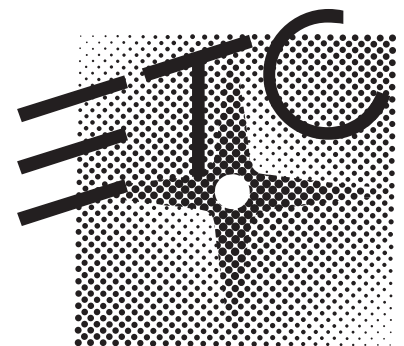


# ELTS



## Emergency Lighting Transfer System (Group 9)

# User Manual





# Emergency Lighting Transfer System User Manual

## Contents

<b>Introduction</b> .....	5
How to use this manual .....	5
Codes and standards.....	5
System Diagram.....	6

## Installation and setup chapters

<b>Installation</b> .....	7
Unpack and Inspect.....	7
ELTS Models.....	8
Mounting the ELTS cabinet.....	9
Installing Remote stations (optional) .....	11
<b>Connecting power and control wiring to the ELTS cabinet</b> .....	12
Transfer switch, Normal power and lighting load connections .....	13
Control and Sensing wire connections.....	15
<b>Testing</b> .....	18
Before you power up for the first time .....	18
Turn on system .....	18
Functional checkout .....	19
<b>Settings</b> .....	21
ELTS timing settings .....	21
ELTS voltage and frequency settings.....	24

## Use and service chapters

<b>Operation</b> .....	25
Automatic operation.....	25
Switching power sources manually .....	26
<b>Service</b> .....	27
Preventive maintenance.....	27
<b>Troubleshooting</b> .....	28
Emergency or Normal Power Stable LED does not turn on properly.....	28
The ELTS will not switch between Normal and Emergency.....	28
Remote stations cannot switch the ELTS.....	29

## Appendices

<b>Appendix A: ELTS specifications</b> .....	30
<b>Appendix B: Wire connection schematics and diagrams</b> .....	31
<b>Appendix C: Transfer switch control system schematics</b> .....	33
<b>Appendix D: Transfer switch load switching schematic</b> .....	34
<b>Appendix E: Test and Maintenance Log</b> .....	35



# Emergency Lighting Transfer System

## Introduction

Welcome to ETC's Emergency Lighting Transfer System (ELTS) User Manual. This manual shows you how to install and use your ELTS system. See *ELTS Models* on page 8 for a breakdown of ELTS models and configurations.

### How to use this manual

This manual is divided into three sections:

- ▼ *Installation* on page 7 tells you how to install and test your system
- ▼ *Operation* on page 25 tells you how to use and service your system
- ▼ The *Appendix B: Wire connection schematics and diagrams* on page 31 contains additional information you may need

### Warnings and notice conventions

These symbols alert you to danger or important information:



**Warning!** Warns you when electricity may cause injury



**Warning!** Warns you when there is a possibility of other types of injury



**Notice:** Alerts you to important information relating to equipment performance or reliability

### Contacting ETC

For questions about ELTS system delivery or general information, contact ETC Customer Service at 800/688-4116.

### Codes and standards

ELTS systems meet the following regulatory standards for emergency lighting transfer devices:

- ▼ **ANSI/UL 1008** – Listed, Automatic Transfer Switches
- ▼ **ANSI/NFPA 110** – Emergency and Standby Power Systems
- ▼ **ANSI/NFPA 70** – National Electric Code
  - Article 701 – Legally Required Standby Systems
  - Article 700 – Emergency Systems
  - Article 540 – 11(c) – Motion Picture Houses
  - Article 520 – 7 – Theatres and Similar Locations
  - Article 518 – 3(c) – Places of Assembly
- ▼ **City of New York, Advisory board, Electrical Department**
- ▼ **OSHA**
- ▼ **Department of Defense**

# System Diagram

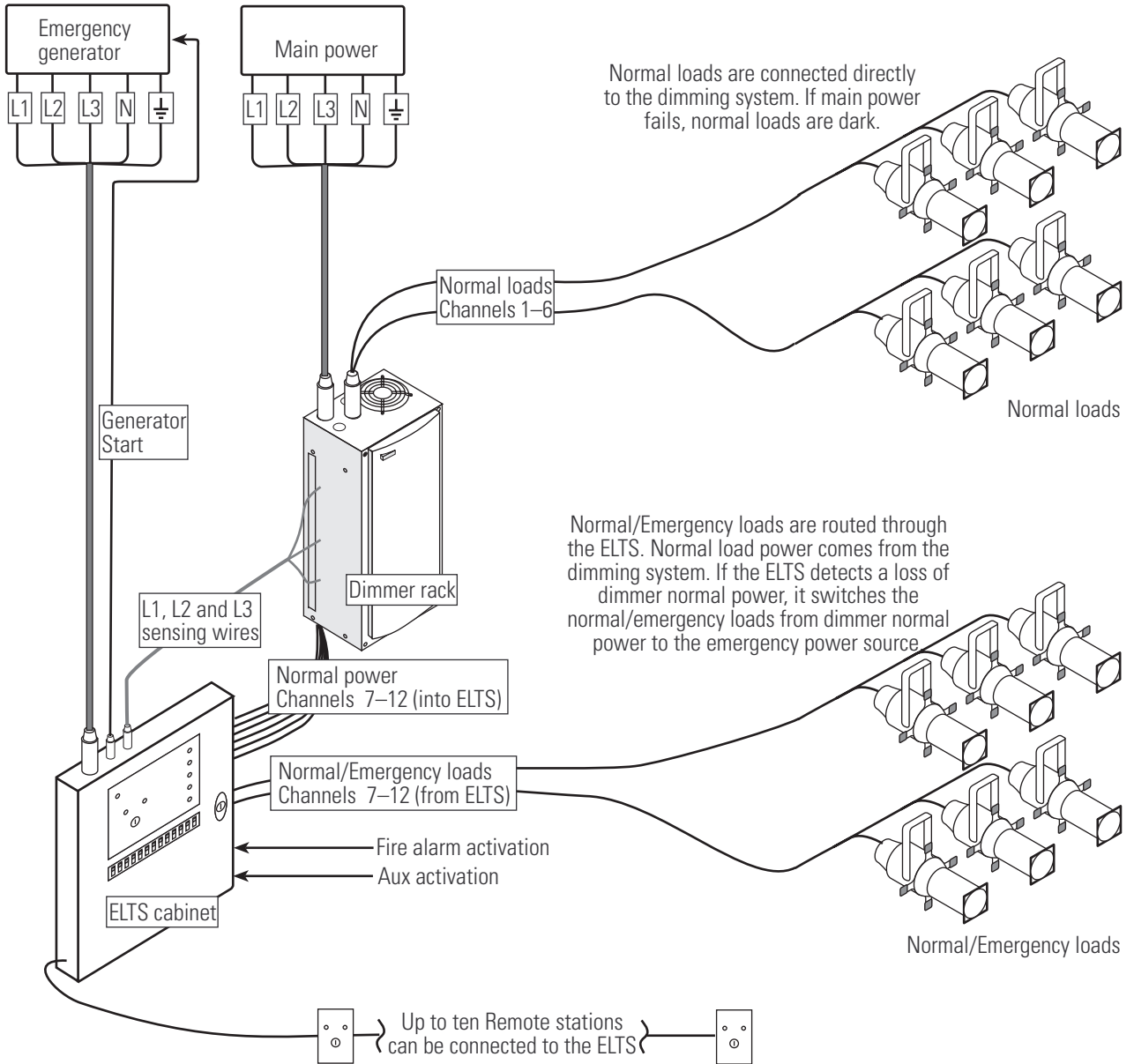


Figure 1: Diagram of a typical ELTS system

# Installation

## Unpack and Inspect

Before you begin installation, check your shipment so you know it arrived complete and undamaged.

1. Check the shipping container for obvious physical damage:
  - ▼ Torn or opened containers
  - ▼ Water stains or wetness
  - ▼ Crushed or punctured boxes
  - ▼ Other shipping-related damage
2. If you find damage, document it to help with a claim against your shipper.
3. Unpack your order and check the contents against the Bill of Materials to be sure your order is complete.
4. Open the ELTS cabinet door and check for loose connections or broken components caused by shipping vibration.
5. If you discover a problem with your order, call ETC Customer Service at 800/688-4116.

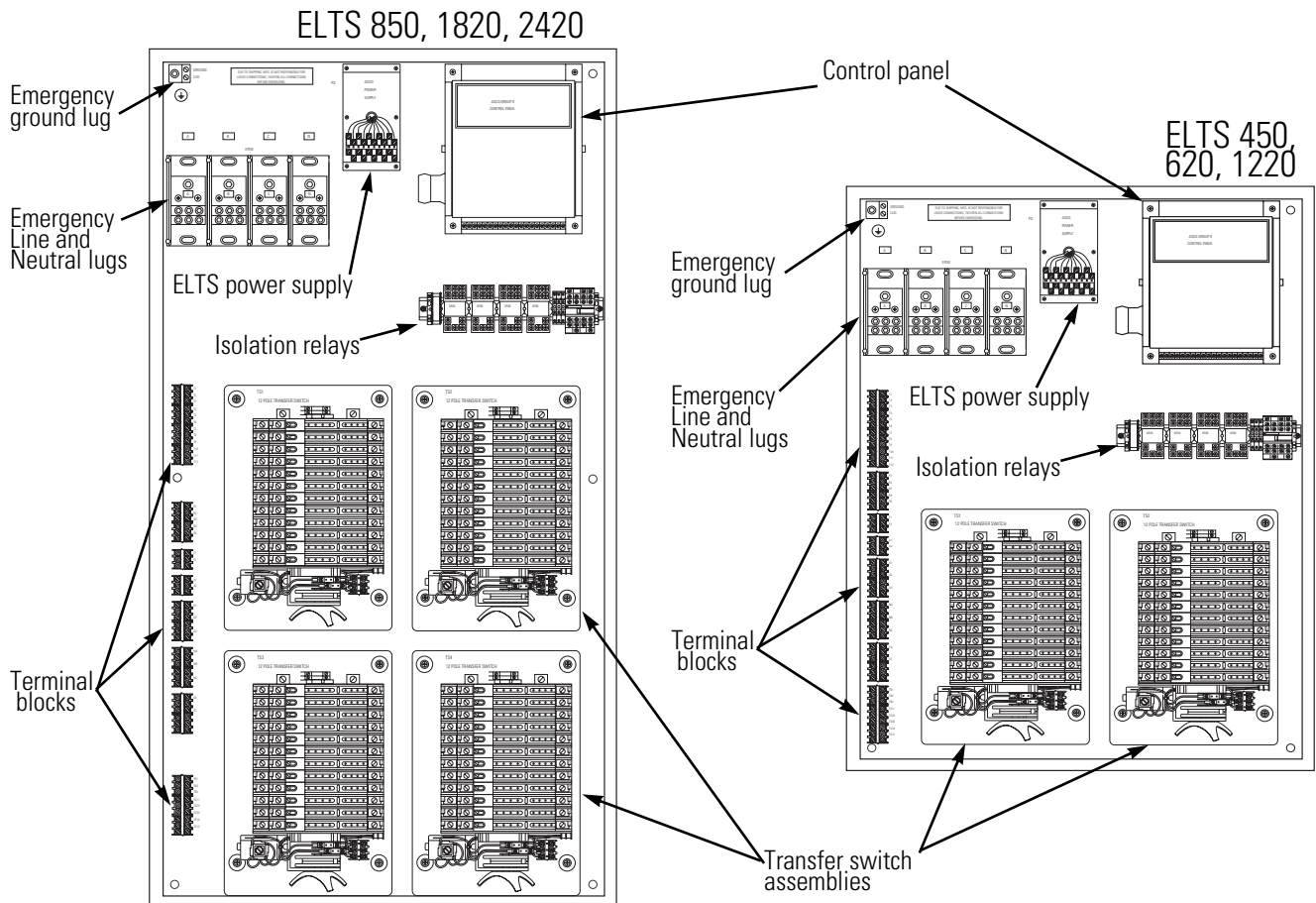
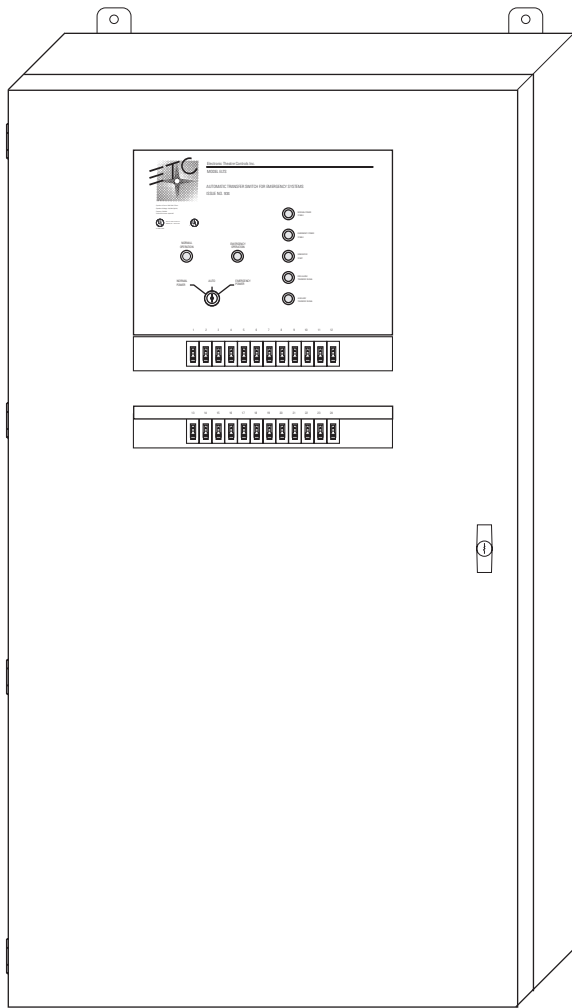


Figure 2: Identifying ELTS components

## ELTS Models



Large ELTS cabinet (30" wide x 54" tall x 9" deep)

**ELTS 850** 8 circuits of 50 amps  
**ELTS 1820** 18 circuits of 20 amps  
**ELTS 2420** 24 circuits of 20 amps

Small ELTS cabinet (30" wide x 36" tall x 9" deep)

**ELTS 450** 4 circuits of 50 amps  
**ELTS 620** 6 circuits of 20 amps  
**ELTS 1220** 12 circuits of 20 amps

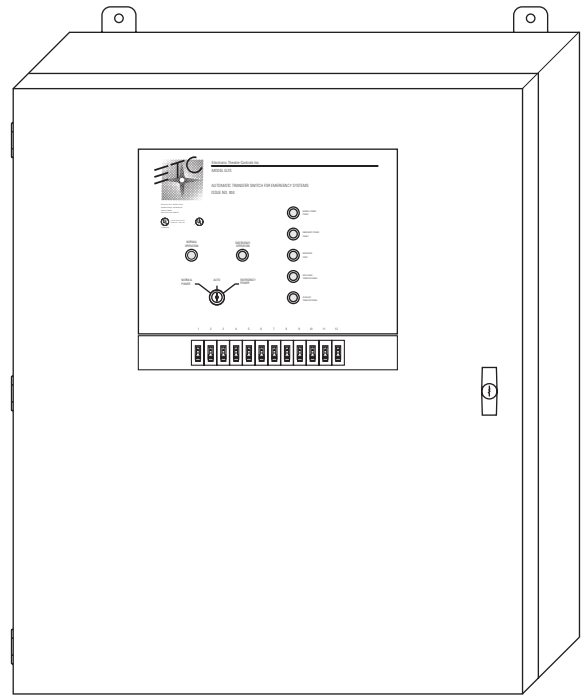


Figure 3: Large and small ELTS cabinets

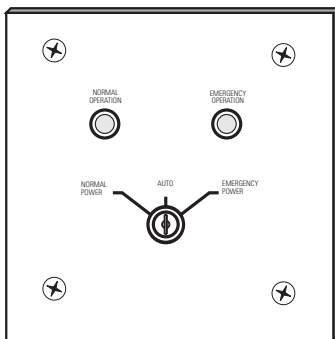


Figure 4: Remote station

### Remote station (part # 1093A2023)

- ▼ Provides front panel keyswitch control at remote locations.
- ▼ Link up to ten stations with parallel wiring.
- ▼ Normal and Emergency LEDs indicate ELTS status.



## Mounting the ELTS cabinet

Mount the ELTS on a load-bearing wall, in a location where it will not be subject to tampering or vandalism. If possible, install the ELTS where it is most secure from damage by a fire, flood or other incident likely to require its use. Do not install the ELTS inside any other electrical enclosure.

### Physical requirements for mounting

You must mount either size ELTS cabinet with sufficient front clearance (30 inches) to allow the door to open completely.

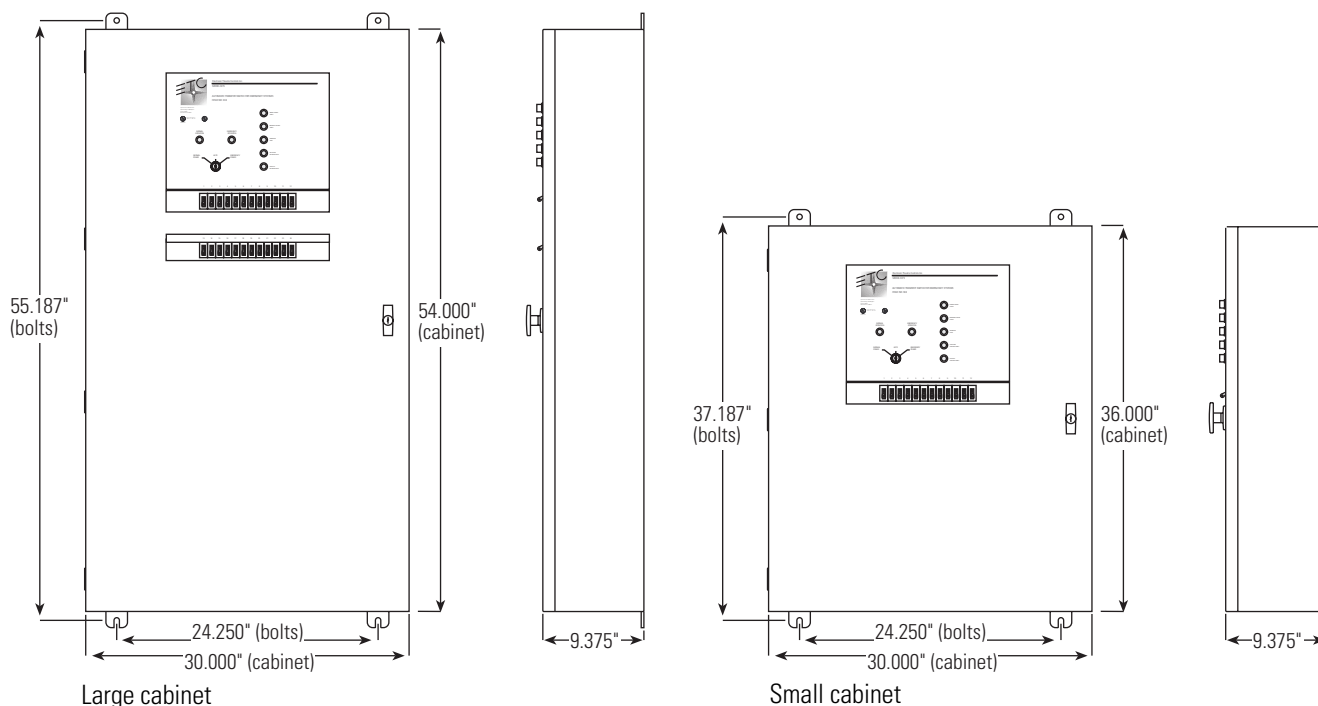


Figure 5: ELTS cabinet mounting dimensions



**Notice:** When planning your installation, make sure to leave space around the cabinet for entry and exit wire conduit. Emergency line and neutral conduit may require extra space due to increased bend radius requirements for larger cables.

## Planning wire entry into the ELTS cabinet

The Emergency power connections must enter the cabinet from the top or side of the cabinet within six inches of the top left corner.

Control, Normal power sensing and options wires connect most easily if they enter above the Remote station terminal or just below the Emergency sensing terminal on the left side of the cabinet.

*Note: Do not run the control, normal power sensing and options wiring in the same conduit as Emergency phase or load power wiring.*

Load wires in from the dimmer rack and out to the lighting loads connect most easily if they enter through the bottom of the cabinet either between or beside the transfer switch assemblies.

*Note: Except for the emergency power supply wires, which must enter near the top left corner of the cabinet, recommended conduit entry locations may be changed based on the requirements of your installation.*

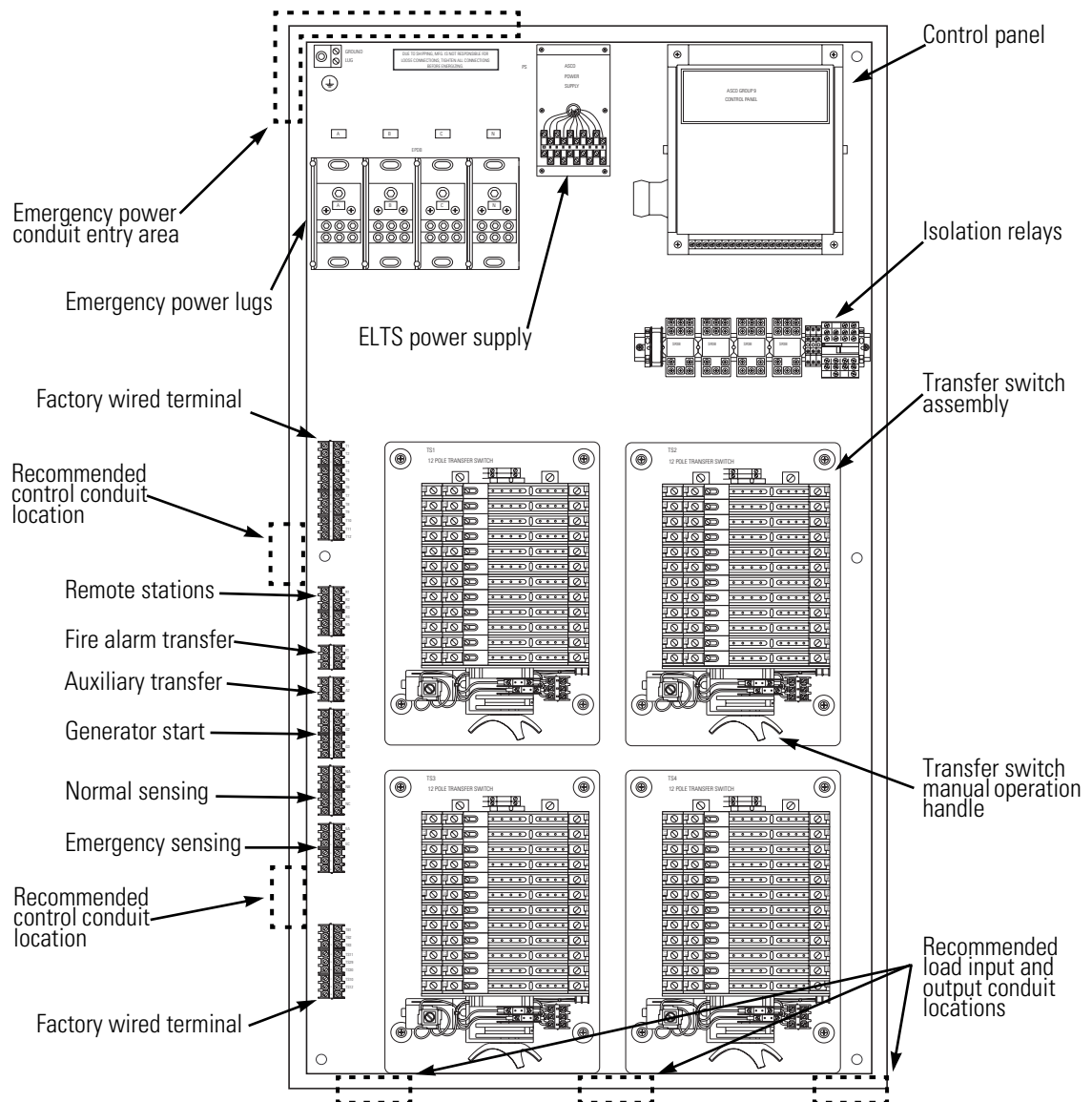


Figure 6: ELTS components

## Mounting the cabinet

After determining where you want to install the cabinet, follow these instructions.

1. Install two 3/8" bolts 24.25 inches apart for the lower two support slots (the installer must supply the mounting hardware).
2. Use the mounting dimensions from Figure 5 : *ELTS cabinet mounting dimensions* on page 9 to drill the holes for the upper two 3/8" bolts.
3. Place the ELTS cabinet on the wall supported by the two lower bolts.



**Notice:** *ELTS cabinets are very heavy. Make sure you have adequate equipment (or help) to lift the cabinet into place and support it while you secure the top two bolts.*

4. Secure the ELTS to the wall with the two upper 3/8" bolts.

## Installing Remote stations (optional)

1. Install a standard two gang backbox (4" x 4" x 3.5") and run wire conduit from it to the ELTS cabinet.
2. Pull five conductor, Class 2 (12 Vdc) wiring through from the backbox to the cabinet.
3. Connect the wires to the terminal strip on the back of the remote station. Note which terminal each wire connects to.
4. Install the Remote station onto the backbox with four 6 - 32 x 1/2" oval head machine screws (provided).
5. To install multiple Remote stations, repeat steps 1 – 4, wiring in parallel between Remote station terminal blocks.

Refer to *Connecting Remote stations to the ELTS* on page 16 for instructions for connecting Remote station wiring inside the ELTS cabinet.

# Connecting power and control wiring to the ELTS cabinet



**Warning!** To prevent death or injury due to electrical shock, Normal and Emergency power to the ELTS must be turned off any time you are connecting or servicing any ELTS.

## Connecting Emergency power

The Emergency power lugs are in the upper left of the ELTS cabinet. The ELTS is available in one or three phase power configurations.

1. Cut a hole within six inches of the top left corner of the ELTS cabinet
2. Install conduit and pull the Emergency power cables into the cabinet.

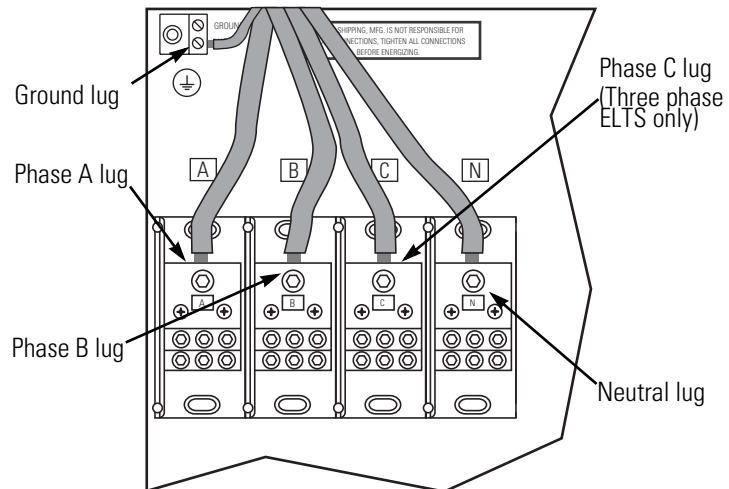
*Note: Top conduit connections are recommended to reduce the cable bending necessary to connect to the lugs.*

*Table 1: Emergency power lug wire sizes and connection torques*

Connection type	Wire size	Torque
Phase and Neutral lugs (3 phase)	6 AWG to 2/0	275 in/lbs
Phase and Neutral lugs (single phase)	6 AWG to 250 MCM	275 in/lbs
Ground lug (both phase types)	14 AWG to 2/0	50 in/lbs

## Three phase (4 wire) connections

1. Connect each phase power cable to the correct lug. See Figure 7, below, to identify the lugs.
2. Connect the Neutral cable to the Neutral lug.
3. Connect the Ground cable to the Ground lug.



*Figure 7: Connecting Emergency power to the ELTS*

## Single phase connection (3 wire)

1. Connect one phase cable to the Phase A lug and one to the Phase B lug. See Figure 7, above, to identify lugs.
2. Connect the Neutral cable to the Neutral lug.
3. Connect the Ground cable to the Ground lug

## Transfer switch, Normal power and lighting load connections

Each transfer switch can have up to six 20 amp circuits or two 50 amp circuits connected to it. You need to connect Line and Neutral inputs from the dimmer rack and outputs to the emergency lighting loads. The Line and Neutral input from Emergency power are delivered prewired.

Table 2 Switch assembly wire sizes and connection torques

Wire size	Torque	Wire size	Torque
14 – 10 AWG	35 in/lbs	8 AWG	40 in/lbs
6 – 4 AWG	45 in/lbs	3 AWG to 2/0	50 in/lbs

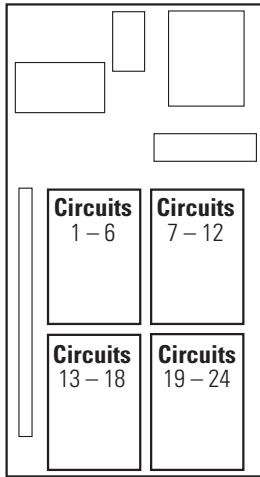


Figure 8: 20 amp Transfer switch circuit assignments

### 20 amp dimmer rack Load and Neutral wire input connections

1. Attach the conduit for the wires from the dimmer rack to the bottom of the ELTS cabinet (recommended).
2. Connect a Neutral wire for each dimmer circuit to terminals **NN1** through **NN6** on the right side of the transfer switch assembly. See Figure 8, left, to match switch assemblies to loads.
3. Connect a Line wire for each dimmer circuit to terminals **NL1** through **NL6** on the right side of the transfer switch assembly.
4. Repeat steps 2 and 3 for the other transfer switch assemblies.

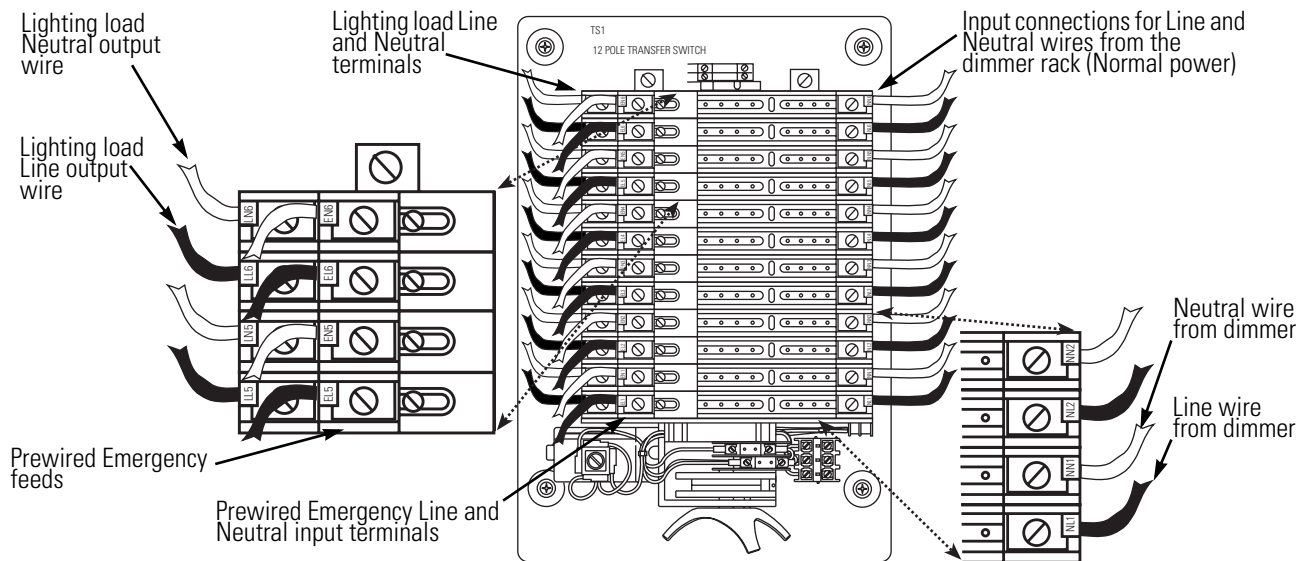


Figure 9: 20 amp Transfer switch connections for Line and Neutral wires

### 20 amp lighting load Line and Neutral output connections

1. Attach the conduit for the wires to the lighting loads through the bottom of the ELTS cabinet (recommended).
2. Connect a Neutral wire for each lighting load to terminals **LN1** through **LN6** on the left side of the transfer switch assembly. See Figure 8, above, to match switch assemblies to loads.
3. Connect a Line wire for each lighting load to terminals **LL1** through **LL6** on the left side of the transfer switch assembly
4. Repeat steps 2 and 3 for the other transfer switch assemblies.

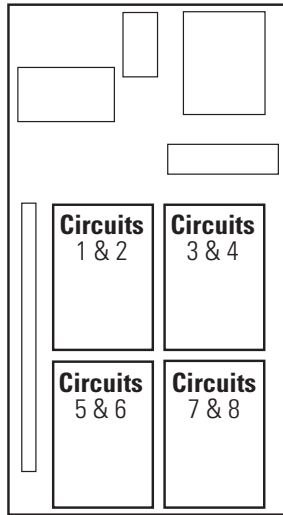


Figure 10: 50 amp transfer switch circuit assignments

### 50 amp dimmer rack Load and Neutral wire input connections

1. Attach the conduit for the wires from the dimmer rack to the bottom of the ELTS cabinet (recommended.)
2. Connect a Neutral wire for each dimmer circuit to terminals **NN1** and **NN2** on the right side of the transfer switch assembly. See Figure 10, left, to match switch assemblies to loads.
3. Connect a Line wire for each dimmer circuit to terminals **NL1** and **NL2** on the right side of the transfer switch assembly.
4. Repeat steps 2 and 3 for the other transfer switch assemblies.

### 50 amp lighting load Line and Neutral output connections

1. Attach the conduit for the wires to the lighting loads through the bottom of the ELTS cabinet (recommended.)
2. Connect a Neutral wire for each lighting load to terminals **LN1** and **LN2** on the left side of the transfer switch assembly. See Figure 10, to match switch assemblies to loads.
3. Connect a Line wire for each lighting load to terminals **LL1** and **LL2** on the left side of the transfer switch assembly
4. Repeat steps 2 and 3 for the other transfer switch assemblies.

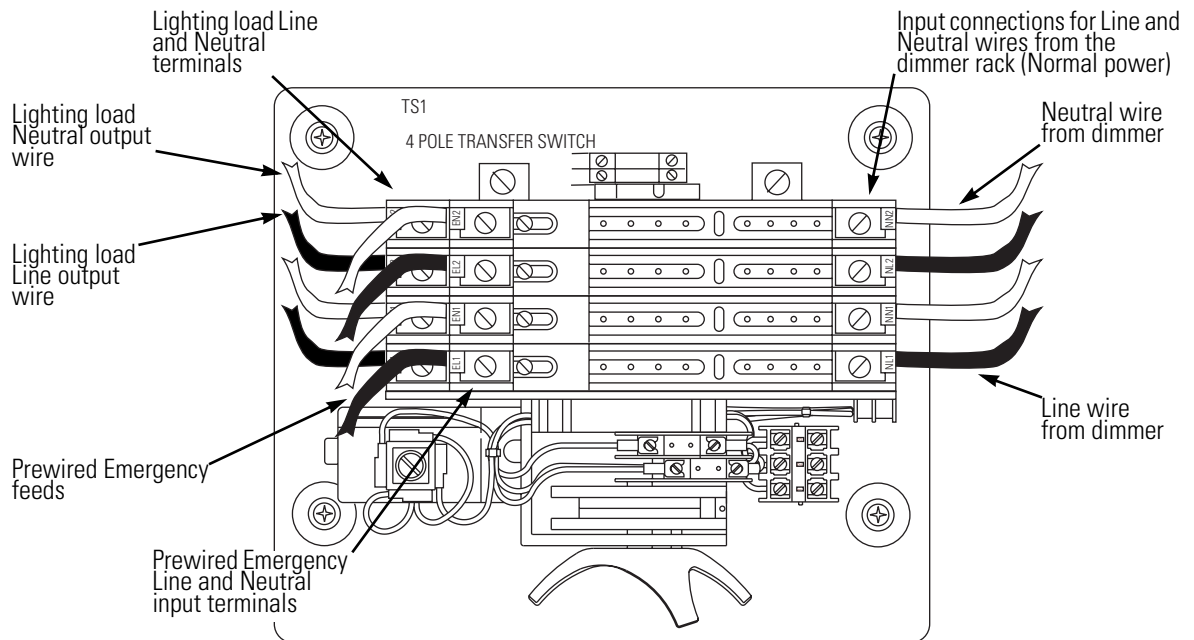
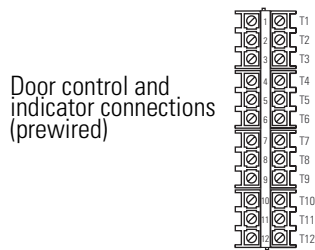


Figure 11: 50 amp Transfer switch connections for Line and Neutral wires

## Control and Sensing wire connections



Control and power sensing wires connect to terminal blocks on the left side of the ELTS cabinet.

Terminals can accept from 8 to 22 AWG wires. Torque terminal screws to 18 in/lbs.

1. Install control and sensing wire conduit on the left side of the ELTS cabinet above the remote station connection terminals or below the Emergency power sensing terminals (recommended conduit location).
2. Pull the wires into the cabinet.

### Connecting the Normal power sensing wires

Normal power sensing wires connect to the phase lugs of the dimmer rack connected to the ELTS. They attach to the Normal power sensing terminal block. Each sensing wire must connect to the ELTS through a 15 amp circuit breaker located *outside* the ELTS cabinet.

*Note: Power sensing wires must be 12 AWG or larger.*

1. Connect a sensing wire to each phase lug of the dimmer rack connected to the ELTS. Mark each wire to identify its phase at the ELTS rack.
2. Connect each sensing wire to a 15 amp circuit breaker close to the dimmer rack. Circuit breakers **CANNOT** be inside the ELTS cabinet.
3. Pull the wires from the circuit breakers through wire conduit to the Normal power sensing terminal block in the ELTS cabinet.
4. Connect the sensing wires to the Normal power sensing terminal block:
  - ▼ Connect phase A to terminal 1 (across from wire NA)
  - ▼ Connect phase B to terminal 3 (across from wire NB)
  - ▼ Connect phase C to terminal 5 (across from wire NC)

*Note: On single phase (three wire) systems, terminal 5 will not be used.*

### Connecting the Emergency power sensing wires

Emergency power sensing wires on ELTS systems with front panel circuit breaker or fuse panels are wired from the Emergency power lugs to the correct terminals on the Emergency power terminal block at the factory.

Sensing wires on systems without front panel circuit breakers must be wired into the ELTS cabinet.

*Note: Emergency power sensing wires must be 12 AWG or larger.*

1. Connect a sensing wire to phase **A** and **C** (**A** and **B** on single phase systems) of the Emergency power supply. Mark each wire to identify its phase at the ELTS rack.
2. Pull the wires through the conduit to the Emergency power sensing terminal block in the ELTS cabinet.
3. Connect the sensing wires to the Emergency sensing terminal block:
  - ▼ Connect phase A to terminal 1 (across from wire NA)
  - ▼ Connect phase C to terminal 5 (across from wire NC)

*Note: On single phase (three wire) systems, connect phase B to terminal 5.*

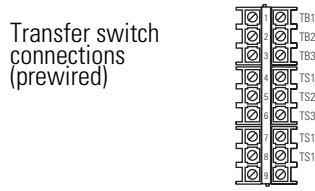
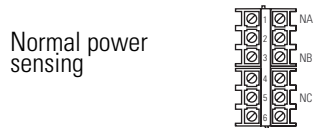
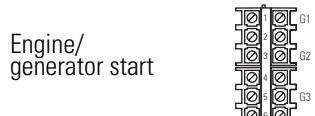
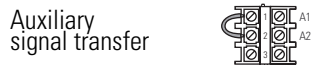


Figure 12: Control and Sensing wire terminal connections

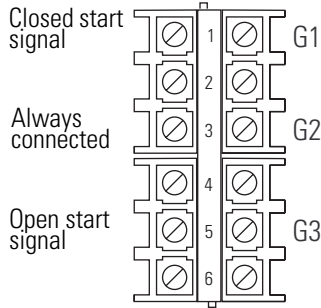


Figure 13: Connections for Engine/generator starting wires

### Connecting the Engine/generator starting wires

The ELTS system can provide both normally open and normally closed starting circuits for engine generator activation.

1. Connect two wires to the terminals of your engine/generator starting circuit.

*Note: Consult your generator installation manual for start signal wiring information.*

2. Pull the wires through the conduit to the engine/generator start terminal block.
3. Connect one of the starting wires to terminal 3 (across from wire G2).
4. Connect the other starting wire to terminal 1 or 5:
  - ▼ For a closed start signal, connect the wires to terminal 1 (across from wire G1)
  - ▼ For an open start signal, connect the wires to terminal 5 (across from wire G3)

### Connecting Remote stations to the ELTS

You can connect up to 10 Remote stations to the ELTS with parallel wiring. For Remote station installation instructions see page 11.

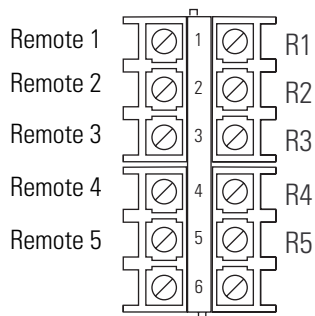


Figure 14: Connections for Remote stations

1. Pull the Remote station wires the Remote station terminal.
2. Connect the Remote wire 1 (Common) to terminal 1 (across from wire R1).
3. Connect the Remote wire 2 (Emergency Select) to terminal 2 (across from wire R2).
4. Connect the Remote wire 3 (Normal Select) to terminal 3 (across from wire R3).
5. Connect the Remote wire 4 (Normal indicator LED) to terminal 4 (across from wire R4).
6. Connect the Remote wire 5 (Emergency indicator LED) to terminal 5 (across from wire R5).



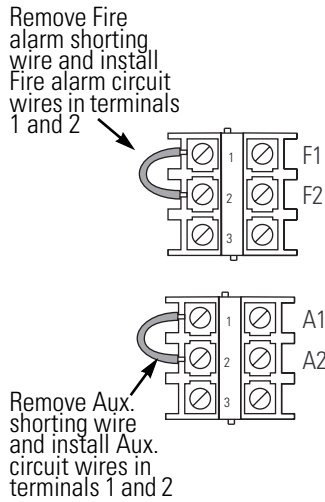


Figure 15: Connecting fire alarm and auxiliary circuit wires

### Connecting fire alarm activation

You can connect your ELTS to your fire alarm system so it switches to Emergency when the alarm is triggered. Your fire alarm system must be able to provide an open signal when it activates.

1. Connect two wires to the terminals of your fire alarm activation circuit.
2. Pull the wires through the conduit to the fire alarm terminal block.
3. Remove the shorting wire between terminal 1 and terminal 2.
4. Connect one wire to terminal 1 (across from wire F1).
5. Connect the other wire to terminal 2 (across from wire F2).

*Note: If you do not use the fire alarm activation feature, leave the shorting wire in place or the ELTS will not operate properly.*

### Connecting auxiliary activation

You can connect your ELTS to an auxiliary circuit so it switches to Emergency when the circuit is triggered. Your auxiliary circuit must provide an open signal when it activates.

1. Connect two wires to the terminals of your auxiliary circuit.
2. Pull the wires through the conduit to the auxiliary terminal block.
3. Remove the shorting wire between terminal 1 and terminal 2.
4. Connect one wire to terminal 1 (across from wire A1).
5. Connect the other wire to terminal 2 (across from wire A2).

*Note: If you do not use the auxiliary activation feature, leave the shorting wire in place or the ELTS will not operate properly.*

# Testing

## Before you power up for the first time

### Checking transfer switch operation manually

By checking transfer switch manual operation before you apply power, you reduce the possibility of failure caused by mechanically frozen, damaged or obstructed switches. Each switch should rotate without catching or binding.



**Warning!** Normal and Emergency power should be off when you open the ELTS cabinet for to check switch operation. Opening the cabinet with power applied exposes you to death or injury from electrical shock.

1. Open the ELTS cabinet.



**Warning!** Rotating the transfer switch assemblies manually with Normal or Emergency power applied may result in the assemblies switching automatically, causing severe hand injuries.

2. Turn the manual operation handle 90° clockwise. **E** (Emergency) should be visible on the assembly about 1.5 inches above the handle.
3. Rotate the handle 180° counter-clockwise. **N** (normal) should be visible.

*Note: If you have difficulty operating the switch, check for installation debris that may be blocking switch operation.*

4. Repeat steps 2 and 3 with the remaining transfer switch assemblies.

## Turn on system

### Voltage checkout

1. Apply power to the ELTS and connected dimmer rack at the main circuit breaker. The green Normal LED lights.
2. Apply emergency power. The red Emergency light turns on.



**Warning!** ELTS voltage tests should only be performed by qualified personnel using **EXTREME** caution. Opening the cabinet with power applied exposes you to death or injury from electrical shock.

3. Open the ELTS cabinet.
4. Use a digital voltmeter (DVM) to test the feed voltage at the Normal power sensing terminal block (Figure 12 on page 15 for location). Phase A is on terminal 1, phase B on terminal 3 and phase C on terminal 5. Voltage must be within  $\pm 10$  percent of the rated voltage for the ELTS.
5. Use the DVM to test the feed voltage at the Emergency power lugs. Phase lugs are labeled either **A**, **B** or **C**. Voltage values must be within  $\pm 10$  percent of the rated voltage for the ELTS.
6. Close the ELTS cabinet.

## Functional checkout

After verifying the Normal and Emergency voltages, check the ELTS system functions.

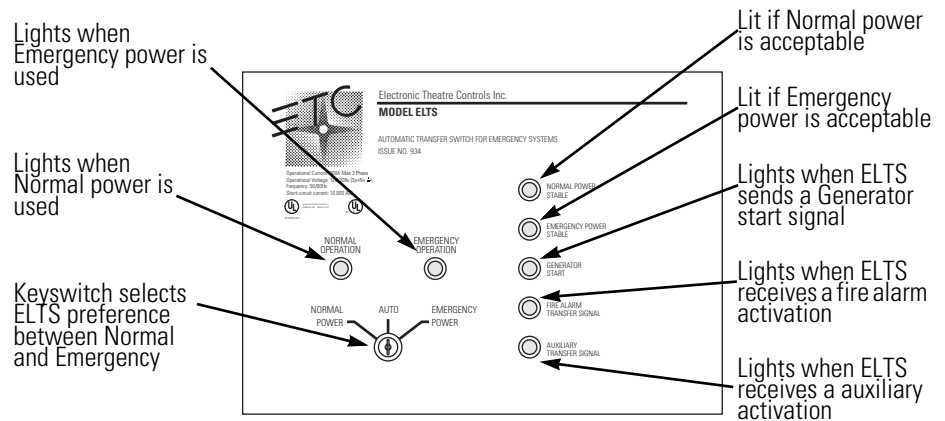


Figure 16: Local control operation and LED indications

### Switch function

1. Insert the key into the keyswitch on the front panel of the ELTS.
2. Turn the key to **EMERGENCY POWER**. The red light above **EMERGENCY OPERATION** turns on and the emergency loads go to full brightness. If Emergency power is provided by an engine/generator, there will be a short delay as the generator turns on and the voltage and frequency stabilize.
3. Release the key. The keyswitch returns to **AUTO** (center) and the **EMERGENCY OPERATION** light remains on.
4. Turn the key to the **NORMAL POWER** position. The green light below **NORMAL OPERATION** turns on if the system is functioning correctly.
5. Release the key. The keyswitch returns to **AUTO** and the **NORMAL OPERATION** light remains on.

### Remote switch functions

After confirming correct function of the keyswitch on the front of the ELTS cabinet, repeat the switch function checkout procedure at EVERY remote station installed on your system.

## Automatic function

The automatic function tests the ELTS's ability to switch back and forth from Normal to Emergency when Normal power is interrupted or restored.

1. Make sure the **NORMAL OPERATION** LED is lit on the ELTS front panel.
2. Turn off the normal power to the dimmer rack connected to the ELTS. The **NORMAL OPERATION** and **NORMAL POWER STABLE** LEDs on the ELTS front panel goes out and the ELTS switches to Emergency power (the **EMERGENCY OPERATION** and **EMERGENCY POWER STABLE** LEDs light, and the emergency loads go to full brightness.) If Emergency power is provided by an engine/generator, there will be a short delay before switching as the generator turns on and the voltage and frequency stabilize.
3. Turn the Normal power back on. The ELTS switches back to Normal power after the retransfer delay times out (the default setting is one minute). On the front of the ELTS, the **EMERGENCY OPERATION** and **EMERGENCY POWER STABLE** LEDs turn off and the **NORMAL OPERATION** and **NORMAL POWER STABLE** LEDs light. If used, the Emergency power engine/generator turns off when the cool down time is complete.

## Options function

ELTS systems can also be activated by fire alarm and auxiliary circuits. Both are operated by a normally closed circuit controlled by the fire alarm or auxiliary relays. When the fire alarm or auxiliary circuit activates, the relay opens, causing the ELTS to switch to Emergency power. To test option relay function, either:

- ▼ Activate the fire alarm or auxiliary relay. The ELTS should switch to Emergency power and the emergency loads should go to full.
- ▼ If you do not wish to activate the fire alarm or auxiliary circuit, generate an open circuit at the ELTS connection to the fire alarm or auxiliary circuit by disconnecting one of the two wires to the ELTS cabinet. The ELTS will switch to Emergency power and the emergency loads should go to full.

*Note: The second method tests the ELTS response to an open circuit, but does not confirm the fire alarm or auxiliary relay's ability to open the circuit to the ELTS.*

# Settings

## ELTS timing settings

ELTS timing settings for momentary outage override, transfer to Emergency delay, return to Normal delay, and generator cool down are set at the factory. You can adjust settings for specific applications any time after installation.



**Caution:** Only make changes to ELTS timing settings if you are familiar with the system and know the reason for making the change.

Table 3: ELTS timing settings

Delay type	Default setting	Range	DIP Switch	Adjustment Pot.
Momentary Outage override	1 second	0.5 - 6 seconds		P4
Transfer to Emergency delay	0	0 - 60 seconds 0 - 8 minutes	SW2 up SW2 down	P2
Return to Normal delay	30 minutes	0 0.5 - 30 minutes	SW1 up SW1 down	P1
Generator cool down cycle	5 minutes	0 - 8 seconds 0.5 - 30 minutes	SW3 up SW3 down	P3

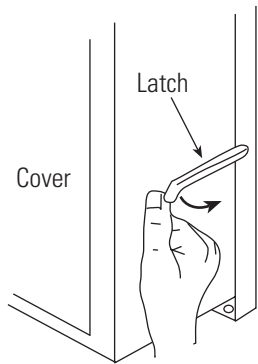


Figure 17: Removing the control panel cover

### Getting access to the ELTS control panel

To make adjustments, you must access the ELTS control panel.

1. Disconnect Normal and Emergency power to the ELTS.



**Warning!** Opening the ELTS cabinet with power on may result in death or injury from electrical shock.

2. Open the ELTS cabinet.
3. Release the two latches on the control panel cover and remove it. See Figure 17, left.

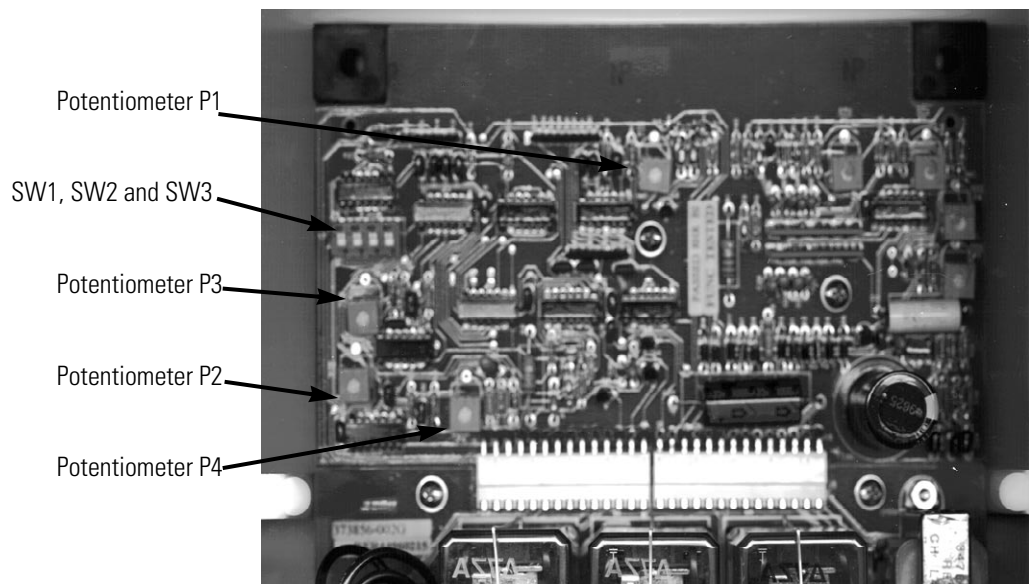


Figure 18: Adjustment potentiometer and DIP switch locations

## Changing the momentary outage override

The momentary outage override is the interval the ELTS will tolerate a Normal power voltage fault without switching to Emergency power. It can be set from 0.5 to 6 seconds using adjustment potentiometer P4.

1. Follow the instructions on page 21 to remove the control panel cover.
2. Locate P4 using Figure 18 : *Adjustment potentiometer and DIP switch locations* on page 21.
3. Turn P4 clockwise to increase the interval or counterclockwise to decrease it. P4 has a 270° adjustment range.

*Note: Potentiometer adjustments change timing as a fractions of the adjustment range. For example, turning the pot half its range changes the timing value by 50%. You will need to use some trial and error and a timing device to achieve exact values.*

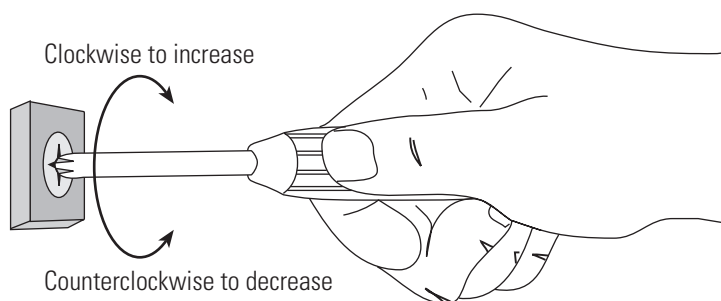


Figure 19: Changing adjustment potentiometer settings

## Changing the Transfer to Emergency delay

The Transfer to Emergency delay sets the time the ELTS waits before switching to Emergency after the Emergency power voltage and frequency stabilize. You can set the delay in two time ranges, from zero to 60 seconds or zero to 8 minutes, using DIP switch SW2 and adjustment potentiometer P2.

1. Follow the instructions on page 21 to remove the control panel cover.
2. Locate SW2 using Figure 18 : *Adjustment potentiometer and DIP switch locations* on page 21.
3. To select the zero to 60 second adjustment range put SW2 up. To select the zero to 8 minute range, put SW2 down.
4. Locate P2 using Figure 18 : *Adjustment potentiometer and DIP switch locations* on page 21.
5. After setting the range, turn P2 clockwise to increase the interval or counterclockwise to decrease it. P2 has a 270° adjustment range.

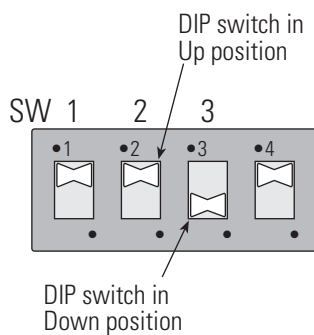


Figure 20: Setting DIP switches

## Changing the Return to Normal delay

The Return to Normal delay sets the time the ELTS waits before switching from Emergency to Normal after Normal power is restored. The delay can be turned off, or set from 0.5 to 30 minutes using DIP switch SW1 and adjustment potentiometer P1.

*Note: To disable the delay on a one-time basis (to quickly restart an interrupted performance or for testing purposes) switch the ELTS back to Normal with the front panel Local switch or a Remote keyswitch station.*

1. Follow the instructions on page 21 to remove the control panel cover.
2. Locate SW1 using Figure 18 : *Adjustment potentiometer and DIP switch locations* on page 21.
3. To turn off the delay put SW1 up. To set the range from 0.5 to 30 minutes, put SW1 down.
4. If SW1 is down, locate P2 using Figure 18 : *Adjustment potentiometer and DIP switch locations* on page 21.
5. Turn P2 clockwise to increase the interval or counterclockwise to decrease it. P2 has a 270° adjustment range.

## Changing the Generator cool down interval

The Generator cool down interval sets the time the ELTS waits before shutting off the Emergency power generator after switching back to Normal power. It can be set from zero to 8 seconds or 0.5 to 30 minutes using DIP switch SW3 and adjustment potentiometer P3.



**Caution: Consult your generator user manual for proper cool down times before changing the Generator cool down interval.**

1. Follow the instructions on page 21 to remove the control panel cover.
2. Locate SW3 using Figure 18 : *Adjustment potentiometer and DIP switch locations* on page 21.
3. To make the adjustment range zero to 8 seconds put SW3 up. To make the range 0.5 to 30 minutes, put SW3 down.
4. Locate P3 using Figure 18 : *Adjustment potentiometer and DIP switch locations* on page 21.
5. After setting the range, turn P3 clockwise to increase the interval or counterclockwise to decrease it. P3 has a 270° adjustment range.

## ELTS voltage and frequency settings

Voltage and frequency settings are set at the factory and should only be adjusted by an authorized ETC representative.



**Caution:** Indiscriminate changes to voltage and frequency sensing settings may affect normal operation of the ELTS and result in switching function failure.

Table 4: 120 volt ELTS voltage and frequency settings

Description	Factory setting	Adjustment range
Normal source voltage pickup	108 volts	102 – 120 volts
Normal source voltage dropout	102 volts	81 – 106 volts
Emergency source voltage pickup	108 volts	102 – 120 volts
Emergency source voltage dropout	92 volts	No adjustment: 15% below pickup setting
Emergency source frequency pickup	57 hertz	57 – 60 hertz
Emergency source frequency dropout	50 hertz	No adjustment: 12% below pickup setting

Table 5: 277 volt ELTS voltage and frequency settings

Description	Factory setting	Adjustment range
Normal source voltage pickup	249 volts	235 - 277 volts
Normal source voltage dropout	235 volts	187 - 244 volts
Emergency source voltage pickup	249 volts	235 – 277 volts
Emergency source voltage dropout	212 volts	No adjustment: 15% below pickup setting
Emergency source frequency pickup	57 hertz	57 – 60 hertz
Emergency source frequency dropout	50 hertz	No adjustment: 12% below pickup setting



# Operation

## Automatic operation

During automatic operation the ELTS system switches back and forth from Normal to Emergency when either power supply is interrupted or restored.

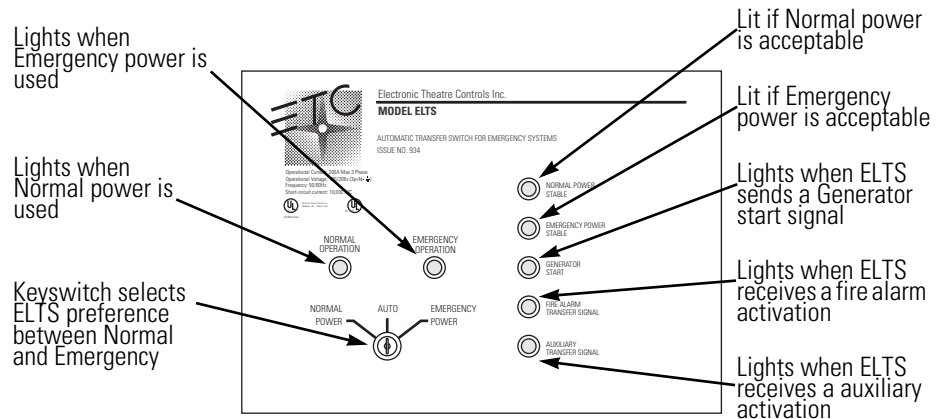


Figure 21: Local control LED indications

## Selecting the preferred power source: Normal or Emergency

Using the local keyswitch on the front of the ELTS cabinet or a Remote keyswitch station installed in your facility, you can select either Normal or Emergency as the preferred power source.

1. Insert the key into the keyswitch and select the desired power source:
  - ▼ To select Normal power, turn the key left. The green **NORMAL OPERATION** LED lights.
  - ▼ To select Emergency power, turn the key right. The red **EMERGENCY OPERATION** LED lights and the emergency loads go to full. If Emergency power is provided by an engine/generator, there will be a short switching delay as the generator turns on and voltage and frequency stabilize.
2. Release the key. The keyswitch returns to center and the indicator light you selected remains on. The ELTS uses the selected power source. If the selected source's voltage or frequency drops below the limit, the ELTS will switch to the other source.
3. When the voltage and frequency of the selected source returns to acceptable levels, the ELTS will switch back to it.

## Remote Station

Remote Keyswitch station operation is identical to the local station. Refer to *Selecting the preferred power source: Normal or Emergency* for instructions.

## Fire alarm or Aux signal switching

If desired, the ELTS system can be activated by fire alarm or auxiliary circuits. When the ELTS receives the fire alarm or auxiliary circuit activation, it will switch to Emergency power.

*Note: If you have selected Emergency as the preferred power with either the Local or Remote keyswitch, the ELTS will not switch power sources after receiving a fire alarm or auxiliary activation.*

## Switching power sources manually

If you need to switch the ELTS from one power source to another when the electronic switching circuits will not function (for example, if you needed to use either Normal or Emergency power, but the voltage or frequency was below the limit) you can set the transfer switch assemblies manually.



1. Disconnect Normal AND Emergency power.

**Warning!** Turn off Normal and Emergency power to the ELTS at the main circuit breaker. Opening the cabinet with power applied exposes you to death or injury from electrical shock.

2. Open the ELTS cabinet.
3. Disconnect the large brown connector on the lower left side of the control panel.

Squeeze the release tabs on both sides of the socket together and pull the plug out

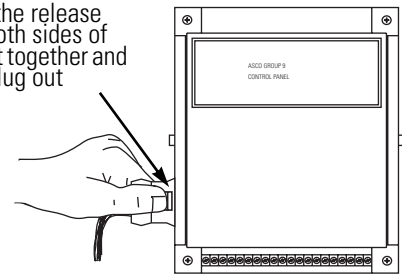


Figure 22: Removing the control panel connector



**Warning!** Operating switch assemblies manually without disconnecting the control panel connector may result in the assemblies switching back automatically, causing severe hand injuries.

- ▼ To switch from Normal to Emergency power: Turn the manual operation handle on the bottom of each transfer switch assembly 90° clockwise. **E** (Emergency) should be visible just above the handle.
- ▼ To switch from Emergency to Normal: Turn the manual operation handle on the bottom of each transfer switch assembly 90° counter-clockwise. **N** (normal) should be visible just above the handle.

4. Close the cabinet door and restore power to the ELTS.

*Note: Do not plug the control panel connector back in until you want the ELTS to resume automatic operation.*

### Restoring automatic operation

1. Disconnect Normal AND Emergency power.



**Warning!** Turn off Normal and Emergency power to the ELTS at the main circuit breaker. Opening the cabinet with power applied exposes you to death or injury from electrical shock.

2. Open the ELTS cabinet.
3. Reconnect the large brown connector on the lower left side of the control panel.
4. Close the cabinet door and restore power to the ELTS.

# Service

## Preventive maintenance

Regular testing and simple maintenance of your ELTS system will result in long service life and reliable performance. To assist in documenting your test and maintenance schedule, a blank *Test and Maintenance Log* is included on page 35. We suggest you post a copy near your ELTS cabinet.



**Warning!** Turn off Normal and Emergency power to the ELTS at the main circuit breaker. Opening the cabinet with power applied exposes you to death or injury from electrical shock.



**Warning!** Rotating the transfer switch assemblies manually with Normal or Emergency power applied may result in the assemblies switching automatically, causing severe hand injuries.

### Monthly testing

1. Manually test the ELTS's transfer function at the local keyswitch on the front of ELTS cabinet. See *Switch function* on page 19 for keyswitch instructions and indications.
2. Note the test results in the test and maintenance log.

### Quarterly testing and maintenance

1. Manually test the ELTS's transfer function at the local keyswitch on the front of ELTS cabinet. See *Switch function* on page 19 for keyswitch instructions and indications.
2. Test the ELTS Auto transfer function. See *Automatic function* on page 20 for automatic transfer instructions and indications.
3. Visually inspect the ELTS cabinet for loose wires or component damage.
4. Note the test results in the test and maintenance log.

### Annual testing and maintenance

1. Manually test the ELTS's transfer function at the local keyswitch on the front of ELTS cabinet. See *Switch function* on page 19 for keyswitch instructions and indications.
2. Test the ELTS Auto transfer function. See *Automatic function* on page 20 for automatic transfer instructions and indications.
3. Visually inspect the ELTS cabinet for loose wires or component damage.
4. Retighten ELTS phase, neutral and ground lugs using values in Table 1 : *Emergency power lug wire sizes and connection torques* on page 12.
5. Vacuum the ELTS cabinet to remove dust and debris that may have collected.
6. Note the test results in the test and maintenance log.

# Troubleshooting

If you have trouble with an installed ELTS system, you can contact ETC Technical Service at 800/775-4382.



**Warning!** *Trouble shooting usually involves opening the ELTS cabinet and metering voltages. Opening the ELTS cabinet with power applied exposes you to death or injury from electrical shock. Use extreme caution during all troubleshooting activities.*

## Emergency or Normal Power Stable LED does not turn on properly

During normal operation, either the Normal Power Stable or Emergency Power Stable LED should be lighted. If one or the other does not light, the problem may be with the LED, Normal or Emergency sensing wiring, or Normal or Emergency power.

1. Switch between Normal and Emergency power on the ELTS control panel keyswitch and observe the results. The ELTS should switch between Normal and Emergency power.
  - ▼ The ELTS switches between Normal and Emergency
    1. Check for loose LED wire connections or defective LEDs.
    2. Make sure the Control Panel connector is properly seated.
  - ▼ The ELTS does not switch between Normal and Emergency. Go to the next ELTS troubleshooting section.

## The ELTS will not switch between Normal and Emergency

### If the system will not switch from Emergency power

1. check for tripped Normal power sensing wire circuit breakers.
2. If the circuit breakers are not tripped, meter Normal power using the procedures in *Voltage checkout* on page 18.

### If the system will not switch from Normal power

1. Meter Emergency power using the procedures in *Voltage checkout* on page 18.
2. If no fire alarm or auxiliary circuits are connected to the ELTS, make sure the terminal jumpers are in place.
3. If fire alarm or auxiliary circuits are connected, meter between the wires to be certain the circuit is closed. An open circuit switches the ELTS to Emergency power.

### If the system does not seem to function in either Normal or Emergency power mode

1. Make sure the control panel connector is properly seated.
2. Check other wire connections for loose terminals or broken wires.
3. Use the procedures in *Checking transfer switch operation manually* on page 18 to test the switching mechanism for mechanical problems.

## Remote stations cannot switch the ELTS

1. Switch between Normal and Emergency power on the ELTS control panel keyswitch and observe the results.

### If the ELTS does not switch locally

Follow the instructions in *The ELTS will not switch between Normal and Emergency* on page 28.

### If the ELTS switches locally

Try switching the ELTS from other Remote station, if multiple stations have been installed

1. If the other stations function, check the wire terminal connections on the problem station. See *Installing Remote stations (optional)* on page 11 for station connection requirements.
2. If the other stations do not function, or there is only one Remote station installed.
3. Check the wire connections on the Remote station terminal block.
4. Check the Remote station fuse in the ELTS cabinet

Remove this cover on the left side of the Isolation relays to check the Remote station fuse

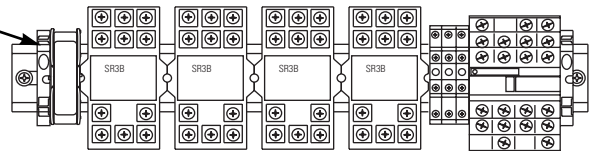


Figure 23: Locating the Remote station fuse

5. Inspect the wiring between the ELTS cabinet and the stations for defects. See *Connecting Remote stations to the ELTS* on page 16 for ELTS connection requirements.

## Some ELTS circuits do not switch when the system changes sources

Partial switching of ELTS circuits indicates one or more transfer switch assemblies, or the wiring to them, is defective.

1. Use the procedures in *Checking transfer switch operation manually* on page 18 to locate any transfer switch assemblies that have not switched and to manually test their function.
2. If an assembly cannot be switched manually, check for something that could be physically obstructing it. If you find something, remove it and manually test the switch again. If you cannot find and remove the cause of the switching failure, the assembly is defective and must be replaced.
3. If the assembly switches manually, check for loose wire connections to the assembly and look for damaged wires between the assembly and the control panel. Repair any wire problems you find and test the system.

# Appendix A: ELTS specifications

## Dimensions

Small cabinet: ELTS 450, ELTS 620, ELTS1220  
36" x 30" x 9"

Large cabinet: ELTS 850, ELTS 1820, ELTS 2420  
54" x 30" x 9"

## Weight

ELTS 450, ELTS 620, ELTS1220 – 305 pounds

ELTS 850, ELTS 1820, ELTS 2420 – 370 pounds

## Electrical

### Operational voltage

120/240V single phase 250 amp maximum

120/208V three phase 175 amp maximum

277/480V three phase 175 amp maximum

Frequency: 50 – 60Hz

Short circuit current: 10 kA @ 120/240V

100,000 kA @ 277/480V

(5 kA with 50 amp circuit breakers)

## Electrical Compliance

- ▼ ANSI/UL 1008 – Listed, Automatic Transfer Switches
- ▼ ANSI/NFPA 110 – Emergency and Standby Power Systems
- ▼ ANSI/NFPA 70 – National Electric Code
  - Article 701 – Legally Required Standby Systems
  - Article 700 – Emergency Systems
  - Article 540 – 11(c) – Motion Picture Houses
  - Article 520 – 7 – Theatres and Similar Locations
  - Article 518 – 3(c) – Places of Assembly
- ▼ City of New York, Advisory board, Electrical Department
- ▼ OSHA
- ▼ Department of Defense

## Environment

Ambient temperature between 32° F and 104°F (0°C and 40°C)

Humidity between 30 and 95 percent (non-condensing)

Altitude below 6500 feet (2000 meters)

# Appendix B: Wire connection schematics and diagrams

Wire connection schematics and diagrams are included to help you understand the internal wiring of your ELTS system.

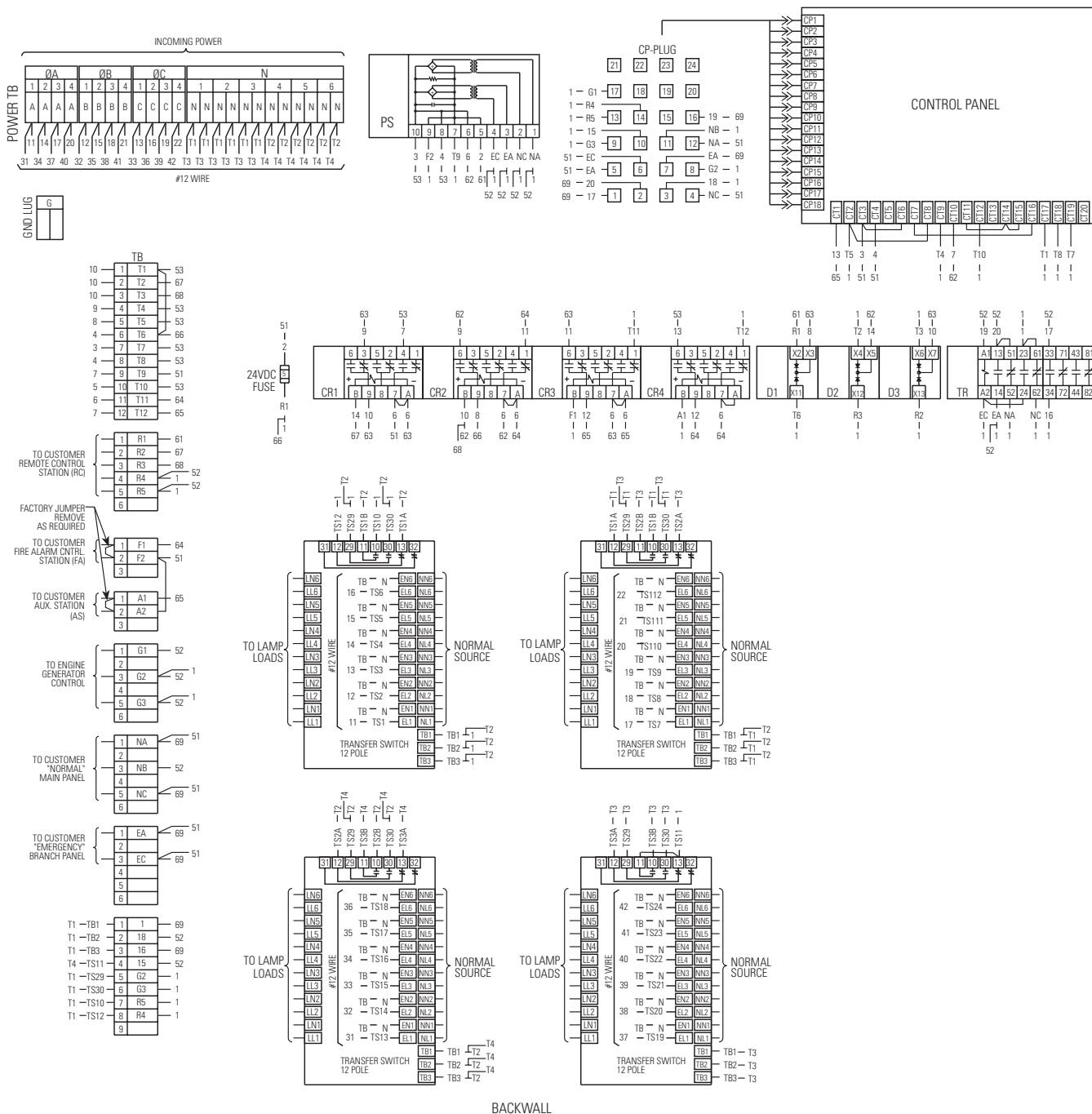


Figure 24: ELTS cabinet wire connection location diagram

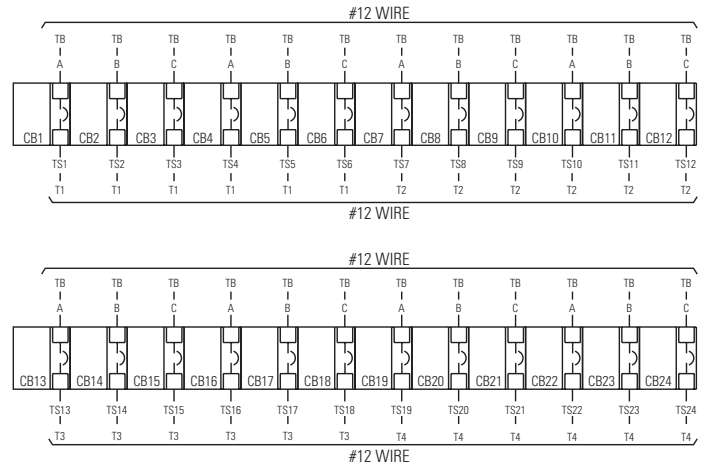
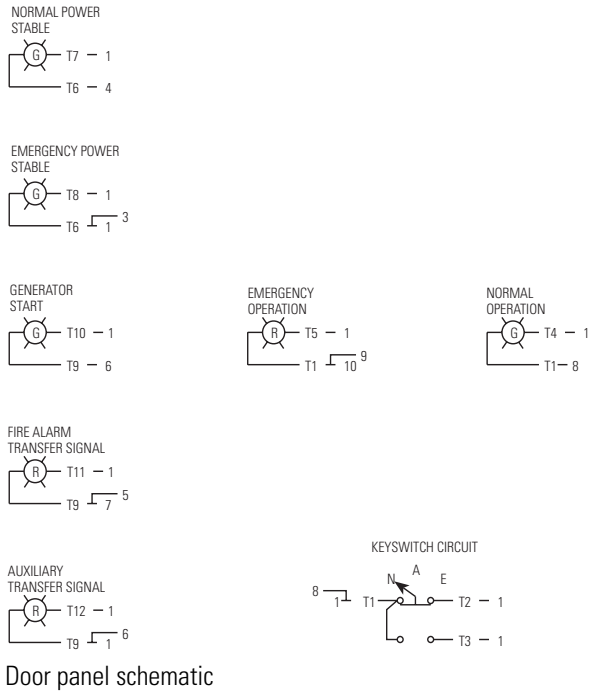


Figure 25: ELTS door panel and breaker bracket wire connection schematics

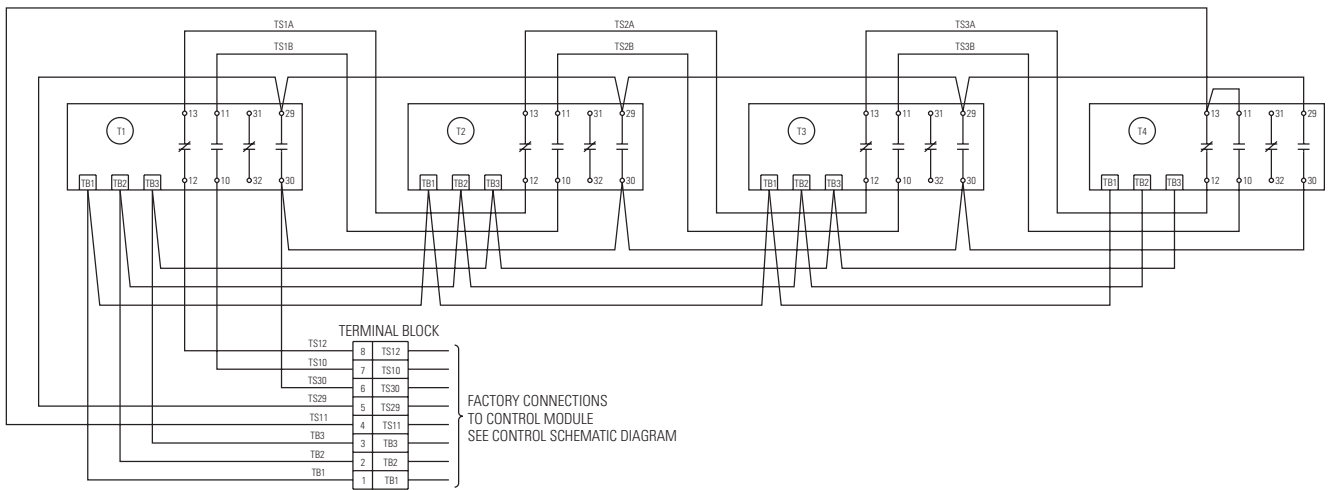


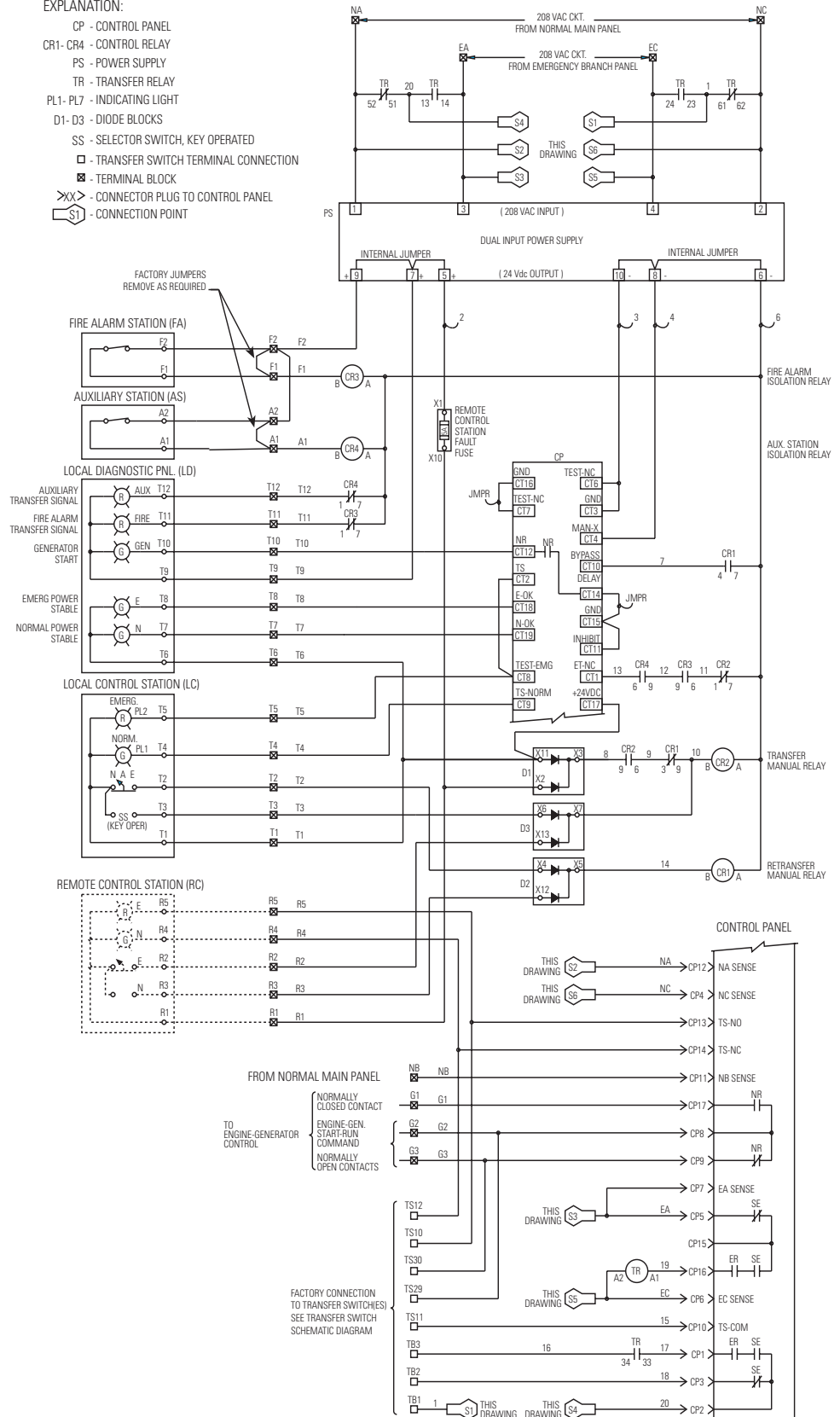
Figure 26: Transfer switch assembly control wire connections schematic



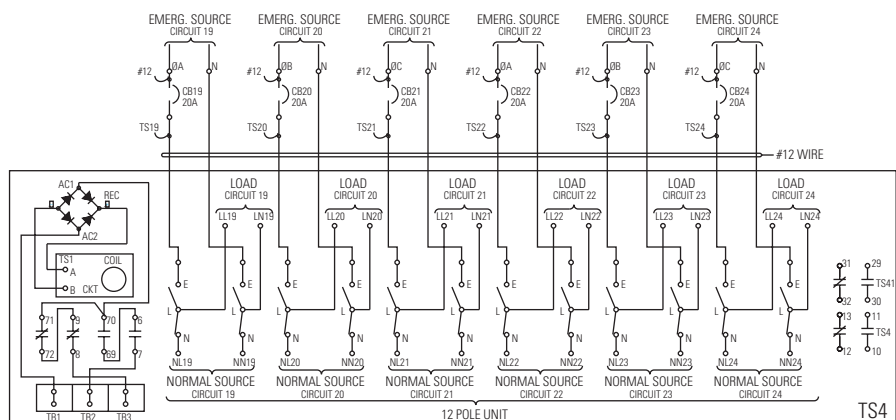
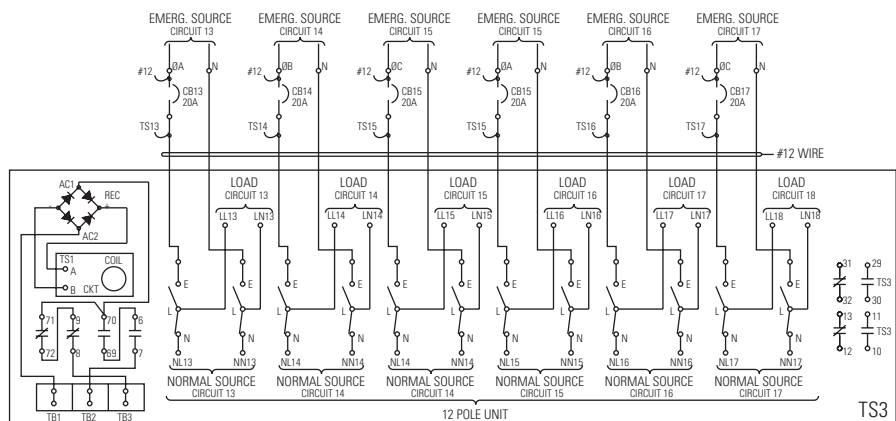
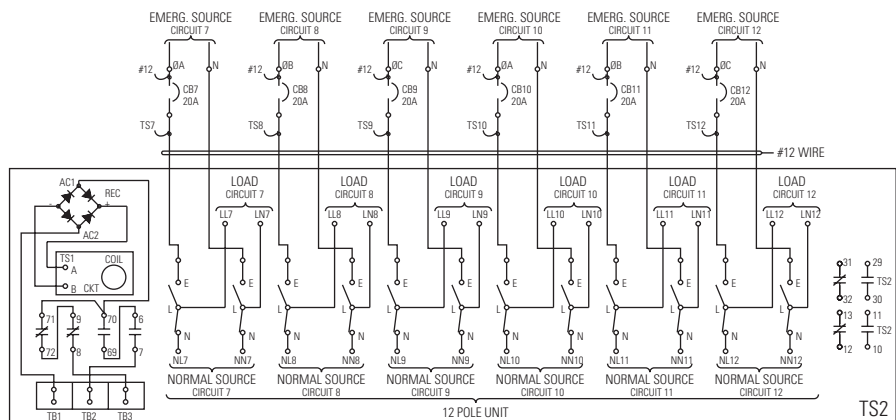
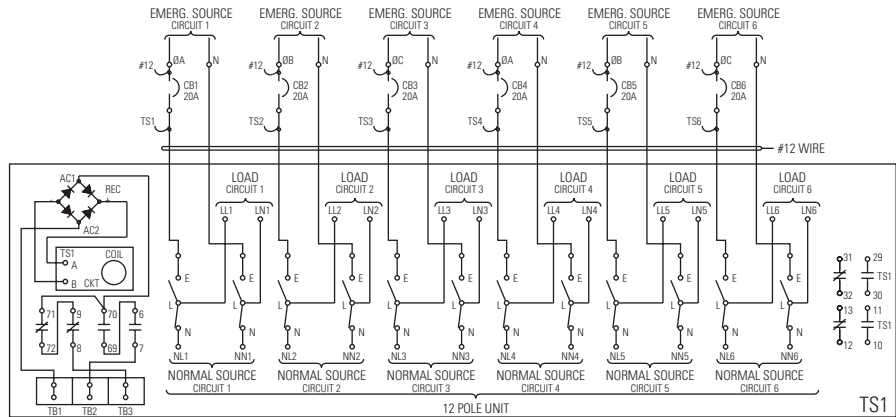
# Appendix C: Transfer switch control system schematics

## EXPLANATION:

- CP - CONTROL PANEL
- CR1- CR4 - CONTROL RELAY
- PS - POWER SUPPLY
- TR - TRANSFER RELAY
- PL1- PL7 - INDICATING LIGHT
- D1- D3 - DIODE BLOCKS
- SS - SELECTOR SWITCH, KEY OPERATED
- - TRANSFER SWITCH TERMINAL CONNECTION
- ⊠ - TERMINAL BLOCK
- XX - CONNECTOR PLUG TO CONTROL PANEL
- S1 - CONNECTION POINT



# Appendix D: Transfer switch load switching schematic



# Appendix E: Test and Maintenance Log

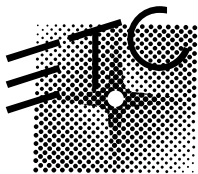
Date installed \_\_\_\_\_

System address \_\_\_\_\_

\_\_\_\_\_

Service contact \_\_\_\_\_

Date	Inspected by	Manual transfer	Automatic transfer	Visual inspection	Vacuumed



## **Electronic Theatre Controls, Inc.**

**North America** 3030 Laura Lane • Middleton, Wisconsin 53562, USA • Tel: (+1) 608 831 4116 • Fax: (+1) 608 836 1736

**Europe** Unit 5 Victoria Industrial Estate, Victoria Road • London, W3 6UU, England • Tel: (+44) 181 896 1000 • Fax: (+44) 181 896 2000

**Asia** Room 605-606, Tower III, Enterprise Square, 9 Sheung Yuet Road • Kowloon Bay, Hong Kong • Tel: (+852) 2799 1220 • Fax: (+852) 2799 9325

**Web** [www.etconnect.com](http://www.etconnect.com) • **Email** [mail@etconnect.com](mailto:mail@etconnect.com) • Copyright 1997-2002 • Specifications subject to change • 1093M1101 • Rev B • Revised 12/2002