuits. R: Resistor of approximately the same resistance value as the load C: 0.1 to 1 µF
Diode		This protection circuit can be used for DC load power circuits. Use a diode with the following ratings. Reverse withstand voltage: Power voltage of the load circuit x 10 Forward current: More than the load current
Varistor		This protection circuit can be used for both AC and DC load power circuits. For a best result, when using a power voltage of 24 to 48V AC/DC, connect a varistor across the load. When using a power voltage of 100 to 240V AC/DC, connect a varistor across the contacts.

3. Do not use a contact protection circuit as shown below:

	This protection circuit is very effective in arc suppression when opening the contacts. But, the capacitor is charged while the contacts are opened. When the contacts are closed, the capacitor is discharged through the contacts, increasing the possibility of contact welding.
	This protection circuit is very effective in arc suppression when opening the contacts. But, when the contacts are closed, a current flows to charge the capacitor, causing contact welding.

Generally, switching a DC inductive load is more difficult than switching a DC resistive load. Using an appropriate arc suppressor, however, will improve the switching characteristics of a DC inductive load.

Soldering

1. When soldering the relay terminals, use a soldering iron of 30 to 60W, and quickly complete soldering (within approximately 3 seconds).

2. Use a non-corrosive rosin flux.

Operating Instructions con't

Other Precautions

1. General notice:
   To maintain the initial characteristics, do not drop or shock the relay.

   The relay cover cannot be removed from the base during normal operation. To maintain the initial characteristics, do not remove the relay cover.

   Use the relay in environments free from condensation, dust, sulfur dioxide (SO_2), and hydrogen sulfide (H_2S).

   Make sure that the coil voltage does not exceed applicable coil voltage range.

2. UL and CSA ratings may differ from product rated values determined by IDEC.

3. Do not use relays in the vicinity of strong magnetic field, as this may affect relay operation.

Safety Precautions

- Turn off the power to the relay before starting installation, removal, wiring, maintenance, and inspection of the relays. Failure to turn power off may cause electrical shock or fire hazard.
- Observe specifications and rated values, otherwise electrical shock or fire hazard may be caused.
- Use wires of the proper size to meet voltage and current requirements. Tighten the terminal screws on the relay socket to the proper tightening torque.
- Surge absorbing elements on AC relays with RC or DC relays with diode are provided to absorb the back electromotive force generated by the coil. When the relay is subject to an excessive external surge voltage, the surge absorbing element may be damaged. Add another surge absorbing provision to the relay to prevent damage.

Precautions for the RU Relays

- Before operating the latching lever of the RU relay, turn off the power to the RU relay. After checking the circuit, return the latching lever to the original position.
- Do not use the latching lever as a switch. The durability of the latching lever is a minimum of 100 operations.
- When using DC loads on 4PDT relays, apply a positive voltage to terminals of neighboring poles and a negative voltage to the other terminals of neighboring poles to prevent the possibility of short circuits.
- DC relays with a diode have a polarity in the coil terminals. Apply the DC voltage to the correct terminals.

HVAC Controls - BABAA Non-Compliant Components Current through 2025-06-11						
Manufacturer	**Part #**	**Description**		**Qty**	**Item Value**	**Total Value**
IDEC	RH2B-ULCAC24V	RELAY DPDT, CHK BUTTON & LIGHT		2	$ 9.00	$ 18.00
IDEC	SH2B-05	RELAY DPDT DIN RAIL SOCKETS		2	$ 6.64	$ 13.28

DEW Construction
277 Blair Park Road, Suite 130
Williston, VT 05495

Michael Snyder, LEED AP BD+C
msnyder@dewconstruction.com
C (802) 798-4976

FORM CD-450 (REV. 10/18)	U.S. DEPARTMENT OF COMMERCE	X GRANT	COOPERATIVE AGREEMENT
FINANCIAL ASSISTANCE AWARD		**FEDERAL AWARD ID NUMBER** 60NANB23D159	
RECIPIENT NAME Burlington School District		**PERIOD OF PERFORMANCE** 09/01/2023 - 08/31/2026	
STREET ADDRESS 150 Colchester Ave		**FEDERAL SHARE OF COST** $9,900,000.00	
CITY, STATE ZIP Burlington, VT 05401-1422		**RECIPIENT SHARE OF COST** $0.00	
AUTHORITY Consolidated Appropriations Act, 2022		**TOTAL ESTIMATED COST** $9,900,000.00	
CFDA NO. AND NAME 11.617 Congressionally-Identified Projects			
PROJECT TITLE: Burlington Aviation Technology Center Facility			

This Award Document (Form CD-450) signed by the Grants Officer constitutes an obligation of Federal funding. By signing this Form CD-450, the Recipient agrees to comply with the Award provisions checked below and attached. Upon acceptance by the Recipient, the Form CD-450 must be signed by an authorized representative of the Recipient and returned to the Grants Officer. If not signed and returned without modifications by the Recipient within 30 days of receipt, the Grants Officer may unilaterally withdraw this Award offer and de-obligate the funds.

X DEPARTMENT OF COMMERCE FINANCIAL ASSISTANCE STANDARD TERMS AND CONDITIONS

R & D AWARD

FEDERAL-WIDE RESEARCH TERMS AND CONDITIONS, AS ADOPTED BY THE DEPT. OF COMMERCE

X SPECIFIC AWARD CONDITIONS

X LINE ITEM BUDGET

X 2 CFR PART 200, UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS, AS ADOPTED PURSUANT TO 2 CFR § 1327.101

48 CFR PART 31, CONTRACT COST PRINCIPLES AND PROCEDURES

MULTI-YEAR AWARD. PLEASE SEE THE MULTI-YEAR SPECIFIC AWARD CONDITION.

X OTHER(S): U.S. DEPARTMENT OF COMMERCE, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY STANDARD TERMS AND CONDITIONS FOR EXTRAMURAL CONSTRUCTION PROJECTS, MAY 11, 2023

SIGNATURE OF DEPARTMENT OF COMMERCE GRANTS OFFICER	DATE
Shiou Liu SHIOU YUN LIU Digitally signed by SHIOU YUN LIU Date: 2023.09.15 08:23:32 -04'00'	
PRINTED NAME, PRINTED TITLE, AND SIGNATURE OF AUTHORIZED RECIPIENT OFFICIAL Tom Flanagan, Superintendent	DATE 9/18/23

Award Number: 60NANB23D159, Amendment Number 0

Federal Program Officer: Robert Slocum

Requisition Number: 195161

Employer Identification Number: 471351664

UEI Number: VCCSKXGSMEJ5

Recipient ID: 1155128

Requestor ID: 1155128

Award ACCS Information

Bureau	FCFY	Project-Task	Organization	Object Class	Obligation Amount
57	2023	1959000-000	10-19-0195-00-00-00-00	41-98-00-00	$9,900,000.00

Award Contact Information

Contact Type	Contact Name	Email	Phone
Administrative	Mr. Barry Gruessner	bgruessn@bsdvt.org	8028648462

NIST Grants Officer:

Shiou Liu
100 Bureau Drive, MS 1650
Gaithersburg, MD 20899-1650
(301) 975-8245

NIST Grants Specialist:

LaShae Green
100 Bureau Drive, MS 1650
Gaithersburg, MD 20899-1650
(301) 975-3070

NIST Financial Assistance Award Number: 60NANB23D159
Amendment: NEW
Recipient: Burlington School District

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
2022 CONGRESSIONALLY IDENTIFIED CONSTRUCTION GRANT PROGRAM
FINANCIAL ASSISTANCE
SPECIFIC AWARD CONDITIONS

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1. Description of Work:

The National Institute of Standards and Technology (NIST) hereby enters into this grant number 60NANB23D159 with Burlington School District to support the work described in the proposal entitled "Burlington Aviation Technology Center Facility" dated November 17, 2022, and any revisions received during the application review, which are hereby incorporated into this award by reference.

The scope of work for this project is anticipated to provide a total building space in the range of 30,000 to 45,000 gross SF to include classrooms, offices, shops/tech areas, storage, hangar space and general building facilities with the intent to educate up to 150 high school students and adults each year with the technical center housing aviation for 11th and 12th graders as well as adult programs that finishes the airframe and powerplant training.

Work will be completed in accordance with the schedule submitted by Burlington School District in the Project Management and Schedule dated November 17, 2022.

The Burlington School District shall diligently pursue the development of the project to ensure completion within this time schedule and shall promptly notify NIST in writing of any event that could substantially delay meeting any of the prescribed time limits for the project as set forth above. The Burlington School District further acknowledges that failure to meet the development time schedule may result in NIST taking action to suspend or terminate the Award in accordance with the regulations set forth at 2 CFR § 200.339.

Where the terms of this award and the proposal differ, the terms of this award shall prevail.

2. Recipient Contact Information:

Administrative:
Barry Gruessner
Grants Director
Burlington School District
150 Colchester Avenue
Burlington, VT 05401-1422
Telephone: 802-864-8462
Email: bgruessn@bsdvt.org

Authorized Representative:
Tom Flanagan
Superintendent
Burlington School District
150 Colchester Avenue
Burlington, VT 05401-1422
Telephone: 802-865-5332
Email: tflanagan@bsdvt.org

3. NIST Award Contact Information:

Grants Officer:
Michelle Shiouyun Liu
National Institute of Standards and Technology
100 Bureau Drive, Mail Stop 1650
Gaithersburg, MD 20899-1650
Telephone: 301-975-8245
Email: shiouyun.liu@nist.gov

Grants Specialist:
LaShae Green
National Institute of Standards and Technology
100 Bureau Drive, Mail Stop 1650
Gaithersburg, MD 20899-1650
Telephone: 301-975-3070
Email: lashae.green@nist.gov

Federal Program Officer:
Robert Slocum
National Institute of Standards and Technology
100 Bureau Drive
Gaithersburg, MD 20899
Email: robert.slocum@nist.gov

4. Award Payments:

This award is hereby funded through advanced payments using the Department of Treasury's Automated Standard Application for Payments (ASAP) system. Payments will be issued in accordance with 2 CFR § 200.305 and the Department of Commerce Financial Assistance Standard Terms and Conditions, B.02, dated November 12, 2020.

Payments for allowable costs may be drawn down as needed by the Recipient enrolled in ASAP. Funds may be requested through ASAP by the authorized *Payment Requestor* who is the individual designated by the Recipient to access Federal funds.

This award has the following control or withdrawal limits set in ASAP:

_____ None
_____ Agency Review required for all withdrawals (see explanation below)
_____ Agency Review required for all withdrawal requests over
$_____ (see explanation below)
__X__ Maximum Draw Amount controls (see explanation below)
$_____ each month
$_____ each quarter
$0.00_____ Max drawdown amount

Explanation:

Environmental & Historic Compliance Requirements
A total of $9,900,000.00 in Federal funding is hereby withheld until the requirements identified in Specific Award Condition (SAC) #17 Environmental and Historic Review is satisfied. A Six-Month Expenditure Plan may be submitted to request funding for expenditures limited to Environmental and Historic Requirement compliance as identified in SAC #17.

In addition, the final site selection for the Burlington Aviation Technology Center Facility must be provided to NIST and approved by NIST prior to advertisement of construction. All federal funding is hereby withheld until this requirement is satisfied, as identified in SAC #19 Final Site Selection, below.

5. Return Payments for Funds Withdrawn through ASAP:

Funds that have been withdrawn through ASAP may be returned to ASAP via the Automated Clearing House (ACH) or via FEDWIRE. The ACH or FEDWIRE transaction may only be completed by the Recipient's financial institution. Full or partial amounts of payments received by a Payment Requestor/Recipient Organization may be returned to ASAP. All funds returned to the ASAP system will be credited to the ASAP Suspense Account. The Suspense Account allows the Regional Financial Center to monitor returned items and ensure that funds are properly credited to the correct ASAP account. Returned funds that cannot be identified and classified to an ASAP account will be dishonored and returned to the originating depositary financial institution (ODFI). The Payment Requestor/Recipient Organization should notify the NIST Grants Office and provide a reason whenever return payments are made.

It is essential that the Payment Requestor/Recipient Organization provide its financial institution with ASAP account information (ALC, Recipient ID and Account ID) to which the return is to be credited. Additional detailed information is accessible at: https://www.fiscal.treasury.gov/asap/.

6. Period of Performance and Funding Limitations:

The period of performance and budget incorporated into this award cover a 3-year period of performance and provide for a maximum total amount of $9,900,000.00 in Federal funding. This award is being fully funded via this award action.

The maximum amount of NIST funding in support of this award will not exceed the amount specified in the award documents, unless otherwise amended in writing by the NIST Grants Officer. The Department of Commerce is not liable for any obligations, expenditures, or commitments which involve any amount in excess of the Federal funds being made available pursuant to this award.

7. Request for Application - 2022 Congressionally Identified Construction Grant Program:

The Department of Commerce, National Institute of Standards and Technology Request for Application (RFA) No. 2022-NIST-RFA-CICGP-01, dated October 18, 2022, is incorporated by reference into this award. It is accessible at: https://www.grants.gov/web/grants/view-opportunity.html?oppId=344108

8. Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements:

The Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements as published in the *Federal Register* on December 30, 2014 (79 FR 78390) is incorporated by reference into this award. It is accessible at: http://www.gpo.gov/fdsys/pkg/FR-2014-12-30/pdf/2014-30297.pdf.

9. Uniform Administrative Requirements, Cost Principles and Audit Requirements

Through 2 C.F.R. § 1327.101, the Department of Commerce adopted Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 C.F.R. Part 200, which apply to awards in this program. Refer to http://go.usa.gov/SBYh and http://go.usa.gov/SBg4. Awards issued pursuant to this program may be subject to specific award conditions as authorized by 2 C.F.R. § 200.208.

10. Deviation to the Department of Commerce Financial Assistance Standard Terms and Conditions, Section A.01 "Reporting Requirements":

The Recipient must submit a Federal Financial Report (SF-425) and Performance Progress Report on a quarterly basis for the periods ending March 31, June 30, September 30, and December 31, or any portion thereof.

Reports are due no later than 30 calendar days following the end of each reporting period. A final SF-425 and Performance Progress Report must be submitted within 120 days after the expiration of the period of performance.

All SF-425 and Performance Progress Reports must be submitted to: GReports@nist.gov, within the prescribed timeframes identified in the terms and conditions of the award.

The Recipient organization name, NIST award number, and reporting period must be included in the email subject line. The Recipient contact information should be included in the body of the message. To the greatest extent possible, SF-425 and Performance Progress Reports should be submitted together in the same email.

SF-425 and Performance Progress Reports must not be sent directly to NIST personnel (e.g. Grants Specialist, Grants Officer, Administrative Assistant, GMD Division Chief, Federal Program Officer, etc.).

Any SF-425 or Performance Progress Reports sent directly to NIST personnel will be returned to the sender with instructions on how to submit through the GReports@nist.gov mailbox.

No other correspondence may be sent through this mailbox; timely responses to any other inquiries received in this mailbox are not guaranteed. The mailbox will not be used for any other purpose ***except*** for purposes identified above.

11. Department of Commerce Financial Assistance Standard Terms and Conditions:

As indicated on the Form CD-450 for this award, the Department of Commerce Financial Assistance Standard Terms and Conditions (ST&C) issued November 12, 2020, are incorporated by reference into this award. The Department's ST&C, as well as a link to 2 CFR Part 200, are accessible at: https://www.commerce.gov/oam/policy/financial-assistance-policy.

12. NIST Standard Terms and Conditions for Extramural Construction Projects:

As indicated on the Form CD-450 for this award, the National Institute of Standards and Technology Standard Terms and Conditions for Extramural Construction Projects (Construction ST&Cs) dated May 11, 2023 are incorporated by reference into this award. The Construction ST&Cs are accessible at NIST Standard Terms and Conditions for Extramural Construction Projects | NIST.

13. Unfunded Grant Actions Mailbox (UGAM):

Requests for unfunded award actions, which include, but are not limited to, requests for no-cost extension, change in key personnel, change in scope of work, and budget revisions must be submitted to: UGAM@nist.gov, within the prescribed timeframes identified in the terms and conditions of the award.

Unfunded award action requests and related correspondence, including justification to support the request, sent to the mailbox ***must*** contain the following information in the email subject line: (1) Recipient name; (2) NIST award number; (3) Principal Investigator/Project Director; and (4) Action being requested (e.g. no cost extension, change in key personnel, etc.).
Unfunded award action requests must not be sent directly to NIST personnel (e.g. Grants Specialist, Grants Officer, Administrative Assistant, GMD Director, Federal Program Officer, etc.).

Any requests sent directly to NIST personnel will be returned to the sender with instructions on how to submit through the UGAM@nist.gov mailbox.

No other correspondence may be sent through this mailbox; timely responses to any other inquiries received in this mailbox are not guaranteed. The mailbox will not be used for any other purpose ***except*** for purposes identified above.

Requests that are processed will be authorized via a Form CD-451 Amendment to the Financial Assistance Award or a Non-Funded Administrative Change Letter.

14. Supervision of the Recipient's Staff and Associates and Compliance with NIST Policies on Use of Federal Facilities and Equipment:

Consistent with Department of Commerce Financial Assistance Standard Terms and Conditions, Section A.05, nothing in this award will be construed as authorizing the Recipient or its employees, agents, or assigns to act as an agent or assign of NIST, and the Recipient must exercise all diligence to ensure that no third party construes the Recipient as an actual, ostensible, or apparent agent of NIST. For purposes of this award, the use of the term "personnel" herein includes all third parties, such as contractors, subrecipients, students, fellows, or others participating under the direction of the Recipient's programs. The Recipient acknowledges that it is independent of NIST in the performance of the approved projects, and that the Recipient assumes full and sole responsibility for all benefits and protections of the Recipient's personnel and agents whose services are utilized by the Recipient in the execution of this award.

Accordingly, the Recipient must control the means and manner of its personnel's activities on the project, including those conducted on a NIST campus, on Recipient property, and at other locations for the project. The Recipient must directly provide a salary, stipend, or other funding to the personnel, and must establish the work schedule and tenure for the personnel. The Recipient is the supervisor of record for the personnel and will coordinate with NIST as needed to ensure that the research remains consistent with NIST program objectives.

15. Estimated Useful Life:

The estimated useful life of the building renovation portion of this project is 15 years from when the date on which the Certificate of Occupancy for the renovations is issued.

16. Property Trust Relationship and Public Notice Filings for Grant-Acquired Property:

In accordance with 2 CFR § 200.316 (Property trust relationship), real property, equipment, and intangible property, that are acquired or improved with a Federal award must be held in trust by the non-Federal entity (*i.e.*, Recipient or Subrecipient) as trustee for the beneficiaries of the project or program under which the property was acquired or improved. This trust relationship exists throughout the duration of the property's estimated useful life, as determined by the Grants Officer in consultation with the Program Office, during which time the Federal Government retains an undivided, equitable reversionary interest in the property (Federal Interest). The non-Federal entity must comply with all use and disposition requirements and restrictions as set forth in 2 C.F.R. §§ 200.310 (Insurance coverage) through 200.316 (Property trust relationship), as applicable, and in the terms and conditions of the Federal award.

The Grants Officer may require a non-Federal entity (*i.e.*, a Recipient or Subrecipient) to execute and to record (as applicable) a statement of interest, financing statement (Form UCC-1), lien, mortgage or other public notice of record to indicate that real or personal property acquired or improved in whole or in part pursuant to this award is subject to the Federal Interest, and that certain use and disposition requirements apply to the property. The statement of interest, financing statement (Form UCC-1), lien, mortgage or other public notice must be acceptable in form and substance to the NIST Grants Officer and must be placed on record in accordance with applicable State and local law, with continuances re-filed as appropriate. In such cases, the NIST Grants Officer may further require the non-Federal entity to provide a written statement from a licensed attorney in the jurisdiction where the property is located, certifying that the Federal Interest has been protected, as required under the award and in accordance with applicable State and local law. The attorney's statement, along with a copy of the instrument reflecting the recordation of the Federal Interest, must be promptly returned to the Grants Officer.

Without releasing or excusing the non-Federal entity from these obligations, the non-Federal entity, by execution of the financial assistance award or by expending Federal financial assistance funds (in the case of a subrecipient), authorizes the NIST Grants Officer to file such notices and continuations as it determines to be necessary or convenient to disclose and protect the Federal Interest in the property. The NIST Grants Officer may elect not to release any or a portion of the Federal award funds until the non-Federal entity has complied with this provision and any other applicable award terms or conditions, unless other arrangements satisfactory to the NIST Grants Officer are made.

17. Environmental and Historic Review:

The Recipient must comply with all applicable requirements, environmental and historic preservation laws, Executive Orders, regulations, standards, and guidance, and identify to NIST any impact a project may have on the environment or historic resources.

Project implementation may not begin prior to the completion of a review of potential environmental impacts, per the National Environmental Policy Act of 1969 (42 U.S.C. 4321, et. seq.) (NEPA) and Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. § 470, et. seq.).

The completion of NEPA compliance activities will result in one of the following: a Categorical Exclusion, an Environmental Assessment/Finding of No Significant Impact (EA/FONSI), or an Environmental Impact Statement. A decision document will not be issued until all required consultations, including, Section 7 of the Endangered Species Act (16 U.S.C. §1531, et. seq.), and any other required consultations are complete. The Recipient must also address compliance with all other applicable federal, state, and local environmental laws and regulations.

Under Section 106 of the NHPA, federal agencies, and by extension recipients of federal grant funds, must evaluate the potential effects of any proposed projects ("undertakings") on properties listed on, or eligible for listing on, the National Register of Historic Places. Grant recipients are encouraged to initiate Section 106 consultation with relevant State Historic Preservation Offices (SHPOs) or, in the case of institutions located on tribal lands, the proper Tribal Historic Preservation Office (THPO) as directed by NIST. NIST will remain involved in resolution in the event of an adverse effect determination.

A Environmental and Historic Review, to include any required consultations under NEPA and Section 106 of the NHPA, must be completed no later than six months after the award start date; unless a formal request for extension is submitted and approved by the Grants Officer. The Recipient must comply with all conditions placed on the project as the result of the consultation processes. The Recipient may not expend any federal grant funds, except as authorized by the Grants Officer pursuant to approval of the 6-month expenditure plan (discussed below).

The Recipient is required to provide the following information that will enable NIST to make a preliminary determination regarding the potential impact of the proposed project on environmental and historic resources:

1. A thorough description of all proposed project activities, particularly buildings and other capital improvement activities that will be conducted. Include: (i) the area and extent of earthwork (drilling, excavation, fill, blasting, dredging, etc.), (ii) environmental communication, documentation, or permitting (planned, pending, or in place), (iii) any determination upon the project by any department of environment or other agency or office, (iv) floodplain mapping on the site itself or any adjacent or contiguous property, (v) any special interest in the project or the site, (vi) any public meetings planned or held regarding the on the site itself or adjacent or contiguous property, (vii) any threatened or

endangered species or any migratory birds or bald or golden eagles on the site itself or adjacent or contiguous property, or (viii) any essential fish habitat or any portion of the National Wild and Scenic River System or Coastal Barrier System or navigable waters on the site itself or adjacent or contiguous property, (ix) any waters of any stream or other body of water "proposed or authorized, permitted or licensed to be impounded, diverted, or otherwise controlled or modified", (x) any identified or potential wetland on the site itself or any adjacent or contiguous property, (xi) any hazardous or regulated substances or Superfund activity on the site itself or adjacent or contiguous property, and/or (xii) any invasive species on the site itself or adjacent or contiguous property.

2. Maps of the project area and ground-level and aerial photographs with installation/renovation locations clearly marked on the buildings impacted. Free online resources, such as Google maps or similar images, are acceptable.

3. For the list of buildings, referenced in Item #1, state the year those buildings were first constructed as well as the dates of any subsequent major renovations. For buildings that are 45 years old or older, provide photos of installation sites, as well as exterior and interior photos of the building. Provide any property relevant to this application which is (i) within the viewshed of a registered historic property or (ii) within a historic district or (iii) registered as historic itself or (iv) noted to be historically or architecturally significant in any study or article of public interest. Provide any communication, documentation, or permitting under the project, e.g., determination upon the project by a SHPO and/or THPO.

NOTE: The Recipient must submit a draft Environmental and Historic Review with all initial required project information listed above in Items #1 – #3 to NIST via UGAM@nist.gov no later than 60 calendar days after award start date, unless an extension has been requested in writing by the Recipient and approved by the Grants Officer.

Follow-on information may be required for NIST to determine the level of impacts of the project on environmental and historic resources. If consultation is required, grantees are encouraged to initiate consultation as referenced above and must provide NIST with relevant documentation of the consultation process. Once appropriate and applicable consultations have been completed, and environmental review documentation has been completed, NIST will review all documentation and determine whether the review sufficiently addresses all resource areas and whether the project may qualify for an approval decision.

Once the above information is provided, NIST will review and provide guidance on the next steps that the recipient should take regarding required consultations and/or environmental and historic preservation documentation required to make environmental determinations. Next steps may include, but are not limited to, the submittal and completion of the following:

1. The completion of any required consultations as described above where applicable and directed by NIST, to include consultations with the SHPO and/or THPO and the appropriate federally-recognized Native American tribes (if applicable), under Section 106 of the NHPA, and/or consultations with the USFWS under Section 7 of the ESA;

2. The completion of environmental review and issuance by NIST of a decision document, as described above, that meets the requirements of NEPA; and

3. Compliance with all other applicable federal, state, and local environmental laws and regulations.

The Recipient is required to provide any information requested by NIST in a timely and effective manner to ensure both initial and ongoing compliance with environmental and historic preservation laws, regulations, and best practices. All such information must be sent to the FPO.

The Recipient shall notify NIST within 24 hours upon receipt of any notices of foreclosure; notices for continuing consultation received from the SHPO, THPO or other consulting party; or notices of noncompliance received from consulting authorities or regulatory agencies. These notices shall be sent to the FPO. Projects which, after consultation with appropriate agencies, are determined to be ineligible for a CE will require the development of an EA/FONSI. The Recipient may wish to coordinate with NIST to rescope or descope the proposed project to avoid or minimize impacts to environmental and historic resources.

Any change to the approved project scope, resulting from consultations or for other reasons, that have the potential for altering the nature or extent of environmental or cultural resources impacts must immediately be brought to the attention of NIST and will be re-evaluated for compliance with applicable regulatory requirements.

For all ground disturbing activities in the vicinity of known archaeological sites or suspected or known burials, the Recipient must ensure that an archaeologist who meets the Secretary of the Interior's Professional Qualification Standards monitors ground disturbance, and if any potential archeological resources or buried human remains are discovered, then the Recipient must immediately cease construction in that area and notify NIST and the interested SHPO, THPO, and tribes. Such construction activities may then only continue with the written approval of NIST.

6-Month Expenditure Plan

While this SAC is in effect, the Recipient shall submit, in advance of any program fund drawdowns from ASAP.gov, a 6-month expenditure plan that presents the proposed expenditure of award funds prior to the completion of the environmental review process, including any preliminary procurement activities. The NEPA Coordinator and the Federal

Preservation Officer will review the plan and provide recommendations to the Federal Program Officer and the Grants Officer for final approval to ensure that the proposed activities and expenditures are reasonable and necessary in the context of environmental and historical compliance. Approval of the Grants Officer is required prior to fund drawdowns of the 6-Month Expenditure Plan through ASAP.gov.

The allowable use of funds for preliminary expenditures prior to beginning project implementation includes, but is not limited to, the initiation of activities necessary to meet the project completion requirements as specified in the award including environmental and historic preservation requirements:

1. Required environmental and historic preservation consultation activities;
2. Purchase or lease of equipment, or entering into binding contracts to do so; and
3. Purchase of applicable or conditional insurance.

The allowable use of preliminary expenditure funds is limited; must not result in an irrevocable commitment of resources; and is only allowed after inclusion in and approval of a 6-month expenditure plan.

18. Signage and Public Acknowledgement Requirements:

a. Signs - The Recipient is encouraged to include project signage, satisfactory in form and content to NIST, that identifies the nature of the project and indicates that "the project is funded by the Consolidated Appropriations Act, 2022." In addition, guidelines for project signage, including an emblem and corresponding logomark, is available in the Official Investing in America Emblem Style Guide: https://www.whitehouse.gov/wp-content/uploads/2023/02/Investing-in-America-Brand-Guide.pdf. Costs associated with signage must be reasonable and limited. The Recipient is encouraged to use recycled or recovered materials when procuring signs. Signs should not be produced or displayed if doing so results in unreasonable cost, expense, or recipient burden. Any construction site sign should be displayed throughout the construction phase of the project in an easily visible location directly linked to the work taking place. The Recipient is responsible to maintain the sign in good condition throughout the construction period.

b. Plaque - Any plaque installed at the discretion of the Recipient, citing the origins or history of the project, should identify the project as a "project funded by Consolidated Appropriations Act, 2022."

c. Communications - Any banner or other message intended for public display on the project site should remain within the spirit of transparency and public information provided herein.

19. Final Site Selection:

Within 60 calendar days of the award start date, the Recipient must provide to the Federal Program Officer and Grants Specialist identified in this award, a final site selection for the Burlington Aviation Technology Center Facility. The site selection must be approved by NIST prior to advertisement of construction. All grant funding will be withheld until this Specific Award Condition is deemed satisfied in writing by the NIST Grants Officer.

End of Specific Award Conditions

OMB Number: 4040-0008
Expiration Date: 02/28/2025

BUDGET INFORMATION - Construction Programs

NOTE: Certain Federal assistance programs require additional computations to arrive at the Federal share of project costs eligible for participation. If such is the case, you will be notified.

COST CLASSIFICATION	a. Total Cost	b. Costs Not Allowable for Participation	c. Total Allowable Costs (Columns a-b)
1. Administrative and legal expenses	$	$	$
2. Land, structures, rights-of-way, appraisals, etc.	$	$	$
3. Relocation expenses and payments	$	$	$
4. Architectural and engineering fees	$ 947,427.00	$ 547,427.00	$ 400,000.00
5. Other architectural and engineering fees	$ 50,000.00	$	$ 50,000.00
6. Project inspection fees	$ 600,000.00	$	$ 600,000.00
7. Site work	$ 7,050,000.00	$	$ 7,050,000.00
8. Demolition and removal	$	$	$
9. Construction	$	$	$
10. Equipment	$	$	$
11. Miscellaneous	$	$	$
12. SUBTOTAL *(sum of lines 1-11)*	$ 8,647,427.00	$ 547,427.00	$ 8,100,000.00
13. Contingencies	$ 1,800,000.00	$	$ 1,800,000.00
14. SUBTOTAL	$ 10,447,427.00	$ 547,427.00	$ 9,900,000.00
15. Project (program) income	$	$	$
16. TOTAL PROJECT COSTS *(subtract #15 from #14)*	$ 10,447,427.00	$ 547,427.00	$ 9,900,000.00

FEDERAL FUNDING

17. Federal assistance requested, calculate as follows: (Consult Federal agency for Federal percentage share.) Enter the resulting Federal share.	Enter eligible costs from line 16c Multiply X 100 %	$ 9,900,000.00