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ADB-ALNACO, INC.
A LEADER IN AIRFIELD LIGHTING

SINCE 1946

INSTRUCTION MANUAL

EALS

(EMERGENCY AIRFIELD LIGHTING SYSTEM)

20 KW/6.6A

L-828 CONSTANT CURRENT REGULATOR

Manufactured per FAA Specification
AC 150/5345-10E
Modified for EALS
per Specification ME-201A

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Additional manuals are available upon request for a nominal charge of $25.

RECORD OF CHANGES

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SAFETY NOTICES

The operating and maintenance personnel should refer to FAA Advisory Circular AC 150/5340-26, "Maintenance of Airport Visual Aids Facilities" for instructions on safety precautions. Personnel must observe the safety regulations at all times. While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS

Operating and maintenance personnel must at all times observe all safety regulations. To avoid casualties, always remove power prior to making any wire connections and touching any parts. See FAA Advisory Circular AC 150/5340-26 concerning safety.

RESUSCITATION

Operating and maintenance personnel should familiarize themselves with the technique for resuscitation found in the First Aid Instruction Manual.

GUARANTEE

ADB-ALNACO, Inc. guarantees the EALS Constant Current Regulator herein, when sold by ADB-ALNACO, Inc. or its approved representatives, will perform in accordance with Specification AC 150/5345-10E modified for EALS per Specification ME-201A, and that any defect in design, materials or workmanship which may occur during proper and normal use during a period of one (1) year from date of installation or a maximum of two (2) years from date of shipment will be corrected by replacement by ADB-ALNACO, Inc., f.o.b. factory. Damage resulting from improper installation does not constitute proper and normal use and is not covered by the warranty. Such corrections shall constitute the limit of all ADB-ALNACO, Inc. liabilities.

SECTION 1. GENERAL INFORMATION AND REQUIREMENTS

1.1 INTRODUCTION.- The ADB-ALNACO, Inc. 20-kW EALS (L-828) Constant Current Regulator (CCR) is designed to supply three output current levels (6.6 amp maximum) for series lighting circuits on airport runways and taxiways*. The regulators are air cooled and designed to accurately regulate the output current to within ±3% of the adjustable nominal level from no load to full load and with nominal input voltage of 416 V ac or 208 V ac, with a range of -5% to +10% of nominal voltage. The nominal output current levels are maintained even when 30 percent of the isolation transformers in the series lighting circuit supplied by the regulator have open secondaries. The ADB-ALNACO, Inc. EALS regulator has the exclusive feature of being the only true output "soft-start" current regulator available. Also, the on/off circuitry in the EALS regulator eliminates the need for special "slow acting" circuit breakers on the input power supply lines.

The regulator may be operated manually or by an EALS control panel (ME-202) or (for commercial use) by using 120 V ac or +48 V dc remote control signals.

Protective circuits automatically shut down the regulator if an over-current or open-circuit occurs in the series lighting circuit. After an input power loss, operation automatically resumes at the same brightness level within 5 seconds after input power is restored. Output lightning and current-surge protection is provided on all units.

1.1.1 Scope.- This manual covers 20-kW L-828 air-cooled constant current regulator, Class 1 (6.6A output current), Style 1 (3 step), in accordance with FAA specification AC 150/5345-10 modified for EALS as described in specification ME-201A. Operation outside the design limitations of these specifications may result in degradation of performance, damage or failure of regulator components or hazardous conditions.

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*NOTE: (1) The EALS CCR should not be used to power an L-849 REIL system unless the CCR is at least half loaded with steady burning lights.

(2) The EALS CCR is not currently designed to be used with an ADB-ALNACO type L-827 or L-829 lamp-out monitor.

1.1.2 Purpose.- This manual describes procedures for the installation, operation, and maintenance of ADB-ALNACO, Inc. EALS Constant Current Regulator.

1.3 EQUIPMENT DATA.- Table 1-1 gives the part number for the EALS regulator and reference data pertinent to the equipment. Table 1-2 list equipment and accessories supplied. Information on items not supplied but which might be required for installation is given in Table 1-3. Table 1-4 gives the approved output current levels and tolerances, while Table 1-6 gives the input current. Recommended input power supply wire for the regulator is listed in Table 1-5.

1.4 PROTECTIVE DEVICES.- The following protective devices are provided on each regulator:

a. Output open-circuit protection

b. Output overcurrent protection

c. Input power-line undervoltage protection

d. Lightning protection on output terminals

e. Fuse protection: input power line, remote control supply voltage (+48 V dc and 120 V ac), and power supply for printed circuit board

f. Input breaker for supply voltage

g. Output Overload Indicating LED

1.5 REGULATION.- Current regulation is obtained under the following conditions:

a. Load variations of zero (short circuit) to full load with input voltage variations of -5% to + 10%, at -40°C up to +55°C (-40°F to +131°F) ambient temperature.

b. With up to 30% of the series isolation transformers open-circuited.

1.6 INDICATORS.-

a. A true rms-reading ammeter mounted on the front panel indicates the output current. The screw of the face of the ammeter is for zeroing the indicator needle.

b. Open-circuit (red) LED

c. Overcurrent (red) LED

d. Overload (red) LED

e. Regulator On (green) LED (system in normal operation)

1.7 INPUT VOLTAGE.- The power transformer for the EALS regulators is designed for an input voltage of either 208 or 416 V ac

TABLE 1-1. EQUIPMENT DATA

Type: 20 kW L-828 CCR (FAA AC 150/5345-10 modified for EALS in accordance with ME-201A)
Air-cooled
Class 1 (6.6 A max. output current)
Style 1 (3-step)
EALS (ME-201) 3-step: 4.8, 5.5, & 5.5 amp
FAA 3-step: 4.8, 5.5 & 6.6 amp

Part Number: 44D1974 - 0000

Nominal Input Voltages: 416 or 208 V ac

Minimum Power Factor: 0.95

Minimum Efficiency: 90%

Soft-Start Feature: The only true output "soft-start" current regulators produced by any manufacturer

Control:

Local Operation: Front panel rotary switch S1 (5 positions: REM, OFF, B1, B2 & B3)

Remote Operation: Using EALS control panel (ME-202) and 120 V ac; Both 120 V ac and +48 V dc source signals (CCI) are provided for commercial use, but only one may be used.

On/Off Switching: Under any load

TABLE 1-1. EQUIPMENT DATA (CONTINUED)

Built-In True RMS-Reading Ammeter: 10 A (maximum scale)

Protection: Overcurrent, open-circuit, lightning and transient protection; output current-surge limitation (protects series incandescent lamps); power supply current is self-limited

After input power loss, operation resumes within 5 seconds after power is restored

Output Current Level: Maintained within ±0.1 ampere at any intensity step

Reactive Loading: The CCRs maintain the current within the limits of Table 1-4 for all brightness steps when the load is connected via isolating transformers, and the secondaries of 30% of these transformers become open-circuited. The load before the isolation transformer secondaries are opened may be any value from half to full load.

Terminal Blocks: Pressure-type for external remote control wiring

Compatible with L-847 circuit selector switches

NOTE

The EALS CCR should not be used to power an L-849 REIL system unless the CCR is at least half loaded with steady burning lights. Also, the EALS CCR is not currently designed to be used with an ADB-ALNACO type L-827 or L-829 lamp-out monitor

Environmental Operating Conditions:

Temperature Range: -40° to +55°C (-40° to +131°F)
Relative Humidity: 0 to 100%
Altitude: sea level to 6,600 ft. (2000 m)

Dimensions: 30 x 32 x 31 in (H x L x D)

Weight: 891 lbs

TABLE 1-2. EQUIPMENT AND ACCESSORIES SUPPLIED

Description	Quantity
EALS (L-828) Constant Current Regulator	1
Instruction Manual	1

TABLE 1-3. EQUIPMENT REQUIRED BUT NOT SUPPLIED

Description	Quantity
Wire, Input Power (see Table 1-5)	A/R
EALS Remote Control Panel (ME-202)	1
Wire, Ground (AWG 2 min.)	A/R
Wire, Output Load (AWG 8, 5000 V ac, type L-824)	A/R
Wire, Shorting Jumper (AWG 8 minimum)	A/R
Disconnect Switch or Main Circuit Breaker	1
Input Lightning Arrestor	A/R
Circuit Breaker for Input Power Lines*	1
Screwdriver	1
True rms Voltmeter (600 V ac scale)	1

TABLE 1-3. EQUIPMENT REQUIRED BUT NOT SUPPLIED
(continued)

Description	Quantity
Voltmeter (60 V dc full scale)	1
Ammeter, (true-rms-reading; 10 A max. scale)	1
Ohmmeter	1
Mounting Bolts and Washers	A/R

*Note: The soft-start feature eliminates need for a special slow-trip circuit breaker on input power lines.

TABLE 1-4. OUTPUT CURRENT LEVELS AND TOLERANCES

EALS ME-201A

Step	Nominal Output	Allowable Range
B3	5.5 A	5.33 - 5.67 A
B2	5.5 A	5.33 - 5.67 A
B1	4.8 A	4.66 - 4.94 A

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FAA AC 150/5345-10

	Nominal Output	Allowable Range
B3	6.6 A	6.40 - 6.70 A
B2	5.5 A	5.33 - 5.67 A
B1	4.8 A	4.55 - 4.94 A

TABLE 1-5.
RECOMMENDED INPUT POWER SUPPLY WIRE
FOR LESS THAN 100 FEET ($90^{O}C$, 600 V MINIMUM)*
BETWEEN CCR AND POWER SOURCE

Rating	416 VAC or 208 VAC
20 KW	AWG 4

*For 100 to 250 ft, use the next larger (even) gage wire

It is recommended that the circuit breaker on the input power supply lines have a rating of 125% of the CCR's input current, as given in Table 1-6, unless local codes require a different rating technique. If no standard-size circuit breaker exists at the 125% value, use the next larger standard-size circuit breaker.

TABLE 1-6. INPUT CURRENT FOR EALS CCR

Rating	208 V ac	416 V ac
20 kW	96 A	48 A

SECTION 2. THEORY OF OPERATION

2.1 INTRODUCTION.- Current regulation is obtained by using SCRs to switch the supply power (varying the "on" duration of the AC cycle) to the power transformer and by using feedback circuitry to monitor the transformer's output. The brightness level is selected from one of three or five preset values. When the load varies, the feedback circuit changes the control-voltage level, which changes the conduction angle of the AC voltage to the SCRs to allow power to flow into the power transformer. This changes the supply power flow to the main transformer to compensate for the load variation and maintain the output current at the preset level.

2.2 THE SCRs.- See Figure 8-3. When power is applied to the constant current regulator (CCR) at input voltage plug or TB8-1 and TB8-2, circuit breaker CB1, and the contactor K1, no current will flow in the primary of the power transformer T1 until the SCRs receive a triggering pulse. When this pulse occurs, the SCRs turn on, allowing current to flow into the primary of the power transformer T1 until the SCR is switched off by the zero crossing (+ to -) of the input power. The path of the current flow is from TB8-1 and TB8-2, CB1, through contactor K1, SCR1 terminals 1B and 3 to L2, L1 and primary of T1, and back to K1, CB1, and TB8-1 and TB8-2. Since alternating current is used for the regulator operation, after zero-crossing the current flows in the opposite direction using the other SCR (see SCR1 terminals 1A and 2).

The power level in the primary of the power transformer is controlled by varying the phase of the conduction angle. If very low output current is desired, the conduction angle would be near zero degrees, i.e., the SCR is not triggered until the input voltage is near zero-crossing. Little power is then available to power transformer T1.

For maximum power to occur in the primary of the power transformer T1, the conduction angle will be near 180 degrees. Immediately after zero-crossing of the input-power sine wave, the SCR is triggered and operates continuously throughout the 180-degree duration of the input sine wave.

For 67% power from the power transformer, the conduction angle will be nearly 90 degrees. This occurs approximately at the voltage peak of the sine wave when the SCR switches into conduction. Switching the transformer on-line at this time creates a rather abrupt rise time, since the input sine wave is at its peak voltage. Choke L1 slows this rapid rise time from the conduction of the SCRs.

2.3 CONTACTOR.- In the event of an SCR failure, the contactor provides a means to break the current driving the primary of the power transformer T1. The contactor K1 (see Figure 8-3) has no making or breaking current across it, since the SCR is off when the contactor is opening and closing. This is accomplished by the coil-control circuitry and provides increased life for the contactor.

2.4 TRANSFORMERS.- Transformer T6 provides 120 V ac remote-control source voltage at TB2 terminal 8 through fuse F5.

Transformers T3 and T4 provide AC voltage to the Control PCB. T3 provides 120/60 V ac. T4 provides 36/18 V ac.

SECTION 3. OPERATION

3.1 CONTROL.- The rotary switch S1 on the front panel is used for local control of the regulator. This control switch has five positions labeled: REM (remote), OFF, and brightness steps B1, B2, and B3. For regulator operation by 120 V ac or +48 V dc remote control signals, rotary switch S1 must be set to REM. Remote control is disengaged when switch S1 is set to any position other than REM.

3.1.1 Local Control.-

a. Rotary switch (S1), positions 1 through 5, provides local control of the CCR's output current level. For operation under ME-201 specifications (Table 3-1A), positions B1, B2 and B3 give an output current of 4.8, 5.5 and 5.5 amps, respectively. Under FAA AC 150/5345-10 specifications (Table 3-1B), positions B1, B2 and B3 give an output current of 4.8, 5.5 and 6.6 amps.

TABLE 3-1A.
ME-201A
THREE-STEP CONSTANT CURRENT REGULATOR

S1=	REM	OFF	B1	B2	B3
RESULT	Operation by remote control signals	CCR off	4.8A	5.5A	5.5A

TABLE 3-1B
FAA L-828
THREE-STEP CONSTANT CURRENT REGULATOR

S1=	REM	OFF	B1	B2	B3
RESULT	Operation by remote control signals	CCR off	4.8A	5.5A	6.6A

b. When rotary switch S1 is set to the OFF position, the regulator is deenergized and cannot be remotely turned on.

c. When switch S1 is set to REM, operation of the regulator is by remote control signals.

3.1.2 Remote Control.-

a. When the rotary switch S1 is set to position REM and EALS remote control panel (ME-202) is connected to the remote control input receptacle on the regulator, the output current of the regulator will correspond to the brightness setting selected from the remote control panel. When switch S1 is set to OFF, remote control signals will not operate the regulator; e.g., energize the CCR to a particular brightness setting or turn the CCR off. Switch S1 must be set to REM for operation of the regulator by remote control.

b. When there are no remote control connections on the CCR's remote control input receptacle the position REM becomes an additional OFF position, i.e., the regulator is deenergized when switch S1 is set to REM.

c. If more than one remote intensity is accidently selected, the highest intensity will be selected.

3.2 SHUTDOWN PROCEDURE.- Set rotary switch S1 to position OFF. Power to the output terminals is now off, and the regulator cannot be energized by remote control signals. Power is still present on the input terminals. To remove input power, disengage disconnect switch or external circuit breaker or turn power generator off.

3.3 TAP ADJUSTMENT FOR MAXIMUM EFFICIENCY.- The power transformer (T1) has been set at the factory for efficient operation with loads having up to 30% open-circuited isolation transformers at maximum load. For optimum CCR regulation of other various loads see Table 3-2 and Figure 8-3.

WARNING

Before making any adjustments on CCR, de-energize regulator by turning rotary switch S1 to OFF and turn off disconnect switch or main circuit breaker. Ground output terminals by using a grounding rod prior to touching any parts.

TABLE 3-2. TAP ADJUSTMENT FOR VARIOUS LOADS

PERCENT OF MAXIMUM LOAD	LOCATION OF WIRE #200 ON T1 SECONDARY (TB6)	LOCATION OF WIRE #201 ON T1 SECONDARY (TB6)
100%	TB6-4	TB6-3
90%	TB6-2	TB6-3
80	TB6-4	TB6-1
70	TB6-2	TB6-1
50	TB6-CT	TB6-3
40	TB6-2	TB6-CT
30	TB6-CT	TB6-1

SECTION 4. PREVENTIVE MAINTENANCE

4.1 GENERAL.- This section establishes the maintenance procedures required for the constant current regulator. The maintenance tasks must be performed on a recurring basis to insure optimum performance, minimize service interruptions and avoid major breakdowns.

WARNING

Only personnel authorized to work on high-voltage equipment should perform maintenance on the regulator.

Operate regulator under local control (using rotary switch S1) when performing maintenance tasks on the regulator. This will prevent the regulator from accidently being turned on and causing serious injury or death.

Always deenergize regulator by turning rotary switch S1 to OFF, and remove input power to regulator by turning off disconnect switch or main circuit breaker (and power generator if used) before opening access door to service regulator.

4.2 PREVENTIVE MAINTENANCE.- The preventive maintenance checks for the regulator are listed in Table 4-1.

4.3 SHORT-CIRCUIT TEST.-

WARNING

Since high open-circuit voltages may result by opening the primary of a series lighting circuit, only personnel authorized to work on high-voltage equipment should be allowed to perform the short-circuit test.

a. Remove input power to regulator [turn off disconnect switch or main circuit breaker (and power generator if used)] and turn rotary switch S1 to OFF.

b. Remove leads from output current plugs, and short output plugs using AWG #8 or larger wire.

c. Energize regulator and turn rotary switch S1 to brightness step B1 and then to the remaining brightness steps. Check the output current on a true rms-reading ammeter at each step. The output current should be within the tolerance given below.

S1 POSITION		ME-201A ALLOWABLE RANGE (PANEL AMMETER) AMPERES
3-STEP	B1	4.66 - 4.94
CCR	B2	5.33 - 5.67
	B3	5.33 - 5.67

S1 POSITION		AC 150/5345-10 ALLOWABLE RANGE (PANEL AMMETER) AMPERES
3-STEP	B1	4.55 - 4.94
CCR	B2	5.33 - 5.67
	B3	6.40 - 6.70

d. If the output current is not within the above specified limits, check the input voltage to regulator. The supply voltage should be within -5% to +10% of the nominal input voltage shown on the regulator nameplate. If supply voltage is correct, readjust output current per Section 7.5.2.

e. Turn off disconnect switch or main circuit breaker (and power generator if used) to remove input power to regulator.

f. Disconnect the shorting jumper and reconnect output cables.

g. Close input-power disconnect switch or main circuit breaker.

4.4 OPEN-CIRCUIT TEST.-

WARNING

Since high open-circuit voltages may result by opening the primary of a series lighting circuit, only personnel authorized to work on high-voltage equipment should be allowed to perform the open-circuit test.

a. Remove input power to regulator [turn off disconnect switch or main circuit breaker (and power generator if used)] and turn rotary switch S1 to OFF.

b. Disconnect cables from the output current plugs.

c. Turn on input power to regulator.

d. Turn rotary switch S1 to the lowest brightness position B1. The open-circuit protective device should automatically deenergize the regulator in less than 2 seconds.

e. Turn rotary switch S1 to OFF. The open-circuit protective device should reset.

f. Turn rotary switch S1 to position B1. The regulator should turn on and then deenergize in less than 2 seconds.

g. If regulator operation is satisfactory, turn rotary switch to OFF, and turn off disconnect switch or main circuit breaker before reconnecting the load.

h. After the load has been reconnected, turn on input power to the regulator.

TABLE 4-1. PREVENTIVE MAINTENANCE TASKS

Interval	Maintenance Task	Action
Daily	Check all control equipment for proper operation	Check local and remote control (if used) on each brightness step.
Monthly	Check input voltage	If input voltage is not within -5% to +10% of the nominal value specified on the regulator nameplate, notify power company to correct voltage.
	Check and record output current on each brightness step	Use a true rms-reading instrument. Adjust current levels if out of tolerance (see Table 1-4).
Annually	Check wiring	Make sure input and output connections are tight and that there are no damaged wires and frayed or burned insulation.
	Inspect housing for rust spots and damage	Clean and touch up rust spots with paint.
	Inspect lightning arrestor connections	Tighten any loose connections. Replace charred or burnt wiring or broken arrestor.
	Perform a short-circuit test	See paragraph 4.3.
	Perform an open-circuit test	See paragraph 4.4.
Unscheduled	Check regulator load	At installation and subsequent load changes make sure that the output voltage times the output current does not exceed the rated load given on the regulator nameplate.

SECTION 5. TROUBLESHOOTING

5.1 TROUBLESHOOTING TABLE.- Preliminary troubleshooting information is given in Section 5.2. The troubleshooting guide for the EALS (L-828) constant current regulator is given in Table 5-2.

WARNING

Only personnel qualified to work on high voltage systems should be permitted to troubleshoot on the regulator.

Deenergize regulator by turning rotary switch S1 to OFF and turn off disconnect switch or main circuit breaker. Ground output terminals by using a grounding rod prior to touching any parts.

If regulator deenergizes suddenly, the output current could be interrupted by an overcurrent, open-circuit, or undervoltage condition. Before inspecting the output circuit, place rotary switch S1 in the OFF position and turn off the external disconnect switch or main circuit breaker. Without this precaution, a dip in the power line may produce an on-cyclying and reenergize the regulator, resulting in an output voltage of several hundreds or thousands of volts which can cause serious injury or death.

5.2 PRELIMINARY TROUBLESHOOTING.- The following is a check list of steps to perform:

a. Check all LED indicators, fuses and circuit breakers. See Table 5-1.

b. Visually examine all areas of the CCR. Are there any burnt or loose connections or parts?

c. Is the input voltage present and within +10% to -5% of nominal? (Is Regulator On (green) LED lit?)

d. If CCR works in local but not in remote, check voltage on remote control lines. Check fuse F5 if 120 V ac or fuse F4 (on Control PCB) if +48 V dc remote-control source voltage is used. If correct, replace Control PCB.

e. Can the CCR be reenergized by turning rotary switch S1 from OFF to brightness step B1? If it can be, the problem is due to open circuit (Open-circuit LED lit?) or overcurrent (Overcurrent LED lit?).

f. Short the output of the CCR with an AWG 10 (2000 V, minimum) wire, and turn the CCR on. If CCR operates normally, problem may be load related.

Table 5-1. Fuses

CB1: Protects contactor K1 (contacts), SCR1, L1, L2 and main transformer T1.

Fuse F3, F4 (1A, Slo-Blo for 416 V ac or 208 V ac Input)
Protects transformers T3 and T4, contactor K1 (coil), triac Q21 and DC power supplies on Control PCB.

Fuse F5 (1/4A, 250 V, Slo-Blo):	Protects the internal 120 V ac CCI source and transformer T6.
Fuse F4 (1/4A, 250 V, Slo-Blo): (on Control PCB)	Protects the internal +48 V dc CCI source circuitry on the Control PCB.

g. If CCR turns on for a few seconds before shutting off and the ammeter indicates zero amps, the problem is either an open circuit (Open-circuit LED lit?) or the current transformer T2 is open. The current transformer T2 can be checked by comparing the primary and secondary current readings.

h. If the CCR turns on and then shuts off after a few seconds and there is a high current reading on the ammeter, the problem is an overcurrent (Overcurrent LED lit?). Adjust the output current. If this does not work, replace the Control PCB and then SCR1.

i. If the CCR does not energize at all (Regulator On (green) LED lit?), check for undervoltage. If correct, replace Control PCB.

TABLE 5-2. TROUBLESHOOTING GUIDE

PROBLEM: REGULATOR DOES NOT TURN ON USING CONTROL SWITCH S1

TEST	REPAIR
(a) Turn off CCR using local control switch S1. Then turn CCR on. Verify that nothing happens and that green LED labeled "REGULATOR ON" is unlit.	Check and replace fuses F3 and F4.
(b) Use an AC voltmeter to probe signals. Connect black lead on meter (common) to earth ground lug on CCR.	
Probe J3 terminals 4 and 6. Each should read approximately 60 V ac.	Replace T3.
(c) Using the AC voltmeter, probe J3 terminals 1 and 3. Each should read approximately 18 V ac.	Replace T4.
(d) If these voltages are normal, failure is in Control PCB, ribbon cable or Switch PCB.	Replace Control PCB, ribbon cable or Switch PCB, in that order.

TABLE 5-2. TROUBLESHOOTING GUIDE (CONTINUED)

PROBLEM: REGULATOR DOES NOT TURN ON USING REMOTE CONTROL BUT OPERATES USING LOCAL CONTROL SWITCH S1

NOTE: When remote control signals enter TB2, LED #2 stays off and leds #1 and #3 will light with a CC input signal.

TEST	REPAIR
(a) Test signals to remote control TB2	Repair external remote control switch or wiring
(b) Is CCI is connected to TB2 terminal 1 for +48 V dc remote control signals?	Check and replace fuse F4 (on Control PCB) with new 1/4-amp slow-blow fuse.
(c) Is CCI is connected to TB2 terminal 8 for 120 V ac remote control signal?	Check and replace fuse F5 (on panel) with new 1/4-amp slow-blow fuse.
(d) Check to see if the LEDs #1 and #3 are lit and there still is no remote operation.	If none of the LEDs are lit, replace Control PCB.

TABLE 5-2. TROUBLESHOOTING GUIDE (CONTINUED)

PROBLEM: REGULATOR REPEATEDLY CAUSES CIRCUIT BREAKER CB1 TO TRIP

TEST	REPAIR
(a) Turn control switch S1 to OFF position. While observing the CCR's output ammeter, turn CCR on. If meter moves, go to TEST "(b)". If meter does not move, feedback transformer T2 or main transformer T1 may have failed.	(a) Replace feedback transformer T2/main transformer T1.
(b) With control switch S1 off, remove connector J4 (by pulling) from PC board. Then turn on control switch S1. If CB1 still trips, SCR1 is probably shorted.	Replace SCR1.
(c) If CB1 does not trip after J4 is removed, Control PCB has failed.	Replace Control PCB.

TABLE 5-2. TROUBLESHOOTING GUIDE (CONTINUED)

PROBLEM: REGULATOR SHUTS DOWN FROM OVERCURRENT PROTECTION (RED LED LIT)

TEST	REPAIR
(a) Test the operation of the overcurrent protection (red LED on). With CCR off, connect a jumper across TP7 to TP9 (see Figure 8-2). Turn on CCR to an output of 5.5 (6.6) amps, and time how long it takes for the overcurrent protection to shut the CCR off. Green "REGULATOR ON" LED will turn off when the overcurrent circuitry operates. The time period will be 20 ±10 s for proper operation. If time period is less than 10 s or more than 30 s, CCR may be improperly calibrated. If CCR will not calibrate properly, then with CB1 and control switch S1 off, remove connector J4 (by pulling) from Control PC board. Then turn on CB1 and then control switch S1.	See calibration instructions in Section 7.5.
(b) If overcurrent indicator (red LED) does not light, then SCR1 is good and Control PCB has failed.	Replace SCR1.
(c) If overcurrent indicator (red LED) lights, then SCR1 or Control PCB has failed.	Replace Control PCB and/or SCR1.

TABLE 5-2. TROUBLESHOOTING GUIDE (CONTINUED)

PROBLEM: REGULATOR SHUTS DOWN FROM OPEN-CIRCUIT PROTECTION (RED LED LIT)	
TEST	REPAIR
(a) Test load for open-circuit condition. Also, short CCR's output current plugs and check for normal operation. See calibration instructions in Section 7.5.	Repair lighting loop.
(b) Inspect contacts of contactor K1.	Replace contactor K1 if defective.
(c) Inspect transformer T5 and R5 (on panel).	Replace T5 or R5.
(d) Turn CCR on and off repeatedly. If green LED indicator for "REGULATOR ON" lights but contactor K1 does not click on, coil of contactor K1 has failed.	Replace contactor K1.
(e) If turning CCR on and off will not light "REGULATOR ON" LED, then Control PCB has failed.	Replace Control PCB.

PROBLEM: INCORRECT CCR OUTPUT CURRENT	
TEST	REPAIR
(a) CCR may be improperly calibrated.	See calibration instructions in Section 7.5.
(b) If CCR will not calibrate properly, then Control PCB may have failed.	Replace Control PCB.

TABLE 5-2. TROUBLESHOOTING GUIDE (CONTINUED)

PROBLEM: OUTPUT OVERLOAD (RED) LED LIT

NOTE

The OUTPUT OVERLOAD LED is not intended to show a regulator failure. It is a warning that the load demand has exceeded the CCR's output current (as adjusted), and a lower than normal output current may result from an excessive load being present.

TEST	REPAIR
(a) The lighting loop has too many burned-out lamps.	Replace burned-out lamps.
(b) The load demand is greater than 4% over -5% input voltage and 12% of nominal input voltage.	Reduce load.
(c) The half-power tap was selected on TB5 terminal 2, and the load demand requires more than 1/2 of the CCR's rated output power.	Move wire #200 from TB5-2 to TB5 terminal 1.
(d) The input voltage is low for the required voltage, as selected on the CCR's TB4. Measure input voltage with CCR in operation.	Provide required voltage to CCR.
(e) CCR's output current may be improperly calibrated.	See calibration instructions in Section 7.5.

SECTION 6. PARTS LIST

6.1 PARTS LIST.- Table 6-1 provides all replaceable parts for each repairable or replaceable component or assembly.

NOTE

Substitution of electronic components may be done only if the substitution is the exact physical equivalent (body or case size) and equal, or better electrical characteristics with respect to tolerance, failure rate and/or reliability.

TABLE 6-1. PARTS LIST

Item No. See Fig. 8-1	Description: Final Assembly	Mfrs. Part No.	ADB-ALNACO Part No.
1	20 kW Power Transformer (T1)		35A0296
2	Inductor, Power, 20 kW, 60 Hz		33A0026
3	Inductor, Air Core, 35 uH, 200 A		33A0027
4	Lightning Arrestor (RV2, RV3)	GE 9L24FTB011AC	32A0024
5	Control PCB Assembly		44D2180
6	Transformer, Current Ratio, 6.6 A/66 mA (T2, T7)		35A0396
7	Transformer, Ratio 6:1 (T5)		35A0343
8	Contactor, 125 A, 120 V ac		53A0276
9	Transformer, 240 V ac to 36 V ac (T4)		35C0345
10	Fuse, 1/4 A, 250 V, S.B.	Buss MDA 1/4	47A0117
11	Transformer (T6), 240 V ac to 120 V ac		35A0344
12	Fuse, 1 A, 480 V		47A0108
13	Transformer, 416 V ac or 208 V ac (T3)		35A0337
15	SCR Network Assembly		44C2026
16	Snubber Network Assembly		44B2213
17	Meter, 10 A Scale, 100 mA Input		52A0107
18	Switch PCB Assembly		44B2006
19	Circuit Breaker, 70 A, 4-pole	AIRPAX #219-4-1-61F-5-9-70	57A0056

TABLE 6-2. RECOMMENDED SPARE PARTS

Recommended Spare Parts for 20kW CCR	
Snubber Network Assembly	44B2213
Fuse, 1/4 A, 250 V, S.B.	47A0117
Fuse, 1 A, 480 V	47A0108
Control PCB Assembly	44D2180
Switch PCB Assembly	44B2006
Lightning Arrestor	32A0024
SCR Network Assembly	44C2026

SECTION 7. INSTALLATION

7.1 INTRODUCTION.- This section provides instructions for the installation of the EALS (L-828) Constant Current Regulator. Refer to the airport project plans and specifications for the specific installation instructions.

7.2 UNPACKING.- Unpack crate upon receipt and examine regulator to insure that no damage has occurred during shipment. Note any exterior damage to crate which might lead to detection of equipment damage. When handling the regulator, care should be taken to maintain the unit in an upright position.

7.2.1 Damage.- If damage to any equipment is noted, a claim form should be filed with the carrier immediately. Inspection of equipment by the carrier may be necessary.

7.3 INSTALLATION.- EALS installation is per ME-201A specification. The regulator can be lifted using a forklift on the bottom of the regulator or with a portable hoist using the two 3/8-inch I.D. eyebolts on top of cabinet. For commercial installation, place regulator inside a well ventilated room with sufficient clearance for personnel to inspect and maintain the unit. The ambient temperature of the room must be between -40°C and +55°C (-40° to +131°F).

The regulator can be placed directly on the floor without the use of bolts. However, if the regulator must be bolted to the floor, there are holes in the bottom 2 outside channels on the regulator for this purpose. Use bolts and lead molies to secure regulator to the floor.

7.4 WIRING CONNECTIONS AND START-UP.- See Figures 8-3 and 8-4. The EALS regulator is delivered ready to operate with 416 V ac input voltage and an EALS remote control panel when properly connected and should not require any electrical adjustments.

WARNING

Installation and operation of the CCR should be performed by personnel qualified to work on high voltage equipment. The high voltage involved with the unit makes it potentially dangerous and may be lethal if contacted by operating personnel.

1. Verify the input supply voltage corresponds to the voltage rating on the nameplate of the regulator. The normal factory setting for EALS operation is 416 V ac.

2. Make sure the rotary switch S1 on the front panel is set to the OFF position.

3. Ground the regulator by making an adequate ground wire (AWG 2 or larger) connection to the earth ground lug on the regulator.

4. An appropriate disconnect-type fuse cutout or circuit breaker shall be provided for the input power supply lines. For installations requiring load switching during regulator operation, the regulator may be connected to an L-847 circuit selector switch.*

5. Install appropriate external lightning arrestors on the input power supply lines as close as possible to the CCR input plugs.

NOTE

Since lightning is a phenomenon that varies in intensity and frequency with geographical locations, it is recommended that each installation evaluate the need for additional lightning protection.

6. Short-circuit the output current receptacles on CCR using AWG 10 (minimum) wire.

7. Connect the voltage supply lines (see below for recommended input wire) from the disconnect switch or main circuit breaker to the input voltage receptacle. Tighten all connections.

RECOMMENDED INPUT POWER SUPPLY WIRE FOR LESS THAN 100 FEET BETWEEN CCR AND POWER SOURCE (90°C, 600 V MINIMUM)*

Rating	208 Vac/416 Vac
20 kW	AWG 4

*For 100 to 250 ft, use the next larger (even) gage wire

*Do not use the CCR to power an L-849 REIL system unless the CCR is at least half loaded with steady burning lights.

NOTE

Do not route output cable in the vicinity of other wiring sensitive to EMI or RFI.

8. Energize regulator (engage main circuit breaker or disconnect switch). Turn rotary selector switch S1 to all brightness steps. Verify current values on the panel ammeter correspond to the appropriate levels as indicated below for each brightness step.

EALS ME-201A

Step	Nominal Output	Allowable Range
B3	5.5 A	5.33 - 5.67 A
B2	5.5 A	5.33 - 5.67 A
B1	4.8 A	4.66 - 4.94 A

****

FAA AC 150/5345-10

	Nominal Output	Allowable Range
B3	6.6 A	6.40 - 6.70 A
B2	5.5 A	5.33 - 5.67 A
B1	4.8 A	4.55 - 4.94 A

9. Deenergize regulator (disengage main circuit breaker or disconnect switch) and turn rotary switch S1 to the OFF position.

10. Connect EALS remote control panel to remote control input receptacle on CCR.

11. Make sure on power transformer secondary taps are set for output load. See Section 3.3 and Fig. 8-3. for tap adjustment procedure.

12. Make sure all wiring connections are tight and no wires are shorting across each other.

CAUTION

Incorrect wiring can damage the regulator. Double check all connections.

13. Energize regulator and set circuit breaker CB1 to the ON position. Set rotary switch S1 to the REM position and operate the CCR by remote control. Verify correct current levels are obtained on all brightness steps.

14. Turn rotary switch S1 to OFF and deenergize regulator (disengage disconnect switch or main circuit breaker). Remove short-circuit link from the output current receptacles.

15. Connect the series lighting circuit to the output current plugs.

NOTE

Do not route output cable in the vicinity of other wiring sensitive to EMI or RFI.

16. Check if the input current x input voltage x CCR efficiency (CCR efficiency = .90) is larger than the kilowatt rating on the CCR nameplate. If it is, either reduce the load or replace the CCR with one having a larger kilowatt rating.

17. Check current output on regulator in all steps in both remote and local control.

NOTE

The regulator has been preset at the factory to the EALS ME-201 current values given in Section 7.4, par. #8. If the regulator is not providing the correct current or the FAA current values are required, it will have to be recalibrated. See Section 7.5.

7.5 CALIBRATION.-

A separate true rms-reading ammeter (minimum accuracy of 1%, such as a Beckman "Tech 360" multimeter with model CT-231 current clamp or equivalent) is required to carry out the calibration of the regulator. Do not use the ammeter on the front panel of the regulator.

7.5.1 Set-Up Procedure.- The following initial steps are required prior to proceeding with the calibration of the regulator.

1. Check to insure the proper input voltage is supplied to CCR.

2. Make sure that the power transformer's TB6 efficiency-adjustment taps are set (wires #200 & #201) for operational load. See Section 3.3.

3. On the output terminal block TB1 connect a true rms-reading ammeter, such as a Beckman "Tech 360" multimeter, and a lamp load equal to 1/2 of the CCR's rated load. If the load is greater than 1/2 of the CCR's rated load, short terminals 1 and 2 on terminal block TB1.

4. Set CCR's local control switch, S1, to intensity step B3 (S1 position fully clockwise).

5. Turn the overcurrent-adjustment potentiometer, R48, (see Figure 8-2) on the Control Printed Circuit Board (Control PCB) fully counterclockwise.

6. Turn CCR on. Observe normal operation for a minimum of 2 minutes during which time the the output should not change and only the green LED marked "REGULATOR ON" should be lit. None of the red alarm LEDs on the front panel should be lit.

7.5.2. Adjustment of Output Current.- After set-up procedure in Section 7.5.1 has been completed, proceed with the following steps to set the output current adjustment level of the CCR.

7.5.2.1 Adjustment for Commercial Use.- To set the brightness steps of the CCR to provide current levels B3 = 4.8A, B4 = 5.5A and B5 = 6.6A, perform the following steps.

1. Turn CCR (with 1/2 to full load) on and set the local control switch, S1, to intensity step B3. Turn potentiometer R47 (master adjustment pot., see Fig. 8-2) totally counter-clockwise (ccw) and R46 (B5) totally clockwise (cw). Turn R47 cw until rms ammeter reading is 6.6A ±0.1 A. NOTE: Use an external rms ammeter, not the panel ammeter.

2. Set switch S1 to brightness step B2, and verify that the true rms ammeter reading corresponds to 5.5A. If not, adjust potentiometer R45 (B4) to get 5.5A.

3. Set switch S1 to brightness step B1. Adjust pot. R44 (B3) to get 4.8A.

4. When the output current adjustment has been completed, turn the CCR off.

7.5.2.2 Adjustment for EALS.- To set the brightness steps of the CCR to provide current levels B3 = 4.8A, B4 = 5.5A and B5 = 5.5A to 6.6A (field adjustable), perform the following steps.

1. Turn CCR (with 1/2 to full load) on and set the local control switch, S1, to intensity step B3. Turn potentiometer R46 (B5, see Fig. 8-2) totally clockwise (cw) if current reading is not 6.6A; adjust R47 (master adjustment pot.) until rms ammeter (Note: use an external ammeter, not the panel ammeter) reading is 6.6A ±0.1 A.

2. Set switch S1 to brightness step B2, and verify that the true rms ammeter reading corresponds to 5.5A. If not, adjust potentiometer R45 (B4) to get 5.5A.

3. Set switch S1 to brightness step B1. Adjust pot. R44 (B3) to get 4.8A.

4. When the output current adjustment has been completed, turn the CCR off.

7.5.3 Overcurrent Adjustment.- Complete the steps in Sections 7.5.1 and 7.5.2 before proceeding with the overcurrent adjustment.

Overcurrent Adjustment Steps:

1. With power off, connect a test lead across TP7 and TP9 (see Figure 8-2) on the Control PCB. This will move the trip level for the overcurrent detection threshold from the normal operating point of 5.76 to 5.5 amps (6.93 to 6.6 amps for commercial applications).

2. Turn switch S1 to the highest brightness step B3. If ammeter does not read 6.6A, adjust pot. R46 until ammeter reads 6.6A.

NOTE

Do not change the adjustment of R47, since this not only will affect the output current of the CCR but the potentiometer adjustment levels for all other current levels.

3. Physically center the overcurrent potentiometer R48 (see Figure 8-2). While viewing the red overcurrent LED on the Control Panel, slowly turn R48 clockwise until the LED begins to glow. Then quickly turn control switch S1 to the next lower intensity step. This will turn the LED off because the current level is less.

NOTE

If the potentiometer R48 is turned too far, the CCR will shut down. If this should occur, return potentiometer R48 to the centered position and reset the CCR by momentarily turning the CCR off and then back on.

4. While watching the overcurrent LED, return S1 to the highest intensity step, and time how long it takes for the overcurrent LED indicator to start to glow. It should take 3 ±1 s.

NOTE

If the LED comes on in less than 2 seconds, turn potentiometer R48 a slightly counterclockwise. If more than 4 seconds are required for the LED to light, turn R48 slightly clockwise. Repeat step 4 until the correct time period (3 ±1 s) is obtained.

5. Turn off the CCR and remove test leads from TP7 and TP9. The trip level for the overcurrent threshold is now calibrated for 5.76 amps (6.93 amps, commercial).

6. For EALS CCR only, set pot. R46 to fully ccw position (5.5A).

7.6 CHANGING INPUT VOLTAGE.- The input voltage has been factory set for the input voltage of 416 V ac per ME-201. If it is desired to change the input voltage to 208 V ac or vice versa, perform the steps listed below.

WARNING

Deenergize CCR by turning rotary switch S1 to OFF and turn off disconnect switch or main circuit breaker (turn off power generator if used). Ground output terminals prior to making any adjustments.

7.6.1 Changing from 416 V ac Input to 208 V ac.- Refer to Figure 8-3 for wiring schematic showing 416 V ac wiring connections.

Make the following wiring changes on terminal blocks TB8 and TB7:

1. Move wire #515 from TB8-5 to TB8-7
2. Move wire #613 from TB8-4 to TB8-3
3. Move wire #615 from TB8-6 to TB8-5
4. Move wire #153 from TB7-2 to TB7-4
5. Move wire #152 from TB7-2 to TB7-3

7.6.2 Changing from 208 V ac Input to 416 V ac.- Refer to Figure 8-3 for wiring schematic showing 416 V ac wiring connections.
Make the following wiring changes on terminal blocks TB8 and TB7:

1. Move wire #515 from TB8-7 to TB8-5
2. Move wire #613 from TB8-3 to TB8-4
3. Move wire #615 from TB8-5 to TB8-6
4. Move wire #153 from TB7-4 to TB7-2
5. Move wire #152 from TB7-3 to TB7-2

7.7 CONNECTIONS FOR COMMERCIAL USE.- To operate the EALS CCR for commercial applications, the following changes may be required:

1. The 416 V ac input voltage can be changed to 208 V ac by following directions in par. 7.6.1.

2. The maximum output current level B3 can be changed from 5.5 A to 6.6 A (FAA Required) as indicated in par. 7.5.2. If the maximum output current level is changed, the overcurrent threshold setting level may also require resetting and described in par. 7.5.3.

3. If it is desired not to use the input, output, and remote control receptacles installed on the CCR, they can be removed and the wiring connected directly to the terminal blocks as follows:

   CONNECT INPUT POWER LINES (See Table 1-5 for recommended power supply wire) TO....TB8-1, TB8-2

   CONNECT SERIES LIGHTING CIRCUIT (AWG 8 minimum, 5000 V ac, Type L-824) TO... TB1-1, TB1-2 or
   top of lightning arrestors (RV2, RV3)

   CONNECT REMOTE CONTROL LINES (AWG 19 minimum, AWG 12 maximum) TO...TERMINAL BLOCK TB2 AS FOLLOWS:

TB2-1	CCI (+48 V dc)
TB2-2	CC
TB2-3	spare
TB2-4	spare
TB2-5	B1
TB2-6	B2
TB2-7	B3
TB2-8	CCI (120 V ac)

NOTE

Tables 7-1 and 7-2 give the necessary terminal block TB2 connections for remote control. Terminal B1 does not need to be wired. Brightness step B1 occurs when the regulator is switched on.

TABLE 7-1. REMOTE CONTROL CONNECTIONS

Terminal Block TB2 Label	Function
CCI	Remote Control Power
CC	Remote On-Command Voltage
B1, B2, B3	Brightness Control

TABLE 7-2. REMOTE 120 VAC CONTROL TB2 CONNECTIONS

REMOTE INTENSITY STEP	CONNECT CCI TO:
HIGH 6.6 A	CC, B3
MEDIUM 5.5 A	CC, B2
LOW 4.8 A	CC, B1
OFF	Nothing

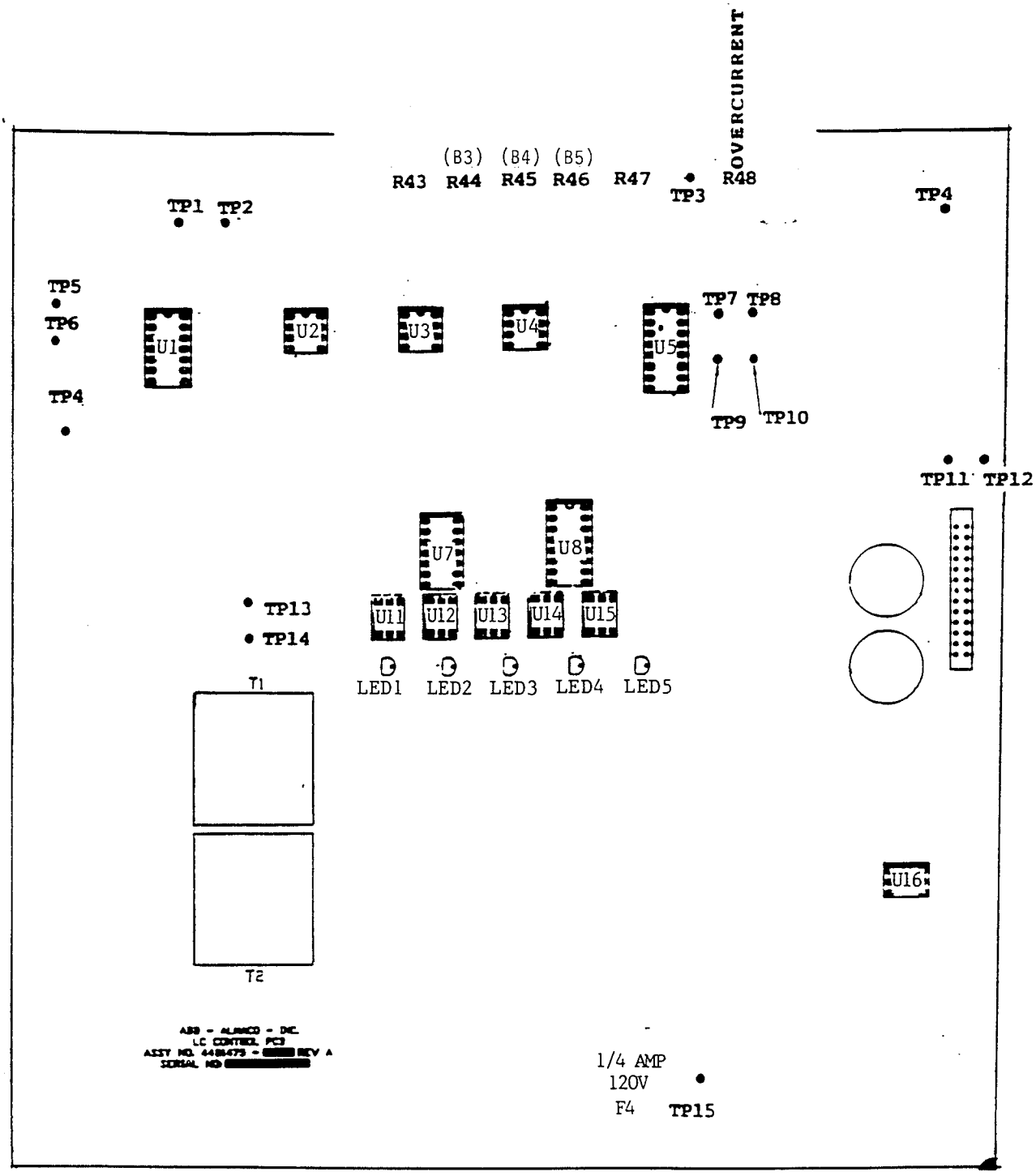
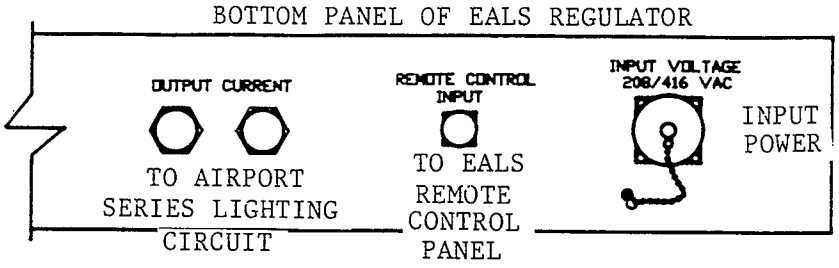
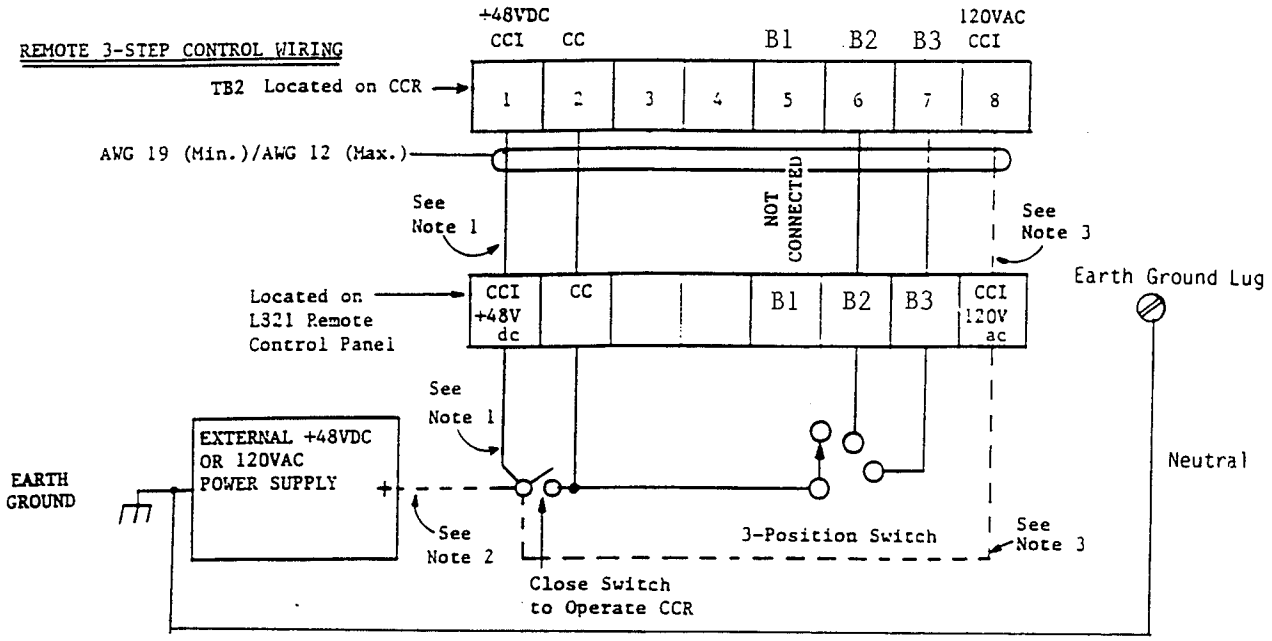


FIGURE 8-2. CONTROL PCB





NOTES:

(1) Wire connected only if using internal +48 VDC power supplied by CCR (CCI +48VDC, TB2-1)

(2) Wire connected only if using external +48 VDC or 120 VAC power supply in place of CCR's internal supply

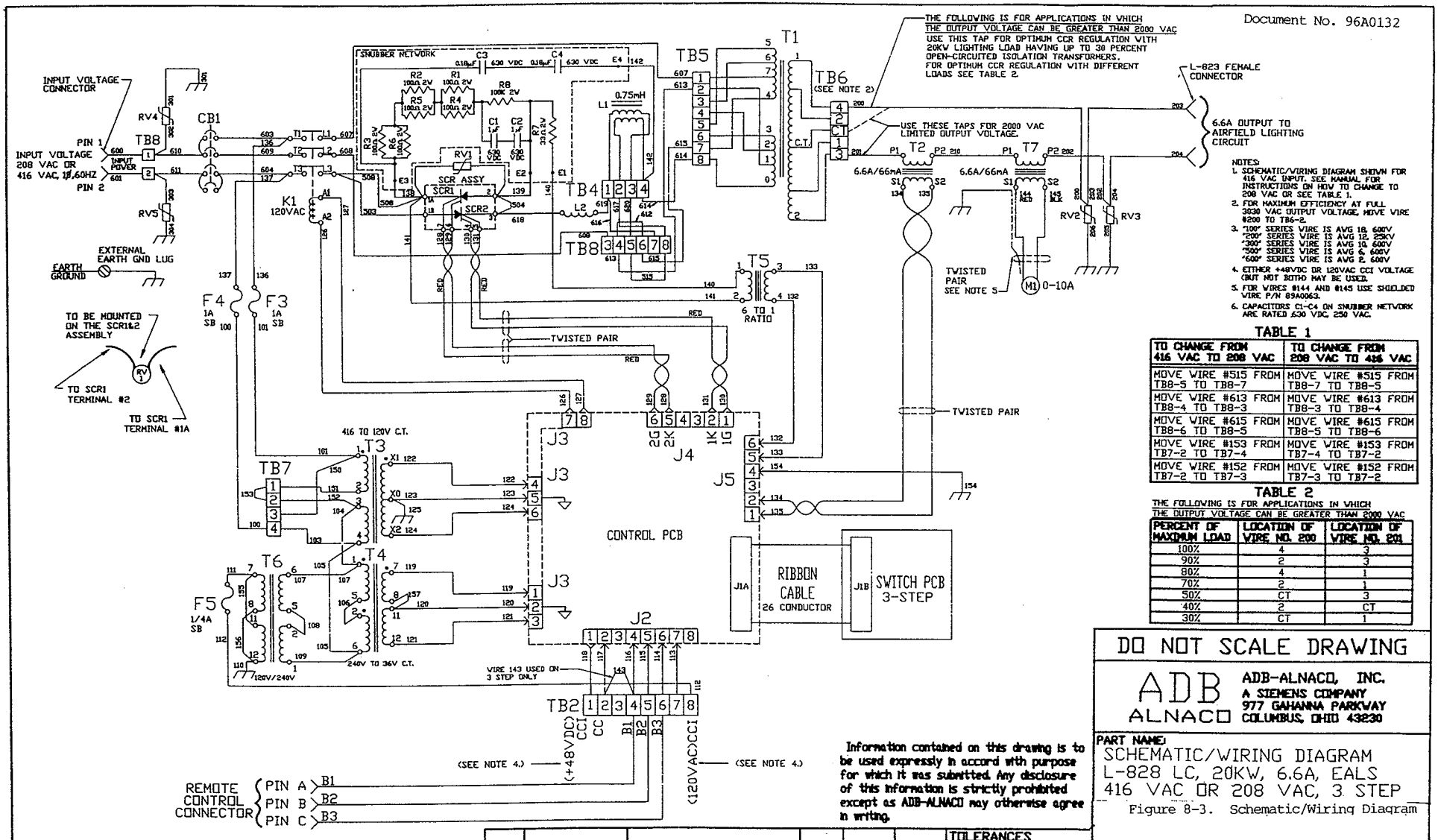
(3) Wire connected only if using internal 120 VAC power supplied by CCR (CCI 120VAC, TB2-8)

(4) When more than one remote control inputs from EALS regulators are to be connected to a common switch, it is suggested that the internally supplied CCI +48 VDC TB2-1 be used, or an external +48 VDC supply. It is not recommended that a 120 VAC supply be used.

CAUTION

EITHER +48 V DC OR 120 VAC CCI MAY BE USED, BUT NOT BOTH.

FIGURE 8-4. EXTERNAL WIRING



NOTES:

1. SCHEMATIC/WIRING DIAGRAM SHOWN FOR 416 VAC INPUT. SEE MANUAL FOR INSTRUCTIONS ON HOW TO CHANGE TO 208 VAC OR SEE TABLE 1.
2. FOR MAXIMUM EFFICIENCY AT FULL 3030 VAC OUTPUT VOLTAGE, MOVE WIRE #200 TO TB6-2.
3. "100" SERIES WIRE IS AVG 18, 600V
   "200" SERIES WIRE IS AVG 12, 250V
   "300" SERIES WIRE IS AVG 10, 600V
   "500" SERIES WIRE IS AVG 6, 600V
   "600" SERIES WIRE IS AVG 2, 600V
4. EITHER +48VDC OR 120VAC CCI VOLTAGE CAN BE USED, BOTH MAY NOT BE USED.
5. FOR WIRES #144 AND #145 USE SHIELDED WIRE P/N 89A0063.
6. CAPACITORS C1-C4 ON SNUBBER NETWORK ARE RATED .630 VDC, 250 VAC.

TABLE 1

TO CHANGE FROM 416 VAC TO 208 VAC	TO CHANGE FROM 208 VAC TO 416 VAC
MOVE WIRE #515 FROM TB8-5 TO TB8-7	MOVE WIRE #515 FROM TB8-7 TO TB8-5
MOVE WIRE #613 FROM TB8-4 TO TB8-3	MOVE WIRE #613 FROM TB8-3 TO TB8-4
MOVE WIRE #615 FROM TB8-6 TO TB8-5	MOVE WIRE #615 FROM TB8-5 TO TB8-6
MOVE WIRE #153 FROM TB7-2 TO TB7-4	MOVE WIRE #153 FROM TB7-4 TO TB7-2
MOVE WIRE #152 FROM TB7-2 TO TB7-3	MOVE WIRE #152 FROM TB7-3 TO TB7-2

TABLE 2

THE FOLLOWING IS FOR APPLICATIONS IN WHICH THE OUTPUT VOLTAGE CAN BE GREATER THAN 2000 VAC

PERCENT OF MAXIMUM LOAD	LOCATION OF WIRE NO. 200	LOCATION OF WIRE NO. 201
100%	4	3
90%	2	3
80%	4	1
70%	2	1
50%	CT	3
40%	2	CT
30%	CT	1

DO NOT SCALE DRAWING

ADB ALNACO

ADB-ALNACO, INC.
A SIEMENS COMPANY
977 GAHANNA PARKWAY
COLUMBUS, OHIO 43230

PART NAME:
SCHEMATIC/WIRING DIAGRAM
L-828 LC, 20KW, 6.6A, EALS
416 VAC OR 208 VAC, 3 STEP

Figure 8-3. Schematic/Wiring Diagram

LET	E.C. No	REVISION	BY	DATE	APPVD
E	———	PROD. UPDATE	CWR	5-6	
D	———	PROD. RELEASE	CWR		

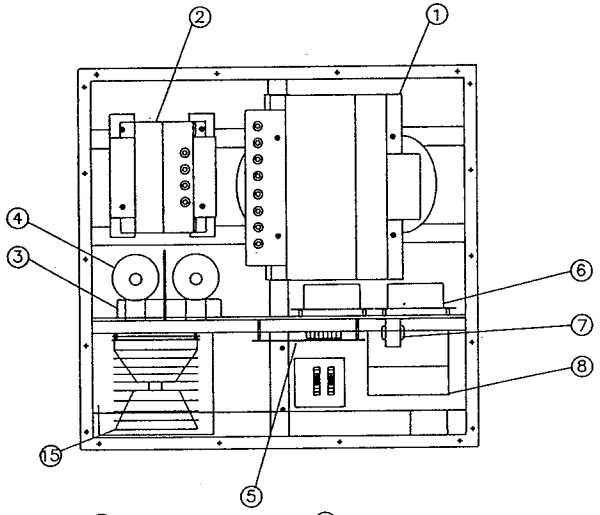
TOLERANCES UNLESS OTHERWISE NOTED:
ANGULAR:
FRACTIONAL:
DECIMAL:

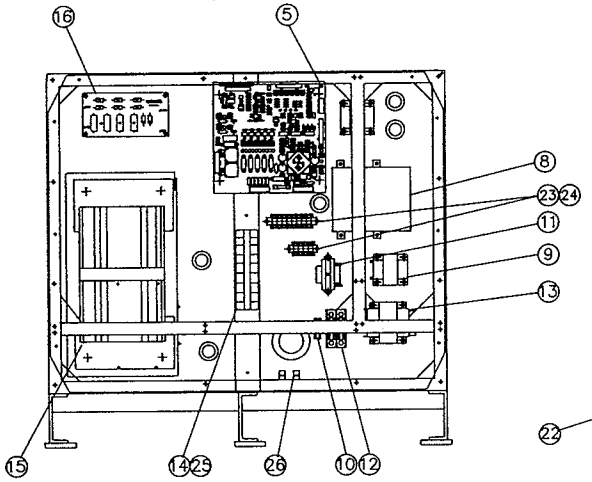
43B0892 E

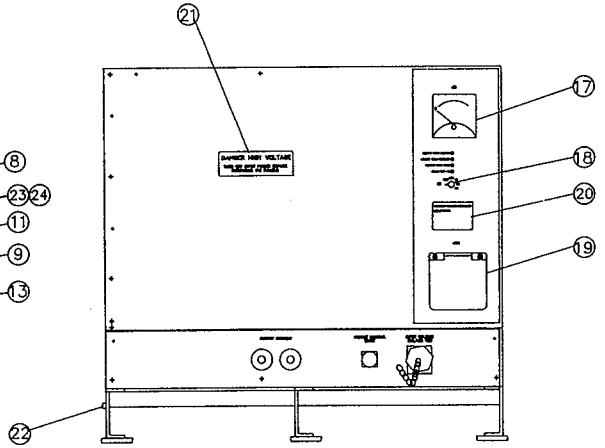
GENERAL ASSEMBLY BILL OF MATERIAL ORDER OF ENTRY: NUMERICAL ORDER OF ALL COMPONENTS. LINE EVERY FIFTH COMPONENT AT A MINIMUM, RH NUMBERS LISTED LAST.

GENERAL ASSEMBLY BILL OF MATERIAL

ITEM NO.	PART NUMBER	PART NAME/DESCRIPTION	QTY.
1	35A0296	TRANSFORMER, POWER, 20KW	1
2	33A0026	INDUCTOR, POWER, 20KW, 60HZ	1
3	33A0027	INDUCTOR, AIR WOUND	1
4	32A0024	LIGHTNING ARRESTOR	2
5	44D2180	P.C.B. CONTROL	1
6	35A0398	TRANSFORMER, CURRENT RATIO, 6.6A/66mA	2
7	35A0343	TRANSFORMER, RATIO 6:1	1
8	53A0276	CONTACTOR, 125A, 120VAC	1
9	35A0345	TRANSFORMER, 240VAC TO 36VAC	1
10	47A0117	FUSE, 1/4AMP 250V	1
11	35A0344	TRANSFORMER, 240VAC TO 120VAC	1
12	47A0108	FUSE, 1A, 480V	2
13	35A0337	TRANSFORMER, 416VAC/208VAC TO 120VAC	1
14	72A0071	TERMINAL BLOCK, 2-8AWG, 600V	8
15	44C2026	SCR NETWORK ASSY	1
16	44B2213	SNUBBER NETWORK ASSY	1
17	52A0107	METER, 10A SCALE, 100mA INPUT	1
18	44B2006	FINAL ASSY, SWITCH P.C.B., 3 STEP	1
19	57A0056	CIRCUIT BREAKER, 70A, 4-POLE	1
20	42A0269	NAMEPLATE, "L-828"	1
21	91A0033	LABEL, "HIGH VOLTAGE"	2
22	72A0155	GROUND LUG	1
23	72A0016	TERMINAL BLOCK, 18-22AWG, 600V	12
24	72A0025	TERMINAL BLOCK END	2
25	72A0070	TERMINAL BLOCK END	1
26	32A0028	VARISTOR V571DA40	2



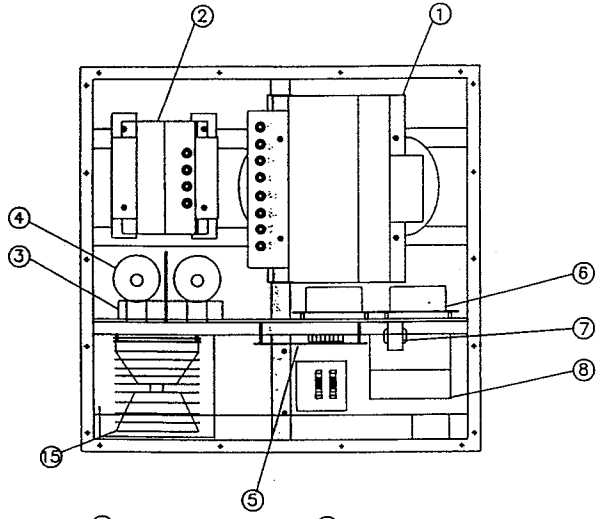


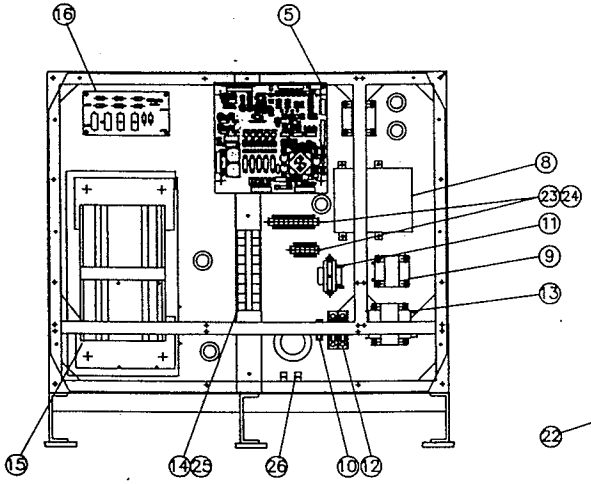


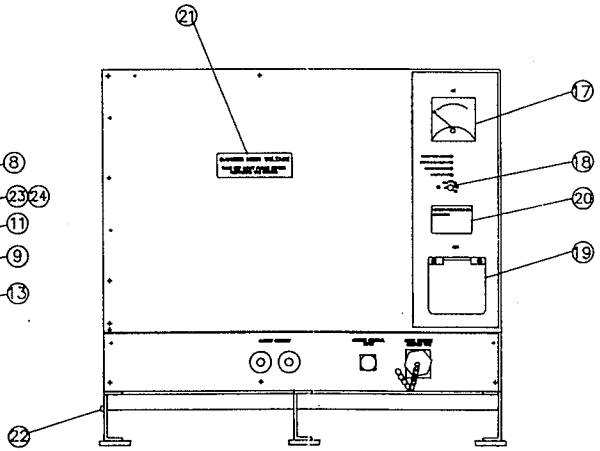
ADB ALNACO
ADB-ALNACO, INC.
A SIEMENS CO.
977 GAHANNA PARKWAY
COLUMBUS, OHIO 43230

PART NAME:

FIGURE 8-1, FINAL ASSY L-828 20KW, EALS







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GENERAL ASSEMBLY BILL OF MATERIAL

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2	33A0026	INDUCTOR, POWER, 20KW, 60HZ	1
3	33A0027	INDUCTOR, AIR WOUND	1
4	32A0024	LIGHTNING ARRESTOR	2
5	44D2180	P.C.B. CONTROL	1
6	35A0396	TRANSFORMER, CURRENT RATIO, 6.6A/66mA	2
7	35A0343	TRANSFORMER, RATIO 6:1	1
8	53A0276	CONTACTOR, 125A, 120VAC	1
9	35A0345	TRANSFORMER, 240VAC TO 36VAC	1
10	47A0117	FUSE, 1/4AMP 250V	1
11	35A0344	TRANSFORMER, 240VAC TO 120VAC	1
12	47A0108	FUSE, 1A, 480V	2
13	35A0337	TRANSFORMER, 416VAC/208VAC TO 120VAC	1
14	72A0071	TERMINAL BLOCK, 2-8AWG, 600V	8
15	44C2028	SCR NETWORK ASSY	1
16	44B2213	SNUBBER NETWORK ASSY	1
17	52A0107	METER, 10A SCALE, 100mA INPUT	1
18	44B2006	FINAL ASSY, SWITCH P.C.B., 3 STEP	1
19	57A0056	CIRCUIT BREAKER, 70A, 4-POLE	1
20	42A0289	NAMEPLATE, "L-828"	1
21	91A0033	LABEL, "HIGH VOLTAGE"	2
22	72A0155	GROUND LUG	1
23	72A0016	TERMINAL BLOCK, 18-22AWG, 600V	12
24	72A0025	TERMINAL BLOCK END	2
25	72A0070	TERMINAL BLOCK END	1
26	32A0028	VARISTOR V571DA40	2

DO NOT SCALE DRAWING

ADB ALNACO
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A SIEMENS COMPANY
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FIGURE 8-1, FINAL ASSEMBLY
L-828 20KW, EALS