Installation Guide

STRA - Wye Delta Starter Kit

Model Numbers:
RTHA
RTHB
RTHC
RTHD

This document applies to service offering applications only.

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

October 2023 **SO-SVN040A-EN**

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labeling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠WARNING

Follow EHS Policies!

Failure to follow instructions below could result in death or serious injury.

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

⚠WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

NOTICE

Compressor Damage!

Failure to disconnect power prior to evaluating the refrigerant system, or application of power while the refrigerant system is in a vacuum could cause compressor motor damage due to the nature of the solid state starter.
Disconnect all electric power including remote disconnects prior to evacuating refrigeration. System power shall not be applied to the chiller while the refrigerant system is in a vacuum.

Copyright

Trademarks

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Revision History

Document updated to reflect Service Offering number.

Table of Contents

General Information

General

This manual is intended to assist in the refresh or conversion of RTHA, RTHB, RTHC, or RTHD starters to Wye Delta operation.

Note: *This upgrade has been designed for units in good working order. It is assumed that unit is charged with the correct amount of refrigerant and oil. Review all filters, tubes, compressors, and controls to determine if any other service procedures are required during equipment downtime.*

NOTICE

Compressor Motor Damage!

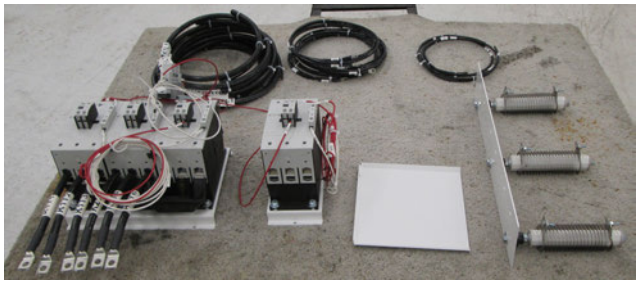
Failure to disconnect power prior to evacuating the refrigerant system, or application of power while the refrigerant system is in a vacuum, will cause compressor motor damage due to the nature of the solid state starter.
Disconnect all electric power including remote disconnects prior to evacuating refrigerant. System power shall not be applied to the chiller while the refrigerant system is in a vacuum.

Important: *Do not energize the unit if the refrigerant side of the system is in a vacuum.*

Catastrophic damage to the compressor motor will occur if supply power is applied while the system is in a vacuum.

About this Kit

Figure 1. Wye delta kit



The Wye Delta kit allows the field refresh or conversion of Trane RTHA, RTHB, RTHC, and RTHD chiller starters. Its installation provides new OEM Trane components to replace the existing starter working power components.

The refresh kit includes new power contactors and a new resistor bank. The contactors include factory installed control wiring with sufficient lengths to allow connection to the chiller controls. It also includes power wiring needed to connect the resistor bank to the K4 transition contactor.

The conversion kit allows an existing cross line or solid state starter to be converted to Wye Delta operation. This kit includes all components found in a starter refresh kit plus the necessary power cabling needed for installation. This kit is not recommended to replace AFD.

Starter Control Wiring

The kit components are compatible with all generations of Series R Trane chiller controls including UCP1, UCP2, CH530 and AdaptiView™/Optimus control families. This is because all of these control families used the same Wye Delta starter contactor and resistor types. If the chiller's original control system is being retained as part of the installation, use the original schematics and wire markings to do the installation.

Upgrading the unit controls to AdaptiView/Optimus generation in combination with the starter upgrade is recommended as this provides the most advanced generation of Trane chiller starter control and protections. Refer to the applicable AdaptiView upgrade schematics for wiring guidance and markings.

Important: *Always follow safe electrical practices while installing the new starter. Be certain to route new wiring neatly through the starter panel. Do not allow the wiring to come in contact with any sharp objects. It is advised to place fish paper between the bottom of the starter cabinet and wiring.*

Kit Materials

Factory provided materials and drawings:

Wye Delta Refresh and Conversion:

- Starter contactor sets, installed on mounting plates with shorting bars, interlocks, aux contactors and control wires installed
- Starter resistor set with cut to length cables*
- Fasteners and resistor terminals (field installed)
- Schematics
- Trim to length highly stranded flexible motor terminal motor cables having motor lugs on one end*.
- 1K11 Relay (RTHA and RTHC W and C kits only)
- Trim to length heavy stranded incoming power cables*
- Cable tags*
  * Cables and resistors are provided with conversion kits. Resistors are not recommended for refresh kits as they are highly reliable and their replacement is not justified.
- UCP2 Connector plugs for RTHB/RTHC Wye Delta conversion kits

Required Tools

Common hand tools and hand-held power tools are required to perform the retrofit. A trained service technician with a well-stocked tool chest should have all of the necessary tools to perform the job. The following list is a sampling of the tools that one could expect to find inside the technicians tool chest:

- Electric Drill and Bit Set
- Screwdrivers
- Wrenches
- Ratchet and Socket Set
- Nut Driver Set
- Wire Cutter
- Wire Stripper

The following special tools are also required to perform the retrofit:

- Computer equipped with the latest version of TechView™ service software
- Cable to connect DynaView™ to a computer. Use a factory approved and tested USB-to-serial cable (Trane part number ADP01161). The Rover Adapter service tool provides the most reliable connection.
- RS-232 male DB9 to female DB9 pin to pin serial cable

  Note: *Cable must not be a null-modem cable. Cable must be less than 50 feet in length.*
- Magnetic screwdriver (South-pole magnet TOL01341)
- Crimping tool for barrel-crimped wire terminals

Field-Provided Materials

- Control Wire
- Wire Markers
- Zip Ties
- Fish Paper
- Fasteners
- Ring Terminals

Before you Start

1. Be sure to evaluate the existing starter for modifications or incorrect power routing that could interfere with installing the new components. See Figure 2 and Figure 3 for examples of incorrect and corrected routing. This is especially true when you are converting a solid state starter to Wye Delta operation. The concern is that the power cables will be routed where the contactors have to be located, making the installation impossible.

   Figure 2 is a picture of an existing starter where the installing electrician brought the power in through the bottom instead of through the top. To install this kit, the owner first had to have an electrician move the incoming power to the top. Failure to notice non-confirming power connections can result in unplanned project delays and expense.

Figure 2. Non-confirming installation

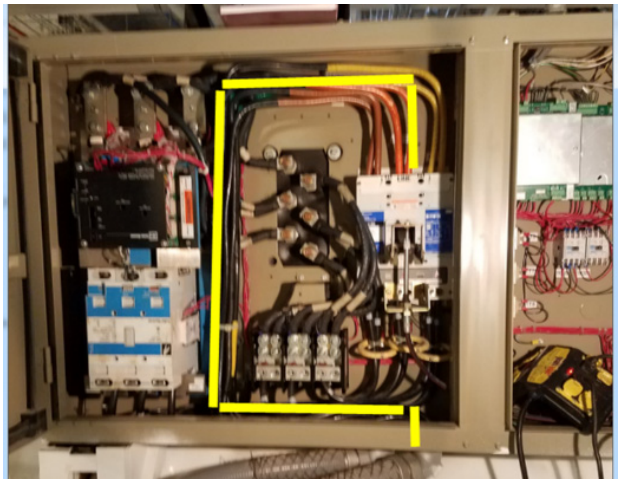
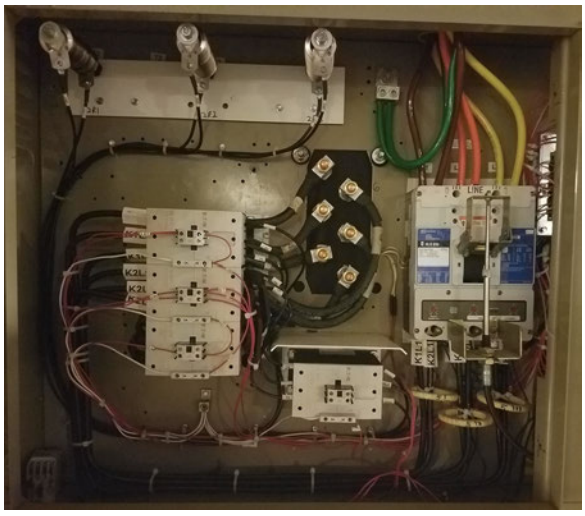


Figure 3. Installation after cables were corrected



2. On projects where a Benshaw solid state starter is being considered as an alternative to a Wye Delta starter, make sure that you confirm that the starter has a shunt trip circuit breaker. It is very difficult to upgrade most Series R starters to shunt trip operation. Therefore, it is very important that you confirm that the unit has a shunt trip breaker or can be upgraded to one before attempting to install a Benshaw solid state starter on an existing chiller.

   All Pueblo built RTHB chillers with A/C515 Cutler Hammer Solid State Starter had shunt trip breakers.

   RTHB chillers without Solid State Starter may or may not have breakers.

   If the original starter does not have a shunt trip breaker, it is likely that your best choice is to do a Wye Delta conversion. The easiest way to confirm if your starter has a breaker is to check the parts list in Webcats.

3. Confirm that the Chiller RLA is within the RLA range printed on the starter kit nameplate. If the starter is too small, contact service products customer support to order a correctly sized starter. If the starter range is greater than the chiller RLA, contact service products customer support to investigate how order a correctly sized resistor kit.
4. Confirm that the Chiller voltage is correct for the voltage printed on the starter kit nameplate. If the voltage is incorrect, contact order services to investigate how order a correctly sized resistor kit.

Model Number Descriptions

STRA0200FAABC1

Digit 1, 2, 3, 4

Starter Retrofit Release A

Digit 5, 6, 7, 8

Maximum RLA

Digit 9 — Volt

A = 200 V, 60 Hz
B = 208 V, 60 Hz
C = 230 V, 60 Hz
D = 380 V, 60 Hz
R = 380 V, 50 Hz
T = 400 V, 50 Hz
U = 415 V, 50 Hz
F = 460 V, 60 Hz
G = 480 V, 60 Hz
H = 575 V, 60 Hz
J = 600 V, 60 Hz

Digit 10, 11

Design Sequence

Digit 12 — Unit Type

A = RTHA
B = RTHB
C = RTHC
D = RTHD
1 = CenTraVac Transition
2 = CenTraVac Direct
3 = CenTraVac Remote

Digit 13 — Starter Type

W = Wye Delta Refresh
C = Wye Delta Conversion
A = Solid State Conversion
T = IT Refresh

Digit 14 — Motor Terminal Size

0 = No Motor Cable
1 = 3/8 in.
2 = 5/8 in.

Digit 15 — Input Cable

0 = No Input Cable
1 = Input Cable

Digit 16 — Resistor Set

0 = No Resistors
1 = 606 Amp and Smaller
2 = G,T. 606 Amp

Identify Existing Solid State Starters

Removal of Existing Starters

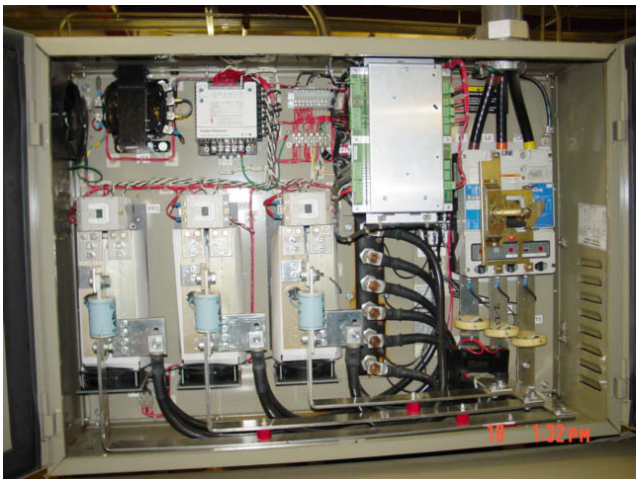
Trane has used four styles of solid state starters over the past several years. Determine whether the SSS is an A515, Cutler Hammer S801 Intelligent Technology (IT), Cutler Hammer EasySTART, or Benshaw Redistart starter by comparing the pictures below.

⚠WARNING

Heavy Object!

Failure to follow instructions below could result in unit dropping which could result in death or serious injury, and equipment or property-only damage.
Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift.

Figure 4. A515 solid state starter



For cross line starter, remove K1 contactor, shorting bars, and power cables and proceed to the applicable assembly installation guidance. For solid state starters refer to the starter removal guidance for your chiller indicated below.

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

Figure 5. Cutler-Hammer S801 Intelligent Technology (IT) starter

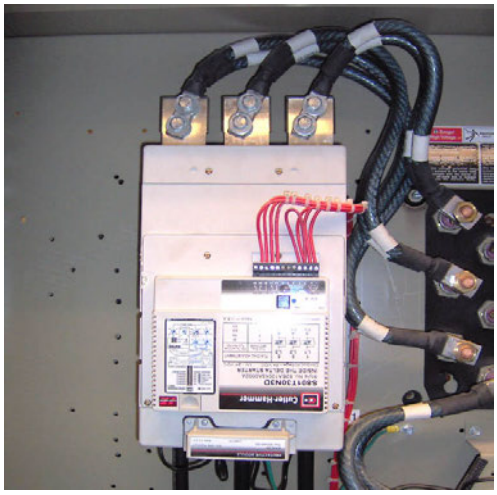


Figure 6. Cutler-Hammer EasySTART

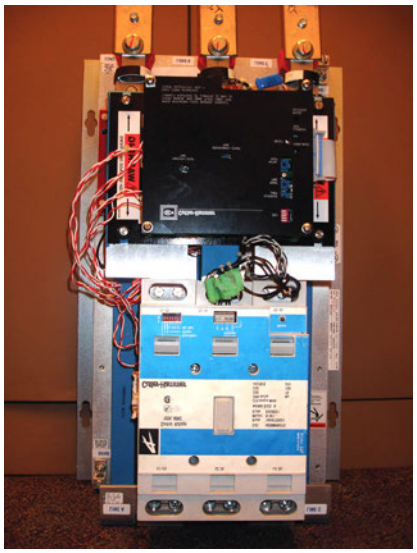
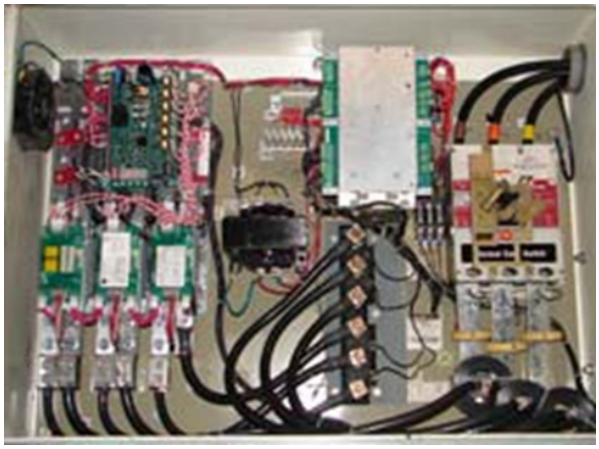


Figure 7. Benshaw Redistart



⚠WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

RTHA and RTHB Chiller Solid State Starter Removal

Remove highlighted materials, related control wires and power cables for the starters below. Cooling fans will not be used and may be removed or abandoned in place.

Figure 8. Location of A15 starter and additional components that are to be removed (highlighted) — RTHB

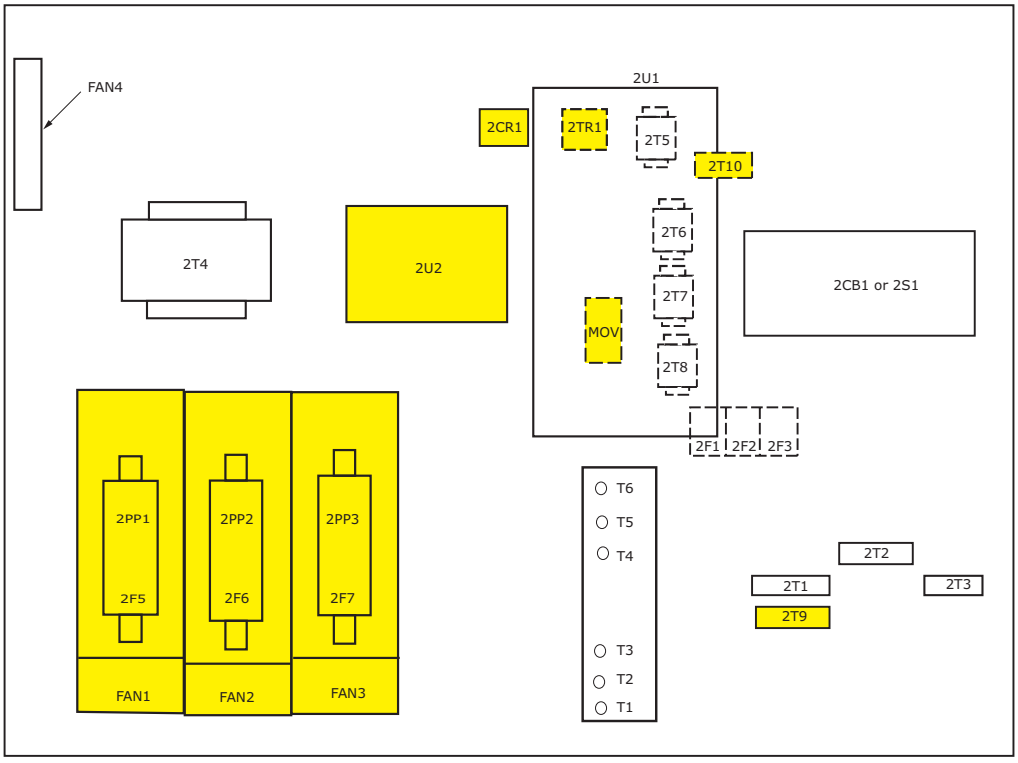
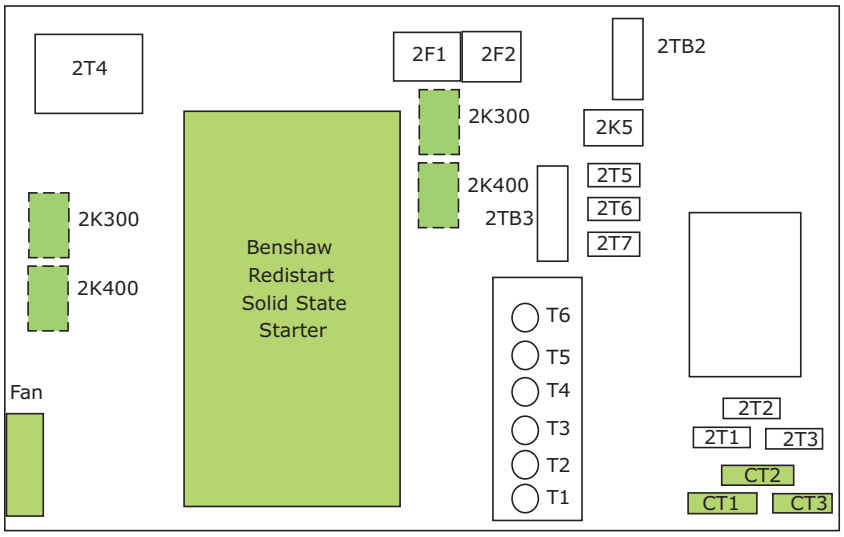


Figure 9. Location of Benshaw Redistart starter and additional components that are to be removed (highlighted)



RTHC Chiller Solid State Starter Removal

Remove highlighted components. Cooling fans will not be used and may be removed or abandoned in place.

Figure 10. Remove the highlighted components (EasySTART) — RTHC

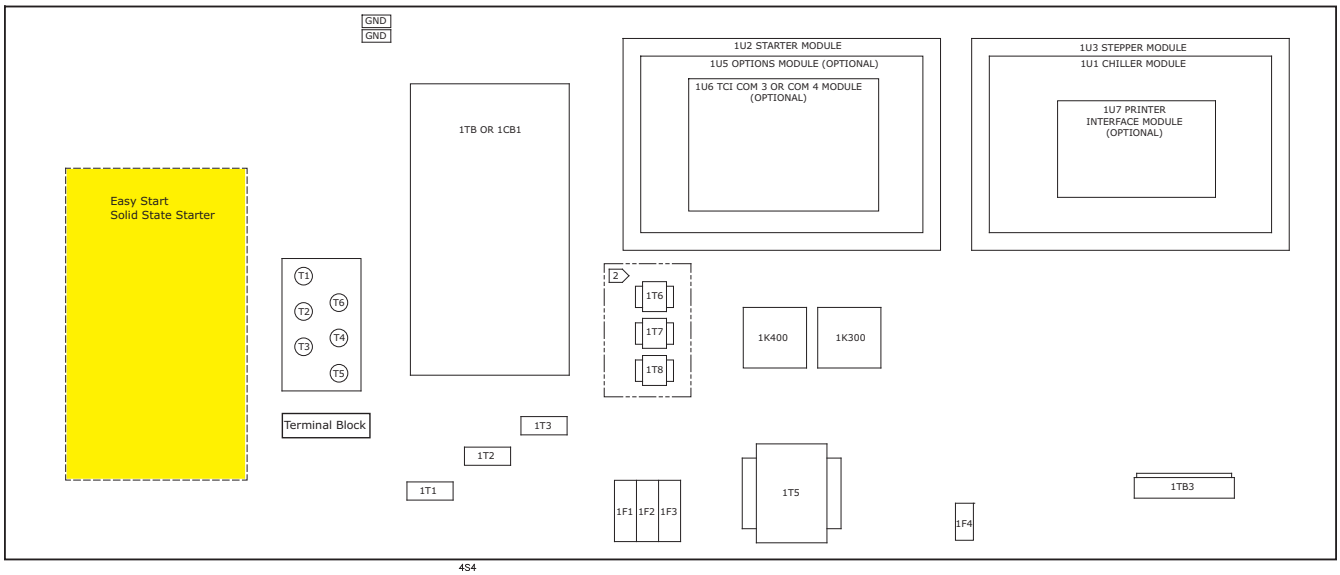
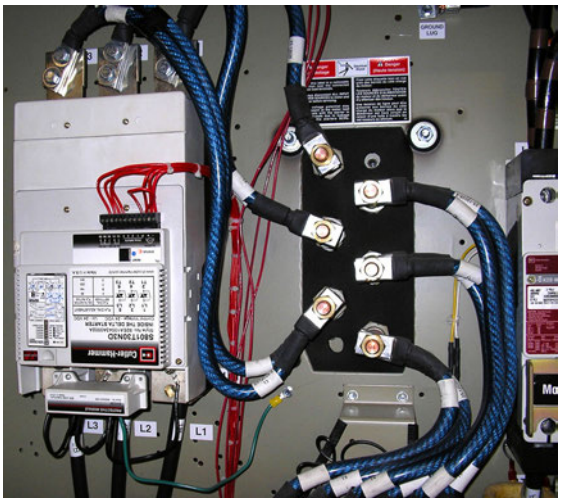


Figure 11. Location of cutler hammer IT starter components to be removed



The following components of an Intelligent Technology (IT) SSS need to be removed prior to installing the Benshaw RediStart starter:

- MOV
- IPS
- !K400 (replace)
- 1TB1

Figure 12. Remove the highlighted components (IT starter) — RTHC

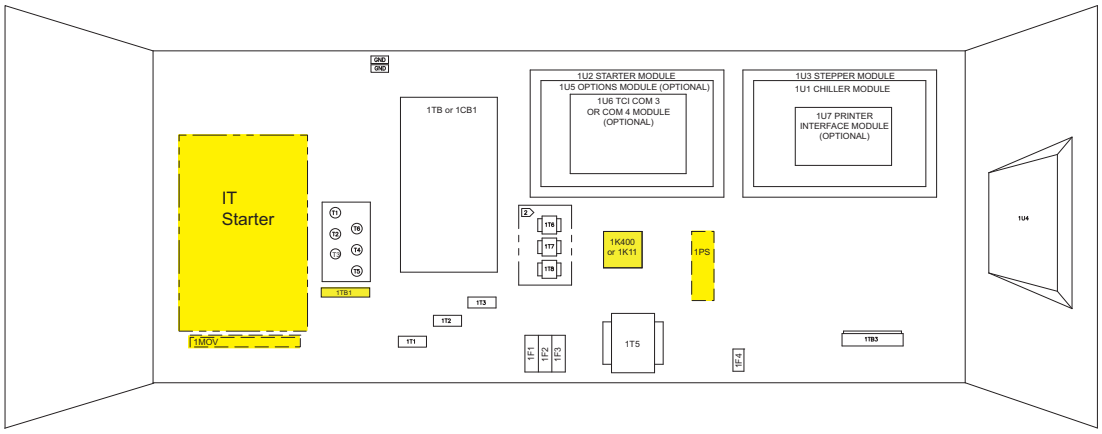
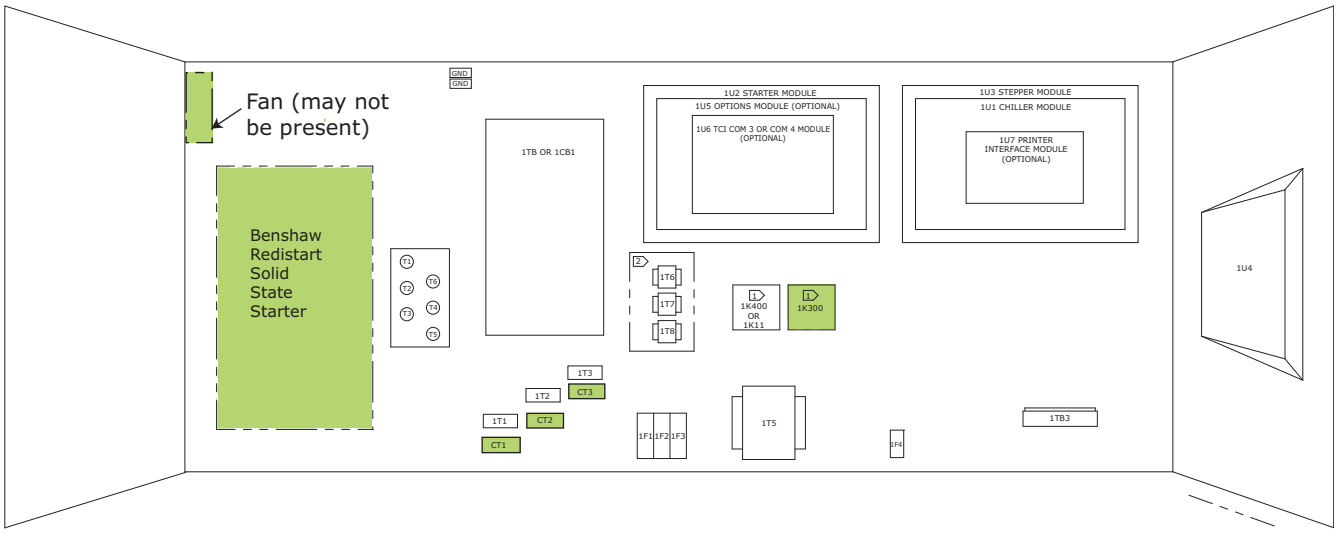


Figure 13. Location of Benshaw Redistart starter and additional components that are to be removed (highlighted)



RTHD Chiller Solid State Starter Removal

Remove the highlighted components. Cooling fans will not be used and may be removed or abandoned in place.

Figure 14. Remove the highlighted components (IT starter) — RTHD

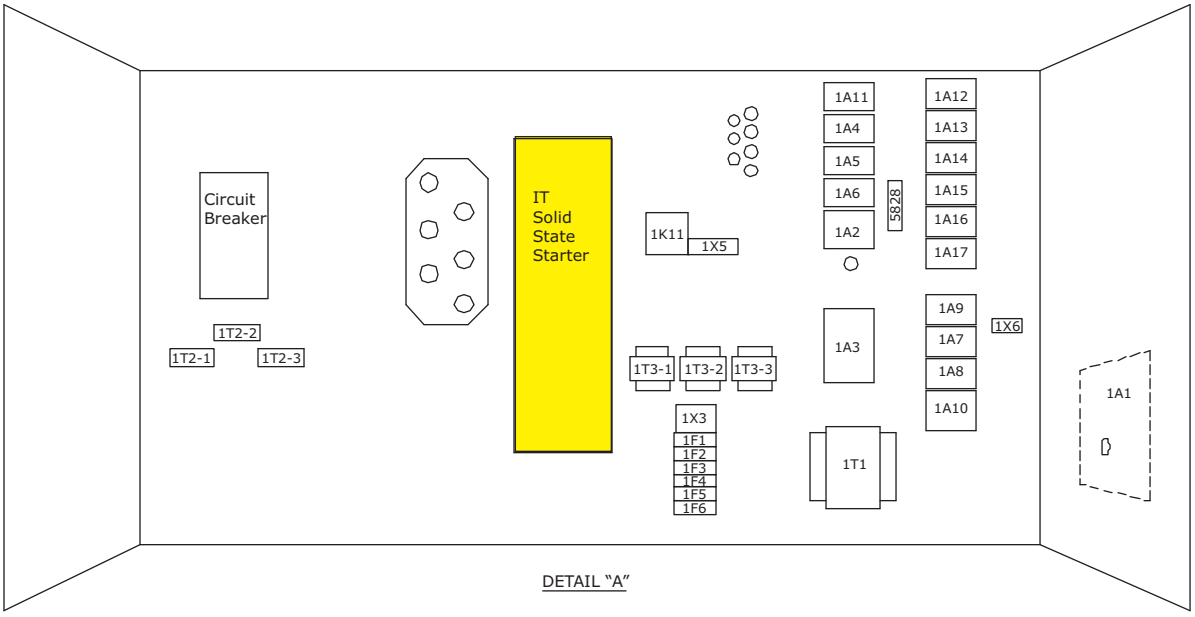
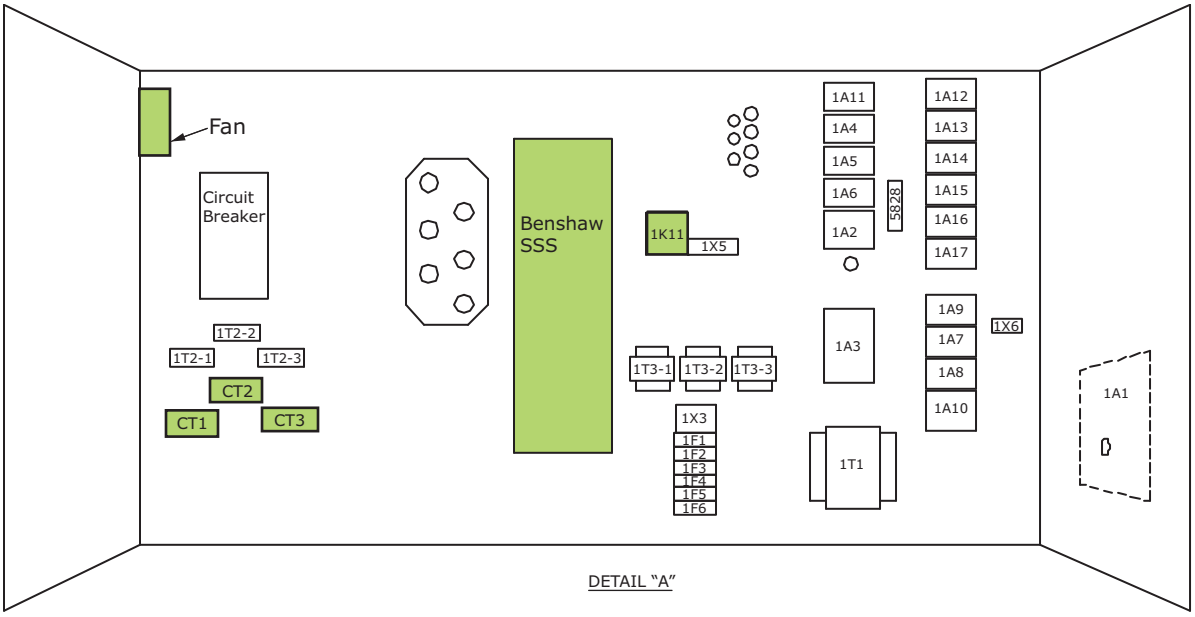


Figure 15. Remove the highlighted components (Benshaw Redistart) — RTHD



Installation for RTHA Units Wye Delta Starters

Install Kit Components

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

The following Wye -Delta starter components need to be installed:

- 2R1-2R6 Resistors

  Note: *We offer but do not require resistors as part of refreshes. The existing resistors are highly reliable and need not be replaced.*

- 2K1-2K4 Contactors
- Power cables

Figure 16 shows the basic layout of the Wye Delta starter with the components that need to be installed highlighted. Note that it is likely but not certain that the mounting hole locations for the new contactors may be the same as those provided on the panel for the original contactors. If they are, you can remove the contactors from the base and mount to the original holes, if that makes installation easier.

Important: *Be careful to protect other electrical components from metal shavings and clean all metal shavings from the enclosure when drilling is completed.*

Note: *If the optional voltage/current meters are mounted on the cabinet door, they must be removed for the new starter to fit properly. Once the meters are removed, block-off plates can be obtained locally. Install per your state and local codes.*

Figure 16. Remove the highlighted components (Wye Delta starter) — RTHA-YD (Note 2TB1/2CB1 is existing)

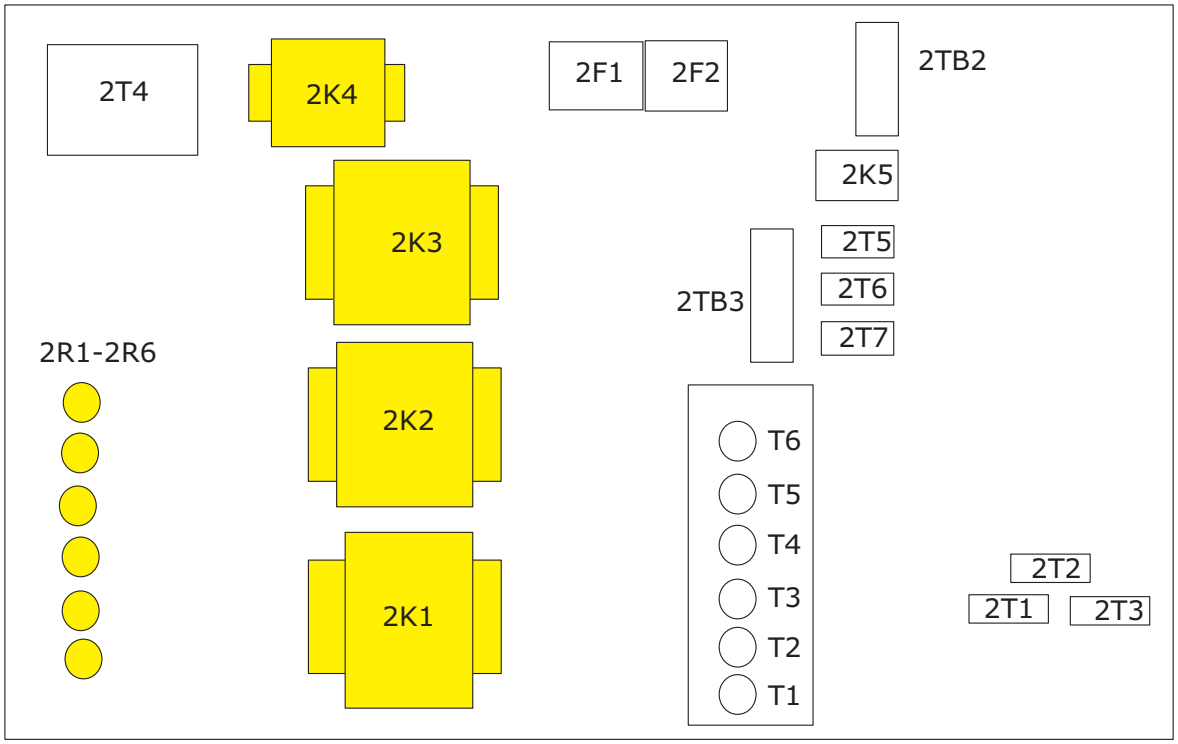


Figure 17. Installation of complete RTHA Wye Delta starter

Wiring

The Series R Wye Delta Kit is compatible with all generations Trane UCP1 and AdaptiView controls found on RTHA chillers. The kit should be installed per the applicable schematic drawing for the unit.

RTHA Control Wiring

The contactor coil terminals and contactor aux switches are wired with 8-foot length of low voltage control wires. Mark and connect these to the unit controls per the applicable unit schematic.

NOTICE

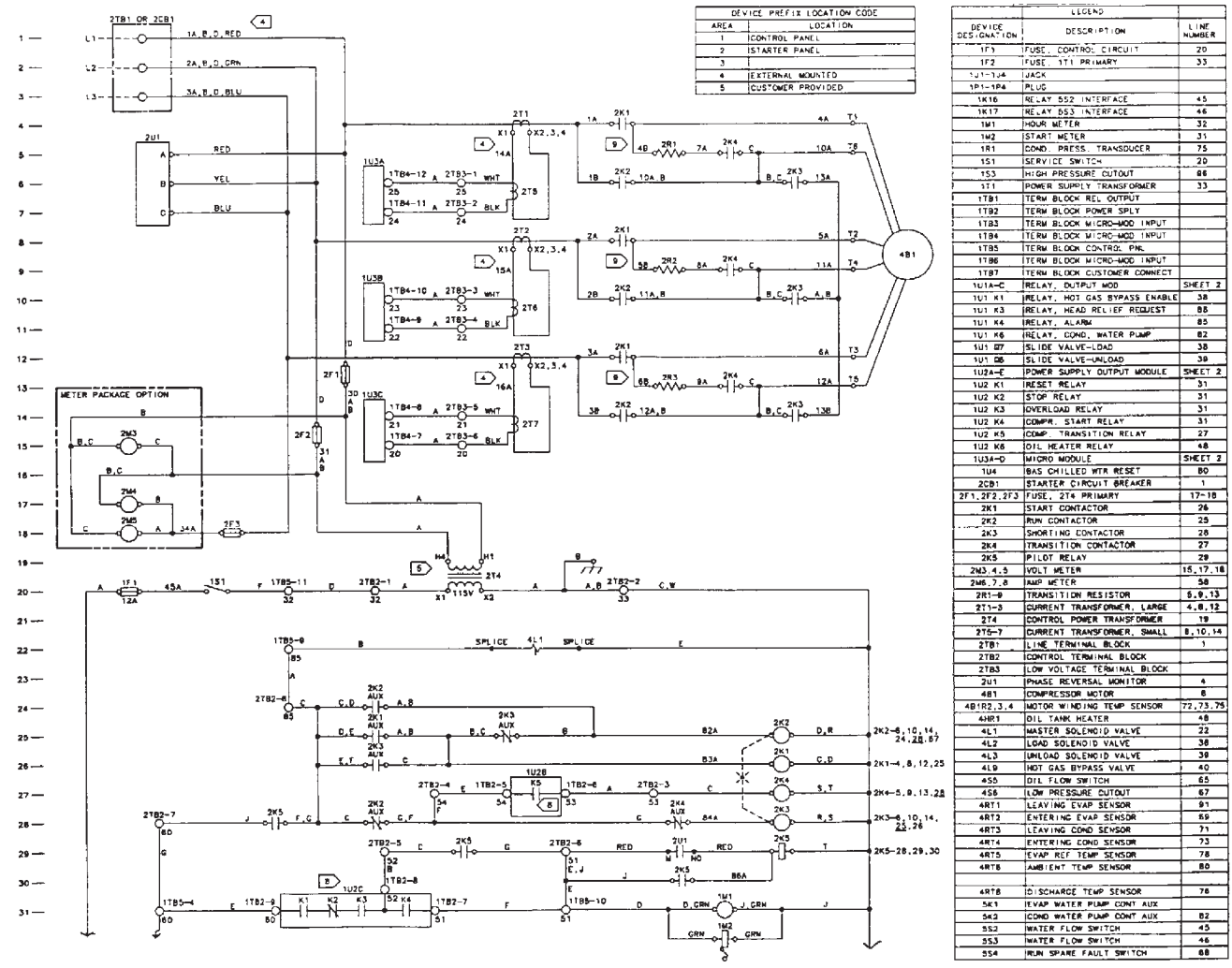
Equipment Damage!

Failure to follow instructions below could cause interference with drive operation and result in damage to the equipment.
Route signal and control wiring separately and in different conduit from power wiring.

RTHA Units Having Original UCP1 Controls

Wire unit controls per original UCP1 schematic X395300281-C.

Figure 18. Original schematic X395300281-C

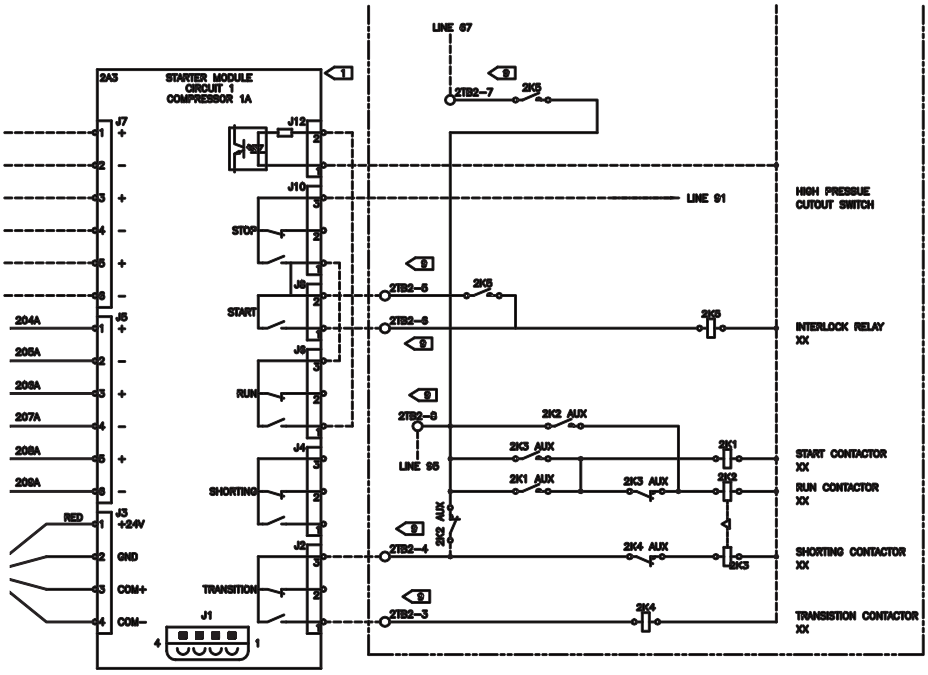


Units Having AdaptiView Upgrades

RTHA units having AdaptiView upgrades can be installed in either of two ways,

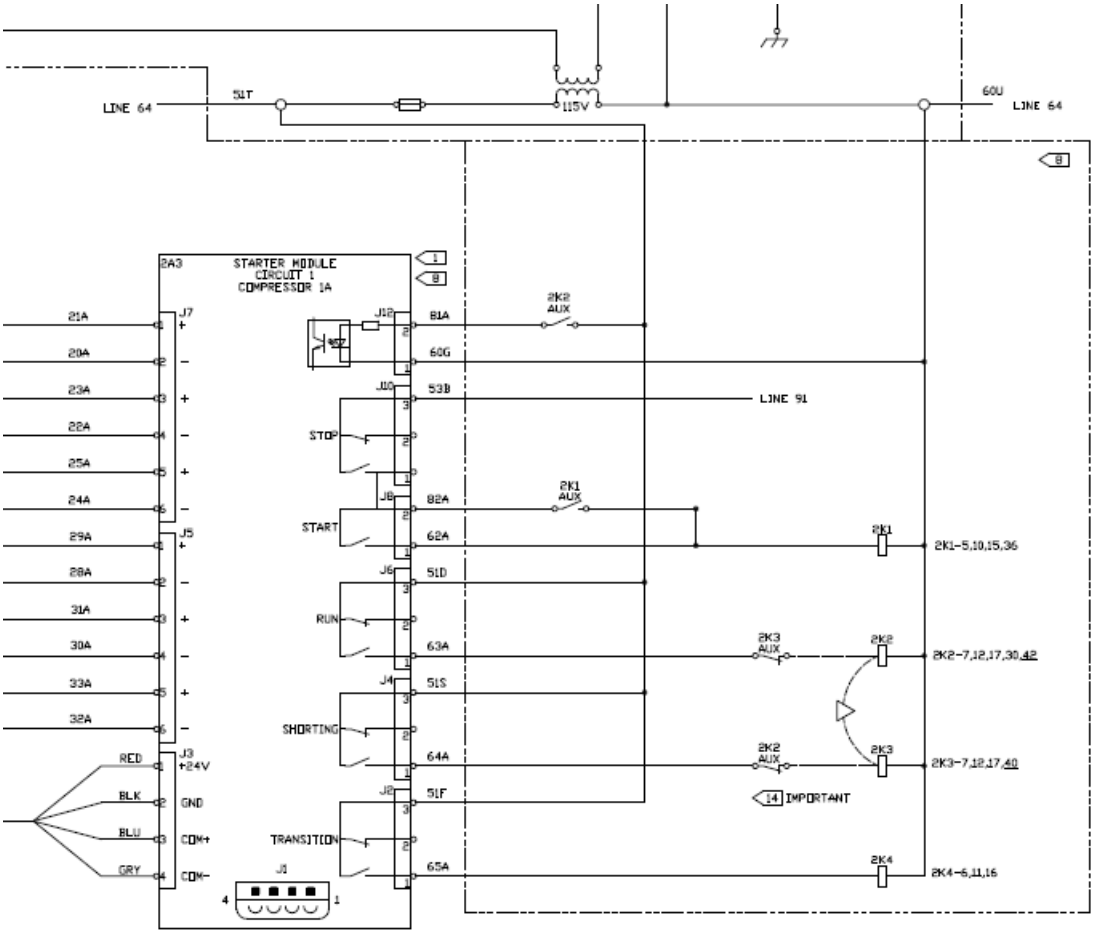
- They can be controlled per the RTHA AdaptiView upgrade IOM schematic 5071-1501. This method maintains the original UCP1 type of interlocked contactor control and allows a much faster AdaptiView control installation because the original starter control method is not changed. The disadvantage of this control option is that this configuration does not allow AdaptiView Dry Run test.

Figure 19. RTHA AdaptiView control schematic 5071-1501



- They can be controlled per the RTHB AdaptiView upgrade IOM schematic 5071-1871B. This method adopts the direct contactor control strategy found on new chillers and allows AdaptiView Dry Run test.

Figure 20. RTHB AdaptiView Upgrade Schematic 5071-1871B



RTHA Power Wiring

Re-use existing power cables for Wye Delta Refresh kits. With Wye Delta conversion kits, new incoming power cables to the K1 and K2 contactors and motor terminal cables are provided. For conversion, you can use these or use the existing solid state starter cables as per your preference.

Trim the cables to the appropriate length, install and mark per schematic. Yellow = Incoming power cable, Red = Motor terminal cable, Blue = Shorting resister wires, Black = Factory provided.

Figure 21. Wye Delta starter cables

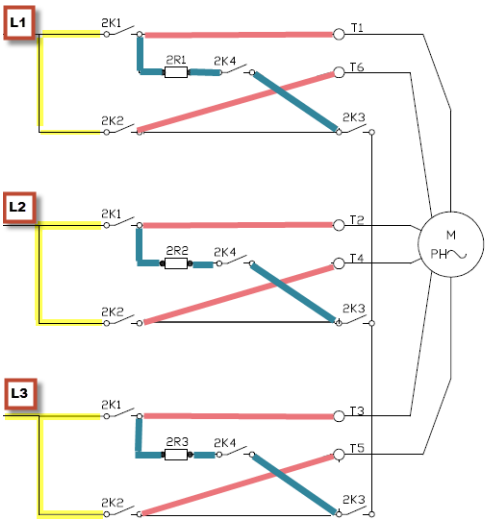
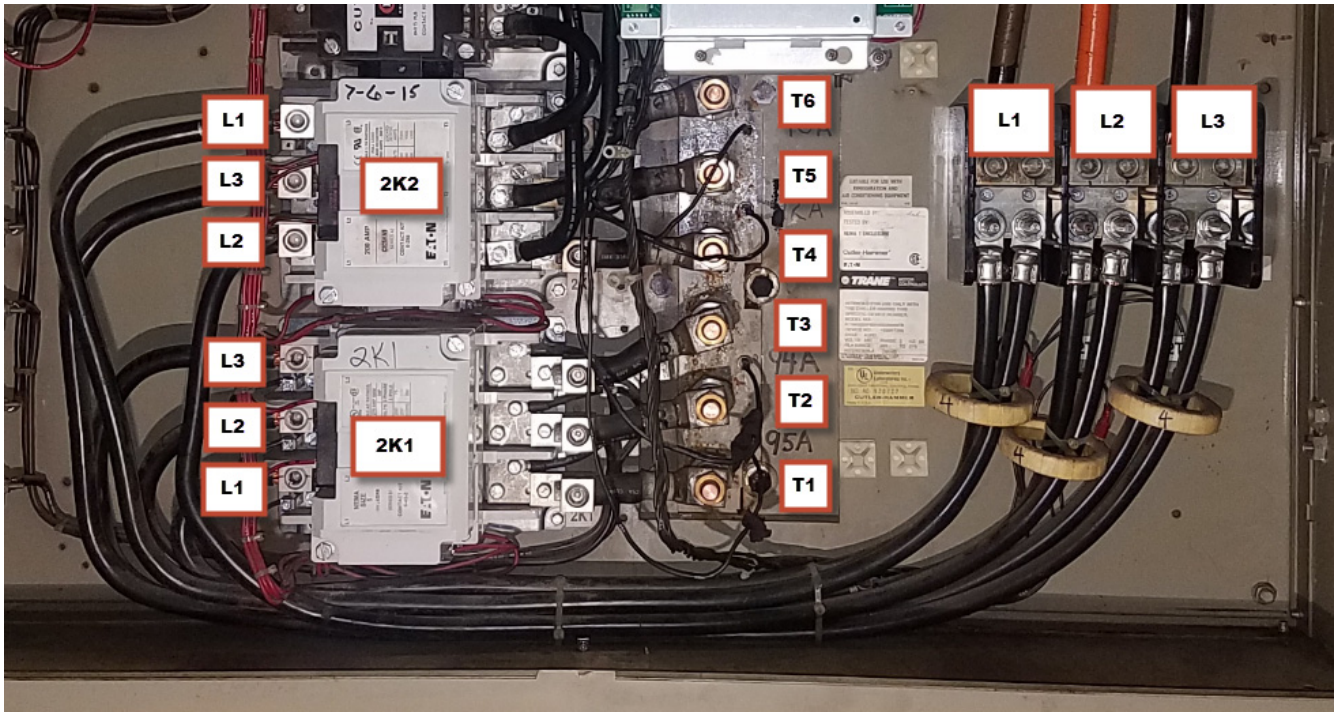


Figure 22. RTHA Power wiring



Installation for RTHB Units Wye Delta Starters

Note: *Check and confirm that RTHB-SB-3 has been performed on chillers built prior to February 1996.*

Install Kit Components

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

The following Wye -Delta starter components need to be installed:

- 2R1-2R6 Resistors

  Note: *We offer but do not require resistors as part of refreshes. The existing resistors are highly reliable and need not be replaced.*

- 2K1-2K4 Contactors
- 1K11 Control Relay
- Power Cables

Figure 24 shows the basic layout of the Wye Delta starter with the components that need to be installed highlighted. Note that it is likely but not certain that the mounting hole locations for the new contactors may be the same as those provided on the panel for the original contactors. If they are, you can remove the contactors from the base and mount to the original holes, if that makes installation easier.

Note: *If the optional voltage/current meters are mounted on the cabinet door, they must be removed for the new starter to fit properly. Once the meters are removed, block-off plates can be obtained locally. Install per your state and local codes.*

Figure 23. Installation of complete RTHB Wye Delta

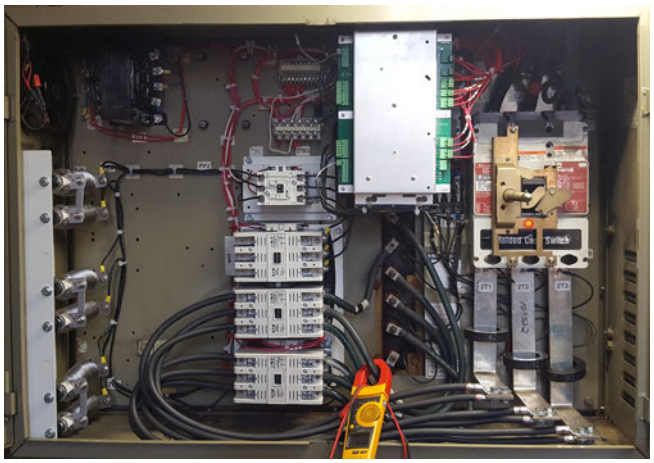
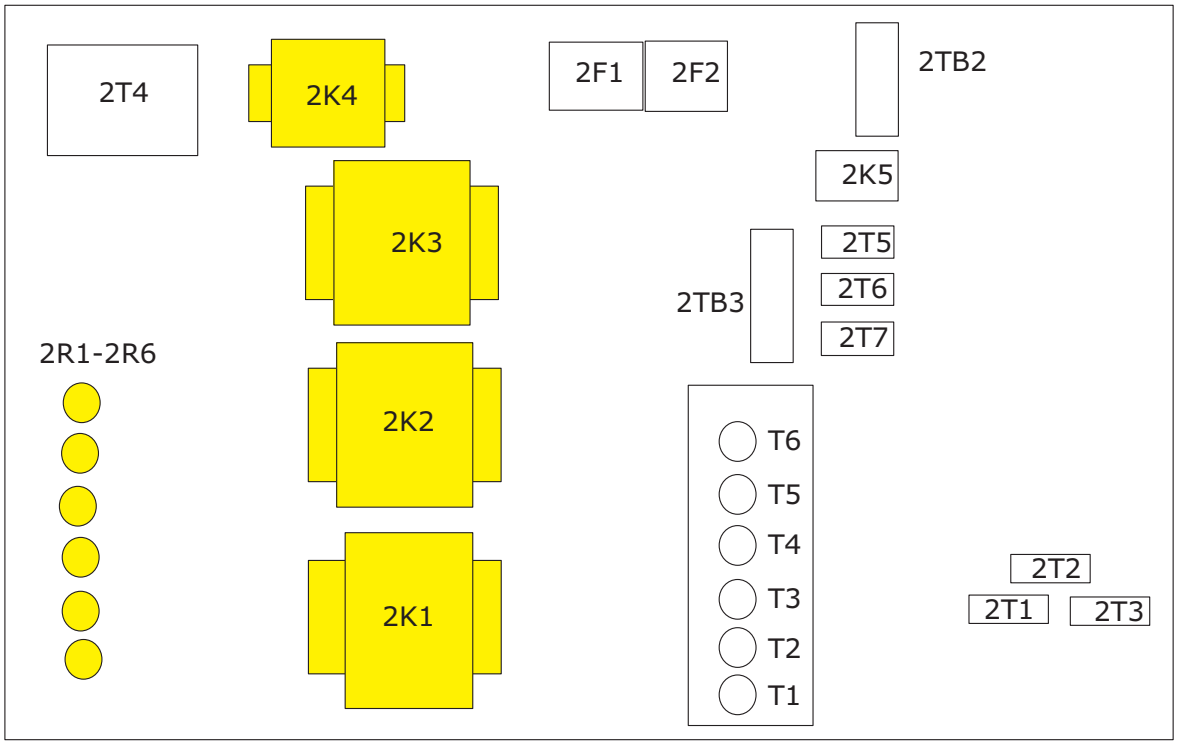


Figure 24. Remove the highlighted components (Wye Delta starter) — RTHB-YD (Note 2TB1/2CB1 is existing)



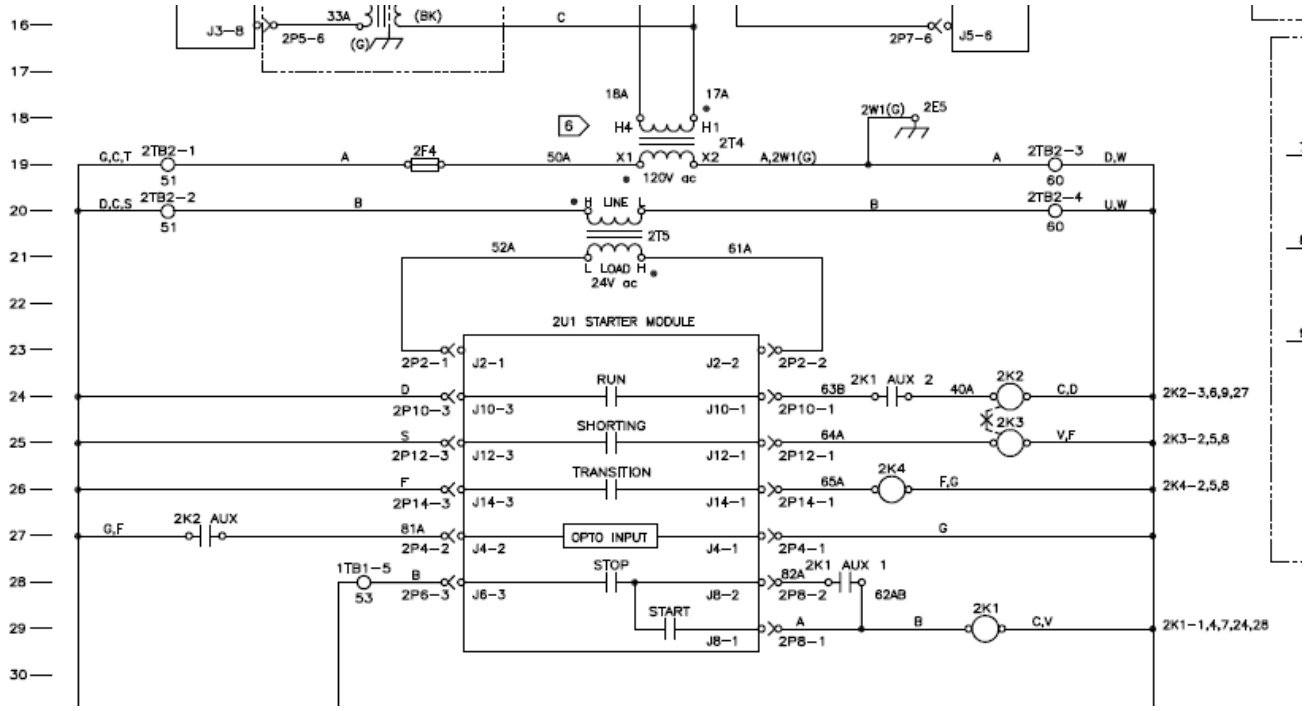
RTHB Control Wiring

All RTHB Wye Delta starters use direct control for both UCP2 and AdaptiView controls. The contactor coil terminals and contactor aux switches are wired with 8-foot length of low voltage control wires. Mark and connect these to the unit controls per the applicable unit schematic.

RTHB Units Having Original UCP2 Controls

Wire unit controls per original UCP2 schematic 2307-6501-B.

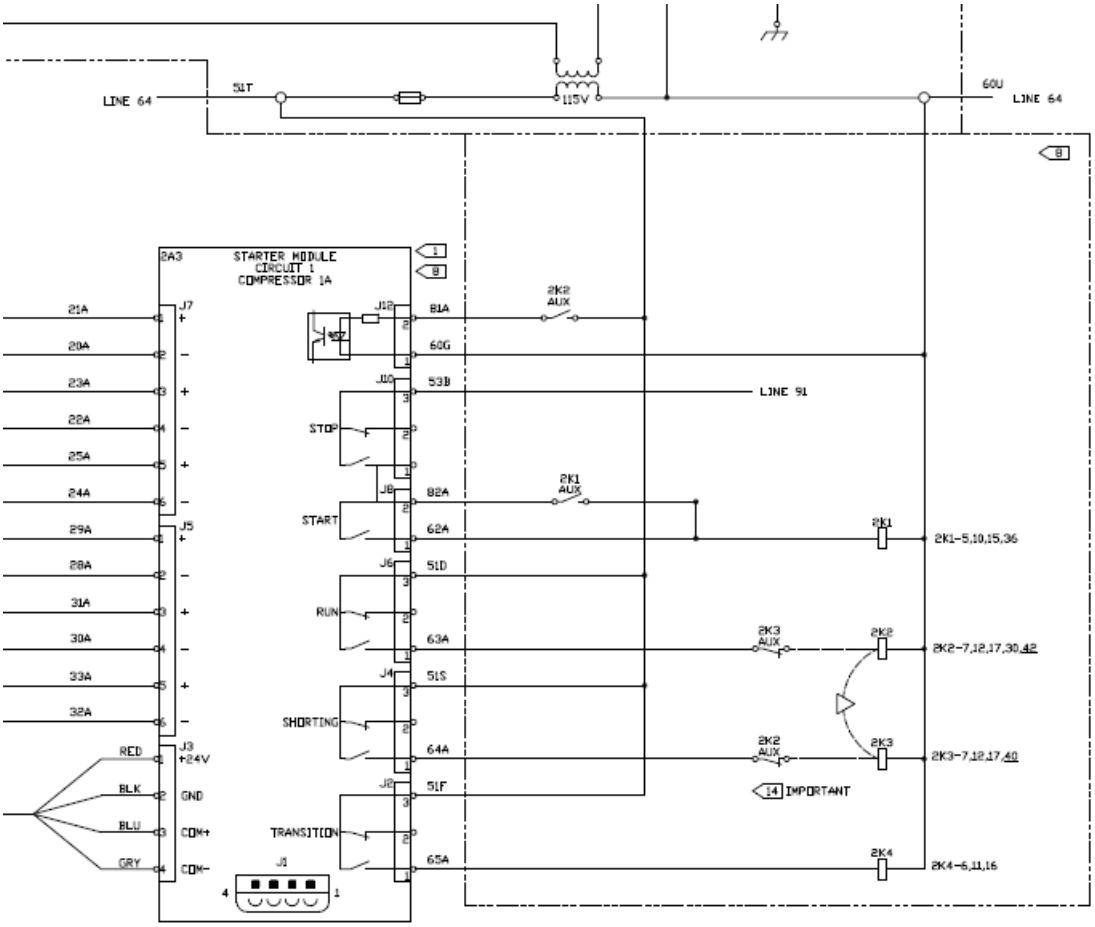
Figure 25. Original schematic 2307-6501-B



RTHB Units Having AdaptiView Upgrades

Wire unit controls per the RTHB AdaptiView upgrade IOM schematic 5071-1871B.

Figure 26. RTHB AdaptiView Upgrade Schematic 5071-1871-B



RTHB Power Wiring

Re-use existing power cables for Wye Delta Refresh kits. With Wye Delta conversion kits new incoming power cables to the K1 and K2 contactors and motor terminal cables are provided. In the case of a conversion, you can use these or use the existing solid state starter cables as per your preference.

Trim the cables to the appropriate length, install and mark per schematic. Yellow = Incoming power cable, Red = Motor terminal cable, Blue = Shorting resister wires, Black = Factory provided.

Figure 27. Wye Delta starter cables

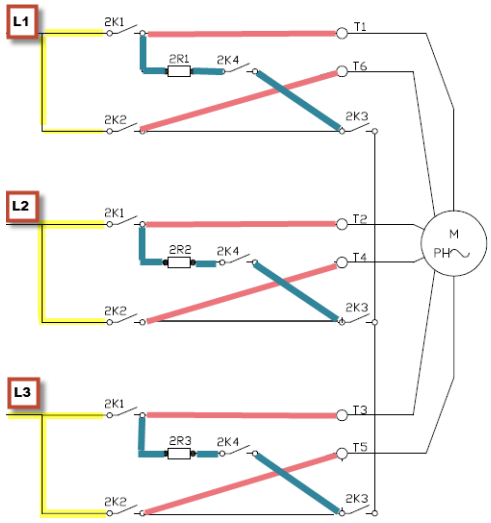
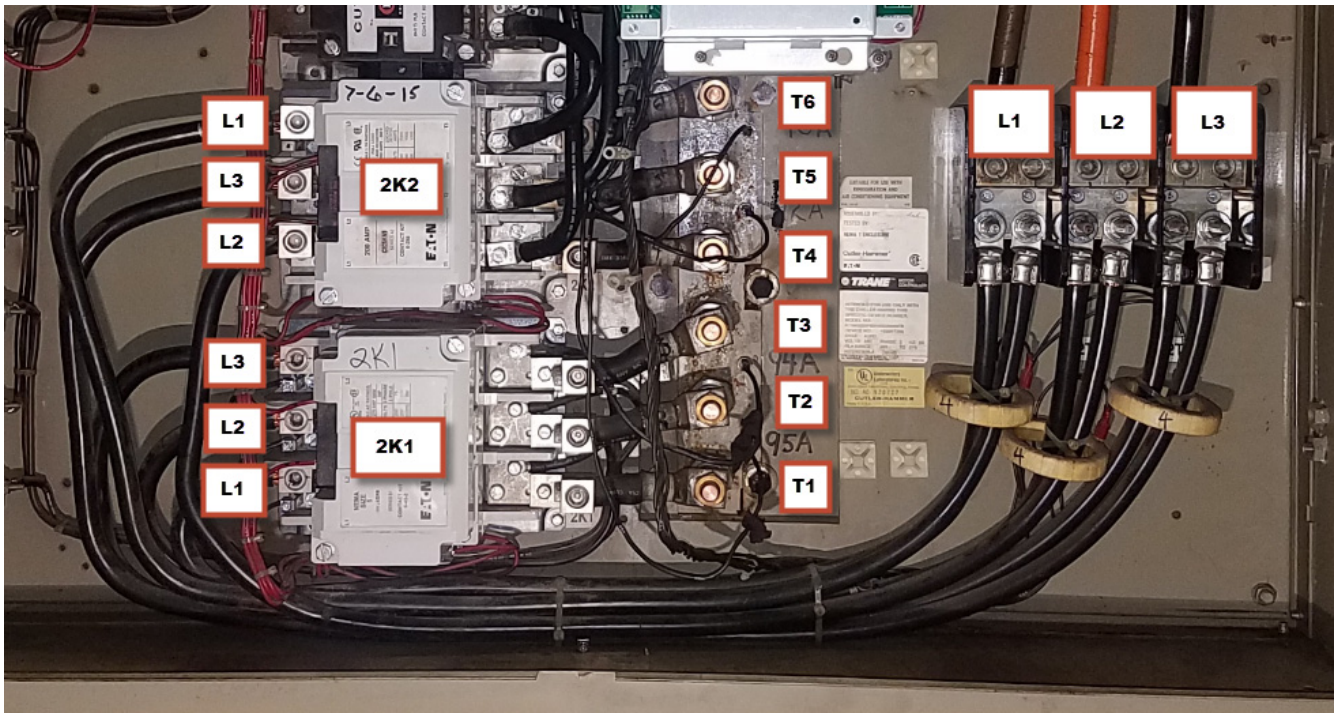


Figure 28. RTHB power wiring



Installation for RTHC Wye Delta Starter

Install Kit Components

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

The following Wye -Delta starter components need to be installed:

- 2R1-2R6 Resistors

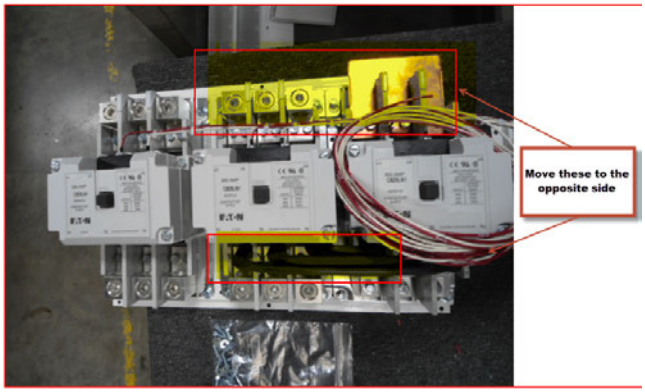
  Note: *We offer but do not require resistors as part of refreshes. The existing resistors are highly reliable and need not be replaced.*

- 2K1-2K4 Contactors
- Power Cables and Control Wires
- 1K11 Control Relay

Notes:

- *The kit provided is set up for RTHA and RTHB chillers which have K1 – K3 contactors set up with K3 at top and K1 at bottom. This is the opposite of the order needed for RTHC. Before installing, swap the jumper cables between K2 and K3 to the opposite side. Move the K3 shorting plate to the opposite side.*

Figure 29. Kit component setup of RTHA and RTHB



- *The K4 contactor has a plate to deflect any condensate that may fall from the motor terminal. Orient the contactor so that the deflector plate is in between the compressor motor terminals and the contactor.*
- *It is likely but not certain that the mounting hole locations for the new contactors may be the same as those provided on the panel for the original contactors. If they are, remove the contactors from the base and mount to the original holes, if that makes installation easier.*

Figure 30 shows the basic layout of the Wye Delta starter with the components that need to be installed highlighted.

Figure 30. Install highlighted components (Wye Delta starter) — RTHC

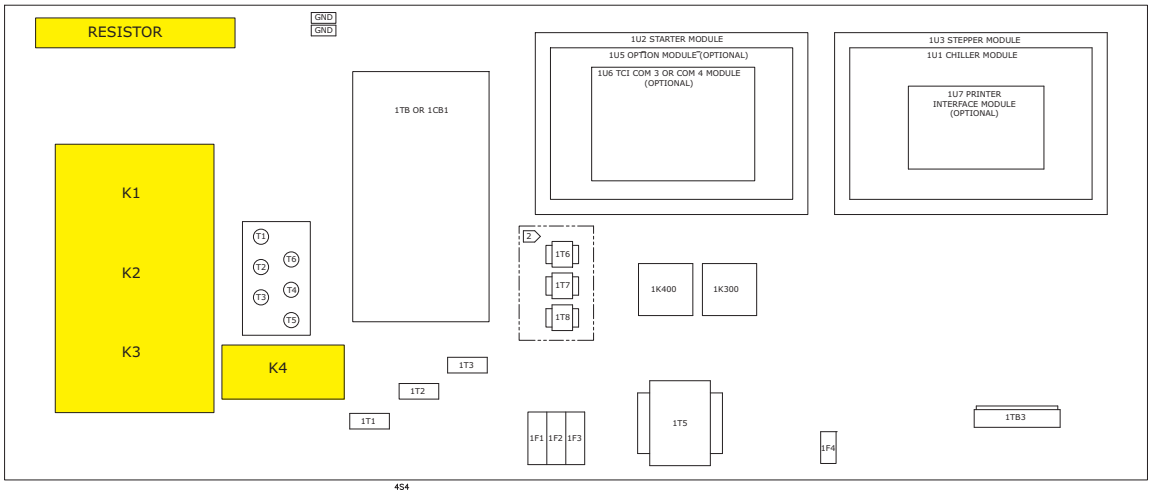
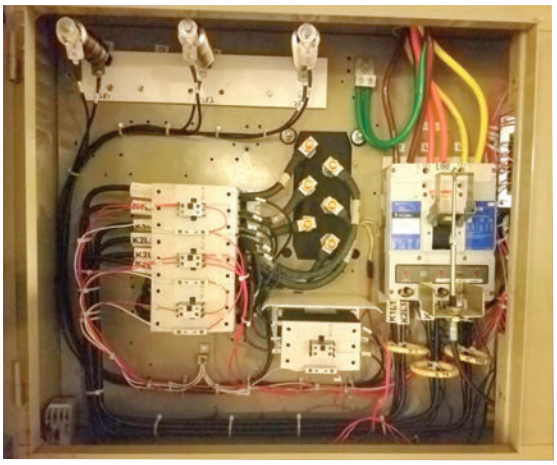


Figure 31. Installation of complete RTHC Wye Delta starter



Wiring

The Series R Wye Delta Kit is compatible with all generations Trane UCP2, and AdaptiView controls found on RTHC chillers. The kit should be installed per the applicable schematic drawing for the unit.

RTHC Control Wiring

All RTHC Wye Delta starters use direct control for both UCP2 and AdaptiView controls. The contactor coil terminals and contactor aux switches are wired with 8-foot lengths of low voltage control wires. Mark and connect these to the unit controls per the applicable unit schematic.

Note: *The UCP2 control schematic and the AdaptiView upgrade share the same interlock and connection scheme. The only difference is minor differences in wire numbering.*

Figure 32. For UCP2 control use 2307-6477 RTHC Wye Delta schematic

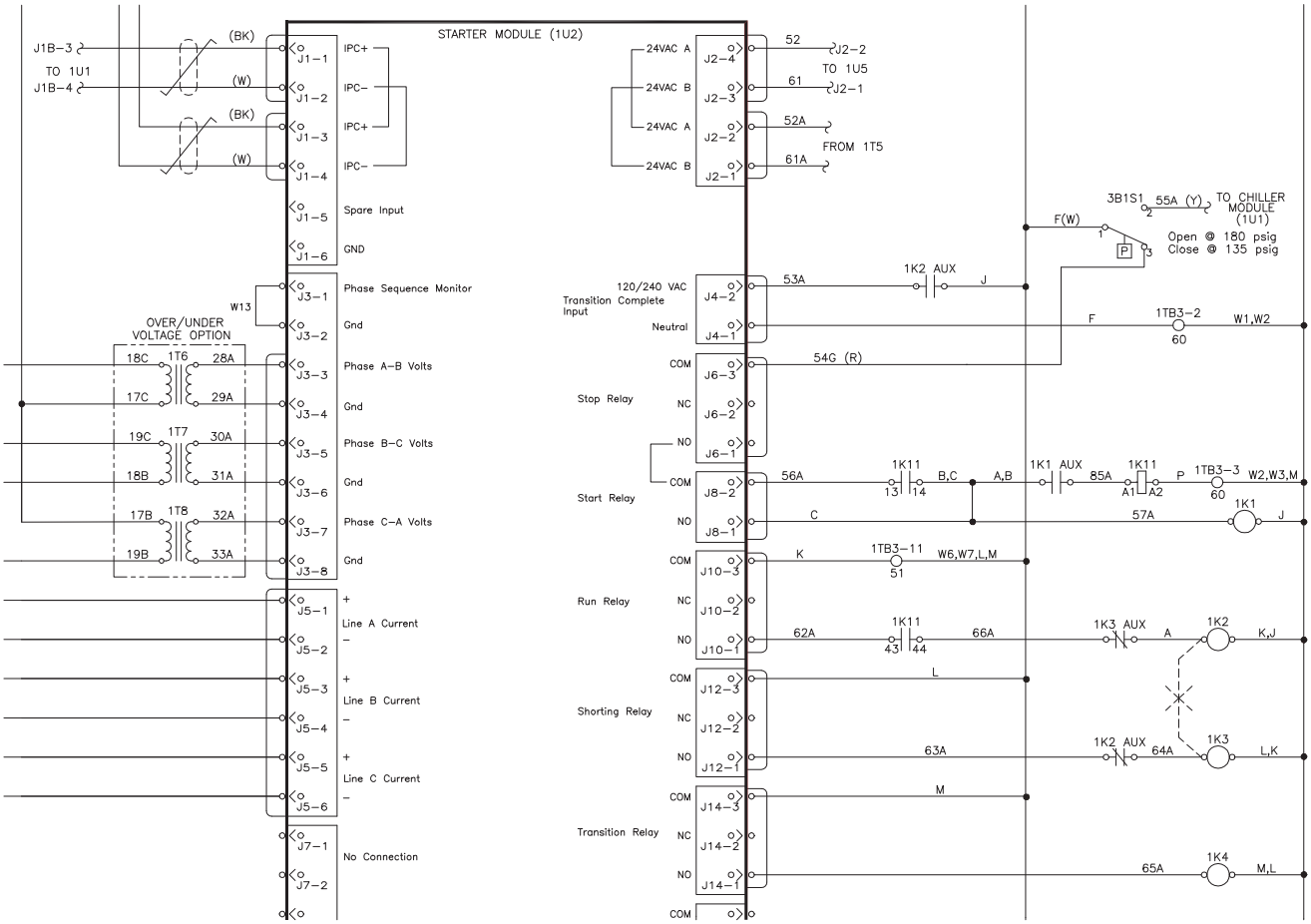
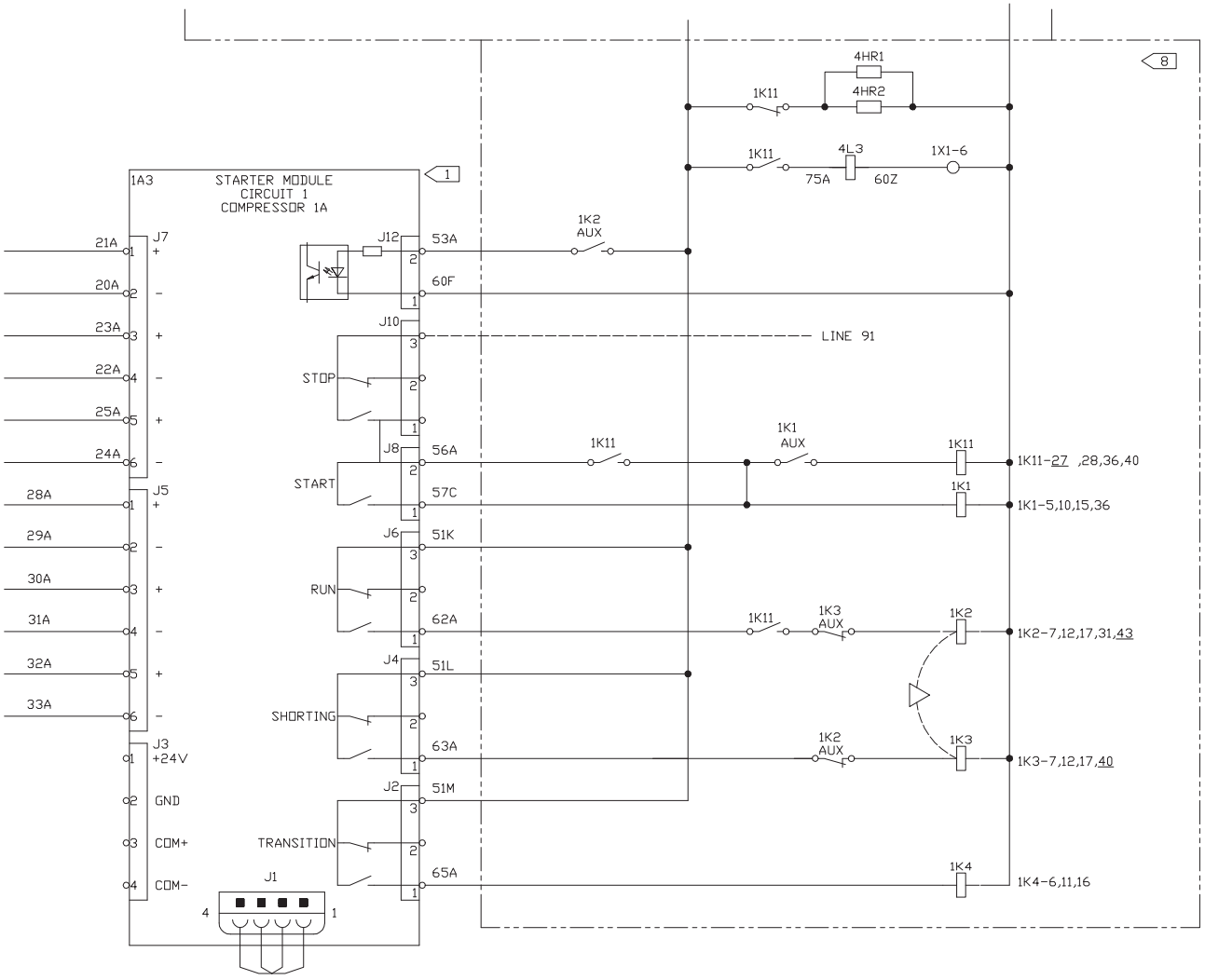


Figure 33. For AdaptiView control use 5071-1879 RTHC AdaptiView upgrade schematic



RTHC Power Wiring

Re-use existing power cables for Wye Delta Refresh kits. With Wye Delta conversion kits new incoming power cables to the K1 and K2 contactors and motor terminal cables are provided. In the case of a conversion, you can use these or use the existing solid state starter cables as per your preference.

Trim the cables to the appropriate length, install and mark per schematic. Yellow = Incoming power cable, Red = Motor terminal cable, Blue = Shorting resister wires, Black = Factory provided.

Figure 34. Wye Delta starter cables

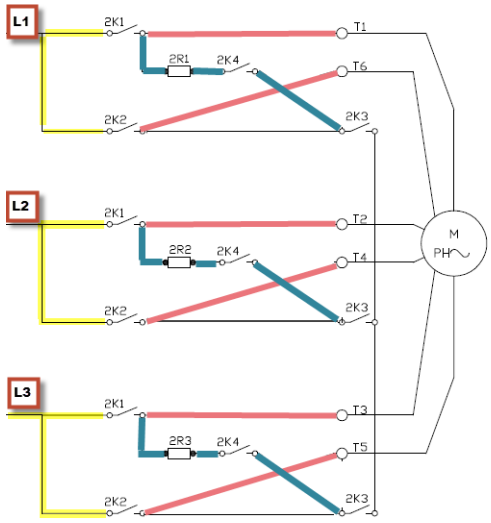
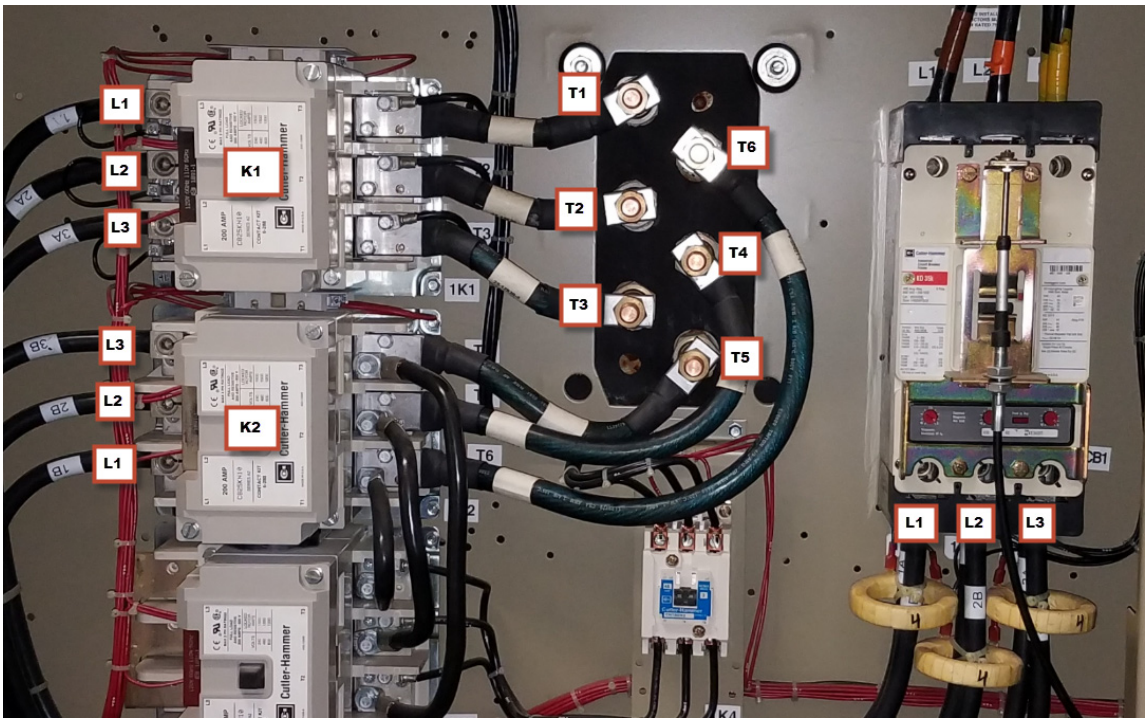


Figure 35. RTHC power wiring



Installation for RTHD Wye Delta Starter

Install Kit Components

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

⚠WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

The following Wye -Delta starter components need to be installed:

- 2R1-2R6 Resistors

  Note: *We offer but do not require resistors as part of refreshes. The existing resistors are highly reliable and need not be replaced.*

- 2K1-2K4 Contactors
- Power cables and control wires

Figure 36 shows the basic layout of the Wye Delta starter with the components that need to be installed highlighted. You will need to remove and mount the K1 - K3 contactors directly to the starter panel to get sufficient clearance from the contactors to the motor terminals. It is likely but not certain that the mounting hole locations for the new contactors may be the same as those provided on the panel for the original contactors.

The Series R Wye Delta Kit is compatible with all generations Trane CH530, and AdaptiView controlled RTHD chillers. The kit should be installed per the applicable schematic drawing for the unit.

Figure 36. Install highlighted components (Wye Delta starter) — RTHD

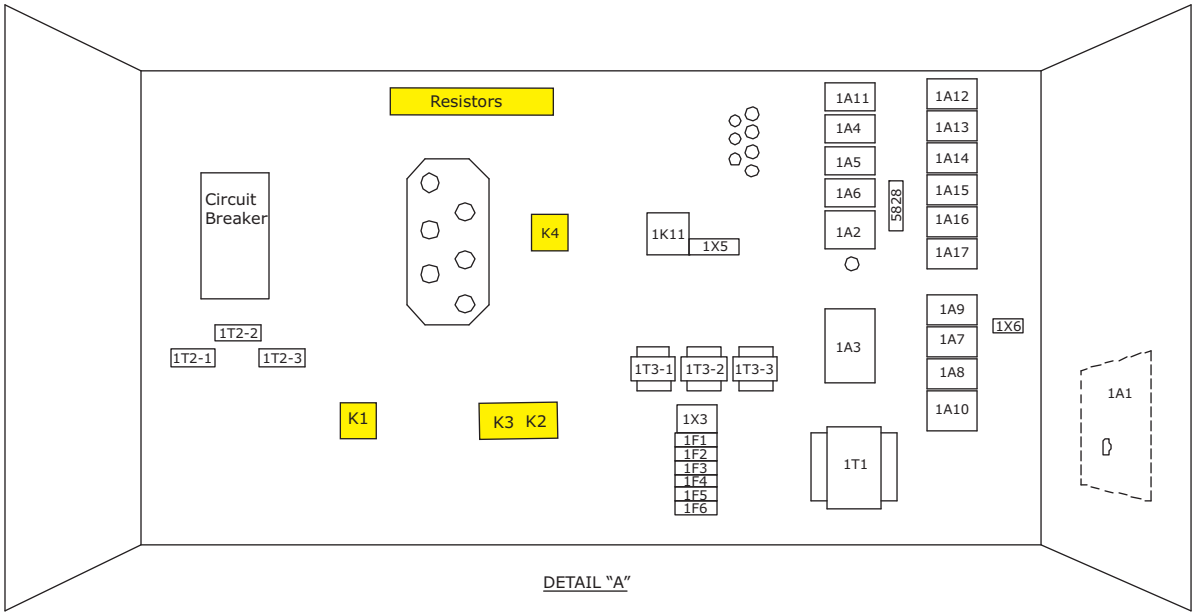
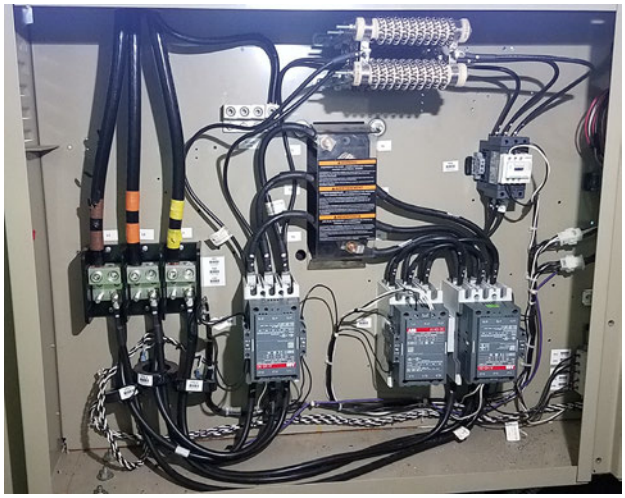


Figure 37. Installation of complete RTHD Wye Delta starter

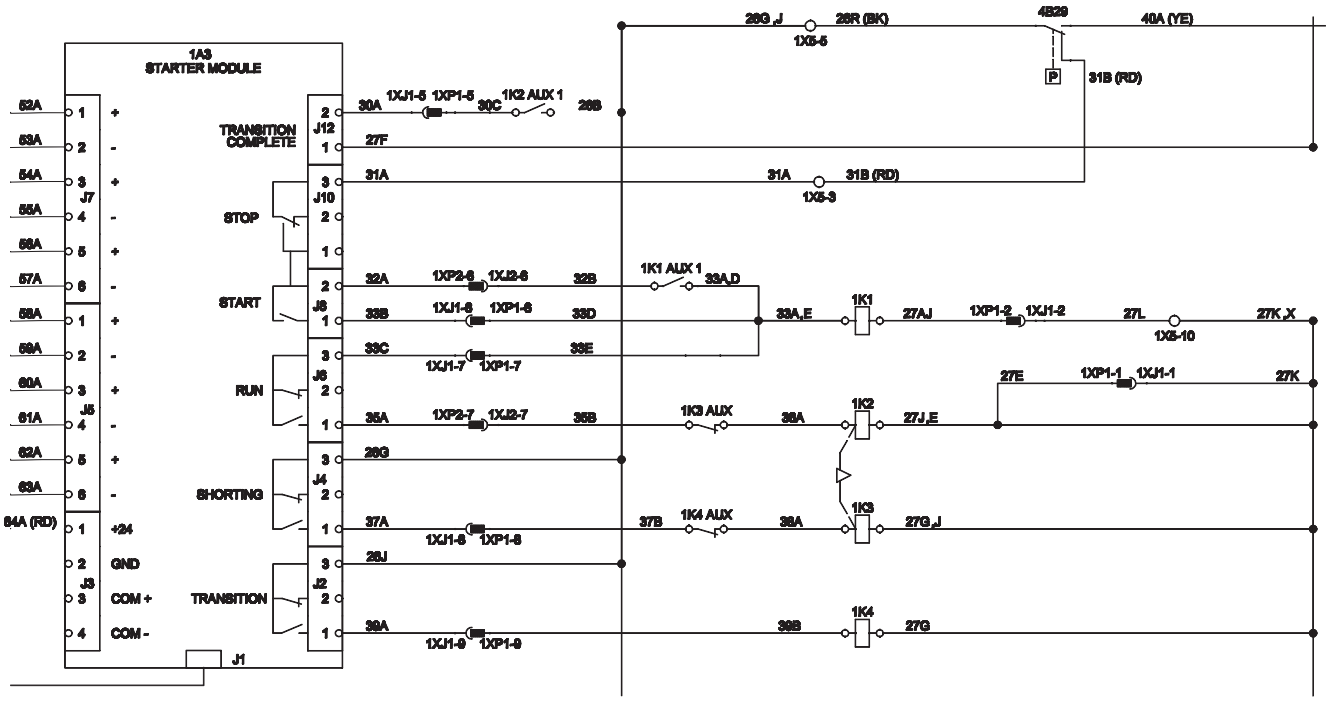


Wiring

RTHD Control Wiring

The contactor coil terminals and contactor aux switches are wired with 8-foot lengths of low voltage control wires. Mark and connect these to the unit controls per the applicable unit schematic.

Figure 38. Use Wye Delta AdaptiView upgrade schematic 2309-7553 for all RTHD units



RTHD Power Wiring

Re-use existing power cables for Wye Delta Refresh kits. With Wye Delta conversion kits new incoming power cables to the K1 and K2 contactors and motor terminal cables are provided. In the case of a conversion, you can use these or use the existing solid state starter cables as per your preference.

Trim the cables to the appropriate length, install and mark per schematic. Yellow = Incoming power cable, Red = Motor terminal cable, Blue = Shorting resister wires, Black = Factory provided.

Figure 39. Wye Delta starter cables

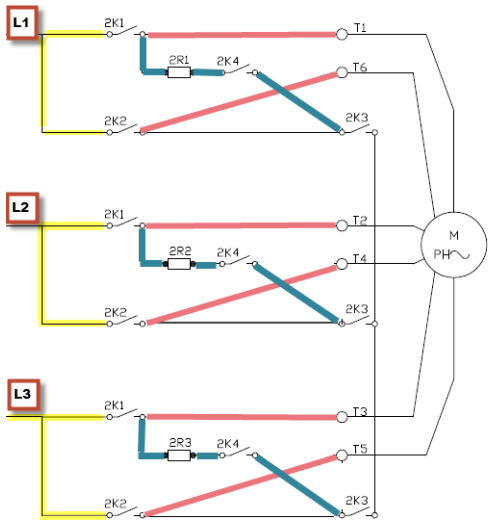
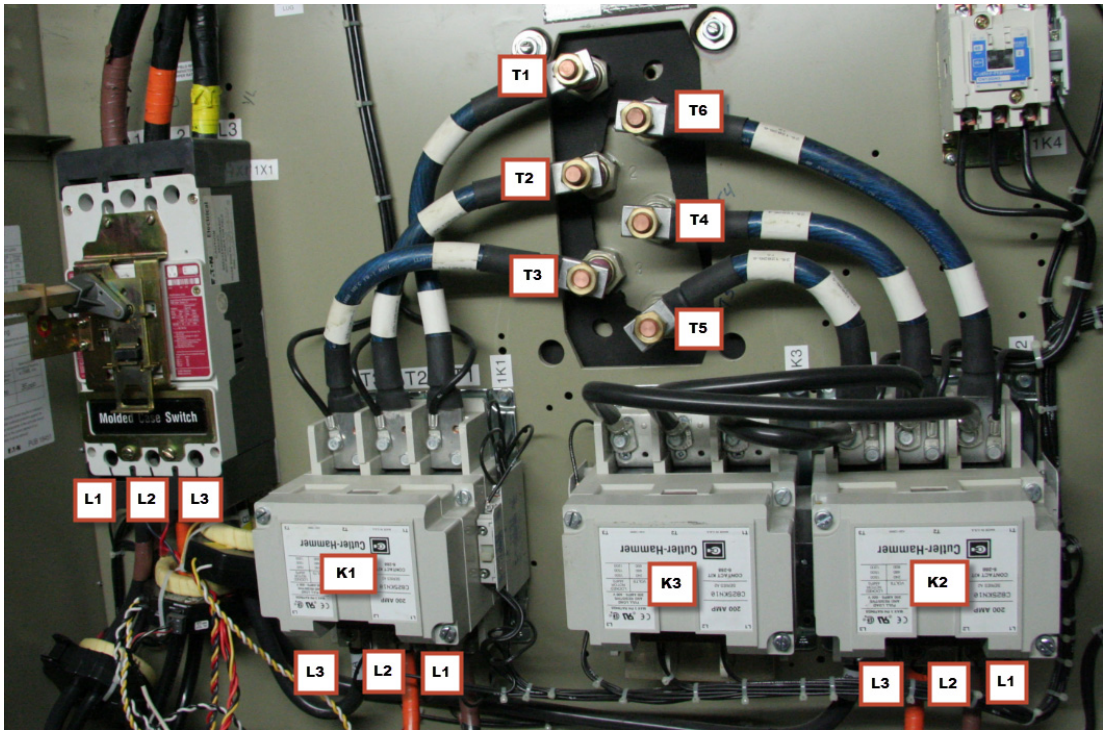


Figure 40. RTHD power wiring



Resistor Check and Installation Procedure

Use the unit RLA and Voltage to confirm that the correct resistors are provided and that the resistor jumpers are correctly set before installing on the chiller. Refer to the starter photographs to determine the correct resistor mounting location. There are three resistor set mountings to choose from:

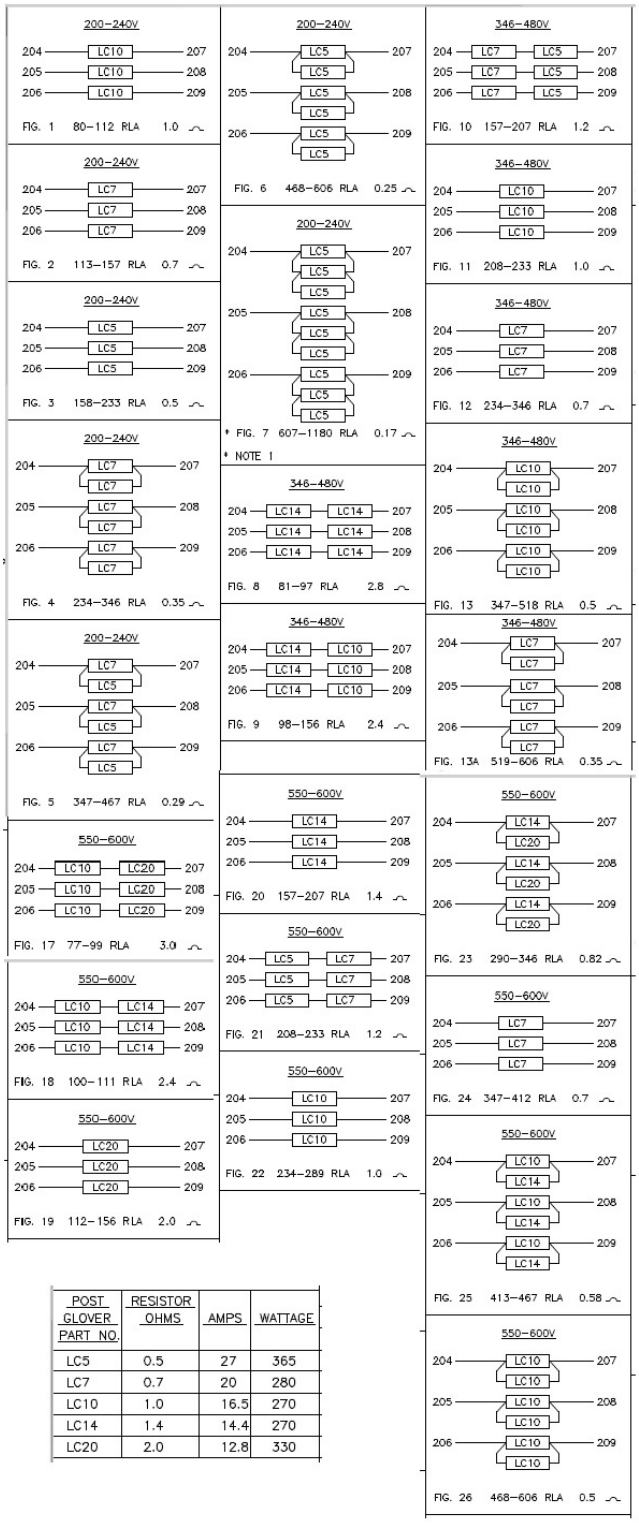
- You can drill through the side or top of the panel using the holes in the resistor bracket as a template. Then, rivet or screw the assembly to the cabinet.

Important: *Be careful to protect other electrical components from metal shavings and clean all metal shavings from the enclosure when drilling is completed.*

- You can counter sink holes in the back of the cabinet to clearance the resistor mounting bolts and then rivet or screw the bracket to the back of the cabinet.
- You can move the resistor sets from the bracket and bolt the individual resistors to the factory-provided holes in the back of the cabinet.

Note: *Use caution when handling the resistors. Getting grease on the resistor elements cause premature failure.*

Figure 41. Resistor voltage and capacity table



POST GLOVER PART NO.	RESISTOR OHMS	AMPS	WATTAGE
LC5	0.5	27	365
LC7	0.7	20	280
LC10	1.0	16.5	270
LC14	1.4	14.4	270
LC20	2.0	12.8	330

Starter Dry Run Procedure - UCP1

UCP1 Dry Run Starter Test

During startup commissioning prior to line voltage being applied, the chiller starter is sequenced to confirm the wiring and components have been properly installed.

Important: *This is a dry run test. The main power to the starter/contactors/motor must be removed through some disconnection means.*

NOTICE

Compressor Damage!

Failure to follow instructions below could result in compressor damage.
Improper power phasing will cause compressor to run backwards. Compressor could be running backwards if it is noisy, low side shell gets hot, suction pressure does not drop within 5 seconds after startup, and compressor only draws ½ expected amps. Stop the compressor immediately and have a qualified electrician or technician properly trained in 3 phase power correct the wiring.

Temporary Auxiliary 120 V Power

Control power to the contactors (115-V) and other 115-V control loads must be provided by other means (drop cord from a 120-V outlet). The fuses on the primary of the combined control power transformer must be removed to prevent reverse transformation from creating hazardous high voltages on the line side and powering the potential transformers (resulting in a diagnostic). The external 115-V connection should be made directly (with proper phasing) to the 120-V secondary of the combined transformer and all other wiring and secondary fuses should remain intact. Remember that the L2 side of the 115-V CPT is grounded and thus ultimately to an earth ground. GFI outlet or cords will fault unless this ground if temporarily disconnected.

Setup

1. Remove Line Voltage.
2. Check Phasing.
3. Pull 2F1, 2F2, 2F3 fuses.
4. Apply external 115 V to 1TB5-11 (hot) and 1TB5-2 (neutral).
5. Turn Control **On** to ensure Heaters continue to be energized; 1S1 closed.
6. Make 2 sets of jumpers with open toggle switches.
7. Bypass 2U1 Phase Reversal Contacts; this is achieved by adding an additional wire jumper from 2TB2-6 to the 2K5 coil. Or see the chiller wiring diagram to bypass 2U1 contact right at the 2K5 Pilot Relay.
8. **Start Switch** -- Put one set of open toggle jumpers between 1TB2-9 and 1TB2-7 (open switch).
9. **Transition Switch** -- Put one set of open toggle jumpers between 1TB2-5 and 1TB2-6 (open switch).

Test Procedure - A successful run test consists of the following operations:

1. Close **Start Switch** (Y-mode of motor operation).
   a. Verify 2K5 Pilot Relay energize.
   b. Verify 2K3 Shorting Contactor energize.
   c. Verify 2K1 Start Contactor energize.
2. After 8 seconds, close **Transition Switch** (Delta-mode of motor operation).
   a. Verify 2K1 Start Contactor remains energized.
   b. Verify 2K4 Transition Contractor energize.
   c. Verify 2K2 Run Contractor energize.
   d. Verify 2K3 Shorting Contractor de-energize.

Completion

Upon successful completion of dry run test, restore unit to normal condition by reversing changes in setup and removing jumpers.

Ready to start if heater has been energized for 3 hours.

Starter Dry Run Procedure - UCP2

Note: *Configure unit starter type as Wye Delta before attempting dry run test.*

UCP2 Dry Run Starter Test

During startup commissioning prior to line voltage being applied, the chiller starter is sequenced to confirm the wiring and components have been properly installed. The UCP2 allows this check out procedure via the service test function.

Important: *This is a dry run test. The main power to the starter/contactors/motor must be removed through some disconnection means.*

Temporary Auxiliary 120 V Power

Control power to the contactors (115-V) and other 115-V control loads must be provided by other means (drop cord from a 120-V outlet). The fuses on the primary of the combined control power transformer must be removed to prevent reverse transformation from creating hazardous high voltages on the line side and powering the potential transformers (resulting in a diagnostic). The external
115-V connection should be made directly (with proper phasing) to the 120-V secondary of the combined transformer and all other wiring and secondary fuses should remain intact. Remember that the L2 side of the 115-V CPT is grounded and thus ultimately to an earth ground. GFI outlet or cords will fault unless this ground is temporarily disconnected.

Starter Dry-Run is enabled at the service test by putting the chiller in local stop and enabling starter dry run in a menu.

- Chiller must be in local stop

  The dry run starter test provides the field with a means of exercising the STARTER Module contacts which then will control the electromechanical starter contactors without line voltage applied.

  Note: *The test will exercise the modules contacts, however the user must look at the starter wiring schematic to determine exactly what is being energized via the particular module contact being exercised / tested.*

  The service technician selects the action from a selection of pre-defined sequences.

  The transition complete input status is monitored as the second line on the CLD during the starter Dry Run modes.

  Starter dry run provides the following states or sequences of operation:

  Disabled: Starter Dry Run is not active. This is the module power-up /reset default state.

  Note: *Any of the following states are exited when the Main Processor is reset, one of the other states or sequences are selected within service tests, or the dry run failure diagnostic is generated.*

  Start Relay On: In this mode the Start Relay On -Closes N.O. contacts at 2U2 J8- 1 to 2, and Stop Relay On- Closes N.O. Contacts at J6- 1 to 3. Relays are both energized simultaneously. Two seconds later the Start Relay is de-energized. The final state of this sequence is with only the Stop Relay energized.

  Shorting Relay On: Energize the Shorting Relay -Closes N.O. Contacts at J12- 1 to 3, at the Starter Module.

  Transition Relay On: Energizes the Transition Relay-Closes N.O. Contacts at J14- 1 to 2, at the Starter Module.

  Run Relay On: Energize the Run Relay-Closes N.O. Contacts at J10- 1 to 3, at the Starter Module.

  Start and Run Relays On: In this mode a sequence of events occurs.

- The Start and Stop Relays are both energized simultaneously.
- Two seconds later, the Start Relay is de-energized.
- Two seconds after the Start Relay is de-energized, the Run Relay is energized.

The final state of this sequence is with only the Stop and Run Relays energized.

During Starter Dry Run, the control monitors phase current and voltage; If a voltage signal greater than 5V is detected at the board edge of the starter module, or greater than 10% RLA current is detected, the test is terminated immediately and the Dry Run Failure diagnostic is generated.

References*: Service alert 148, CVHE-OM-C, CVHE-CLD-1a, CVHE-SB-32, CVHE-W-8A.*

Starter Dry Run Procedure - CH530

CH530/AdaptiView when wired with direct control of contactors.

Note: *There is no dry run testing for contactors wired in the original UCP1 configuration even if controlled by CH530/AdaptiView).*

CH530/AdaptiView Dry Run Starter Test

During startup commissioning prior to line voltage being applied, the chiller starter can be “dry run” sequenced to confirm the wiring and components have been properly installed. CH530 allows this check out procedure via the service tool function only. [For electromechanical starter checkout, not applicable to Solid State or AFD, as these starter types would require line voltage to be applied to function].

Important: *This is a dry run test. The main power to the starter/contactors/motor must be removed through some disconnection means.*

Follow Lock Out / Tag Out Procedures.

Prevent Backfeed of Voltage

The control power 120 volt fuse, must be removed; otherwise the 120 Vac will be stepped up to line voltage and reverse transformation creating hazardous high voltages on the line side and powering the potential transformers (also resulting in CH.530 diagnostics).

Temporary Auxiliary 120 V Power

Control power to the contactors (115 V) and other 115-V control loads must be provided by other means (drop cord from a 120 V outlet).

The external 115-V connection should be made directly (with proper phasing) L1 to the fuse holder LOAD SIDE terminal, and L2 to the L2 secondary of the control power transformer and all other wiring and secondary fuses should remain intact. Remember that the L2 side of the
115-V CPT is grounded and thus ultimately to an earth ground. GFI outlet or cords will fault unless this ground if temporarily disconnected.

The CH530 provides a factory and field service Starter Dry-Run feature. Starter Dry-Run is enabled at the service tool by putting the chiller in local stop and enabling starter dry run in a menu. The Main Processor must be in local stop.

The dry run starter test provides the field with a means of exercising the STARTER LLID (Module) contacts which then will control the electromechanical starter contactors without line voltage applied.

Note: *The test will exercise the modules contacts, however the user must look at the starter wiring schematic to determine exactly what is being energized via the particular module contact being exercised / tested.*

The service technician selects the action from a selection of pre-defined sequences.

The following monitor items are incorporated into TechView:

- Starter Dry Run - Starter Status
- Starter Dry Run - Transition Complete Input status

Starter Dry Run provides the following states or sequences of operation:

Disabled: Starter Dry Run is not active. This is the CH530 power-up / reset default state.

Note: *Any of the following states are exited when the Main Processor is reset, one of the other states or sequences are selected at the service tool, or the dry run failure diagnostic is generated.*

Start Relay On: In this mode the Start Relay On -Closes N.O. Contacts at J8- 1 to 2, and Stop Relay On- Closes N.O. Contacts at J10- 1 to 3. Relays are both energized simultaneously.

Two seconds later the Start Relay is de-energized. The final state of this sequence is with only the Stop Relay energized.

Shorting Relay On: Energize the Shorting Relay -Closes N.O. Contacts at J4- 1 to 3, at the Starter Module.

Transition Relay On: Energiz.es the Transition Relay-Closes N.O. Contacts at J12- 1 to 2, at the Starter Module.

Run Relay On; Energize the Run Relay-Closes N.O. Contacts at J6- 1 to 3, at the Starter Module.

Start and Run Relays On: In this mode a sequence of events occurs.

- The Start and Stop Relays are both energized simultaneously.
- Two seconds later, the Start Relay is de-energized.
- Two seconds after the Start Relay is de-energized, the Run Relay is energized.

The final state of this sequence is with only the Stop and Run Relays energized.

During Starter Dry Run, the CH530 monitors phase current and voltage; If a voltage signal greater than 5 V is detected at the board edge of the CH530 starter LLID, or greater than 10 percent RLA current is detected, the test is terminated immediately and the Dry Run Failure diagnostic is generated.

Wye Delta Schematic

X395300281-C	RTHA UCP1 starter control schematic
5071-1501	RTHA AdaptiView upgrade starter control schematic
2307-6501B	RTHB UCP2 starter control schematic
5071-1871B	RTHB AdaptiView upgrade starter control schematic
2307-6477K	RTHC UCP2 starter control schematic
5071-1879B	RTHC AdaptiView upgrade starter control schematic
2309-7552J	RTHD UC800, sensors and power supply schematic
2309-7553J	RTHD Wye Delta starter module and panel I/O schematic
2309-7554J	RTHD optional I/O schematic
2309-7555J	RTHD legend and locations

Component Dimensions

Figure 42. RTHA-RTHC 207 amps

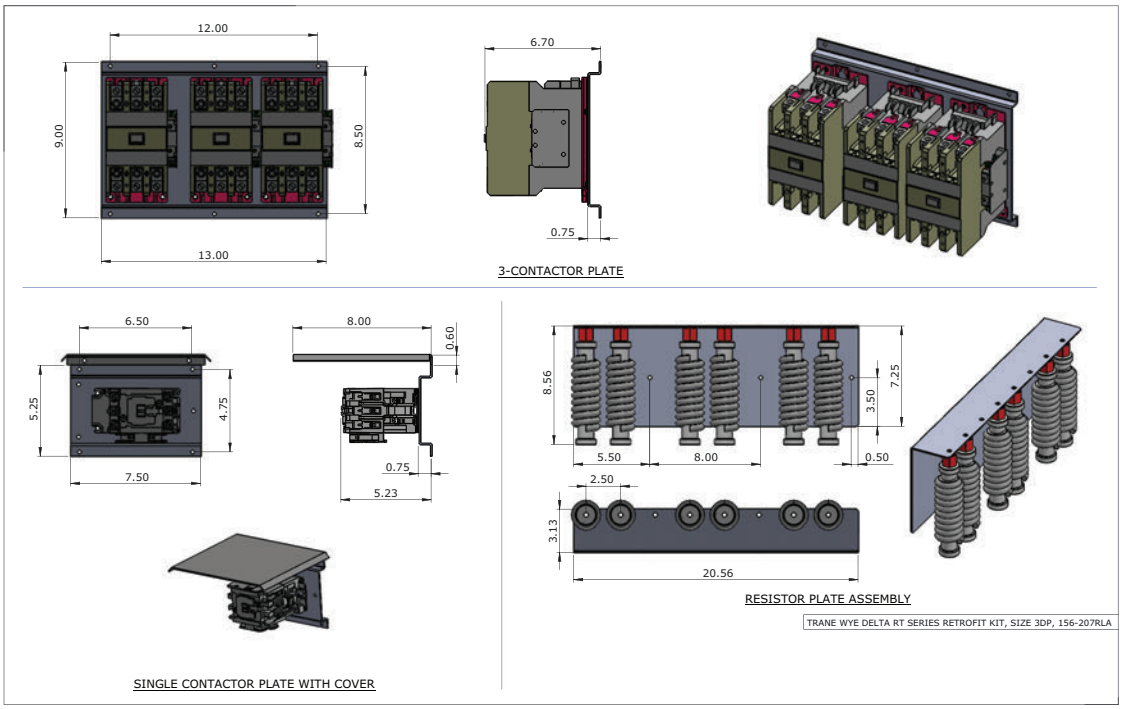


Figure 43. RTHA-RTHC 346 amps

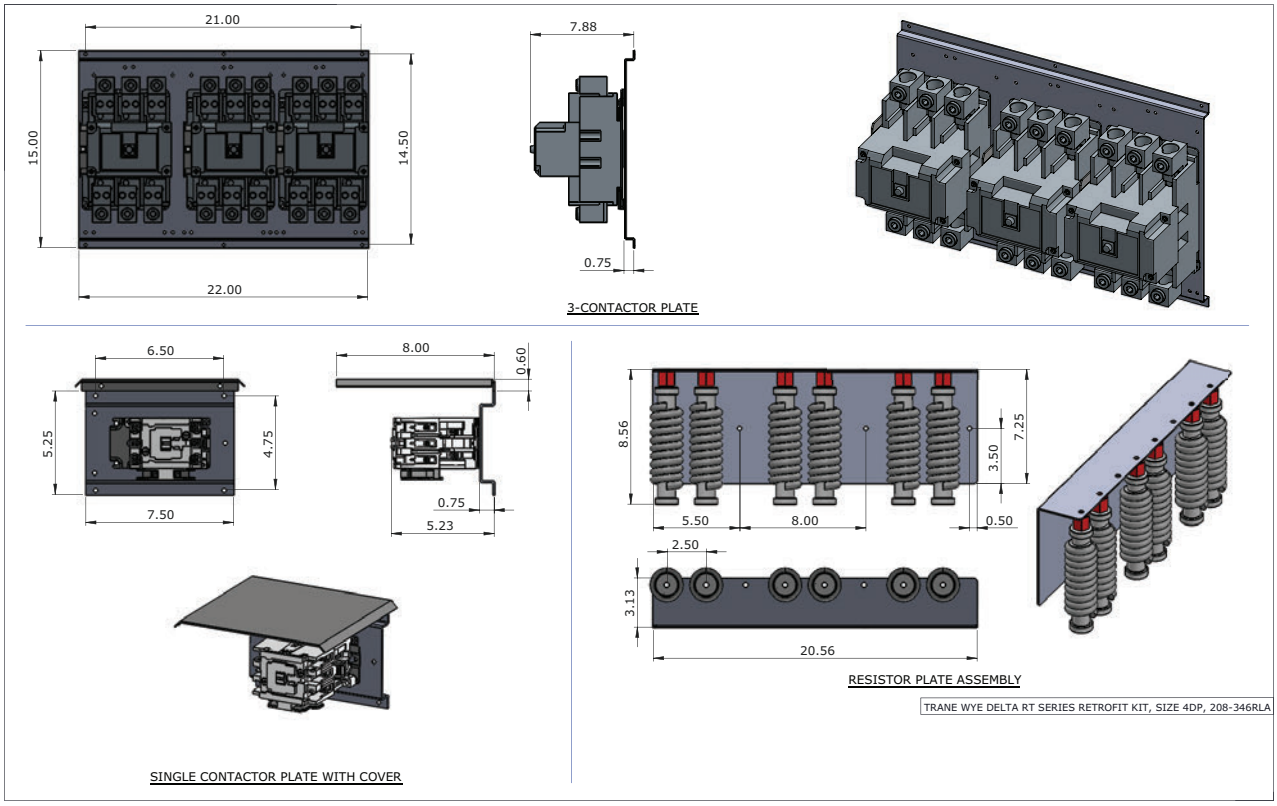


Figure 44. RTHA-RTHC 467 amps

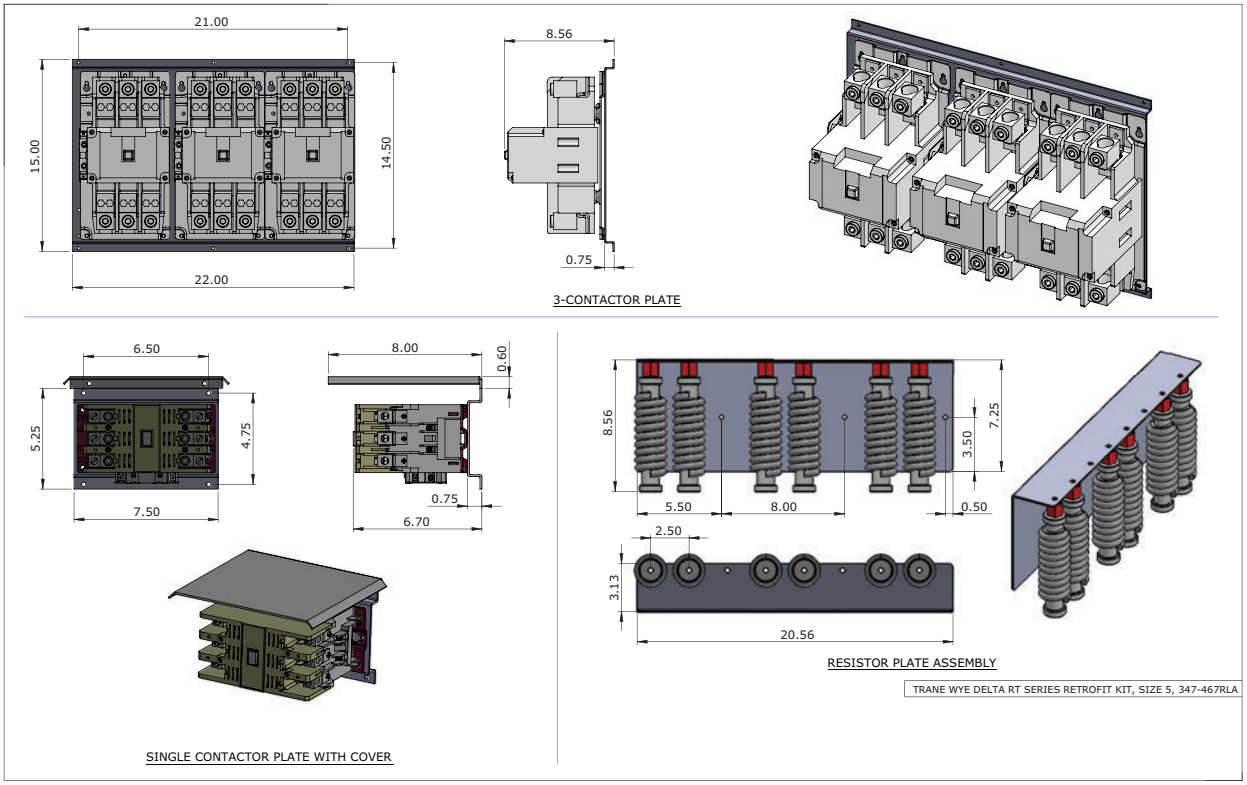


Figure 45. RTHA-RTHC 606 amps

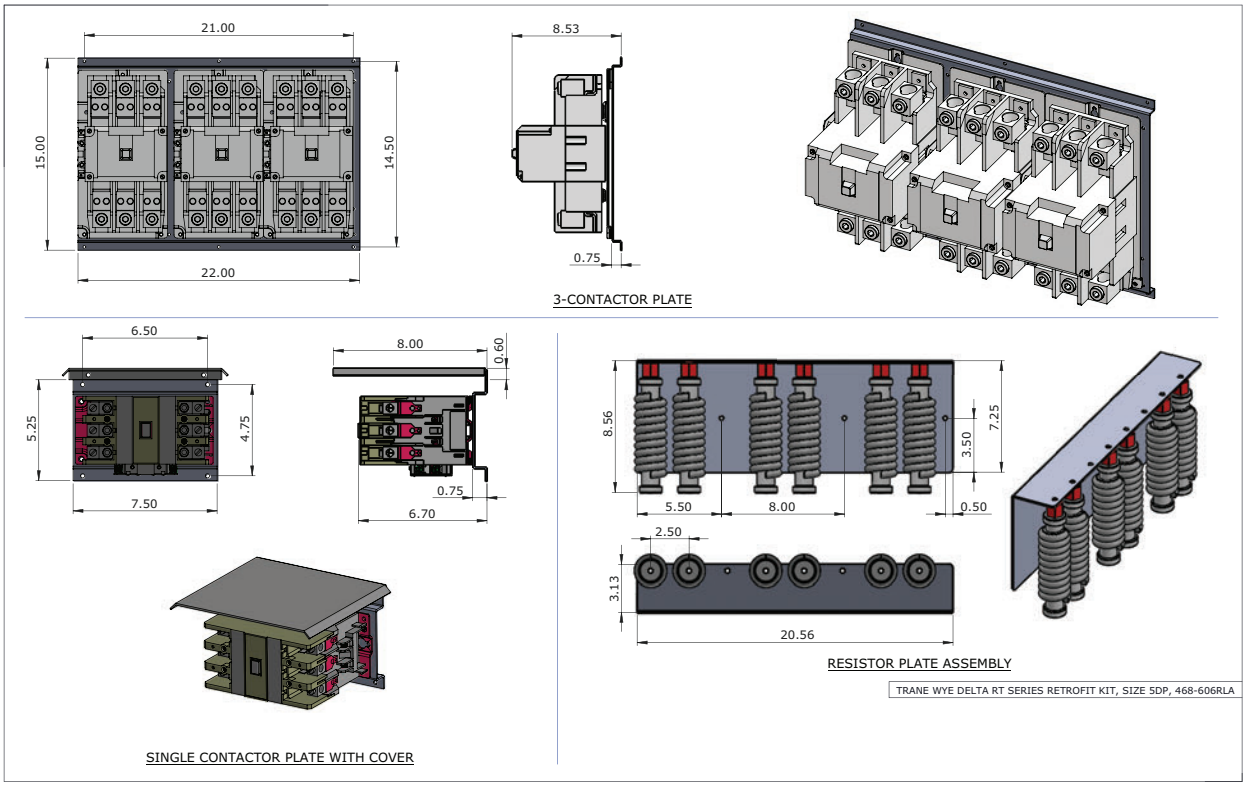


Figure 46. RTHD 207 amps

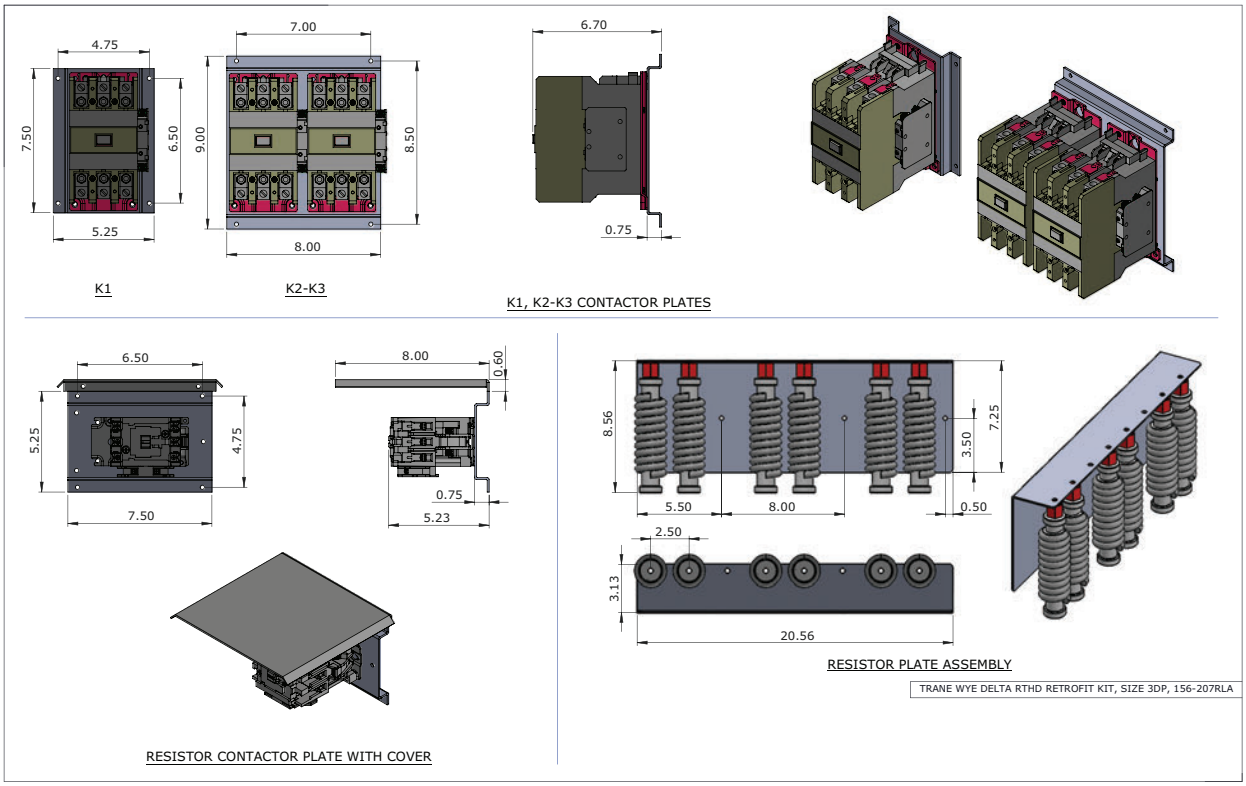


Figure 47. RTHD 346 amps

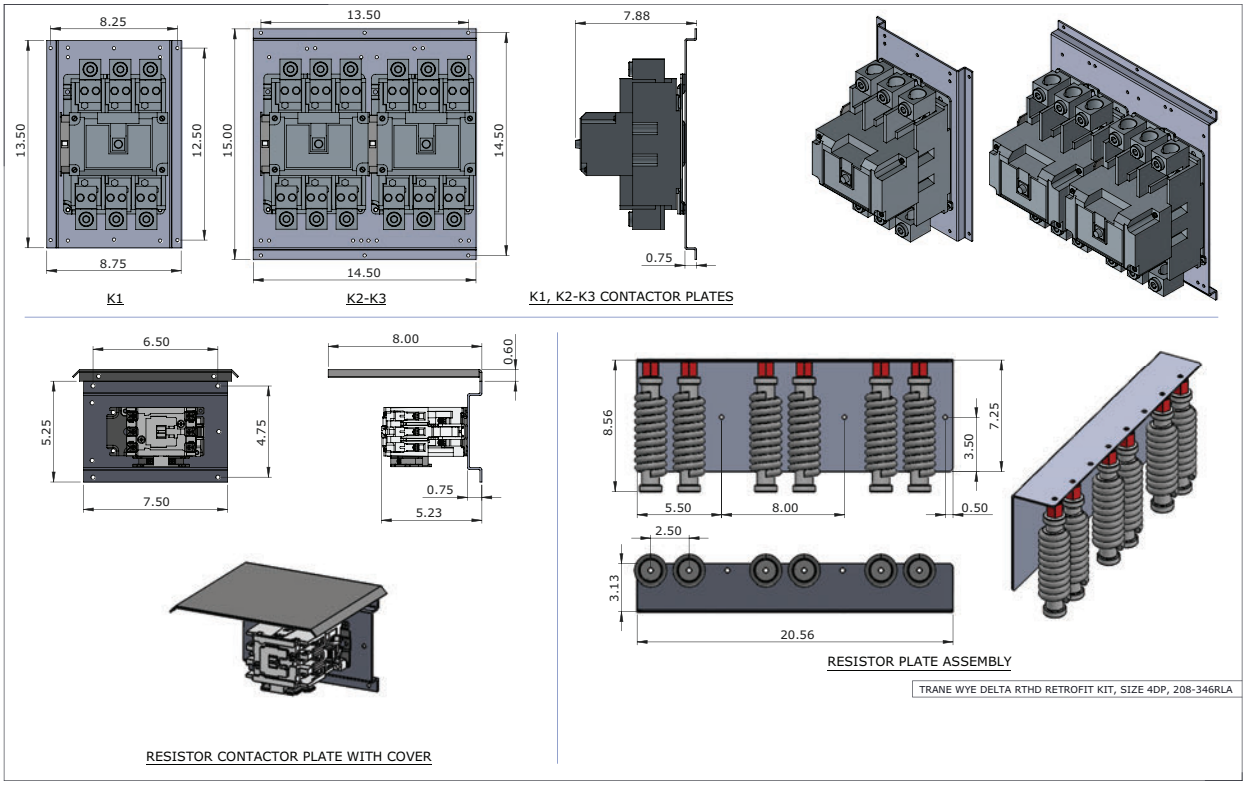


Figure 48. RTHD 467 amps

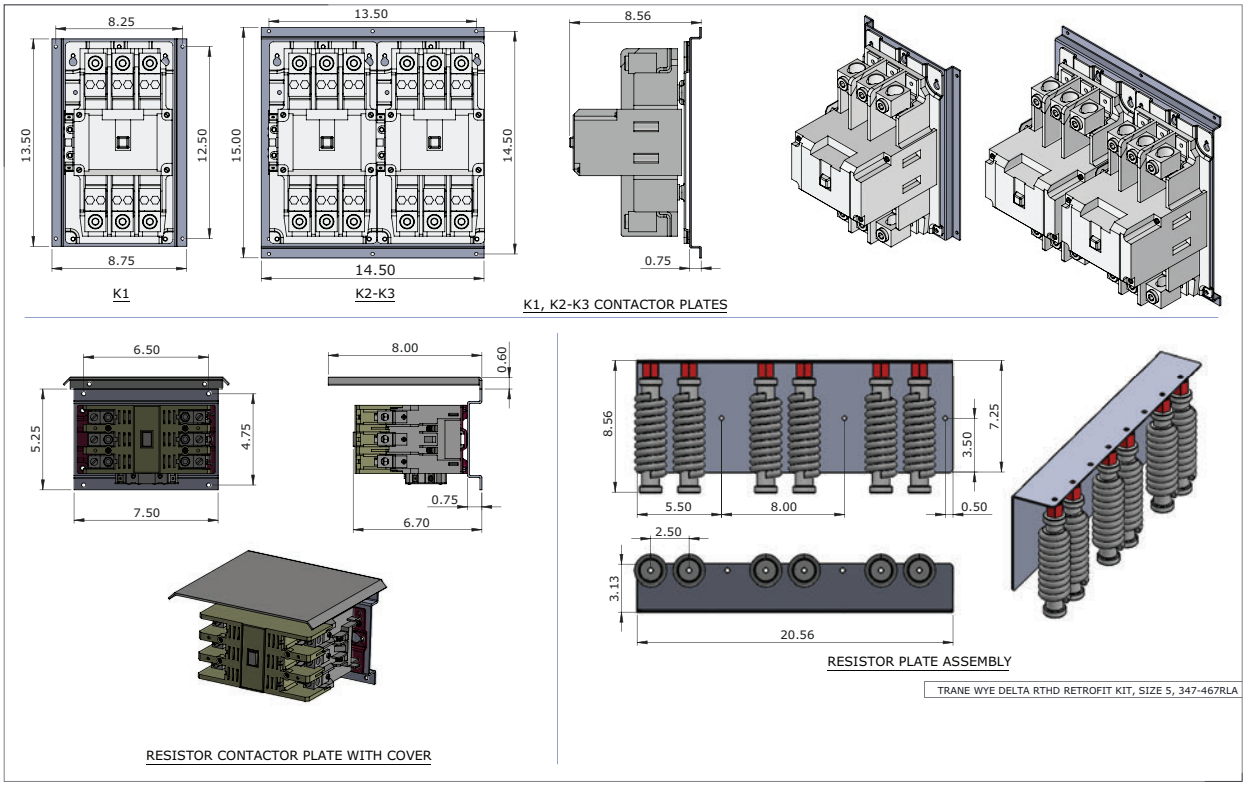
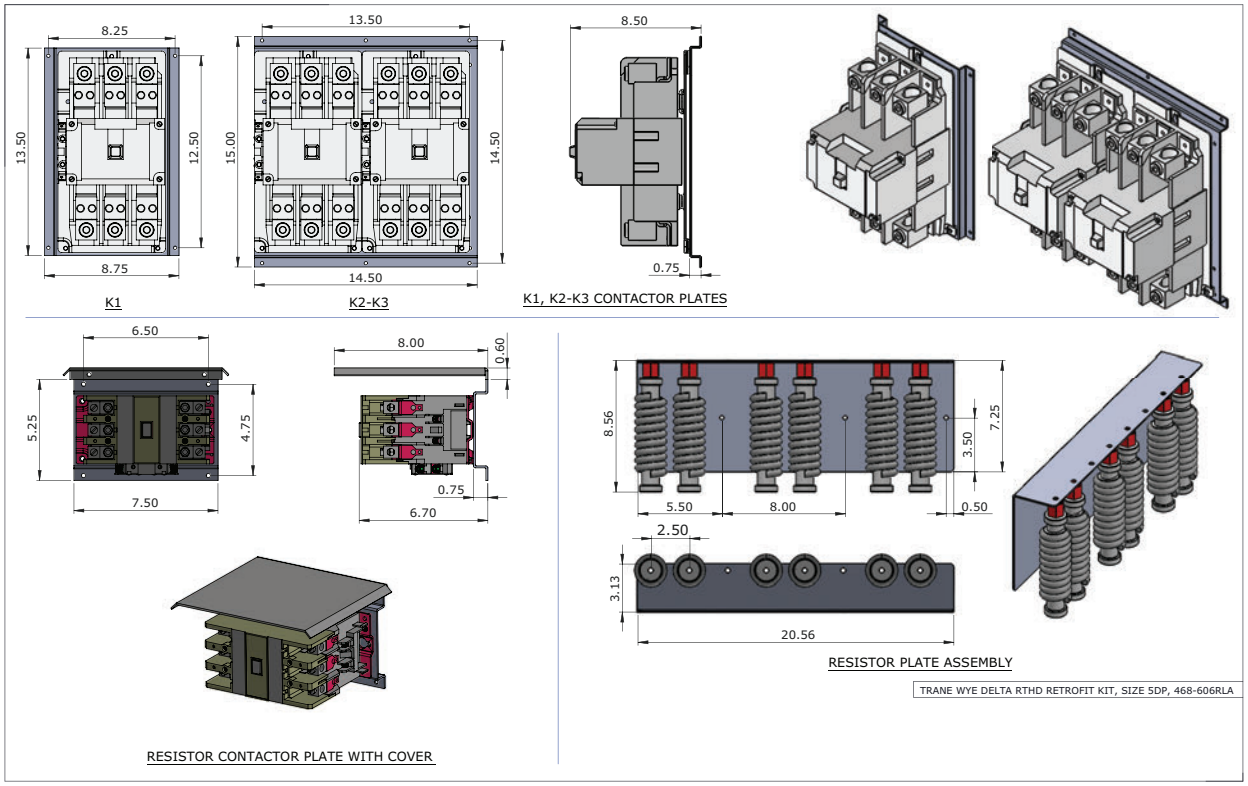


Figure 49. RTHD 606 amps



NOTICE

Compressor Damage!

Failure to follow instructions below could result in compressor damage.
Improper power phasing will cause compressor to run backwards. Compressor could be running backwards if it is noisy, low side shell gets hot, suction pressure does not drop within 5 seconds after startup, and compressor only draws ½ expected amps. Stop the compressor immediately and have a qualified electrician or technician properly trained in 3 phase power correct the wiring.

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SO-SVN040A-EN 13 Oct 2023
Supersedes STRA-SVN001C-EN (Aug 2020)