INSTRUCTION MANUAL

REGULATED POWER SUPPLIES

LCS-B SERIES
THIS MANUAL APPLIES TO UNITS
BEARING SERIAL NO. PREFIXES A-D

LAMBDA

LAMBDA ELECTRONICS CORP.-MELVILLE, L. I., N. Y.

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G-9431-5

LAMBDA ELECTRONICS CORP. MELVILLE, L.I., N.Y.
MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

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SPECIFICATIONS AND FEATURES

Specifications apply for all models

DC OUTPUT - Voltage regulated for line and load.

TABLE I

VOLTAGE AND CURRENT

RANGES

MODEL	VOLTAGE RANGE	MAXIMUM CURRENT (AMPS) AT AMBIENT TEMPERATURE				INPUT POWER (WATTS*)
		40°C	50°C	60°C	71°C	
LCS-B-2	2±5%	6.5	5.3	4.5	3.3	110
LCS-B-5-OV	5±5%	5.8	5.0	4.0	3.0	110
LCS-B-6	6±5%	5.5	4.7	3.8	2.9	115
LCS-B-12	12±5%	3.8	3.6	3.0	2.2	120
LCS-B-15	15±5%	3.2	2.8	2.5	1.5	125
LCS-B-20	20±5%	2.7	2.3	2.0	1.4	125
LCS-B-24	24±5%	2.1	2.0	1.8	1.2	115
LCS-B-28	28±5%	1.8	1.7	1.6	1.0	115
LCS-B-36	36±5%	1.4	1.3	1.1	0.7	110
LCS-B-48	48±5%	1.1	1.0	0.9	0.6	110
LCS-B-100	100±5%	0.46	0.46	0.46	0.34	95
LCS-B-120	120±5%	0.40	0.40	0.40	0.30	95
LCS-B-150	150±5%	0.32	0.32	0.32	0.25	95
LCS-B-01	0-7	3.7	3.3	2.7	1.7	90
LCS-B-02	0-18	2.0	1.8	1.6	1.2	80
LCS-B-03	0-32	1.1	1.0	0.8	0.5	70
LCS-B-04	0-60	0.6	0.55	0.45	0.3	65
LCS-B-05	0-120	0.25	0.25	0.22	0.16	55

*With output loaded to full 40°C rating and input voltage 132 volts AC, 60 Hz.
Current range must be chosen to suit the appropriate maximum ambient temperature. Current ratings apply for entire voltage range.

REGULATED VOLTAGE OUTPUT

Regulation (line).....0.01 percent plus 1.0 millivolt for input variations from 105-132 or 132-105 volts AC.

Regulation (load).....0.01 percent plus 1.0 millivolt for load variations from no load to full load or full load to no load

Remote Programmnng

External Resistor.....Nominal 1000 ohms/volt output

Programming Voltage...One-to-one voltage change

Ripple and Noise.....250 microvolts rms; 1 millivolt peak to peak with 57-63 Hz input

Temperature Coefficient....Output change in voltage (0.01% + 0.3mv)/°C using an external programming resistor, less than (0.015% + 0.3mv) /°C with internal resistor

Remote Sensing.....Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation

AC INPUT - 105-132, 205-265 or 187-242 ("V" option) volts AC at 47-440 Hz. For input power, see table I. Ratings apply for 57-63Hz; at 47-57 Hz derate current rating 10% for each ambient temperature given in table I. For 63-440 Hz input, consult factory.

OVERLOAD PROTECTION

Thermal.....Thermostat, resets automatically when over temperature condition is eliminated

Electrical

External.....Automatic electronic current limiting circuit, limits output current to a preset value less than 110% of 40°C current rating. Automatic current limiting protects the load and power supply when external overloads and direct shorts occur

Internal.....Fuse F1 provides protection against internal circuit failure.

OVERVOLTAGE PROTECTION - Model LCS-B-5-OV includes a fixed built in overvoltage protection circuit which prevents damage to the load caused by excessive power supply output voltage. Overvoltage protection firing range is between 6.2 and 7.4 volts D.C.

INPUT AND OUTPUT CONNECTIONS - Terminal block on rear of chassis.

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE- Continuous duty from -20°C to 71°C ambient with corresponding load current ratings for all modes of operation

STORAGE TEMPERATURE - (non-operating) -55°C to 85°C

CONTROLS

DC Output Control.....Voltage adjust control permits adjustment of DC output voltage via access hole located in nameplate.

PHYSICAL DATA

Size.....3-3/16" x 4-11/16" x 6-1/2"

Weight.....7 lbs. net; 8 lbs. shipping wt.

Finish.....Grey, FED STD 595 No. 26081

MOUNTING - Three surfaces, each with tapped mounting holes, can be utilized for mounting this unit. All LCS-B power supplies can be mounted with Top, Front, or Right Side facing up. Top, Front, or Right Side must be in a horizontal plane. Refer to figure 12 for mounting details.

MODEL OPTIONS

"V" Option.....Standard LCS-B power supplies can be obtained for 205-265 VAC input or 187-242 VAC input. See nameplate for AC input rating. See schematic for rewireing of AC input. At 45-57 Hz input, derate current 10% for each ambient temperature given in Table I. At 63-440 Hz input, consult factory for details of operation.

"S" Option.....All fixed voltage LCS-B power supplies (LCS-B-5-0V - LCS-B-48 Only) must be specified with the "S" option when used with the System Power Sequencer. On units with "S" option resistor R20 is jumped, see schematic diagram.

ACCESSORIES

Rack Adapters.....Rack adapters LRA-4, LRA-6, LRA-8, LRA-10, LRA-11, LRA-12, and LRA-13 used for ruggedized mounting with or without chassis slides are available as well as rack adapters LRA-3 and LRA-5, which are used for simple rack installations where chassis slides are not required.

Overvoltage Protector.....Externally mounted, Overvoltage Protectors LMOV-1, LMOV-2, and LMOV-3 are available for use with models LCS-B-2 and LCS-B-6 through LCS-B-48 power supplies. On models LCS-B-01 through LCS-B-04, use Overvoltage Protectors LHOV-4,LHOV-5,and LHOV-6.

Metering Panel.....A Systems Metering Panel SMP-3 or SMP-5 may be used in conjunction with the LCS-B power supplies. The panel, mounted in rack adapters LRA-8 or as applicable LRA-10, LRA-11, and used with a Systems Cable, contains a voltmeter and an ammeter, each with three ranges and a push button selector switch. The selector switch allows monitoring of the voltage and current of any of up to 8 outputs.

Metered and Non-Metered Panels....Metered panels MP-3, MP-5 and Non-Metered panels P-3, P-5 are available for use with Lambda rack adapters LRA-4, LRA-6, or LRA-7.

THEORY OF OPERATION

GENERAL

The Lambda power supply consists of an AC input circuit and transformer; a bias supply consisting of an auxiliary rectifier and filter, and pre-regulator*; a main regulator circuit consisting of the main rectifier and filter, a series regulator, emitter follower driver, a current comparator*, a voltage comparator*, an amplifier*, current and voltage sensing networks and a voltage reference circuit*.

* This circuit element is part of integrated circuit (IC1) in the supply.

The circuit arrangement is shown in block diagram form, Figure 10 The circuitry is discussed with reference to the block diagram and the schematic diagram.

FUNCTIONAL DESCRIPTION

Single phase input power is applied to transformer T1 through the input circuit which contains a thermostat to protect the supply against over heating.

The main rectifier, a full wave rectifier, provides the power which is filtered by capacitor C6 and, as applicable, C3 and then regulated via a series regulator and delivered to the output. Half-wave auxiliary rectifier CR1 provides voltage filtered by capacitor C1 for the preregulator located in IC1. The reference element, powered by the preregulator, provides a reference voltage for the current comparator and the voltage comparator.

Constant voltage circuit operation is determined by changes in the load which cause a change in one input to the voltage comparator. A second input to comparator is a reference voltage that is developed by a constant current of 1 milliampere flowing in divider element R8. The comparator compares the output voltage change with the reference voltage resulting in an error signal at the output of the comparator.

The error signal from the comparator is then current amplified by drivers Q1 and Q2. The amplified signal from the drivers controls the voltage across the series regulators Q3 and Q4, which function as the active regulating elements in the supply.

* Current limit circuit operation for models LCS-B-2 through LCS-B-150 is determined by changes in the load. The current comparator samples load current through current sensing resistor R7. When the voltage drop across R7 increases to the preset voltage reference determined by R6, R9, and R13, the current comparator conducts. Thus, when the output current rating of the unit is exceeded the current comparator conducts, decreasing the current through drivers Q1 and Q2, resulting in an increase of voltage across the series regulator and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by fixed resistors R6, R7, R9 and variable resistor R13.

When operating conditions approach short circuit, the output voltage decreases. Since the voltage determined by R13 is proportional to the output voltage, when the output voltage decreases, the amplifier is biased into turn on at lower and lower load currents until output voltage decreases to zero and current decreases to a predetermined low value.

* The following theory applies to models LCS-B-01 through LCS-B-05.

Current limit circuit operation is determined by changes in the load. When load current increases above the rated current value, the voltage drop across current limit potentiometer R13 increases causing the amplifier to turn on. With the amplifier conducting the current to drivers Q1 and Q2 decreases, limiting the base current to series regulators Q3 and Q4 which results in an increase of voltage across the series regulators and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by the factory setting of current limit potentiometer R13.

When operating conditions reach short circuit, the output voltage value decreases to zero and the current remains at the current limit value.

OV CIRCUIT, FUNCTIONAL DESCRIPTION (LCS-B-5-OV ONLY)

When the power supply output voltage increases above zener breakdown voltage of CR28 (approximately 6.2 volts) and gate voltage of SCR1 (approximately 0.6 volts), CR28 conducts and current is supplied to the gate of SCR1. SCR1 fires, causing the power supply output voltage to drop.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 40°C. For continuous operation, load current must not exceed the rating for each ambient temperature and will remain limited to less than 110% of 40°C rating.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before appling AC input power.

Ground Connections. The Lambda power supply can be operated either with negative or positive output terminal grounded. Both positive and negative ground connections are shown in the diagrams for all suggested output connections illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminal block on the rear of the supply. Apply input power to terminals 1 and 2; always connect the ungrounded (hot) lead to terminal 1.

The supply positive terminal is brought out to terminal 6. The supply negative terminal is brought out to terminal 4. Recommended wiring of the power supply to the load and selection of wiring is shown in figures 1 through 9. Selection of proper wiring is made on the basis of load requirements. Make all performance checks and measurements of current or voltage at the rear output terminals. Connect measuring devices directly to terminals or use the shortest leads possible.

SUPPLY LOAD CONNECTIONS

Connections For Operation as a Constant Voltage Source

The output impedance and regulation of the power supply at the load may change when using the supply as a constant voltage source and connecting leads of practical length are used. To minimize the effect of the output leads on these characteristics, remote sensing is used. Recommended types of supply-load connections with local or remote sensing are described in the following paragraphs.

Refer to figure 1 to determine voltage drop for particular cable length, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Two-Wire Connection, Figure 3. The two-wire connection, with local sensing, is the connection suitable for applications with relatively constant load.

Four-Wire Connection, Figure 4. The four-wire connection with remote sensing, provides complete compensation for the DC voltage drops in the connecting cables. Sensing leads should be twisted pair to minimize AC pick-up.

Programmed Voltage Connections, Using External Resistor, Figure 5. Discrete voltage steps can be programmed with a resistance voltage divider valued at 1000 ohms/volt and a shorting-type switch as shown in Figure 5. When continuous voltage variations are required, use a variable resistor with the same 1000 ohms/volt ratio in place of the resistive voltage divider and shorting-type switch. Use a low temperature coefficient resistor to assure most stable operation. Before programming, adjust programming resistor for zero resistance and set voltage adjust control to the minimum rated output voltage.

As shown in figure 5, voltages can be programmed utilizing either local or remote sensing connections, as desired.

Programmed Voltage Connections, Using Programming Voltage, Figure 6. The power supply voltage output can be programmed with an externally connected programming power supply. The output voltage of the programmed supply will maintain a one-to-one ratio with the voltage of the programming supply if the output voltage control of the programmed supply is set to minimum output voltage.

The programming supply must have a reverse current capability of 1.5 ma. minimum.

Alternatively, when supplies with less than 1.5 ma reverse current capability are used, a resistor capable of drawing 1.5 ma at the minimum programming voltage must be connected across the output terminals of the supply. This programming supply must be rated to handle all excess resistor current at the maximum programming voltage.

Connections For Series Operation

The voltage capability of LCS-B power supplies can be extended by series operation. A maximum of 300 volts can be connected between either the +DC or -DC terminal and chassis ground with a maximum voltage capability of 300 volts possible for model LCS-B-150.

Figure 7, and as applicable, 7A shows the connections for either local or remote sensing in a series connection where the voltage control of each unit functions independently to control the output.

Figure 7 applies only to the LCS-B-01 through LCS-B-05 power supplies. If a common load is used, the maximum current rating of the unit with the lower current rating must not be exceeded.

Figure 7A shows the series connection applicable to the LCS-B-2 through LCS-B-150 power supplies. A diode, having a current carrying capability equal to or greater than the maximum current rating of the supply, must be used and connected as shown in figure 7A. The diode blocking voltage should be at least twice the maximum rated power supply current and voltage ratings.

Connections For Parallel Operation (Applicable only to LCS-B-01 --- LCS-B-05)

The current capability of LCS-B power supplies can be extended by parallel operation of LCS-B power supplies of equal* voltage capacities.

Units "M" and "S" are shown connected for parallel operation in figures 8 and 9. One power supply designated the "M" unit controls its own output as well as the output of the second power supply, designated the "S" unit.

* For applications using supplies of unequal voltage ratings, consult factory for details of operation.

Unit S operates to regulate its current in a ratio to that of the M unit by comparing the current in its internal sampling resistor with that current sampled by the master internal sampling resistor.

CAUTION: Always set "S" unit voltage control to zero (fully CCW) curing parallel operation, otherwise excessive current will flow through "M" unit voltage control.

NOTE: In order to maintain regulation specifications on model LCS-B-05, current must never fall below 0.5 ma.

OPERATION AFTER PROTECTIVE DEVICE SHUTDOWN

Thermostat Shutdown

The thermostat opens the input circuit only when the temperature of the internal heat sink exceeds a maximum safe value. The thermostat will automatically reset when the temperature of the heat sink decreases to a safe operating value. After eliminating the cause(s) for overheating and allowing time for the power supply to cool to a proper temperature, resume operation of the supply.

Fuse Shutdown

Fuses will blow when the maximum rated current value for the fuse is exceeded. Fatigue failure of fuses can occur when mechanical vibrations from the installation combine with thermally induced stresses to weaken the fuse metal. Many fuse failures are caused by a temporary condition and replacing the blown fuse will make the fuse protected circuit operative. When the LCS-B supply is used with the overvoltage protector option fuse F1 will provide load protection against internal component failure.

MAINTENANCE

GENERAL

This section describes trouble analysis routine, replacement procedures, calibration and test procedures that are useful for servicing the Lambda LCS-B power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on specifications and features for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check fuse, primary power lines, external circuit elements, and external wiring for malfunction before trouble shooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumper and supply-load connections or fuse failure due to metal fatigue.

Use the electrical schematic diagram and block diagram, figure 11, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistors with an instrument that has a highly limited current capability. Observe proper polarity to avoid error in measurement. The forward transistor resistance is low but never zero; backward resistance is always higher than the forward resistance.

For good transistors, the forward resistance for any junction is <u>always</u> greater than zero.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on, before checking for additional defective components could damage the replaced component.

When soldering semi-conductor devices, wherever possible, hold the lead being soldered with a pair of pliers placed between the component and the solder joint to provide an effective heat sink.

<u>NOTE</u>: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values. Only a dead short is a true indication of a shorted capacitor.

PRINTED CIRCUIT BOARD MAINTENANCE TECHNIQUES

1. If foil is intact but not covered with solder, it is a good contact. Do not attempt to cover with solder.

2. Voltage measurements can be made form either side of the board. Use a needlepoint probe to penetrate to the wiring whenever a protective coating is used on the wiring. A brass probe can be soldered to an alligator clip adapted to the measuring instrument.

3. Wherever possible use a heat sink when soldering transistors.

4. Broken or damaged printed wiring is usually the result of an imperfection, strain or careless soldering. To repair small breaks, tin a short piece of hook-up wire to bridge the break, and holding the wire in place, flow solder along the length of wire so that it becomes part of the circuitry.

5. When unsoldering components from the board never pry or force loose the part; unsolder the component by using the wicking process described below:

a) Select a 3/16 inch tinned copper braid for use as a wick; if braid is not available, select AWG No. 14 or No. 16 stranded wire with 1/2 inch insulation removed.

b) Dip the wick in liquid rosin flux.

c) Place the wick onto the soldered connection and apply soldering iron onto the wick.

d) When sufficient amount of solder flows onto the wick, freeing the component, simultaneously remove iron and wick.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes, and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

a) AC power of proper voltage and frequency is preset at input terminals.

b) Either positive or negative terminal is connected to chassis ground.

c) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

TROUBLE SHOOTING CHART

Symptom	Probable Cause	Remedy
1. Zero volts DC output	OUTPUT VOLTAGE control turned fully CCW	Check OUTPUT VOLTAGE control for proper setting and correct as necessary

TROUBLE SHOOTING CHART

Symptom	Probable Cause	Remedy
1. (con't)	Short circuit across output of supply	Check load & load connections, correct as necessary
Zero volts DC output	F1 open	Replace F1;if it blows immediately, check shorted diode CR7, transistors Q1 Q2,Q3 & Q4 & capacitor C7;replace as necessary
	Series regulator section open	Check Q1 & Q2 for open replace as necessary
	Shorted CR6 or CR7 (as applicable)	Check CR6 or CR7 for open,replace as necessary
	Current sensing resistor open	Check R7 for open,R6 for short
	Aux. rectifier CR1 open	Check CR1 for open, replace as necessary
	Open CR8,CR9,or R1	Check & replace as necessary
2. Unable to adjust output voltage	Damaged OUTPUT VOLTAGE control	Check R8 for short and/or open, replace as necessary
3. High ripple at line frequency or twice line frequency & unregulated DC output	Series regulator transistors shorted	Check and replace as necessary; Q1, Q2, Q3, Q4
	Defective main rectifier causes ripple at twice line frequency	Check for open and/or short CR2,CR3,CR4 & CR5 or,as applicable, CR14 or CR15
4. Same as 3, except intermittent	Foreign matter fallen into unit	Check for loose bench hardware & wire clippings that may have fallen through cover
5. High ripple at frequency other than line or twice line frequency	Oscillation due to defective component in filter network	Check for open C7,C2 & check for open and/or shortin C11 & R2.Replace defective component.
6. Large spikes at output	Capacitors C5,or as applicable,C4 & C14, open	Replace C5(or C4 & C14)

PERFORMANCE CHECKS

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 11. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

Set the differential meter, DVM (John Fluke Model 801H or equivalent) to the selected power supply operating voltage. Check the power supply load regualtion accuracy while switching from the load to no-load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105-132 or 132-105 volts AC and check the power-supply line regulation accuracy on the DVM differential meter.

Use a VTVM, Ballantine 320 or equivalent, to measure rms ripple voltage of the power supply DC output. Use oscilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

ADJUSTMENT OF CALIBRATION CONTROL R13

Whenever Q3, Q4, R6, R7, R9, R11, R13, R21, or IC1 are replaced, and voltage and current indications do not reflect maximum ratings, adjust R13 as follows. The adjustment procedure requires that the power supply is removed from associated equipment, is at an ambient temperature of 25-30°C, and is stabilized and not operating.

1. Remove AC input power to the supply.

2. Break seal on wiper of R13 from resistor housing and turn to full CW position.

3. Operate power supply for constant voltage with local sensing connected as shown in figure 3, with no external load.

4.* Turn voltage adjust control until minimum rated output voltage is obtained.

5.* Apply load so that output current is 110% of 40°C rating for the unit.

6.* Using an oscilloscope, Tektronix 503 or equivalent, observe output voltage while adjusting R13 in CCW direction. Adjust R13 until output ripple increases sharply and oscilloscope pattern changes.

7.* After adjustment is completed, remove AC power input to the supply and use glyptol sealant to seal wiper of R13 to resistor housing.

8.* After sealing, check setting and repeat adjustment procedure if required.

* Perform alternate steps 4A through 9A for adjustment of R13 on models LCS-B-01 - LCS-B-05.

4A. Turn voltage adjust control until rated output voltage is obtained.

5A. Apply load so that output current is 110% of 40°C rating for the unit.

6A. Using an oscilloscope, Tektronix 503 or equivalent, observe unit output voltage while adjusting R13 in a CCW direction. Adjust R13 until output ripple increases sharply and oscilloscope pattern changes.

7A. Place a DC ammeter of appropriate scale across output terminals 4 and 6 of the supply. The meter indication shall be a maximum of 115% of 40°C rating for the unit.

8A. After adjustment is completed, remove AC input power to the supply and use glyptol sealant to seal wiper of R13 to resistor housing.

9A. After sealing, check setting and repeat adjustment procedure if required.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest office of the Lambda Electronics Corp. where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt of this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used in the Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.

2. Lambda part number.

3. Description of part together with circuit designation.

4. If part is not an electronic part, or is not listed, provide a description, function, and location of the part.

PARTS LIST

The electrical parts located on Lambda models LCS-B-2 — LCS-B-150 and LCS-B-01 — LCS-B-05 are listed here. Parts common to a group of models are listed first. Unique parts of individual models within the group are listed separately, by model, immediately following the group common-parts listing. In addition, there are separate listings of parts for the "V" option and LMOV and LHOV accessories.

COMMON PARTS
MODELS LCS-B-2 — LCS-B-150 AND LCS-B-01 — LCS-B-05

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C1	Cap., elect., 40 mf -10 +75%, 25 vdc	CBP-40-036	$ 1.20
C2	Cap., mylar, 0.047 mf ±10%, 200 vdc	CGL-47-018	.39
C9	Cap., mylar, 1.0 mf ±10%, 200vdc	CGN-10-005	1.55
C10	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009	.50
C13	Not assigned		
C15	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C16, C17, C19 thru C22	Not assigned		
CR1, CR10, CR11	Rectifier	FBL-00-030	1.40
CR12	Not assigned		
CR13	Same as CR1		
CR17	Not assigned		
CR21*	Rectifier, zener diode	FBM-Z130	5.70
CR22†	Rectifier, zener diode	FBM-Z139	.27
CR23 thru CR27	Not assigned		
IC1*	Integrated Circuit	FBT-00-031	9.75
R1	Res., film, 8,660 ohms ±1%, ¼ w	DCS-87-071	.25
R5	Res., comp., 1,200 ohms ±10%, ¼ w	DCB-1221	.10
R9	Res., film, 10,000 ohms ±1%, ½ w	DCT-10-046	.45
R10*	Res., comp., 36 megohms ±5%, ¼ w	DCB-3665	.19
R12	Res., comp., 68,000 ohms ±10%, ¼ w	DCB-6831	.10
R14, R15	Not assigned		
R16	Res., comp., 470 ohms ±10%, ¼ w	DCB-4711	.10
R22, R24 thru R39	Not assigned		
XF1	Fuseholder	HRM-00-016	.33

*On models with serial no. prefix A, IC1 is FBT-00-010, $10.00; R10 is 68 M ±10%, DCB-6861, $0.15; CR21 is not used.

†CR22 not used on units with serial no. prefixes A-C.

UNIQUE PARTS
MODEL LCS-B-2

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C3	Cap., elect., 7,500 mf -10+100%, 15 vdc	CBS-75-077	$ 4.50
C4	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C5	Not assigned		
C6	Same as C3		
C7	Cap., elect., 450 mf -10+100%, 25 vdc	CBR-45-075	2.00
C8	Not assigned		
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34
C12	Not assigned		
C14	Same as C4		
C18, CR2 thru CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9	Not assigned		
CR14, CR15	Rectifier	FBL-00-054	1.50
CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 15A, 8AG, NORM-BLO	FFR-15-000	.17
Q1, Q2	Transistor, NPN	FBN-L113	2.75
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511	.10
R3	Res., comp., 5,600 ohms ±5%, 1 w	DGB-5625	.21
R4	Res., comp., 1,000 ohms ±10%, ½ w	DEB-1021	.12
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.21 ohms ±5%, 5 w	DFM-21-072	.75
R8	Res., var., ww, 2,000 ohms ±10%, 1 w	DNS-20-034	3.00
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ±10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 1,600 ohms ±5%, ½ w	DCS-16-015	.25
R21	Res., film, 10,000 ohms ±5%, ½ w	DCT-10-008	.25
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-124-013	5.00
T1	Transformer	ABA-LCSB-2	21.35

UNIQUE PARTS (Cont.)
MODEL LCS-B-5-OV

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C3	Cap., elect., 7,500 mf -10+100%, 15 vdc	CBS-75-077	$ 4.50
C4	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C5	Not assigned		
C6	Same as C3		
C7	Cap., elect., 450 mf -10+100%, 25 vdc	CBR-45-075	2.00
C8	Cap., elect., 10 mf ±20%, 10 vdc	CBP-10-027	2.00
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34
C12	Not assigned		
C14	Same as C4		
C18, CR2 thru CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9	Not assigned		
CR14, CR15	Rectifier	FBL-00-054	1.50
CR16, CR18 thru CR20	Not assigned		
CR28	Rectifier, zener diode	FBM-Z140	.27
F1	Fuse, 15A, 8AG, NORM-BLO	FFR-15-000	.17
Q1, Q2	Transistor, NPN	FBN-L113	1.96
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511	.10
R3	Res., comp., 5,600 ohms ±5%, 1 w	DGB-5625	.21
R4	Res., comp., 2,200 ohms ±10%, 1 w	DGB-2221	.12
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.21 ohm ±5%, 5 w	DFM-21-072	.75
R8	Res., var., ww, 5,000 ohms ±10%, 1 w	DNS-50-036	3.15
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms, ±10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 3,600 ohms ±5%, ½ w	DCS-36-017	.25
R21	Res., film, 24,000 ohms ±5%, ½ w	DCT-24-031	.75
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
R40	Res., comp., 100 ohms ±10%, ¼ w	DCB-1011	.06
S1	Thermostat	FKA-124-013	5.00

UNIQUE PARTS (Cont.)
MODEL LCS-B-5-OV (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
SCR1	Rectifier, silicon controlled	FBP-00-036	$ 4.20
T1	Transformer	ABA-LCSB-5	21.35

MODEL LCS-B-6

C3	Cap., elect., 7,500 mf -10+100%, 15 vdc	CBS-75-077	4.50
C4	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C5	Not assigned		
C6	Same as C3		
C7	Cap., elect., 450 mf -10+100%, 25 vdc	CBR-45-075	2.00
C8	Not assigned		
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34
C12	Not assigned		
C14	Same as C4		
C18, CR2 thru CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9	Not assigned		
CR14, CR15	Rectifier	FBL-00-054	1.50
CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 15A, 8AG, NORM-BLO	FFR-15-000	.17
Q1, Q2	Transistor, NPN	FBN-L113	1.96
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511	.10
R3	Res., comp., 5,600 ohms ±5%, 1 w	DGB-5625	.21
R4	Res., comp., 3,300 ohms ±5%, 1 w	DGB-3325	.36
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.21 ohm ±5%, 5 w	DFM-21-072	.75
R8	Res., var., ww, 5,000 ohms, ±10%, 1 w	DNS-50-036	3.15
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms, ±10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 3,600 ohms ±5%, ½ w	DCS-36-017	.25
R21	Res., film, 24,000 ohms ±5%, ½ w	DCT-24-031	.75
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-124-013	5.00
T1	Transformer	ABA-LCSB-6	21.35

UNIQUE PARTS (Cont.)

MODEL LCS-B-12

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C3	Cap., elect., 2,500 mf -10+100%, 40 vdc	CBS-25-075	$ 4.50
C4	Not assigned		
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C6	Same as C3		
C7	Cap., elect., 450 mf -10+100%, 25 vdc	CBR-45-075	2.00
C8	Not assigned		
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34
C12, C14	Not assigned		
C18	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008	.25
CR2 thru CR5	Rectifier	FBL-00-054	1.50
CR6, CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9, CR14 thru CR16, CR18, thru CR20	Not assigned		
F1	Fuse, 10A, 8AG NORM-BLO	FFR-10-000	.07
Q1, Q2	Transistor, NPN	FBN-L109	2.25
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511	.10
R3, R4	Res., comp., 5,600 ohms ±5%, 1 w	DGB-5625	.21
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016	1.30
R8	Res., var., ww, 10,000 ohms ±10%, 1 w	DNT-10-045	3.75
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ±10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 9,100 ohms ±5%, ½ w	DCS-91-025	.25
R21	Res., film, 100,000 ohms ±1%, ¼ w	DCV-10-027	.45
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-137-014	2.50
T1	Transformer	ABA-LCSB-12	21.35

MODEL LCS-B-15

C3	Cap., elect., 2,100 mf -10+100%, 35 vdc	CBS-21-043	3.87
C4	Not assigned		

UNIQUE PARTS (Cont.)

MODEL LCS-B-15 (cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	$ .65
C6	Same as C3		
C7	Cap., elect., 280 mf -10+100%, 40 vdc	CBR-28-074	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34
C12, C14	Not assigned		
C18	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008	.25
CR2 thru CR5	Rectifier	FBL-00-054	1.50
CR6, CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 10A, 8AG, NORM-BLO	FFR-10-000	.07
Q1, Q2	Transistor, NPN	FBN-L109	2.25
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511	.10
R3	Res., comp., 5,600 ohms ±5%, 1 w	DGB-5625	.21
R4	Res., comp., 8,200 ohms ±10%, 1 w	DGB-8221	.18
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.3 ohm ±5%, 3 w	DFM-30-053	.50
R8	Res., var., ww, 10,000 ohms ±10%, 1 w	DNT-10-045	3.75
R11	Same as R7		
R13	Res., var., 5,000 ohms ±10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 9,100 ohms ±5%, ½ w	DCS-91-025	.25
R21	Res., film, 100,000 ohms ±1%, ¼ w	DCV-10-027	.45
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-124-013	5.00
T1	Transformer	ABA-LCSB-15	21.35

MODEL LCS-B-20

C3	Cap., elect., 2,100 mf -10+100%, 35 vdc	CBS-21-043	3.87
C4	Not assigned		
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C6	Same as C3		

UNQIUE PARTS (Cont.)
MODEL LCS-B-20 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C7	Cap., elect., 280 mf -10+100%, 40 vdc	CBR-28-074	$ 1.77
C8	Not assigned		
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34
C12, C14, C18	Not assigned		
CR2 thru CR5	Rectifier	FBL-00-054	1.50
CR6, CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 10A, 8AG, NORM-BLO	FFR-10-000	.07
Q1, Q2	Transistor, NPN	FBN-L109	2.25
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511	.10
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031	.13
R4	Res., comp., 8,200 ohms ±10%, ½ w	DEB-8221	.12
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.39 ohm ±5%, 3 w	DFM-39-043	1.00
R8	Res., var., ww, 20,000 ohms ±10%, 1 w	DNT-20-010	2.85
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ±10%, ½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 15,000 ohms ±2%, ½ w	DCT-15-013	.30
R21	Res., film, 100,000 ohms ±1%, ¼ w	DCV-10-027	.45
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-124-013	5.00
T1	Transformer	ABA-LCSB-20	21.35

MODEL LCS-B-24

C3, C4	Not assigned		
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C6	Cap., elect., 2,700 mf -10+100%, 50 vdc	CBS-27-089	3.60
C7	Cap., elect., 175 mf -10+100%, 50 vdc	CBR-17-073	1.77
C8	Not assigned		

UNIQUE PARTS (Cont.)
MODEL LCS-B-24 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	$ .34
C12, C14, C18	Not assigned		
CR2 thru CR5	Rectifier	FBL-00-054	1.50
CR6, CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 10A, 8 AG, NORM-BLO	FFR-10-000	.07
Q1, Q2	Transistor, NPN	FBN-L109	2.25
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 150 ohms ±10%, ¼ w	DCB-1511	.10
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031	.13
R4	Res., comp., 18,000 ohms ±10%, 1 w	DGB-1831	.15
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.48 ohm ±5%, 3 w	DFM-48-061	.75
R8	Res., var., ww, 20,000 ohms ±10%, 1 w	DNT-20-010	2.85
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ±10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 15,000 ohms ±2%, ½ w	DCT-15-013	.30
R21	Res., film, 100,000 ohms ±1%, ¼ w	DCV-10-027	.45
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.06
S1	Thermostat		
T1	Transformer	ABA-LCSB-24	21.35

MODEL LCS-B-28

C3, C4	Not assigned		
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C6	Cap., elect., 1,600 mf -10+100%, 60 vdc	CBS-16-074	3.60
C7	Cap., elect., 175 mf -10+100%, 50 vdc	CBR-17-073	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34

UNIQUE PARTS (Cont.)
MODEL LCS-B-28 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C12, C14, C18	Not assigned		
CR2 thru CR5	Rectifier	FBL-00-054	$ 1.50
CR6, CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 5A, 8 AG, NORM-BLO	FFR-05-000	.12
Q1, Q2	Transistor, NPN	FBN-L109	2.25
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211	.06
R3	Res., comp., 10,000 ohms ± 10%, 1 w	DGB-1031	.13
R4	Res., comp., 18,000 ohms ± 10%, 1 w	DGB-1831	.15
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.56 ohm ±5%, 3 w	DFM-56-042	.50
R8	Res., var., ww, 20,000 ohms ± 10%, 1 w	DNT-20-010	2.85
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ± 10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 24,000 ohms ±5%, ½ w	DCT-24-031	.75
R21	Res., film, 120,000 ohms ± 1%, ½ w	DCV-12-019	.75
R23	Res., comp., 4,700 ohms ± 10%, ¼ w	DCB-4721	.06
S1	Thermostat	FKA-124-013	5.00
T1	Transformer	ABA-LCSB-28	21.35

MODEL LCS-B-36

C3	Cap., elect., 1,100 mf -10+100%, 60 vdc	CBS-11-042	3.67
C4	Not assigned		
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C6	Same as C3		
C7	Cap., elect., 160 mf -10+100%, 60 vdc	CBR-16-102	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34
C12, C14, C18	Not assigned		

UNIQUE PARTS (Cont.)
MODEL LCS-B-36 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR2 thru CR5	Rectifier	FBL-00-054	$ 1.50
CR6, CR7	Not assigned		
CR8	Rectifier	FBL-00-030	1.40
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 5A, 8 AG, NORM-BLO	FFR-05-000	.12
Q1, Q2	Transistor, NPN	FBN-L109	2.25
Q3, Q4	Transistor, NPN	FBN-36220	2.85
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211	.06
R3	Res., comp., 10,000 ohms ± 10%, 1 w	DGB-1031	.13
R4	Res., comp., 18,000 ohms ± 10%, 1 w	DGB-1831	.15
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.74 ohm ±5%, 3 w	DFM-74-070	.51
R8	Res., var., cermet, 23,000 ohms ± 10%, 0.75w	DRT-23-008	4.40
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ± 10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 24,000 ohms ±5%, ½ w	DCT-24-031	.75
R21	Res., film, 120,000 ohms ± 1%, ½ w	DCV-12-019	.75
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-118-012	5.00
T1	Transformer	ABA-LCSB-36	21.35

MODEL LCS-B-48

C3	Cap., elect., 730 mf -10+100%, 85 vdc	CBR-73-029	4.20
C4	Not assigned		
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C6	Same as C3		
C7	Cap., elect., 60 mf -10+100%, 100 vdc	CBP-60-051	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0068 mf ±10%, 200 vdc	CGK-68-001	.34
C12, C14, C18	Not assigned		

UNIQUE PARTS (Cont.)
MODEL LCS-B-48 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR2 thru CR5	Rectifier	FBL-00-054	$ 1.50
CR6, CR7	Not assigned		
CR8	Rectifier	FBL-00-036	.60
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 5A, 8 AG, NORM-BLO	FFR-05-000	.12
Q1, Q2	Transistor, NPN	FBN-L108	2.52
Q3, Q4	Transistor, NPN	FBN-35902	6.15
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211	.06
R3	Res., comp., 27,000 ohms ±10%, 1 w	DGB-2731	.15
R4	Res., comp., 18,000 ±10%, 1 w	DGB-1831	.15
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 0.91 ohm ±2%, 3 w	DFM-91-060	.95
R8	Res., var., cermet, 23,000 ohms ±10%, 0.75 w	DRT-23-008	4.40
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ±10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 39,000 ohms ±5%, ½ w	DCT-39-015	.30
R21	Res., film, 200,000 ohms ±1%, ¼ w	DCV-20-028	.50
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-118-012	5.00
T1	Transformer	ABA-LCSB-48	21.35

MODEL LCS-B-100

C3, C4	Not assigned		
C5	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009	.50
C6	Cap., elect., 240 mf -10+100%, 200 vdc	CBR-24-033	3.25
C7	Cap., elect., 39 mf -10+100%, 200 vdc	CBP-39-050	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0047 mf ±10%, 200 vdc	CGK-47-002	.33
C12, C14, C18	Not assigned		

UNIQUE PARTS (Cont.)
MODEL LCS-B-100 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR2 thru CR5	Rectifier	FBL-00-033	$ 1.65
CR6, CR7	Not assigned		
CR8	Same as CR2		
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 1½A, 8 AG NORM-BLO	FFR-01-500	.12
Q1, Q2	Transistor, NPN	FBN-L115	2.75
Q3, Q4	Transistor, NPN	FBN-38982	12.60
R2	Res., comp., 100 ohms ±10%, ¼ w	DCB-1011	.06
R3	Res., comp., 100,000 ohms ±10%, 1 w	DGB-1041	.18
R4	Res., ww, 40,000 ohms ±5%, 5 w	DFT-40-047	1.50
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 2.3 ohms ±2%, 3 w	DFN-23-077	.85
R8	Res., var., cermet 75,000 ohms ±10%, 0.75w	DRT-75-010	4.40
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ±10%, 1½w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 91,000 ohms ±5%, ½ w	DCT-91-055	.24
R21	Res., film, 432,000 ohms ±1%, ½ w	DCV-43-024	.50
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-118-012	5.00
T1	Transformer	ABA-LCSB-100	21.35

MODEL LCS-B-120

C3, C4	Not assigned		
C5	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009	.50
C6	Cap., elect., 240 mf -10+100%, 200 vdc	CBR-24-033	3.25
C7	Cap., elect., 39 mf -10+100%, 200 vdc	CBP-39-050	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0047 mf ±10%, 200 vdc	CGK-47-002	.33
C12, C14, C18	Not assigned		

UNIQUE PARTS (Cont.)
MODEL LCS-B-120 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR2 thru CR5	Rectifier	FBL-00-033	$ 1.65
CR6, CR7	Not assigned		
CR8	Same as CR2		
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 1½A, 8 AG, NORM-BLO	FFR-01-500	.12
Q1, Q2	Transistor, NPN	FBN-L115	2.75
Q3, Q4	Transistor, NPN	FBN-38982	12.60
R2	Res., comp., 100 ohms ±10%, ¼ w	DCB-1011	.06
R3	Res., comp., 100,000 ohms ±10%, 1 w	DGB-1041	.18
R4	Res., ww, 40,000 ohms ±5%, 5 w	DFT-40-047	1.50
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 2.7 ohms ±2%, 3 w	DFN-27-053	1.04
R8	Res., var., cermet, 75,000 ohms ±10%, 0.75 w	DRT-75-010	4.40
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ±10%, 1½ w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 91,000 ohms ±5%, ½ w	DCT-91-055	.24
R21	Res., film, 432,000 ohms ±1%, ½ w	DCV-43-024	.50
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-118-012	5.00
T1	Transformer	ABA-LCSB-120	21.35

MODEL LCS-B-150

C3, C4	Not assigned		
C5	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009	.50
C6	Cap., elect., 200 mf -10+100%, 250 vdc	CBR-20-045	2.68
C7	Cap., elect., 30 mf -10+100%, 250 vdc	CBP-30-017	2.00
C8	Not assigned		
C11	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008	.25
C12, C14, C18	Not assigned		

UNIQUE PARTS (Cont.)
MODEL LCS-B-150 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR2 thru CR5	Rectifier	FBL-00-033	$ 1.65
CR6, CR7	Not assigned		
CR8	Same as CR2		
CR9, CR14 thru CR16, CR18 thru CR20	Not assigned		
F1	Fuse, 1½A, 8 AG, NORM-BLO	FFR-01-500	.12
Q1, Q2	Transistor, NPN	FBN-L115	2.75
Q3, Q4	Transistor, NPN	FBN-38982	12.60
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211	.06
R3	Res., comp., 100,000 ohms ±10%, 1 w	DGB-1041	.18
R4	Res., ww, 40,000 ohms ±5%, 5 w	DFT-40-047	1.50
R6	Res., comp., 47 ohms ±10%, ½ w	DEB-4701	.12
R7	Res., ww, 3.0 ohms ±3%, 3 w	DFN-30-023	.59
R8	Res., var., cermet, 75,000 ohms ±10%, 0.75 w	DRT-75-010	4.40
R11	Same as R7		
R13	Res., var., ww, 5,000 ohms ±10%, 2 w	DNS-50-086	1.02
R17 thru R19	Not assigned		
R20	Res., film, 120,000 ohms ±1%, ½ w	DCV-12-019	.17
R21	Res., film, 432,000 ohms ±1%, ½ w	DCV-43-024	.50
R23	Res., comp., 4,700 ohms ±10%, ¼ w	DCB-4721	.10
S1	Thermostat	FKA-118-012	5.00
T1	Transformer	ABA-LCSB-150	21.35

MODEL LCS-B-01

C3	Cap., elect., 3,600 mf -10+100%, 20 vdc	CBS-36-044	3.00
C4	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C5	Not assigned		
C6	Same as C3		
C7	Cap., elect., 660 mf -10+100%, 25 vdc	CBR-66-087	4.50
C8	Not assigned		
C11	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008	.25
C12	Cap., elect., 2.2 mf ±20%, 20 vdc	CBN-22-029	1.23
C14	Same as C4		
C18	Not assigned		

UNIQUE PARTS (Cont.)
MODEL LCS-B-01 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C23	Same as C11		
CR2 thru CR6	Not assigned		
CR7	Rectifier	FBL-00-054	$ 1.50
CR8, CR9	Rectifier	FBL-00-030	1.40
CR14 thru CR16	Same as CR7		
CR18 thru CR20	Not assigned		
F1	Fuse, 10A, 8 AG, NORM-BLO	FFR-10-000	.07
Q1, Q2	Transistor, NPN	FBN-L113	1.96
Q3, Q4	Transistor, NPN	FBN-36485	4.13
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211	.06
R3	Res., comp., 1,000 ohms ±10%, 1 w	DGB-1021	.12
R4	Res., ww, 220 ohms ±3%, 5 w	DFR-22-079	.51
R6	Res., film, 249 ohms ±1%, ¼ w	DCR-25-034	.50
R7	Res., ww, 0.25 ohm ±5%, 5 w	DFM-25-016	1.30
R8	Res., var., cermet, 9,000 ohms ±10%, 0.75 w	DRS-90-003	4.40
R11	Same as R7		
R13	Res., var., ww, 100 ohms ±10%, 1½ w	DNR-10-046	1.26
R17 thru R21	Not assigned		
R23	Res., comp., 100,000 ohms ± 10%, ¼ w	DCB-1041	.57
S1	Thermostat	FKA-137-014	2.50
T1	Transformer	ABA-LCSB-01	21.35

MODEL LCS-B-02

C3	Cap., elect., 3,100 mf -10+100%, 30 vdc	CBS-31-030	3.00
C4	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C5	Not assigned		
C6	Same as C3		
C7	Cap., elect., 280 mf -10+100%, 40 vdc	CBR-28-074	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008	.25
C12	Not assigned		
C14	Same as C4		
C18, CR2 thru CR6	Not assigned		
CR7	Rectifier	FBL-00-054	1.50
CR8, CR9	Rectifier	FBL-00-030	1.40

UNIQUE PARTS (Cont.)
MODEL LCS-B-02 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR14 thru CR16	Same as CR7		
CR18, CR19	Same as CR8		
CR20	Not assigned		
F1	Fuse, 5A, 8 AG, NORM-BLO	FFR-05-000	$ .12
Q1, Q2	Transistor, NPN	FBN-L109	2.25
Q3, Q4	Transistor, NPN	FBN-36220	2.85
Q5	Same as Q1		
R2	Res., comp., 330 ohms ±10%, ¼ w	DCB-3311	.10
R3	Res., comp., 3,300 ohms ±5%, 1 w	DGB-3325	1.86
R4	Not assigned		
R6	Res., film, 249 ohms ±1%, ¼ w	DCR-25-034	.50
R7	Res., ww, 0.56 ohm ±5%, 3 w	DFM-56-042	.50
R8	Res., var., cermet, 23,000 ohms ± 10%, 0.75 w	DRT-23-008	4.40
R11	Same as R7		
R13	Res., var., ww, 100 ohms ±10%, 1½ w	DNR-10-046	1.26
R17	Same as R3		
R18	Res., comp., 820 ohms ±10%, ¼ w	DCB-8211	.06
R19	Same as R2		
R20, R21	Not assigned		
R23	Res., comp., 100,000 ohms ± 10%, ¼ w	DCB-1041	.57
S1	Thermostat	FKA-137-014	2.50
T1	Transformer	ABA-LCSB-02	21.35

MODEL LCS-B-03

C3, C4	Not assigned		
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C6	Cap., elect., 1,100 mf -10+100%, 60 vdc	CBS-11-042	3.67
C7	Cap., elect., 175 mf -10+100%, 50 vdc	CBR-17-073	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008	.25
C12, C14, C18	Not assigned		
CR2 thru CR5	Rectifier	FBL-00-054	1.50
CR6	Not assigned		
CR7	Same as CR2		
CR8, CR9	Rectifier	FBL-00-030	1.40
CR14	Not assigned		
CR16	Same as CR2		

UNIQUE PSRTS (Cont.)
MODEL LCS-B-03 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR18, CR19	Same as CR8		
CR20	Not assigned		
F1	Fuse, 5A, 8 AG, NORM-BLO	FFR-05-000	$ .12
Q1, Q2	Transistor, NPN	FBN-L109	2.25
Q3, Q4	Transistor, NPN	FBN-36220	2.85
Q5	Same as Q1		
R2	Res., comp., 270 ohms ±10%, ¼ w	DCB-2711	.06
R3	Res., comp., 10,000 ohms ±10%, 1 w	DGB-1031	.13
R4	Not assigned		
R6	Res., film, 249 ohms ±1%, ¼ w	DCR-25-034	.50
R7	Res., ww, 0.91 ohm ±2%, 3 w	DFM-91-060	.95
R8	Res., var., cermet, 40,000 ohms ±10%, 0.75 w	DRT-40-009	4.40
R11	Same as R7		
R13	Res., var., ww, 100 ohms ±10%, 1½ w	DNR-10-046	1.26
R17	Same as R3		
R18	Res., comp., 820 ohms ±10%, ¼ w	DCB-8211	.06
R19	Res., comp., 330 ohms ±10%, ¼ w	DCB-3311	.10
R20, R21	Not assigned		
R23	Res., comp., 100,000 ohms ±10%, ¼ w	DCB-1041	.57
S1	Thermostat	FKA-137-014	2.50
T1	Transformer	ABA-LCSB-28	21.35

MODEL LCS-B-04

C3	Cap., elect., 730 mf -10+100%, 85 vdc	CBR-73-029	4.20
C4	Not assigned		
C5	Cap., mylar, 0.1 mf ±10%, 200 vdc	CAM-10-012	.65
C6	Same as C3		
C7	Cap., elect., 60 mf -10+100%, 100 vdc	CBP-60-051	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008	.25
C12, C14, C18	Not assigned		
CR2 thru CR5	Rectifier	FBL-00-033	1.65
CR6	Rectifier	FBL-00-036	.60
CR7	Not assigned		
CR8	Same as CR6		
CR9	Rectifier	FBL-00-030	1.40
CR14 thru CR16	Not assigned		

UNIQUE PARTS (Cont.)
MODEL LCS-B-04 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR18, CR19	Same as CR9		
CR20	Same as CR6		
F1	Fuse, 1½A, 8 AG, NORM-BLO	FFR-01-500	$ .12
Q1, Q2	Transistor, NPN	FBN-L108	2.52
Q3, Q4	Transistor, NPN	FBN-35902	6.15
Q5	Same as Q1		
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211	.06
R3	Res., comp., 27,000 ohms ±10%, 1 w	DGB-2731	.15
R4	Not assigned		
R6	Res., film, 249 ohms ±1%, ¼ w	DCR-25-034	.50
R7	Res., ww, 1.63 ohms ±2%, 3 w	DFN-16-080	.63
R8	Res., var., cermet, 75,000 ohms ±10%, 0.75 w	DRT-75-010	4.40
R11	Same as R7		
R13	Res., var., ww, 100 ohms ±10%, 1½ w	DNR-10-046	1.26
R17	Same as R3		
R18	Res., comp., 820 ohms ±10%, ¼ w	DCB-8211	.06
R19	Res., comp., 330 ohms ±10%, ¼ w	DCB-3311	.10
R20, R21	Not assigned		
R23	Res., comp., 100,000 ohms ±10%, ¼ w	DCB-1041	.57
S1	Thermostat	FKA-137-014	2.50
T1	Transformer	ABA-LCS-B-48	21.35

MODEL LCS-B-05

C3, C4	Not assigned		
C5	Cap., mylar, 0.033 mf ±10%, 400 vdc	CGL-33-009	.50
C6	Cap., elect., 240 mf -10+100%, 200 vdc	CBR-24-033	3.25
C7	Cap., elect., 39 mf -10+100%, 200 vdc	CBP-39-050	1.77
C8	Not assigned		
C11	Cap., mylar, 0.0022 mf ±10%, 200 vdc	CGK-22-008	.25
C12, C14, C18	Not assigned		
CR2 thru CR6	Rectifier	FBL-00-033	1.65
CR7	Not assigned		
CR8	Same as CR2		
CR9	Rectifier	FBL-00-030	1.40
CR14 thru CR16	Not assigned		
CR18, CR19	Same as CR9		

UNIQUE PARTS (Cont.)
MODEL LCS-B-05 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
CR20	Same as CR6		
F1	Fuse, 1½A, 8 AG, NORM-BLO	FFR-01-500	$ .12
Q1, Q2	Transistor, NPN	FBN-L115	2.75
Q3, Q4	Transistor, NPN	FBN-38982	12.60
Q5	Same as Q1		
R2	Res., comp., 220 ohms ±10%, ¼ w	DCB-2211	.06
R3	Res., comp., 100,000 ohms ±10%, 1 w	DGB-1041	.18
R4	Not assigned		
R6	Res., film, 249 ohms ±1%, ¼ w	DCR-25-034	.50
R7	Res., ww, 4.0 ohms ±5%, 3 w	DFN-40-043	.66
R8	Res., var., cermet, 150,000 ohms ±10%,0.75w	DRV-15-006	5.10
R11	Same as R7		
R13	Res., var., ww, 100 ohms ±10%, 1½ w	DNR-10-046	1.26
R17	Same as R3		
R18	Res., comp., 820 ohms ±10%, ¼ w	DCB-8211	.06
R19	Res., comp., 330 ohms ±10%, ¼ w	DCB-3311	.10
R20, R21	Not assigned		
R23	Res., comp., 100,000 ohms ±10%, ¼ w	DCB-1041	.57
S1	Thermostat	FKA-124-013	5.00
T1	Transformer	ABA-LCSB-100	21.35

PARTS FOR "V" OPTION

On all LCS-B models with the suffix "V" capacitor C10 and transformer T1 change. Part no. change for C10 is listed here. For transformer T1 used on these models, see standard LCS-B model parts list for the standard transformer part no. and add suffix "G"* to the part no. Price for T1 does not change.

* Suffix "V" for serial no prefixes A & B.

ALL MODELS

C10	Cap., paper, 0.01 mf ±10%, 1000 vdc	CAL-10-021	1.77

PARTS FOR OVERVOLTAGE PROTECTOR ACCESSORY MODELS
LMOV-1, LMOV-2, LMOV-3, LHOV-4, LHOV-5, LHOV-6
COMMON PARTS

C1	Cap., mylar, 0.01 mf ±20%, 80 vdc	CGL-10-008	.50
Q1	Transistor, NPN	FBN-L102	2.40
R3	Res., film, 200 ohms ±5%, ½ w	DCR-20-010	.20

PARTS FOR OVERVOLTAGE PROTECTOR ACCESSORY MODELS
LMOV-1, LMOV-2, LMOV-3, LHOV-4, LHOV-5, LHOV-6
COMMON PARTS (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
R4	Res., thermistor, 425 ohms ±5%, 1¼ w	DKR-43-004	$ 1.52
R5, R6	Res., comp., 1,200 ohms ±10%, ½ w	DEB-1221	.12
R8	Res., comp., 15,000 ohms ±10%, ½ w	DEB-1531	.12
R10	Same as R5		
SCR1	Rectifier, silicon controlled	FBP-00-009	6.00

UNIQUE PARTS
MODEL LMOV-1

Q2	Transistor, PNP	FBN-L103	1.76
R1	Res., var., ww, 2,000 ohms ±10%, 1 w	DNS-20-034	3.00
R2	Res., film, 560 ohms ±2%, ½ w	DCR-56-002	.65
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305	.15
R9	Not assigned		

MODEL LMOV-2

Q2	Transistor, PNP	FBN-L103	1.50
R1	Res., var., ww, 2,000 ohms ±10%, 1 w	DNS-20-034	3.00
R2	Res., film, 1,470 ohms ±1%, ½ w	DCS-15-031	.30
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305	.15
R9	Not assigned		

MODEL LMOV-3

Q2	Transistor, PNP	FBN-L114	3.50
R1	Res., var., ww, 20,000 ohms ±10%, 1 w	DNT-20-010	2.85
R2	Res., film, 4,700 ohms ±2%, ½ w	DCS-47-028	.30
R7	Res., comp., 39 ohms ±5%, ¼ w	DCB-3905	.15
R9	Res., comp., 22 ohms ±10%, ½ w	DEB-2201	.12

MODEL LHOV-4

Q2	Transistor, PNP	FBN-L114	3.50
R1	Res., var., ww, 10,000 ohms ±10%, 1 w	DNT-10-045	3.75
R2	Res., film, 560 ohms ±2%, ½ w	DCR-56-002	.25
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305	.15
R9	Res., comp., 22 ohms ±10%, ½ w	DEB-2201	.12

PARTS FOR OVERVOLTAGE PROTECTOR ACCESSORY MODELS LMOV-1, LMOV-2, LMOV-3, LMOV-4, LHOV-5, LHOV-6 (Cont.)

UNIQUE PARTS (Cont.)

MODEL LHOV-5

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
Q2	Transistor, PNP	FBN-L114	$ 3.50
R1	Res., var., ww, 20,000 ohms ± 10%, 1 w	DNT-20-010	2.85
R2	Res., film, 560 ohms ±2%, ½ w	DCR-56-002	.25
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305	.15
R9	Res., comp., 22 ohms ±10%, ½ w	DEB-2201	.12

MODEL LHOV-6

Q2	Transistor, PNP	FBN-L114	3.50
R1	Res., var., ww, 30,000 ohms ± 10%, 0.6 w	DNT-30-027	9.90
R2	Res., film, 560 ohms ±2%, ½ w	DCR-56-002	.25
R7	Res., comp., 33 ohms ±5%, ¼ w	DCB-3305	.15
R9	Res., comp., 22 ohms ±10%, ½ w	DEB-2201	.12

PARTS FOR METERED AND NON-METERED PANEL ACCESSORIES MODELS MP-3, MP-5, P-3, P-5

C1, C2	Cap., tant., 2.5 mf -15 + 75%, 100 vdc (ALL)	CBN-25-010	1.80
DS1	Pilot light assembly (ALL)	HRD-00-007	.83
F1	Fuse, 3A, 3AG, SLO-BLO (ALL)	FFC-03-000	.33
M1*	Voltmeter, 0-5 vdc (LCS-B-2)	EBN-50-003	16.45
M1*	Voltmeter, 0-8 vdc (LCS-B-5-OV, LCS-B-6, LCS-B-01)	EBN-80-005	16.45
M1*	Voltmeter, 0-15 vdc (LCS-B-12)	EBP-15-017	15.97
M1*	Voltmeter, 0-20 vdc (LCS-B-15, LCS-B-02)	EBP-20-014	16.45
M1*	Voltmeter, 0-25 vdc (LCS-B-20)	EBP-25-018	16.45
M1*	Voltmeter, 0-40 vdc (LCS-B-24 thru LCS-B-36, LCS-B-03)	EBP-40-013	16.45

PARTS FOR METERED AND NON-METERED PANEL ACCESSORIES (Cont.) MODELS MP-3, MP-5, P-3, P-5 (Cont.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
M1*	Voltmeter, 0-60 vdc (LCS-B-48)	EBP-60-015	$15.97
M1*	Voltmeter, 0-120 vdc (LCS-B-100)	EBR-12-075	16.45
M1*	Voltmeter, 0-150 vdc (LCS-B-120)	EBR-15-076	16.45
M1*	Voltmeter, 0-200 vdc (LCS-B-150)	EBR-20-077	16.45
M2*	Ammeter, 0-10 adc (LCS-B-2 thru LCS-B-6)	EDP-10-013	15.97
M2*	Ammeter, 0-6 adc (LCS-B-12 thru LCS-B-20, LCS-B-01)	EDN-60-018	16.45
M2*	Ammeter, 0-5 adc (LCS-B-24)	EDN-50-021	16.45
M2*	Ammeter, 0-3 adc (LCS-B-28, LCS-B-36, LCS-B-02)	EDN-30-019	18.00
M2*	Ammeter, 0-2 adc (LCS-B-48, LCS-B-03)	EDN-20-022	12.00
M2*	Ammeter, 0-1 adc (LCS-B-100 thru LCS-B-150)	EDN-10-014	12.00
R1	Res., var., ww, 2,200 ohms ± 5%, 2 w (LCS-B-2)	DNS-22-053	1.68
R1	Res., var., ww, 4,500 ohms ± 5%, 2 w (LCS-B-5-OV, LCS-B-6)	DNS-45-059	2.88
R1	Res., var., ww, 9,000 ohms ± 5%, 2 w (LCS-B-12, LCS-B-15, LCS-B-01)	DNS-90-051	2.81
R1	Res., var., ww, 23,000 ohms ± 5%, 2 w (LCS-B-02)	DNT-23-069	15.14
R1	Res., var., cermet, 27,000 ohms ± 10%, 2 w (LCS-B-20 thru LCS-B-48)	DRT-27-001	4.93
R1	Res., var., cermet, 40,000 ohms ± 10%, 2 w (LCS-B-03)	DRT-40-040	5.76
R1	Res., var., cermet, 75,000 ohms ± 10%, 2 w (LCS-B-100 thru LCS-B-150)	DRT-75-041	7.36
S1**	Switch, SPST (ALL)	FDA-11-001	.94
S1†	Switch, SPST (ALL)	FDA-11-040	2.22
XF1	Fuseholder	HRK-00-007	1.60

* This part only used on MP-3, MP-5
** This part only used on MP-3, P-3
† This part only used on MP-5, P-5

PARTS FOR METERED AND NON-METERED PANEL ACCESSORIES WITH "V" OPTION

On all metered and non-metered panels with suffix "V", fuse F1 changes and a resistor is added in series with pilot light DS1. Part nos. for F1 and DS1-Res. are listed here.

F1	Fuse, 1.5A, 3AG SLO-BLO	FFC-01-500	.45
DS1-Res.	Res., comp., 120,000 ohms ±10%, ½w	DEB-1241	.12

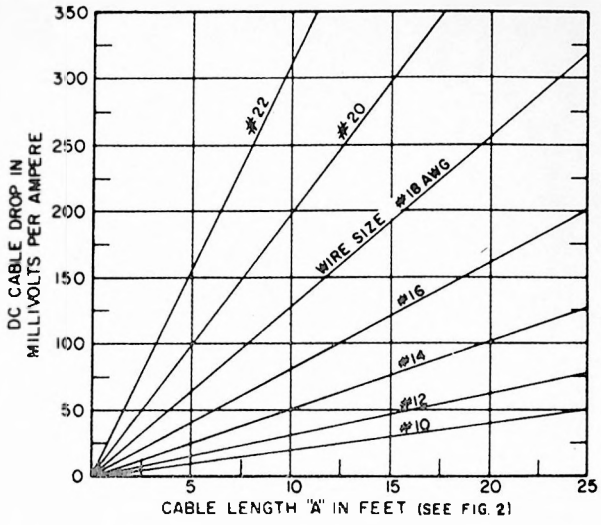


Figure 1. Cable Connection Chart

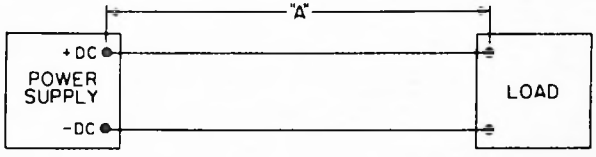
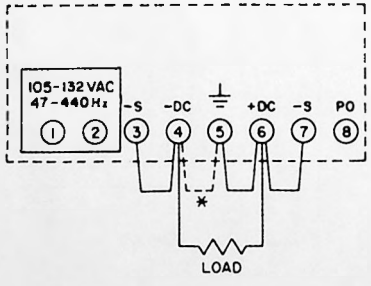
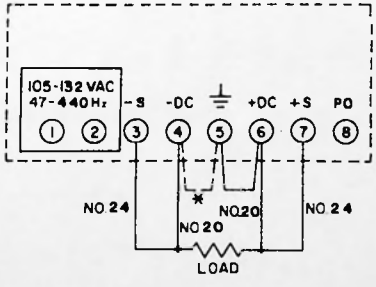


Figure 2. Cable Length "A" in Feet



NOTE:
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.

Figure 3. Two-Wire Connection



NOTE:
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.

Figure 4. Four-Wire Connection

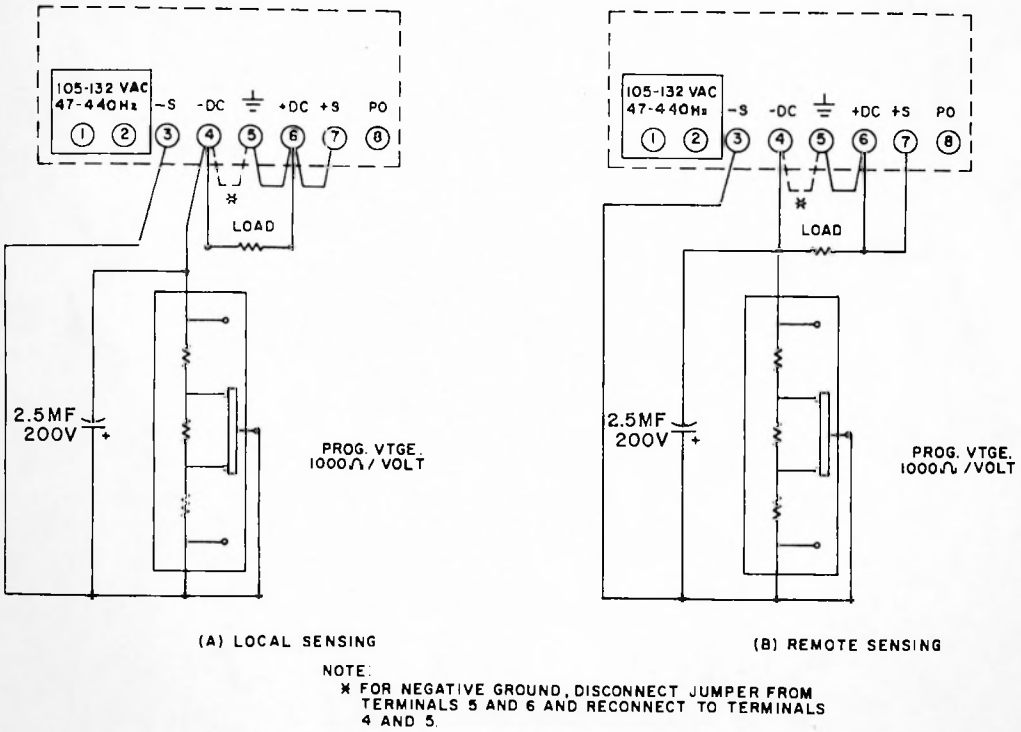


Figure 5. Programmed Voltage, With External Resistor

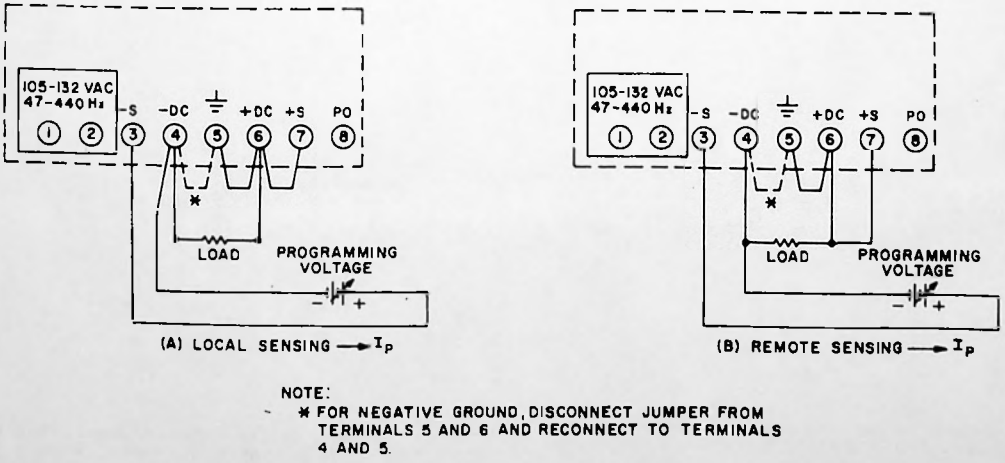
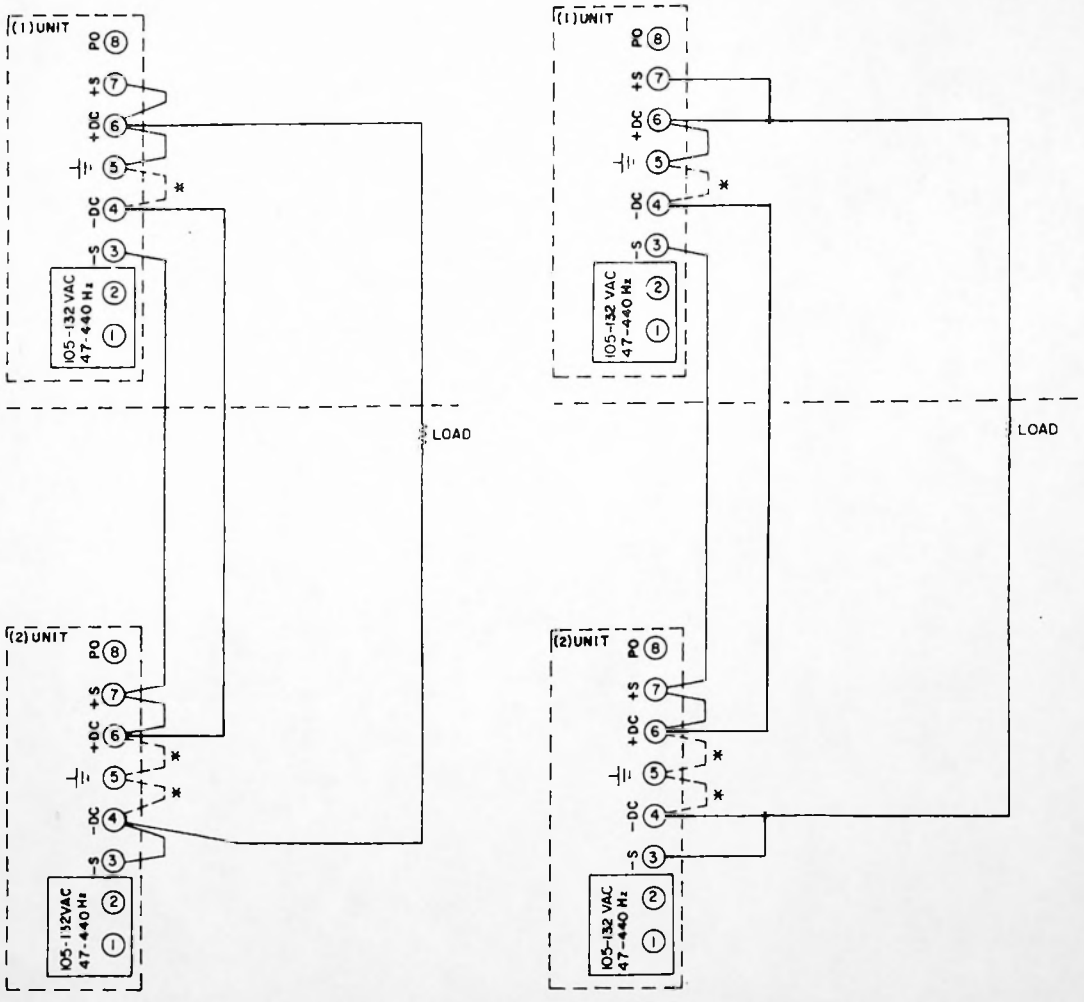


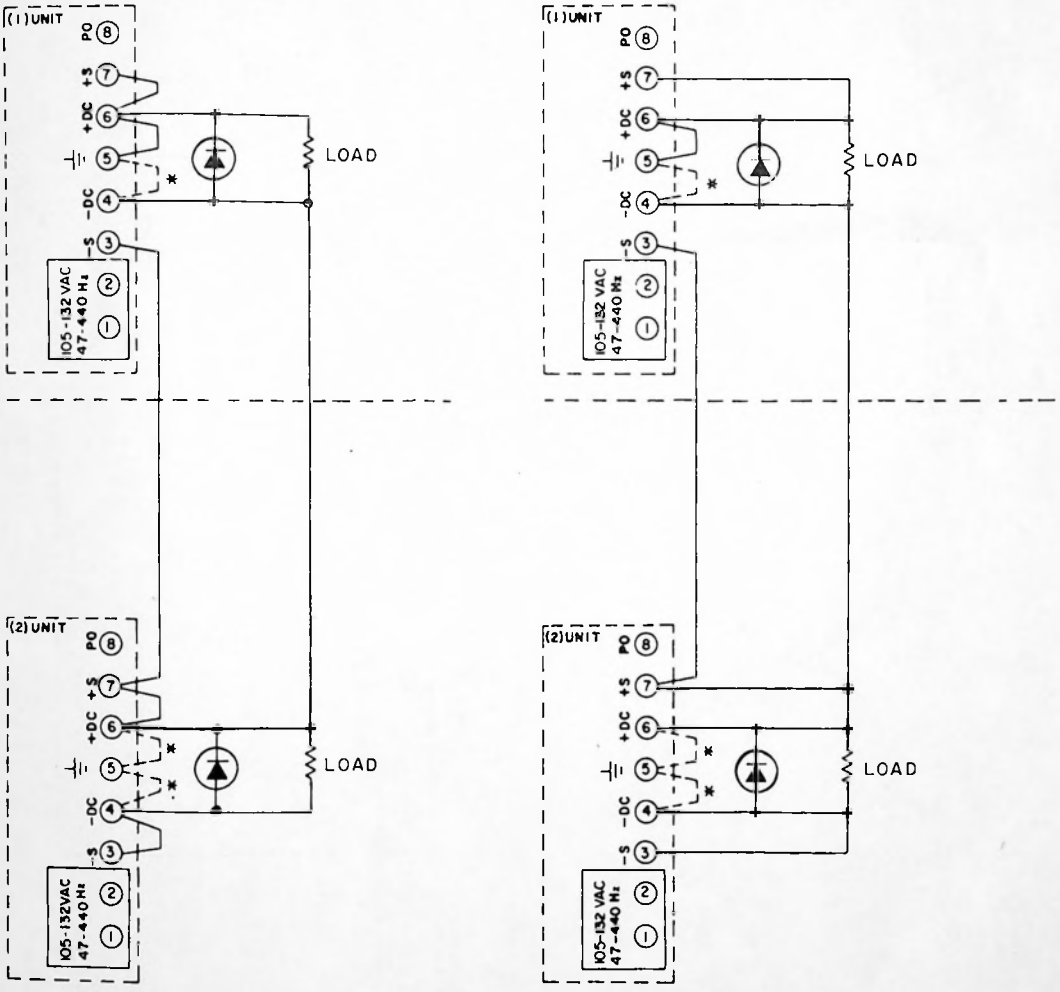
Figure 6. Programmed Voltage, With External Programming Voltage Source



NOTE:
* MAKE ONLY ONE GROUND CONNECTION FOR THE SERIES COMBINATION; TO CHANGE GROUND AS SHOWN, REMOVE JUMPER FROM TERMINALS 5 AND 6 ON (M) UNIT AND CONNECT ANY ONE OF THE OTHER JUMPERS AS SHOWN IN DOTTED LINE

Figure 7. Series Connection, LCS-B-01 thru LCS-B-05 Only,

Common Load



NOTE:
* MAKE ONLY ONE GROUND CONNECTION FOR THE SERIES COMBINATION; TO CHANGE GROUND AS SHOWN, REMOVE JUMPER FROM TERMINALS 5 AND 6 ON (M) UNIT AND CONNECT ANY ONE OF THE OTHER JUMPERS AS SHOWN IN DOTTED LINE.

Figure 7A, Series Connection (Diodes Not Required for LCS-B-01 thru LCS-B-05), Dual Load

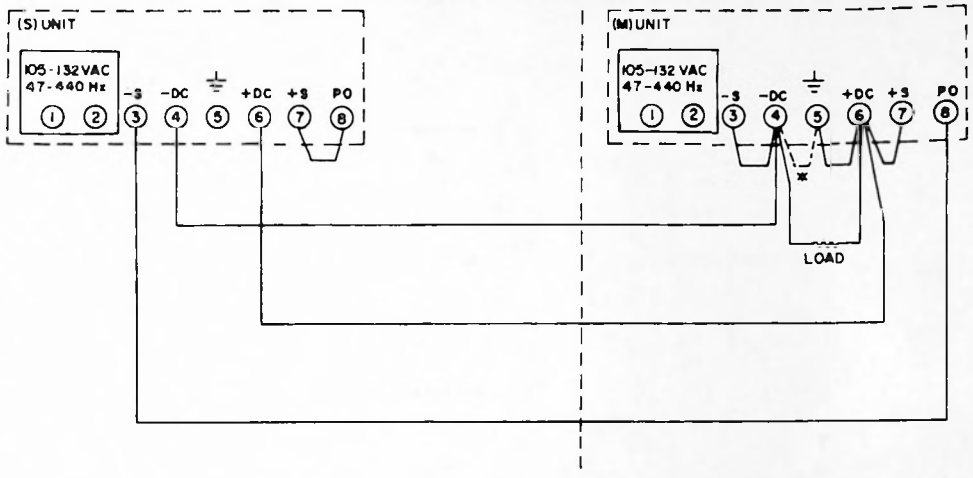


Figure 8. Parallel Connection, Local Sensing, LCS-B-01—LCS-B-05 Only

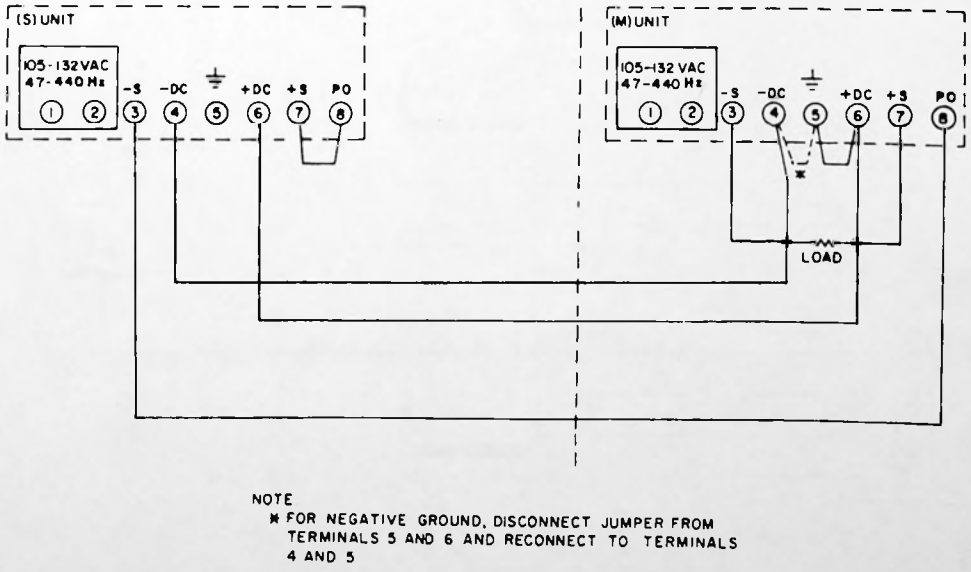
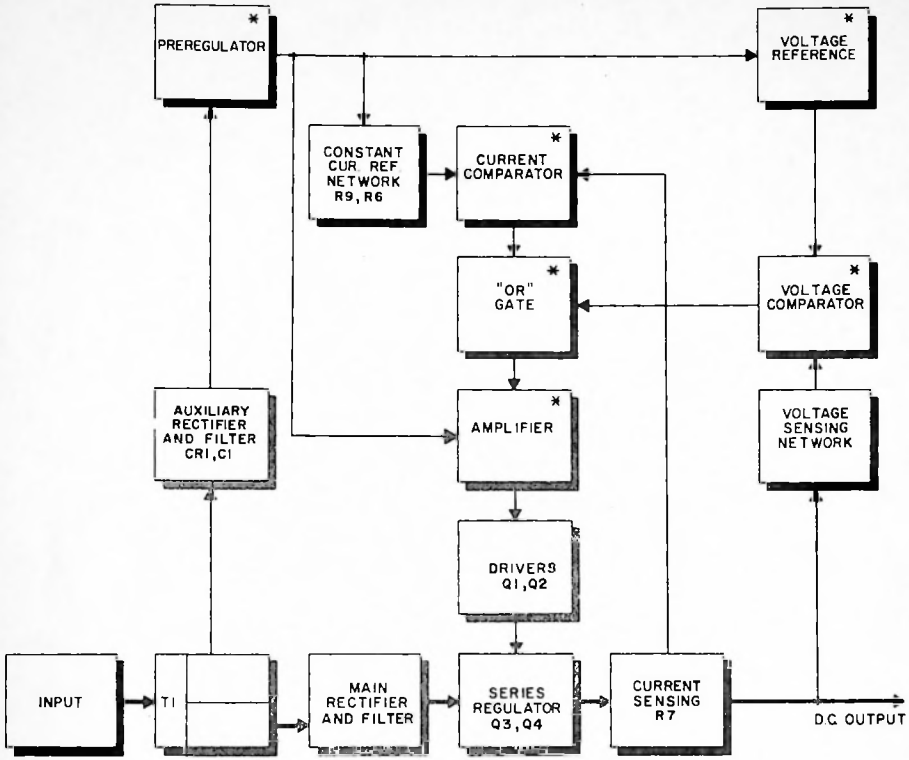
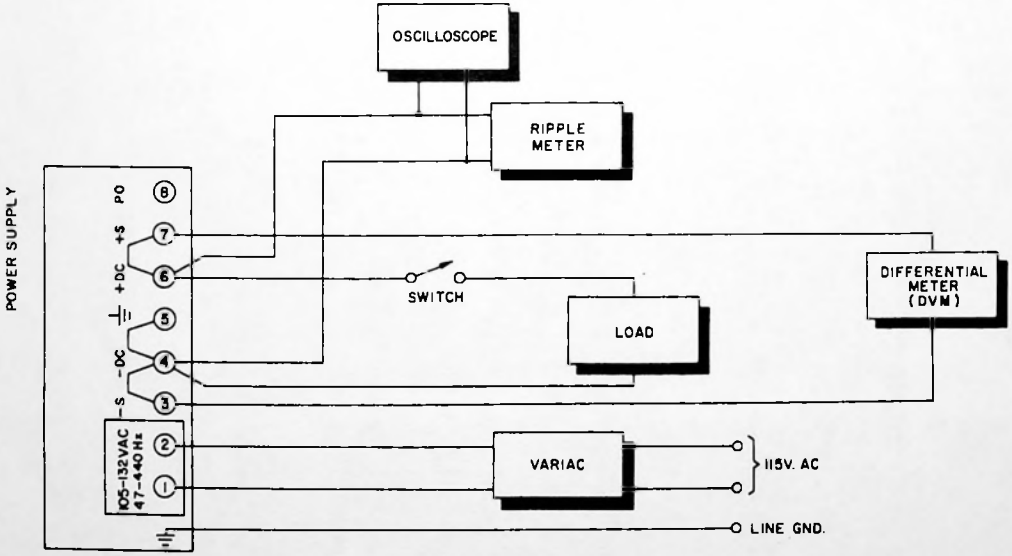


Figure 9. Parallel Connection, Remote Sensing, LCS-B-01—LCS-B-05 Only



* THIS CIRCUIT ELEMENT IS LOCATED IN IC1.

Figure 10. Typical Block Diagram



NOTES:

1. REGULATION AND RIPPLE CHECK METERS MUST NOT BE GROUNDED THROUGH THREE-WIRE LINE CORD TO GROUND.
2. PERFORM CHECKS WITH LOCAL SENSING CONNECTIONS ONLY.

Figure 11. Test Connections For Constant Voltage Performance Checks

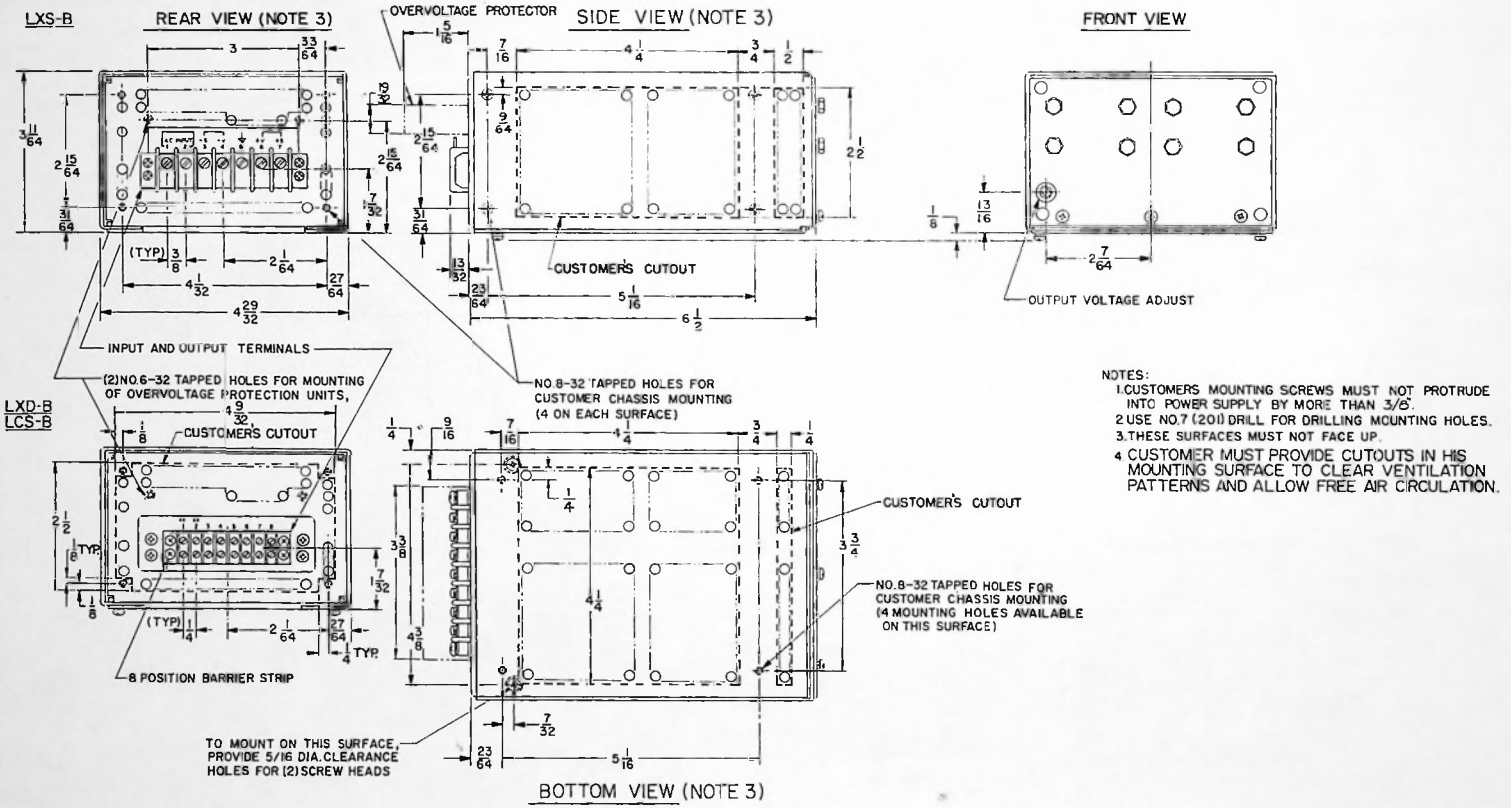
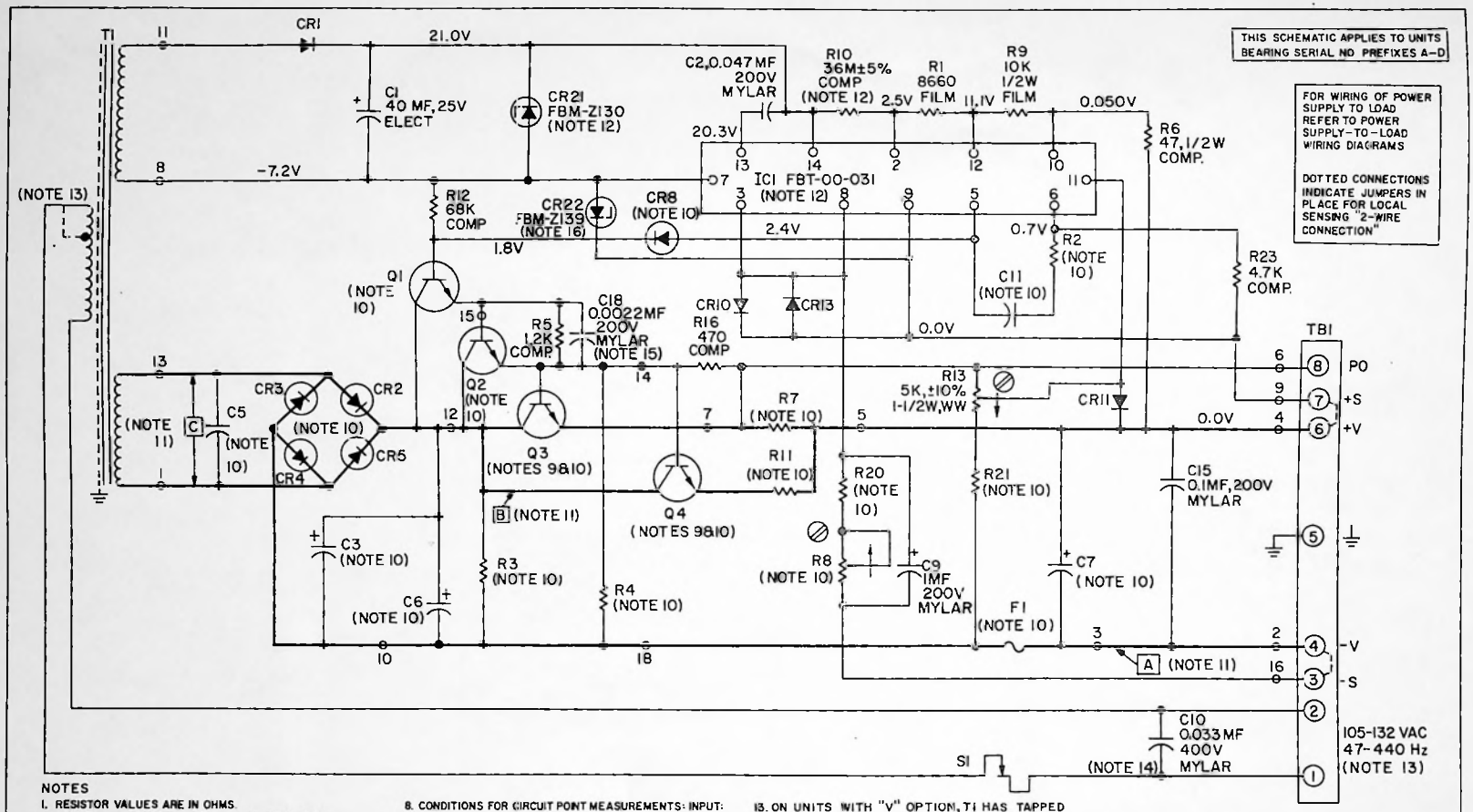


Figure 12. Outline Drawing



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/4 WATT, RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±2% FILM ±1%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%, +100%, MYLAR ±10%; CERAMIC 10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL. SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD.
6. DESIGNATION IS LAMBDA PART NUMBER.
7. DERATE CURRENT 10% FOR 47-57Hz, FOR 63-440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115VAC, 60Hz; NO LOAD. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED; +S AND +V SHORTED, -S AND -V SHORTED
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. ON MODELS WITH SERIAL NO. PREFIX A IC1 IS FBT-00-010, R10 IS 68M ± 10% AND CR21 IS NOT USED.
13. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A & B, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
14. ON UNITS WITH "V" OPTION, C10 IS 0.01MF, 1000V, PAPER.
15. C18 ONLY USED ON MODELS LCS-B-12 AND LCS-B-15.
16. CR22 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-C.

MODELS	
LCS-B-12	LCS-B-36
LCS-B-15	LCS-B-48
LCS-B-20	LCS-B-100
LCS-B-24	LCS-B-120
LCS-B-28	LCS-B-150

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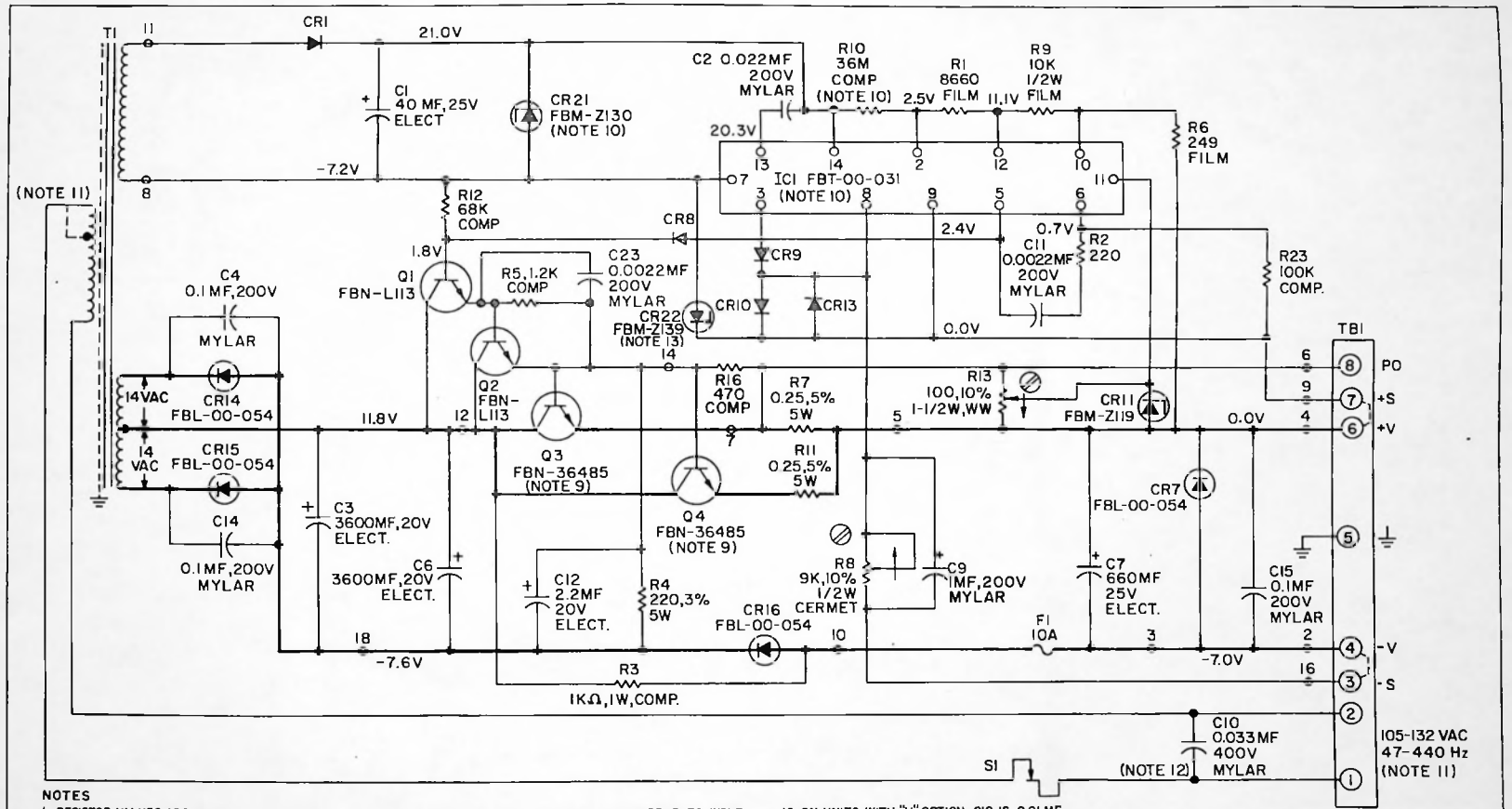
TABLE I
SCHEMATIC DATA REFERENCES
MODELS LCS-B-12 THRU LCS-B-150

Models	Schematic Voltage Measurements			Schematic Components																
				C3	C5	C6	C7	C11	CR2-CR5	CR8	F1	Q1, Q2	Q3, Q4	R2	R3	R4	R7, R11	R8	R20	R21
	A (Vdc)	B (Vdc)	C (Vac)	-10 +100% ELECT	±10% MYLAR	-10 +100% ELECT	-10 +100% ELECT	±10%, 200V MYLAR	*FBL-00-	*FBL-00-	(AMPS)	*FBN-	*FBN-	±10%, 1/4W COMP	1W COMP		WW	±10%	1/2W FILM	±1% FILM
LCS-B-12	-12	11.4	20.2	2500mf 40vdc	0.1mf 200 vdc	2500mf 40vdc	450mf 25vdc	0.0068mf	054	030	10	L109	36220	150	5.6K ±5%	5.6K ±5%,1W COMP	0.25 ±5% 5W	10K 1W WW	9.1K ±5%	100K 1/4W
LCS-B-15	-15	10.5	23.1	2100mf 35vdc	0.1mf 200 vdc	2100mf 35vdc	280mf 40vdc	0.0068mf	054	030	10	L109	36220	150	5.6K ±5%	8.2K ±10%, 1W COMP	0.30 ±5% 3W	10K 1W WW	9.1K ±5%	100K 1/4W
LCS-B-20	-20	20	29.3	2100mf 35vdc	0.1mf 200 vdc	2100mf 35vdc	280mf 40vdc	0.0068mf	054	030	10	L109	36220	150	10K ±10%	8.2K ±10%, 1/2W COMP	0.39 ±5% 3W	20K WW	15K ±2%	100K 1/4W
LCS-B-24	-24	24	34.5	Not used	0.1mf 200 vdc	2700mf 50vdc	175mf 50vdc	0.0068mf	054	030	10	L109	36220	150	10K ±10%	18K ±10%, 1W COMP	0.48 ±2% 3W	20K WW	15K ±2%	100K 1/4W
LCS-B-28	-28	27	39.4	Not used	0.1mf 200 vdc	1600mf 60vdc	175mf 50vdc	0.0068mf	054	030	5	L109	36220	220	10K ±10%	18K ±10%, 1W COMP	0.56 ±5% 3W	20K WW	24K ±5%	120K 1/2W
LCS-B-36	-36	27	45.3	1100mf 60vdc	0.1mf 200 vdc	1100mf 60vdc	160mf 60vdc	0.0068mf	054	030	5	L109	36220	220	10K ±10%	18K ±10%, 1W COMP	0.74 ±5% 3W	23K CERMET	24K ±5%	120K 1/2W
LCS-B-48	-48	40	62.7	730mf 85vdc	0.1mf 200vdc	730mf 85vdc	60mf 100vdc	0.0068mf	054	036	5	L108	35902	220	27K ±10%	18K ±10%, 1W COMP	0.91 ±5% 3W	23K CERMET	39K ±5%	200K 1/4W
LCS-B-100	-100	67	120	Not used	0.033 mf 400 vdc	240mf 200vdc	39mf 200vdc	0.0047mf	033	033	1-1/2	L115	38982	100	100K ±10%	40K ±5%, 5W WW	2.3 ±2% 3W	75K CERMET	91K ±5%	432K 1/2W
LCS-B-120	-120	74	138	Not used	0.033 mf 400 vdc	240mf 200vdc	39mf 200vdc	0.0047mf	033	033	1-1/2	L115	38982	100	100K ±10%	40K ±5%, 5W WW	2.7 ±2% 3W	75K CERMET	91K ±5%	432K 1/2W
LCS-B-150	-150	93	173	Not used	0.033 mf 400 vdc	200mf 250vdc	30mf 250vdc	0.0022mf	033	033	1-1/2	L115	38982	220	100K ±10%	40K ±5%, 5W WW	3.0 3% 3W	75K CERMET	120K ±1%	432K 1/2W

*Lambda part number



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/4 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±2% FILM ±1%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC −10%, +100%; MYLAR ±10%; CERAMIC ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES CONNECTION TO CHASSIS
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. # FBL-00-030, USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DERATE CURRENT 10% FOR 47−57Hz, FOR 63−440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115VAC, 60Hz, MAX. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED; +S AND +V SHORTED, −S AND −V SHORTED
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. ON MODELS WITH SERIAL NO. PREFIX A IC1 IS FBT-00-010, R10 IS 68M AND CR21 IS NOT USED.
11. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187−242V INPUT (USING TAP) OR FOR 205−265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A & B, "V" OPTION UNITS, T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205−265V.
12. ON UNITS WITH "V" OPTION, C10 IS 0.01 MF, 1000V, PAPER.
13. CR22 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A−C.

MODEL
LCS-8-01

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO POWER SUPPLY-TO-LOAD WIRING DIAGRAMS

DOTTED CONNECTIONS INDICATE JUMPERS IN PLACE FOR LOCAL SENSING "2-WIRE CONNECTION"

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A−D

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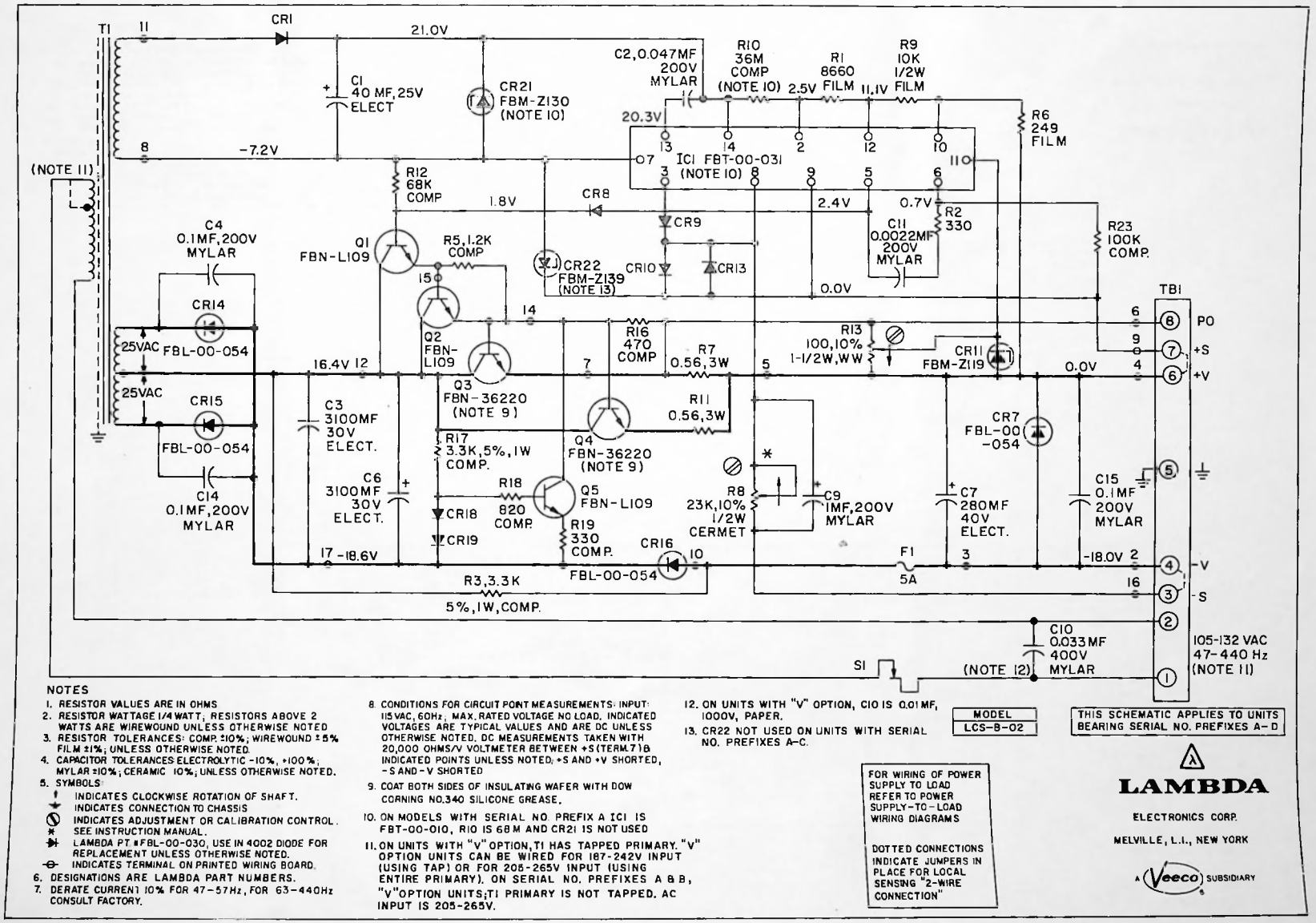

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   - * SEE INSTRUCTION MANUAL.
   - LAMBDA PT. # FBL-00-030, USE IN 4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD.
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DERATE CURRENT 10% FOR 47-57Hz, FOR 63-440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60Hz, MAX. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED; +S AND +V SHORTED, -S AND -V SHORTED
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. ON MODELS WITH SERIAL NO. PREFIX A IC1 IS FBT-00-010, R10 IS 68M AND CR21 IS NOT USED
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12. ON UNITS WITH "V" OPTION, C10 IS 0.01 MF, 1000V, PAPER.
13. CR22 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-C.

MODEL
LCS-B-02

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-D

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO POWER SUPPLY-TO-LOAD WIRING DIAGRAMS

DOTTED CONNECTIONS INDICATE JUMPERS IN PLACE FOR LOCAL SENSING "2-WIRE CONNECTION"

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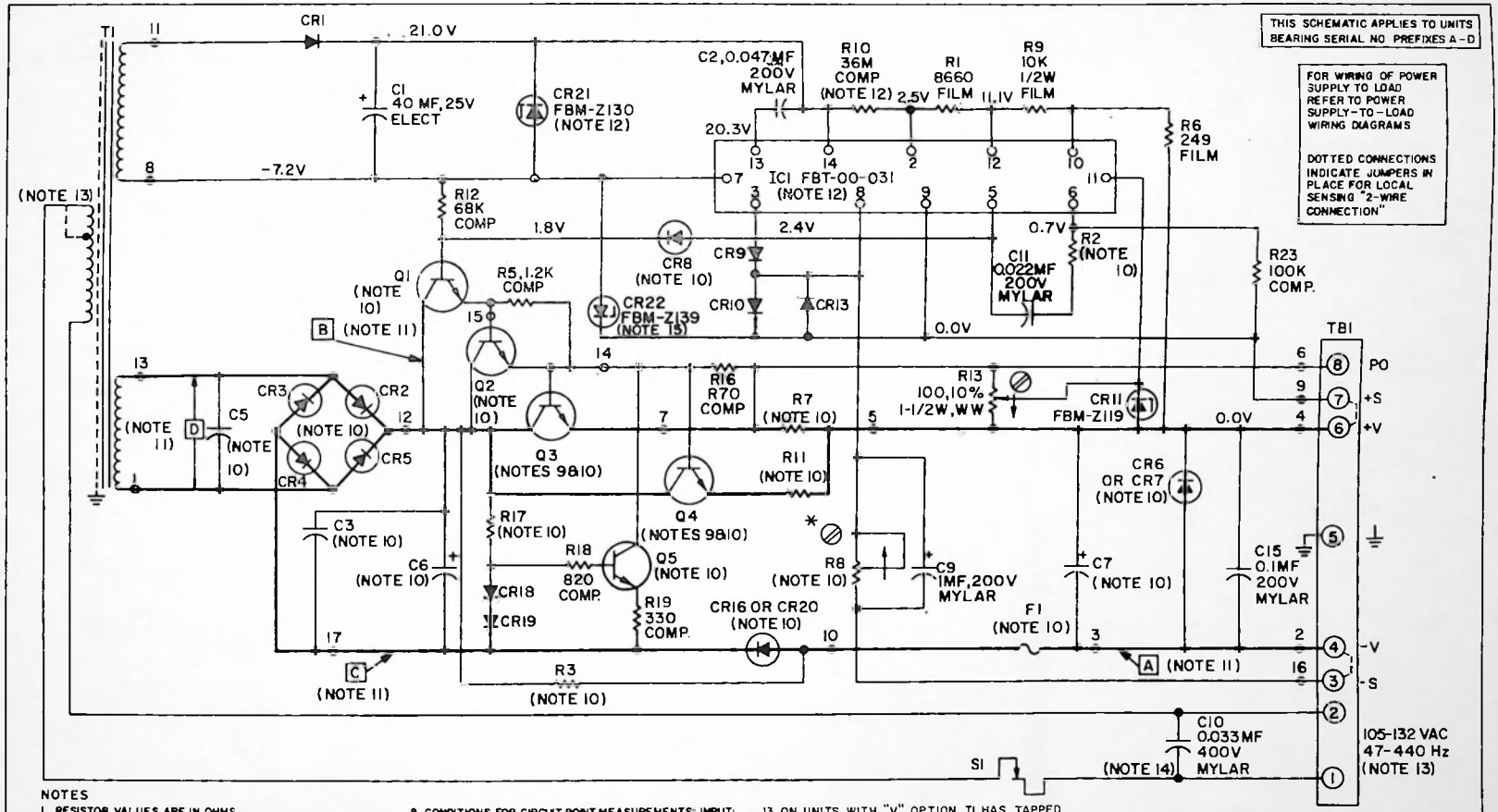

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5. SYMBOLS:
   - ! INDICATES CLOCKWISE ROTATION OF SHAFT.
   - ⏚ INDICATES CONNECTION TO CHASSIS
   - ⊘ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - * SEE INSTRUCTION MANUAL.
   - ⋗| LAMBDA PT #FBL-00-030, USE IN 400Z DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - ⊖ INDICATES TERMINAL ON PRINTED WIRING BOARD.
6. DESIGNATION IS LAMBDA PART NUMBER.
7. DERATE CURRENT 10% FOR 47-57Hz, FOR 63-440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60Hz, MAX. RATED VOLTAGE NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED; +S AND +V SHORTED, -S AND -V SHORTED
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. ON MODELS WITH SERIAL NO. PREFIX A IC1 IS FBT-00-010, R10 IS 68M AND CR21 IS NOT USED.
13. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A & B, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
14. ON UNITS WITH "V" OPTION, C10 IS 0.01 MF, 1000V, PAPER.
15. CR22 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-C.

MODELS
LCS-B-03
LCS-B-04
LCS-B-05

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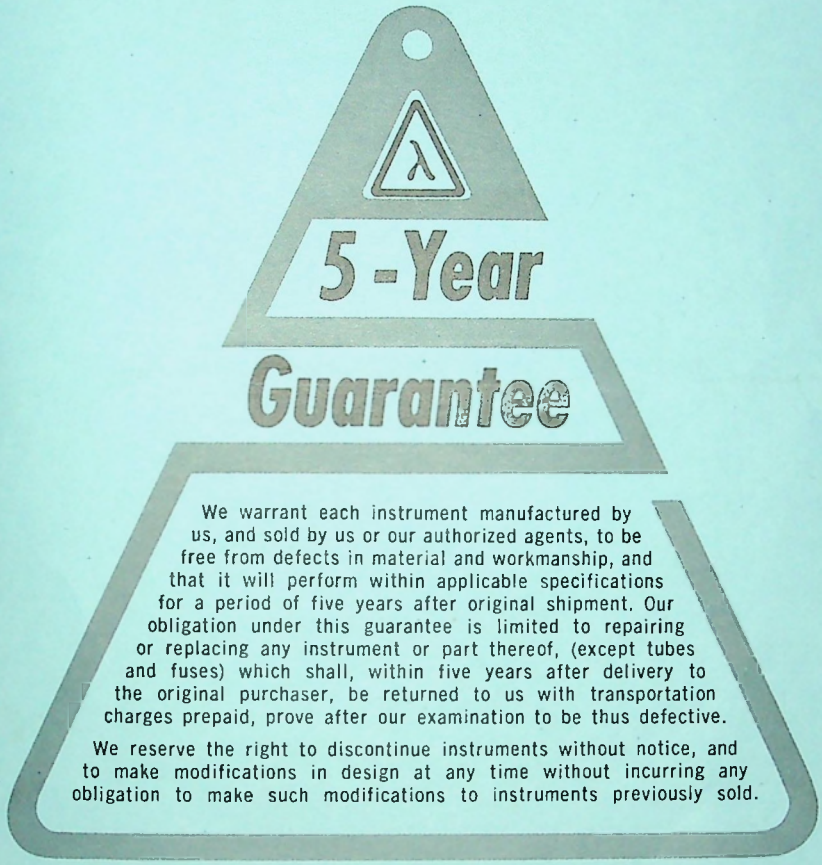

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