Emergency Lighting Transfer System

ELTS2
Installation and User Operation Manual

Revision C

Part Number: **1096M1200** Rev C
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Table of Contents

Introduction

Welcome to the Emergency Lighting Transfer System (ELTS2) Installation and User Operation Manual. This manual contains the procedures for safe and efficient installation and user operation of the UL 1008 listed Emergency Lighting Transfer System.

Using this Manual

This manual is divided into three sections:

- Section 1: ”Introduction” and ”Product Overview”
- Section 2: ”Installation Procedure” and ”Power Up and Check System”
- Section 3: ”Operation” and ”How the ELTS2 Works”

Codes and Standards

The ELTS meets or exceeds the following regulatory standards for emergency lighting transfer devices:

- Full UL and cUL Listing and Approval for emergency transfer
  - ANSI/UL 1008 Transfer Switch Equipment, UL File # E157852
- Complies with ANSI/NFPA 110, Standard for Emergency and Standby Power Systems
- Satisfies requirements of the National Electrical Code (NFPA 70):
  - Article 700 - Emergency Systems
  - Article 701 - Legally Required Standby Systems
  - Article 702 - Optional Standby Systems
  - Section 518.3(C)- Assembly Occupancies
  - Section 520.7 - Theatres and Similar Locations
  - Section 540.11(C) - Motion Picture Projection Rooms

Contacting ETC®

If you have any questions regarding the installation or operation of your ELTS2 please contact ETC Technical Services at the office nearest you.

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Warnings and Notice Conventions

These symbols are used throughout this document to alert you to danger or important information.

Note: *Notes are helpful hints and information that is supplemental to the main text.*

CAUTION: *A Caution statement indicates situations where there may be undefined or unwanted consequences of an action, potential for data loss or an equipment problem.*

WARNING: ***A Warning statement indicates situations where damage may occur, people may be harmed, or there are serious or dangerous consequences of an action.***

WARNING: ***RISK OF ELECTRIC SHOCK! This warning statement indicates situations where there is a risk of electric shock.***

- Please email comments about this manual to: **TechComm@etcconnect.com**

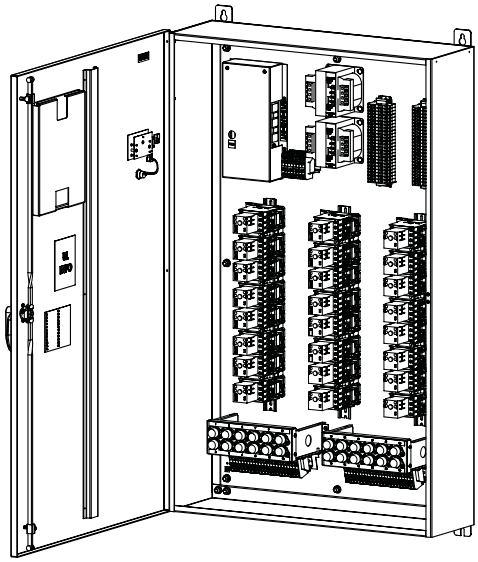
Product Overview

The ETC Emergency Lighting Transfer System (ELTS2) is a UL 1008 Listed emergency load transfer switch designed to switch lighting loads from one power source to another when there is a power failure or other emergency situation present.

When a normal power failure is detected the ELTS2 automatically transfers the load (both hot and neutral conductors) of the associated dimmer output to a separate emergency power source. When normal power is restored the ELTS2 reconnects the load to normal power. The local control panel includes a test keyswitch and LED indicators which clearly display the system status.

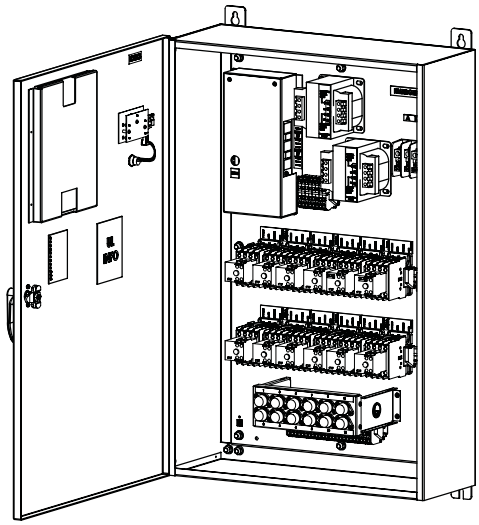
The ELTS2 is available in two panel sizes as standard, a small enclosure for two to twelve 20 amp circuits of emergency AC lighting loads and a large enclosure for two to twenty-four 20 amp circuits of emergency AC lighting loads.

The ELTS2 is available with optional discrete (Type D) emergency branch circuit feeds from an external circuit breaker panel (by others) or emergency main feed (Type M) with built in branch circuit distribution.



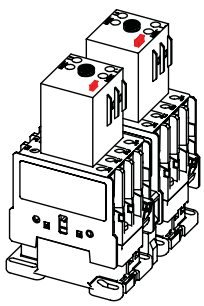
As shown: ELTS2-1-D-277-24

Large NEMA 1 cabinet with 24 Discrete emergency circuits



As shown: ELTS2-1-M-3P-12

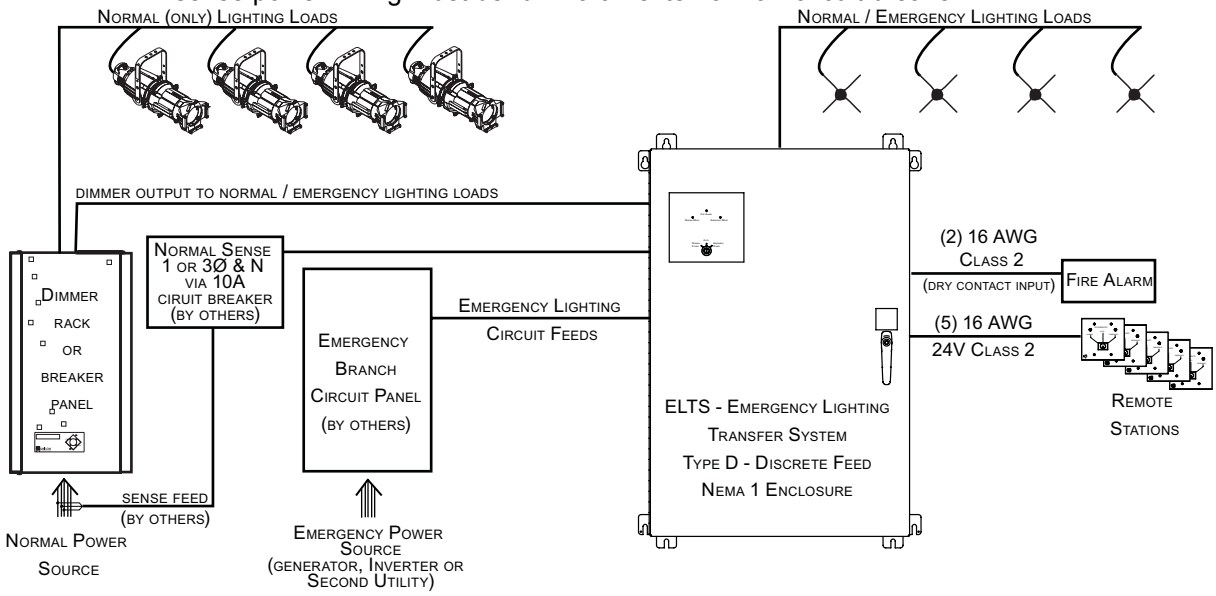
Small NEMA 1 cabinet with Main feed and 12 emergency circuits



Each transfer switch is comprised of a pair of contactors, one for two 20A circuits of normal inputs and one for two 20A circuits of emergency inputs. The two contactors in the assembly are connected by a mechanical interlock in a manner that ensures the circuits break from normal power before making the transfer to emergency power and vice-versa.

Type D (Discrete Feed) Overview

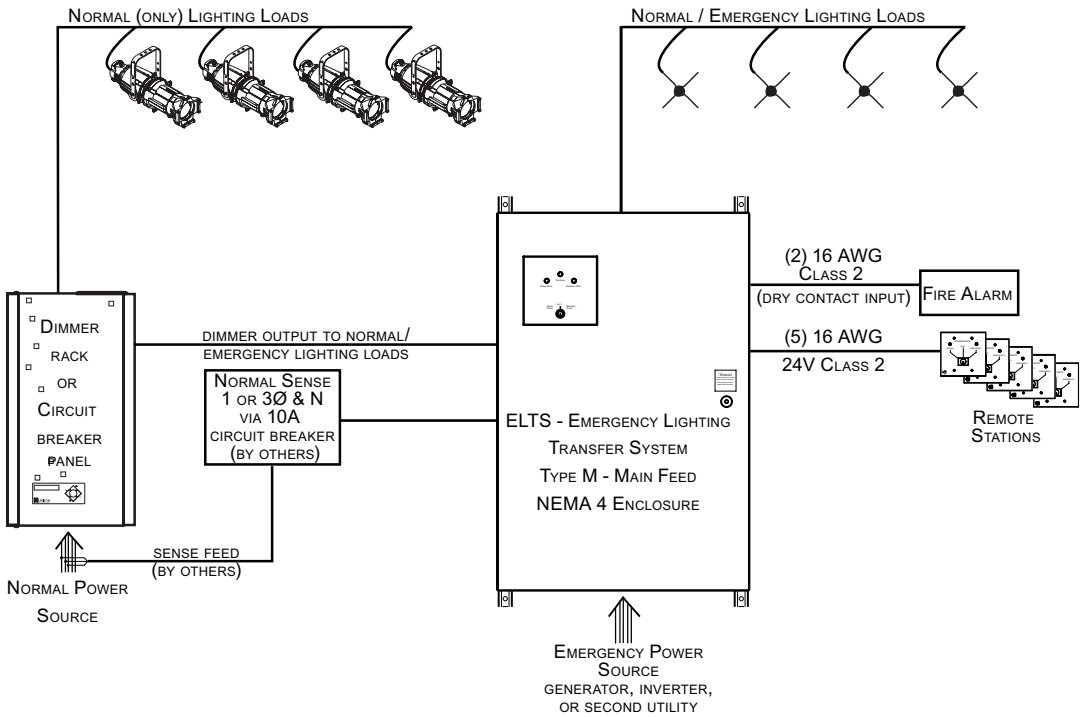
Type D ELTS2 units, each 20A emergency circuit, hot and neutral conductors, are independently fed from an adjacent emergency branch circuit breaker panel (by others). Normal 20A circuits are fed from an adjacent dimmer rack or branch circuit panel. Normal sense power wiring must be run via an external 10A circuit breaker.



Note: *The sense feed power consumption is essentially none.*

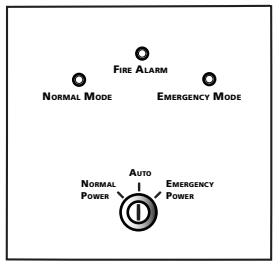
Type M (Main Feed) Overview

Type M ELTS2 units, emergency mains are connected to phase lugs within the unit. Mains power is distributed through factory wiring to built-in branch circuit distribution and overcurrent protection. Normal 20A circuits are fed from an adjacent dimmer rack or branch circuit panel. Normal sense power wiring must be run via an external 10A circuit breaker.



Standard Features

- The ELTS2 has a highly visible integrated local control station with a three position test key switch (Auto, Normal Power, and Emergency Power) for system test. The local station also includes a full complement of system status indicators including:



  - Normal Mode - green LED
  - Emergency Mode - red LED
  - Fire Alarm - red LED

- The ELTS2 enclosure provides ample space for contractor wiring.
  - Standard NEMA 1 rated enclosure is 14 AWG welded steel enclosure with a hinged locking door.
  - Optional NEMA 4 rated enclosure is watertight and includes a hinged locking door.
- 277 VAC units are provided with integral transformers to step down normal phase A and emergency phase A feeds into the control electronics.
- ELTS2 units are provided with 20A fuses for branch circuit protection.
- Dual inline pin (Dip) switches on the control electronics are provided for user-selectable timing delays for power transfer between:
  - the loss of normal power and the transfer to emergency power.
  - the restoration of normal power and the transfer from emergency power back to normal power.
- A normally closed dry contact closure is provided for Fire Alarm input.
- Up to five remote stations may be used per ELTS2 system. Remote stations include a key switch for switching between normal and emergency states. Each station also includes two LEDs illuminating the active ELTS2 state, Normal Mode or Emergency Mode.
- After normal power is restored the transfer switches return to the state previous to the power loss.
- A transfer switch consists of a pair of contactors, one for normal inputs and one for emergency inputs.
  - Each contactor provides connection for line and neutral of two 20A circuits on the input side.
  - The two contactors in the assembly are connected by a mechanical interlock which ensures the circuits break from normal power before making the transfer to emergency power.
  - Transfer Switches are rated for any mix of loads including tungsten, fluorescent, and discharge lamps. In general terms resistive, capacitive and inductive loads.
  - Transfer Switches are rated for 6,000 cycles at full tungsten load.

Product Variants

The ELTS2 is a factory configured product.

ELTS2	Enclosure Type	Emergency Feed Inputs	Voltage Options	Circuits
ELTS2	1 = NEMA 1 4 = NEMA 4	Type D = Discrete Feeds	120 = 120 VAC circuits @ 20A	2 - 12 for small enclosure 2 - 24 for large enclosure
			277 = 277 VAC circuits @ 20A	
		Type M = Mains Feed	3P = 208Y/120 VAC (3Ø 4-wire)	
			1P = 120/240 VAC (1Ø 3-wire)	
			277 = 277/480 VAC (3Ø 4-wire)	

Note: *Do not mix voltages within the ELTS2 unit.*

The number of circuits ordered determines the size of enclosure provided. Circuits are available only in multiples of two.

- Small enclosure - limited to 2 - 12 20A transfer switches
- Large enclosure - limited to 2 - 24 20A transfer switches

Definitions

break -before- make - a switch that is configured to break (open) the first set of contacts before engaging (closing) the new contacts. This prevents the momentary connection of both the normal and emergency feeds at the same time.

emergency feed - the power feed connected to the ELTS2 that is derived from the emergency source (generator, inverter, or second utility).

Emergency Mode - the contactors are switched to a state where the load is connected to the emergency feed.

emergency sense feed - wires carrying voltage and frequency from Phase A of the emergency source to the ELTS2 control electronics board for transfer switch operation in Emergency Mode. This connection is wired for you at the factory.

enclosure - refers to the ELTS2 cabinet with locking door only.

local station - the key switch station, with status indicators, on the front of the ELTS2 unit locking door.

normal feed - the power feed connected to the ELTS2 that is derived from the normal service.

Normal Mode - the contactors are switched to a state where the load is connected to the normal feed.

normal sense feed - wires carrying voltage and frequency from the normal source to the ELTS2 control electronics board for transfer switch operation in Normal Mode. This feed is provided by the installing electrical contractor.

power fail - when a phase of the normal power feed connected to the ELTS2 falls to below the specified voltage for that phase for the preset amount of time. During a power fail, the ELTS2 will transfer all connected lighting loads to the alternate power source when it is available and stable.

remote station - a key switch station that is located in a remote location from the ELTS2 unit.

sub panel - the interior panel of the ELTS2 unit including the electronics and transfer switches.

Unit - refers to the entire ELTS2 including the cabinet with locking door and sub panel.

Section 1
Installation

Installation Requirements

Locate the ELTS2 unit in a location where it will not be subject to tampering or vandalism. If possible, install the ELTS2 where it is most secure from damage by a fire, flood or other incident likely to require its use. For proper operation of your ELTS2 unit, be sure the intended installation conforms to the following environmental and electrical specifications.

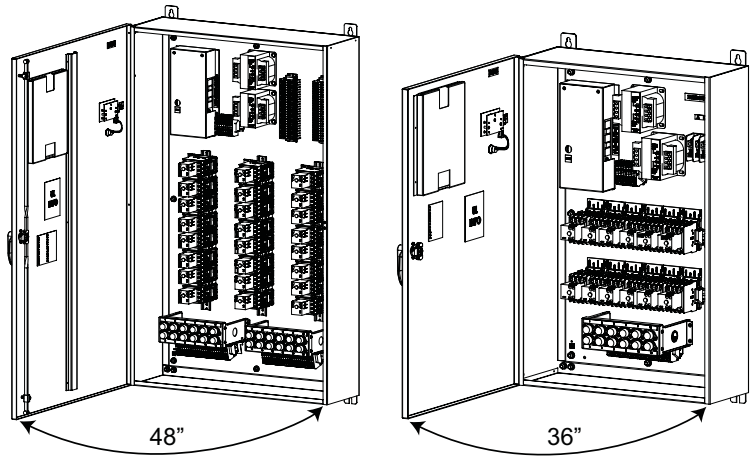
Installation Environment

- 0-40°C (32-104°F ambient temperature) dry room (30-90% humidity, non-condensing)
- Dust-free
- The ELTS2 unit should be supported by a wall strong enough to hold the enclosure fully loaded with transfer switches (large unit approximately 250 lbs).
- Mounting tabs are provided for installation convenience.

Clearance

Enclosure Size	Dimensions (h x w x d)	Weight
NEMA 1 Small unit - fully loaded to 12 circuits	36 x 24 x 8.5	150 lbs
NEMA 1 Large unit - fully loaded to 24 circuits	48 x 30 x 8.5	235 lbs
NEMA 4 Small unit - fully loaded to 12 circuits	36 x 24 x 11	155 lbs
NEMA 4 Large unit - fully loaded to 24 circuits	48 x 30 x 11	245 lbs

- Suggested mounting 36” height to the bottom of the enclosure.
- Clearance on the left and right side of the enclosure should be a minimum of 2”. Emergency main feed conduit may require extra space due to increased bend radius requirements for larger cables.
- Suggested door clearance is 36” from the front of the small enclosure and 48” from the front of the large enclosure to allow the enclosure door to open completely.



Electrical Requirements

WARNING: *Emergency (alternate) power must match normal power within the ELTS2 unit. Mixing voltages within the ELTS2 may cause system failure.*

The ELTS2 is available in two base voltages including 120 VAC or 277 VAC.

120 VAC / 60Hz units may be any form of 120 VAC power including:

- 208Y / 120 VAC @ 60Hz, three phase, 4 wire plus ground
- 120 / 240 VAC @ 60Hz, single phase, 3 wire plus ground
- 120 VAC @ 60Hz, single phase, 2 wire plus ground

277 VAC / 60Hz units may be any form of 277 VAC power including:

- 277 / 480 VAC @ 60Hz, three phase, 4 wire plus ground
- 277 VAC single phase, 2 wire plus ground

Note: *A unit manufactured as a 120 VAC unit cannot operate on a 277 VAC supply and vice-versa. 277 VAC units are manufactured with two transformers which are used to step down voltage to the control electronics board.*

Maximum Input Current Ratings:

- 480 amps for the large unit fully loaded with 24 - 20A emergency circuits
  - 160 amps per phase in a three phase configuration
  - 240 amps per leg when configured for single phase
- 240 amps for the small unit fully loaded with 12 - 20A emergency circuits
  - 80 amps per phase in a three phase configuration
  - 120 amps per leg when configured for single phase.

Branch circuit protection:

- ELTS2 units utilize built-in 20A fuses for branch circuit protection.
- Built-in fuses provide 65,000A Short Circuit Current Rating (SCCR) and insure compliance with NEC Section 700.27 Coordination. Larger upstream breakers cannot be tripped by downstream circuit faults.
- ELTS2 20A circuits are rated for a maximum continuous load of 1920 watts per circuit at 120 VAC and 4432 watts per circuit at 277 VAC.

Note: *This equipment should be installed and wired by a qualified electrician. Always follow applicable building and electrical codes when installing this equipment.*

If you are not certain if your installation complies with local or national codes, contact your local building inspector. Service by qualified personnel only.

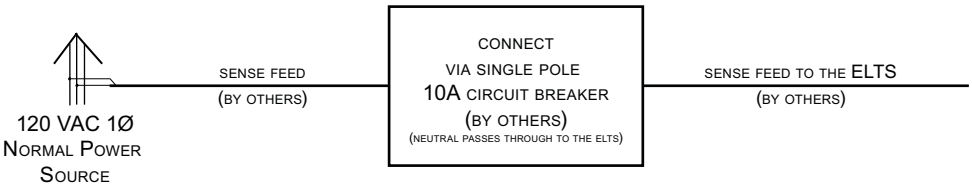
Sense Feed Requirements

Normal Sense Feed Requirements

Normal sense feed requirements vary depending on the installation.

Normal Power Type	Circuit Breaker	Notes
120 VAC 1Ø 2-wire	10A 1 pole	**A 10 amp circuit breaker is highly recommended but a 15 amp circuit breaker may be substituted if required.**
208Y / 120 VAC 3Ø 4-wire	10A 3 pole	
120 / 240 VAC 1Ø 3-wire	10A 2 pole	
277 / 480 VAC 3Ø 4-wire	10A 3 pole	
277 / 480 VAC 1Ø 3-wire	10A 2 pole	

Example: For a single phase 120 VAC installation, the normal sense feed requirements include a single pole 10A circuit breaker and a neutral pass-through to the ELTS2.



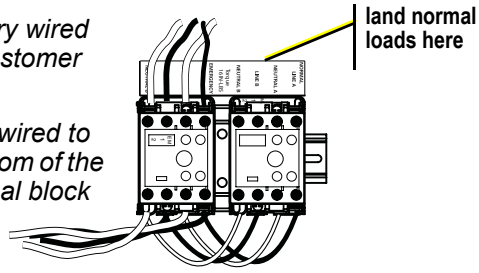
Note: *The circuit breaker may be 10 amp but no more than 15 amp.*

Transfer Switch Specification

A transfer switch is comprised of a pair of contactors, one for normal inputs and one for emergency inputs (factory wired). Transfer switches provide connection for line and neutral of two 20A circuits on the input side. The two contactors in the assembly are connected by a mechanical interlock in a manner that ensures the circuits break from normal power before making the transfer to emergency power, and vice-versa.

Emergency inputs to the transfer switch are factory wired leaving only the normal inputs to the switch for customer termination.

Load outputs from the transfer switch are factory wired to the overcurrent protection fuses located at the bottom of the ELTS2, then to the emergency load output terminal block for customer termination.



The transfer switches are rated for mixed loads consisting of resistive, tungsten and discharge lamps.

Verify Contents of the Shipping Carton

Before you begin installation check your shipment for physical damage that may have occurred during transit.

- If you discover damage be sure to document it to help with the claim to your shipper.
- Unpack your order and check the contents against the packing list to be sure your order is complete.
- Open the ELTS2 enclosure door and check for loose connections or broken components caused by shipping vibration.
- If you discover a problem, contact ETC at +608 831 4116 or toll free: 800 688 4116.

Parts and Specialty Tools Required

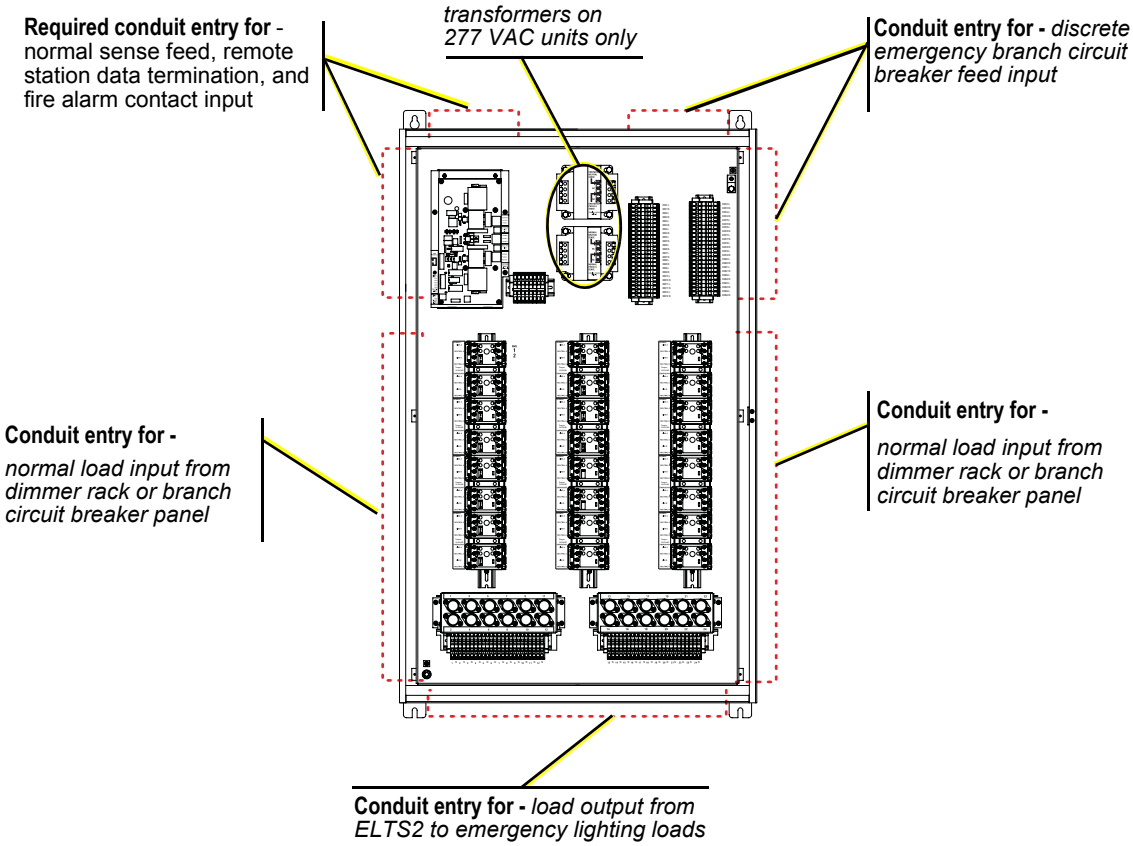
- Required mounting hardware (not supplied by ETC) 4 each 3/8” bolts or screws 2-4” long, wall anchors are suggested.
- Required 1 - 10A external circuit breaker (not supplied by ETC) for normal sensing wires. This breaker may be 1, 2, or 3 pole depending on the power source.

Cable Specification and Conduit Access

Note: *All Class 2 low voltage wiring is **required** to enter the unit in the top left conduit entry access point. Do not run the Class 2 wires in the same conduit as sense, phase, or load power wiring.*

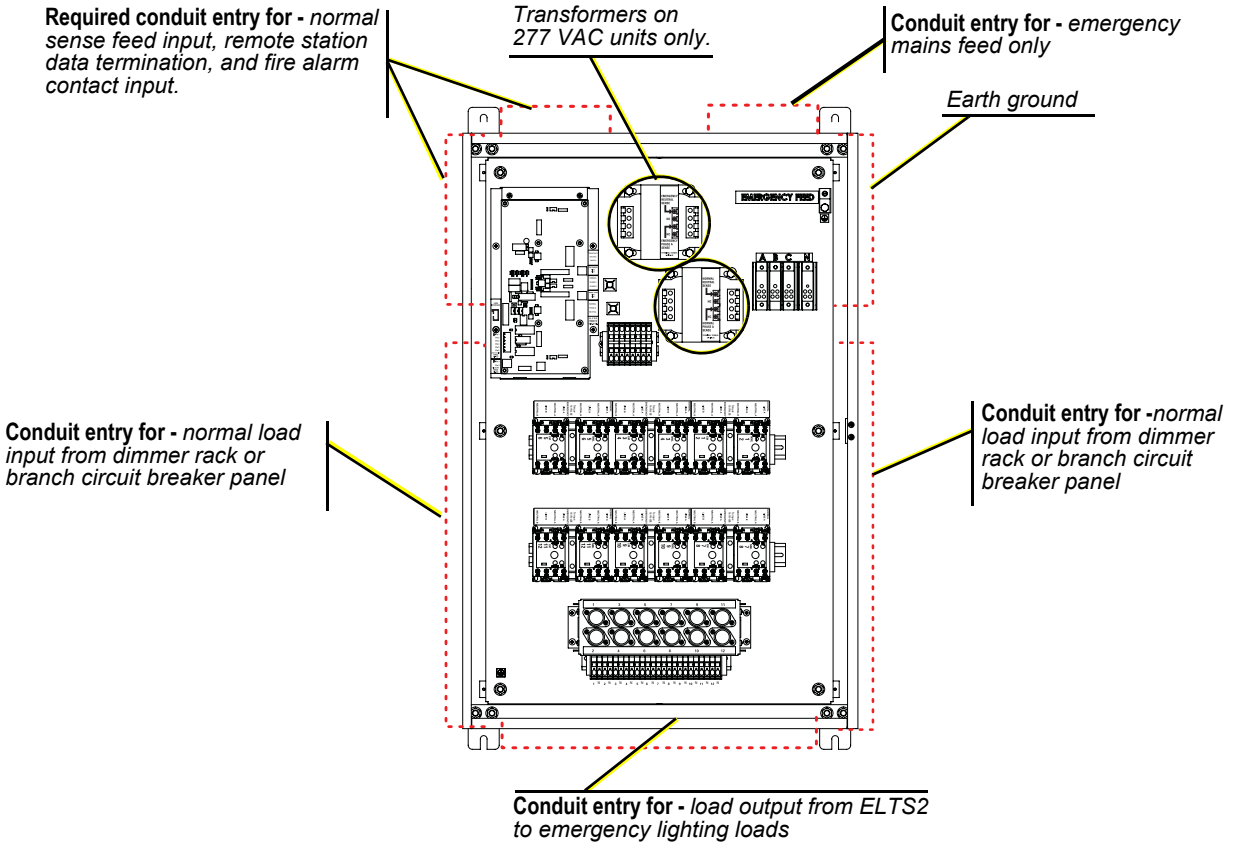
Type D (Discrete Feed) Cable Specification and Conduit Access

Connection Purpose	Terminal Accepts	Torque	Notes
20A circuit from a normal source (dimmer rack or circuit breaker panel) to the transfer switch	12-8 AWG	16 in/lbs	Line and neutral conductors only! No ground lugs provided in the ELTS2.
20A discrete emergency branch circuit breaker feed input	12-8 AWG		Line and neutral conductors only! No ground lugs provided in the ELTS2.
Emergency lighting load output terminal strip	22-8 AWG		
(1) normal sense feed - *single phase or three phase (must match normal power feeds) + neutral*	20-6 AWG		Normal power sense must connect to the ELTS2 through an external 10A circuit breaker. Reference *"Sense Feed Requirements", page 9* for details.
Fire Alarm - dry contact input	22-10AWG 2 conductor Class 2		normally closed dry contact input
Remote Stations	22-12 AWG, 5 conductor + 24Vdc, Class 2		Up to 5 remote stations per system typically wired in a parallel topology.



Type M (Main Feed) Cable Specification and Conduit Access

Purpose	Terminal Accepts	Torque	Notes
20A circuit from a normal source (dimmer rack or circuit breaker panel) to the transfer switch	14-8 AWG	16 in/lbs	Line and neutral conductors only! No ground lugs provided in the ELTS2.
(1) normal sense feed - *single phase or three phase (must match normal power feeds) + neutral*	6-20 AWG		Normal power sense must connect to the ELTS2 through an external 10A circuit breaker. Reference *"Sense Feed Requirements", page 9* for details.
Emergency Main Feed (small enclosure 2 - 12 circuits)	Ø and N lugs 2/0 - 14 AWG Ground lug (same)	10 ft-lbs	Use with an emergency power source (generator, inverter or second utility). **NOTE:** Emergency and normal power must match within the unit.
Emergency Main Feed (large enclosure 2 - 24 circuits)	Ø and N lugs 350MCM - 6 AWG Ground lug 2/0 - 14 AWG	31.25 ft-lbs 10 ft-lbs	
Emergency lighting load output terminal strip	22-8 AWG		
Fire Alarm - dry contact input	10-22 AWG, 2 conductor Class 2		normally closed dry contact input
Remote Stations	12-22 AWG, (5) conductor + 24 Vdc, Class 2		Up to 5 remote stations per system typically wired in a parallel topology.



Determine the Installation Location

Locate the ELTS2 unit in a location where it will not be subject to tampering or vandalism. If possible, install the ELTS2 where it is most secure from damage by a fire, flood or other incident likely to require its use.

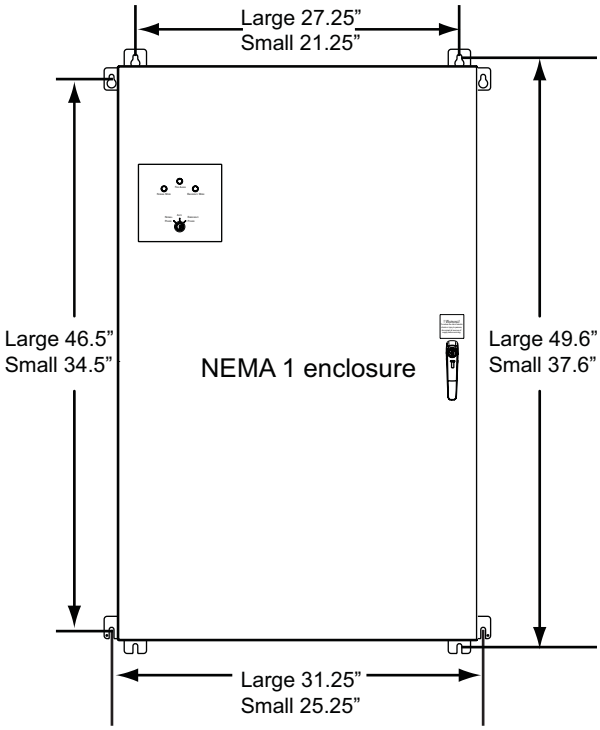
The ELTS2 unit should be supported by a wall strong enough to hold the enclosure fully loaded with transfer switches. Reference *"Clearance", page 7* for product weight, dimensions and clearance requirements.

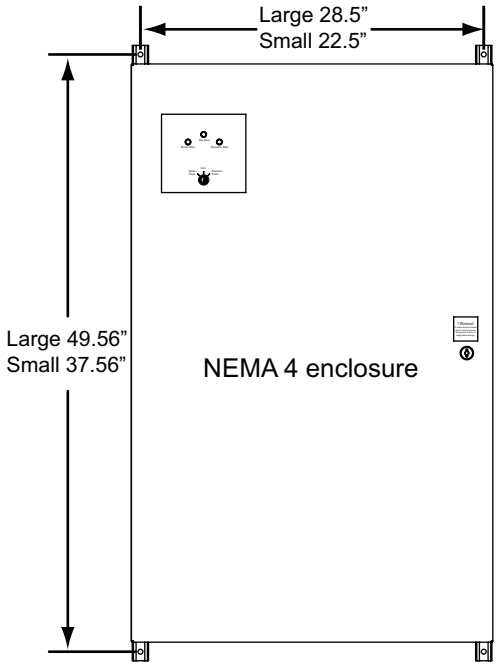
After determining the installation location for your ELTS2 unit, follow the instructions outlined below to install the mounting hardware.

Install Mounting Hardware

Installation of the mounting hardware depends on the type of enclosure you are installing, the standard NEMA 1 or the optional NEMA 4 enclosure.

CAUTION: ***ELTS2 units are heavy. Be sure you have proper equipment or assistance to lift the unit into place and support it while securing the mounting hardware.***



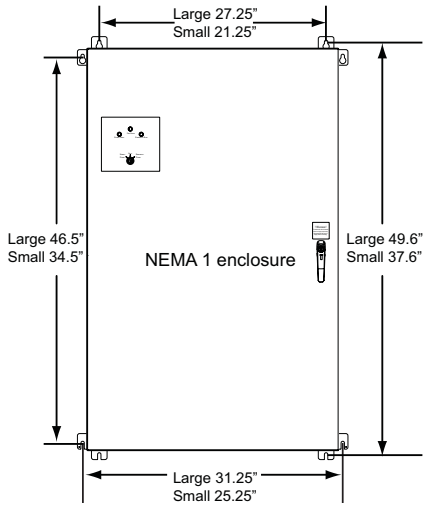


The NEMA 1 and NEMA 4 enclosures may be installed utilizing the standard top / bottom mounting tabs that are provided with the unit. As an alternative to the standard top / bottom tab mounting, you may install the NEMA 1 enclosure using the (optional) horizontal tab mounting kit for side mounting. Reference *"Side Mount Hardware Installation", page 33*.

Note: *It is the installation contractors responsibility to follow all local code restrictions.*

Install NEMA 1 Enclosure

CAUTION: ***ELTS2 units are heavy. Be sure you have proper equipment or assistance to lift the unit into place and support it while securing the mounting hardware.***



Step 1: Using the measurements provided, pre-drill and install two 3/8" mounting bolts for the lower two support keyhole slots.

Step 2: Using the measurements provided, pre-drill the holes for the top two 3/8" mounting bolts.

Step 3: Rest the enclosure on the wall, supported by the lower two mounting bolts installed in Step 1.

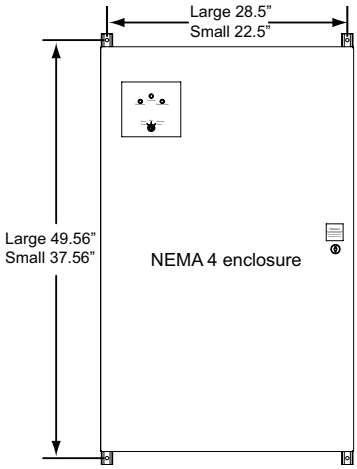
Step 4: Secure the enclosure to the wall with the top two mounting bolts.

Step 5: Check that the enclosure is plumb and secure to the wall. Strictly follow all local code restrictions.

Install NEMA 4 Enclosure

Note: *Use watertight conduit hubs or equivalent provision for watertight connection at the conduit entrance to maintain the integrity of the NEMA 4 enclosure.*

CAUTION: ***ELTS2 units are heavy. Be sure you have proper equipment or assistance to lift the unit into place and support it while securing the mounting hardware.***



Step 1: Using the measurements provided, pre-drill the holes for the bottom two 3/8" mounting bolts.

Step 2: Align the enclosure to the wall and install the two 3/8" mounting bolts for the lower mounting support tabs.

Step 3: Install the two 3/8" mounting bolts for the top two mounting support tabs.

Step 4: Check that the enclosure is plumb and secure to the wall. Strictly follow all local code restrictions.

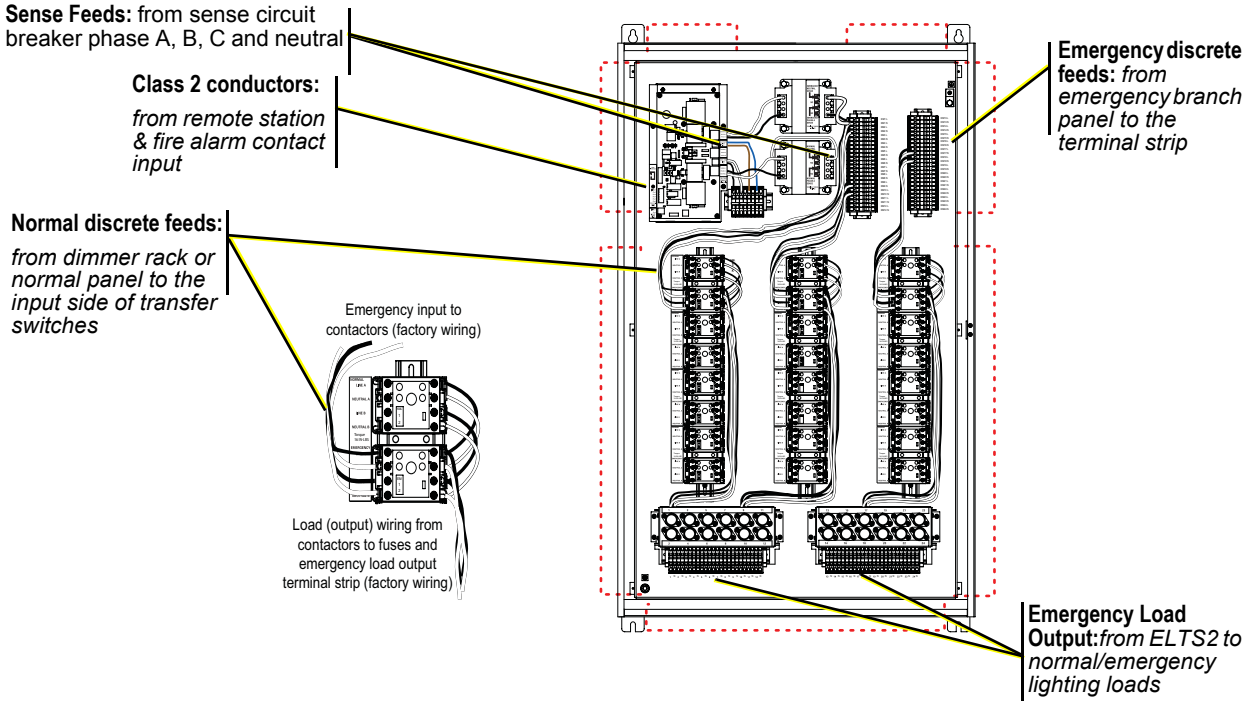
Rough-In Conduit and Cable

WARNING: ***To prevent death or serious injury due to electrical shock, normal (utility) and emergency (alternate) power supplies must be turned off prior to connecting power source and load lines to the ELTS2 unit.***

Requirements for installation vary depending on the type of ELTS2 in your installation, type D - Discrete Feed or type M - Main Feed. Reference page 11 and page 12 for specification of cable and conduit access requirements for each ELTS2 type.

Rough-In Conduit and Cable for Type D (Discrete Feed) Unit

The discrete feed ELTS2 is designed for emergency systems where **20A emergency branch circuits** (hot and neutral conductors only) are fed to the discrete emergency branch circuit terminal strip. **Normal 20A circuits** (hot and neutral conductors only) typically fed from an adjacent dimmer rack or circuit breaker panel are wired directly to the normal input side of transfer switch assembly. Each normal and emergency circuit to the ELTS2 must have branch circuit protection external of the ELTS2 unit.



Note: *Do not pull individual circuit ground wires through the ELTS2 unit as ground lugs are not provided. ETC recommends pulling circuits through grounded metal conduit or providing other means of grounding each circuit.*

The **normal sense feeds** may enter the enclosure from the top left corner or top left side of the enclosure. Normal sense from the source must connect to external 10A circuit breaker first (provided by others), then pulled through conduit to the ELTS2 control board. *See "Sense Feed Requirements" on page 9.*

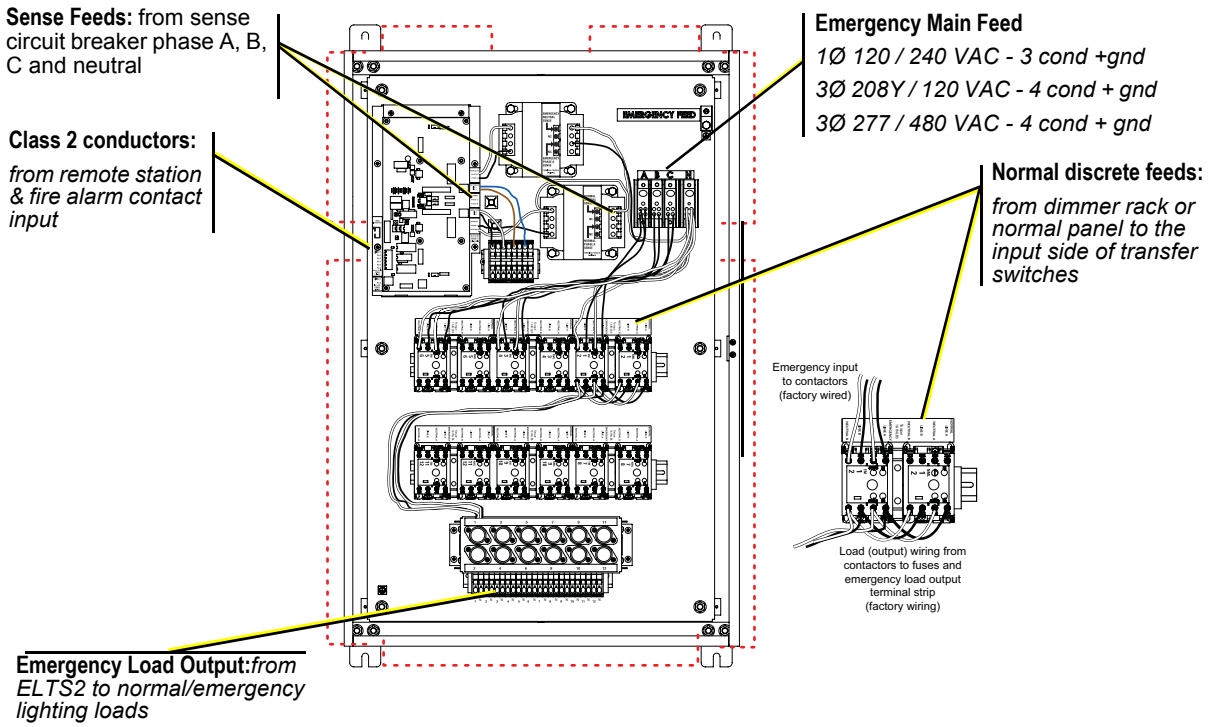
ELTS2 units manufactured for **277 VAC operation** include two transformers, one for Normal Mode operation and one for Emergency Mode operation. Normal (phase A and neutral) sense feed wiring connect at the transformer instead of the control electronics board. Normal phase B and phase C sense feeds connect at the control board.

Low Voltage Class 2 conductors for remote stations and the fire alarm contact input should enter the enclosure from the top left or top left side of the unit.

Rough-In Conduit and Cable for Type M (Main Feed) Unit

The main feed ELTS2 is designed for systems where **emergency mains are connected to phase lugs** within the ELTS2 unit. Mains power is distributed to the transfer switches then to fuses which provide branch circuit protection.

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



Normal 20A circuits (hot and neutral conductors only) typically fed from an adjacent dimmer rack or circuit breaker panel are wired directly to the normal side of transfer switch assembly. Each circuit to the ELTS2 must have branch circuit protection external of the ELTS2 unit.

Note: *Do not pull individual circuit ground wires through the ELTS2 unit. ETC recommends pulling circuits through grounded metal conduit or providing other means of grounding each circuit.*

The **normal sense feeds** may enter the enclosure from the top left corner or top left side of the enclosure. Normal sense wires from the source must first connect to external 10A circuit breaker first (provided by others), then pulled through conduit to the ELTS2 control board. *See "Sense Feed Requirements" on page 9.*

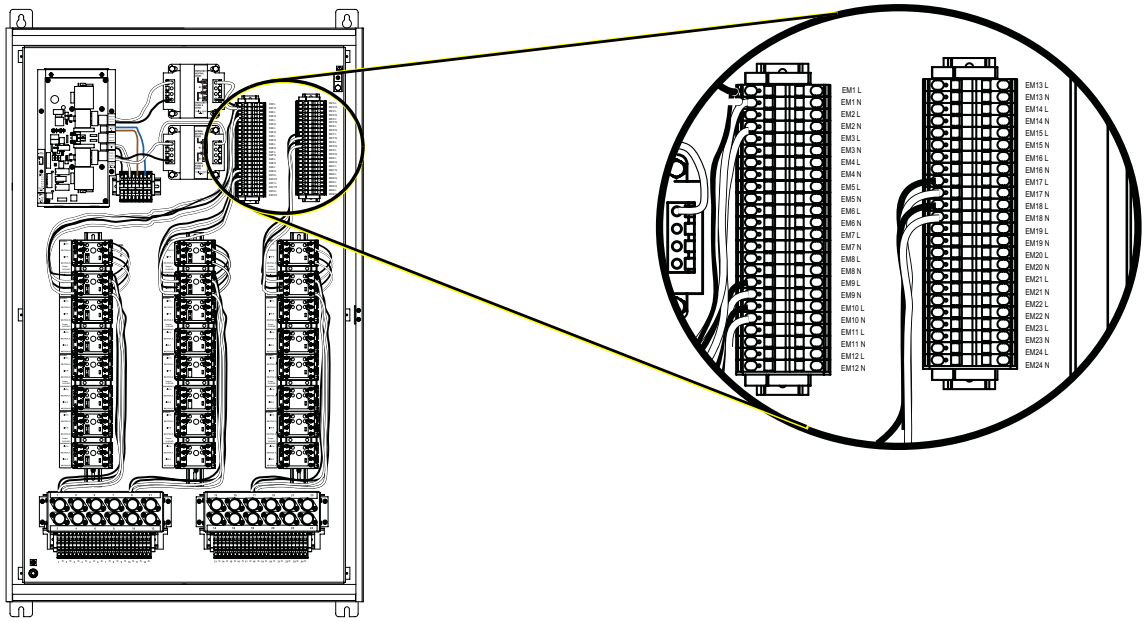
ELTS2 units manufactured for **277 VAC operation** include two transformers, one for Normal Mode operation and one for Emergency Mode operation. Normal phase A and neutral sense feed wiring connects at the transformer instead of the control board. Normal phase B and C sense feeds connect at the control electronics board.

Low Voltage Class 2 conductors for remote stations and the fire alarm contact input should enter the enclosure from the top left or top left side of the unit.

Note: *Do not pull the Class 2 wires, fire alarm and remote station, through the same conduit as sense, phase, or load power wiring*

Connect Emergency Discrete Inputs for “Type D” Unit

Connect Emergency Discrete Input Wires to the Terminal Strip



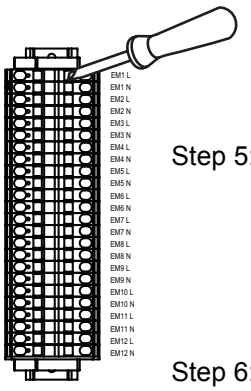
Note: *Discrete ELTS2 systems require external distribution and overload protection (circuit breaker) for each 20A circuit.*

Step 1: Locate the input side of the emergency discrete feed terminal strip.

Step 2: Pull the emergency hot and neutral wires to the terminal strip from the branch circuit panel. Each terminal is clearly labeled with circuit designations.

Step 3: Strip back each conductors sheathing 9/16”.

Step 4: Connect circuit #1’s emergency hot wire to the terminal strip beginning with the terminal labeled “**EM1 L**”



a: Align a 5mm (3/16”) slotted screwdriver with the top of the terminal and press down firmly until the terminal gate opens.

b: Insert the proper wire into the terminal and remove the screwdriver. The wire will hold securely in place.

Step 5: Connect circuit #1’s emergency neutral wire to the terminal strip beginning with the terminal labeled “**EM1 N**”.

a: Align a 5mm (3/16”) slotted screwdriver with the top of the terminal and press down firmly until the terminal gate opens.

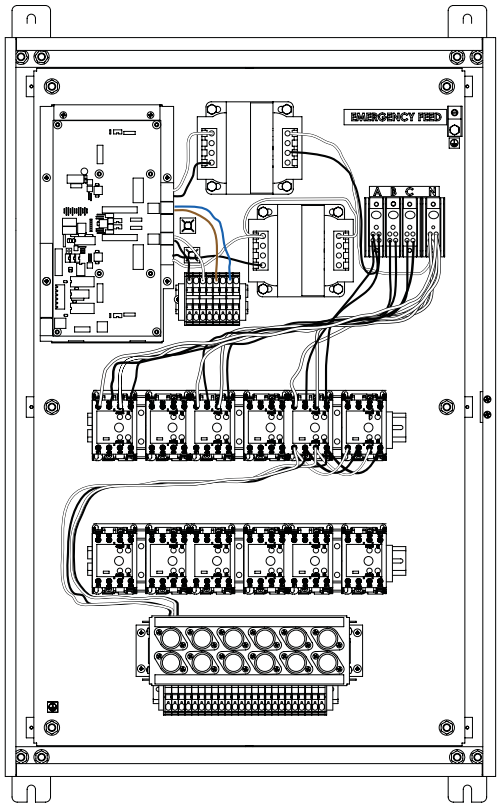
b: Insert the proper wire into the terminal and remove the screwdriver. The wire will hold securely in place.

Step 6: Repeat steps 1 through 5 for all emergency discrete feeds.

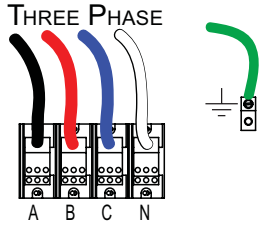
CAUTION: *Care should be taken to ensure you are not inserting the wire sheathing into the terminal strip.*

Connect Emergency Mains for “Type M” Unit

Connect Mains Feed

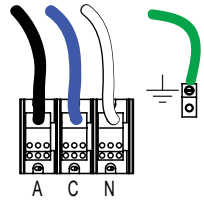


THREE PHASE



Type M ELTS2 units manufactured for Three Phase are factory-wired with phase balanced emergency mains distribution (ØA, ØB, ØC) to fuses.

SINGLE PHASE



Type M ELTS2 units manufactured for Single Phase are factory-wired with phase balanced emergency mains distribution (ØA and ØC) to the integral branch circuit protection or fuses.

Step 1: Pull the emergency power cables to the phase lugs.

Step 2: Strip each conductor back 5/8” for the large unit or 7/16” back for the small unit.

Step 3: Connect phase mains input wires as illustrated in the graphics above for either single phase or three phase operation (as ordered).

Step 4: Connect the neutral cable to the neutral lug.

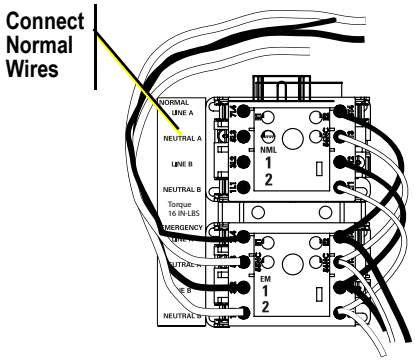
Step 5: Connect the ground cable to the ground lug.

Step 6: Torque the connections to the correct values using the table below:

Enclosure size	Phase Lugs Accept	Phase Lugs Torque	Ground Lug Accepts	Ground Lug Torque
Small (2 - 12 circuits)	2/0 - 14 AWG	160 in.lbs	2/0 - 14 AWG	120 in-lbs
Large (2 - 24 circuits)	350MCM - 6 AWG	375 in.lbs	2/0 - 14 AWG	120 in-lbs

CAUTION: *Factory wiring may loosen during transit! Check each of the mains power distribution terminal blocks to ensure the factory wiring to the transfer switches remain secure after transport.*

Connect Normal Input Wires to the Transfer Switch



Note: *ELTS2 systems require external distribution and overload protection (circuit breaker) for each 20A circuit.*

Step 1: Locate the input side of the transfer switch assembly. Each terminal is clearly labeled with circuit designations.

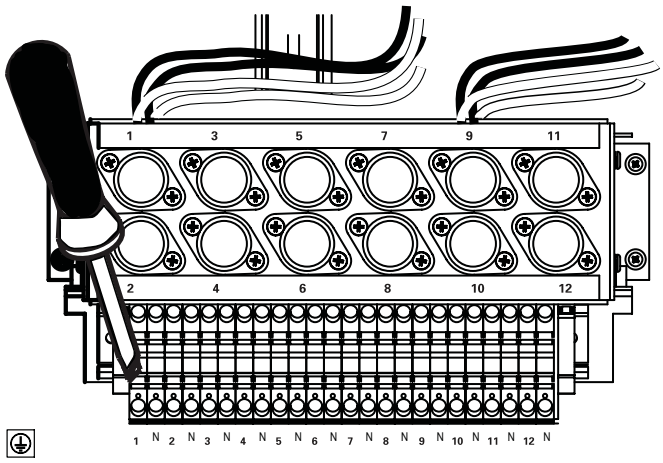
Step 2: Pull the normal discrete hot and neutral wires to the transfer switch input side. Termination is available for two normal 20A circuits per transfer switch.

Step 3: Strip back each conductor 3/8”.

Step 4: Insert each wire into the appropriate terminal and secure.

Step 5: Repeat for the remaining normal circuits in the ELTS2.

Connect Load Output Wires to the Terminal Strip



Step 1: Locate the emergency load output terminal strip (beneath the fuses). Each terminal is clearly labeled with circuit designations.

Step 2: Pull hot and neutral load wires for emergency circuit 1 to the terminal strip.

Step 3: Strip back each conductor 9/16”.

Step 4: Connect the emergency lighting load hot wire for circuit # 1.

a: Align a 5mm (3/16”) slotted screwdriver with the top of the terminal and press

down firmly until the terminal gate opens.

b: Insert the proper wire into the terminal and remove the screwdriver. The wire will hold securely in place.

Step 5: Connect the emergency lighting load neutral wire for circuit # 1.

a: Align a 5mm (3/16”) slotted screwdriver with the top of the terminal and press down firmly until the terminal gate opens.

b: Insert the proper wire into the terminal and remove the screwdriver. The wire is held securely in place.

Step 6: Repeat steps 1 - 5 for the remaining emergency lighting loads in the ELTS2 unit.

Connect 120 VAC Sense Power Wiring

Note: *Connect normal sense wires from the source to an external circuit breaker first, then pull the sense wires from the external circuit breaker through conduit to the ELTS2. Reference ”Sense Feed Requirements”, page 9 for installation requirements.*

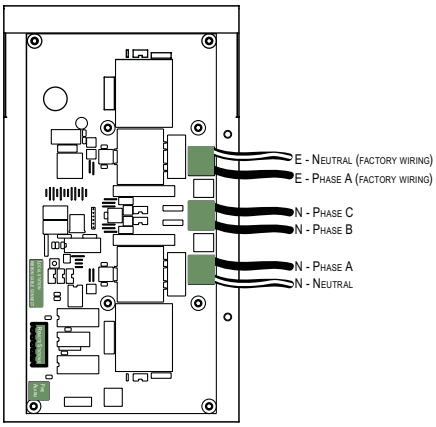
Step 1: Locate the control electronics board on the top left side of the ELTS2 enclosure.

Step 2: Pull the normal sense wires to the right side of the control electronics board.

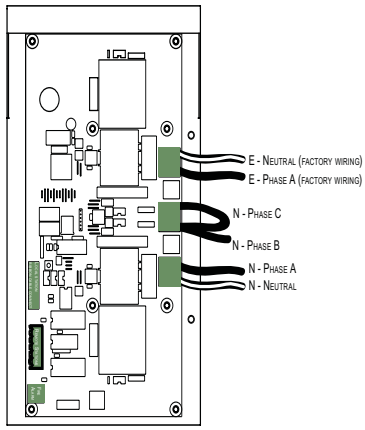
Step 3: Strip the conductors back 3/8”.

Step 4: Connect wires to the control electronics (reference graphics below for indication of termination location).

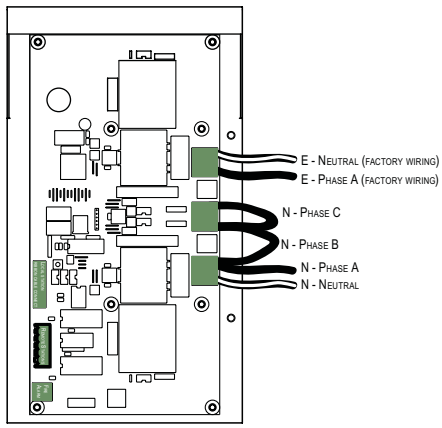
3 Ø 4 Wire Installation



1 Ø 3 Wire Installation



1 Ø 2 Wire Installation

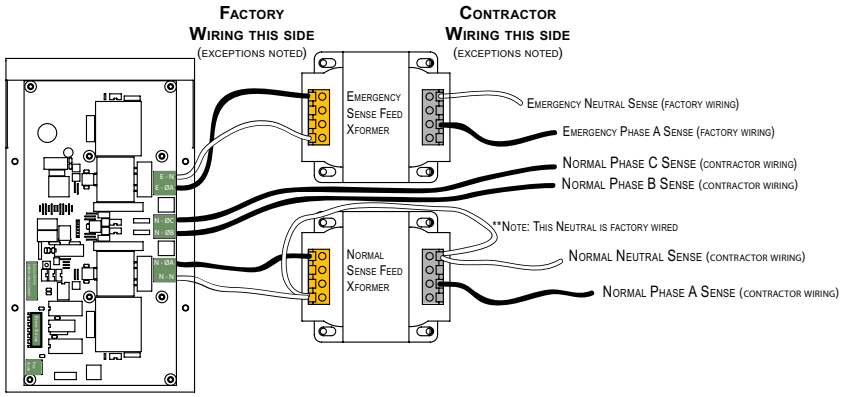


Connect 277 VAC Sense Power Wiring

Note: *Connect normal sense wires from the source to an external circuit breaker first, then pull the sense wires from the external circuit breaker through conduit to the ELTS2. Reference "Sense Feed Requirements", page 9 for installation requirements.*

Step 1: Locate the two transformers on the top of the ELTS2 sub panel.

Step 2: Pull the normal phase A and neutral sense wire to the right side of the transformers and strip the conductors back 3/8".



Step 3: Connect the wires as illustrated in the graphic above.

Step 4: Pull the normal phase B and phase C sense wires to the control board and strip the conductors back 3/8".

Step 5: Connect the wires as illustrated in the graphic above.

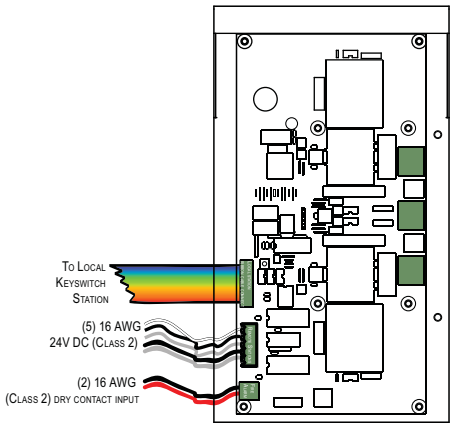
Step 6: Reference *"Cable Specification and Conduit Access", page 11* for the terminal torque rating on each connection.

Connect Fire Alarm and Remote Station Wiring

Locate **J3** on the control electronics board. This two position screw terminal is the connection point for the dry contact input of the Fire Alarm system. When no contact input is required, leave the factory installed jumper in the terminal to maintain a closed circuit contact.

Locate **J2** on the control electronics board. This five position screw terminal is the connection point for the remote key switch station data wires.

J1 on the control electronics board is the ribbon cable connection for the local key switch station on the door of the ELTS2 unit. This connection is made for you at the factory.



Connect Fire Alarm Wiring

A jumper cable is installed in the fire alarm contact input of the ELTS2 when the unit is manufactured. This jumper cable maintains the closed contact input if no fire alarm contact input is installed. Remove this jumper wire only to replace it with dry contact input wiring from the fire alarm system.

Step 1: Locate the two position screw terminal (J3) on the control electronics board.

Step 2: Pull the fire alarm dry contact input wires required to the terminal.

Step 3: Strip the conductors back 3/8”.

Step 4: Loosen the screws enough to remove the jumper cable from the terminal.

Step 5: Insert the wires, one per position in the terminal and secure.

Connect Remote Station Wiring

Recommended installation is that the remote key switch stations are installed with wiring in parallel between remote station terminal blocks. You may terminate up to two remote key switch station data runs to the control electronics board.

Note: *Remote station wiring is accomplished using a parallel topology. You must know the wire assignment used at the remote station being connected for proper connection to the ELTS2.*

Step 1: Locate the five position screw terminal (J2) on the control electronic board.

Step 2: Pull the remote station wiring required to the terminal.

Step 3: Strip the conductors back 3/8”.

Step 4: Insert the wires as follows:

- Position 1 - +24V Common
- Position 2 - Normal Switch
- Position 3 - Emergency Switch
- Position 4 - Normal Mode LED
- Position 5 - Emergency Mode LED

Power Up and Check System

Power Up

WARNING: *Death by injury from electrical shock! Close the ELTS2 door before applying power to the ELTS2.*

Step 1: Apply normal power to the ELTS2, the connected dimmer rack and/or circuit breaker panel at the main circuit breaker panel. When normal power is stable the Normal Mode LED on the local key switch station will illuminate and the transfer switches will switch all connected loads to the normal source power.

- The ELTS2 transfers to Normal Mode only when the normal power source is at or above the specified voltage required. *See "Specified Voltage Pickup and Dropout" on page 27.*

Step 2: Apply emergency power to the ELTS2.

- When normal source power is at or above specified voltage required, the system will remain in Normal Mode. **Automatic** function of the system will change to Emergency Mode only when the fire alarm contact is sent or normal source power drops below specified voltage. *See "Specified Voltage Pickup and Dropout" on page 27.*

Step 3: Check the indicators on the installed remote stations.

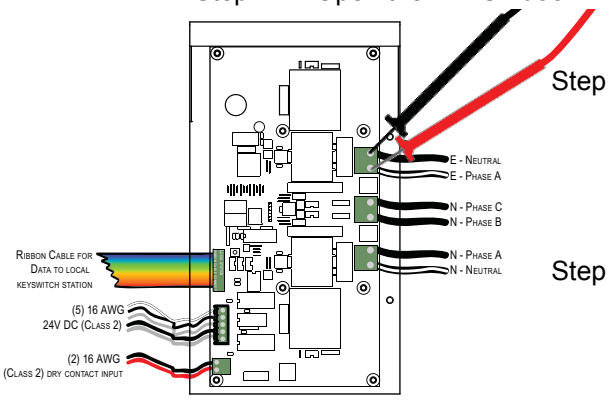
- Each station when properly installed will indicate the ELTS2 status with LED illumination, **Normal Mode** or **Emergency Mode**.

Check System Voltage

Use of a digital volt meter is required for this procedure.

WARNING: *ELTS2 voltage tests should only be performed by qualified personnel using EXTREME CAUTION. Opening the cabinet with power applied exposes you to death or severe injury from high voltage electrical shock.*

Step 1: Open the ELTS2 door.



Step 2: Measure the sense feed voltage at the emergency power sense feed terminal blocks (phase A and neutral) on the control electronics board. Voltage should be within ± 10 percent of the rated voltage of the ELTS2 unit (120 VAC or 277 VAC).

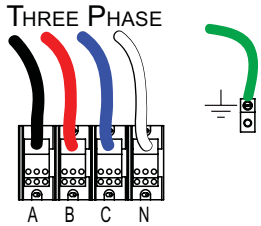
Step 3: Measure the sense feed voltage at the normal power sense feed terminal blocks. Voltage should be within ± 10 percent of the rated voltage for the ELTS2 unit (120 VAC or 277 VAC).

a: Measure between phase A and neutral.

b: Measure between phase B and neutral.

c: Measure between phase C and neutral.

Step 4: Measure the feed input of a mains feed ELTS2. Phase lugs are located in the upper right side of the ELTS2 unit and are clearly labeled A, B, C, N and ground.



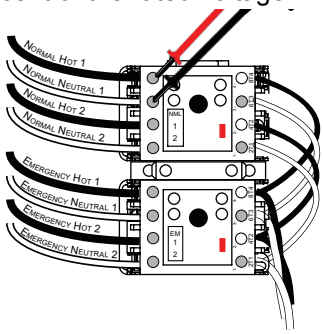
- Check voltage across phase and neutral. Voltage values must be within ± 10 percent of the rated voltage for the ELTS2 unit.

Step 5: Measure each of the transfer switch normal circuit inputs (hot and neutral).

- Voltage values should be within ± 10 percent of the rated voltage.

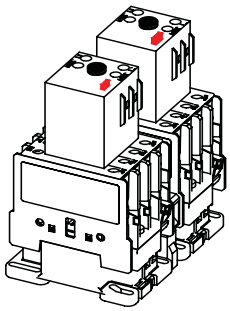
Step 6: Type discrete feed ELTS2 units only, measure each of the transfer switch emergency circuit inputs (hot and neutral).

- Voltage values should be within ± 10 percent of the rated voltage.



Manual Operation

Manual operation is not the preferred method of switching the transfer switches from normal to emergency power and vice-versa. As a last resort, if an electrical short has disabled the control electronics, you have the option of manually switching each of the transfer switches.



For manual operation you must follow the same practice that the ELTS2 follows during automatic operation, this includes break-before-make switching.

Each transfer switch is made of a pair of contactors with a mechanical latch per contactor. Each mechanical latch includes two buttons, one black round button and one red rectangular button. The black button depresses when the contactor is active, the red button releases the contactor.

Step 1: To deactivate an active conductor press the red release button. The contactor will deactivate the power source from the lighting loads.

Step 2: To activate the other side of the transfer switch depress the black button firmly until it catches. (If the button will not depress, check that the other contactor has deactivated).

Automatic Operation Test

Test the automatic function of the ELTS2 to ensure its ability to switch from normal to emergency power when normal power is interrupted and back again when it is restored.

Step 1: Check the Normal Mode LED on the local station of the ELTS2 is illuminated.

Step 2: Turn off normal power to the dimmer rack or circuit breaker panel connected to the ELTS2.

- The Normal Mode LED on the local station of the ELTS2 will deactivate.
- The ELTS2 switches to emergency power, the Emergency Mode LED illuminates, and all connected loads will illuminate to full bright.

Note: *There will be a short delay between the transfer of normal power to emergency power. This delay is user adjustable on dip switches and allows the user to delay the transfer for a period of time when the emergency source is on and stable.* *See "Normal to Emergency Transfer Delay" on page 29.*

Step 3: Restore normal power.

- The Emergency Mode LED on the local station of the ELTS2 will deactivate.
- The ELTS2 switches to normal power, the Normal Mode LED illuminates and all connected loads will resume normal operation.

Note: *There will be a short delay between the transfer of emergency power to normal power. This delay is user adjustable on dip switches and allows the user to delay the transfer for a period of time when the normal source is on and stable.* *See "Emergency to Normal Transfer Delay" on page 29.*

Section 2
Operation

How the ELTS2 Works

The ELTS2 automatically transfers branch circuits from a normal power source to an emergency (alternate) power source when normal power fails. This is a UL 1008 transfer switch for use not as part of the building service but as an emergency egress lighting load transfer switch typically receiving loads from a dimmer rack.

The ELTS2 operates on priority of power failure first, fire alarm activation, and last local and remote stations. During a power failure, local and remote stations do no affect the state of the ELTS2.

When a power fail is detected the ELTS2 disconnects the normal power feed and switches the lighting loads to the connected emergency power source ***ONLY when stable emergency power is available.***

When the ELTS2 has switched to emergency power, local and remote station indicators illuminate to indicate the system is operating in Emergency Mode. When normal power has been restored, the emergency feed is disconnected and the loads are switched back to the normal power. Local and remote station indicators illuminate to indicate the system is operating in Normal Mode.

How the ELTS2 Determines a Power Failure

Initially to determine a power fail the ELTS2 monitors voltage on phase A, B and C of normal power. When any phase drops to or below the dropout voltage, the ELTS2 switches the loads to the connected emergency (alternate) power source. When any one of the phases of normal power fails, the ELTS2 considers that all phases of normal power have failed, the normal power indicator goes off and the emergency power indicator illuminates red.

Specified Voltage Pickup and Dropout

Voltage pickup and dropout values are not adjustable.

Event	120 VAC Models	277 VAC Models
emergency phase A pickup voltage	100 VAC	230 VAC
normal phase A dropout voltage	80 VAC	185 VAC
normal phase A pickup voltage	100 VAC	230 VAC
normal phase B dropout voltage	80 VAC	80 VAC
normal phase B pickup voltage	81 VAC	81 VAC
normal phase C dropout voltage	80 VAC	80 VAC
normal phase C pickup voltage	81 VAC	81 VAC

How Time Delays Work

Two sets of dip switches are provided on the ELTS2 control board for user adjustable time delays. The time elapsed after sensing a normal power failure and before switching to the emergency feed is adjustable from 170 ms- 10 seconds. When shipped from the factory, the switches are set to 170 ms. The time elapsed after sensing the restoration of normal

power and before switching back to the normal feed is adjustable from 170 ms- 60 seconds. When shipped from the factory, the switches are set to 30 seconds. Both time delays apply to any transfer type in the ELTS2 including loss of power, fire alarm, or system test. *See "Adjust the Power Transfer Delays" on page 29.*

Fire Alarm Contact Input Operation

The ELTS2 is supplied with a normally closed dry contact closure for use with a fire alarm input. When the input is opened the connected loads are placed in Emergency Mode and the local station "Fire Alarm" indicator will illuminate. When the contact is closed the input is internally strapped to a closed state and the ELTS2 will return to Normal Mode.

Local and Remote Control Station Operation

Local Control Station

The ELTS2 is provided with an integrated (local) key switch station on the front of the unit for user access to manual switching between normal and Emergency Mode. In addition, the ELTS2 is provided with three highly visible indicators of system status.

- The test key switch is a three position momentary key switch. Turning to the right switches to the ELTS2 into Emergency Mode. Turning to the left switches the ELTS2 into Normal Mode. During a power fail, both local and remote controls are ignored and will not change the state of the transfer switches.

CAUTION: *It is important to understand that use of the local and remote key switch stations switched to emergency power are only a **simulation** of normal power loss. To return the unit to normal operating mode you must switch the key switch to normal power. Once switched to normal power, if normal power is present, the lighting loads will switch to operate under normal source power and the **Normal Mode indicator** will light. The Emergency Mode indicator will deactivate.*

- Normal Mode indicator - green LED that indicates the loads are powered from the normal power source.
- Emergency Mode indicator - red LED that indicates the loads are powered from the Emergency (alternate) power source.
- Fire Alarm indicator - indicates that the ELTS2 is in an Emergency Mode as a result of a fire alarm input.

Remote Control Station

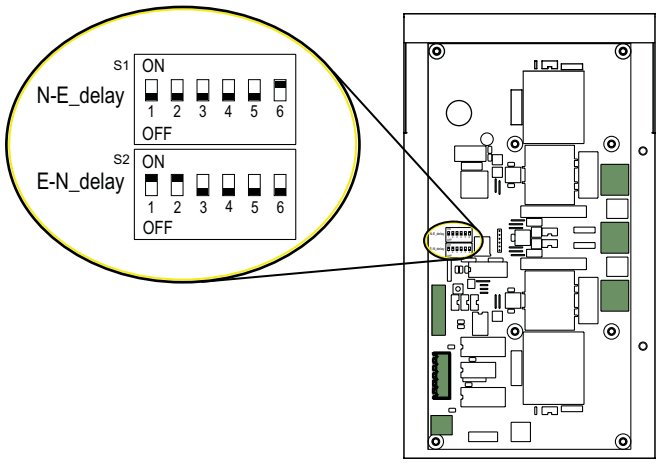
The ELTS2 provides termination for up to five remote stations which may be installed in a parallel topology. Each station includes two indicators, Normal Mode and Emergency Mode, for remote indication of the ELTS2 system state.

- The test key switch is a three position momentary key switch. The center position is "Auto, meaning standby ready for automatic operation. Turning the switch to the right switches to Emergency Mode. Turning the switch to the left switches to Normal Mode.

CAUTION: *It is important to understand that use of the local and remote key switch stations switched to emergency power are only a **simulation** of normal power loss. To return the unit to normal operating mode you must switch the key switch to normal power. Once switched to normal power, if normal power is present, the lighting loads will switch to operate under normal source power and the **Normal Mode indicator** will light. The Emergency Mode indicator will deactivate.*

- Normal Mode Indicator - Indicates the loads are powered from normal power feeds.
- Emergency Mode Indicator - Indicates the presence of phase A of the emergency feeds.

Adjust the Power Transfer Delays



Use a sharp point, such as a pick or jewelers screwdriver, to move the switches into the correct On or Off position.

Normal to Emergency Transfer Delay

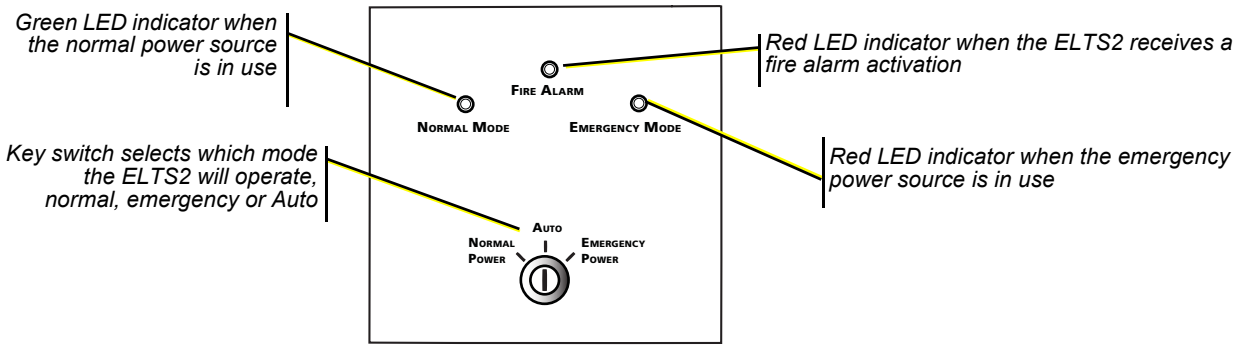
Labeled N-E_delay (S1) on the control electronics board. This switch configures the delay time between loss of normal power and the transfer to emergency power, when emergency power is stable. Normal to emergency power delay is adjustable from 0-10 seconds and applies to any transfer type including fire alarm, manual test, and loss of power.

Delay (seconds)	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6
170 ms	OFF	OFF	OFF	OFF	OFF	**ON**
1	OFF	OFF	OFF	**ON**	**ON**	OFF
2	OFF	OFF	OFF	OFF	**ON**	OFF
3	OFF	OFF	**ON**	**ON**	OFF	OFF
4	OFF	OFF	OFF	**ON**	OFF	OFF
5	OFF	**ON**	**ON**	OFF	OFF	OFF
6	OFF	OFF	**ON**	OFF	OFF	OFF
7	**ON**	**ON**	OFF	OFF	OFF	OFF
8	OFF	**ON**	OFF	OFF	OFF	OFF
9	**ON**	OFF	OFF	OFF	OFF	OFF
10	OFF	OFF	OFF	OFF	OFF	OFF

Emergency to Normal Transfer Delay

Labeled E-N_delay (S2) on the control electronics board. This switch configures the delay time between the transfer from emergency power back to normal power when normal power is stable. Emergency to normal power delay is adjustable from 0-60 seconds applies to any transfer type including fire alarm, manual test, and loss of power.

Delay (seconds)	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6
170 ms	OFF	OFF	OFF	OFF	OFF	**ON**
2	OFF	OFF	OFF	**ON**	**ON**	OFF
5	OFF	OFF	OFF	OFF	**ON**	OFF
10	OFF	OFF	**ON**	**ON**	OFF	OFF
15	OFF	OFF	OFF	**ON**	OFF	OFF
20	OFF	**ON**	**ON**	OFF	OFF	OFF
25	OFF	OFF	**ON**	OFF	OFF	OFF
30	**ON**	**ON**	OFF	OFF	OFF	OFF
40	OFF	**ON**	OFF	OFF	OFF	OFF
50	**ON**	OFF	OFF	OFF	OFF	OFF
60	OFF	OFF	OFF	OFF	OFF	OFF



Local and Remote Key Switch Test

Local and remote stations are provided as a tool for use during system test and maintenance. Each station type operate identical of each other except the local station has a higher control priority to the remote stations. Use the local and remote key switch stations to **simulate** the loss of normal power and to test the system's transfer of emergency lighting loads from the normal power source to the emergency power source if stable emergency power is present.

Step 1: Insert the key into the local key switch station on the front of the ELTS2 unit or the remote station.

CAUTION: *It is important to understand that use of the local and remote key switch stations switched to emergency power are only a **simulation** of normal power loss. To return the unit to normal operating mode you must switch the key switch to normal power. Once switched to normal power, if normal power is present, the lighting loads will switch to operate under normal source power and the **Normal Mode indicator** will light. The Emergency Mode indicator will deactivate.*

Step 2: Turn the key to emergency power.

- The red Emergency Mode LED will light and all emergency lighting loads will transfer to emergency power and illuminate to full bright.

Note: *There will be a short delay between the transfer of normal power to emergency power. This delay is user adjustable on dip switches and allows the user to delay the transfer for a period of time when the emergency source is on and stable.* *See "Normal to Emergency Transfer Delay" on page 29.*

- The key switch is momentary and returns to Auto when released. Emergency Mode is still the forced mode of operation and will remain such until the key switch is forced to normal power again.

Step 3: Turn the key to the normal power. The green Normal Mode LED will light. All emergency lighting loads will transfer to normal power and normal operation resumes.

Note: *There will be a short delay between the transfer of emergency power to normal power. This delay is user adjustable on dip switches and allows the user to delay the transfer for a period of time when the normal source is on and stable.* *See "Emergency to Normal Transfer Delay" on page 29.*

- The key switch is momentary and returns to Auto when released. Normal operation resumes.

Fire Alarm Test

Test the fire alarm contact input:

Step 1: Activate the fire alarm.

- The Normal Mode indicator on the local station of the ELTS2 will deactivate.
- The ELTS2 switches to emergency power and the Fire Alarm LED and the Emergency Mode LED illuminate.
- All connected lighting loads illuminate to full bright.

Note: *There will be a short delay between the transfer of normal power to emergency power. This delay is user adjustable on dip switches and allows the user to delay the transfer for a period of time when the emergency source is on and stable.* *See "Normal to Emergency Transfer Delay" on page 29.*

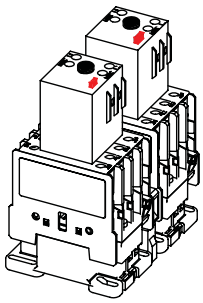
Step 2: Reset the fire alarm.

- The Fire Alarm LED and Emergency Power LED on the local station of the ELTS2 will deactivate.
- The ELTS2 switches to normal power and the Mode indicator will illuminate and all connected lighting loads will resume normal operation.

Note: *There will be a short delay between the transfer of emergency power to normal power. This delay is user adjustable on dip switches and allows the user to delay the transfer for a period of time when the normal source is on and stable.* *See "Emergency to Normal Transfer Delay" on page 29.*

Manual Operation

Manual operation is not the preferred method of switching the transfer switches from normal to emergency power and vice-versa. As a last resort, if an electrical short has disabled the control electronics, you have the option of manually switching each of the transfer switches.



For manual operation you must follow the same practice that the ELTS2 follows during automatic operation, this includes break-before-make switching.

Each transfer switch is made of a pair of contactors with a mechanical latch per contactor. Each mechanical latch includes two buttons, one black round button and one red rectangular button. The black button depresses when the contactor is active, the red button releases the contactor.

Step 1: To deactivate an active contactor press the red release button. The contactor will deactivate the power source from the lighting loads.

Step 2: To activate the other side of the transfer switch depress the black button firmly until it catches. If the button will not depress, check that the other contactor has deactivated.

Service

Preventive Maintenance

Regular testing and simple maintenance of your ELTS2 system will result in long service life and reliable performance. *See "Automatic Operation Test" on page 25.* Maintain and post a test and maintenance log near the ELTS2 cabinet.

Replacement Parts

Replacement Fuse

Emergency load output fuses are available from ETC, use part number F106, or purchase the fuses from your local electrical supply house. Use a 20A, 480 VAC Buss SC-20 fuse.

Replacement Door Key

Contact ETC Technical Services or your local ETC Service Center for a replacement door key.

- NEMA 1 Enclosure Type - request ETC Part # HW8152.
- NEMA 4 Enclosure Type - request ETC Part # HW8376.

Replacement Local Station Key

Contact ETC Technical Services or your local ETC Service Center for a replacement local station key. Request ETC Part # S203.

Appendix A

Side Mount Hardware Installation

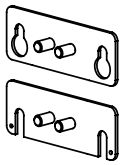
Overview

By default, ETC ships the ELTS2 NEMA 1 type unit with top and bottom mounting brackets installed. This document contains instructions for installing the optional side mounting hardware kit (ETC part number 1096K1001) to the ELTS2 cabinet.

Procedure

Step 1: Locate and remove the existing top / bottom mounting brackets and hardware.

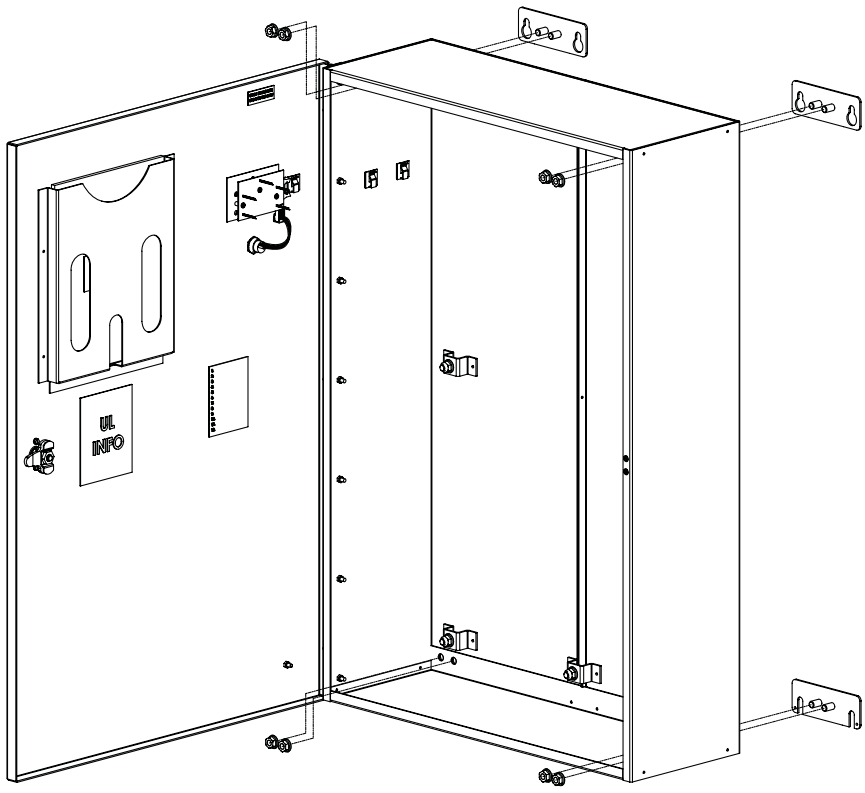
Step 2: Locate the new side mounting hardware kit which includes four brackets, two of each kind pictured in the graphic below.



- The brackets with full keyholes mount to the top sides of the cabinet.
- The brackets with slotted keyholes mount to the bottom sides of the cabinet.

Step 3: Use the nuts previously removed in Step 1 to secure the new brackets onto the enclosure as indicated in the graphic below.

The subpanel has been removed from this graphic for clarity of hardware installation.



Step 4: Tighten the nuts onto the threads for a secure installation.

Reference the *ELTS2 Installation and User Operation Manual* (1096M1200) for detailed instructions to install your ELTS2.

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Web: www.etcconnect.com ■ ■ Product information and specifications subject to change.
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