



Device Controller

Installation Guide

Model Numbers:

CDCZ24S 3.1

CDCZ24RS-NC-3.1

CDCZ24RS-NO-3.1

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The Consert solution is covered by U.S. Pat. No. 7,715,951 and other U.S. and international patents pending. A list of patents and published patent applications relating to the Consert solution may be found at www.consert.com/patents.

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INTRODUCTION

Utilizing standards-based hardware and hardware interfaces to ensure universal connectivity, the Consert[®] **Tru** Load Device Controller measures metrology data of devices of up to 50 amps of service, or 2 HP, such as HVACs, electric water heaters, and pool pumps in compliance with ANSI C12.1 accuracy requirements. This real-time empirical data collection is aggregated and delivered to the Consert **Tru** Smart Energy Gateway via the onboard ZigBee[®] wireless radio communications. Offering a new level of intelligence and control at the device level, the Consert **Tru** Load Device Controller when paired with the Smart Energy Gateway empowers homeowners and small businesses to participate in cost saving activities overseen by their utilities that help both parties benefit economically and environmentally.

For environmental specifications see [Appendix B: Environmental Specifications](#) on page 15, and for regulatory information, including the FCC ID, see [Appendix C: Regulatory Information](#) on page 16.

BEFORE YOU START

These instructions describe how to install the Consert Tru Load Device Controllers for use with the Consert® energy management solution. These Device Controllers can be installed on 120-VAC or 240-VAC equipment such as HVACs, electric water heaters, and pool pumps rated under 2 HP or 50 Amps.

- The Tru Load Device controllers should be installed according to the National Electrical Code (NEC) and local code requirements.
- Read all instructions before proceeding with the installation.
- For assistance, please contact Consert Installation Support at the numbers provided by the Consert Project Manager.

SUPPLIES NEEDED FOR EACH INSTALLATION

The following supplies are required for each installation. Refer to the work order for specifics for each participant, such as equipment to be controlled.

The following will be supplied for each installation, as required:

- One Tru Load Device Controller without a relay (CDCZ24S 3.1) for each HVAC unit. These device controllers carry up to a maximum load of 50 amps, based on minimum circuit ampacity (MCA) listed on the nameplate.
- One Tru Load Device Controller with a relay for each electric water heater, or other controlled equipment, such as a pool pump, as follows:
 - For equipment that has a maximum load of 40 amps or a maximum HP rating of 2HP, use model number CDCZ24RS NO 3.1.
 - For equipment that has a maximum load of 30 amps or a maximum HP rating of 1.5 HP, use model number CDCZ24RS-NC-3.1.
- #6, #8, #10, #12, and #14 black wire to make jumpers for the disconnects or panel.

The different wire sizes are required for the various conditions that will be encountered in the field. #10 and #12 are the most common sizes used and each installation uses a minimum of 6" of wire for each jumper.

- Romex:
 - #10 romex, 2-wire with ground, for connecting to the water heater.
 - ½" or ¾" romex clamp connectors.

The romex is used to make the connections to the water heater when the Tru Load Device controller is connected at the water heater using a 4x4 junction box.

- Non-metallic liquid-tight flexible conduit:
 - ½" non-metallic liquid-tight outdoor use flexible conduit that meets local code requirements.
 - ½" non-metallic liquid-tight conduit connectors (straight and 90°) to connect the flex to the controlled equipment, disconnects, panels, or junction boxes.

■ Wire Nuts:

- Blue or Orange twist on wire nuts (Min 2 #22 to Max 2 #14)
- Red twist-on wire nuts (Min 2 #18 to Max 4 #10).
- Blue twist-on wire nuts (Min 3 #12 to Max 2 #6).
- Al to Cu wire connectors (up to #6).

The red wire nuts are the most commonly used size.

■ Fasteners:

See *Approved Device Controller Attachment Methods* on page 14 for approved device controller attachment methods.

- Hex head #10 Tek screws, minimum 1¼ inch, for mounting the Tru Load Device Controllers to non-brick/block surfaces. Four are required for each device controller.
- Plastic anchor kit with #10 screws for mounting the device controller to block or brick surfaces. Four screws and anchors are required for each device controller.
- 3/16x3" toggle bolts for mounting the Tru Load Device Controllers to sheetrock. Four bolts are required for each device controller.
- Self-drilling drywall anchors
- Ground Screws for use with the 4x4 metal junction boxes.

■ ¾" to ½" reducing washers.

■ Breakers and fuses

- A supply of classified 15-70 amp 2-pole breakers for use when the current breakers are not the correct size for the equipment on the circuit.
- A supply of classified low voltage regular and mini blade air handler fuses, assorted amp. ratings

■ Rubber and vinyl tape for insulating the Al to Cu connectors. Each Al to Cu connection must be wrapped with rubber tape first to ensure sufficient protection, followed by the vinyl tape to secure the rubber tape.

■ Junction boxes

- One 4" X 4" square metal junction box with 4" X 4" metal cover for each Tru Load Device Controller connected to a water heater, if required.
- A supply of 4" X 4" square box extensions
- A supply of 4" X 4" octagon box extensions
- A supply of ½" and ¾" knockout seals.

WHEN YOU ARRIVE AT THE INSTALLATION SITE

Perform these verifications **BEFORE** installing any devices.

- ☐ **Verify that the HVAC system (including air handler), water heater, pool pump, and other equipment to be controlled, are wired according to the NEC. If they are not, contact Installation Support for possible disqualification of the installation. Record the reason for disqualification, or approval to continue with the installation, on the Installation Form.**
- ☐ HVAC System
 - ☐ Verify that the HVAC system, including air handler, is wired according to NEC standards.
 - ☐ If the HVAC is an Amana brand or other communicating unit, do not install the thermostat or related control equipment, unless the owner has installed a special wiring harness. Without the wiring harness, a communicating HVAC is not compatible with the Consert thermostat because it uses wireless thermostats only.
 - ☐ If there is no disconnect and the device controller cannot be mounted at the panel, contact local Installation Support for instructions.
 - ☐ Verify the size of the wire used to connect the breaker or fuse to the HVAC disconnect is correctly sized per the unit's minimum circuit ampacity (MCA). If it is not properly sized, do not install any related control equipment.
 - ☐ Verify the size of the wire used to connect the disconnect to the HVAC. If it is not of sufficient size, replace with proper size wire, if instructed to do so by the electric provider and/or local Installation Support.
- ☐ Determine the location of the water heater and other equipment. If any are located in an area where the equipment is exposed to physical damage, ensure that the device controller can be mounted where it is readily accessible. The attic or under the building are acceptable locations. If the device controller can't be mounted where it is readily accessible, do not install it.
- ☐ Breaker box or fused disconnect:
 - ☐ Verify the size of the breakers or fuses to which the controlled equipment is attached. If they are the wrong size, replace with classified 20-60 amp 2-pole breakers or fuses sized per the maximum breaker or fuse on the unit name plate. Do not replace if you are not going to install related Consert equipment, but inform participant.
 - ☐ Verify that the panel breakers or fuses are correctly labeled for the equipment being controlled. Correct the labeling as required.
- ☐ If the home has more than one HVAC, determine which thermostat controls which system. See *Installing a Tru Load Device Controller to an HVAC Unit* on page 8.

INSTALLATION INSTRUCTIONS

INSTALLING A TRU LOAD DEVICE CONTROLLER TO AN HVAC UNIT

This procedure is for connecting a Tru Load Device Controller to an HVAC Unit.

Before Starting This Procedure

If the HVAC system, including the air handler, is not wired according to NEC standards, contact Installation Support for possible disqualification of the installation. Record the reason for disqualification, or approval to continue, on the installation form.



- See *Approved Device Controller Attachment Methods* on page 14 for attachment requirements.
- **Only use device controller model number CDC224S-3.1 for HVAC Units. It does not have a relay. This device controller can handle up to 50 amps.**
- **Do not open the device controller.**

Installation Procedure

- 1 If the home has more than one HVAC system, determine which thermostat controls which system:
 - a Turn all thermostats to the off position.
 - b Turn one thermostat to cool mode with a target temperature sufficient to switch on the compressor.
 - c Verify which compressor fan turned on and indicate this on the installation form for the respective thermostat.
 - d Repeat above steps for all thermostats.
- 2 For each HVAC system, verify the MCA rating to ensure it is less than the 50-amp maximum and that the correct size wire is used to connect the device controller.

Note: If the MCA is larger than 50 amps, do not install the Tru load Device Controller.

Use the following size wires for the disconnect or panel jumpers, based on the HVAC unit MCA:

- Up to 15 amps = # 14
- 15-20 amps = #12
- 20–30 amps = #10
- 30-40 amps = #8
- 40-55 Amps = #6

- 3** For each HVAC, determine the best location for the device controller. It can be connected to an accessible panel or to the HVAC disconnect. The Tru Load Device Controller should be aligned with the panel or disconnect.



If mounting at the disconnect:

- If the line between the disconnect and unit is not the correct size, replace, if authorized by Installation Support to do so. Include this information on the Installation Form.
 - If the disconnect has metal flex between the disconnect and the unit, replace it with non-metallic liquid-tight flexible conduit, if authorized by Installation Support to do so. Include this information on the Installation Form.
 - If there is no flex between the disconnect and the unit, install non-metallic liquid-tight flexible conduit, if authorized by Installation Support to do so. Include this information on the Installation Form.
 - If disconnect does not have connectors, install connectors, if feasible and authorized by Installation Support. Include this information on the Installation Form.
 - If there is no disconnect and the device controller cannot be mounted at the panel contact Installation Support for instructions.
- 4 Mount the controller with the conduit connection down. DO NOT mount in any other orientation.** See *Approved Device Controller Attachment Methods* on page 14 for the approved attachment method.
- 5** For each HVAC system, install the device controller on the load side of the HVAC disconnect, breaker, or fuse, using approved connectors. It must be connected on the load side so that there is no power to the device controller when the unit is switched off for servicing.

- a** Disconnect the power from the HVAC system.
- b** Connect the flex from the device controller to the disconnect or panel using approved fittings. Use right angle connectors as needed to avoid crimping the flex.
- c** Connect as shown in Figure 1. Numbers in brackets [] point to related locations in the wiring diagram.

- 1)** Remove the load wires [7 and 8] from the disconnect connection block or panel breaker [4]. **Do Not Cut**
- 2)** Add jumpers [5 and 6] sized according to unit. Jumper [5] is not required if the black wire is long enough to connect directly to the connection block or panel breaker.
- 3)** Connect the black device controller wire [1] to jumper [5], or directly to the connection block or breaker if it is long enough.

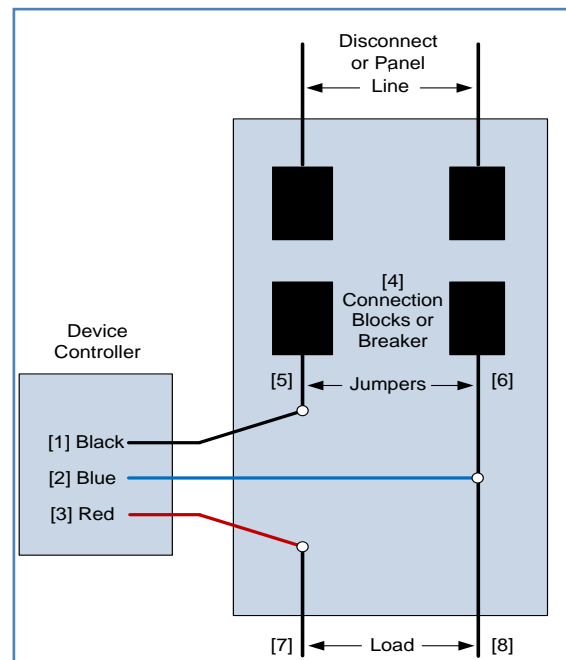


Figure 1 HVAC Wiring Diagram

- 4) Connect the **red** device controller wire [3] to the load wire [7].
- 5) Connect the **blue** device controller wire [2] to the jumper wire [6] and the load wire [8].
- 6 Restore power to the HVAC system. The device controller lights should flash briefly when the power is switched on, verifying that it is connected correctly.

INSTALLING A TRU LOAD DEVICE CONTROLLER TO 240-VAC EQUIPMENT

This procedure is for connecting a Tru Load Device Controller to a water heater or other 240-VAC equipment, except an HVAC system. For an HVAC system, see *Installing a Tru Load Device Controller to an HVAC Unit* on page 8.

Before Starting This Procedure

If the HVAC system, including the air handler, is not wired according to NEC standards, contact Installation Support for possible disqualification of the installation. Record the reason for disqualification, or approval to continue, on the installation form.



- If the equipment has an HP rating, the rating cannot exceed 1½ HP. See *Approved Device Controller Attachment Methods* on page 14 for attachment requirements.
- **Only use one of the following device controllers:**
 - **For equipment that has a maximum load of 40 amps or a HP rating of 2HP, use model number CDC224RS-NO-3.1.**
 - **For equipment that has a maximum load of 30 amps or a HP rating of 1.5 HP, use model number CDC224RS-NC-3.1.**
- **Do not open the device controller.**

Installation Procedure

- 1 With the power switched on, measure the ampacity to ensure that it is less than the maximum of amps for the device controller. For a water heater, you may have to run the hot water to force the heating element to switch on before you can obtain a valid ampacity reading.
- 2 Ensure you are working with the correct circuit by switching the breaker off and checking the voltage at the equipment to verify that the power is off.
- 3 Determine the best location for the device controller. The device controller should be readily accessible. It can be connected to an accessible panel or disconnect, or at the equipment, using a 4x4 junction box.
 - If the equipment is located in an area where it is exposed to physical damage, the device controller must be mounted where it is readily accessible. The attic or under the building are acceptable locations.

If code requires that equipment exposed to physical damage be connected with flexible conduit from the junction box to the



equipment and it is not, replace if authorized to do so by Installation Support. The DC should also be connected to the junction box with flexible conduit.

- If installing the device controller on a water heater or other equipment that is controlled by a timer, disconnect both the line and load wires to the timer. If feasible, use the timer housing as the junction box.

4 Mount the controller with the conduit connection down. DO NOT mount in any other orientation. See *Approved Device Controller Attachment Methods* on page 14 for the approved attachment method.

5 Verify the amp rating and breaker or fuse size of the equipment being controlled to ensure the correct size wire is used to connect the device controller. If the breaker or fuse is not the correct size, replace with classified 20-30 amp 2-pole breaker, fuse sized per the maximum breaker, or fuse on the unit name plate, if authorized to do so by Installation Support.

Notes: If the supply wire is larger than #10, verify that the equipment rating is 30 amps or less. If the equipment rating is greater than 30 amps, do not install the Tru Load Device Controller.

6 Install the device controller on the load side of the water heater, using approved connectors. It must be connected on the load side so that there is no power to the device controller when the unit is switched off for servicing.

7 Connect the device controller. The preferred location is at an accessible panel or disconnect. These instructions are for connecting the controller using a 4x4 junction box. The wiring is the same when connecting to an accessible panel or disconnect.

a Disconnect the power from the water heater.

b Mount the device controller and prepare wiring:

- If the device controller is being installed at the water heater:
 - a) Mount the device controller and junction box close to the water heater.
 - b) Disconnect and remove the supply wires from the water heater and run them to the junction box.
 - c) If required, install new wire from the water heater to the junction box using romex or other approved wiring (typically #10).
- If the device controller is being installed at an accessible panel or disconnect, mount the controller close to the panel or disconnect. You should not have to use the junction box.

c Connect as shown in Figure 2. Numbers in brackets [] point to related locations in the wiring diagram.

- 1) Connect the black device controller wire [1] to line wire [4].
- 2) Connect the red device controller wire [3] to the load wire [7].
- 3) Connect the blue device controller wire [2] to line wire [5] and load wire [8].
- 4) Tie grounds together [6].
- 5) Connect grounds [6] and ground jumper wire [9] to box with ground screw.

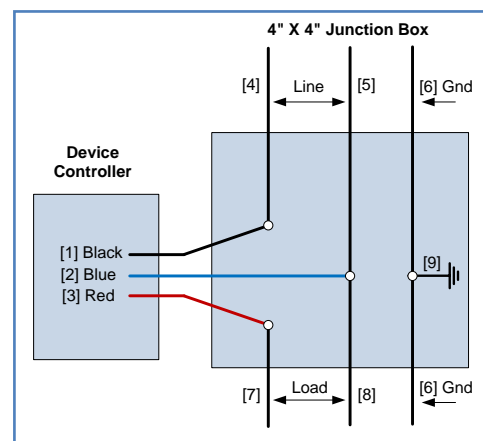


Figure 2 Water Heater Wiring Diagram

- 8 Restore power to the equipment. The device controller lights should flash briefly when the power is switched on, verifying that it is connected correctly.

INSTALLING A TRU LOAD DEVICE CONTROLLER TO 120-VAC EQUIPMENT

This procedure is for connecting a device controller to 120-VAC equipment such as a 120-VAC water heater or a pool pump up to 1.5 HP.

Before Starting This Procedure

If the HVAC system, including the air handler, is not wired according to NEC standards, contact Installation Support for possible disqualification of the installation. Record the reason for disqualification, or approval to continue, on the installation form.



- See *Approved Device Controller Attachment Methods* on page 14 for attachment requirements.
- **Only use one of the following device controllers:**
 - For equipment that has a maximum load of 40 amps or a HP rating of 2HP, use model number CDCZ24RS-NO-3.1.
 - For equipment that has a maximum load of 30 amps or a HP rating of 1.5 HP, use model number CDCZ24RS-NC-3.1.
- **Do not open the device controller.**

Installation Procedure

- 1 With the power switched on, measure the ampacity to ensure that it is less than the maximum of amps for the device controller. For a water heater, you may have to run the hot water to force the heating element to switch on before you can obtain a valid ampacity reading.
- 2 Ensure you are working with the correct circuit by switching the breaker off and checking the voltage at the equipment to verify that the power is off.
- 3 Verify the amp rating and breaker or fuse size of the equipment being controlled to ensure the correct size wire is used to connect the device controller. If the breaker is not the correct size, replace with classified 20-30 amp single-pole breaker or the correct size fuse.

Notes: If the supply wire is larger than #10, verify that the equipment rating is 30 amps or less. If the equipment rating is greater than 30 amps, do not install the Tru Load Device Controller.

- 4 Determine the best location for the device controller and 4x4 junction box, if needed. **Mount the controller with the conduit connection down. DO NOT mount in any other orientation.** See *Approved Device Controller Attachment Methods* on page 14 for the approved attachment method.



- If the equipment is located in an area where it is exposed to physical damage, the device controller must be mounted where it is readily accessible. The attic or under the building are acceptable locations.

If code requires that equipment exposed to physical damage be connected with flexible conduit from the junction box to the equipment and it is not, replace. The DC should also be connected to the junction box with flexible conduit.

- If installing the device controller on a water heater or other equipment that is controlled by a timer, disconnect both the line and load wires to the timer. If feasible, use the timer housing as the junction box.

5 Install the device controller on the load side of the controlled equipment, using approved connectors. It must be connected on the load side so that there is no power to the device controller when the unit is switched off for servicing.

6 Connect the device controller. The preferred location is at an accessible panel or disconnect.

a Disconnect the power from the controlled equipment.

b Mount the device controller and prepare wiring:

- If the device controller is being installed at the controlled equipment:
 - a)** Mount the device controller and junction box, if required, close to the controlled equipment.
 - b)** Disconnect and remove the supply wires from the controlled equipment and run them to the device controller or junction box as appropriate.
 - c)** Install new wire from the controlled equipment to the device controller or junction box, as appropriate.
- If the device controller is being installed at an accessible panel or disconnect, mount the controller close to the panel or disconnect. You should not have to use a junction box.

c Connect as shown in Figure 3. Numbers in brackets [] point to related locations in the wiring diagram.

- 1)** Connect the black device controller wire [1] to line wire [4]
- 2)** Connect the red device controller wire [3] to the load wire [7].
- 3)** Connect the blue device controller wire [2] to neutral wire [5] and neutral wire [8].
- 4)** Tie grounds together [6].
- 5)** Connect grounds [6] and ground jumper wire [9] to box with ground screw, if required.

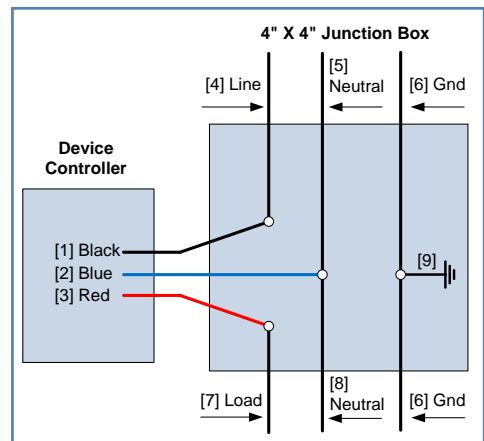


Figure 3 120-Volt Wiring Diagram

7 Restore power to the equipment. The device controller lights should flash briefly when the power is switched on, verifying that it is connected correctly.

Appendix A. APPROVED DEVICE CONTROLLER ATTACHMENT METHODS

To meet UL requirements, the Tru Load Device Controllers should be attached as follows:

Surface	Attachment
Brick or block	Plastic Anchor Kit
Wood, Masonite, Hardiplank, vinyl and similar siding materials	4 #10 x 1¼ inch Tek screws
Sheetrock	2 #10x1 ¼-inch Tek screws and 2 3/16x3 inch toggle bolts or self-drilling drywall anchors. Two of the mounts should be mounted into a stud and two mounts can be attached using toggle bolts.

Appendix B. ENVIRONMENTAL SPECIFICATIONS

The **Tru** Load Device Controller is designed to function in normal residential and small business environments. The parts and assembled controller meet the following environmental specifications:

- Industrial temperature rated parts (-40°C to +85°C)
- Assembled device controller temperature range -40° C to +65° C
- UL916 rated enclosure; UL50 and UL50E ratings pending

Appendix C. REGULATORY INFORMATION

- FCC ID: YJ4CMGYZCDCZ31
- Certified to UL916
- Complies with Part 15 of the FCC Rules
- USA-Federal Communications Commission (FCC)

Operation is subject to the following two conditions:

- 1) This device may not cause harmful interference, and
- 2) This device must accept any interference received, including interference that may cause undesired operation.

Cautions:

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- **Exposure to Radio Frequency Radiation.**
To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Note:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Device Controller Installation

