Powering Business Worldwide

O & M Manual for the RLC1 Automatic Transfer Switch

Instructional Booklet

⚠ WARNING

READ AND UNDERSTAND THE INSTRUCTIONS CONTAINED HEREINAFTER BEFORE ATTEMPTING TO UNPACK, ASSEMBLE, OPERATE, OR MAINTAIN THIS EQUIPMENT.

HAZARDOUS VOLTAGES ARE PRESENT INSIDE TRANSFER SWITCH ENCLOSURES THAT CAN CAUSE DEATH OR SEVERE PERSONAL INJURY. FOLLOW PROPER INSTALLATION, OPERATION, AND MAINTENANCE PROCEDURES TO AVOID THESE VOLTAGES.

THE TRANSFER SWITCH EQUIPMENT COVERED BY THIS INSTRUCTION BOOK IS DESIGNED AND TESTED TO OPERATE WITHIN ITS NAMEPLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS MAY CAUSE THE EQUIPMENT TO FAIL RESULTING IN DEATH, SERIOUS BODILY INJURY, AND/OR PROPERTY DAMAGE. ALL RESPONSIBLE PERSONNEL SHOULD LOCATE THE DOOR MOUNTED EQUIPMENT NAMEPLATE AND BE FAMILIAR WITH THE INFORMATION PROVIDED ON THE NAMEPLATE. A TYPICAL EQUIPMENT NAMEPLATE IS SHOWN IN FIGURE 1.

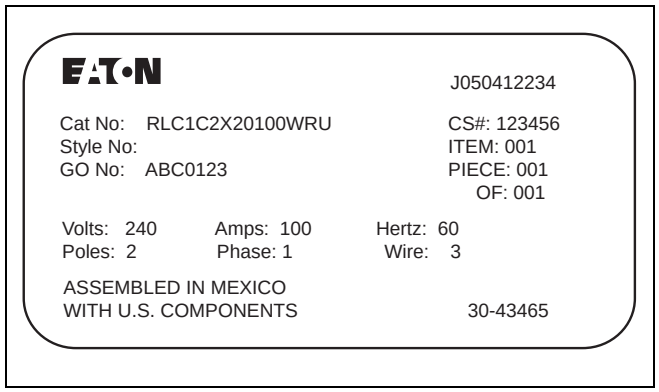

Figure 1. Typical Automatic Transfer Switch Equipment Nameplate.

All possible contingencies that may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is required by the purchaser regarding a particular installation, application, or maintenance activity, please contact an authorized Eaton sales representative or the installing contractor.

SECTION 1: INTRODUCTION

1.1 Preliminary Comments and Safety Precautions

This technical document is intended to cover most aspects associated with the installation, application, operation, and maintenance of the Automatic Transfer Switch (ATS). It is provided as a guide for authorized and qualified personnel only. Please refer to the specific WARNING and CAUTION in Section 1.1.2 before proceeding. If further information is required by the purchaser regarding a particular installation, application, or maintenance activity, please contact an authorized Eaton sales representative or the installing contractor.

1.1.1 Warranty and Liability Information

No warranties, expressed or implied, including warranties of fitness for a particular purpose of merchantability, or warranties arising from course of dealing or usage of trade, are made regarding the information, recommendations, and descriptions contained herein. In no event will Eaton be responsible to the purchaser or user in contract, in tort (including negligence), strict liability, or otherwise for any special, indirect, incidental or consequential damage, or loss whatsoever, including but not limited to damage or loss of use of equipment, plant or power system, cost of capital, loss of power, additional expenses in the use of existing power facilities, or claims against the purchaser or user by its customers resulting from the use of the information and descriptions contained herein.

1.1.2 Safety Precautions

All safety codes, standards, and/or regulations must be strictly observed in the installation, application, operation, and maintenance of this device.

⚠ WARNING

THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS DOCUMENT ARE FOR PERSONAL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL HEADING IS SHOWN ABOVE TO FAMILIARIZE PERSONNEL WITH THE STYLE OF PRESENTATION. THIS WILL HELP TO ENSURE THAT PERSONNEL ARE ALERT TO WARNINGS, WHICH APPEAR THROUGHOUT THE DOCUMENT. IN ADDITION, CAUTIONS ARE ALL UPPER CASE AND BOLDFACE.

⚠ CAUTION

READ AND UNDERSTAND THE MATERIAL PRESENTED IN THIS DOCUMENT BEFORE ATTEMPTING INSTALLATION, APPLICATION, OPERATION, OR MAINTENANCE OF THE EQUIPMENT. IN ADDITION, ONLY QUALIFIED PERSONS SHOULD BE PERMITTED TO PERFORM ANY WORK ASSOCIATED WITH THE EQUIPMENT. ANY WIRING INSTRUCTIONS PRESENTED IN THIS DOCUMENT MUST BE FOLLOWED PRECISELY. FAILURE TO DO SO COULD CAUSE PERMANENT EQUIPMENT DAMAGE.

1.2 General Information

ATSs are used to protect critical electrical loads against loss of power. The load's utility power source is backed up by a generator power source. An ATS is connected to both the utility and generator power sources and supplies the load with power from one of these two sources. In the event that power is lost from the utility power source, the ATS transfers the load to the generator power source. Once the utility power is restored, the load is automatically transferred back to the utility power source (Figure 2).

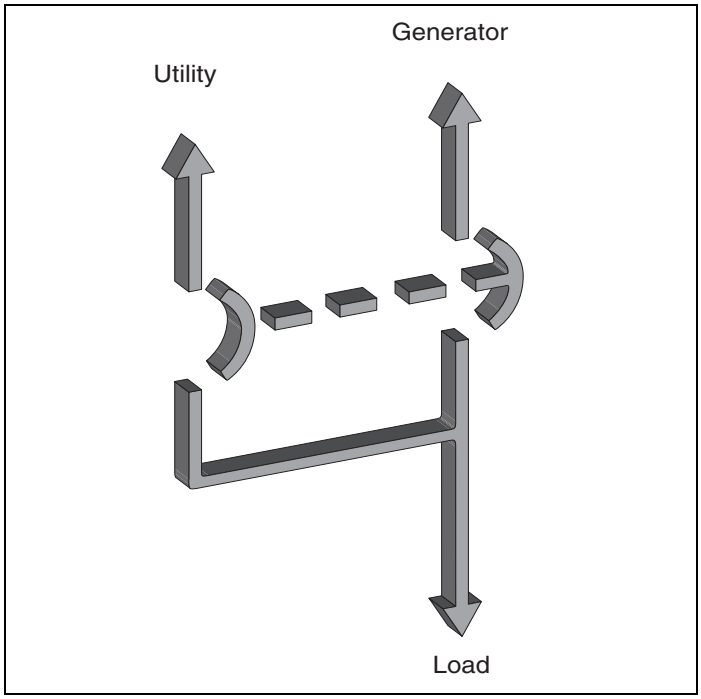

Figure 2. Typical Load Transfer Switch (Contactor) Schematic.

An intelligence system initiates the transfer when the utility power source fails or falls below a preset voltage. An engine start is then initiated and the ATS transfers to the generator power source when sufficient generator voltage is available. When the utility power source is restored, the ATS automatically transfers back and the generator will shut down after a time delay. In the event the utility power source fails and the generator power source does not appear, the ATS remains connected to the utility power source until the generator power source does appear. Conversely, if connected to the generator power source and the generator power source fails while the utility power source is still unavailable, the ATS remains connected to the generator power source.

ATSs automatically perform the transfer function, and include three basic elements.

1. Main contacts to connect and disconnect the load to and from the source of power.
2. Solenoids to make the transfer of the main contacts from source to source.
3. Intelligence/supervisory circuits to constantly monitor the condition of the power sources and thus provide the intelligence necessary for the switch and related circuit operation.

1.2.1 Design Configuration

The Eaton Residential ATS is a rugged, compact design that utilizes contactors to transfer essential loads from one power source to another (see Figure 3). The Residential ATS contains suitable mechanical and electrical interlock switches to eliminate the possibility of connecting the utility service to the generator output. In addition, a manual override lever is provided for the transfer function

DO NOT MANUALLY TRANSFER THE SWITCH WHILE UNDER LOAD.

Figure 3. RLC1 ATS (100 A).

1.2.2 Optional Service Entrance Feature

The ATS can be ordered in either a standard or service entrance (SE) configuration. When ordered as an SE, integral overcurrent protection is built into the switch. Therefore, the ATS can be installed at the point of service entrance without the need for an upstream disconnect device. Also the switch comes with a generator breaker on the generator (source-2) side of the contactor (see Figure 5). The generator breaker can be switched OFF to prevent the transfer of power from the generator source to the load, if the service entrance breaker is switched OFF manually. (not an overload condition)

Figure 4. An RLC1 200 A Standard ATS.

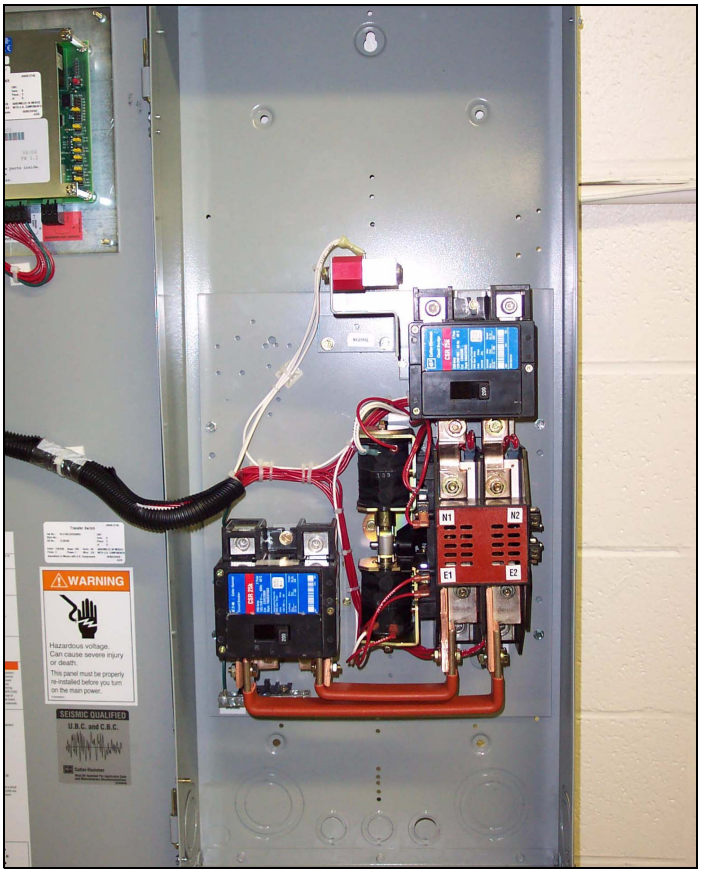

Figure 5. An RLC1 200 A SE ATS.

The benefits of the SE configuration are:

- Combined service disconnect and over-current protection in the ATS reduces the overall equipment and installation costs.
- Fewer components and power connections reduce maintenance requirements.

1.2.3 Optional Load Shed

Four sets of contacts are available and can be used to control large connected loads on the generator (i.e. air conditioners, hot tubs, etc.)

1.3 Transfer Switch Catalog Number Identification

ATS equipment catalog numbers provide a significant amount of relevant information pertaining to a specific piece of equipment. The Catalog Number Identification Table (see Table 1) provides the required interpretation information. An example is offered to initially simplify the process.

Example: Catalog Number (circled numbers correspond to position headings in Table 1).

The catalog number RLCMSXJ20100WRU describes an ATS.

①to②	③	④	⑤to⑥	⑦	⑧	⑨to⑫	⑬	⑭	⑮
RL	C	1	C 2	X	2	0100	W	R	U

The intelligence represented by the control panel is microprocessor logic. The frame is for 100A service, and the switch is a 2-pole, fixed mount contactor. The continuous current rating of this equipment is 100A and applicable at 240 Vac, 60 Hz. The ATS equipment is enclosed in a NEMA 3R enclosure and listed for UL applications.

1.4 Environmental and Operational Conditions

Normally, an ATS is applied indoors in an electrical equipment room. It can also be used for normal outdoor applications (with a NEMA 3R enclosure) where the equipment is subject to falling rain, freezing temperatures, and 95% humidity (non-condensing). The ambient temperature range for operation is between -20 and 70°C (-4 and 158°F).

1.5 Glossary

With respect to their use within this document and as they relate to transfer switch and controller operation, the following terminology is defined.

Available
A source is defined as “available” when it is within its undervoltage/underfrequency/overfrequency setpoint ranges for the nominal voltage and frequency setting.

Connected
Connected is defined as when the input is shorted by an external contact or connection.

Failed or Fails
A source is defined as “failed” when it is outside of the applicable voltage and frequency setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the time delay emergency fail (TDEF) time delays expires.

Failsafe
Failsafe is a feature that prevents disconnection from the only available power source and also forces a transfer or re-transfer operation to the only available power source.

Re-Transfer
Re-transfer is defined as a change of the load connection from the Generator to the Utility.

Utility
Utility is the primary source (normal source, normal power source, or normal).

Generator
Generator is the secondary source (generator emergency source, emergency power source, emergency, standby, or backup source).

Utility: Failed or Fails
Utility is defined as "failed" when it is outside of its undervoltage setpoint ranges for the nominal voltage and frequency setting.

Generator: Failed or Fails
Generator is defined as "failed" when it is outside of its undervoltage/underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the Time Delay Emergency Fail (TDEF) time delay expires.

Transfer

Transfer is defined as a change of the load connection from the Utility to the Generator power source.

Unconnected
Unconnected is defined as when the input is not shorted by an external contact or connection.

Table 1. ATS Catalog Number Explanation.

POSITIONS 1-2	POSITION 3	POSITION 4	POSITION 5-6	POSITION 7
Basic Device	Switching Device	Control Panel	Switch Position	Service Entrance
Residential/Light Commercial RL	Contactor C	ATC-100 1	2 position C2	Standard X Service Entrance E

POSITION 8	POSITIONS 9-12	POSITION 13	POSITION 14	POSITION 15
Number of Poles	Ampere Rating	Voltage/Frequency	Enclosure	Listing
Two 2	100 A – 0100 200 A – 0200	240 Vac/60 Hz W 208 Vac/60 Hz B	NEMA 1 S NEMA 3R R	UL Listed U

SECTION 2: RECEIVING, HANDLING, AND STORAGE

2.1 Receiving

Every effort is made to ensure that the ATS equipment arrives at its destination undamaged and ready for installation. The packing is designed to protect the internal components as well as the enclosure. Care should be exercised, however, to protect the equipment from impact at all times. Do not remove the protective packaging until the equipment is at the installation site and ready to be installed.

When the ATS equipment reaches its destination, the customer should inspect the shipping container for any obvious signs of rough handling and/or external damage that occurred during transportation. Record any external and internal damage for reporting to the transportation carrier and to the Eaton sales representative, once a thorough inspection is complete. All claims should be as specific as possible and include the Shop Order and General Order numbers.

A shipping label affixed to the shipping container includes a variety of equipment and customer information, such as General Order and catalog numbers. Make certain that this information matches the other shipping paper information.

Each ATS enclosure is packaged in its own box. Do not discard the packing material until the equipment is ready for installation.

Once the packaging is removed from the shipment, the enclosure door can be opened. A plastic bag of documents will be found in the enclosure. Important documents, such as wiring diagrams and appropriate instruction leaflets are enclosed within the bag and should be filed in a safe place.

2.2 Handling

As previously mentioned, ATS equipment is packaged in its own box. Protect the equipment from impact at all times and do not double stack. Once the equipment is at the installation site and ready to be installed, the packaging material can be removed. Refer to Section 4 of this manual for specific installation instructions.

2.3 Storage

Although well packaged, this equipment is not suitable for outdoor storage. The equipment warranty will not be applicable if there is evidence of outdoor storage. If the equipment is to be stored indoors for any period of time, it should be stored with its protective packaging material in place. Protect the equipment at all times from excessive moisture, construction dirt, corrosive conditions, and other contaminants. It is strongly suggested that the package-protected equipment be stored in a climate-controlled environment of -20 to 65°C (-4 to 149°F), with a relative humidity of 80% or less. Do not, under any circumstance, stack other equipment on top of an ATS equipment enclosure, whether packaged or not.

SECTION 3: EQUIPMENT DESCRIPTION

3.1 Introduction

The Eaton Residential ATS is assembled and tested at the factory. It is designed to be used in conjunction with standby power distribution equipment to provide an alternate source of power to critical circuits in the event that the primary power source is interrupted.

This ATS monitors both utility and generator power sources and automatically transfers critical load circuits between the two sources, depending on which source is available. The utility power source is preferred and will remain connected to the switch if it is available.

3.2 Power Panel

The power panel is used for making load, power, and neutral connections. The power contactor is mounted on a steel baseplate (Figure 6).

3.2.1 Main Contacts

This ATS incorporates a power contactor. The main contacts connect and disconnect the load to and from the different power sources. The power contactor is mechanically and electrically interlocked to prevent the two sets of main contacts from being closed simultaneously.

Figure 6. Typical Power Panel for 100 A Model.

3.3 ATC-100 Logic Panel

The ATC-100 is a microprocessor-based transfer switch logic control package. The hardware and software of the controller contain the intelligence/supervisory circuits that constantly monitor the condition of the power sources. It provides the intelligence necessary for the operation of the ATS (Figure 7).

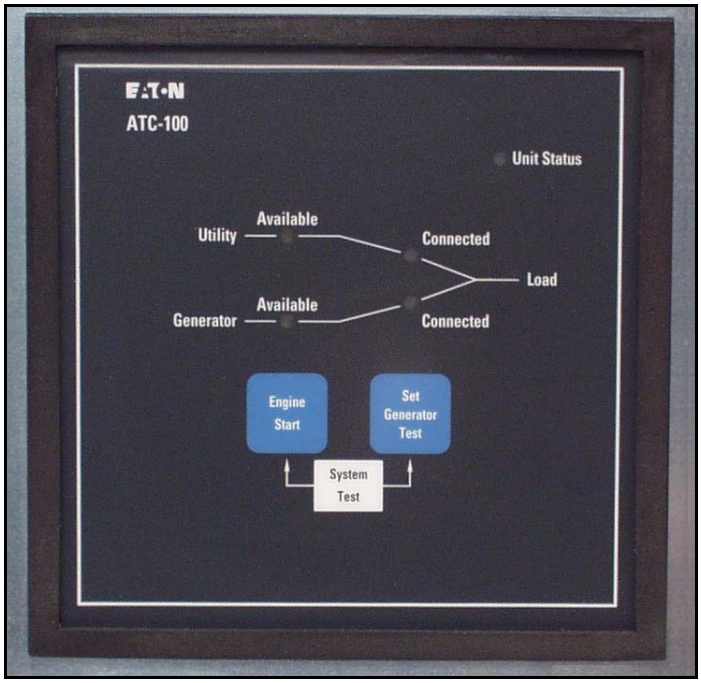

Figure 7. ATC-100 Logic Control Panel.

The ATC-100 controller has an operating temperature of -20 to 70°C (-4 to 158°F).

The controller circuit board is protected by an insulating conformal coating.

The specifications, under normal operating conditions, are as follows:

- Tolerance for voltage sensing function: ±1% of full scale
- Tolerance for frequency sensing function: ±0.3 Hz of setting

3.4 RLC1 ATS Features

A variety of standard and optional features are available for Eaton ATSs. **All features or combinations of features may not be available on specific ATSs**. All features and/or accessories are Underwriters Laboratories (UL) listed unless noted.

3.4.1 Standard Features

The following is a list of the standard features for the ATC-100 Controlled ATS.

1. Time Delay Normal to Emergency (TDNE)

This feature provides a time delay when transferring from the Utility to the Generator power source. Timing begins when the Generator becomes available. It permits controlled transfer of the load circuit to the Generator.

Jumper selectable at 2 seconds or 15 seconds.

2. Time Delay on Engine Starting (TDES)

This feature provides a time delay of the signal to initiate the engine/generator start cycle in order to override momentary power outages or voltage fluctuations of Utility.

Fixed at 3 Seconds.

3. Time Delay Emergency to Normal (TDEN)

This feature provides a time delay of the re-transfer operation to permit stabilization of Utility. Timing begins when the Utility becomes available. If the Generator fails during timing, then re-transfer is immediate overriding the time delay.

Fixed at 5 Minutes.

4. Time Delay for Engine Cool-down (TDEC)

This feature provides a time delay of the signal to initiate the engine/generator stop cycle after the re-transfer operation. This allows the engine/generator to cool down by running unloaded. Timing begins on completion of the re-transfer cycle.

Fixed at 5 Minutes

5. Generator Monitoring and Protection

This feature provides monitoring and protection based on the Generator voltage and/or frequency setpoints. All feature 5 functions are Failsafe operations.

5J. All Phase Undervoltage and Underfrequency Protection

Undervoltage:
Dropout: 80% of nominal
Pickup: 90% of nominal

Underfrequency:
Dropout: 90% of nominal
Pickup: 95% of nominal

5N. All Phase Overfrequency

Overfrequency:
Dropout: 115% of nominal
Pickup: 110% of nominal

6. Test Operators

Eaton ATSs are provided with a Test Pushbutton that simulates a loss of the Utility power source as standard (Feature 6B). All programmed time delays (TDNE, TDEN, etc.) will be performed as part of the Test. Engine run time of the Test is equal to the Generator Test (Feature 23) programmed setpoint. All Tests are Failsafe protected.

6B. Test Pushbutton

Programmable setpoints include:

1. Load or No Load Testing, or Off
2. Engine run time equal to the Generator Test (Feature 23) setting

7. Time Delay Emergency Fail (TDEF)

This feature provides a time delay that prevents a connected Generator power source from being declared "Failed" in order to override momentary generator fluctuations. If the Generator power source remains in the failed state then, 0.5 seconds after the TDEF timer expires, the transfer switch will proceed with the programmed sequence for retransfer.

Fixed at 6 Seconds

12. Power Source Annunciation

This feature provides LEDs to give switch position and power source availability indications.

Switch Position

Provides LEDs to indicate the switch position

12C. Utility - Source Connected

This feature provides a green LED that, when lit, indicates the load is connected to the Utility.

12D. Generator - Source Connected

This feature provides a red LED that, when lit, indicates the load is connected to Generator.

Power Source Availability

Provides LEDs to indicate if a power source is available. LEDs may be integral or separate from the controller.

12G. Utility - Available

This feature provides a white LED that, when lit, indicates the Utility is available.

12H. Generator - Available

This feature provides an amber LED that, when lit, indicates the generator is available.

23. Generator Test

This feature provides a means for automatic testing of the engine generator set or standby power system. All programmed time delays will be performed during plant exerciser operations.

23A. Generator Test Selectable – Off 7/14/28 Day Interval

This feature provides for automatic test operation of the generator. Available test cycles are 7, 14, or 28 days with a 15-minute duration.

Programmable setpoints allow for selection of three test cycles:

- Generator Start/Run Only (No Load);
- Generator Test with Load Transfer; or
- Disabled

This is a "Failsafe" operation.

26. Utility - Monitoring and Protection

This feature provides Utility monitoring and protection functions. If the Utility power supply fails, then the ATC 100 will begin the sequence of operations necessary to transfer the load circuit to the Generator power supply. All Feature 26 monitoring and protection functions are Failsafe operations.

26P. All Phase Undervoltage Protection

Adjustable Undervoltage:
Dropout: 80% of nominal
Pickup: 90% of nominal

3.4.2 Optional Features

The following is a list of the optional features for the ATC-100 Controlled ATS. **All features or combinations of features may not be available on specific ATSs**

14. Relay Auxiliary Contacts

14G. Utility Present: Provides two (2) normally open and two (2) normally closed contacts. The relay is energized when the Utility is available.

14H. Generator Present: Provides two (2) normally open and two (2) normally closed contacts. The relay is energized when the Generator is available.

15. Switch Position Indication Contact

This feature provides a contact that indicates if the power switching device is in the "Open" or "Closed" position.

15E. Utility Position Indication Contact

This feature provides 1 dry form "C" contact that indicates the position of the Utility power switching device.

15F. Generator Position Indication Contact

This feature provides 1 dry form "C" contact that indicates the position of the Generator power switching device.

38. Stainless Steel Logic Cover

38C. SS ATC-100 Cover

This feature provides a pad-lockable stainless steel cover for the ATC-100 Controller.

3.5 Optional Features

The following is a list of optional features for the ATS.

15. Switch Position Indication Contact

Provides a contact that indicates if the power switching device is in the "Open" or "Closed" position.

15M. Load Shed

Four sets of contacts are available and can be used to control large connected loads on the generator (i.e. air conditioners, hot tubs, etc.).

16. Integral Overcurrent Protection

Provides thermal-magnetic overcurrent protection integral to the power switching device(s). All Feature 16 options include a "Lockout" function. If the power switching breaker trips on an overcurrent condition then "Lockout" is displayed on the Automatic Transfer Controller display and automatic operation is prevented until the appropriate source is manually reset. On non-automatic switches, a blue light is supplied to indicate the "Lockout".

16S. External Overcurrent Protection on the Utility Power Switching Device

Provides overcurrent protection on the Utility power switching device.

26. Utility - Monitoring and Protection

Provides Utility monitoring and protection functions. If the Utility fails then the Automatic Transfer Controller will begin the sequence of operations necessary to transfer the load to the Generator. All Feature 26 monitoring and protection functions are "Failsafe" operations.

26M. Generator Utility Sensing

Allows for the switch to operate with generators that have internal utility sensing. This option comes as a kit that needs to be field installed.

32G. Time Delay Neutral (TDN)

This feature provides a time delay in the neutral position during the transfer and re-transfer operations during which both the Utility source and the Generator source are disconnected from the load circuit. TDN cannot be implemented on a transfer switch using a 2-position contactor.

Jumper selectable at Disable (0 seconds) or Enable (2 seconds).

37A. Service Equipment Rated Transfer Switch

This feature provides the label "Suitable for use as Service Equipment" and the features necessary to meet the requirements for the label.

3.6 Standards

Eaton ATS equipment, enclosed in NEMA 3R enclosures, are listed for application by UL. In addition, Eaton ATSs are listed in File E38116 by Underwriters Laboratories, Inc. under Standard UL 1008. This standard covers the requirements for ATSs intended for use in ordinary locations to provide lighting and power as follows:

a. In standby systems, in accordance with article 702 of the National Electrical Code.

Eaton ATSs are available to meet NFPA 110 for standby power systems.

Eaton ATS equipment are listed for application by CSA. In addition, Eaton ATSs are listed in the Legacy File LR96245 Master Contract 163545 by Canadian Standards Association under Standard 22.2 #178-1978

SECTION 4: INSTALLATION AND WIRING

4.1 General

Eaton ATSs are factory wired and tested. Installation requires solidly mounting the enclosed unit and connecting the power cables and the auxiliary pilot circuits. Physical mounting procedures and power cable connections are covered in this section.

Once a transfer switch is properly installed and wired, it should be mechanically and electrically checked for proper installation and operation. The procedures for these initial mechanical and electrical checks are outlined in Section 5 of this manual.

BE CERTAIN THAT THE DOOR IS PROPERLY INSTALLED BEFORE THE TRANSFER SWITCH EQUIPMENT IS PUT INTO SERVICE. THE DOOR PROVIDES PROTECTION FROM DANGEROUS VOLTAGES AT THE LINE AND LOAD TERMINALS WHEN THE EQUIPMENT IS IN OPERATION. FAILURE TO DO SO COULD RESULT IN PERSONAL INJURY OR DEATH.

4.2 Mounting Location

Choose a location that offers a flat, rigid mounting surface capable of supporting the weight of the enclosed ATS equipment (see Figure 8, 100 A and 200 A Standard, Figure 9, 100 A SE, Figure 10, 200 A SE). Protect the transfer switch at all times against excessive moisture, dust, dirt, lint, and corrosive vapors.

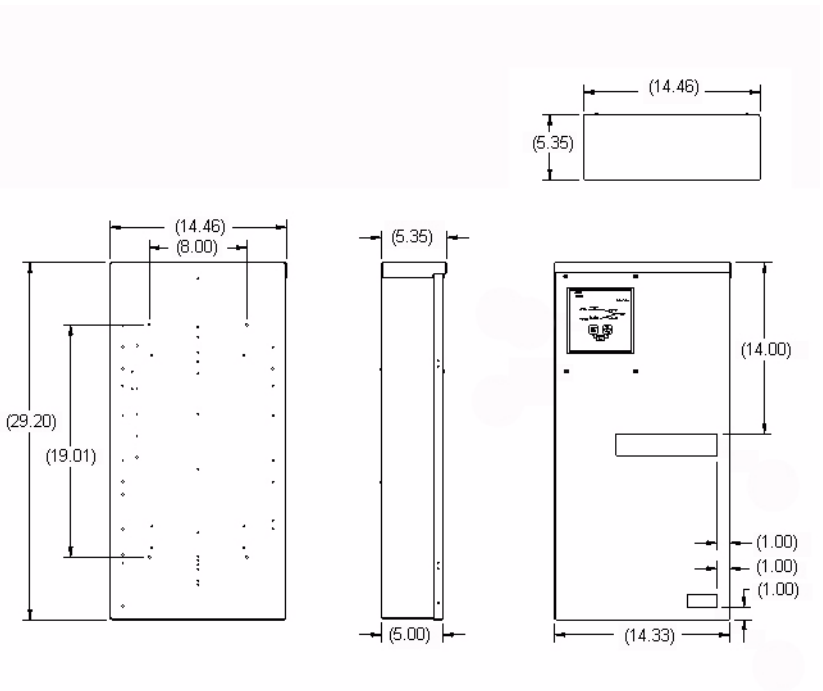

Figure 8. Dimensions and Plan View of a Standard RLC1 ATS (in.) (100 A and 200 A).

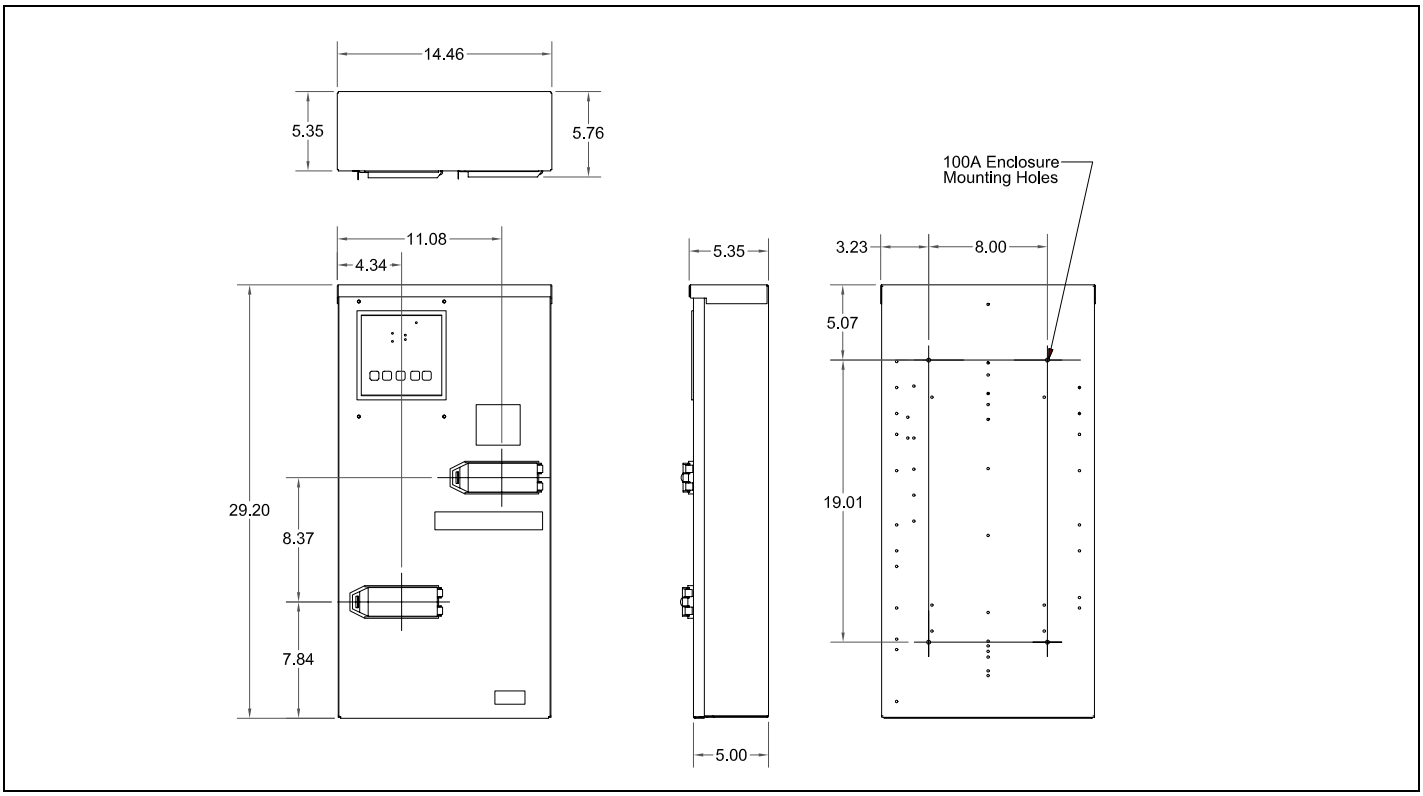

Figure 9. Dimensions and Plan View of SE RLC1 ATS (in.) (100 A).

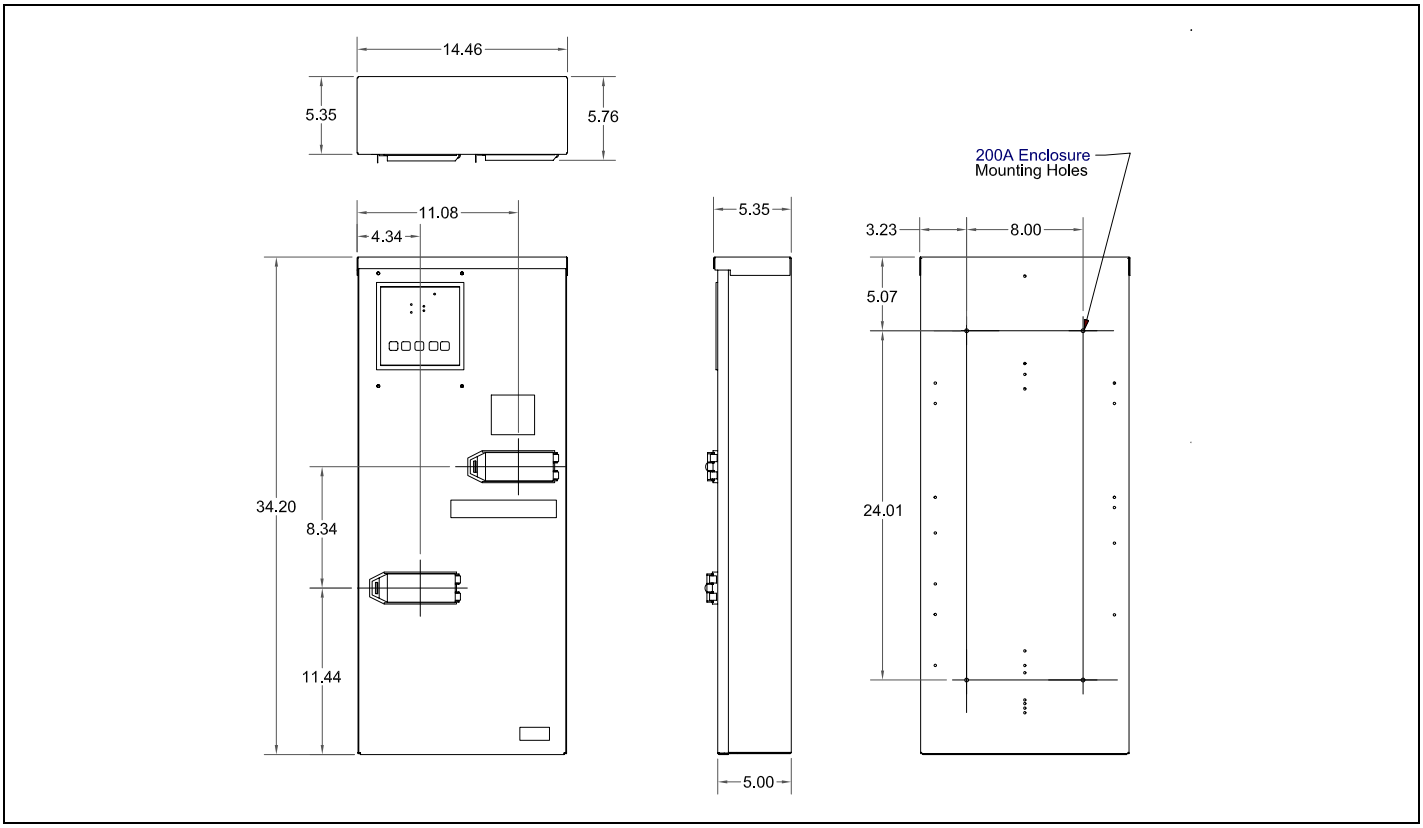

Figure 10. Dimensions and Plan View of a SE RLC1 ATS (in.) (200 A).

Check to ensure there are no pipes, wires, or other mounting hazards in the immediate mounting area that could create a problem.

Carefully remove all packing material from the ATS enclosure at the installation site. Even though an equipment inspection was performed when the equipment was received, make another careful inspection of the enclosure and the ATS mechanism as the packing material is removed and the enclosure readied for mounting. Be especially alert for distorted metal, loose wires, or damaged components.

4.3 Mounting Procedure

EXTREME CARE SHOULD BE TAKEN TO PROTECT THE ATS FROM DRILL CHIPS, FILINGS, AND OTHER CONTAMINANTS WHEN MAKING THE CABLE ENTRY HOLES AND MOUNTING THE ENCLOSURE TO PREVENT COMPONENT DAMAGE OR A FUTURE MALFUNCTION.

NOTICE

THE INSTALLATION MUST FULLY COMPLY WITH ALL APPLICABLE CODES, STANDARDS, AND REGULATIONS.

With the enclosed ATS equipment unpacked and ready for mounting, proceed with the following steps.

Step 1: Depress the padlockable catch at the bottom of the door and slide the door downward (see Figure 11). Open the door.

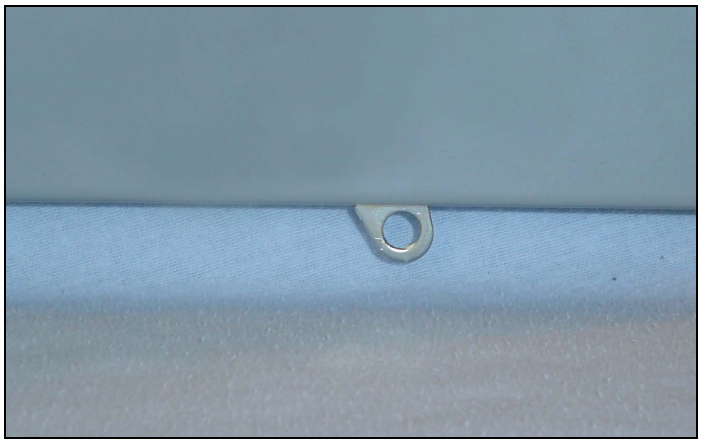

Figure 11. Location of the Door Latch.

Step 2: Use the knockouts for cable entry and control wiring.

NOTICE

FOR CONTROL WIRING (GENERATOR ENGINE START WIRING), THE WIRES MUST BE ISOLATED FROM BOTH THE UTILITY AND GENERATOR POWER SOURCE CABLES.

Step 3: Mount the switch to a rigid structure as close to the electrical loads as possible.

4.4 Power Cable Connection

WARNING

POWER CONDUCTORS MAY HAVE VOLTAGE PRESENT THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. DE-ENERGIZE ALL POWER OR CONTROL CIRCUIT CONDUCTORS TO BE CONNECTED TO THE ATS EQUIPMENT BEFORE BEGINNING TO WORK WITH THE CONDUCTORS AND/OR TERMINATING THEM TO THE EQUIPMENT

CAUTION

TO HELP PREVENT COMPONENT DAMAGE OR FUTURE MALFUNCTIONS, USE EXTREME CARE TO KEEP CONTAMINANTS OUT OF THE ATS EQUIPMENT WHEN MAKING THE POWER CABLE CONNECTIONS.

Test all power cables prior to connection to the unit to ensure that the conductors or cable insulation has not been damaged while being pulled into position.

Power cables are to be connected to solderless, screw type lugs located on the automatic transfer switching devices. Verify that the lugs supplied will accommodate the power cables being used. Also verify that the cables comply with all local electrical codes. Standard ATS equipment, as supplied from the factory, will accommodate the wire sizes shown in Table 2.

Table 2. Wire Sizes for ATSs.

TRANSFER SWITCH AMP RATING	CONTACTOR WIRE SIZE RANGE	NUMBER OF CABLES PER PHASE
100	#14 – 2/0	1
200	#4 – 300 KCMIL	1

Carefully strip the insulation from the power cables to avoid nicking or ringing of the conductor strands. Prepare the stripped conductor termination end by cleaning it with a wire brush. If aluminum conductors are used, apply an appropriate joint compound to the clean conductor surface area.

CAUTION

IMPROPER POWER CABLE CONNECTIONS CAN CAUSE EXCESSIVE HEAT AND SUBSEQUENT EQUIPMENT FAILURE.

Note: Tighten the cable lugs to the torque identified on the label affixed to the unit's door.

Step 1: Connect cables as follows (see Figures 12 and 13, and Table 2):

- The utility power cables to the utility lugs; or SE breaker if installed
- The generator power cables to the generator lugs or generator breaker lugs (for SE only);
- The customer load cables to the main distribution panel (load) lugs;
- The neutral cables to the neutral bar; and
- The ground wires to the ground bar.

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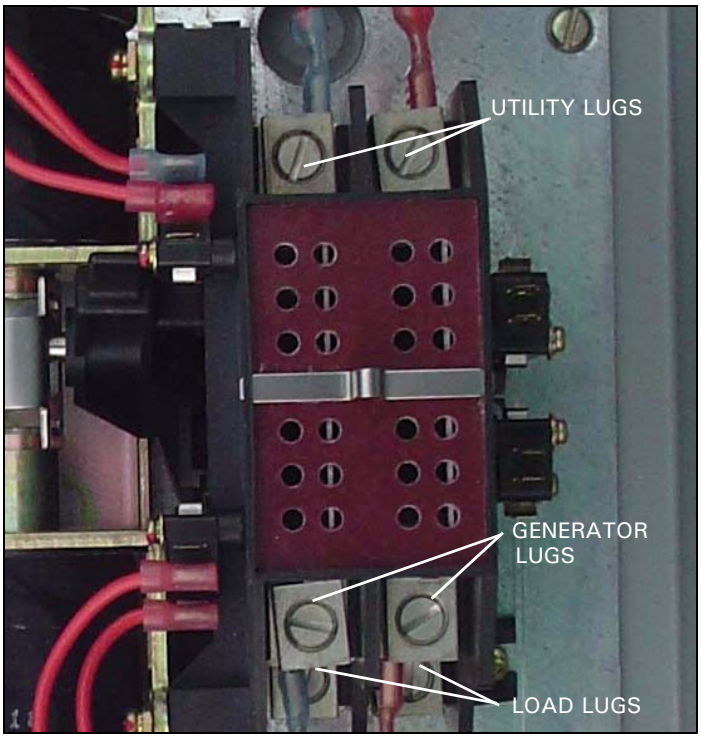

Figure 12. Cable Connection Locations (100 A).

Figure 13. Cable Connection Locations (200 A).

Step 2: The generator start terminals are located at the bottom of the ATC-100 controller and are used when the generator has an automatic start feature (see Figure 14). See Section 4.9 for more detailed information on connecting the generator start cables.

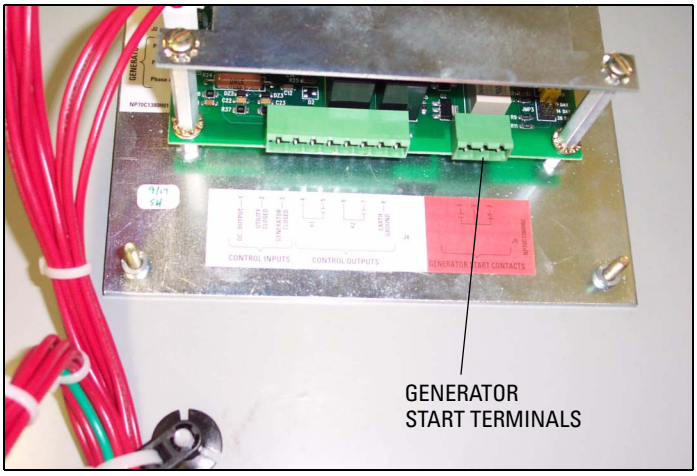

Figure 14. Generator Start Terminals Location.

Step 3: Tighten all cables and wiring to specifications.

4.5 Wiring

⚠ WARNING

POWER CONDUCTORS AND CONTROL WIRING MAY HAVE VOLTAGE PRESENT THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. DE-ENERGIZE ALL POWER OR CONTROL CIRCUIT CONDUCTORS BEFORE BEGINNING TO PERFORM ANY WIRING ACTIVITY TO OR WITHIN THE ATS EQUIPMENT.

⚠ CAUTION

CHECK THE ATS EQUIPMENT NAMEPLATE AND THE ATC-100 FOR RATED VOLTAGE. IT SHOULD BE THE SAME AS THE UTILITY AND GENERATOR LINE VOLTAGES. OPERATING THE EQUIPMENT ON IMPROPER VOLTAGE CAN CAUSE EQUIPMENT DAMAGE.

4.6 Installation

In a typical installation for critical loads (see Figure 15), the ATS (1) and the generator (2) are connected to the power supply. The ATS (1) and emergency distribution panel (3) receive utility power from a dedicated breaker in the utility service panel (4). The ATS and emergency panel receive generator power from the generator (2). Power from the utility feeds the utility panel.

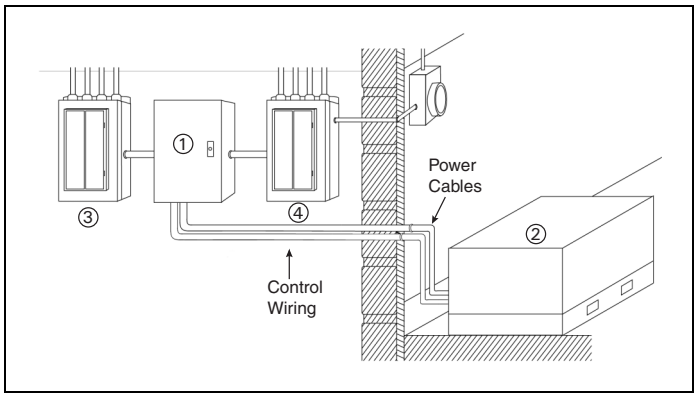

Figure 15. Typical Installation of a Residential or Light Commercial ATS.

The switch (1) and generator (2) are connected to the power supply. The automatic transfer switch is located between the emergency distribution (3) and the utility panel (4).

When the utility power fails, the ATS will sense the failure, the generator will start , and when sufficient generator voltage is available, the ATS will switch all loads to the emergency panel. All emergency loads will receive power from the generator. A line breaker is required between the generator power source and the transfer switch (see Figure 16). When utility power returns, the ATS will switch all power back to the utility panel and the generator will shut down.

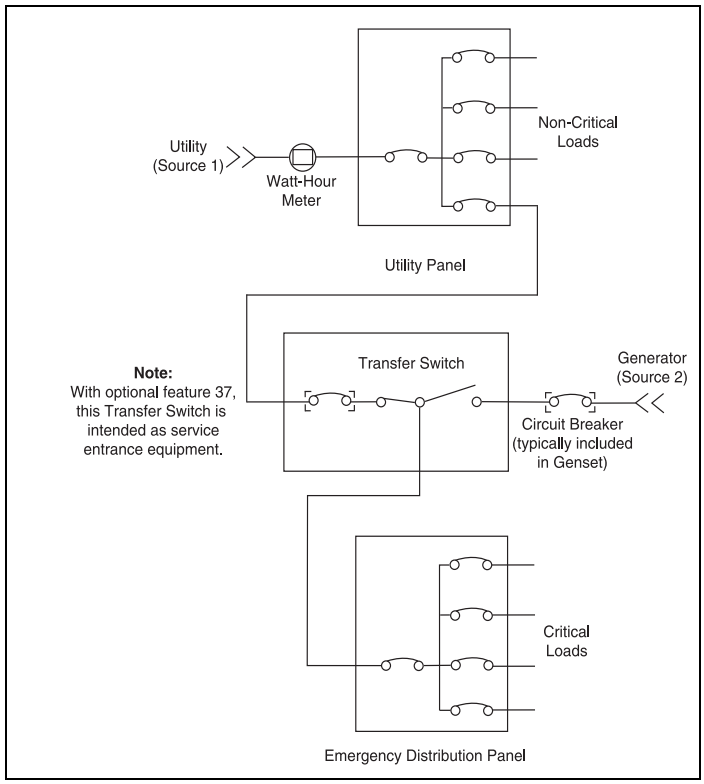

Figure 16. Diagram of a Typical Installation (Critical Loads Only).

In addition, another typical installation for loads can be considered (see Figure 17). Refer to Figure 18 for a loads connection diagram.

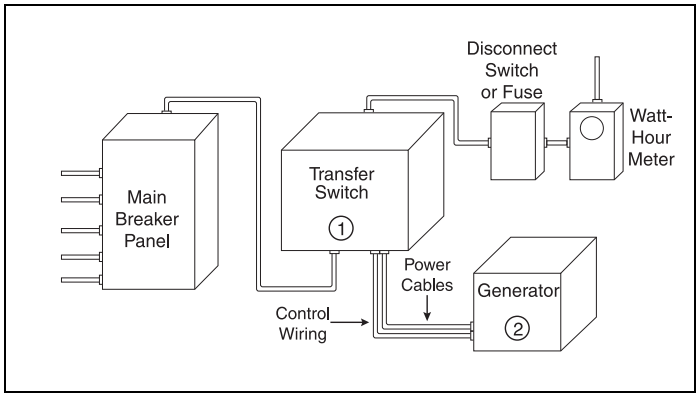

Figure 17. Typical Installation of a Residential or Light Commercial ATS.

The switch (1) and generator (2) are connected to the power supply. The ATS is located between the utility and the loads.

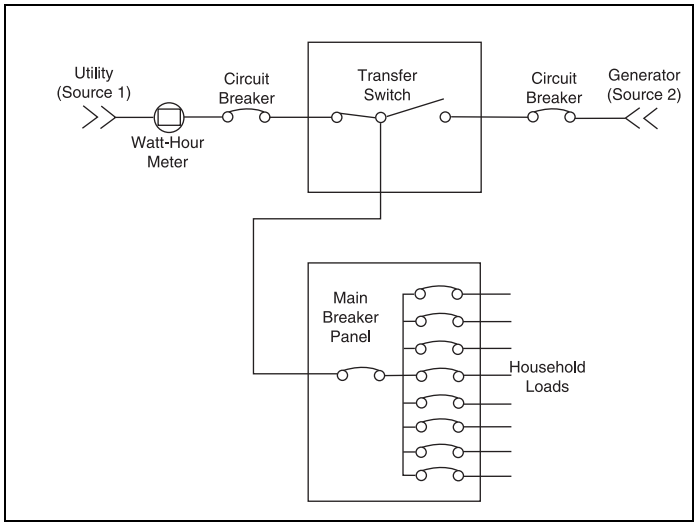

Figure 18. Diagram of a Typical Installation (All Loads).

4.7 Generator Start Connection

The generator start contact connections are located below the ATC-100 Controller.

Note: Prior to making the generator start connection to the ATS, set the generator control selector switch to the OFF position to prevent an unwanted generator start. Control wiring, such as the generator start wires, must be run in a separate conduit from the power cables.

A contact closes or opens between the terminals 1, 2 and 3 on J5 connector of the ATC-100 controller (see fig. 19) when a generator start signal is provided by the ATS logic. The wiring diagram in Section 7 (see Figure 24) provides additional generator start connection information. Use the proper wire size as listed by the generator set (Genset) manufacturer.

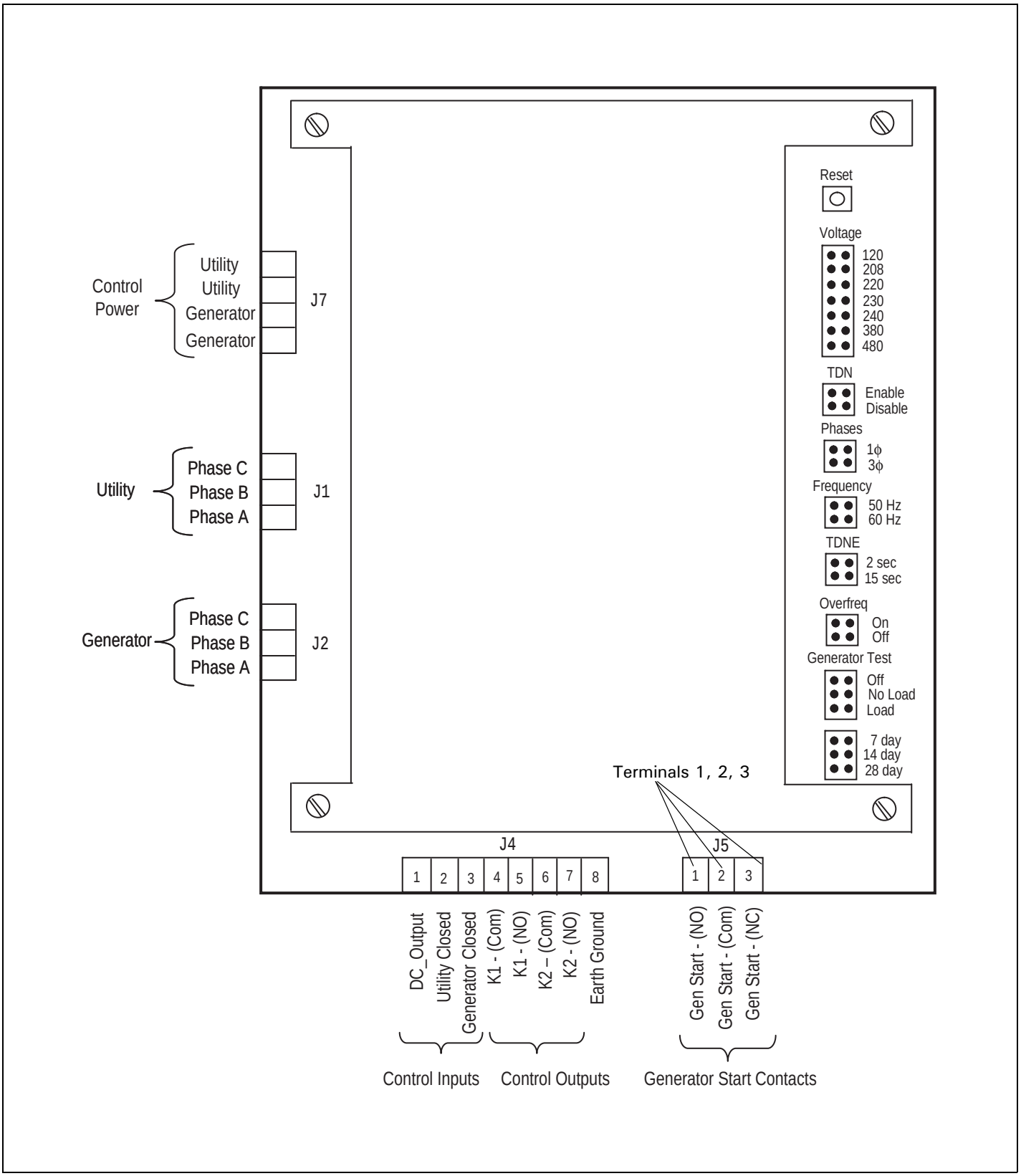

Figure 19. Location of Terminals 1, 2, and 3 on the J-5 Connector ATC-100.

4.8 Preliminary Checks

After the ATS enclosure is installed and power cables are connected to the equipment, thoroughly inspect the unit to ensure that no tools were left inside and that the cabinet is free of debris. If necessary, use a vacuum cleaner to remove any and all construction or installation debris from the equipment.

Read and understand all labels on the equipment. Review and understand the wiring diagrams supplied with the equipment. Note any optional accessories that may have been furnished with this unit and review their operation.

Verify that the phase-to-phase line voltages of both the utility and generator power sources are the same and that they match the rated voltage as indicated on the ATS ratings label.

⚠ CAUTION

SEVERE EQUIPMENT DAMAGE CAN RESULT IF THE UNIT IS NOT APPLIED AT PROPER VOLTAGE. DO NOT ENERGIZE THE EQUIPMENT IF THE SUPPLY VOLTAGES DO NOT MATCH EQUIPMENT RATINGS LABEL.

4.9 Terminal Block Wire Installation and Removal

Proceed with the following steps and associated figures to install or remove terminal block wiring.

Step 1: Figure 20 shows two tension clamp terminal blocks. There is a large one and small one, but the operation is the same for both. A small tool, such as a blade screwdriver, will be pushed into the square hole next to the wire hole and a wire will be inserted into the larger circular hole on the outer edge.

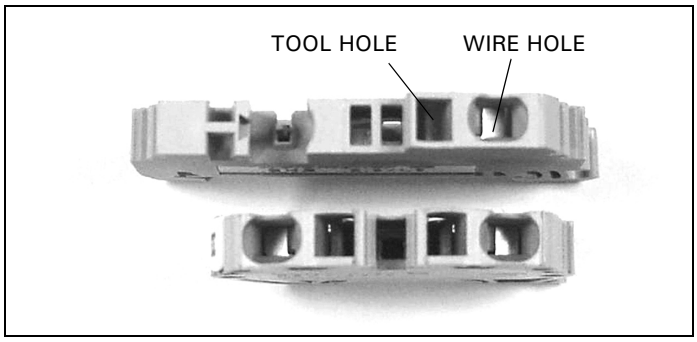

Figure 20. Tension Clamp Terminal Blocks.

Step 2: Begin by inserting a small, blade screwdriver into the square (tool) hole with the flat surface of the screwdriver against the back wall of the hole (see Figure 21). With a little bit of force, push the screwdriver in on a slight angle toward the center of the clamp. Be sure to slide it in until it clicks. You will then see the clamp open in the wire hole.

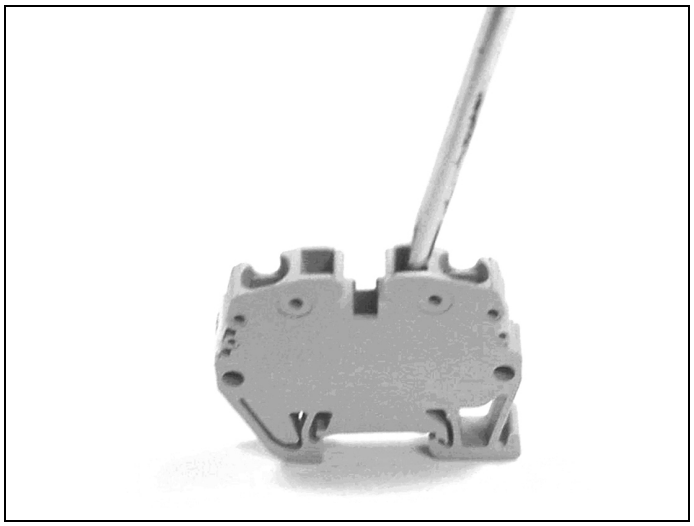

Figure 21. Screwdriver Inserted in the "Tool" Hole.

Step 3: Once the screwdriver is in place, obtain a stripped wire (strip about 0.25 in.) and insert it into the larger circular wire hole. Push the wire in until it can go no further (see Figure 22).

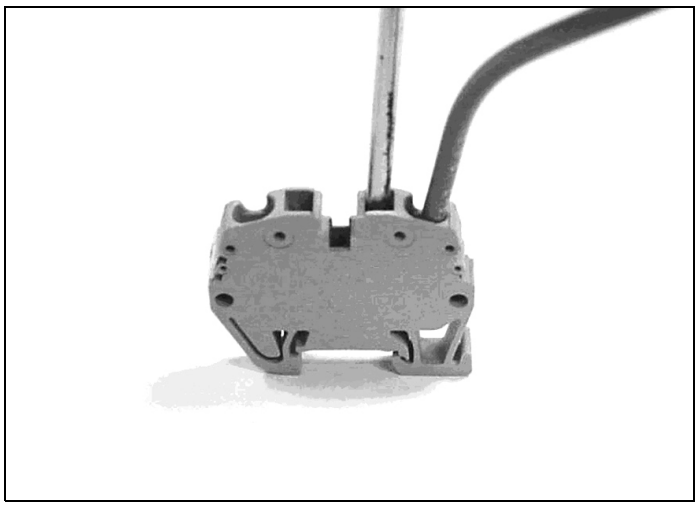

Figure 22. Wire Inserted in the "Wire" Hole.

SECTION 5: FUNCTIONAL TESTING

⚠ WARNING

YOU ARE READY TO ENERGIZE THE EQUIPMENT. VOLTAGES WITHIN THE ENCLOSURE ARE CAPABLE OF CAUSING SEVERE PERSONAL INJURY OR DEATH. USE EXTREME CAUTION TO AVOID CONTACT WITH ENERGIZED EQUIPMENT.

5.1 Preliminary Checks

Step 1: Check all loads connected to the ATS to ensure that they are ready to be energized.

5.2 Energize the Switch

Step 1: Close the upstream utility power source breaker or switch to connect the ATS to the utility power source voltage.

Step 2: If the ATS unit is not already in the UTILITY position, the solenoid will engage and the contactor will automatically switch to the UTILITY position.

Step 3: Using a voltmeter, measure the line-to-line and the line-to-neutral voltages across the utility line terminals to ensure the utility voltage is correct.

⚠ WARNING

CONTACT WITH ENERGIZED COMPONENTS WILL CAUSE ELECTRICAL SHOCK CAPABLE OF PRODUCING SEVERE PERSONAL INJURY OR DEATH. USE EXTREME CAUTION TO AVOID CONTACT WITH ENERGIZED COMPONENTS WHEN USING A METER FOR VOLTAGE CHECKS.

Step 4: Position the generator control selector switch, located on the standby generator, to the AUTOSTART position. (It may also be labeled REMOTE START.)

Step 5: Close the upstream generator power source breaker or switch to connect the ATS to the generator power supply source.

5.3 Operational Checks

Step 1: Open the upstream utility breaker originally closed in Step 1 of Section 5.2.

NOTICE

THIS WILL SIMULATE AN INTERRUPTION OF THE UTILITY POWER SOURCE.

Step 2: After a time delay, the standby generator engine will start.

Step 3: The ATS Time Delay Normal (Utility) to Emergency (Generator) (TDNE) will begin to time after the generator engine begins to run. After time out, the solenoid will engage and the contactor will automatically switch from the UTILITY to the GENERATOR position.

Step 4: Using a voltmeter, measure the line-to-line and line-to-neutral voltages across the generator line terminals to ensure that the generator emergency voltage is correct. If necessary, make adjustments to the voltage regulator on the generator according to the manufacturer's recommendations to correct any voltage deviations. The ATS will only respond to the correct voltage from the generator power source.

Step 5: Close the utility breaker described in Step 1 of Section 5.2.

Step 6: The ATS Time Delay Emergency (Generator) to Normal (Utility) (TDEN) timer will begin timing, and the solenoid will engage and automatically switch from the GENERATOR to the UTILITY position and the generator will shut down.

5.4 Manual Operation

⚠ WARNING

DO NOT ATTEMPT TO MANUALLY OPERATE THE ATS WITH THE UTILITY OR GENERATOR AVAILABLE.

⚠ WARNING

HIGH VOLTAGES ARE PRESENT IN AND AROUND TRANSFER SWITCH EQUIPMENT. BEFORE ATTEMPTING TO MANUALLY TRANSFER, DISCONNECT THE LINE POWER FROM THE EQUIPMENT BEING SERVICED BY OPENING AND LOCKING OUT, IF POSSIBLE, THE NEXT HIGHEST DISCONNECT DEVICE. FAILURE TO FOLLOW THIS PROCEDURE COULD CAUSE SEVERE PERSONAL INJURY AND/OR DEATH.

ALWAYS TURN THE UTILITY POWER OFF AND TURN THE GENERATOR (IF A GENERATOR) CONTROL SELECTOR SWITCH TO THE "OFF" POSITION BEFORE ATTEMPTING A MANUAL TRANSFER.

To manually operate:

1. Disconnect all sources of power.
2. Disconnect the J7 connector from the ATC-100 controller.
3. Locate the manual lever between the solenoids.
4. Locate the handle used to manually transfer the switch.
5. Attach the handle to the manual lever.
6. Move the lever up to go to Utility or move the lever down to go to generator.
7. Once the manual operation is complete and automatic operation is desired, connect the sources of power.
8. Check for 120 Vac at the plug across the Utility - Utility inputs if the Utility is available.
9. Check for 120 Vac at the plug across the Generator - Generator inputs if the Generator is available. (See troubleshooting guide if values are above 130 Vac or below 110 Vac.)
10. Insert the J7 connector into the controller.

Figure 23. ATS Manual Operating Handle in Use.

SECTION 6: ADJUSTMENTS

6.1 General

Refer to I.B. 01602019E, supplied with the ATS for ATC-100 Controller adjustments and programming.

SECTION 7: MAINTENANCE AND COMPONENT REPLACEMENT

7.1 Introduction

⚠ WARNING

HIGH VOLTAGES ARE PRESENT IN AND AROUND TRANSFER SWITCH EQUIPMENT. BEFORE INSPECTING OR MAINTAINING THIS EQUIPMENT, DISCONNECT THE LINE POWER FROM THE EQUIPMENT BEING SERVICED BY OPENING AND LOCKING OUT, IF POSSIBLE, THE NEXT HIGHEST DISCONNECT DEVICE. FAILURE TO FOLLOW THIS PROCEDURE COULD CAUSE SEVERE PERSONAL INJURY AND/OR DEATH.

In general, ATS equipment is designed to be relatively maintenance free under normal usage. However, because of the variability of application conditions and the importance placed on dependable operation by this type of equipment, inspection and maintenance checks should be made on a regularly scheduled basis. Since equipment maintenance will consist mainly of keeping the equipment clean, the frequency of maintenance will depend, to a large extent, on the cleanliness of its surroundings. If a significant amount of dust or foreign matter is present, a more frequent maintenance schedule should be followed.

It is suggested that visual inspections of the equipment be made on a regular basis, not just during regularly scheduled periods. Always be alert for an accumulation of dirt in and around the structure, loose parts and/or hardware, cracks and/or discoloration to insulation, and damaged or discolored components.

Figure 24 is the wiring diagram for the RLC1 ATS switch.

Note: Only qualified and experienced personnel should attempt any diagnostic work using this diagram.

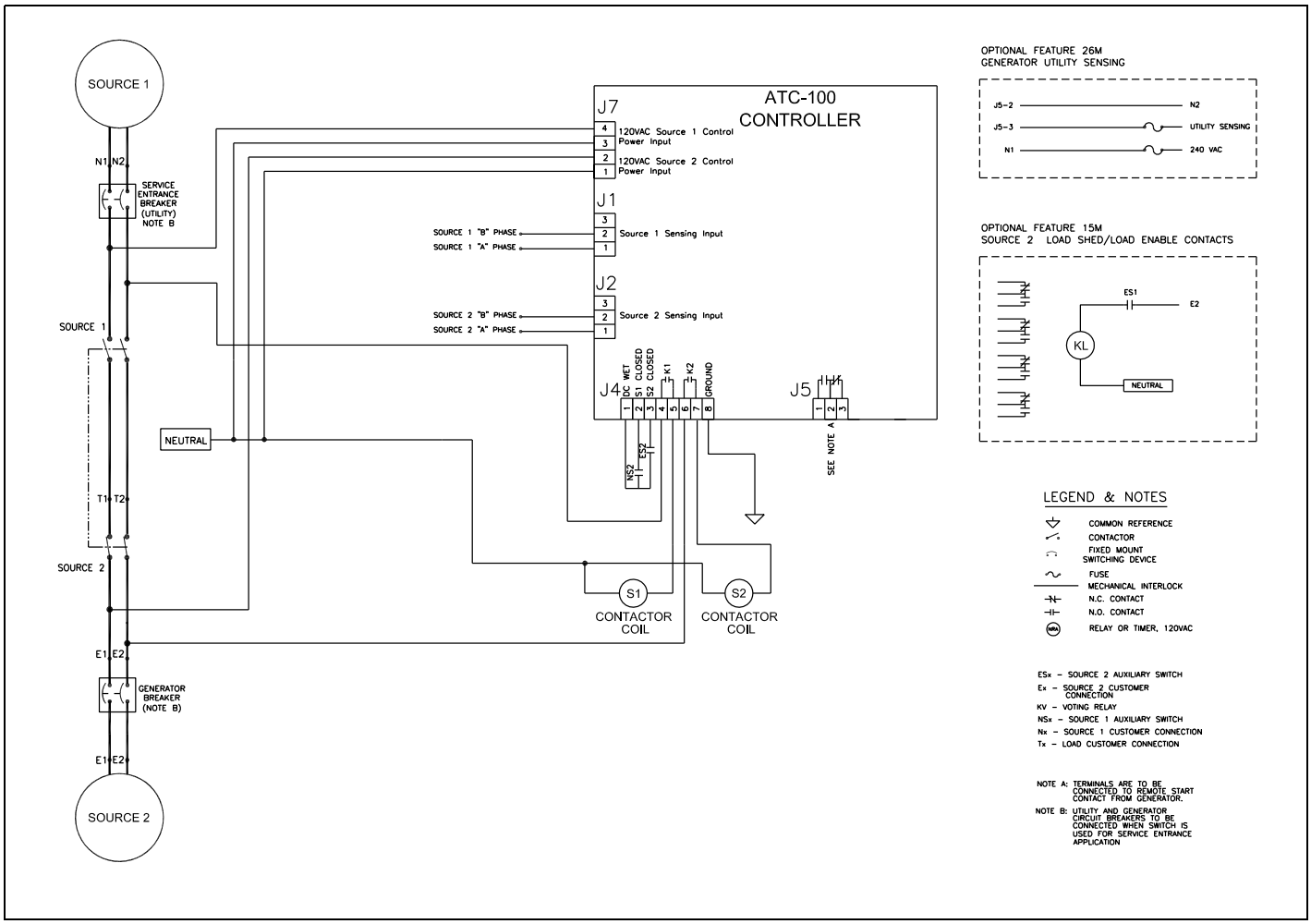

Figure 24. Wiring Diagram for the RLC1 ATS.

7.2 Procedures

A suggested maintenance procedure to be followed is outlined in Table 3.

Table 3. Recommended Periodic Maintenance Procedures

STEP	ACTION
a. Make the transfer switch equipment safe for inspection and/or maintenance.	Disconnect the line power from the equipment being serviced by opening next highest disconnect device. Make certain that any accessory control power is switched off.
b. Inspect the structure area for safety hazards or potential maintenance problems.	Inspect the area, especially where the contactor is installed, for any safety hazards, including personal safety and fire hazards. Exposure to certain chemical vapors can cause deterioration of the electrical connections. Inspect for accumulated dirt, loose hardware, or physical damage. Examine the primary insulation for evidence of cracking or overheating. Overheating will show as discoloration, melting, or blistering of the conductor insulation, or as pitting or melting of the conductor surfaces due to arcing. Inspect the secondary control connections for damage, and control wiring for insulation integrity.
c. Inspect the contactor for dust, dirt, soot, grease, moisture, or corrosion.	Remove dust, dirt, soot, grease, moisture, and corrosion contamination from the surface of the switching device using a dry, soft lint-free cloth, dry soft bristle brush, and vacuum cleaner. Do not blow debris into the contactor. If contamination is found, look for the source and fix the problem.
d. Check for material integrity, uneven wear, discoloration, or loose hardware.	Severe material cracking will require replacement and loose hardware will need to be tightened.
e. Check the terminals and connectors for looseness or signs of overheating.	Overheating will show as discoloration, melting, or blistering of the conductor insulation. Connections that do not have signs of looseness or overheating should not be disturbed.
f. Exercise the contactor if it is not often exercised while in operation. This will permit the wiping action by the contacts.	If a switching device is used for frequent switching during normal operation, this step can be disregarded.
g. Return the transfer switch equipment to service.	Make certain all barriers are in place and the door is closed. Re-apply generator and utility power.

7.3 Maintenance Log

DATE	ACTION
Example: 01/01/04	Inspected and cleaned.

7.4 Component Replacement

Certain components within the ATS are field replaceable. Figure 25 identifies the field replaceable parts. Table 4 lists the part numbers to use when ordering replacement components. To order replacement components, contact an authorized Eaton sales representative.

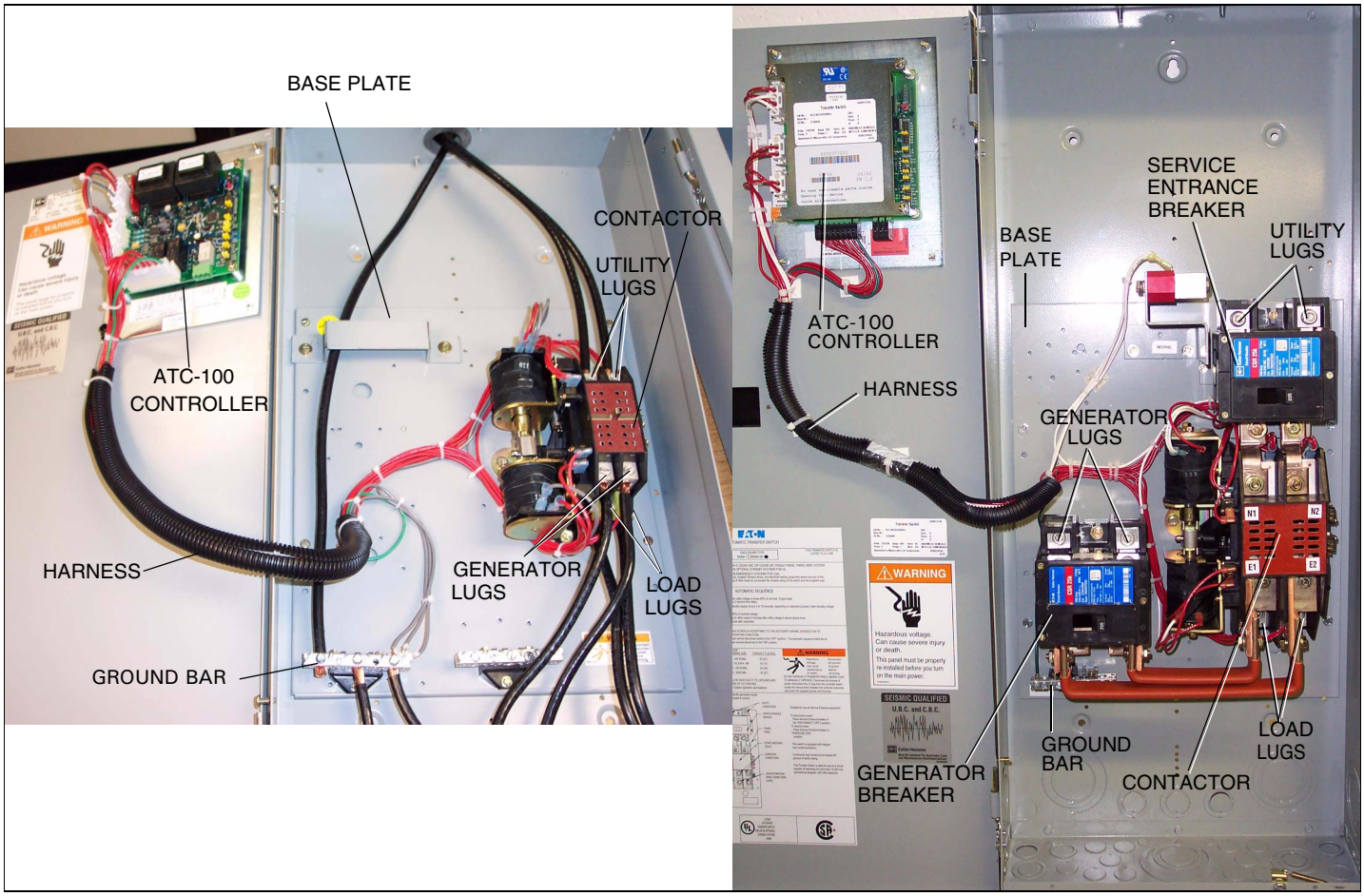

Figure 25. Field Replaceable Components (Left RLC1 100 A Standard, Right RLC1 200 A SE).

Table 4. Field Replaceable Components

COMPONENT	PART NUMBER	ATS MODEL
Contactor	8160A99G51	100 A
Contactor	8160A99G52	200 A
ATC-100 Controller	ATC-100	100 & 200 A
Harness RLC1	5724B93	100 & 200 A
Load Shed	8160A99G36	100 & 200 A
Service Entrance Breaker	8160A99G41	100 A
Service Entrance Breaker	8160A99G42	200 A
Generator Breaker (SE only option)	8160A99G41	100A
Generator Breaker (SE only option)	8160A99G42	200A

Notes:

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