



# **DLF-100-200-1500**

## **OPERATOR'S MANUAL**

**DYNALOAD DIVISION**

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## 1. INTRODUCTION

The Dynaload is a precision instrument which simulates electrical loads to test power supplies, generators, servo systems, batteries, and similar electrical power sources. It simulates, at the option of the user, resistive loads (amps/volt) or may be switched to a constant current load characteristic (current regulated at a pre-selected value). Provisions are also made for external programming in automated test setups. The external programming voltage is from 0-10V, with an input impedance of 10K minimum. Load current is directly proportional to the programming voltage.

The meter normally reads average pulse current, so for accuracy when loading in the pulse mode it is recommended to monitor the current sample output.

The circuit breaker used to connect the source to the power devices in the load is electronically controlled and senses overvoltage.

In the event of an overvoltage condition protection circuits open the electronic circuit breaker. In the event of an overcurrent or overpower condition, circuitry is activated to limit the load current.

## 2. SPECIFICATIONS

The following specifications apply:

Load Voltage:	0-100V
Load Current:	0-200A
Average Power Dissipation:	0-1500W
Self-Protection:	Overvoltage--less than 120V Overcurrent--less than 120A Over-power --less than 1800W

Front Panel Switches - Refer to front panel layout

- S101 AC, Power ON/OFF Switch
- S1 Voltmeter Range Select Switch
- S2 Ammeter Range Select Switch
- S3 DC Load ON/OFF Switch

### MODE SELECTION

- S4 20A DC LOAD - 0 to 20A constant current mode which is controlled by the front panel DC Load adjust.
- S5 200A DC LOAD - 0 to 200A constant current mode which is controlled by the front panel DC Load adjust.
- S6 12A/V DC LOAD - 0 to 12A/V constant resistance mode which is adjusted by the front panel DC Load adjust.
- S7 120A/V DC LOAD - 0 to 120A/V constant resistance mode which is adjusted by the front panel DC Load adjust.
- S8 20A PULSE LOAD - 0 to 20A pulse mode. The amplitude, frequency, duty cycle and DC baseline are adjustable by the front panel controls.
- S9 200A PULSE LOAD - 0 to 200A pulse mode. The amplitude, frequency, duty cycle and DC baseline are adjustable by the front panel controls.
- S10 REMOTE PROGRAM - In this mode the user can program the current level with a 0 to 10V programming voltage applied to J101 on the rear panel. The front panel controls are locked out.

S11 SHORT CIRCUIT - Drives load to saturation. Effective resistance is less than .015 ohms.

#### FRONT PANEL ADJUSTMENTS

Refer to Front Panel Layout.

DC Load Adjust - Coarse and fine adjust controls with a 10 to 1 ratio for precise setting of load current for the constant resistance and constant current functions. This control is also functional in the pulse mode to adjust the DC load component.

Pulse Amplitude - Coarse and fine adjust controls with a 10 to 1 ratio for setting the peak current in the pulse mode, the maximum setting is 200 Amps peak.

Freq. Adj. - Coarse and fine controls adjust the frequency of the pulse generator.

Width - Adjusts the percentage of the on time to off time ratio of the pulse generator a minimum of 10% on time, to maximum of 90% on time can be achieved.

#### FRONT PANEL STATUS INDICATORS

DC This indicator is on when the DC circuit breaker is engaged.

OV When an overvoltage condition exists alarm will light and the DC breaker will disengage.

OC This alarm will light when the Dynaload is in current limit.

OP This alarm will light when the Dynaload has reached power limit.

OT If the Dynaload reaches overtemperature this alarm will light and the load will stop drawing current.

LOC This indicator will be on when one of the local modes are selected.

REM This indicator will light when the Dynaload is in the remote programming mode.

#### REAR PANEL CONNECTIONS

E+ Positive Load Input  
E- Negative Load Input

J103 AC, Input Connector

J101 Program Input Connector

### 3. OPERATING INSTRUCTIONS

The following procedure is recommended for connecting the Dynaload: The AC and DC Dynaload switches should be turned off so that the load is disconnected. The load adjustment controls should be set in the counterclockwise position. The mode selector switch should be set to the appropriate mode to be used. The Dynaload should be plugged into standard 115V, 50-60 Hz power (optional input voltage ranges are available), and connections should be made from the source to be tested to the appropriate load terminals of the dynaload. (E+ and E- on the rear of the unit.) If external modulation is to be used, the external programming voltage should also be connected.

With the AC power switch on, the digital meters should turn on. The DC-on should now be actuated. The front panel Dynaload voltmeter should indicate the source voltage. (If the circuit breaker does not close, or if there is no indication of source voltage, check all the external connections for voltage and polarity.) The load may now be increased by turning the load adjust controls clockwise until the appropriate load is obtained. External instrumentation may be used to monitor current waveforms and eliminate the effects of line voltage drops at high currents.

### 3.1 Constant Resistance Mode (Amps/Volt)

Two scales are provided, 0-12A/V and 0-120A/V. Minimum resistance on the 0-12A/V range is .083 ohms, and minimum resistance on the 0-120A/V range is .0083 ohms. For example, to test a 12V battery with a two ohm resistive load, the 12A/V mode should be selected, and the coarse and fine load adjust controls adjusted to obtain the 6A load. The two ohm load is now set, and this resistance value will remain constant for the full range of input voltage.

The resistive load characteristics of the dynaload simulate a pure resistance down to approximately 1 to 2V input; i.e., for a given resistance setting, the current is directly proportional to the voltage over wide dynamic ranges. In the very low voltages, the power transistors will saturate.

### 3.2 Constant Current Mode

Some power sources, such as variable power supplies, are rated at a fixed maximum load current and adjustable over a predetermined voltage range: i.e., 5-30V @ 20A. If the resistive load characteristic were used for this type of test, it would be necessary to reset the load each time the power supply voltage was changed, in order to maintain the full load current. However, if the load is set to the 20A constant current mode, a load of 20A is applied, then the power supply can be adjusted from 5-30V, and the load current will remain constant.

It should be noted that many power supplies are designed for short circuit protection by internal current limiting and bendback, and therefore, may not start up into a constant current type of load. Accordingly, the constant resistance characteristic should be used as a load when simulating short circuit protection and recovery of most power supplies, unless otherwise specified by the manufacturer.

### 3.3 Pulse Mode

The pulse load may be varied from 0-20A or from 0-200A peak current by the pulse amplitude control on the front panel. The frequency may be varied from approximately 200Hz to 20KHz by the frequency control on the front panel and the duty cycle of the square wave can be adjusted from 10% to 90% with the width control on the front panel. This pulse load may be superimposed on top of a constant DC load, which may be selected by the DC load control on the front panel.

If the pulse is to be used down to a no-load state,\* the DC load controls should be turned fully counterclockwise. The maximum total of the pulse and DC load will be limited around 220A by the internal current limit protection.

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\*The pulse load is most effective with some steady state load current to which the pulse added. Pulsing from zero load creates a delay in the pulse rise and fall. The pulse current should be monitored on an oscilloscope to assure proper operation.

The rise time of the load current pulse is approximately 15 us for a 10-200A pulse and return. Operation at low voltages (less than 5V) may result in transient to less than 1V at the input terminal due to Ldi/dt drops in the power leads. This in turn may cause pulse waveform distortion and the user should monitor the load current waveforms to assure proper operation.

The DC and pulse load may be mixed in any combination through the use of the separate DC load coarse and fine and the pulse load coarse and fine controls.

### 3.4 External Modulation

In the external modulation mode, the dynaload acts as a constant current load with the constant current proportional to the external voltage applied to J101.

The dynaload will program from 0-200A with a 0-10V @ 1 MA control signal. The input impedance of the external modulation terminals is approximately 10K ohms.

The linearity of the external program is set to be within  $\pm 1\%$  above 2A.

The load may be pulsed or it will follow the programming waveform within the transient response limits of the Dynaload.

### 3.5 Power Rating

The model DLF 100-200-1500 will dissipate 1500W continuously. In order to assure that overheating does not occur, the rear and top of the Dynaload should be clear for the air intake and the air exhaust; i.e., the cooling air enters from the top and leaves from the rear. The dynaload should periodically be checked for dust accumulation.

### 3.6 Protective Circuits

The Dynaload has internal current limiting at approximately 220A maximum. In the event that an overvoltage is applied to the Dynaload, an internal overvoltage circuit will open the circuit breaker, thereby protecting all internal circuits.

The voltage current product (power) is also monitored to prevent an overpower condition from happening. Accordingly, the current limit characteristic is set to approximately 220A, which is maintained to approximately 6.8V. At this point, the current limit characteristic is reduced as the input voltage is increased, thereby limiting the maximum power which may be programmed into the Dynaload.

### 3.7 Special Applications

The Dynaload may be used for AC load testing, within its ratings, by the use of an external bridge rectifier, so that the Dynaload sees pulsating DC, but the AC source sees an AC load. The

effect of the rectifier is to slightly distort the Dynaload characteristics at low voltages and currents. The Dynaload is not normally recommended for testing AC sources above 1000 cycles unless the user specifically recognizes the load characteristics at higher frequencies.

### 3.8 Effects of Cable Inductance on Pulse Loading

When the Dynaload is used for high current pulse loading, the effects of cable inductance must be considered. A special 5 foot coaxial power cable is provided with the DLF to minimize wiring inductance and its use is strongly recommended. Other types of wiring or larger cables will limit speed of response and may cause ringing, etc.

The critical parameters are the 15 microsecond rise time and the 1.0V minimum compliance specifications. If the inductance of the cables from the voltage source to the dynaload is great enough to cause the voltage at the Dynaload to go below 1.0V, then excessive current wave form distortion will occur. This is because the power devices are driven into saturation in an attempt to reach the programmed current which cannot occur because of the low Drain voltage. Once in a saturated state, the response time is much slower. The result is a significant overshoot on the rising edge of the pulse.

The following is suggested to partially compensate for longer power leads:

1. 1 microhenry = 2.4 feet of wire (total).
2. 50A @ 15 microseconds rise time = 3.3 volt drop with 1 microhenry.
3. The inductive drop cannot exceed the difference between the source voltage and the 1.0V compliance.

For example: To test a 5.0v source with a 85A pulse, the maximum cable length would be:

$$E_{\text{Max drop}} = 4.0V$$

$$E = L(di/dt) \quad 4.0V = L(85A/15\mu s)$$

$$L = 0.71 \text{ microhenries maximum}$$

$$\text{Maximum cable length} = 1.7 \text{ feet total}$$

Since this distance is relatively short, a low inductance cable is provided. This cable (5 feet long with an overall inductance of 5 uh) is compensated for internally by the load.

If the distance from the load to the source must be greater than this, there are several methods to increase the maximum distance. One way is to use several insulated conductors. This cuts the inductance in half if 4 are used instead of 2, or by

one-third if 6 are used. This doubles or triples the maximum length, respectively. If oscillations or ringing occur with longer cables, the unit may be stabilized by an electrolytic capacitor in series with a damping resistor across the terminals of the load.

#### 4. CALIBRATION PROCEDURES (Refer to FIG. 1)

##### 4.1 Current Sample calibrate

- A. Set current sample for 10.0V with Dynaload drawing 200A, adjust R5(CS CAL) on the A6 PC board.
- B. With the Dynaload drawing 20A set current sample for 1.0V, adjust R10(CS OFFSET) on A6.
- C. Repeat these two steps until no further adjustments are necessary.

##### 4.2 Remote Programming Calibrate

- A. Set programming source to 10.0V adjust R1(REMOTE) on A1 so the Dynaload draws 200.0A
- B. Set program source for 1.0V and adjust R14(OFFSET) on A1 so the load draws 20.0A.
- C. Repeat steps A and B until no further adjustments are necessary. Check programming linearity at 1.0V intervals.

##### 4.3 Voltmeter Calibrate

- A. Select the high range and apply 100V to the load inputs. Adjust R47(HV) on A4 so the voltmeter indicates the correct voltage.

B. Select the low range and apply 10V to the load inputs. Adjust R45(LV) on A4 so the voltmeter indicates the correct voltage.

#### 4.4 Ammeter Calibrate

- A. Select the high range and with the Dynaload drawing 200.0A adjust R42(HA) on A4 so the ammeter indicates the correct current.
- B. Select the low range and with the Dynaload drawing 15.0A adjust R40(LA) on A4 so the ammeter indicates the correct current.

#### 4.5 Constant Current Calibrate

- A. Select the 20A constant current mode and turn the DC Load coarse adjust fully clockwise. Adjust R4(LCC) on A4 so the load draws 20.0A.
- B. Select the 200A constant current mode and turn the DC Load coarse adjust fully clockwise. Adjust R5(HCC) on A4 so the load draws 200.0A.

#### 4.6 Constant Resistance Calibrate

- A. Select the 12A/V constant resistance mode, apply 10.0V to DC load inputs and turn the DC Load coarse adjust fully clockwise. Adjust R8(LA/V) on A4 until the load draws 120.0A.
- B. Select the 120A/V constant resistance mode, apply 1.5V to the DC load inputs and turn the DC Load coarse adjust fully clockwise. Adjust R9(HA/V) so the load draws 180.0A.

#### 4.7 Current Limit Calibrate

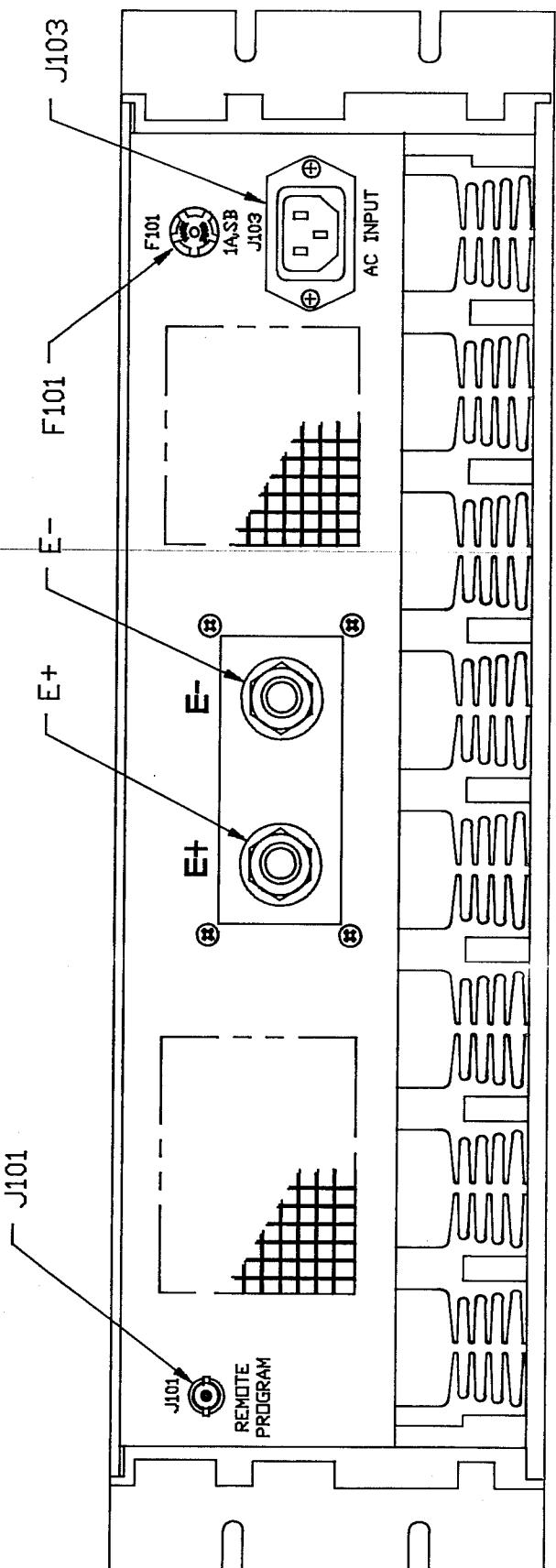
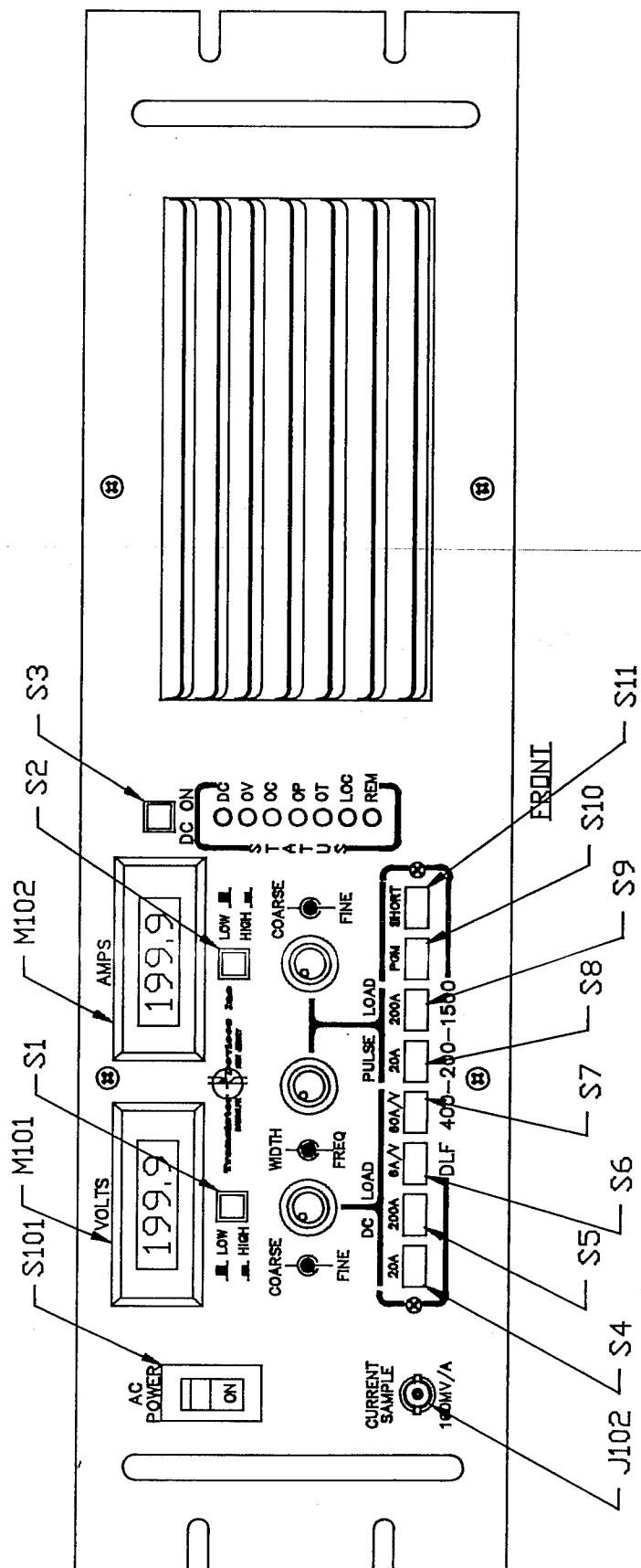
Select the 120A/V constant resistance range and apply 2V to the load inputs. Increase the current to between 210 and 240 amps. Adjust R7(CL) on A1 until current limit is achieved and the OC alarm lights.

#### 4.8 Power Limit Calibrate

Select the 0-200A constant current mode and apply 20V to the load inputs. Increase the current to 85A and adjust R10(CL) on A1 to limit the current between 76A and 85A at 20V input. Check that the PL alarm lights. Increase input voltage to 50V and the current should be limited between 31A and 34A.

#### 4.9 Oversvoltage Calibrate

Set oversvoltage trip point between 110V and 120V by adjusting R24(OV) on A1. Check that the OV alarm lights.



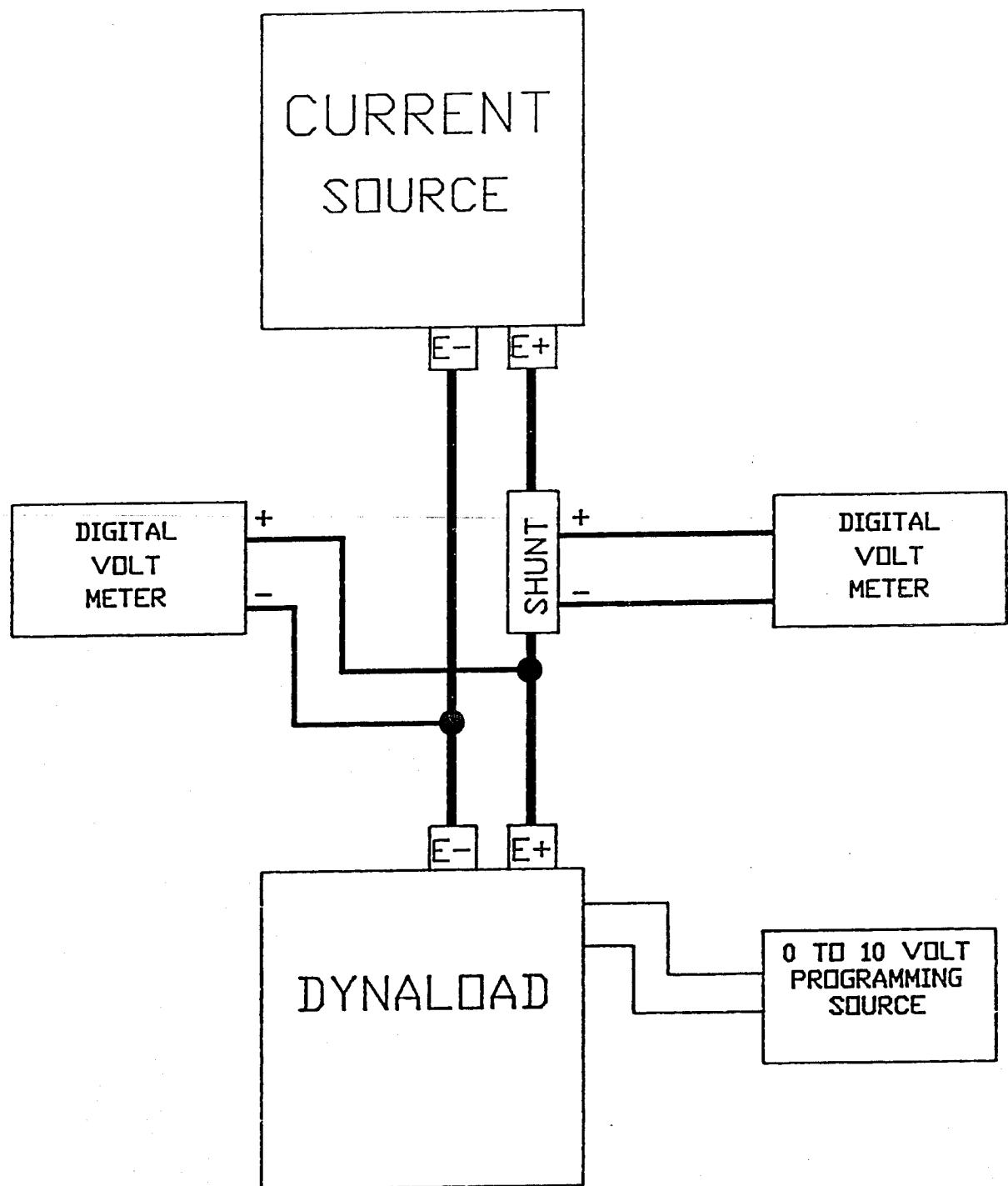
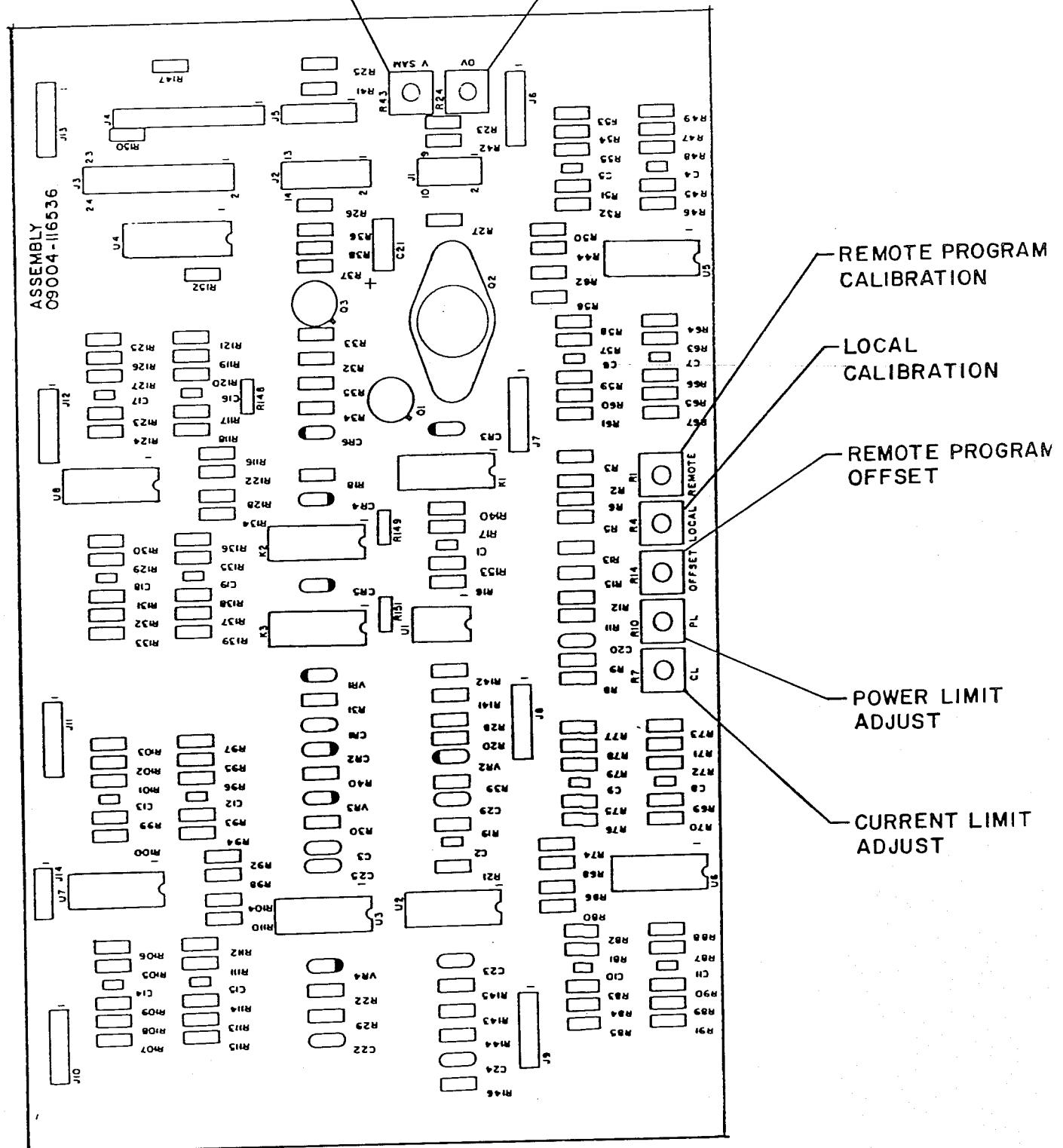
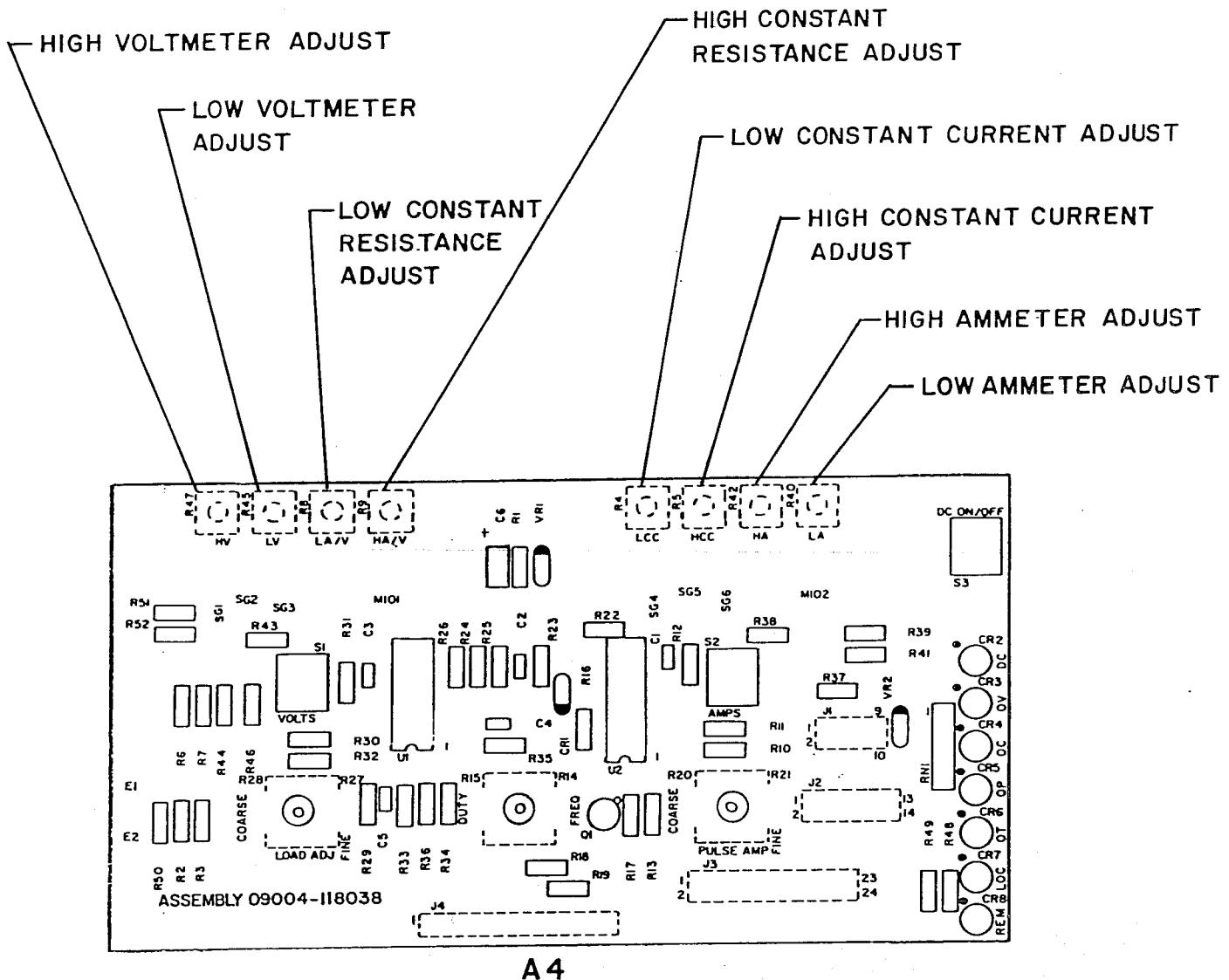
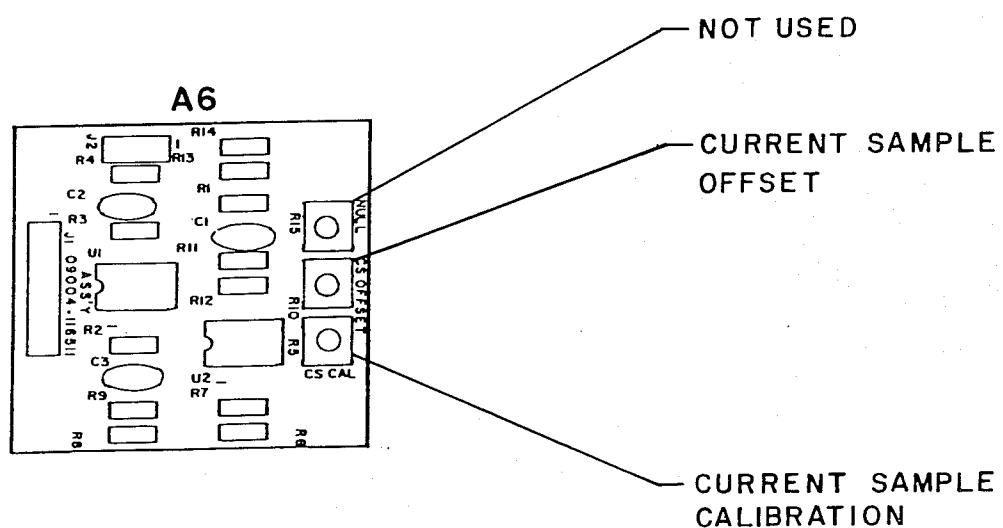


FIGURE 1. CALIBRATION SETUP





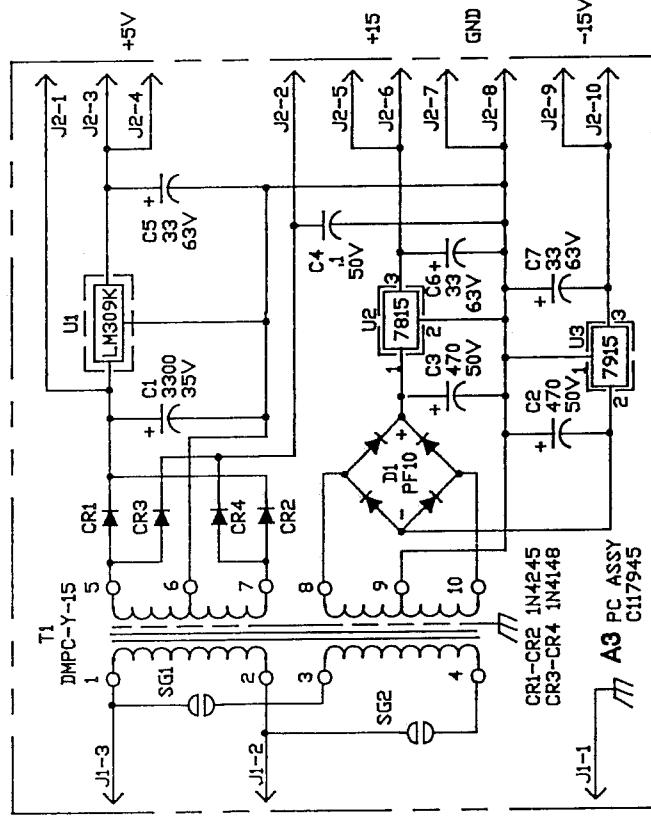
A4



ZONE/REV	REVISIONS

DESCRIPTION	DATE

APP'D

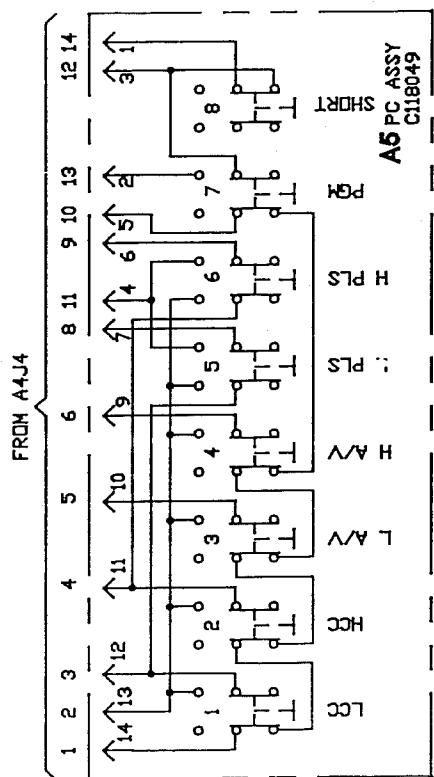


NOTES

1. UNLESS OTHERWISE SPECIFIED
- ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 2%
- ALL CAPACITANCE VALUES ARE IN MICROFARADS

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FRACTION *	CHK				POWER SUPPLY
SPS3716	A				
SPS3715	P				
DLF1500	D				
DLF750			APPROVED		
NEXT ASSY			BY DIRECTION OF		
USED ON			APPLICATION		
			SCALE	DLF/PWRSUP1	HEET

ZONE/REV	DESCRIPTION	DATE	APP'D
A	REVISE & RELEASE TO PRODUCTION ERN 16599	7-15-91	7C



A5 SELECTOR SWITCH FUNCTION

SWITCH IDENT	MODEL NO.					
	DLF 100-100-750	DLF 400-100-750	DLF 100-200-1500	DLF 400-200-1500	DLF 100-600-4000	DLF 400-600-4000
LCC	10A	10A	20A	20A	60A	.5A
HCC	100A	100A	200A	200A	600A	5A
LA/V	10A/V	3A/V	12A/V	6A/V	30A/V	.01A/V
HA/V	100A/V	30A/V	120A/V	60A/V	300A/V	.10A/V
L PLS	10A	10A	20A	20A	60A	.5A
H PLS	100A	100A	200A	200A	600A	5A
PGM	PGM	PGM	PGM	PGM	PGM	PGM
SHORT	SHORT	SHORT	SHORT	SHORT	SHORT	SHORT

ITEM REF ID	CODE IDENT NO.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	PARTS LIST	Transistor Devices Inc
					RENDON New Jersey
<b>UNLESS OTHERWISE SPECIFIED TOLERANCES ARE IN INCHES *</b>					
TOLERANCES	INCHES *	CNTL NO.	DR. CROUSE B NOV 90	DRAWING TITLE	Transistor Devices Inc
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SPPS3716					
SPPS3715					
3 PLACE DECIMALS *					
DLF-4000					
2 PLACE DECIMALS *					
DLF-1500					
1 PLACE DECIMALS *					
MATERIAL					
APPROVED					
BY DIRECTION OF					
NEXT ASSY USED ON					
APPLICATION					
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					HEET OF

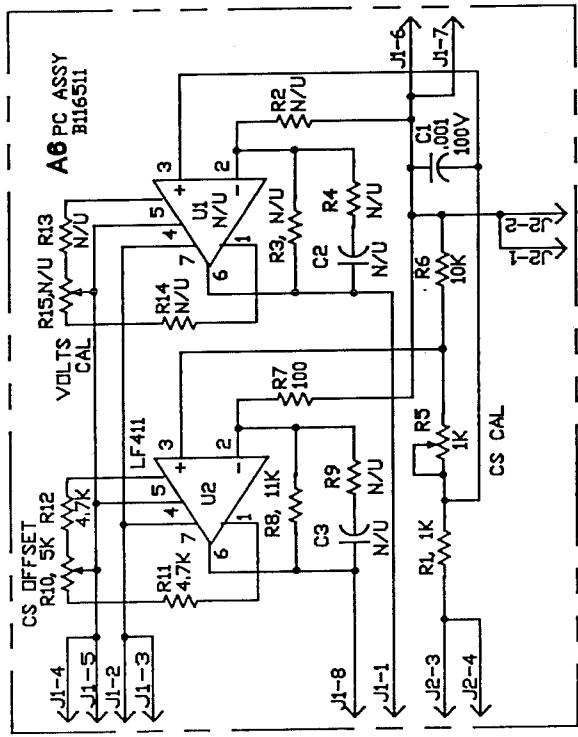
ZONE/REV	DESCRIPTION	DATE APPD

REVISIONS

ZONE/REV

DESCRIPTION

DATE APPD



## NOTES:

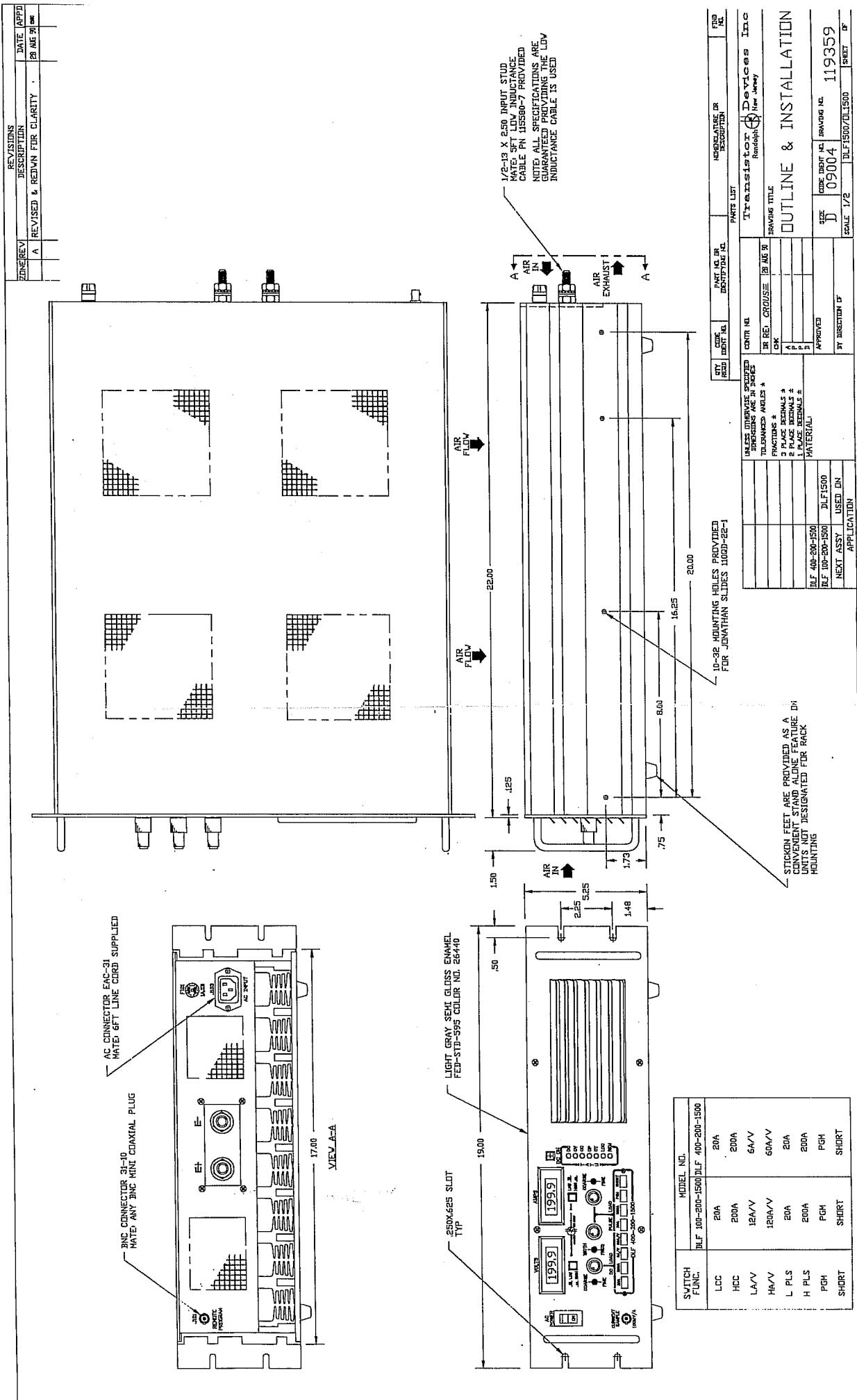
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ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 2%

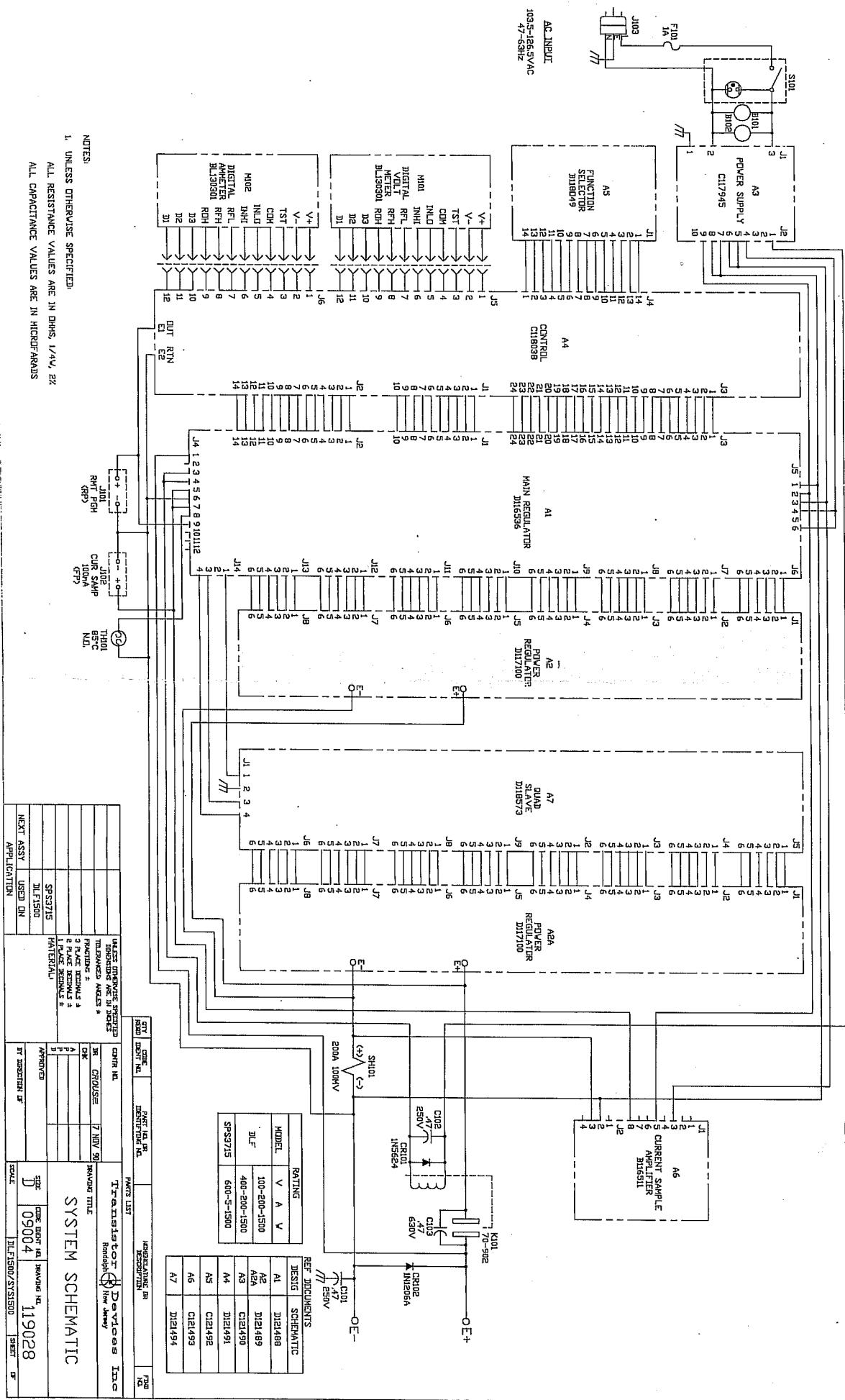
ALL CAPACITANCE VALUES ARE IN MICROFARADS

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			CURRENT SAMPLE AMPLIFIER		
			SIZE	DRAWING NO.	
			C	09004	
			SCALE	DLF/SCH/AMP	SHEET
					121493

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	CONTR. NO.
TOLERANCES, ANGLES *	DR. CROUSE 17 AUG 90
FRACTIONS *	CK
3 PLACE DECIMALS *	A
2 PLACE DECIMALS *	P
1 PLACE DECIMALS *	D
MATERIAL	
DLF4000	
DLF1500	
DLF750	
NEXT ASSY USED ON	
APPLICATION	



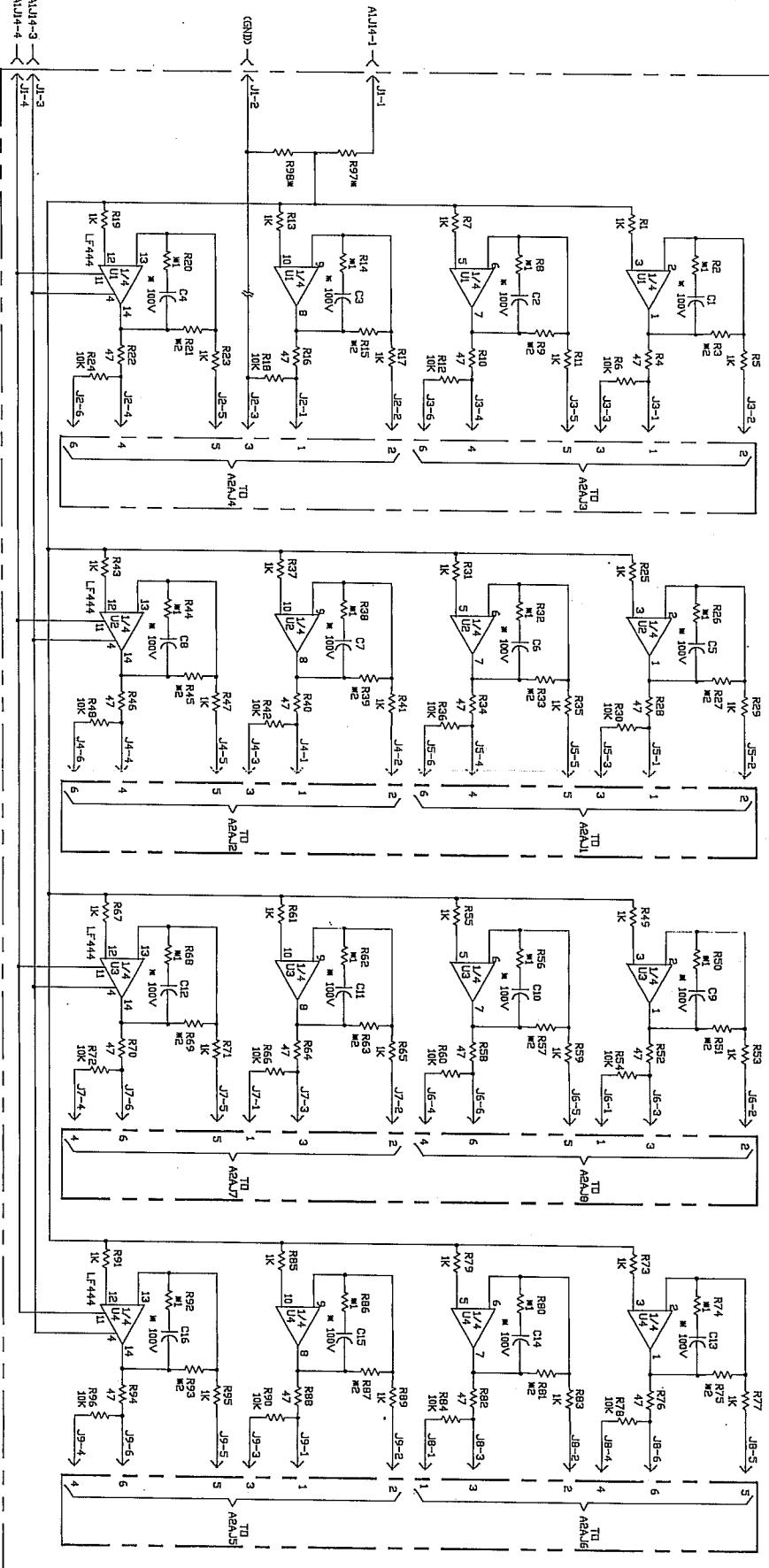
ZONREV	REVISIONS	DESCRIPTION	DATE	REFD
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\* SEE TABLE

A7 PC ASSY J11857/3

ZONE/REV.	REVISIONS	DATE APPROD	
:	A ECN	ADD SP53862 AND VALUE TABLE	9-16-91



DESIG	DILF	SP53862
R1	400-200-1500	SP538715
R2	10K	SP53862
R3	4.7K	SP53862
R4	10K	SP53862
R5	5.6K	SP53862
R6	.001	SP53862
R7	.001	SP53862
R8	.001	SP53862
R9	.001	SP53862
R10	.001	SP53862
R11	.001	SP53862
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R96	.001	SP53862
R97	.001	SP53862
R98	.001	SP53862
R99	.001	SP53862
R100	.001	SP53862

## NOTES

1. UNLESS OTHERWISE SPECIFIED
- ALL RESISTANCE VALUES ARE IN OHMS, 1% 4%, 2%
- ALL CAPACITANCE VALUES ARE IN MICROFARADS

ITEM	QUANTITY	DESCRIPTION	REF.
R1	10K	J11857	R
R2	10K	1MEG	R
R3	4.7K	10K	R
R4	5.6K	39K	R
R5	.001	.001	R
R6	.001	.001	R
R7	.001	.001	R
R8	.001	.001	R
R9	.001	.001	R
R10	.001	.001	R
R11	.001	.001	R
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R34	.001	.001	R
R35	.001	.001	R
R36	.001	.001	R
R37	.001	.001	R
R38	.001	.001	R
R39	.001	.001	R
R40	.001	.001	R
R41	.001	.001	R
R42	.001	.001	R
R43	.001	.001	R
R44	.001	.001	R
R45	.001	.001	R
R46	.001	.001	R
R47	.001	.001	R
R48	.001	.001	R
R49	.001	.001	R
R50	.001	.001	R
R51	.001	.001	R
R52	.001	.001	R
R53	.001	.001	R
R54	.001	.001	R
R55	.001	.001	R
R56	.001	.001	R
R57	.001	.001	R
R58	.001	.001	R
R59	.001	.001	R
R60	.001	.001	R
R61	.001	.001	R
R62	.001	.001	R
R63	.001	.001	R
R64	.001	.001	R
R65	.001	.001	R
R66	.001	.001	R
R67	.001	.001	R
R68	.001	.001	R
R69	.001	.001	R
R70	.001	.001	R
R71	.001	.001	R
R72	.001	.001	R
R73	.001	.001	R
R74	.001	.001	R
R75	.001	.001	R
R76	.001	.001	R
R77	.001	.001	R
R78	.001	.001	R
R79	.001	.001	R
R80	.001	.001	R
R81	.001	.001	R
R82	.001	.001	R
R83	.001	.001	R
R84	.001	.001	R
R85	.001	.001	R
R86	.001	.001	R
R87	.001	.001	R
R88	.001	.001	R
R89	.001	.001	R
R90	.001	.001	R
R91	.001	.001	R
R92	.001	.001	R
R93	.001	.001	R
R94	.001	.001	R
R95	.001	.001	R
R96	.001	.001	R
R97	.001	.001	R
R98	.001	.001	R
R99	.001	.001	R
R100	.001	.001	R

NOTES: DASHING INDICATES NOT RECOMMENDED

DIMINISHES TOLERANCES AND

FUNCTIONS \* 0.25 MILS \* 0.0005 INCHES \*

2 PLACES DECIMAL &amp; 2 PLACES DECIMAL &amp;

1 PLACE DECIMAL &amp; 1 PLACE DECIMAL \*

APPROVED:

SIZE: D

CURE MOUNT: 10 mils

P/N: 09004

REV: 09/16/91

P/N: 121494

SHEET: 09

SCHEMATIC

QUAD SLAVE

HARDWARE

EDITION REV.		REVISIONS	DESCRIPTION	DATE APPROVED
A		ADD. SP5952 AND VALUE TABLE	9-16-91	
1	ECN			

1/2 OF A1 SP5955

2

R48  
1K  
J6-2 → 2

R72  
1K  
JB-2 → 2

R56  
1K  
J11-2 → 2

R10  
1K  
J13-5 → 5

R45  
1/4  
1  
R46  
1K  
J6-1 → 1

R8  
1/4  
1  
R21  
1K  
JB-1 → 1

R93  
1/4  
1  
R94  
1K  
J11-3 → 3

R117  
1/4  
1  
R118  
1K  
J13-5 → 6

R47  
47  
1  
R49  
1K  
J6-3 → 3

R78  
1/4  
1  
R79  
1K  
JB-3 → 3

R89  
1/4  
1  
R90  
1K  
J11-1 → 1

R119  
1/4  
1  
R120  
1K  
J13-5 → 6

R51  
1/4  
1  
R52  
1K  
J6-2 → 2

R75  
1/4  
1  
R76  
1K  
JB-4 → 4

R81  
1/4  
1  
R82  
1K  
JB-5 → 5

R95  
1/4  
1  
R96  
1K  
J11-5 → 5

R53  
1K  
J6-4 → 4

R77  
1K  
JB-4 → 4

R83  
1/4  
1  
R84  
1K  
JB-5 → 5

R102  
1K  
J11-5 → 5

R59  
1K  
J7-1 → 1

R74  
1K  
JB-4 → 4

R98  
1/4  
1  
R99  
1K  
J11-6 → 6

R108  
1K  
J11-6 → 6

R60  
1K  
J7-2 → 2

R80  
1K  
JB-5 → 5

R90  
1K  
J9-3 → 3

R104  
1K  
J10-3 → 3

R63  
1/4  
1  
R64  
1K  
J7-3 → 3

R87  
1/4  
1  
R88  
1K  
J9-3 → 3

R105  
1/4  
1  
R106  
1K  
J10-4 → 4

R111  
1/4  
1  
R112  
1K  
J10-4 → 4

R65  
1K  
J7-4 → 4

R89  
1/4  
1  
R90  
1K  
J9-4 → 4

R107  
1K  
J10-5 → 5

R114  
1/4  
1  
R115  
1K  
J10-5 → 5

R66  
1K  
J7-5 → 5

R81  
1/4  
1  
R82  
1K  
J9-5 → 5

R109  
1K  
J10-6 → 6

R118  
1/4  
1  
R119  
1K  
J10-6 → 6

R67  
1K  
J7-6 → 6

R83  
1/4  
1  
R84  
1K  
J9-6 → 6

R105  
1/4  
1  
R106  
1K  
J10-7 → 7

R115  
1/4  
1  
R116  
1K  
J10-7 → 7

R68  
1K  
J7-7 → 7

R85  
1/4  
1  
R86  
1K  
J9-7 → 7

R107  
1K  
J10-8 → 8

R122  
1K  
J10-8 → 8

R69  
1K  
J7-8 → 8

R87  
1/4  
1  
R88  
1K  
J9-8 → 8

R109  
1K  
J10-9 → 9

R129  
1K  
J10-9 → 9

R70  
1K  
J7-9 → 9

R89  
1/4  
1  
R90  
1K  
J9-9 → 9

R107  
1K  
J10-10 → 10

R132  
1K  
J10-10 → 10

R71  
1K  
J7-10 → 10

R83  
1/4  
1  
R84  
1K  
J9-10 → 10

R109  
1K  
J10-11 → 11

R134  
1K  
J10-11 → 11

R72  
1K  
J7-11 → 11

R85  
1/4  
1  
R86  
1K  
J9-11 → 11

R109  
1K  
J10-12 → 12

R135  
1/4  
1  
R136  
1K  
J10-12 → 12

R73  
1K  
J7-12 → 12

R87  
1/4  
1  
R88  
1K  
J9-12 → 12

R109  
1K  
J10-13 → 13

R137  
1K  
J10-13 → 13

R74  
1K  
J7-13 → 13

R85  
1/4  
1  
R86  
1K  
J9-13 → 13

R109  
1K  
J10-14 → 14

R138  
1K  
J10-14 → 14

R75  
1K  
J7-14 → 14

R85  
1/4  
1  
R86  
1K  
J9-14 → 14

R109  
1K  
J10-15 → 15

R139  
1K  
J10-15 → 15

CONTINUED  
FROM SHEET 1

C

B

A

NOTES  
1 UNLESS OTHERWISE SPECIFIED.  
ALL RESISTANCE VALUES ARE IN OHMS 1/4W, 2%

ALL CAPACITANCE VALUES ARE IN MICROFARADS

DESIGN	DILF	SPS2715	SPS2716	SPS3962
#1	10K	600-5-1500	600-5-1500	400-5-1500
#2	1 MEG	10K	10K	100
C-139	100K	100K	100K	100K

ALL RESISTANCE VALUES ARE IN OHMS 1/4W, 2%

ALL CAPACITANCE VALUES ARE IN MICROFARADS

UNLESS OTHERWISE SPECIFIED

SCHEMATIC

QUAD MASTERS

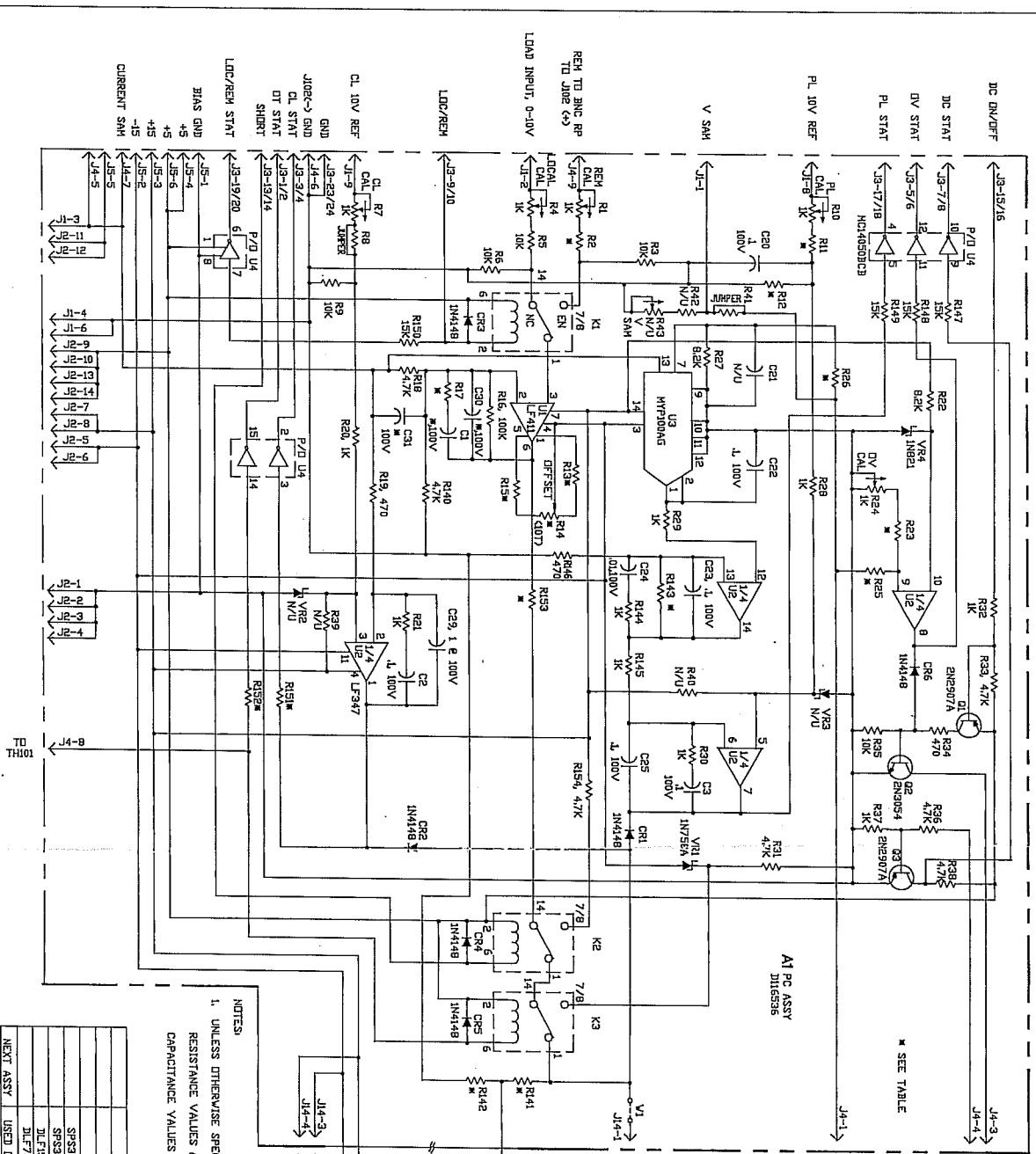
SCHEMATIC

QUAD MASTERS

SCHEMATIC

QUAD MASTERS

SHEET 2 OF 2



\* SEE TABLE

ZONE REV	REV	DESCRIPTION	DATE
A	ADD SPS3862 TO TABLE OF VALUES	9-56-91	
R2	400-400-750	DLF-500-500	SPS3715
R3	9.1K	7.5K	SPS3715
R4	2.7K	2.7K	SPS3862
R5	10K	10K	SPS3862
R6	10K	10K	SPS3862
R7	10K	2.2K	SPS3862
R8	5.5K	5.5K	SPS3862
R9	5.5K	6.2K	SPS3862
R10	390K	390K	SPS3862
R11	4.7K	4.7K	SPS3862
R12	4.7K	4.7K	SPS3862
R13	27K	27K	SPS3862
R14	15K	15K	SPS3862
R15	15K	15K	SPS3862
R16	100K	100K	SPS3862
C1	.0022	.0022	SPS3862
C2	-.01	.01	SPS3862
C3	-.01	.01	SPS3862

-CONTINUED ON SHEET 2

NOTES  
 1. UNLESS OTHERWISE SPECIFIED.  
 RESISTANCE VALUES ARE IN OHMS, 1/4W, 25°C  
 CAPACITANCE VALUES ARE IN MICROFARADS

REF	COMPONENT NO.	PART NO. OR SUBSTITUTE NO.	DESCRIPTION OR NOTATION OR SPECIFICATION
J1	1	1	
J2	2	2	
J3	3	3	
J4	4	4	
J5	5	5	
J6	6	6	
J7	7	7	
J8	8	8	
J9	9	9	
J10	10	10	
J11	11	11	
J12	12	12	
J13	13	13	
J14	14	14	
J15	15	15	
J16	16	16	
J17	17	17	
J18	18	18	
J19	19	19	
J20	20	20	
R1	1	1	
R2	2	2	
R3	3	3	
R4	4	4	
R5	5	5	
R6	6	6	
R7	7	7	
R8	8	8	
R9	9	9	
R10	10	10	
R11	11	11	
R12	12	12	
R13	13	13	
R14	14	14	
R15	15	15	
R16	16	16	
R17	17	17	
R18	18	18	
R19	19	19	
R20	20	20	
R21	21	21	
R22	22	22	
R23	23	23	
R24	24	24	
R25	25	25	
R26	26	26	
R27	27	27	
R28	28	28	
R29	29	29	
R30	30	30	
R31	31	31	
R32	32	32	
R33	33	33	
R34	34	34	
R35	35	35	
R36	36	36	
R37	37	37	
R38	38	38	
R39	39	39	
R40	40	40	
R41	41	41	
R42	42	42	
R43	43	43	
R44	44	44	
R45	45	45	
R46	46	46	
R47	47	47	
R48	48	48	
R49	49	49	
R50	50	50	
R51	51	51	
R52	52	52	
R53	53	53	
R54	54	54	
R55	55	55	
R56	56	56	
R57	57	57	
R58	58	58	
R59	59	59	
R60	60	60	
R61	61	61	
R62	62	62	
R63	63	63	
R64	64	64	
R65	65	65	
R66	66	66	
R67	67	67	
R68	68	68	
R69	69	69	
R70	70	70	
R71	71	71	
R72	72	72	
R73	73	73	
R74	74	74	
R75	75	75	
R76	76	76	
R77	77	77	
R78	78	78	
R79	79	79	
R80	80	80	
R81	81	81	
R82	82	82	
R83	83	83	
R84	84	84	
R85	85	85	
R86	86	86	
R87	87	87	
R88	88	88	
R89	89	89	
R90	90	90	
R91	91	91	
R92	92	92	
R93	93	93	
R94	94	94	
R95	95	95	
R96	96	96	
R97	97	97	
R98	98	98	
R99	99	99	
R100	100	100	
C1	.0022	.0022	SPS3862
C2	-.01	.01	SPS3862
C3	-.01	.01	SPS3862
C4	-.01	.01	SPS3862
C5	-.01	.01	SPS3862
C6	-.01	.01	SPS3862
C7	-.01	.01	SPS3862
C8	-.01	.01	SPS3862
C9	-.01	.01	SPS3862
C10	-.01	.01	SPS3862
C11	-.01	.01	SPS3862
C12	-.01	.01	SPS3862
C13	-.01	.01	SPS3862
C14	-.01	.01	SPS3862
C15	-.01	.01	SPS3862
C16	-.01	.01	SPS3862
C17	-.01	.01	SPS3862
C18	-.01	.01	SPS3862
C19	-.01	.01	SPS3862
C20	-.01	.01	SPS3862
C21	-.01	.01	SPS3862
C22	-.01	.01	SPS3862
C23	-.01	.01	SPS3862
C24	-.01	.01	SPS3862
C25	-.01	.01	SPS3862
C26	-.01	.01	SPS3862
C27	-.01	.01	SPS3862
C28	-.01	.01	SPS3862
C29	-.01	.01	SPS3862

### SCHEMATIC

MAIN REGULATOR

APPENDIX  
BY INVENTOR IF  
SCALE  
DRAWER  
SHEET 1

NEXT ASSY USED ON  
APPLICATION

DATE 09/04 DRAWING NO. 214883

TIME 09:00 DRAFTSMAN

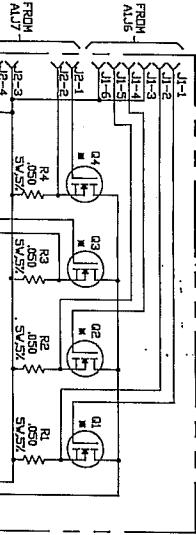
INSTRUMENTS  
DRAFTSMAN'S  
HANDS

FUNCTIONS \*  
PAC. DECODES \*

3 PLACE DECIMALS \*

1 PLACE DECIMALS \*

INSTR REV	REVISIONS	DATE APPROV
-----------	-----------	-------------

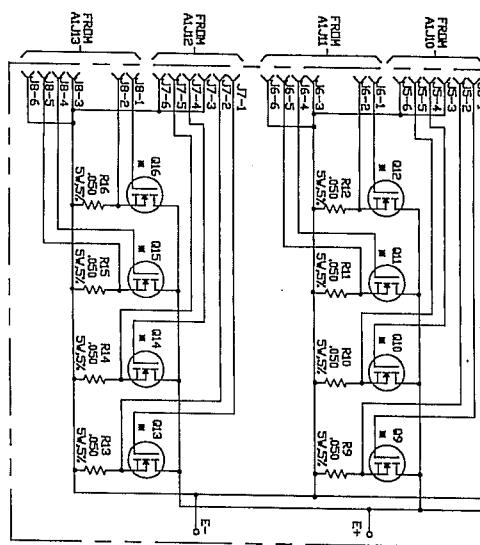


■ SEE TABLE

UNIT RATING	PART NO. Q1 THRU Q16
100V	JRF520
400V	2N6770-2
600V	902-RAN

#### NOTES

- 1. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, 2%
- ALL CAPACITANCE VALUES ARE IN MICROFARADS



APPLICATION	PRINT DATE 09/04/99	REV. NO. 121489
<b>PRINTS ON THIS SHEET</b>		
TRANSISTOR PART NO. S80516	PRINT NO. B	REV. NO. 20
TRANSISTOR PART NO. S823715	PRINT NO. C	REV. NO. 1
TRANSISTOR PART NO. DUF1500	PRINT NO. D	REV. NO. 3
TRANSISTOR PART NO. DUF730	PRINT NO. E	REV. NO. 1
<b>SCHEMATIC</b>		
MATERIAL	APPROVED	10/04/99
APPROVED	PRINT DATE NO. 09/04/99	REV. NO. 121489
APPROVED	09/04/99	121489
<b>TRANSISTOR Devices Inc.</b>		
Transistor Devices Inc. Montgomery New Jersey		
TRANSISTOR Devices Inc. Montgomery New Jersey		

