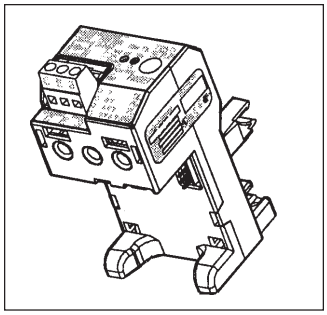
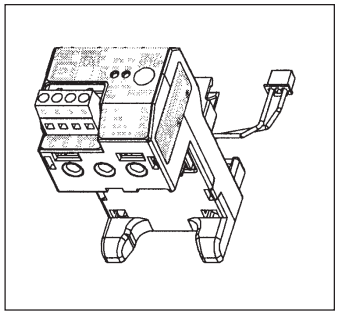
Instruction Leaflet for the C395 Non-Reversing and Reversing 45 mm Electronic Overloads



Non-Reversing Overload



Reversing Overload

DESCRIPTION

The C395ADDN/C395CFDN Non-Reversing Overloads are designed to attach directly to the Freedom Non-Reversing 45 mm Contactor with 110/120 50/60 Hz volt coils.

The C395AD**R**DN/C395CF**R**DN Reversing Overload is designed to attach directly to the Freedom 45 mm Reversing Contactor with 110/120 50/60 Hz volt coils. (The Reversing Overload has two sets of coil connections).

The RMS Motor current is measured magnetically via the passthrough motor connections. The rated Trip Current may be set in increments of 10% from 0.25A to 20.0A for the C395ADDN and from 10.3A to 35.5A for the C395CFDN while the class may be selected to be 10, 20, 30 and Design E. Additionally, features such as Phase Loss, Phase Imbalance, JAM, and Auto reset may be enabled or disabled. The overload includes two diagnostic LEDs which indicate ON/OFF status, alarms, and cause of trip.

INSTALLATION

WARNING

DO NOT INSTALL OR PERFORM MAINTENANCE ON THIS DEVICE WHILE EQUIPMENT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING WITH INSTALLATION OR MAINTENANCE.

Only qualified persons, as defined in the National Electric Code, who are familiar with the installation, maintenance and operation of this device and the equipment onto which is to be installed, as well as applicable local, state and national regulations and industry standards and accepted practices regarding safety of personnel and the equipment safety should be permitted to install, maintain or operate this device. These instructions are provided only as a general guide to such qualified persons and are not all-inclusive. They do not cover every application or circumstances which may arise in the installation, maintenance or operation of this equipment. Users are advised to comply with all local, state and national regulations and industry standards and accepted practices regarding safety of personnel and the equipment safety.

Before installing the C395 system, please review the following application restrictions.

1. Do not install where the Relative Humidity will exceed 95%, or where condensation will form due to rapid temperature changes. A heater should be provided to prevent the formation of condensation.
2. Do not install where corrosive gases are present.
3. Do not install where dust, salt, or iron particle densities are high.
4. Do not run the control wiring in the same duct as, or bundled together with the power cables. I/O wiring length should not exceed 500m (1641 ft).
5. Do not install where the unit may be subject to direct impact or high vibration.

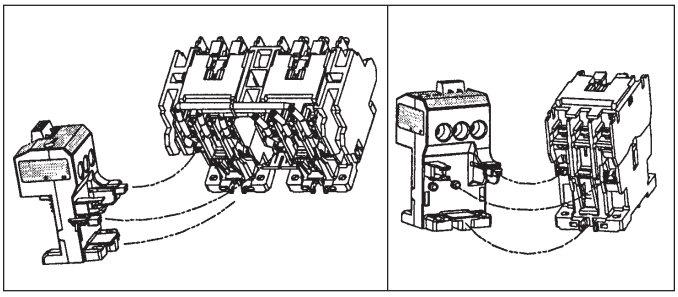


Fig. 1A C395 Overload — Contactor Installation

WARNING

REMOVE ALL POWER FROM THE INSTALLATION BEFORE ATTEMPTING TO INSTALL OR SERVICE THIS CONTACTOR DEVICE.

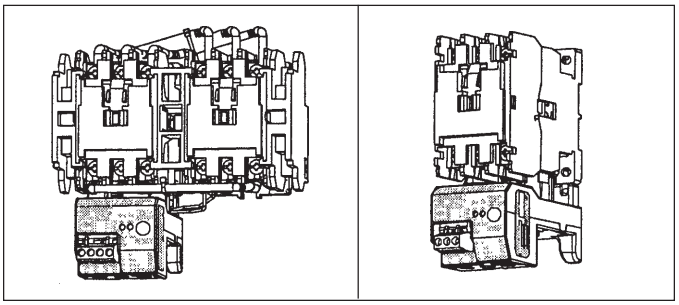


Fig. 1B C395 Overload Installed

Snap the C395 Overload/Controller onto the Freedom Contactor as indicated in Figure 1A and 1B by aligning the electrical connector first. Be sure that the pins on the coil connector are not bent. This connection not only provides the mechanical connection to the contactor, but also automatically wires the coil to the trip/control circuitry of the C395.

For the reversing overload, bend the reversing straps of the Reversing contactor toward the top of the contactors before attempting to install the C395 Overload/ Controller. After the reversing Overload/Controller is snapped in placed as described above, snap the flying lead wired connection to the contactor on the right-side.

Do not wire directly to the contactor coils. Mount the starter in an enclosure with a volume of not less than 240 cubic inches using either the DIN rail or the starter mounting plate. Attach the line side wiring to L1, L2 and L3 respectively and tighten to the specified torque on contactor nameplate.

Non-Reversing Overload Control Wiring

The C395ADDN/C395CFDN Non-Reversing Overloads has a separable control wiring terminal block which powers the overload and also provides hardwired control of the device. Each terminal is designed to accept up to two #14 wires, and consists of three terminals labeled “C,” “E” and “3.” The “C” terminal should always be connected to the grounded neutral of the circuit. The “E” terminal provides power for the overload as well as many of the options, and should be connected to 120/110 50/60 Hz. The “3” is the direct hardwire control for the contactor and should be wired to the start logic.

Strip control wires to no more than 1/4", and tighten all control wiring to 5 lb-in. Figure 2 illustrates a typical non-reversing wiring diagram.

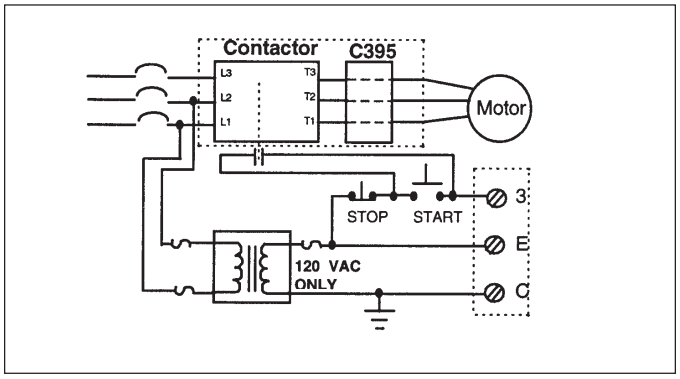


Fig. 2 Typical Non-Reversing Wiring Diagram

Reversing Overload Control Wiring

The C395AD**R**DN/C395CF**R**DN Reversing Overload has a separable control wiring terminal block which powers the overload and also provides hardwired control of the contactor. Each terminal is designed to accept up to two #14 wires, and consists of four terminals labeled “C,” “E,” “3” and “5.” The “C” and “E” terminals are described above. The “3” is the direct hardwire forward control for the contactor, while the “5” controls the reverse contactor. These inputs should be wired to the start/stop logic. Figure 3 illustrates a typical reversing wiring diagram.

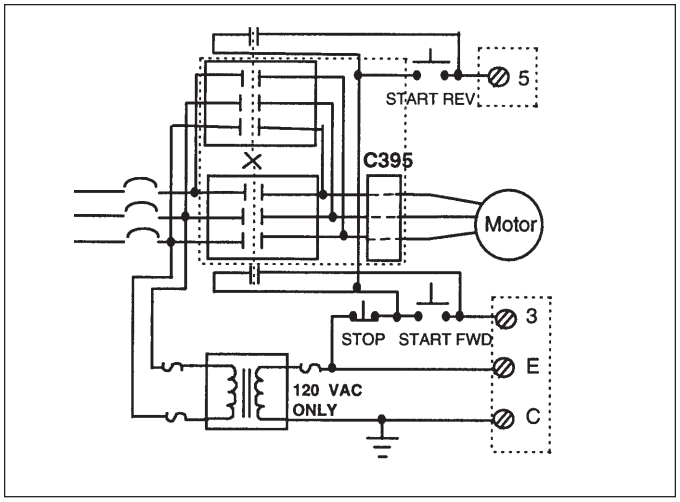


Fig. 3 Typical Reversing Wiring Diagram

POWER WIRING

The contactor lugs on the load side should be backed out fully. Pass the motor leads through the overload to T1, T2 and T3 respectively and tighten to the specified torque on contactor nameplate. The Overload can be removed in order to facilitate this step, and then reattached after the load Lugs are securely tightened. Never strip the load leads more than 1/2". For applications requiring #8 wire, or wire with an insulation diameter greater than 0.180, a **C395PT45DN** add-on module is recommended to provide the proper motor lead termination.

OVERLOAD SET-UP

The overload is shipped with following default settings:

Heater = 00 for AD 33 for CF
Class = 10
Phase Loss = Disabled
Phase Imbalance = Disabled
JAM = Disabled
Auto Reset = Disabled
Power Up Delay = 0.9 Seconds
Anti-Recycle Time = 0.0 seconds

In general, at least the heater and class must be set before the motor may be put in operation. The overload may be set up using the Handheld Programmer **C395PHHDN**, the Hardware Programming Key **C395HPKDN**, or by using the Overload's reset button. The following describes the procedure that should be used to set up the overload using the reset button. For other programming devices, consult the IL of the device to be used.

Note: Changing the configuration of the overload, reset the thermal protection.

1. Locate the **FLA** and Service Factor **SF** of the motor. Determine the appropriate heater number from Figure 3. For motors with a service factor greater than or equal to 1.15 increase the heater indicated in Figure 4 by one.
2. Apply control voltage to the E terminal. Do not close the contactor.
3. Hold the reset button down for about 5 seconds. After about 1 second, both LEDs will begin to flash. Once the program mode has been entered, both LEDs will come on solid. Release the reset button. This is the 10's heater state.

Rated Current			
Heater	**Min.**	**Max.**	**Trip**
00	.22	.23	.25
01	.24	.26	.27
02	.26	.28	.30
03	.29	.31	.33
04	.32	.34	.37
05	.35	.38	.40
06	.39	.41	.44
07	.42	.46	.49
08	.47	.50	.54
09	.51	.55	.59
10	.56	.61	.65
11	.62	.67	.71
12	.68	.74	.78
13	.75	.81	.86
14	.82	.90	.95
15	.91	.99	1.00
16	1.00	1.09	1.15
17	1.10	1.20	1.26
18	1.21	1.32	1.39
19	1.33	1.45	1.53
20	1.46	1.59	1.68
21	1.60	1.75	1.85
22	1.77	1.93	2.04
23	1.95	2.12	2.24
24	2.14	2.33	2.46
25	2.36	2.57	2.71
26	2.59	2.82	2.98
27	2.85	3.11	3.28
28	3.14	3.42	3.61
29	3.45	3.76	3.97
30	3.79	4.13	4.36
31	4.17	4.55	4.80
32	4.60	5.00	5.28
33	5.05	5.50	5.81
34	5.55	6.05	6.39
35	6.11	6.66	7.03
36	6.72	7.32	7.73
37	7.39	8.06	8.50
38	8.13	8.86	9.35
39	8.94	9.75	10.3
40	9.84	10.7	11.3
41	10.8	11.8	12.4
42	11.9	13.0	13.7
43	13.1	14.3	15.1
44	14.4	15.7	16.6
45	15.8	17.3	18.2
46	17.4	19.0	20.0
99			Custom

Fig. 4A Heater Table for the C395ADDN/C395ADRDN

Rated Current			
Heater	**Min.**	**Max.**	**Trip**
33	8.9	9.7	10.3
34	9.8	10.7	11.3
35	10.8	11.8	12.4
36	11.9	13.0	13.7
37	13.1	14.3	15.1
38	14.4	15.7	16.6
39	15.8	17.3	18.2
40	17.4	19.0	20.0
41	19.2	20.9	22.0
42	21.1	23.0	24.3
43	23.2	25.3	26.7
44	25.5	27.8	29.3
45	28.1	30.6	32.3
46	30.9	33.7	35.5
99		Custom	

Fig. 4B Heater Table for the C395CFDN/C395CFRDN

4. Press the reset button the number of 10's in the heater number from Figures 4A and 4B. Once the reset button is inactive for about two seconds, the C395 will play the number of 10's selected three times. If the number is not correct, press the reset button at any time until the correct number plays back. The 10's will roll over from 4 to 0.
5. Once Step 4 is completed, and before the end of the third playback, press and hold the reset button down until the next desired program state is indicated. Figure 6 illustrates the programming structure, while Figure 5 defines the various programmable features and how they are displayed.

Local Program control may be disabled using the Hardware programming key or the Handheld Programmer.

SET-UP VERIFICATION

When the contactor is not energized, the reset button may be pressed and held until both LEDs start flashing. Releasing the reset button at that time places the overload in the verification mode and it will begin to review the heater selection displaying first the 10's and then the 1's. Each subsequent press will display the state while the button is pressed, and display the data three times when it is released. Once the settings of the overload are entered, they should be marked on the overload faceplate. If a custom FLA has been entered, the unit will display heater 99, and a display device must be used to determine the exact FLA.

PROTECTIVE FEATURES

PHASE LOSS

The phase loss algorithm compares minimum and maximum currents and generates a difference term. If the difference term is less than rated current, the loss term = difference/rated current; otherwise, loss term = difference/maximum current. The loss trip level is factory set at 60%. If the loss term is ≤60% the unit will ultimately trip. The trip time is proportional to the loss term squared. See Figure 7.

Key ✻ = Flashing, ● = On Solid, ❍ = Off		
State Ind.	**Mode/Variable**	**Function Description**
10's 1's ✻ ✻	VERification Mode	Releasing the reset button when both LEDs are flashing enables the VERification mode. In this mode, all setups may be reviewed, but not changed. After about five seconds, the LEDs will both light solid indicating that the Program **PGM** has been entered.
10's 1's ● ●	VER PGM 10's + 1's 10's	Blinks the number of **10's** in the heater selected three times. Increments the **10's** digit each short press of the reset button
10's 1's ● ❍	PGM 1's	Blinks the number of **1's** three times. Increments the **1's** digit each short press of the reset button.
10's 1's ❍ ●	Trip Class Both Modes	Blinks the number of **10's** in the Trip Class selected. Blinks four times for Design E. Increments the **10's** digit each short press of the reset button.
10's 1's ✻ ●	Phase Unbalance Both Modes	Lights the **EN** LED if enabled, and the **DIS** LED if disabled. A short press of the reset button toggles the selection.
10's 1's ● ✻	Phase Loss Both Modes	Lights the **EN** LED if enabled, and the **DIS** LED if disabled. A short press of the reset button toggles the selection.
10's 1's ❍ ✻	Auto Reset Both Modes	Lights the **EN** LED if enabled, and the **DIS** LED if disabled. A short press of the reset button toggles the selection. Automatic reset should not be used with 2-wire control circuits where automatic starting of the motor may be hazardous.
10's 1's ✻ ❍	JAM Both Modes	Lights the **EN** LED if enabled, and the **DIS** LED if disabled. A short press of the reset button toggles the selection.

Fig. 5 Program/Verification State Indication and Data

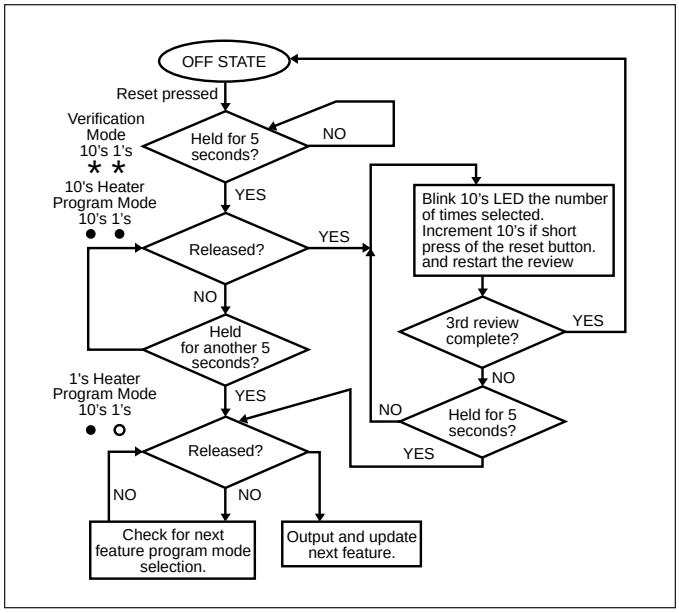


Fig. 6 General Programming Structure

PHASE IMBALANCE

The phase imbalance algorithm compares minimum and maximum currents and generates a difference term. If the difference term is less than the rated current, the imbalance term = difference/rated current; otherwise, imbalance term = difference/maximum current. The imbalance trip level is factory set at 15%. If the imbalance term is >15% the unit will ultimately trip. The trip time is inversely proportional to the imbalance squared. See Figure 7. If the imbalance term is >60% at the time of trip, the unit will trip on phase loss, not phase imbalance. For custom trip times consult the factory for more information.

JAM

The JAM protective function is activated one second after the motor current drops below the rated current. If the current ever rises above 400% again for a duration of one second, the JAM function will trip the motor. The JAM trip time can be set using the handheld programmer C395PHHDN.

AUTO RESET

The auto reset when enabled will reset overload, phase loss and phase imbalance trips after 2 – 3 minutes. If power is removed during this time, the unit will reset 2 – 3 minutes after power is restored.

COIL CONTROL AND PROTECTION

The C395 has onboard circuitry to detect the state of the contactor contacts. In applications where the SPBS, or DeviceNet are in control of the unit, external electrical contacts are not required. In addition, the onboard circuitry can detect coil overcurrents which may result from attempting to start the contactor at too low a voltage, or from contamination at the polefaces. When high currents are detected in the coil circuit, the overload will trip the coil on a trip type 8.

PUSH TO TEST

The overload push to test feature is accessed by pressing and holding the reset button for about five seconds while the contactor is closed. The push to test feature may be disabled using the Handheld Programmer.

DIAGNOSTIC LEDS

COP 10's 1's ✻ ❍	Blinks the 10's/EN LED once every 8 seconds if power is on the unit, and the microprocessor is performing normally.
ALM 10's 1's ✻ ●	Blinks the 10's/EN LED at the rate of 1/second when an overload condition exists.
RUN 10's 1's ❍ ●	The 1's/DIS LED is illuminated whenever the contactor is closed and sealed under C395 control.
TRIP 10's 1's ● ✻	Lights the 10's/EN LED.

Trip Diagnostics — Whenever the Trip LED is illuminated, the cause of trip will be blinked on the 1's/DIS LED.

1 — Thermal Trip
2 — Phase Imbalance
3 — Phase Loss
4 — JAM
6 — Test Trip
7 — Communication Fault
8 — Coil Fault
10 — Missing HOA Option
12 — Illegal Option
13 — Forced Trip
14 — Illegal Heater
15 — EEprom Fault

TRIP TIMES AND CURVES

Thermal — Four basic thermal curves are supported as well as warm start even after loss of power. The Design E cooling is also supported.

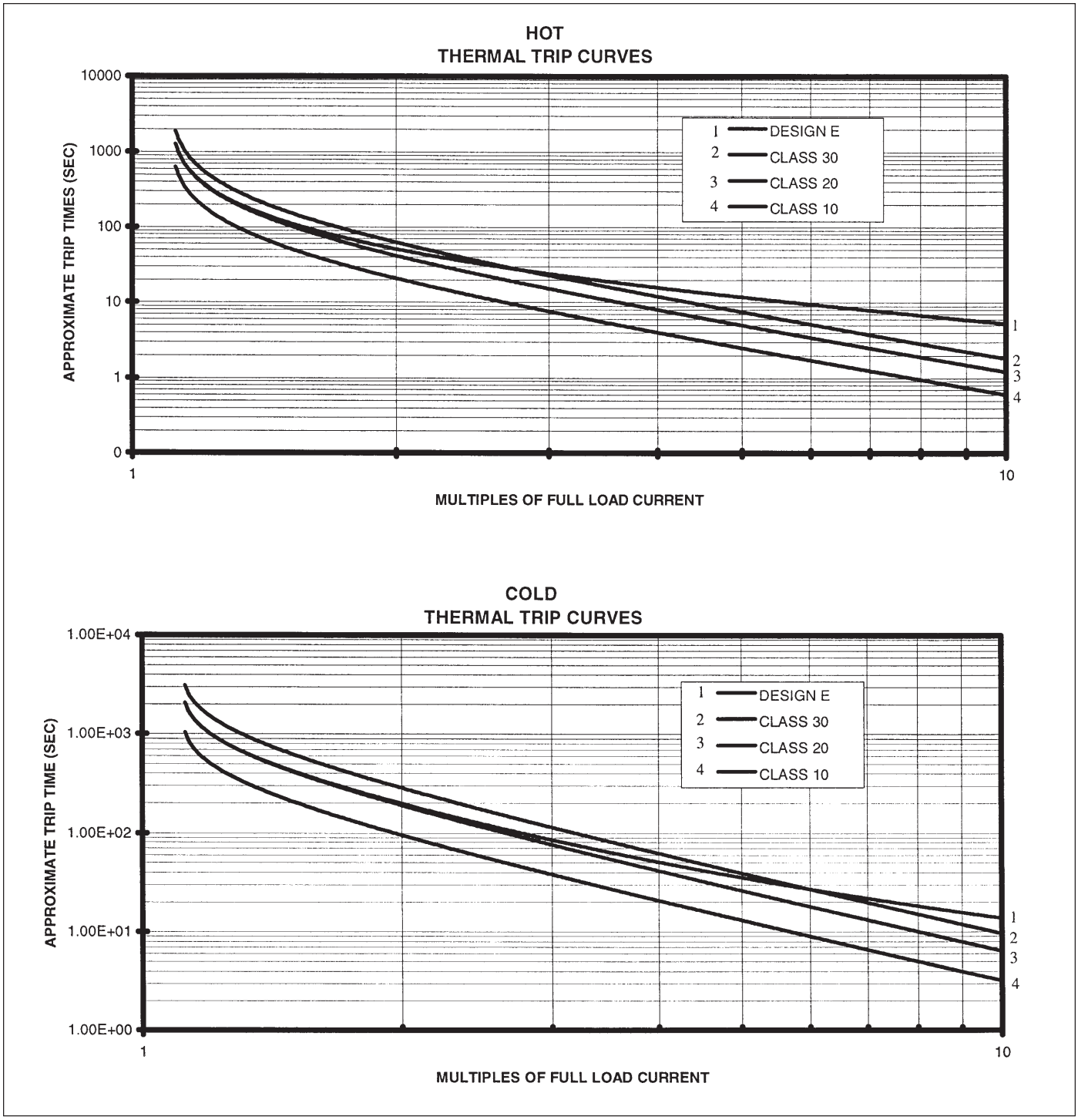
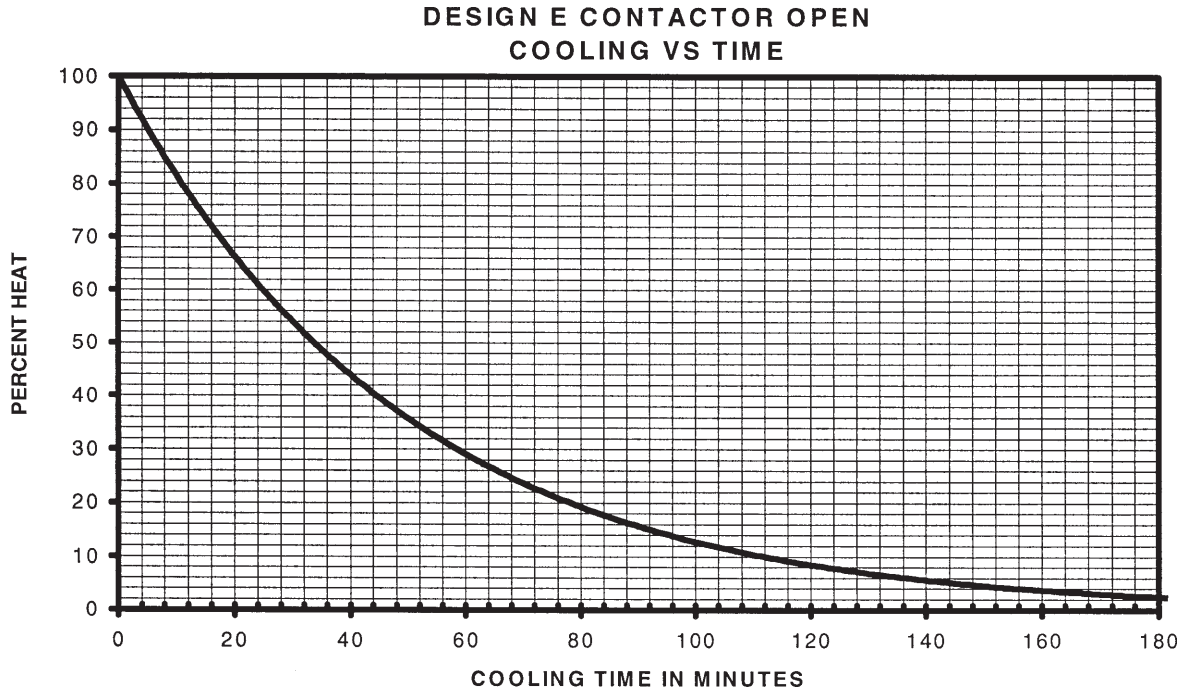


Fig. 7 Operation Curves: Thermal Trip, Design E Cooling, Percent Imbalance and Percent Loss



Note: Design E has a much longer cooling rate than normal. Design E will cool at a different rate than which it heats when the contactor is open. All others heat and cool at the same rate.

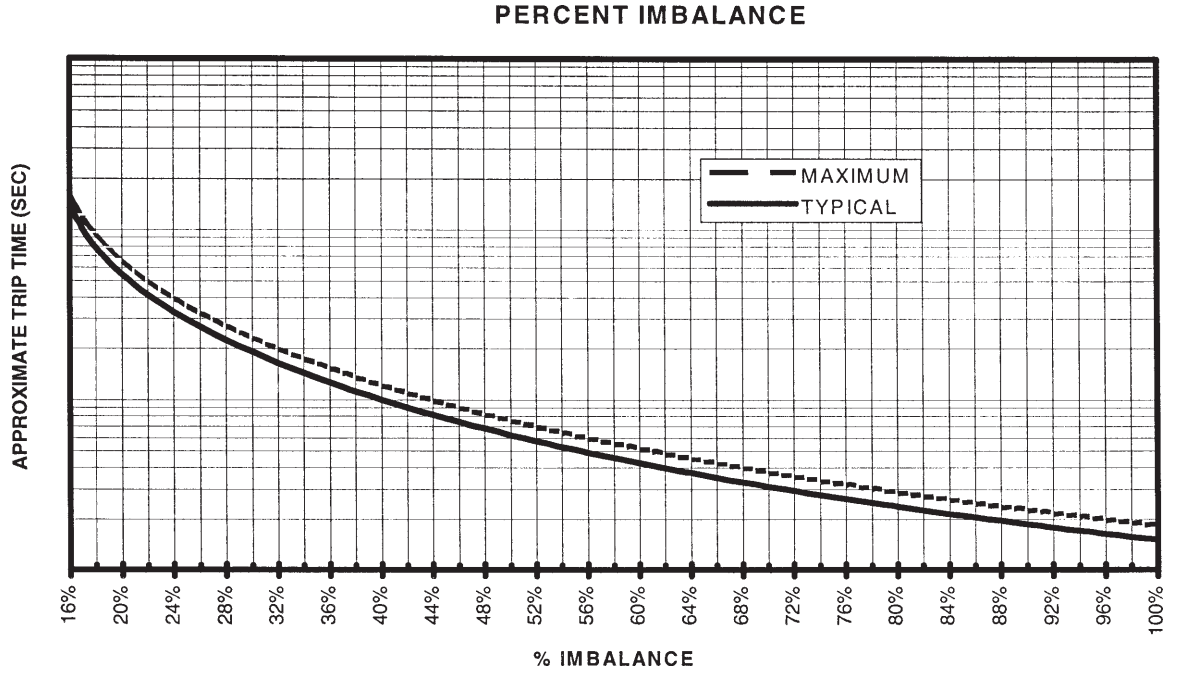


Fig. 7 Operation Curves — Cont.

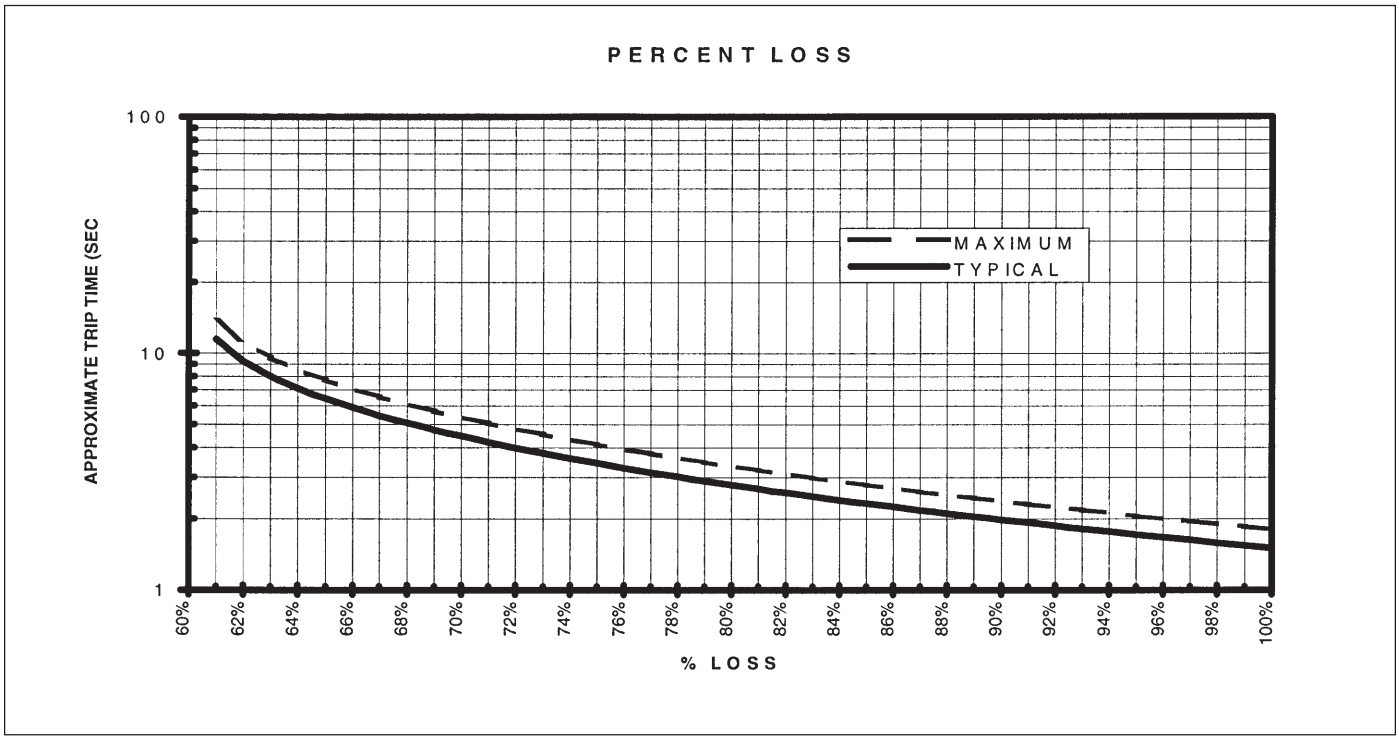


Fig. 7 Operation Curves — Cont.

EMERGENCY STOP

The emergency stop should break the E terminal connection of the C395 Overload.

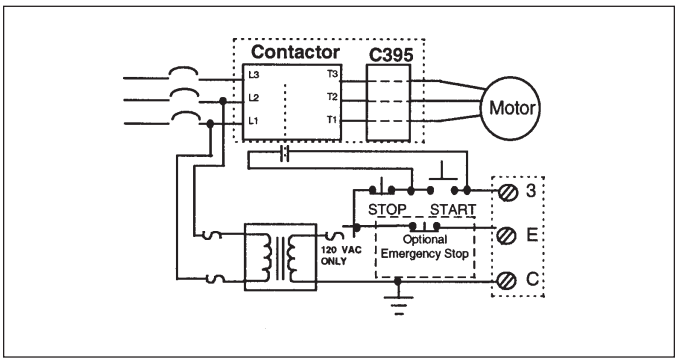


Fig. 8 Typical Emergency Stop Wiring

TROUBLESHOOTING HINTS

If the C395 does not operate as expected, check the following:

1. Is there 110/120 50/60 Hz between the E and C terminals? No, check power wiring and fuses.
2. Is the Trip LED illuminated? Yes, then record the cause of trip, and take corrective action such as verify the Trip Rating and Class.
3. Is the trip type 8? Yes, then remove all power, and inspect the magnet gap. Verify the VA of the transformer and its output voltage.
4. Is a thermal trip occurring during starting? Yes, then check the Class rating.
5. Is the unit tripped on an illegal option? Yes, remove power, then remove the option and check the connector. Insert the option and reapply power.

RATINGS

Control Voltage and Power Ratings

120V AC ± 10%
50/60 Hz
50 VA minimum
C terminal should always be grounded
Pickup 3 terminal 80V AC
Dropout 3 terminal 65V AC

Control Wire (75°C — Copper)

Size ..... 14 – 18
Maximum Number ..... Two #14 – 18
Strip Length ..... 1/4 – 5/16
Torque ..... 5 lb-in

Motor Wire (75°C — Copper)

Maximum OD ..... 0.200"

Maximum Wire ..... #10

If wire with a larger OD is required, order the **C395PT45DN**.

Short Circuit Rating

5000A rms symmetrical, 600V AC

AMBIENT RATINGS

Operating ..... -25 to 70°C at device
-25 to 40°C external ambient (enclosed)
Storage ..... -40 to 85°C
20 to 95% ..... Relative humidity noncondensing

Vibration

Operating 5G
Non-Operational 15G

Altitude

Operating or Non-Operating ..... -1641 to 6566 ft
-500 to 2000M

Class Ratings

Class	% of Trip Rated Current	Max. Trip Time Seconds
10	600%	10
20	600%	20
30	600%	30
E	800%	20 (Cold)

PROGRAMMABILITY

(C395PHHDN) the following parameters may be programmed directly:

Custom FLA Currents
0.22 – 18.0A in 0.01A steps in the AD
8.95 – 32.0A in 0.01A steps in the CF

Custom Class — 4 -60 in 1 second steps

Using the **C395 Handheld Programmer**
Power-Up Delay — 0.1 – 300 seconds
Anti-Recycle Delay — 0.1 – 300 seconds

Enable or Disable

Phase Loss
Auto Reset
Local Reset
JAM
Phase Imbalance
Local Overload Test Trip
Local Pushbutton Programming

STILL NEED HELP???
Contact Cutler-Hammer Automation
Phone: (800) 231-1145

Cutler-Hammer
4201 N. 27th Street
Milwaukee, WI 53216

Effective February 1997
Printed in U.S.A./CCI