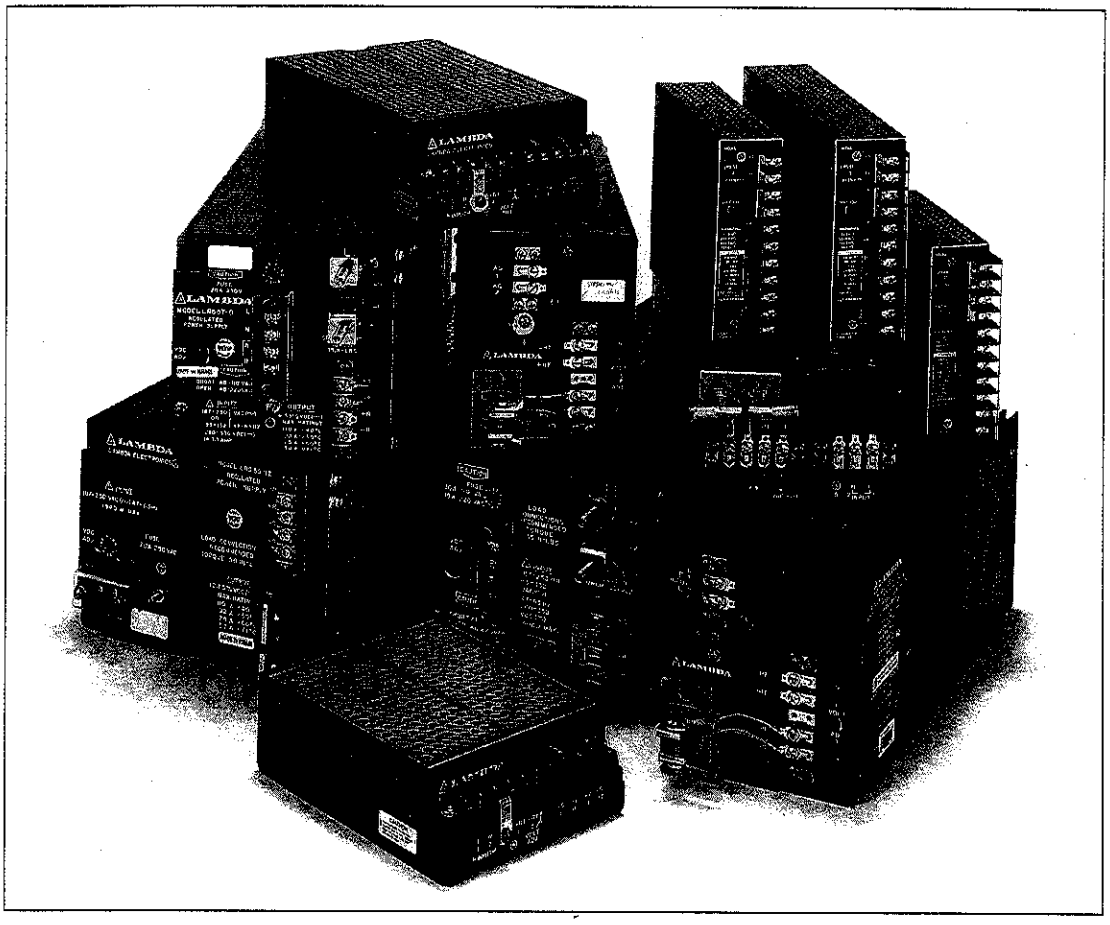
Part I – AC-to-DC Power Supplies

LAMBDA'S LR SERIES



High Reliability for Rugged Environments in Military and Industrial Applications

Lambda's LR Series single output power supplies are an ideal solution for rugged, low-noise environments found in some industrial appliations. Environments such as shock, vibration, humidity, low and high temperature and high altitude, can seriously degrade performance thereby jeopardizing the integrity and dependability of the power supply in electronic equipment. Lambda's LR Series is designed, manufactured, and tested specifically to operate in these environments.

The LR Series features 99 models from 20W to 1250W. All models meet the most rigorous high grade industrial requirements and the stringent specifications of MIL-STD-810C. And by using a standard product design, power supplies can be selected quickly, at less cost – and with utmost confidence.

LR SERIES FEATURES

Meets MIL-STD-810C Environmental Tests	Lambda's LR Series guarantees performance specifications per MIL-STD-810C for MIL and Rugged Industrial Applications. 1) Low Pressure – Method 500.1, Procedure I. 2) High Temperature – Method 501.1, Procedures I and II. 3) Low Temperature – Method 502.1, Procedure I. 4) Temperature-Shock – Method 503.1, Procedure I. 5) Temperature-Altitude – Method 504.1, Procedure I. Class 2 (– 10°C Operating). 6) Humidity – Method 507.1, Procedure I. 7) Fungus – Method 508.1, Procedure I. 8) Vibration – Method 514.2, Procedures X and XI. 9) Shock – Method 516.2, Procedures I and III.
MIL-Spec Construction	The LR Series is designed using components, ratings and mounting methods rigidly specified by Lambda.
Meets Worldwide EMI Requirements	Conducted EMI conforms to FCC Docket 20780 Class A, MIL-STD-461A and VDE 0871 Class A.
Wide Range Operating Temperature	Guaranteed performance from – 10°C to +71°C ensures operation in any rugged environment.
Quality Assurance	Procedure similar to MIL-I-45208 and referenced to MIL-Q-9858A.
Worldwide Input Range	User selectable AC inputs of 95-132 VAC or 187-265VAC, 47-440Hz meets worldwide requirements, minimizing inventory and reducing system costs.
Meets Worldwide Safety Requirements	Lambda's LR Series is UL Recognized, CSA Certified and TUV Licensed.
Low Output Ripple and Noise	The LR Series features output ripple and noise specs as low as 10mV RMS, 35mV pk-pk. When used in conjunction with an MRS DC output ripple filter, the output ripple is reduced to less than 4mV for extremely noise sensitive applications.
Convection Cooled	Ideal for applications where fan cooling is not an option.
5 Year Guarantee	Lambda's industry-high 5 year guarantee includes parts and labor. The LR Series is guaranteed to operate at supplied specifications for 5 years.

Part I – AC-to-DC Power Supplies

LR SERIES SPECIFICATIONS

AC Input

line ..... 95 to 132VAC, 47-440Hz.
95 to 132VAC or 187 to 265VAC (user selectable), 47-440Hz on LRS-49, 50, 51, 57, 58.
85 to 132/170 to 265 VAC, 47-440Hz on "M" option models.
187 to 265VAC, 47-440Hz on LRS-59 only.

power ..... LRS-49: 30 watts maximum.
LRS-50: 51.5 watts maximum.
LRS-51: 96 watts maximum.
LRS-52: 137 watts maximum.
LRS-53: 225 watts maximum.
LRS-54: 380 watts maximum.
LRS-55: 515 watts maximum.
LRS-56: 819 watts maximum.
LRS-57: 1100 watts maximum.
LRS-58: 1350 watts maximum.
LRS-59: 1900 watts maximum.

Efficiency

50% min for 2V model of LRS-49. 55% min for all other 2V models. 65% min for 5V and 6V models of LRS-49. 67% min. for 5V and 6V models of LRS-52. 66% min for 12V and 15V models of LRS-49. 68% min for 5V and 6V models of LRS-50. 70% min for 5V through 15V models of LRS-53, 54; 12V and 15V models of LRS-50; 20V through 48V models of LRS-49. 73% min on 5V and 6V models of LRS-51; 20V through 48V models of LRS-50. 75% min for 5V and 6V models of LRS-55, 56; 5V through 15V models of LRS-57, 58, 59; 12V and 15V models of LRS-51; 12V through 20V models of LRS-52; 20V through 48V models of LRS-53, 54. 77% min for 12V through 20V models of LRS-55, 56. 78% min for 20V through 48V models of LRS-51; 24V through 48V models of LRS-52. 80% min for 20V through 48V models of LRS-57, 58, 59; 24V through 48V models of LRS-55, 56.

EMI

Conducted EMI conforms to FCC Docket 20780 Class A, and MIL-STD-461A Notice 4 CE04 for power leads. LRS-57, LRS-58, LRS-59, and "M" and "V" option models also conform to VDE 0871 Class A.

DC Input

145VDC ± 10%. (260 to 370VDC for LRS-49, 50, 51, 57, 58, 59 and "M" and "V" option models.)

DC Output

Voltage range shown in tables.

Regulated Voltage

regulation, line ..... 0.1% from low line to high line.
regulation, load ..... 0.1% from no load to full load.
ripple and noise
(20MHz Bandwidth) ..... 10mV RMS, 35mV pk-pk for 2V models of LRS-49, 50, 51 and all 5V and 6V models. (25mV pk-pk for all other 2V models).
15mV RMS, 100mV pk-pk for 12V through 28V models.
35mV RMS, 150mV pk-pk for 48V models.
temperature coefficient ..... 0.03%/°C.
remote programming resistance ... 1000Ω/volt.
remote programming voltage ..... volt per volt.

Overload Protection Electrical

Automatic electronic self-resetting current limiting circuit.

Thermal Protection

Self-resetting thermostat.

Fusing

Line fuse removes the power supply from the line if a short occurs in the input circuitry.

Overvoltage Protection

Overvoltage protection is standard on all models. AC must be recycled to reset the OV circuit.

In-rush Limiting

The turn-on in-rush current will not exceed 40 amps peak from a cold start. (13 amps on LRS-49, 50. 19 amps on LRS-51. 50 amps on LRS-57, 58, 59.)

Hold Up Time

2V, 5V and 6V models will remain within regulation limits for at least 16.7 msec. after loss of AC power when operating at full load, V_o max, and 105VAC input at 60Hz. (105 or 210VAC for LRS-49, 50, 51, 57, 58 and "M" option models. 210VAC at 60Hz for LRS-59.)

Overshoot

No overshoot at turn-on, turn-off or power failure.

Remote Sensing

Provision is made for remote sensing to eliminate the effects of power output lead resistance on DC regulation.

Remote Turn-On/Turn-Off

Provision is made for digitally controlled remote turn-on, turn-off (TTL Compatible).

Cooling

All units are convection cooled. No fans or blowers are needed.

Operating Temperature Range

Continuous duty – 10°C to + 71°C with suitable derating above 40°C. Guaranteed turn-on at – 20°C.

Storage Temperature Range

– 55°C to + 85°C.

DC Output Controls

Simple screwdriver adjustment over the entire voltage range.

Input and Output Connections

All connections are made through barrier strip terminals, except output connections of LRS-54, LRS-55, LRS-56, LRS-57, LRS-58 and LRS-59 which are made through heavy duty threaded bus bars.

Mounting

Two mounting surfaces and two mounting positions on LRS-52, 53, 54. One mounting surface and one mounting position on LRS-49, 50, 51, 55, 56, 57, 58, 59.

Fungus Proofing

All units are inherently fungi inert.

Military Specifications

The LRS-49, 50 and 51 are pending approval of environmental testing. The remainder of the series has passed environmental testing in accordance with MIL-STD-810C.

Accessories

Rack Adapters and other accessories are available. See page 152 of this catalog.

Physical Data

Package Model	Lbs. Net	Lbs. Ship	Size Inches
LRS-49	1⅜	2⅜	1½ × 4 17/32 × 4 23/32
LRS-50	1½	2½	1½ × 4 17/32 × 5 15/32
LRS-51	2	3	1 11/16 × 4 17/32 × 7 13/64
LRS-52	2¼	3¼	2 × 4⅞ × 6¼
LRS-53	3¼	4¼	2⅜ × 4⅞ × 8½
LRS-54	6½	7½	3 × 4⅞ × 11
LRS-55	7	8½	3¾ × 4⅞ × 10½
LRS-56	8½	10	4 7/16 × 4⅞ × 11½
LRS-57	10½	12	5 × 4⅞ × 12
LRS-58	12½	14	5½ × 4⅞ × 13⅛
LRS-59	16½	19	6⅝ × 4⅞ × 13 25/32

Options

AC Input (Add Suffix[1])	For Operation at:	Price
– V (LRS-55, 56 only)	185 to 265VAC, 47-440Hz	12%
– M (LRS-52, 53, 54 only)	95 to 132VAC or 187 to 265VAC, 47-440Hz (customer selectable)	12%

[1]Add Suffix after package number, i.e.: LRS-55V-5, LRS-52M-5.

Safety Agency Approvals

UL recognized. CSA certified. The LRS-58, 59 are under evaluation. 110/220 and 220 input versions are TUV licensed.

Guaranteed For 5 Years

Five year guarantee includes labor as well as parts. Guarantee applies to operation at full published specifications at end of 5 years.

Rugged Environment Ratings Table—Single Output

LZS SERIES
- Worldwide AC Input
- EMI Meets VDE, FCC Curve B
- Wide Range Outputs

LR SERIES
- Convection Cooled
- EMI Meets VDE, FCC Curve A
- MRS Output Ripple Filters Available

LD/LN SERIES
- Linear Power Supplies
- Low Output Ripple
- Low Leakage Current

MAX CURRENT AMPS (MAX POWER WATTS)[1] AT AMBIENT TEMPERATURE OF 40°C	50°C	60°C	71°C	Vout ADJ. RANGE	COMPLETE ELEC. SPEC. PG.	UNIT PRICE PER DELIVERED QUANTITY 1	10	25	MODEL
5V OUTPUT									
4.00	3.20	2.40	2.00	4.75-5.25	20	198	189	181	LRS-49-5
7.00	5.60	4.20	3.50	4.75-5.25	20	250	237	227	LRS-50-5
12.00	9.60	7.20	6.00	4.75-5.25	20	315	300	288	LRS-51-5
15.00	13.70	11.10	5.90	4.75-5.25	20	361	344	330	LRS-52-5
25.00	21.50	17.50	10.00	4.75-5.25	20	491	469	448	LRS-53-5
40.00	34.00	27.50	19.50	4.75-5.25	20	602	574	550	LRS-54-5
60.00	51.00	41.00	30.00	4.75-5.25	20	768	730	701	LRS-55-5
90.00	77.00	61.00	45.00	4.75-5.25	20	949	906	869	LRS-56-5
130.00	110.00	90.00	68.00	4.75-5.25	20	1245	1185	1138	LRS-57-5
180.00	147.00	120.00	83.00	4.75-5.25	20	1507	1434	1377	LRS-58-5
250.00	200.00	165.00	125.00	4.75-5.25	20	1833	1747	1677	LRS-59-5
12V OUTPUT									
1.70	1.40	1.00	0.90	11.40-12.60	20	198	189	181	LRS-49-12
3.00	2.40	1.80	1.50	11.40-12.60	20	250	237	227	LRS-50-12
5.20	4.10	3.10	2.60	11.40-12.60	20	315	300	288	LRS-51-12
7.80	6.80	4.90	2.30	11.40-12.60	20	361	344	330	LRS-52-12
12.50	11.20	9.60	7.20	11.40-12.60	20	491	469	448	LRS-53-12
22.00	18.50	15.00	10.00	11.40-12.60	20	602	574	550	LRS-54-12
30.00	26.00	22.00	16.00	11.40-12.60	20	768	730	701	LRS-55-12
47.00	41.00	34.00	21.90	11.40-12.60	20	949	906	869	LRS-56-12
65.00	58.00	48.00	34.00	11.40-12.60	20	1245	1185	1138	LRS-57-12
84.00	69.00	56.00	40.00	11.40-12.60	20	1507	1434	1377	LRS-58-12
110.00	92.00	74.00	53.00	11.40-12.60	20	1833	1747	1677	LRS-59-12

Notes: [1]Max output power cannot exceed rating in parenthesis within specified output voltage range.
[2]Currents are 10-15% higher when used without a cover. Consult the factory.

Rugged Environment Ratings Table—Single Output

LZS SERIES
- Worldwide AC Input
- EMI Meets VDE, FCC Curve B
- Wide Range Outputs

LR SERIES
- Convection Cooled
- EMI Meets VDE, FCC Curve A
- MRS Output Ripple Filters Available

LD/LN SERIES
- Linear Power Supplies
- Low Output Ripple
- Low Leakage Current

MAX CURRENT AMPS (MAX POWER WATTS)[1] AT AMBIENT TEMPERATURE OF 40°C	50°C	60°C	71°C	Vout ADJ. RANGE	COMPLETE ELEC. SPEC. PG.	UNIT PRICE PER DELIVERED QUANTITY 1	10	25	MODEL
15V OUTPUT									
1.40	1.10	0.80	0.70	14.25-15.75	20	198	189	181	LRS-49-15
2.60	2.00	1.60	1.30	14.25-15.75	20	250	237	227	LRS-50-15
4.20	3.30	2.50	2.10	14.25-15.75	20	315	300	288	LRS-51-15
6.40	5.60	4.00	1.90	14.25-15.75	20	361	344	330	LRS-52-15
10.00	9.00	7.70	5.80	14.25-15.75	20	491	469	448	LRS-53-15
18.00	15.00	12.00	8.00	14.25-15.75	20	602	574	550	LRS-54-15
25.00	22.00	19.00	13.00	14.25-15.75	20	768	730	701	LRS-55-15
38.00	33.00	28.00	17.90	14.25-15.75	20	949	906	869	LRS-56-15
52.00	46.00	38.00	27.00	14.25-15.75	20	1245	1185	1138	LRS-57-15
68.00	56.00	45.50	32.00	14.25-15.75	20	1507	1434	1377	LRS-58-15
90.00	75.00	60.00	43.00	14.25-15.75	20	1833	1747	1677	LRS-59-15
24V OUTPUT									
0.90	0.70	0.50	0.50	22.80-25.20	20	198	189	181	LRS-49-24
1.80	1.40	1.10	0.90	22.80-25.20	20	250	237	227	LRS-50-24
3.00	2.40	1.80	1.50	22.80-25.20	20	315	300	288	LRS-51-24
4.10	3.60	2.60	1.20	22.80-25.20	20	361	344	330	LRS-52-24
6.50	5.80	5.00	3.80	22.80-25.20	20	491	469	448	LRS-53-24
11.50	9.50	7.50	4.50	22.80-25.20	20	602	574	550	LRS-54-24
16.00	14.00	12.00	8.00	22.80-25.20	20	768	730	701	LRS-55-24
25.00	22.50	18.50	11.60	22.80-25.20	20	949	906	869	LRS-56-24
33.50	29.00	24.00	17.00	22.80-25.20	20	1245	1185	1138	LRS-57-24
44.00	36.00	29.50	20.50	22.80-25.20	20	1507	1434	1377	LRS-58-24
60.00	50.00	40.00	28.00	22.80-25.20	20	1833	1747	1677	LRS-59-24

Notes: [1]Max output power cannot exceed rating in parenthesis within specified output voltage range.
[2]Currents are 10-15% higher when used without a cover. Consult the factory.

Rugged Environment Ratings Table—Single Output

LZS SERIES
- Worldwide AC Input
- EMI Meets VDE, FCC Curve B
- Wide Range Outputs

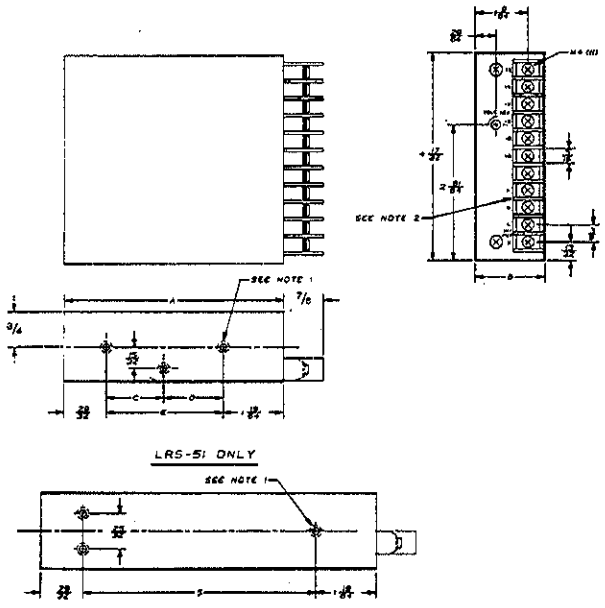
LR SERIES
- Convection Cooled
- EMI Meets VDE, FCC Curve A
- MRS Output Ripple Filters Available

LD/LN SERIES
- Linear Power Supplies
- Low Output Ripple
- Low Leakage Current

MAX CURRENT AMPS (MAX POWER WATTS)[1] AT AMBIENT TEMPERATURE OF				Vout	COMPLETE ELEC. SPEC.	UNIT PRICE PER DELIVERED QUANTITY			
40°C	50°C	60°C	71°C	ADJ. RANGE	PG.	1	10	25	MODEL
28V OUTPUT									
0.70	0.60	0.40	0.40	26.60-29.40	20	$ 198	$ 189	$ 181	LRS-49-28
1.60	1.30	1.00	0.80	26.60-29.40	20	250	237	227	LRS-50-28
2.50	2.00	1.50	1.20	26.60-29.40	20	315	300	288	LRS-51-28
3.50	3.10	2.20	1.10	26.60-29.40	20	361	344	330	LRS-52-28
5.70	5.10	4.40	3.30	26.60-29.40	20	491	469	448	LRS-53-28
9.50	8.50	6.50	4.00	26.60-29.40	20	602	574	550	LRS-54-28
14.00	12.00	10.00	7.00	26.60-29.40	20	768	730	701	LRS-55-28
22.00	20.00	16.00	10.00	26.60-29.40	20	949	906	869	LRS-56-28
29.00	25.50	21.00	15.00	26.60-29.40	20	1245	1185	1138	LRS-57-28
38.00	31.00	25.50	17.50	26.60-29.40	20	1507	1434	1377	LRS-58-28
52.00	43.00	34.00	24.00	26.60-29.40	20	1833	1747	1677	LRS-59-28
48V OUTPUT									
0.40	0.30	0.20	0.20	45.60-50.40	20	198	189	181	LRS-49-48
0.90	0.70	0.50	0.40	45.60-50.40	20	250	237	227	LRS-50-48
1.50	1.20	0.90	0.70	45.60-50.40	20	315	300	288	LRS-51-48
2.00	1.70	1.20	0.60	45.60-50.40	20	361	344	330	LRS-52-48
3.30	2.80	2.40	1.80	45.60-50.40	20	491	469	448	LRS-53-48
5.80	5.10	3.60	2.30	45.60-50.40	20	602	574	550	LRS-54-48
8.20	7.20	6.20	4.20	45.60-50.40	20	768	730	701	LRS-55-48
13.00	12.00	9.50	6.00	45.60-50.40	20	949	906	869	LRS-56-48
17.50	15.50	12.50	9.00	45.60-50.40	20	1245	1185	1138	LRS-57-48
22.50	18.50	15.00	10.50	45.60-50.40	20	1507	1434	1377	LRS-58-48
31.00	26.00	21.00	15.00	45.60-50.40	20	1833	1747	1677	LRS-59-48

Notes: [1]Max output power cannot exceed rating in parenthesis within specified output voltage range.
[2]Currents are 10-15% higher when used without a cover. Consult the factory.

LRS-49
LRS-50
LRS-51



DIM. MODEL	A	B	E
LRS-49	4 23/32	1 1/2	2 33/64
LRS-50	5 15/32	1 1/2	3 17/64
LRS-51	7 13/64	1 11/16	

NOTE 1) NO. 6-32 TAPPED HOLES (3) FOR CUSTOMER CHASIS MOUNTING.
SCREWS MUST NOT PROTRUDE INTO POWER SUPPLY BY MORE THAN 15/64 INCH.

NOTE 2) 95 - 132 VAC INPUT, SHORT A TO B
187 - 250 VAC INPUT, A TO B OPEN

TABLE OF WEIGHTS		
MODEL	NET (LBS.)	SHIPPING (LBS.)
LRS-49	1 3/8	2 3/4
LRS-50	1 1/2	2 1/2
LRS-51	2	3

Part I – AC-to-DC Power Supplies

LR SERIES MECHANICAL DRAWINGS

LRS-52
LRS-53

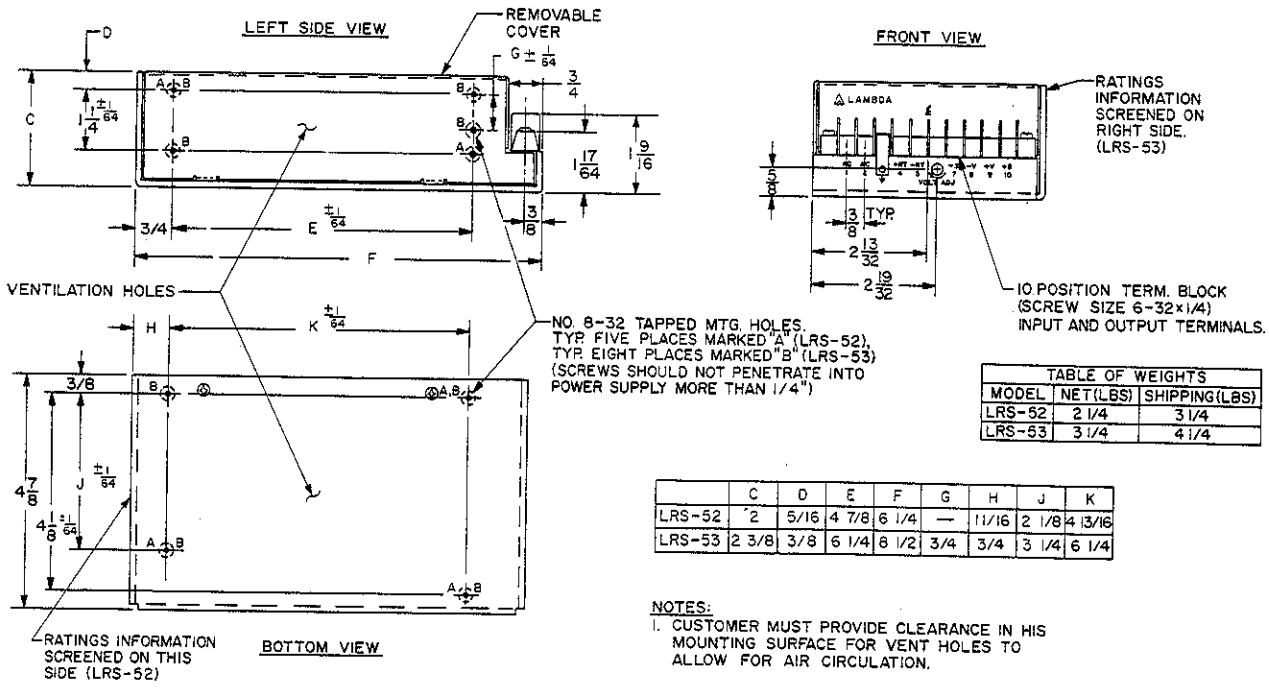
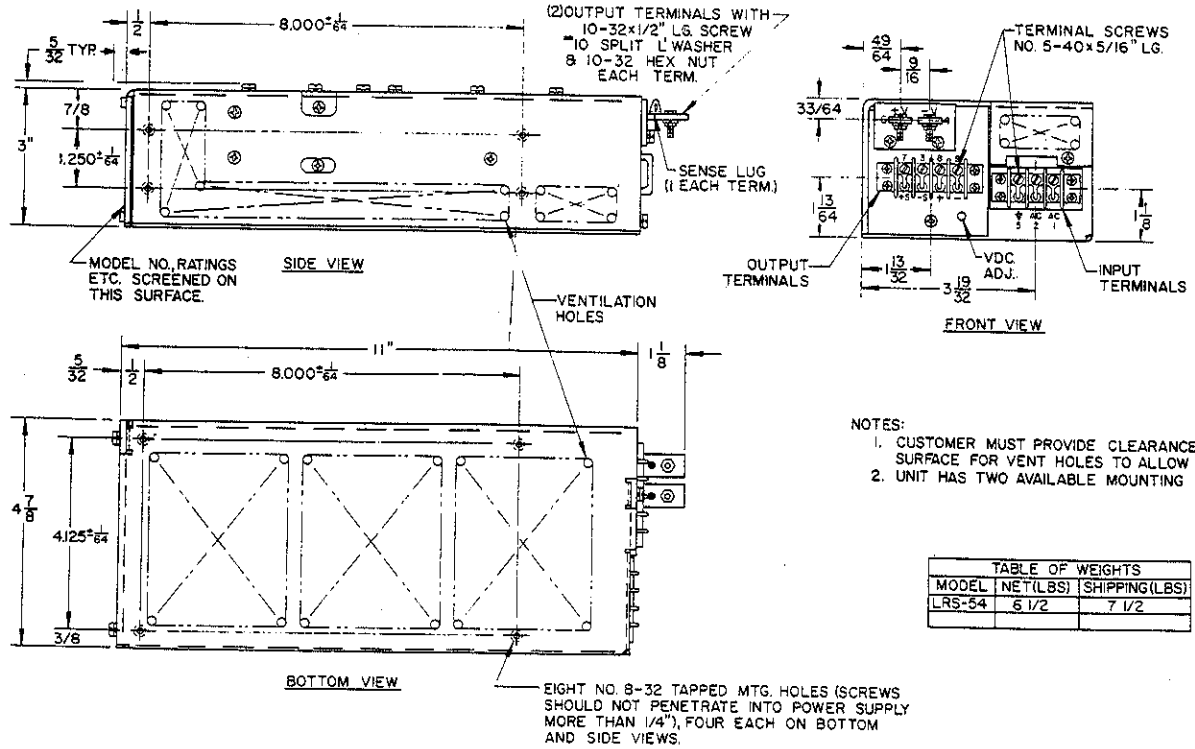


TABLE OF WEIGHTS		
MODEL	NET (LBS)	SHIPPING (LBS)
LRS-52	2 1/4	3 1/4
LRS-53	3 1/4	4 1/4

	C	D	E	F	G	H	J	K
LRS-52	2	5/16	4 7/8	6 1/4	—	11/16	2 1/8	4 13/16
LRS-53	2 3/8	3/8	6 1/4	8 1/2	3/4	3/4	3 1/4	6 1/4

NOTES:
1. CUSTOMER MUST PROVIDE CLEARANCE IN HIS MOUNTING SURFACE FOR VENT HOLES TO ALLOW FOR AIR CIRCULATION.

LRS-54



NOTES:
1. CUSTOMER MUST PROVIDE CLEARANCE IN HIS MOUNTING SURFACE FOR VENT HOLES TO ALLOW FOR AIR CIRCULATION.
2. UNIT HAS TWO AVAILABLE MOUNTING SURFACES.

TABLE OF WEIGHTS		
MODEL	NET (LBS)	SHIPPING (LBS)
LRS-54	6 1/2	7 1/2

LR SERIES MECHANICAL DRAWINGS

LRS-55
LRS-56

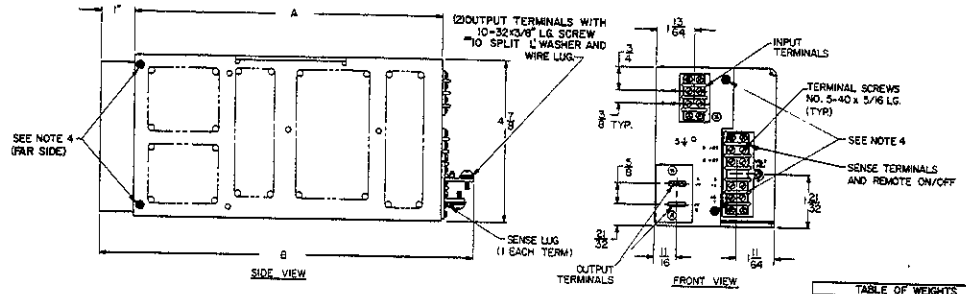
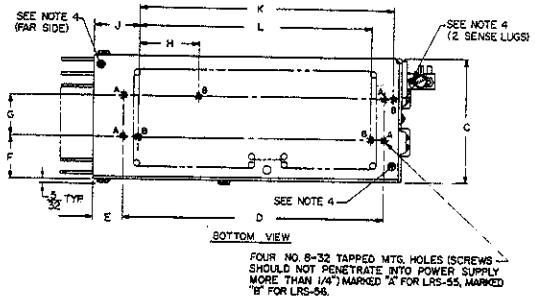


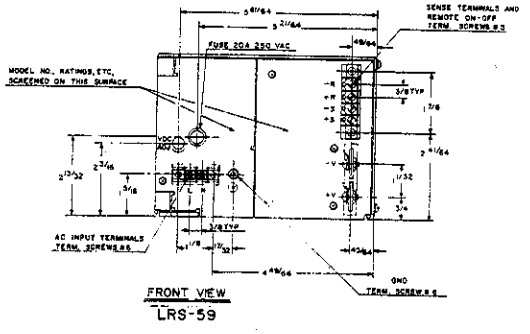
TABLE OF WEIGHTS		
MODEL	NET(LBS)	SHIPPING(LBS)
LRS-55	8 1/2	10
LRS-56	9 1/2	11

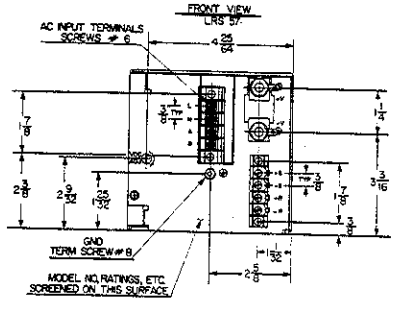


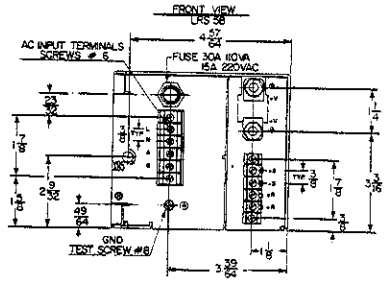
	A	B	C	D	E	F	G	H	J	K	L
LRS-55	9 1/2	11 7/8	3 3/4	8.000"	1"	1 17/32	1.250	—	—	—	—
LRS-56	10 1/2	12 7/8	4 11/32	—	—	27/64	3.300	3.000	1 11/16	7.343	7.125

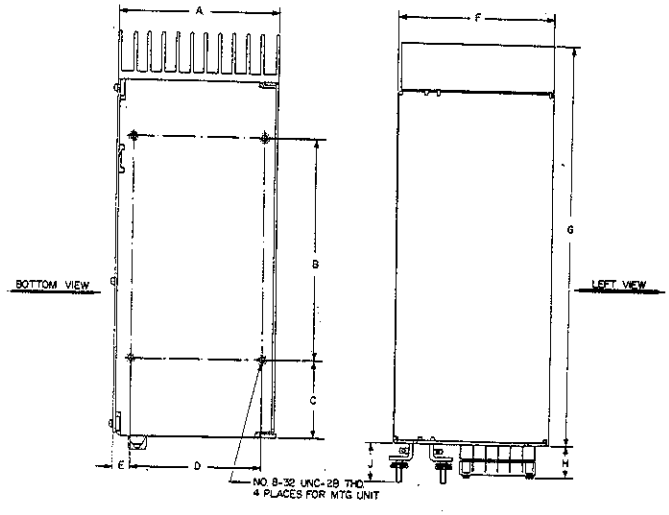
NOTES:
1. CUSTOMER MUST PROVIDE CLEARANCE IN HIS MOUNTING SURFACE FOR VENT HOLES TO ALLOW FOR AIR CIRCULATION.
2. UNIT HAS ONE MOUNTING SURFACE.
3. RADIATOR FINS MUST BE MOUNTED IN A VERTICAL POSITION.
4. TO OPEN UNIT FOR SERVICING, REMOVE (8) 6-32 SCREWS SHOWN SHADED.

LRS-57
LRS-58
LRS-59









NOTES: 1. CUSTOMER TO PROVIDE CLEARANCE IN HIS MOUNTING SURFACE FOR VENT HOLES TO ALLOW FOR AIR CIRCULATION
2. CUSTOMER MOUNTING SCREWS MUST NOT PROTRUDE INTO POWER SUPPLY BY MORE THAN 5/16 INCH FOR LRS 57 & NOT MORE THAN 3/8 FOR LRS 58.

DIMENSION / MODEL	A	B	C	D	E	F	G	H	J
LRS 57	5	6.891	2 1/2	4.062	23/64	4 7/16	12 7/16	1 1/8	—
LRS 58	5 1/2	6.891	2 1/2	4.062	1 5/16	4 7/16	13 5/8	—	1 1/8
LRS 59	6 1/8	8.000	2 29/64	4.125	1 1/8	4 7/8	13 5/8	—	1 1/8