TDI POWER

DLF-100-50-250
OPERATOR'S MANUAL

DYNALOAD DIVISION
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T A B L E   O F   C O N T E N T S

ILLUSTRATIONS

. INTRODUCTION

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

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

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

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

SPECIFICATIONS

The following specifications apply:

Load Voltage:	0-100V
Load Current:	0-50A
Average Power Dissipation:	0-250W
Self-Protection:	Overvoltage--less than 120V
	Overcurrent--less than 60A
	Over-power --less than 300W

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   5A DC LOAD - 0 to 5A constant current mode which is controlled by the front panel DC Load adjust.

S5   50A DC LOAD - 0 to 50A constant current mode which is controlled by the front panel DC Load adjust.

S6   2A/V DC LOAD - 0 to 2A/V constant resistance mode which is adjusted by the front panel DC Load adjust.

S7   20A/V DC LOAD - 0 to 20A/V constant resistance mode which is adjusted by the front panel DC Load adjust.

S8   5A PULSE LOAD - 0 to 5A pulse mode. The amplitude, frequency, duty cycle and DC baseline are adjustable by the front panel controls.

S9   50A PULSE LOAD - 0 to 50A 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.

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S11   SHORT CIRCUIT - Drives load to saturation. Effective resistance is less than .05 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 100 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 this 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

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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, 0-2A/V and 0-20A/V.   Minimum sistance on the 0-2A/V range is .5 ohms, and minimum resistance on e 0-20A/V range is .05 ohms. For example, to test a 12V battery th a two ohm resistive load, the 2A/V mode should be selected, and e coarse and fine load adjust controls adjusted to obtain the 6A ad.   The two ohm load is now set, and this resistance value will nain constant for the full range of input voltage.

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

3.2 Constant Current Mode

Some power sources, such as variable power supplies, are rated a fixed maximum load current and adjustable over a predetermined ltage range: i.e., 5-10V @ 20A. If the resistive load aracteristic were used for this type of test, it would be :essary to reset the load each time the power supply voltage was anged, in order to maintain the full load current. However, if e load is set to the 50A constant current mode, a load of 20A is ilied, then the power supply can be adjusted from 5-10V, and the id current will remain constant.

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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 0-5A or from 0-50A peak current by the pulse amplitude control on the front panel. The frequency may be varied from approximately 800Hz 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 55A by the internal current limit protection.

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.

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The rise time of the load current pulse is approximately 15 us ɔr a 5-50A pulse and return. Operation at low voltages (less than ') may result in transient to less than 1V at the input terminal ɪe to Ldi/dt drops in the power leads. This in turn may cause ɪlse waveform distortion and the user should monitor the load ɪrrent waveforms to assure proper operation.

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

3.4 <u>External Modulation</u>

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

The dynaload will program from 0-50A with a 0-10V @ 1 MA ntrol signal. The input impedance of the external modulation rminals is approximately 10K ohms.

The linearity of the external program is set to be within ±1% ɔve 1A.

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

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3.5 Power Rating

The model DLF 100-50-250 will dissipate 250W 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 0A 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 60A, which is maintained to approximately 4.2V. 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

ffect of the rectifier is to slightly distort the Dynaload haracteristics at low voltages and currents. The Dynaload is not ormally recommended for testing AC sources above 1000 cycles unless he user specifically recognizes the load characteristics at higher requencies.

3.8 <u>Effects of Cable Inductance on Pulse Loading</u>

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

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

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

1. 1 microhenry = 2.4 feet of wire (total).

2. 50A @ 15 microseconds rise time = 3.3 volt drop with 1 icrohenry.

3. The inductive drop cannot exceed the difference between he source voltage and the 1.0V compliance.

For example: To test a 5.0v source with a 50A pulse, the aximum cable length would be:

E Max drop = 4.0V

$$E = L(di/dt) \quad 4.0V = L(50/15us)$$

L = 1.2 microhenries maximum

Maximum cable length = 2.88 feet total

ince this distance is relatively short, a low inductance cable is ⁻ovided. This cable (5 feet long with an overall inductance of 5 ٦) is compensated for internally by the load.

If the distance from the load to the source must be greater ١an this, there are several methods to increase the maximum istance. One way is to use several insulated conductors. This ١ts the inductance in half if 4 are used instead of 2, or by

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

CALIBRATION PROCEDURES (Refer to FIG. 1)

4.1 Current Sample calibrate

    A. Set current sample for 10.0V with Dynaload drawing
       50A, adjust R2(CS CAL) on the A8 PC board.

    B. With the Dynaload drawing 5A set current sample for
       1.0V, adjust R8(CS OFFSET) on A8.

    C. Repeat these two steps until no further adjustments
       are necessary.

4.2 Remote Programing Calibrate

    A. Set programming source to 10.0V adjust R1(REMOTE)
       on A1 so the Dynaload draws 50.0A

    B. Set program source for 1.0V and adjust R14(OFFSET)
       on A1 so the load draws 5.0A.

    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 R24(HV) on A5 so the voltmeter
       includes the correct voltage.

B. Select the low range and apply 10V to the load inputs. Adjust R26(LV) on A5 so the voltmeter indicates the correct voltage.

4.4 Ammeter Calibrate

A. Select the high range and with the Dynaload drawing 50.0A adjust R28(HA) on A5 so the ammeter indicates the correct current.

B. Select the low range and with the Dynaload drawing 15.0A adjust R30(LA) on A5 so the ammeter indicates the correct current.

4.5 Constant Current Calibrate

A. Select the 5A constant current mode and turn the DC Load coarse adjust fully clockwise. Adjust R2(LCC) on A4 so the load draws 5.0A.

B. Select the 50A constant current mode and turn the DC Load coarse adjust fully clockwise. Adjust R4(HCC) on A4 so the load draws 50.0A.

4.6 Constant Resistance Calibrate

A. Select the 2A/V constant resistance mode, apply 10.0V to DC load inputs and turn the DC Load coarse adjust fully clockwise. Adjust R6(LA/V) on A4 until the load draws 20.0A.

B. Select the 20A/V constant resistance mode, apply 2.0V to the DC load inputs and turn the DC Load coarse adjust fully clockwise. Adjust R8(HA/V) so the load draws 40.0A
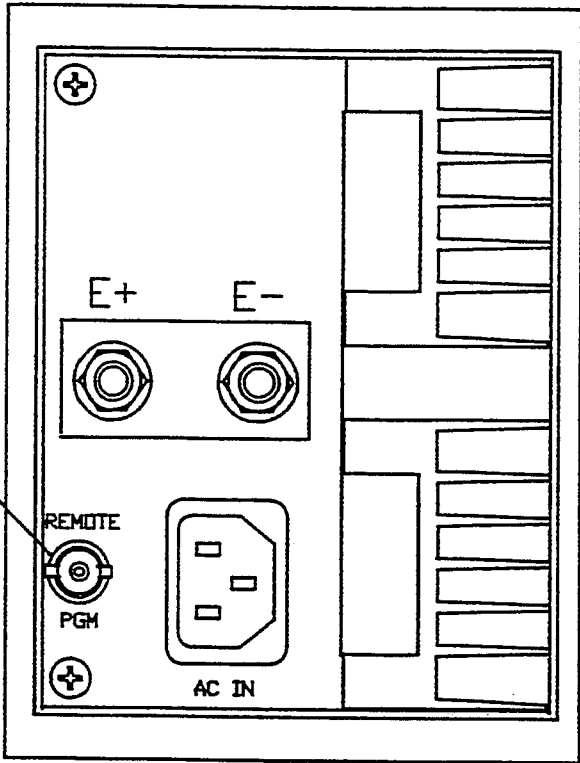
4.7 Current Limit Calibrate

Select the 20A/V constant resistance range and apply 3V to the load inputs. Increase the current to between 52 and 55 amps. Adjust R7(CL) on A1 until current limit is achieved and the OC alarm lights.
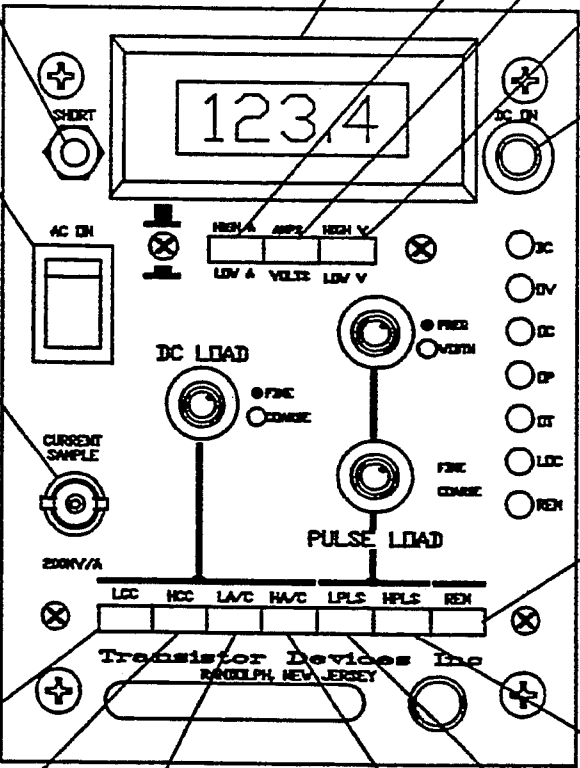
4.8 Power Limit Calibrate

Select the 0-50A constant current mode and apply 20V to the load inputs. Increase the current to 15A and adjust R10(PL) on A1 to limit the current between 14A and 15A at 20V input. Check that the PL alarm lights. Increase input voltage to 50V and the current should be limited between 5.5A and 6.0A.

4.9 Overvoltage Calibrate

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

J101

E+   E−

REMOTE

PGM

AC IN

REAR

S101

S11

J102

S1

M101

S2

S3

S12

SHORT

123.4

DC ON

AC ON

HIGH A   AMPS   HIGH V

LOW A   VOLTS   LOW V

DC LOAD

FREQ

VOLTM

FINE

COARSE

FINE

COARSE

CURRENT
SAMPLE

PULSE LOAD

S10

DC

DV

DC

DP

DT

LOC

REM

200MV/A

LCC   HCC   LA/C   HA/C   LPLS   HPLS   REM
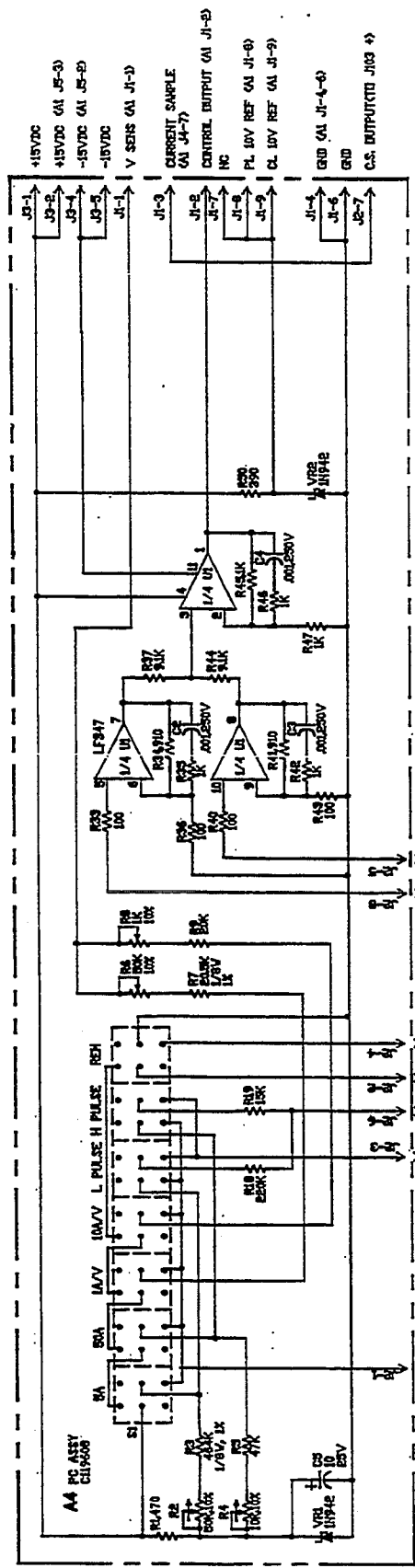
Transistor Devices Inc

RANDOLPH, NEW JERSEY

FRONT

S9

S4   S5   S6   S7   S8
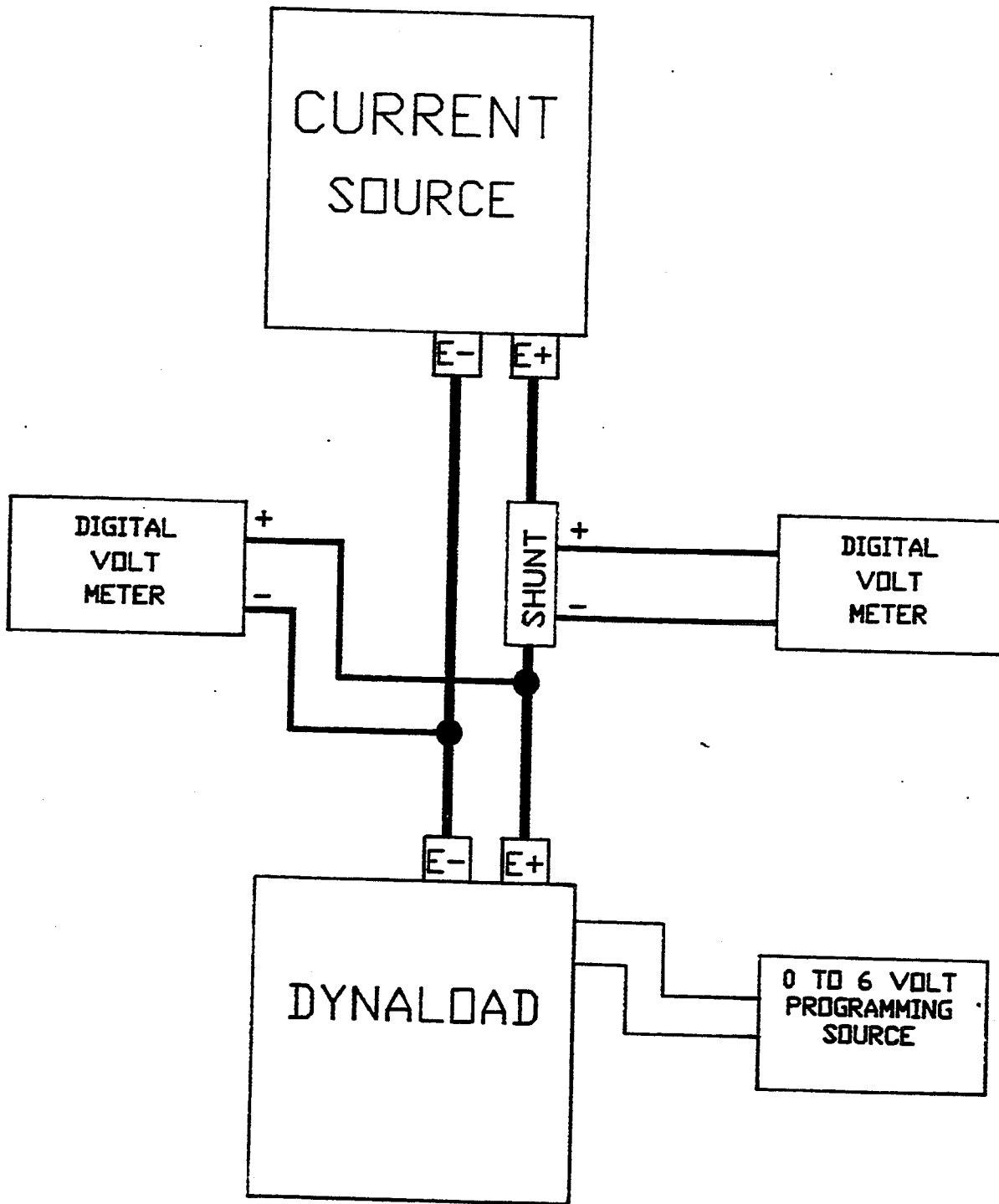
FIGURE 1. CALIBRATION SETUP

SCHEMATIC
MAIN REGULATOR

Transistor Devices Inc
New Jersey

119369

www.valuetronics.com

REVISIONS

ZONE	REV	DESCRIPTION	DATE (APPD)
	A	REVISED & REDWN BY AUTOCAD	11 NOV 90

1/4-20 X .250 INPUT STUDS
MATES 4FT LOW INDUCTANCE CABLE
PN 115500-1 PROVIDED

NOTE: ALL SPECIFICATIONS ARE GUARANTEED
PROVIDING THE LOW INDUCTANCE CABLE IS USED

3.65

4.68

21.91

1.25

.125

AC CONNECTOR EAC-31
MATES 6FT LINE CORD
PROVIDED

STICK-ON FEET ARE PROVIDED AS A CONVENIENT STAND ALONE
FEATURE ON UNITS NOT DESIGNATED FOR RACK MOUNTING

NOTES:
1. DIMENSIONS ARE FOR ENGINEERING REF ONLY
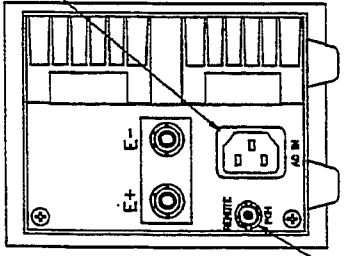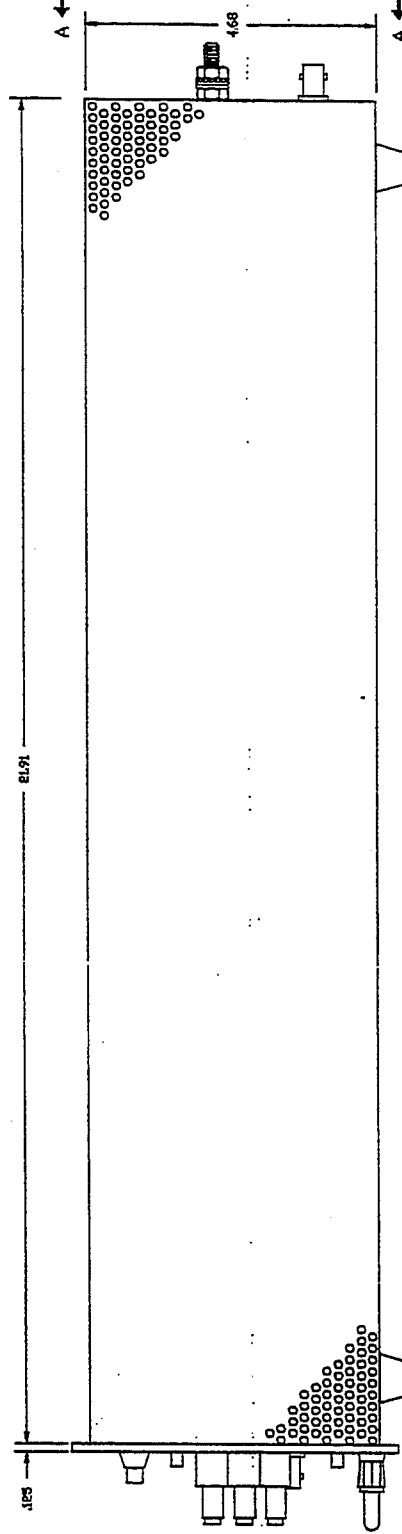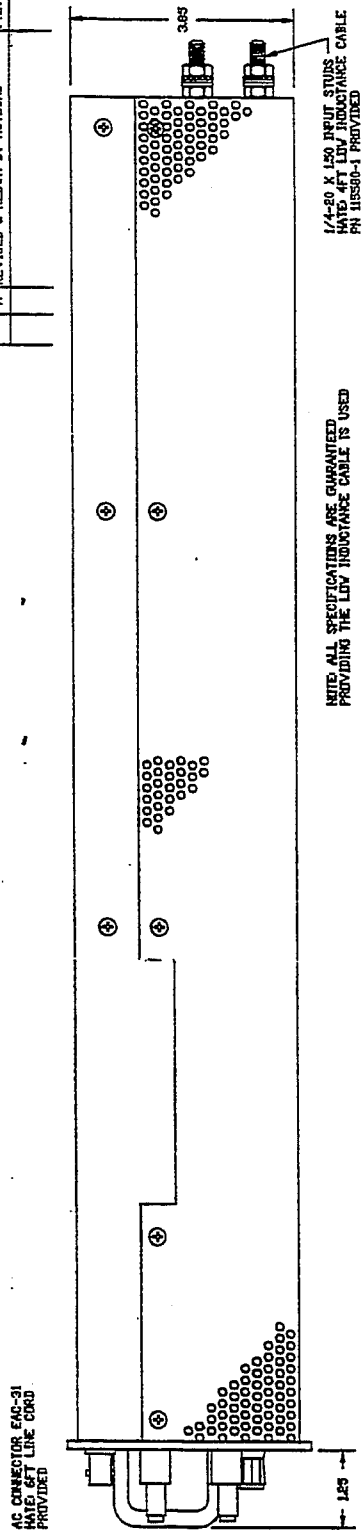
VIEW A-A

BNC CONNECTOR 31-10
MATES ANY BNC MINT COAXIAL PLUG

E-   E+

AC IN

199.9

PLUG LOAD

5.25

4.00
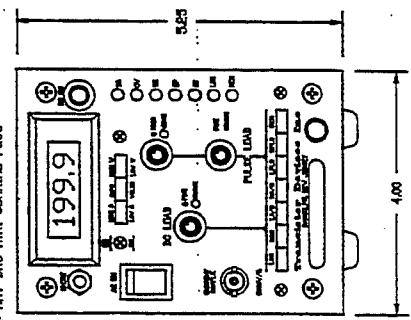
SWITCH FUNC.	MODEL NO.			
	DLF 100-50-250	DLF 400-50-250		
LCC	5A	5A		
HCC	50A	50A		
LA/V	3A/V	1.5A/V		
HA/V	30A/V	15A/V		
L PLS	5A	5A		
H PLS	50A	50A		
PGM	PGM	PGM		
SHORT	SHORT	SHORT		

PARTS LIST

Transistor Devices Inc
Neptune, New Jersey

NOMENCLATURE OR DESCRIPTION   OUTLINE & INSTALLATION

	DR	CROUSE	17 OCT 90	SIZE D	CODE IDENT NO. 09004	DRAWING NO. 119368

SCALE 1/1   DLF250/DLF250   SHEET 1/1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ANGLES ±
FRACTIONS ±
3 PLACE DECIMALS ±
2 PLACE DECIMALS ±
1 PLACE DECIMALS ±
MATERIAL

DLF 400-50-250
DLF 100-50-250   DLF250
NEXT ASSY   USED ON
APPLICATION