

Sorensen

DCR-B2 SERIES **500-Watt & 1000-Watt** **Power Supplies**

Service Manual

Manual covers DCR-B2 models:

500-Watt

10-40B2
20-25B2
40-13B2
60-9B2
80-6B2
150-3B2
300-1.5B2
600-.75B2

1000-Watt

10-80B2
20-50B2
40-25B2
60-18B2
80-12B2
150-6B2
300-3B2
600-1.5B2

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SECTION 1 _____ THEORY OF OPERATION

1.1 INTRODUCTION

This section provides a basic discussion of unit operating principles, which may be used in conjunction with the troubleshooting chart provided in Section 3, to enable the logical and rapid isolation of unit faults. A brief description of the phase control principle is given first, followed by a block diagram analysis of system functions. The function of each section is then described in detail.

1.2 PHASE CONTROL PRINCIPLE

The sinusoidal wave in Figure 1-1 represents normal ac line voltage. If, by some means, conduction of this voltage is delayed, the average voltage output will be reduced. Control of the delay then results in control of the average voltage. This is phase control. The silicon controlled rectifier (SCR) acts like a switch, activated by the delay circuit, to provide the phase control. The delay is expressed in degrees and is known as the firing angle. Figure 1-1 shows firing angles of 60° and 120° .

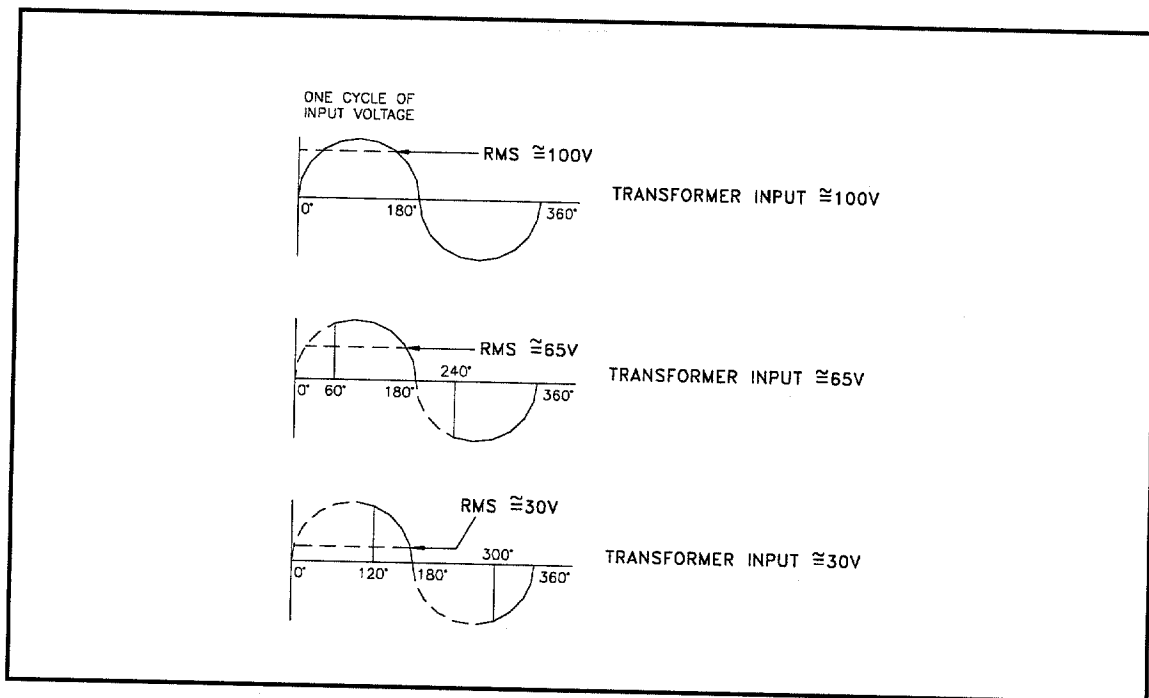


Figure 1-1 Phase Control Firing Angles

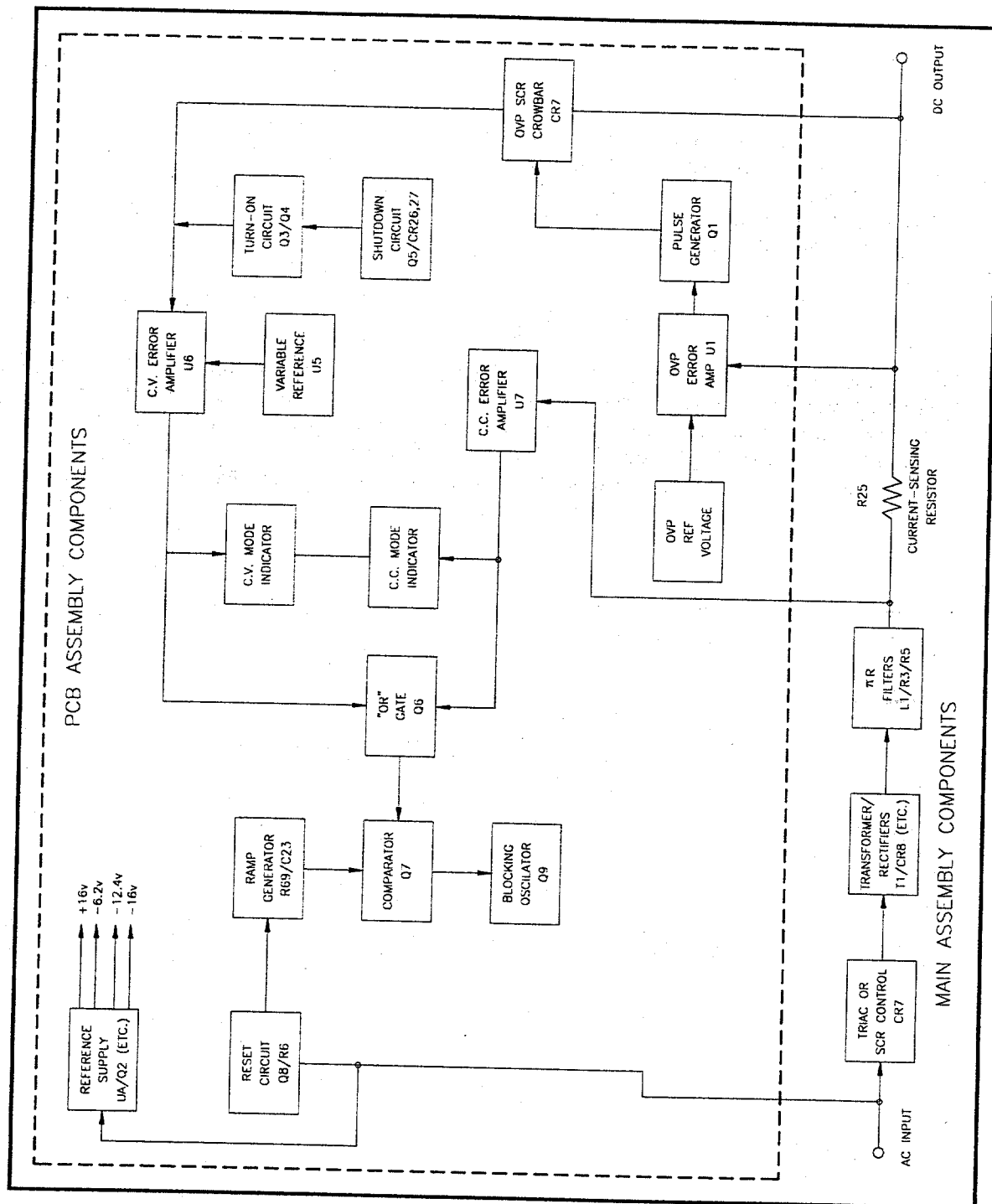


Figure 1-2 DCR-B2 Functional Block Diagram

1.3 BLOCK DIAGRAM ANALYSIS (FIGURE 1-2)

The ac input voltage is first applied to CR7 (Triac), which is in series with power transformer T1. CR7 functions with the control circuits to form a feedback loop which prevents a change in output voltage when either the line or load changes.

To accomplish this, the control circuits issue a phase adjusted firing pulse to CR7 once during each half cycle of the input ac voltage. These circuits continuously sample the output voltage, which establishes the precise time at which the firing pulse is to be generated. The phase controlled ac voltage is stepped up or down by power transformer T1, and coupled through a full-wave rectifier and filtering circuits to the output terminals.

Feedback signals from the output back to CR7 originate in the constant voltage/current error amplifiers U6/U7. In the constant voltage mode, U6 continuously compares the supply output with a reference voltage generated by a variable reference programming circuit, (U5). A difference in these voltages appears as an error signal, which is delivered to amplifier U6. This dc error signal is applied to Q6 (comparator input #1). A sawtooth ramp voltage, generated by Q8, R69 and C23, is applied to Q7 (comparator input #2). The comparator output (across R62) sets the conduction angle of blocking oscillator Q9. The duration of Q9 conduction is directly proportional to the error signal, and its output triggers CR7 into conduction. CR7 acts as a switch, whose firing angle is dependent on the magnitude of dc error signal, thus controlling the overall supply output.

Similarly, in the constant current mode, changes in line or load are sensed by R25, in series with the output. It is then amplified by U7, and applied to Q6 comparator input. Output control from this point is essentially the same as in the constant voltage analysis, above.

1.4 DETAILED CIRCUIT DESCRIPTION

NOTE

All component designators are referenced to PCB schematic diagram Figure 3-1 unless otherwise noted.

1.4.1 REFERENCE AND BIAS SUPPLIES

The precisely regulated voltage required for operation of the control circuitry is produced by a reference supply consisting of zener diodes D5/D6, operational amplifier U4, passing stage Q2, transformer T2 and center-tapped full wave rectifier D35/D36/D37/D38. (See main schematic).

The reference supply output appears across a comparison bridge composed of divider R31/R32, D16, and R77. Error signals are sensed across this bridge and amplified by U4. The variable impedance characteristic of passing stage Q2 changes the level of absorbed voltage across the stage, maintaining the output at a precisely controlled negative 12.4 volts (Figure 1-3).

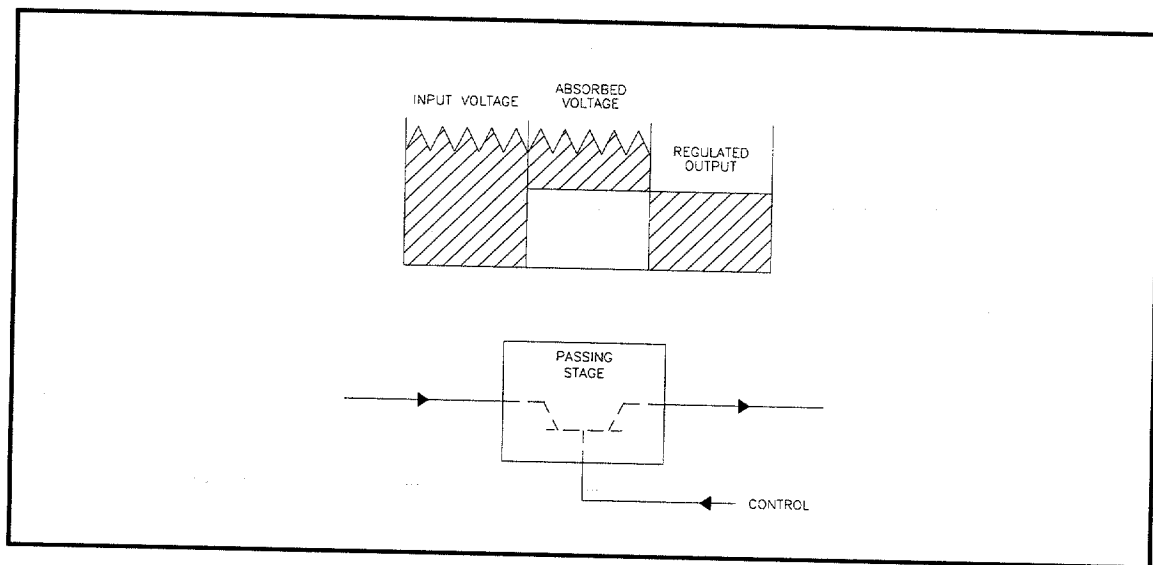


Figure 1-3 Passing Stage Principle

To illustrate circuit operation, assume an increase in the T2 (Figure 3-4) supply output. Pin 2 of U4 will become more negative, and the output at pin 6 more positive, tending to turn Q2 off. The reduction in drive current increases the impedance of Q2, and consequently its absorbed voltage, resulting in precise regulation of reference supply output.

Several other bias supplies are used to power the control circuitry:

1. +20 volts from D7. Note that there is no filtering on this 20 volt output. This signal is used as a time reference to the ac line. The +20 volt source is then gated through D21, and filtered by C18 to provide the +20 Vdc primary operating power for the control PCB.
2. The 20 volts across C18 is fed to R47 and D8, to create +16 volts for sections of the control circuitry. The +16 volts across D8 is then fed to R23 and D4 to generate and precisely regulate the +11.7V for the current amplifier reference voltage.
3. +30 Vdc unregulated (D35 and D37 on the overall schematic) is used to operate the current/voltage mode lamps, OVP control circuit, and remote current voltage select reference.

1.4.2 VOLTAGE MODE SECTION

Primary components of this circuit include constant voltage error amplifier U6, variable reference voltage programmer U5, and emitter-follower stage Q6. The circuit functions as follows:

Pin 3 of U5 is connected to plus sense. Front panel voltage controls R10/R11 function as variable feedback resistances from U5 pin 6 to pin 2. The negative 12.4 volt reference through R39/38/37 establishes the desired programming current range, so that 0 to 10 volt signal is obtained at pin 6 of U5.

The main error amplifier is U6. Pin 4 of U6 is at virtual dc ground since pin 5 is at ground (+sense). Thus, the current through R74 can be varied from 0 to 1 milliamperere. This current, through R79, programs the supply to the desired output. U6 pin 5 senses this output, and compares it to the voltage developed at U6 pin 4. The resultant is an error signal, amplified by U6, and coupled to R61 through the emitter of Q6.

An illustration of voltage mode operation. An increase in system output drives U6 pin 4 more negative. U6 pin 11, and thus the Q6 emitter also become more negative, creating the error voltage necessary to retard the firing angle of CR7 through T1/Q9 action as noted in the block diagram analysis.

C15/R44 establishes ac loop stability, aided by C16/R45.

1.4.3 CURRENT MODE SECTION

The primary component in this section is constant current amplifier U7. The 11.7V reference voltage is divided down by bridge dividers R20/R21 and R24/R19 to U7 pins 5 and 4 respectively. The resultant voltages are referenced to the positive output, through a current sensing resistor (R21), with R12/R13 serving as the front panel current adjust potentiometers.

R46/C17 establishes ac loop stability. C11/R36 (Variable) is a secondary stability network used for inductive load compensation.

R22/C7 acts to prevent rapid changes in the phase delay angle, caused by large transients. This protects the power components from overstress.

Trimmer R17 is used to adjust zero output current (compensating for current tolerances and offset voltage of U7).

Trimmer R18 is used to adjust for maximum current setting (compensating for tolerances in panel pot R12 and current shunt R25).

An illustration of current mode operation: If the output current approaches the current limit setting, the voltage across the sensing resistor becomes larger. This is seen as a positive error voltage at U7 pin 5, which is amplified and applied to the U7 output, pin 10. The output of U7, pin 10 (emitter) is passed through D20 to the base of the output stage of U7 at pin 13. The injected current causes the collector of U7, pin 11 to fall, reducing output. (See Voltage Mode section, para. 1.4.2, for additional details).

1.4.4 RAMP GENERATOR, RESET CIRCUIT AND COMPARATOR

The ramp generator consists of R69 and C23. The ramp voltage at the junction of R69/C23 is coupled through D30 to the base of Q7. This voltage starts at a maximum level, and decreases exponentially until reset by Q8 at 8.3 millisecond intervals (each 1/2 cycle of line voltage). The reset pulse for Q8 is generated through D7/R48 as follows:

The reset circuit consists of Q8 and R68. The full wave rectified ac input from T2 is impressed across D7/R48. D7 clamps the base of Q8 at its zener level, keeping it shut off (D21 is forward biased). As the impressed voltage drops toward zero, the zener voltage follows. D21 becomes reverse biased. Q8 then turns on from base bias through R68, charging C23 when the line voltage crosses zero.

The comparator consists of Q7/Q6, D30, R61, and R62. Comparator Q7/Q6 compares the dc signal from either the voltage or current mode amplifier (applied to Q6) with the ramp generator voltage. The varying output of Q7 (across R62) establishes the conduction angle of blocking oscillator Q9.

1.4.5 BLOCKING OSCILLATOR CIRCUIT

Q9 functions as a switch, providing the triggering voltage for D33 and D32 proportional to the error signal received from the comparator circuit. The blocking oscillator circuit functions as follows: Assume that at a given time the Q7 dc emitter voltage is several volts below the reference level provided by the reference supply circuit (paragraph 1.4.1). At a point when the ramp voltage, appearing at the base of Q7, is more negative than that on its emitter, Q7 conducts. This drives the base of Q9 positive, causing Q9 to conduct. As its collector current (I_c) increases, regenerative action occurs through pulse transformer T2, forcing Q9 into saturation. (I_c) continues to increase until T2 core saturates. Then T2 voltage decreases, removing Q9 base current. At this point Q9 comes out of saturation. The cycle is then repeated. The output of the pulse generator is a series of narrow pulses, continuing until the end of the line halfcycle.

1.4.6 TURN-ON AND SHUT-DOWN CIRCUITS

Primary components of the turn-on circuit are Q3, Q4, R56, R55, D28 and C22. Circuit operation is as follows: When power is initially applied to the unit, the bases of Q3/Q4 are driven positive, due to C22 coupling the rising voltage of the +16 volt bias supply. Q3 and Q4 are thus in saturation. The resultant negative voltage at the Q3/Q4 collector maintains voltage error amplifier U6 and the blocking oscillator/mixer circuits at cut off.

This action inhibits the output of the power supply from coming up. As C22 charges, the supply output will increase exponentially. Q3/Q4 gradually come out of saturation until the voltage across C22 reaches the point where they are shut off. The supply is then functioning in its normal manner.

The shut-down circuit, consisting of Q5, R58, R59, and D26/D27, cuts off the unit output when the cathode of either diode is connected to the plus sense connection. The circuit function is to actuate Q5, which turns Q3 and Q4 on. When the connection is removed, the power supply returns to normal, with the slow start described above.

D27 (TB3 pin 11) is available for customer use to shut down the dc output. Terminal 11 can be connected to +sense (TB3 Term 1) by either an isolated relay contact or an open collector logic signal (sinking approximately 0.2mA).

D26 is used internally to shut down the DCR-B2 output when the OVP is tripped.

1.4.7 POWER SECTION

The input ac voltage is applied to the primary of power transformer T1 through an SCR, (CR7). The output is rectified by a full wave bridge, and filtered by a Pi network with a damping resistor (R3). The filtered dc is then applied to the output terminals.

1.4.8 OVERVOLTAGE PROTECTOR

The OVP consists of a fast-response silicon-controlled rectifier crowbar (CR8). A reference voltage (+12V) is generated by zener D1 and R3. This reference voltage is compared to the output voltage in a bridge circuit, by the ratio of R6 to R16 plus R18 (adjust pot). The bridge output is applied to U1, pins 3 and 4. Assume that the resistor ratio is set (by adjust pot R18) to produce a balanced bridge at a specified output voltage. If the output voltage exceeds this preset value, U41, pin 3 will be driven positive relative to pin 4. The result is a positive output at pin 9 to turn on Q1. Q1 applies the +30V unregulated voltage to the primary of T1. The induced current in the secondary of T1 provides a trigger for the SCR crowbar. D12 activates the SCR, causing a crowbar function across the power supply output terminals.

The SCR recovers as soon as the output voltage is dropped, and removes the crowbar current. R5 supplies holding current to CR8 to hold the crowbar on.

To reset the OVP, power must be removed from the power supply input. After a moment to reset, lower the output voltage control, and reapply power to the input.

1.4.9 INDICATOR LAMPS

DS2, which indicates Constant Voltage mode, is wired across P49 and P1-19 as shown on the Control PCB schematic, Figure 6-1. DS3, which indicates Constant Current mode, is wired across P1-9 and P1-19.

U8 is an operational amplifier used to drive DS2 and DS3. The lamps and U8 are powered from the +30V supply.

The input signal to U8 determines which lamp lights, as follows:

A. Constant Current Mode (Current Limit) DS3

The input terminals of U8 are pins 2 and 3. Pin 2 is driven positive relative to pin 3 when the current amplifier (U7) output (pin 10) is in control (i.e., during current mode operation). Pin 2 positive signal will drive U8 output (pin 6) low (towards the +30V return). Pin 6 acts to reduce the voltage on DS2 and increases the voltage on DS3. DS3 is turned on brightly and DS2 is turned off.

B. Constant Voltage Mode (DS2)

During Voltage Mode operation, U8 pin 2 polarity reverses due to loss of U7 pin 10 voltage, so that U8 pin 6 output is driven high (towards +30V). This turns on DS2 and turns off DS3.

1.4.10 CHANGEABLE CURRENT PROGRAMMING PARAMETERS

0-400 mV Operation:

Dual range current mode signal programming is controlled by SW1, U3, U2 and associated parts. The signal programming voltage is applied between TB3-8(+) and TB3-9() with the jumper between TB3-7 and TB3-8 removed. For 0-400mV signal control voltage, SW1-1 is closed. This directly connects TB3-8 to R17 as in the standard DCR-B2 current mode signal programming. SW1-2 and SW1-3 are open.

0-10V Operation:

For 0-10V signal control voltage, SW1 is open; SW2 and SW3 are closed. Thus, the input voltage goes to pin U3B-5 via R12 and R11. D3 and R12 limit the input voltage to 15V maximum. R11, R9, R10 and U3A (pins 1,2,&3) comprise an inverting amplifier with a gain of 20-25. The gain inverting amplifier is set so that the output at SW1-2 is equal to .4V with $V_{in}=10V$ (approx. 24). As input voltage goes from 0-10V, the output voltage goes from 0-400mV.

U2 and associated parts allow the front panel control pots to output a variable voltage even when they are disconnected from the control circuitry, ie, TB3-8.

SECTION 2 _____ MAINTENANCE

2.1 GENERAL

This section provides troubleshooting data, periodic servicing, calibration, performance and hi-pot testing procedures. The troubleshooting data should be used in conjunction with the schematic diagrams and Section 1 which outlines the principles of operation. Any questions pertaining to repair should be directed to the nearest Sorensen representative or to the factory. Include the model and serial numbers in any correspondence. Should it be necessary to return a unit to the factory for repair, prior authorization from Sorensen Company must be obtained.

2.2 PERIODIC SERVICING

Whenever a unit is removed from service, it should be cleaned, using naphtha or an equivalent solvent on painted surfaces, and a weak solution of soap and warm water for the front panel. Compressed air may be used to blow dust from in and around components.

2.3 TROUBLESHOOTING

Table 2-1 provides a list of malfunction symptoms along with a tabulation of the possible cause(s) for each symptom. Note that the failure of a single component may result in a chain reaction effect. As additional aids to troubleshooting, voltage checkpoints have been designated on the printed circuit schematic diagram.

2.4 CALIBRATION

Following repair, the unit should be recalibrated to insure that replacement components have not altered performance. Refer to Table 2-3 for unit calibration specifications. The following is the calibration procedure to ensure that full rated voltage output is available:

1. Make sure input power has been removed from unit and circuit breaker set to "OFF" position.
2. Set SW1 on PCB to "ON", "OFF", "OFF".
3. Adjust course voltage knob to midpoint and course current fully clockwise.
4. Set power to unit and turn circuit breaker "ON".
5. Check to see if output is approximately 1/2 rated voltage.
6. Adjust course voltage fully clockwise. With maximum voltage pot (R37 on PCB) adjust output voltage to 105% of rated.
7. Set output to rated voltage with four significant digits.
8. Set both course and fine current knobs fully counter clockwise.

9. Verify unit has gone from voltage mode to current mode by noting a significant drop in output voltage, by illumination of DS3.
10. Set fine current adjustment to midpoint and apply short circuit.
11. Using minimum current Adj. (R17 on PCB) adjust output current to exactly 0 amps.
12. Adjust fine current fully clockwise; slowly adjust course current fully clockwise.
13. Using maximum current Adj. (R18 on PCB) adjust output current to 115% of rated.
14. Turn circuit breaker "OFF".
15. Set SW1 to "OFF", "ON", "ON".
16. Turn course current knob counter clockwise fully.
17. Turn circuit breaker "ON".
18. Slowly Adj. course current knob fully clockwise.
19. With short circuit still applied, set current using 10V gain Adj. (R75 on PCB) to 115% of rated current.
20. Remove short circuit.
21. Turn unit "OFF". Reset SW1 to "ON", "OFF", "OFF".
22. Turn unit back "ON".
23. Apply rated load with rated voltage out.
24. With voltmeter (positive lead on inside of R21 and negative lead on cathode of D24) use R7 on front panel to set 400 MV, $\pm 1\%$. Reset current meter with R6.
25. Apply pot lock to all pots, also R6 & R7.
26. Calibration complete.

Table 2-1 DCR-B2 Troubleshooting

1	No output (voltage mode)	a) Wrong input voltage b) Open fuses and circuit breaker* c) Reference voltages (check levels) d) Defective U6 or U5 e) Collector to emitter short on Q8, Q6, Q3, Q5 or Q4 f) Q9 open or shorted
2	Fuse opens or circuit breaker trips	a) CR7 shorted* b) Input capacitors shorted* c) D32, D33 shorted or open*
3	High output voltage (meter pointer pegs)	a) Sensing or programming leads or link open* b) Defective U6 or U5 c) Q7 shorted collector to emitter d) Q6 open collector to emitter e) CR7 shorted*
4	No output (current mode), or unit will not current limit	a) Defective U7 b) C7 shorted c) D20 open d) Shorted COARSE CURRENT potentiometer* e) Collector to emitter short on Q8, Q6, Q3, Q5 or Q4 f) Q9 open or shorted
5	Output oscillates (current mode)	a) Potentiometer R36 on unit PCB improperly adjusted

*Chassis components (ref. Figure 2-3)

2.5 PERFORMANCE TESTING

Sensitive instruments like the DCR-B require rigorous testing methods if a true performance evaluation is to be made. Wherever possible, twisted leads should be used with test equipment to reduce stray pickup. At the power supply terminal board, these leads must be firmly held by the terminal screws. Alligator clips and similar types of connectors are not suitable. Grounding techniques in which more than one device in the setup is grounded may introduce extraneous ripple that, although unrelated to the power output ripple, is displayed on the test oscilloscope.

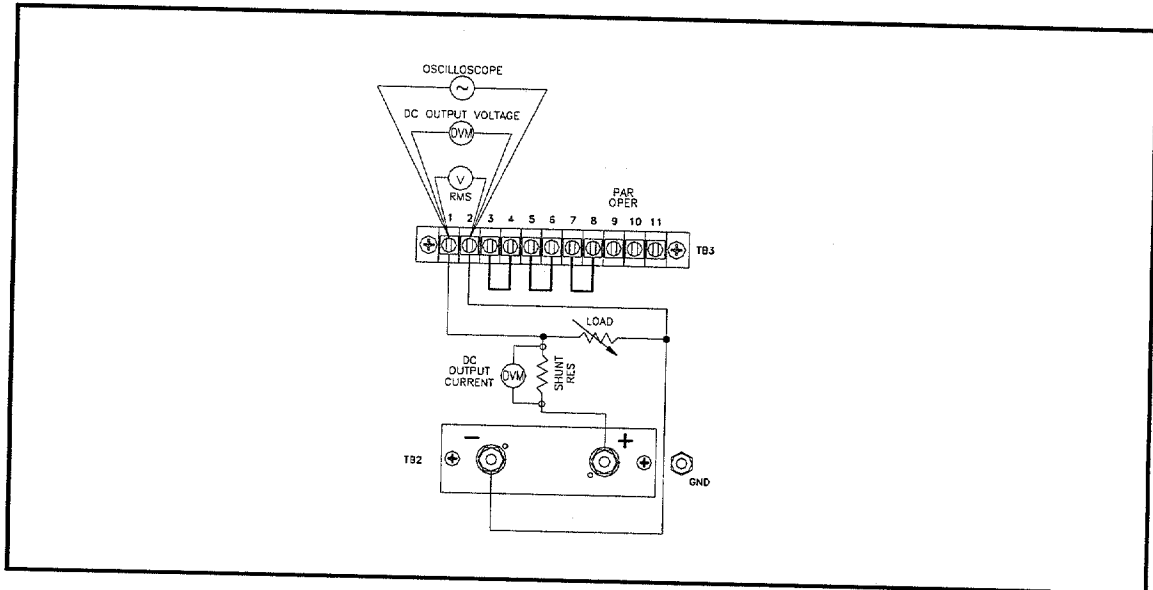


Figure 2-1 Performance Test Setup

2.5.1Voltage Mode Regulation and Ripple

To check voltage mode regulation and ripple, proceed as follows:

1. Connect a sensitive digital voltmeter and an RMS ac voltmeter across unit output terminals per Figure 2-1. Select a current shunt per Table 2-2 with a DVM for current output readings.

Use an autotransformer for AC line input with a current rating that exceeds the maximum unit input current called out in the unit specifications.

NOTE

Input devices such as autotransformers or line regulators can distort the input wave sufficiently to adversely affect performance measurements.

2. Apply high ac line input per specifications and remove load. Set the POWER switch to ON.
3. Rotate COARSE CURRENT control fully clockwise.
4. Use COARSE and FINE VOLTAGE controls to obtain rated output voltage. Note DVM reading after a few minutes of warm up time.

5. Decrease ac input voltage to low line specification. Output voltage change should not exceed limits specified in Table 2-3.
6. Close load switch and adjust load for rated current. Using high ac line specification and full load, verify ripple meets specification.

2.5.2 **Current Mode Regulation**

To check current mode regulation, proceed as follows:

1. At no load, adjust output to maximum rated voltage, and set COARSE CURRENT control fully clockwise.
2. Connect a sense resistor (Table 2-2) or a precision meter shunt in series with a variable load across the output terminals.
3. Connect input power at low line per unit specifications. Apply load until rated current of supply is reached. (Unit has voltage mode indicated.) Adjust COARSE CURRENT control until CURRENT mode indicator is lit and output voltage drops at least 5% off full scale value.
4. Connect a digital voltmeter across the sensing resistor, and note the indication.
5. Increase input voltage until voltage is at high line, and reduce the load resistance to zero (short). Note indication on the DVM. Change in voltmeter reading (expressed in millivolts) should be divided by sense resistor value to obtain regulation in milliamperes. Limits are provided in Table 2-3.

2.5.3 **Transient Response**

Test for transient response as follows:

1. Connect an oscilloscope across the unit output terminals.
2. Set unit POWER switch to ON. Adjust COARSE VOLTAGE control for rated output, and COARSE CURRENT control fully clockwise.
3. Apply half load, and then abruptly apply full load (or switch from full load to half load). Return to steady state operation should occur within 50 milliseconds (typical). See Table 2-3 for typical transient deviation voltage values.

NOTE

Load switching time should be less than 3 milliseconds.

Table 2-2**Sensing Resistor Values (Current Mode Regulation Check)**

DCR MODEL	SENSE RESISTOR (Ohms)
10-40B2	0.01, 50W
10-80B2	.00625, 50W
20-25B2	0.01, 50W
20-50B2	.0200, 50W
40-13B2	0.01, 50W
40-25B2	.0400, 25W
60-9B2	0.1, 25W
60-18B2	.0556, 20W
80-6B2	0.1, 25W
80-12B2	.0833, 12W
150-3B2	0.1, 25W
150-6B2	.167, 6W
300-1.5B2	1.0, 10W
300-3B2	.333, 3W
600-.75B2	1.0, 10W
600-1.5B2	.333, 1W

Table 2-3
Unit Calibration Specifications

DCR Model	<u>Regulation</u>		Ripple Volt Mode (mV)	Transient Deviation (Volts)	Maximum Compliance (Vdc)	Cur. Mode Upper Lim. Set Pt. (A)
	Voltage Mode (mV)	Current Mode (mA)				
10-40B2	3	100	65	0.6	10	46
10-80B2	3	200	65	1.0	10	92
20-25B2	6	62.5	65	1.2	20	28.75
20-50B2	10	125	65	1.6	20	58
40-13B2	12	32.5	90	2.4	40	14.95
40-25B2	12	63	90	2.9	40	29
60-9B2	18	22.5	125	3.6	60	10.35
60-18B2	18	45	125	4.0	60	21
80-6B2	24	15	150	4.8	80	6.9
80-12B2	24	33	150	5.3	80	14
150-3B2	45	7.5	300	9.0	150	3.45
150-6B2	45	16	300	9.5	150	7.0
300-1.5B2	90	3.75	700	18	300	1.725
300-3B2	90	8	700	20	300	3.5
600-.75B2	180	2	1200	36	600	0.8625
600-1.5B2	180	4	1200	40	600	1.7

2.6HI-POT TEST PROCEDURE

High potential test procedures have been carefully carried out at the factory. These units are 100% tested and should not require further testing in the field.

CAUTION

High potential test can overstress or destroy the power semiconductors in this power supply if improperly applied.

Isolation measurements may be made using a standard VOM (Simpson 260 or equivalent) on the highest resistance scale available.

If it is essential to use the high potential test method, please contact the factory for information on special precautions that should be taken.

CAUTION

Sorensen Company cannot be held liable for any malfunctions resulting from the application of a high potential test (greater than 100V). See standard Sorensen Company warranty.

SECTION 3

DRAWINGS AND PARTS LISTS

3.1.....GENERAL

This manual contains schematic diagrams, PCB parts location drawings, and replaceable parts lists. The parts lists are keyed to the applicable schematic diagrams, and assembly drawings by the Reference Designator and Item Number.

3.1.1 Circuit Symbol (Reference Designator)

This is an alpha-numeric identification of the component as called out on the unit drawings.

3.1.2..... Sorensen Part Number

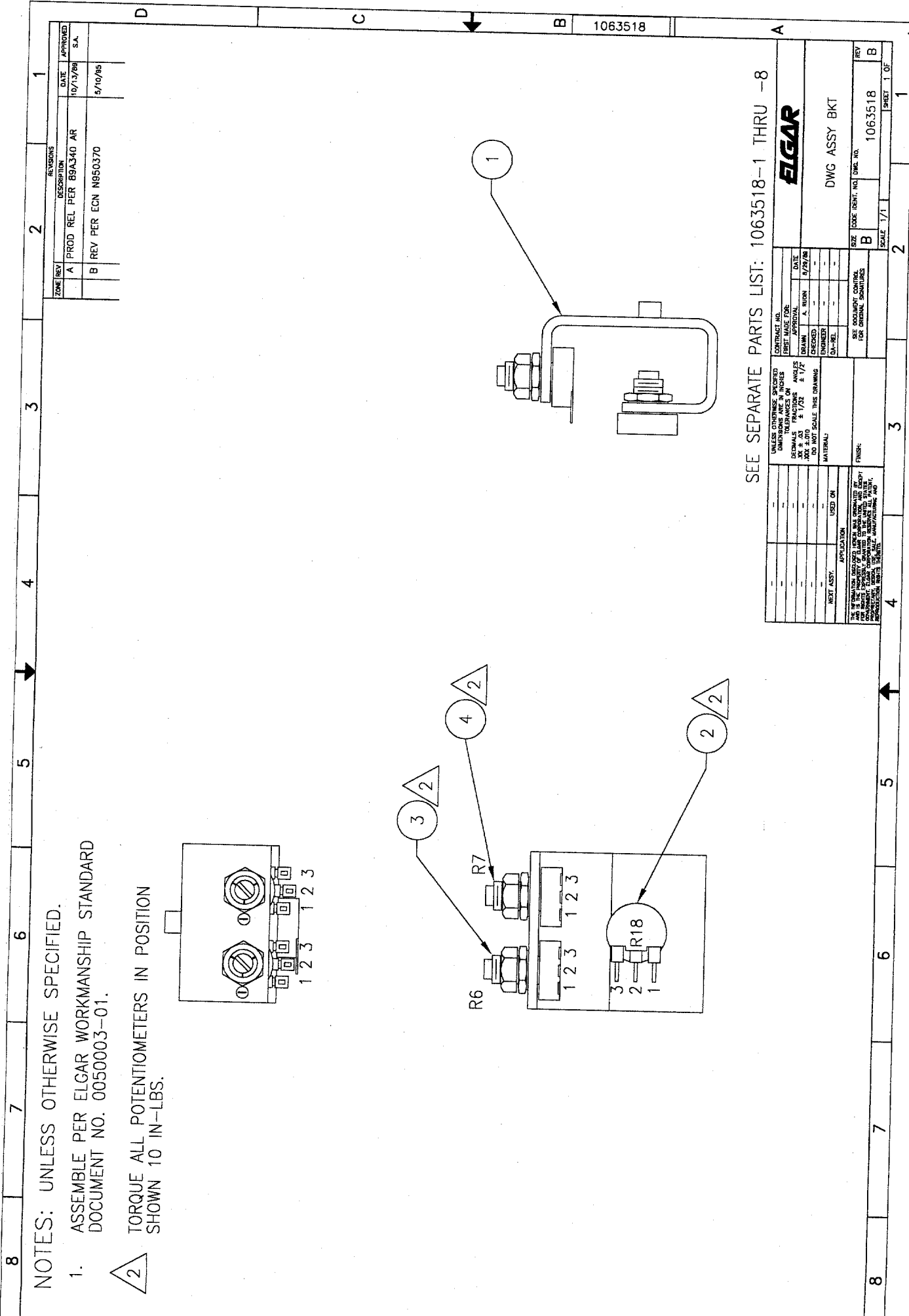
The Sorensen part number should be used when ordering parts directly from:

Sorensen
Sales & Technical Support
9250 Brown Deer Road
San Diego, CA 92121-2294
1-800-525-2024
Tel: (858) 450-0085
Fax: (858) 458-0267
Email: sales@sorensen.com
www.sorensen.com

3.2REPLACEMENT PARTS LISTS (See Attached)

3.3 ASSEMBLY DRAWINGS (See Attached)

DRAWING #		DESCRIPTION
500 WATT	1000 WATT	
M360646	M360646	REPLACEMENT PARTS LIST
1063996	1063996	DWG OUTLINE
1064093	1064377	SCHEMATIC, UNIT
1063006	1063006	SCHEMATIC, CONTROL PCB
1063829	1064371	FINAL ASSY
	1064436	BASE ASSY
1063513	1063513	FRONT PANEL ASSY
1064468	1063514	REAR PANEL ASSY
1063005	1063005	CONTROL PCB ASSY
1063865	1063865	CAP ASSY
1063518	1063518	POT ASSY



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ASSEMBLE PER ELGAR WORKMANSHIP STANDARD DOCUMENT NO. 0050003-01.

2. TORQUE ALL POTENTIOMETERS IN POSITION SHOWN 10 IN-LBS.

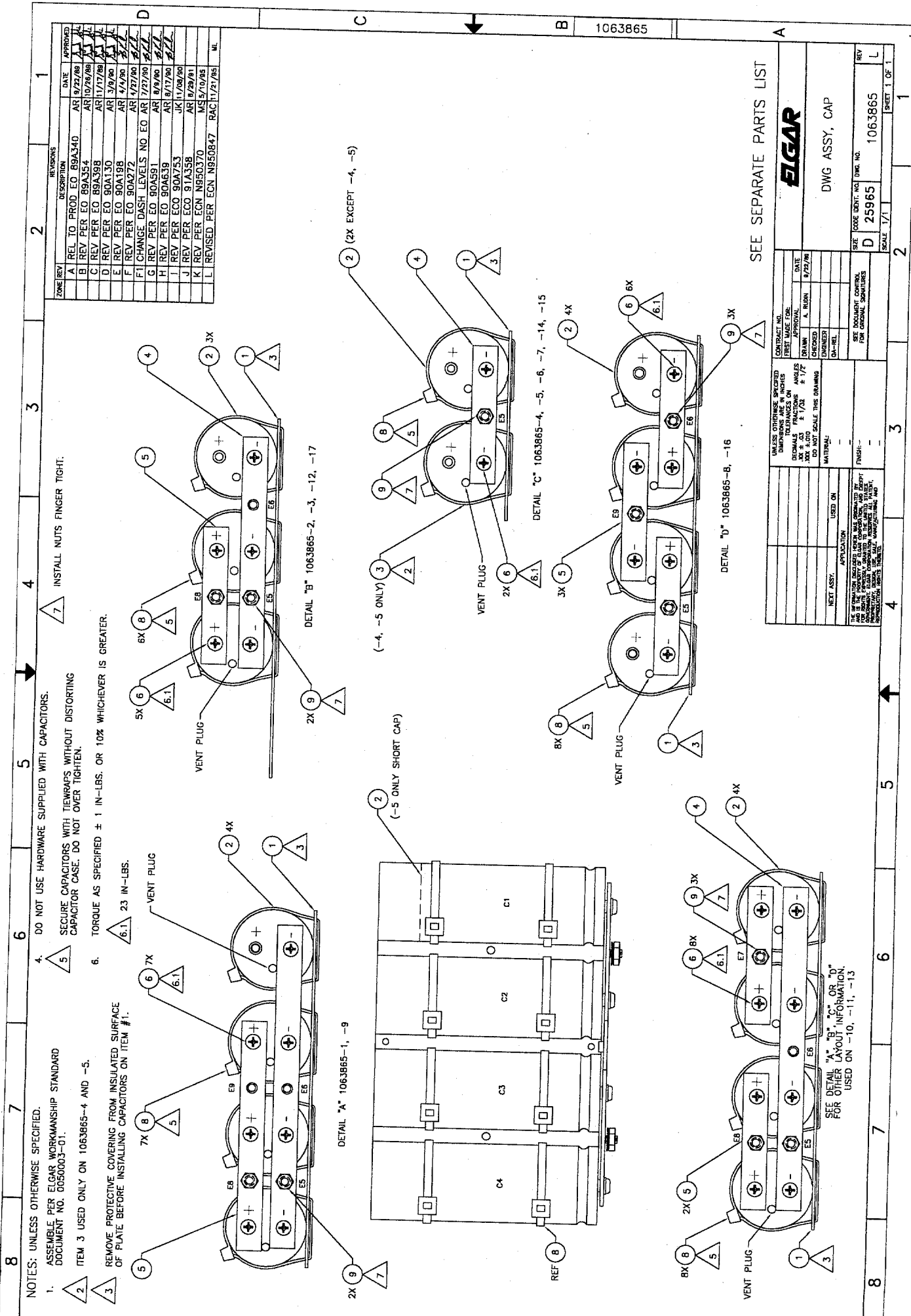
ZONE	REV	DESCRIPTION	DATE	APPROVED
A	PROD REL PER	B9A340 AR	10/13/88	S.A.
B	REV PER ECN	N950370	5/10/85	

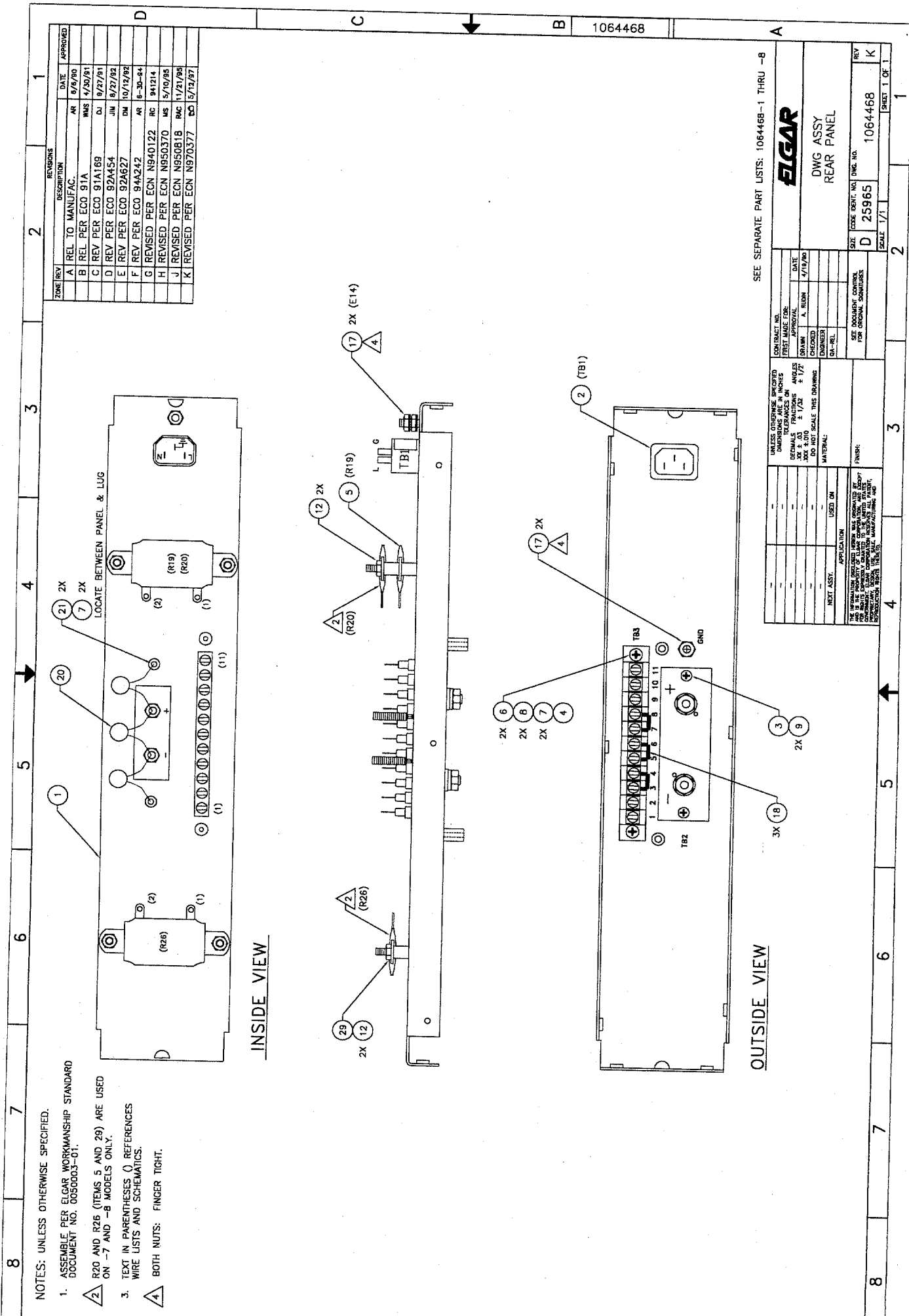
SEE SEPARATE PARTS LIST: 1063518-1 THRU -8

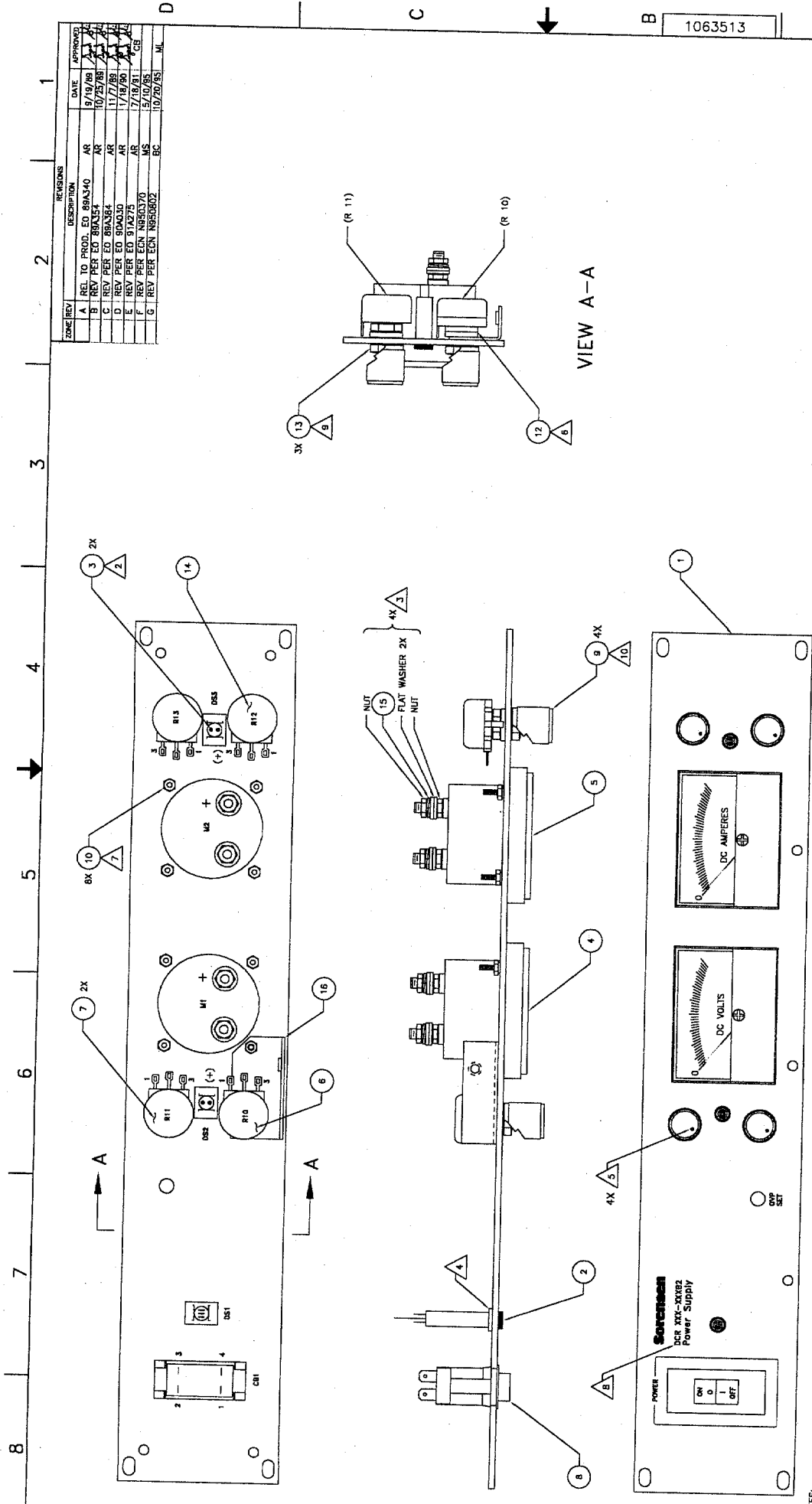
CONTRACT NO.		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	
LAST MADE DATE	DATE	DECIMAL TOLERANCES ON DIMENSIONS	ANGLES
8/20/88	8/20/88	.XX ± .01	± 1/2°
DRAWN	BY	DO NOT SCALE THIS DRAWING	
CHECKED	ENGINEER		
3A-REL			
MATERIAL		USED ON	
NEXT ASSY.		APPLICATION	
THIS IS A STANDARD DRAWING AND IS NOT TO BE USED FOR MANUFACTURING OR ASSEMBLY WITHOUT THE APPROVAL OF THE DESIGN ENGINEER. ANY CHANGES TO THIS DRAWING MUST BE APPROVED BY THE DESIGN ENGINEER.			
SEE DOCUMENT CONTROL FOR ORIGINAL SIGNATURES		FINISH:	
SIZE CODE IDENT. NO.		DWG. NO.	
B		1063518	
REV		B	
SCALE 1/1		SHEET 1 OF 1	

ELGAR

DWG ASSY BKT







REVISIONS		DATE		APPROVED	
ZONE	REV	DESCRIPTION	DATE	APPROVED	DATE
A	REL TO PROD	ED 88A340	AR	9/19/88	1
B	REV PER	ED 88A342	AR	10/25/88	2
C	REV PER	ED 88A344	AR	11/7/88	3
D	REV PER	ED 90A330	AR	7/19/90	4
E	REV PER	ED 91A275	AR	7/19/91	5
F	REV PER	ED 95A370	AR	5/10/95	6
G	REV PER	ED 98A302	AR	10/20/98	7

CONTRACT NO.		DATE		APPROVED	
CONTRACT NO.	DATE	CONTRACT NO.	DATE	CONTRACT NO.	DATE
1063513-XX	6/15/94	1063513-XX	6/15/94	1063513-XX	6/15/94

UNLESS OTHERWISE SPECIFIED		DIMENSIONS IN INCHES		TOLERANCES	
UNLESS OTHERWISE SPECIFIED	DIMENSIONS IN INCHES	TOLERANCES	UNLESS OTHERWISE SPECIFIED	DIMENSIONS IN INCHES	TOLERANCES
DECIMALS	FRACTIONS	ANGLES	DECIMALS	FRACTIONS	ANGLES
± 0.010	± 1/32	± 1/2	± 0.010	± 1/32	± 1/2
DO NOT SCALE THIS DRAWING					

MATERIAL		FINISH	
MATERIAL	FINISH	MATERIAL	FINISH
1063513-XX	1063513-XX	1063513-XX	1063513-XX

NEXT ASSY.		APPLICATION		USED ON	
NEXT ASSY.	APPLICATION	USED ON	NEXT ASSY.	APPLICATION	USED ON
1063513-XX	1063513-XX	1063513-XX	1063513-XX	1063513-XX	1063513-XX

FOR LIST OF PARTS SEE 1063513-XX		SCALE		SHEET	
FOR LIST OF PARTS SEE 1063513-XX	SCALE	SHEET	FOR LIST OF PARTS SEE 1063513-XX	SCALE	SHEET
1063513-XX	1063513-XX	1063513-XX	1063513-XX	1063513-XX	1063513-XX

- NOTES:
- ASSEMBLE PER ELGAR WORKMANSHIP STANDARD DOCUMENT NO. 0050003-01.
 - RED PIN ON DS2 & DS3 INDICATES "A".
 - HARDWARE SUPPLIED WITH METERS EXCEPT ITEM #13. TORQUE BOTTOM NUT TO IN-LBS FINGER TIGHT TOP NUT. TO ELIMINATE ROTATION.
 - WHITE DOT ON KNOB MUST BE AT 7 O'CLOCK POSITION WITH POTENTIOMETER FULLY COUNTER CLOCKWISE.
 - HARDWARE SUPPLIED WITH POTENTIOMETER EXCEPT ITEM #12.
 - DO NOT USE VENDOR SUPPLIED MTG. HARDWARE.
 - MODEL NUMBER NOT SHOWN.
 - HARDWARE SUPPLIED WITH POTENTIOMETER EXCEPT ITEM #13. TORQUE NUT 10 IN-LBS; DO NOT SCRATCH FRONT PANEL WHILE INSTALLING NUT.
 - .03 GAP BETWEEN KNOB AND FRONT PANEL.

NOTES: UNLESS OTHERWISE SPECIFIED.

1. ASSEMBLE PER ELGAR WORKMANSHIP STANDARD DOCUMENT NO. 005003-01.

2. FOR WIRING TERMINATIONS OF ITEM 13 & 14, SEE TABLE 1.

3. TORQUE AS SPECIFIED ± 1 IN-LBS OR 10X WHICHEVER IS GREATER.

4. 10 IN-LBS.

5. ALIGN UP TO 3 PIECES OF ACRYLIC FOAM (APPROX. 1" SQ.) ON TOP OF EACH OTHER AND STICK ONTO THE CHASSIS RIB, CENTERED UNDER TRANSFORMER.

6. USE ON -7 (200-1.5), & -8 (600-75) ONLY.

7. APPLY SPOT OF RTV TO P2 CHASSIS.

8. LOCATE SHUNT ASSY FROM C1 (+) TO TB2 (+).

9. USE ON -1 (10-40), -2 (20-25) & -8 (600-75) ONLY.

10. APPLY A THIN LAYER OF THERMAL GREASE, ITEM 38 BEFORE INSTALLATION OF THE RECTIFIER, ITEM 18.

11. SEE SEPARATE PARTS LIST 1063829-1 THRU -8

12. DWG ASSY FINAL, DCRB2 3.5"

13. CODE IDENT NO. 1063829

14. REV U

ZONE	REV	DESCRIPTION	REVISIONS	DATE	APPROVED
	N	REDRAW FOR CLARITY		RC 5/7/95	
	P	REV PER ECN N950370		MS 5/10/95	
	R	REV PER ECN N950309		DR 8/2/95	ML
	T	REV PER ECN N950819		DR 9/18/95	ML
	U	REVISED PER ECN N010606		JPM 4/12/02	G. Stapp

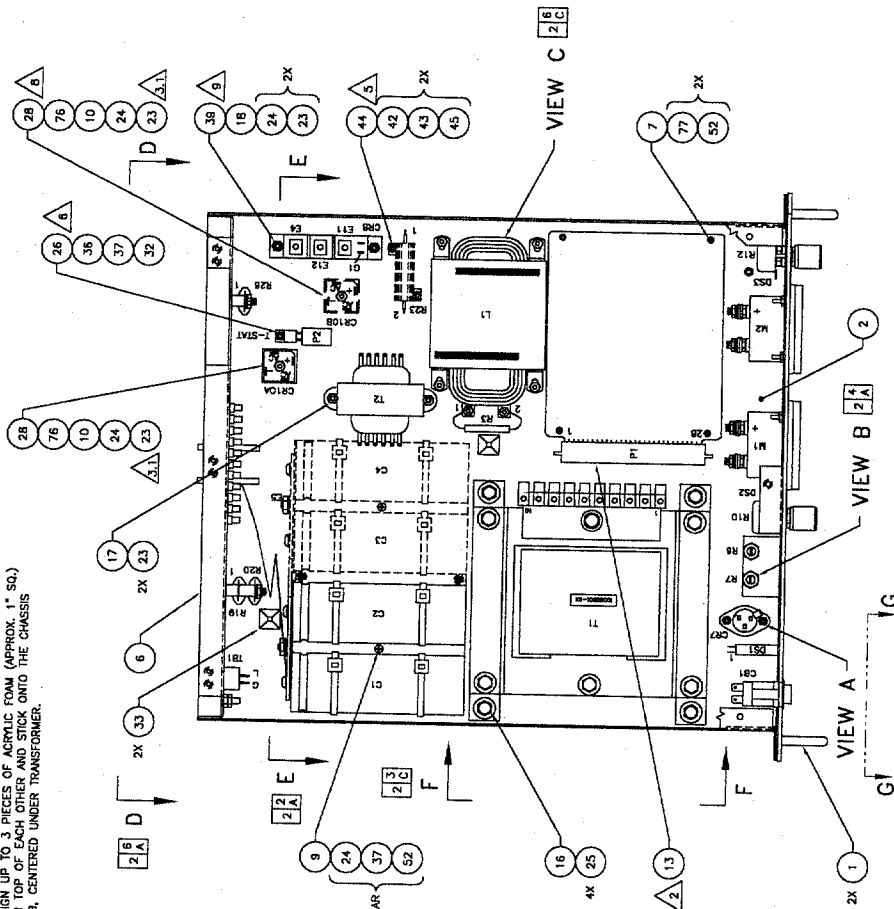
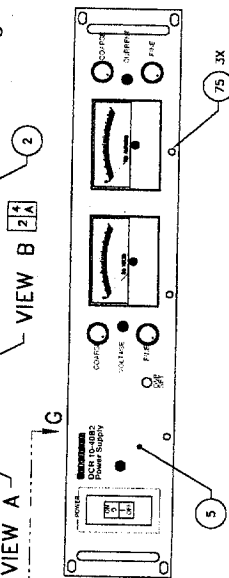


TABLE 1

MODEL	WIRING DIAGRAM
10-40	W380178-01
20-25	W380177-01
40-13	W380177-01
60-3	W380178-01
80-8	W380178-01
150-3	W380178-01
300-1.5	W380178-01
600-75	W380180-01

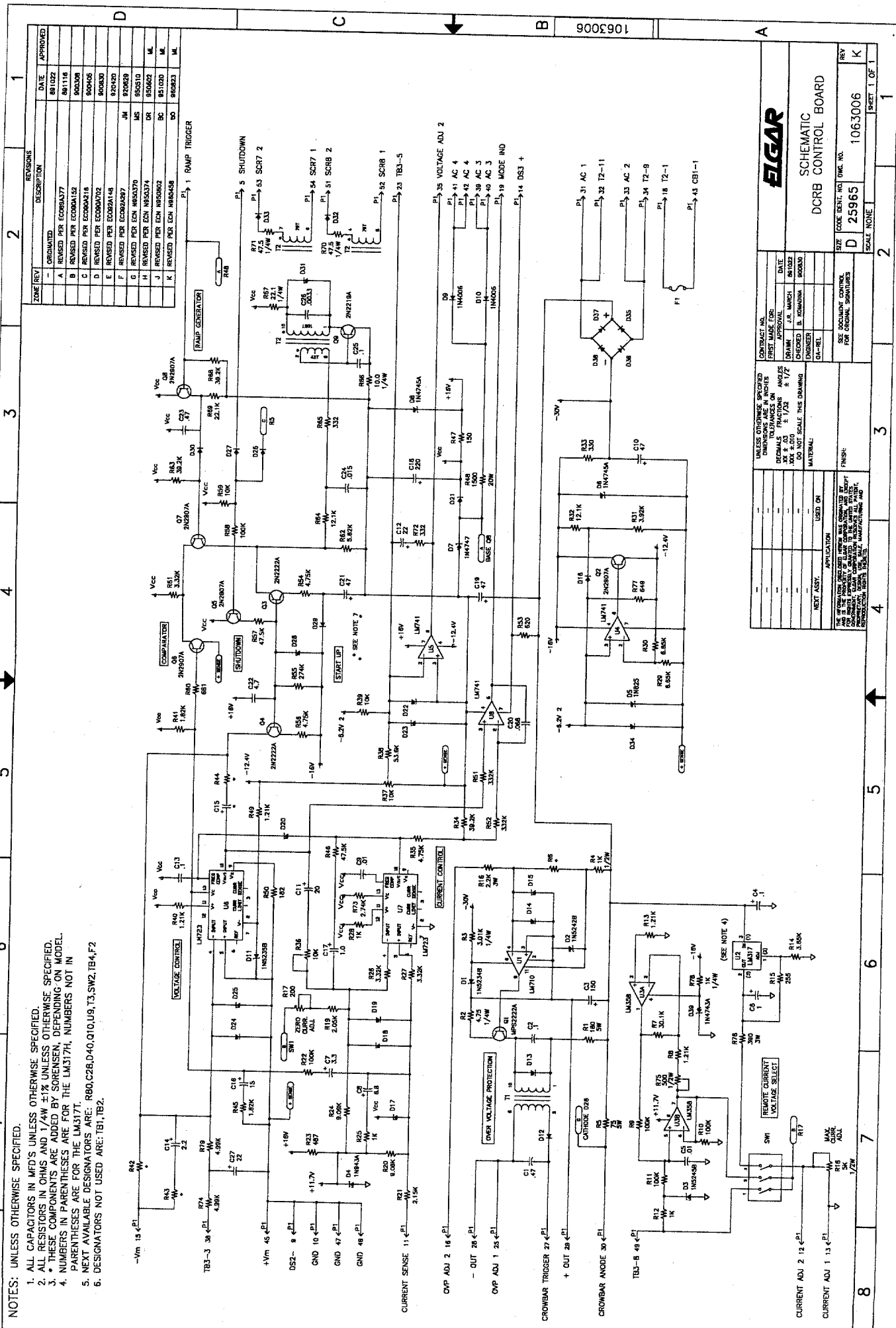
VIEW A
SCALE: 1/1



VIEW B
SCALE: 1/1

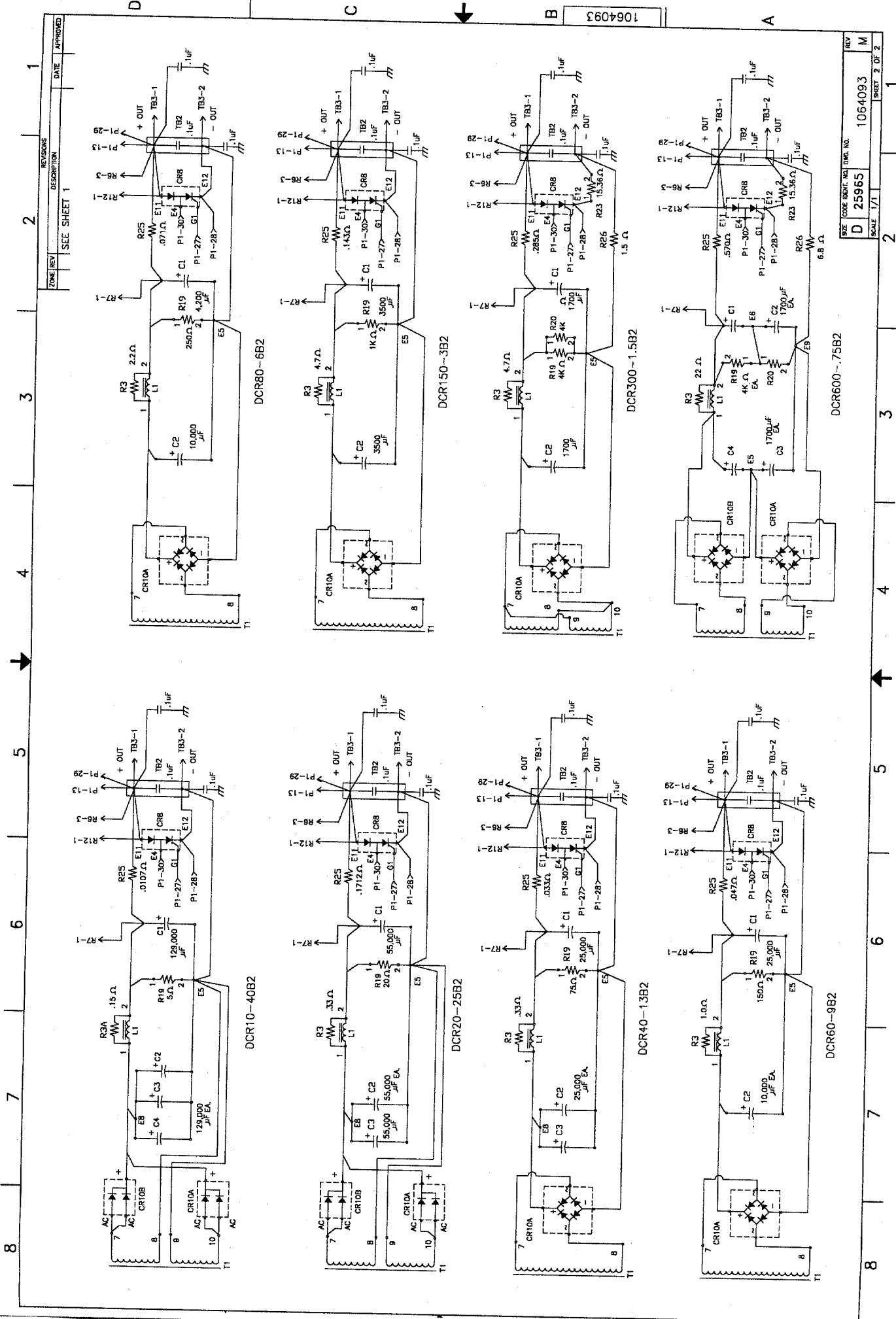
SEE SEPARATE PARTS LIST 1063829-1 THRU -8

CONTRACT NO.		DATE	
FIRST ORDER FOR APPROVAL		9/25/95	
DRAWN		A. RICH	
CHECKED		ENGINEER	
QA-REL.			
MATERIAL			
NEXT ASSY.			
APPLICATION			
THIS INFORMATION AND DATA ARE FOR INFORMATION ONLY AND ARE NOT TO BE USED FOR ANY OTHER PURPOSE. THE USER OF THIS INFORMATION AND DATA SHALL BE RESPONSIBLE FOR THE PROPER USE OF THIS INFORMATION AND DATA.			
DWG ASSY FINAL, DCRB2 3.5"			
CODE IDENT NO. 1063829			
REV U			



ZONE	REV	ORIGINATED	DESCRIPTION	REMARKS	DATE	APPROVED
A		REVISED PER ECOM04177			681022	
B		REVISED PER ECOM04180			681116	
C		REVISED PER ECOM04218			900308	
D		REVISED PER ECOM04702			900405	
E		REVISED PER ECOM04148			900630	
F		REVISED PER ECOM04287			910420	
G		REVISED PER ECOM04370			920629	
H		REVISED PER ECOM04374			950510	
J		REVISED PER ECOM04662			950602	UL
K		REVISED PER ECOM04668			951020	UL
		REVISED PER ECOM04668			960823	UL

[illegible]



ZONE	REV	DESCRIPTION	DATE	APPROVED
1	1	SEE SHEET 1		

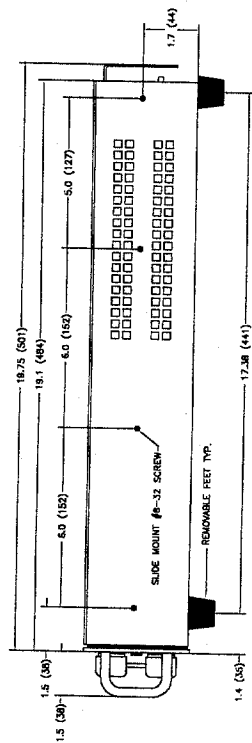
SIZE	CODE	IDENT.	NO.	DATE	REV
D	25965	1064093	M		
SCALE 1/1					SHEET 2 OF 2

NOTES: UNLESS OTHERWISE SPECIFIED.

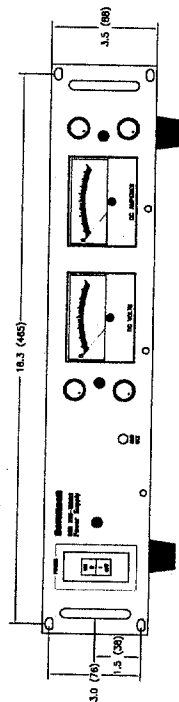
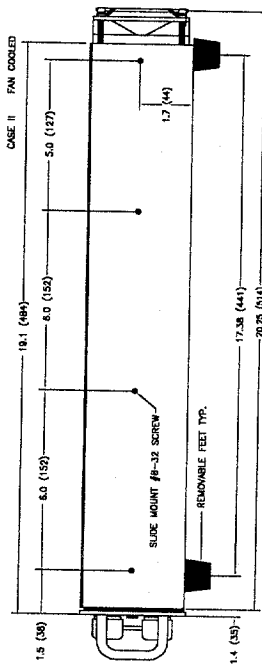
1. ALL DIMENSIONS ARE IN INCHES (mm).

2. SLIDE-RAIL OPTION AVAILABLE.

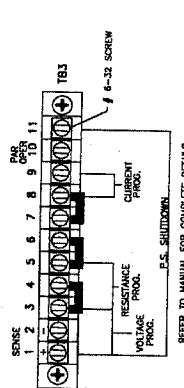
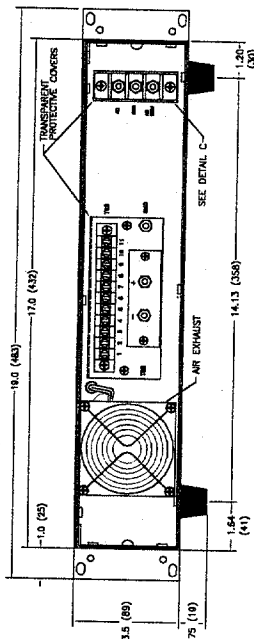
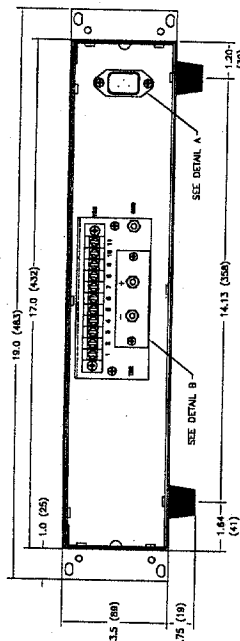
CASE I CONNECTION COOLED



CASE II FAN COOLED



CASE I AND II - FRONT VIEW



REFER TO MANUAL FOR COMPLETE DETAILS

DETAIL A

(CONNECTION COOLED)

SCALE 1/1

DETAIL C

SCALE 1/1

DETAIL B

SCALE 1/1

ELGAR

DWG OUTLINE
DCRB2 3.5"

CONTRACT NO.
FIRST MADE FOR
APPROVAL
DATE
DRAWN
CHECKED
ENGINEER
DATE

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES IN
DECIMALS FRACTIONS IN
XX 1/32 1/16 1/8 1/4 3/8 1/2 5/8 3/4 7/8 1 1 1/4 1 1/2 1 3/4 2 2 1/4 2 1/2 3 3 1/4 3 1/2 4 4 1/4 4 1/2 5 5 1/4 5 1/2 6 6 1/4 6 1/2 7 7 1/4 7 1/2 8 8 1/4 8 1/2 9 9 1/4 9 1/2 10 10 1/4 10 1/2 11 11 1/4 11 1/2 12 12 1/4 12 1/2 13 13 1/4 13 1/2 14 14 1/4 14 1/2 15 15 1/4 15 1/2 16 16 1/4 16 1/2 17 17 1/4 17 1/2 18 18 1/4 18 1/2 19 19 1/4 19 1/2 20 20 1/4 20 1/2 21 21 1/4 21 1/2 22 22 1/4 22 1/2 23 23 1/4 23 1/2 24 24 1/4 24 1/2 25 25 1/4 25 1/2 26 26 1/4 26 1/2 27 27 1/4 27 1/2 28 28 1/4 28 1/2 29 29 1/4 29 1/2 30 30 1/4 30 1/2 31 31 1/4 31 1/2 32 32 1/4 32 1/2 33 33 1/4 33 1/2 34 34 1/4 34 1/2 35 35 1/4 35 1/2 36 36 1/4 36 1/2 37 37 1/4 37 1/2 38 38 1/4 38 1/2 39 39 1/4 39 1/2 40 40 1/4 40 1/2 41 41 1/4 41 1/2 42 42 1/4 42 1/2 43 43 1/4 43 1/2 44 44 1/4 44 1/2 45 45 1/4 45 1/2 46 46 1/4 46 1/2 47 47 1/4 47 1/2 48 48 1/4 48 1/2 49 49 1/4 49 1/2 50 50 1/4 50 1/2 51 51 1/4 51 1/2 52 52 1/4 52 1/2 53 53 1/4 53 1/2 54 54 1/4 54 1/2 55 55 1/4 55 1/2 56 56 1/4 56 1/2 57 57 1/4 57 1/2 58 58 1/4 58 1/2 59 59 1/4 59 1/2 60 60 1/4 60 1/2 61 61 1/4 61 1/2 62 62 1/4 62 1/2 63 63 1/4 63 1/2 64 64 1/4 64 1/2 65 65 1/4 65 1/2 66 66 1/4 66 1/2 67 67 1/4 67 1/2 68 68 1/4 68 1/2 69 69 1/4 69 1/2 70 70 1/4 70 1/2 71 71 1/4 71 1/2 72 72 1/4 72 1/2 73 73 1/4 73 1/2 74 74 1/4 74 1/2 75 75 1/4 75 1/2 76 76 1/4 76 1/2 77 77 1/4 77 1/2 78 78 1/4 78 1/2 79 79 1/4 79 1/2 80 80 1/4 80 1/2 81 81 1/4 81 1/2 82 82 1/4 82 1/2 83 83 1/4 83 1/2 84 84 1/4 84 1/2 85 85 1/4 85 1/2 86 86 1/4 86 1/2 87 87 1/4 87 1/2 88 88 1/4 88 1/2 89 89 1/4 89 1/2 90 90 1/4 90 1/2 91 91 1/4 91 1/2 92 92 1/4 92 1/2 93 93 1/4 93 1/2 94 94 1/4 94 1/2 95 95 1/4 95 1/2 96 96 1/4 96 1/2 97 97 1/4 97 1/2 98 98 1/4 98 1/2 99 99 1/4 99 1/2 100 100 1/4 100 1/2 101 101 1/4 101 1/2 102 102 1/4 102 1/2 103 103 1/4 103 1/2 104 104 1/4 104 1/2 105 105 1/4 105 1/2 106 106 1/4 106 1/2 107 107 1/4 107 1/2 108 108 1/4 108 1/2 109 109 1/4 109 1/2 110 110 1/4 110 1/2 111 111 1/4 111 1/2 112 112 1/4 112 1/2 113 113 1/4 113 1/2 114 114 1/4 114 1/2 115 115 1/4 115 1/2 116 116 1/4 116 1/2 117 117 1/4 117 1/2 118 118 1/4 118 1/2 119 119 1/4 119 1/2 120 120 1/4 120 1/2 121 121 1/4 121 1/2 122 122 1/4 122 1/2 123 123 1/4 123 1/2 124 124 1/4 124 1/2 125 125 1/4 125 1/2 126 126 1/4 126 1/2 127 127 1/4 127 1/2 128 128 1/4 128 1/2 129 129 1/4 129 1/2 130 130 1/4 130 1/2 131 131 1/4 131 1/2 132 132 1/4 132 1/2 133 133 1/4 133 1/2 134 134 1/4 134 1/2 135 135 1/4 135 1/2 136 136 1/4 136 1/2 137 137 1/4 137 1/2 138 138 1/4 138 1/2 139 139 1/4 139 1/2 140 140 1/4 140 1/2 141 141 1/4 141 1/2 142 142 1/4 142 1/2 143 143 1/4 143 1/2 144 144 1/4 144 1/2 145 145 1/4 145 1/2 146 146 1/4 146 1/2 147 147 1/4 147 1/2 148 148 1/4 148 1/2 149 149 1/4 149 1/2 150 150 1/4 150 1/2 151 151 1/4 151 1/2 152 152 1/4 152 1/2 153 153 1/4 153 1/2 154 154 1/4 154 1/2 155 155 1/4 155 1/2 156 156 1/4 156 1/2 157 157 1/4 157 1/2 158 158 1/4 158 1/2 159 159 1/4 159 1/2 160 160 1/4 160 1/2 161 161 1/4 161 1/2 162 162 1/4 162 1/2 163 163 1/4 163 1/2 164 164 1/4 164 1/2 165 165 1/4 165 1/2 166 166 1/4 166 1/2 167 167 1/4 167 1/2 168 168 1/4 168 1/2 169 169 1/4 169 1/2 170 170 1/4 170 1/2 171 171 1/4 171 1/2 172 172 1/4 172 1/2 173 173 1/4 173 1/2 174 174 1/4 174 1/2 175 175 1/4 175 1/2 176 176 1/4 176 1/2 177 177 1/4 177 1/2 178 178 1/4 178 1/2 179 179 1/4 179 1/2 180 180 1/4 180 1/2 181 181 1/4 181 1/2 182 182 1/4 182 1/2 183 183 1/4 183 1/2 184 184 1/4 184 1/2 185 185 1/4 185 1/2 186 186 1/4 186 1/2 187 187 1/4 187 1/2 188 188 1/4 188 1/2 189 189 1/4 189 1/2 190 190 1/4 190 1/2 191 191 1/4 191 1/2 192 192 1/4 192 1/2 193 193 1/4 193 1/2 194 194 1/4 194 1/2 195 195 1/4 195 1/2 196 196 1/4 196 1/2 197 197 1/4 197 1/2 198 198 1/4 198 1/2 199 199 1/4 199 1/2 200 200 1/4 200 1/2 201 201 1/4 201 1/2 202 202 1/4 202 1/2 203 203 1/4 203 1/2 204 204 1/4 204 1/2 205 205 1/4 205 1/2 206 206 1/4 206 1/2 207 207 1/4 207 1/2 208 208 1/4 208 1/2 209 209 1/4 209 1/2 210 210 1/4 210 1/2 211 211 1/4 211 1/2 212 212 1/4 212 1/2 213 213 1/4 213 1/2 214 214 1/4 214 1/2 215 215 1/4 215 1/2 216 216 1/4 216 1/2 217 217 1/4 217 1/2 218 218 1/4 218 1/2 219 219 1/4 219 1/2 220 220 1/4 220 1/2 221 221 1/4 221 1/2 222 222 1/4 222 1/2 223 223 1/4 223 1/2 224 224 1/4 224 1/2 225 225 1/4 225 1/2 226 226 1/4 226 1/2 227 227 1/4 227 1/2 228 228 1/4 228 1/2 229 229 1/4 229 1/2 230 230 1/4 230 1/2 231 231 1/4 231 1/2 232 232 1/4 232 1/2 233 233 1/4 233 1/2 234 234 1/4 234 1/2 235 235 1/4 235 1/2 236 236 1/4 236 1/2 237 237 1/4 237 1/2 238 238 1/4 238 1/2 239 239 1/4 239 1/2 240 240 1/4 240 1/2 241 241 1/4 241 1/2 242 242 1/4 242 1/2 243 243 1/4 243 1/2 244 244 1/4 244 1/2 245 245 1/4 245 1/2 246 246 1/4 246 1/2 247 247 1/4 247 1/2 248 248 1/4 248 1/2 249 249 1/4 249 1/2 250 250 1/4 250 1/2 251 251 1/4 251 1/2 252 252 1/4 252 1/2 253 253 1/4 253 1/2 254 254 1/4 254 1/2 255 255 1/4 255 1/2 256 256 1/4 256 1/2 257 257 1/4 257 1/2 258 258 1/4 258 1/2 259 259 1/4 259 1/2 260 260 1/4 260 1/2 261 261 1/4 261 1/2 262 262 1/4 262 1/2 263 263 1/4 263 1/2 264 264 1/4 264 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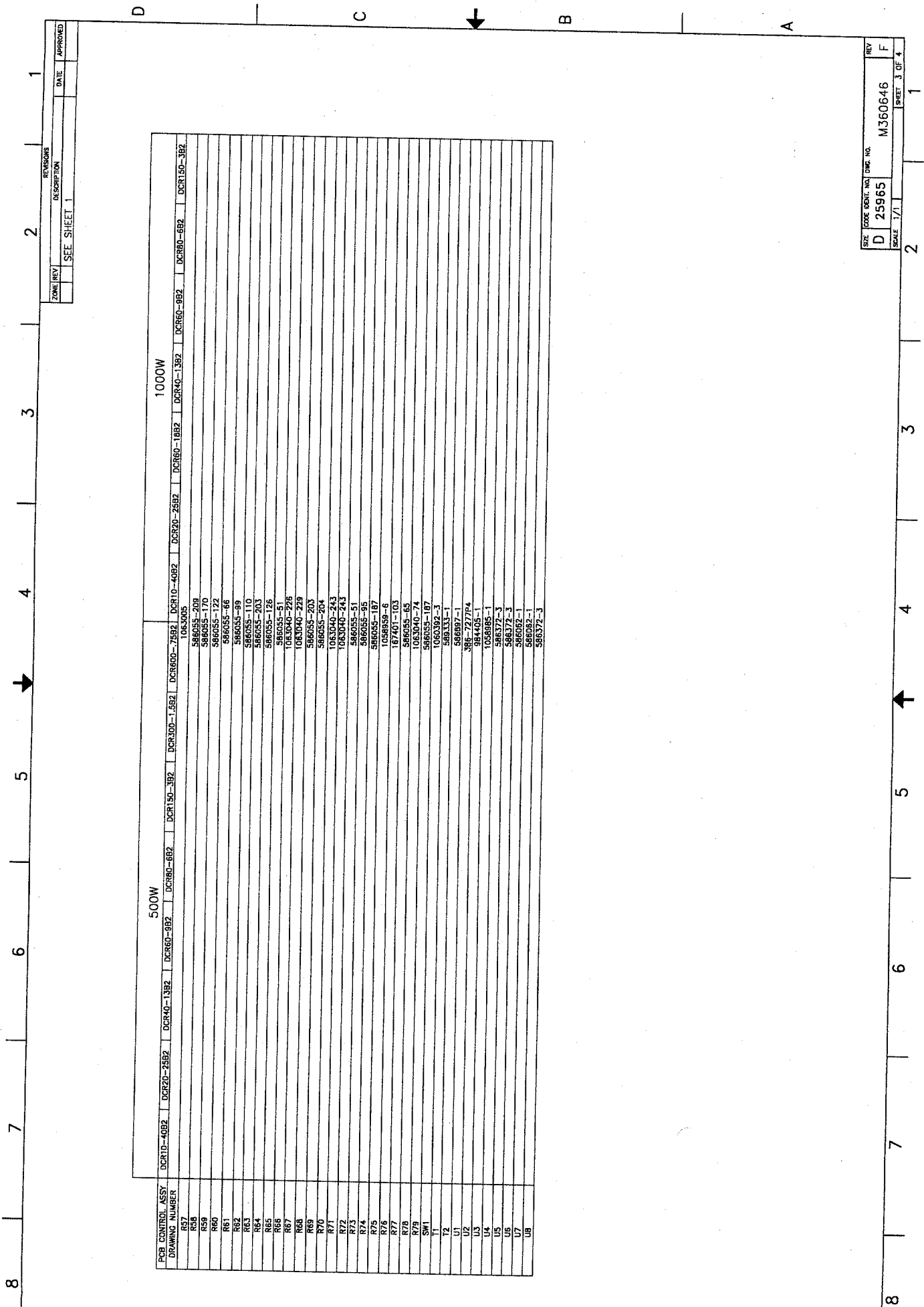
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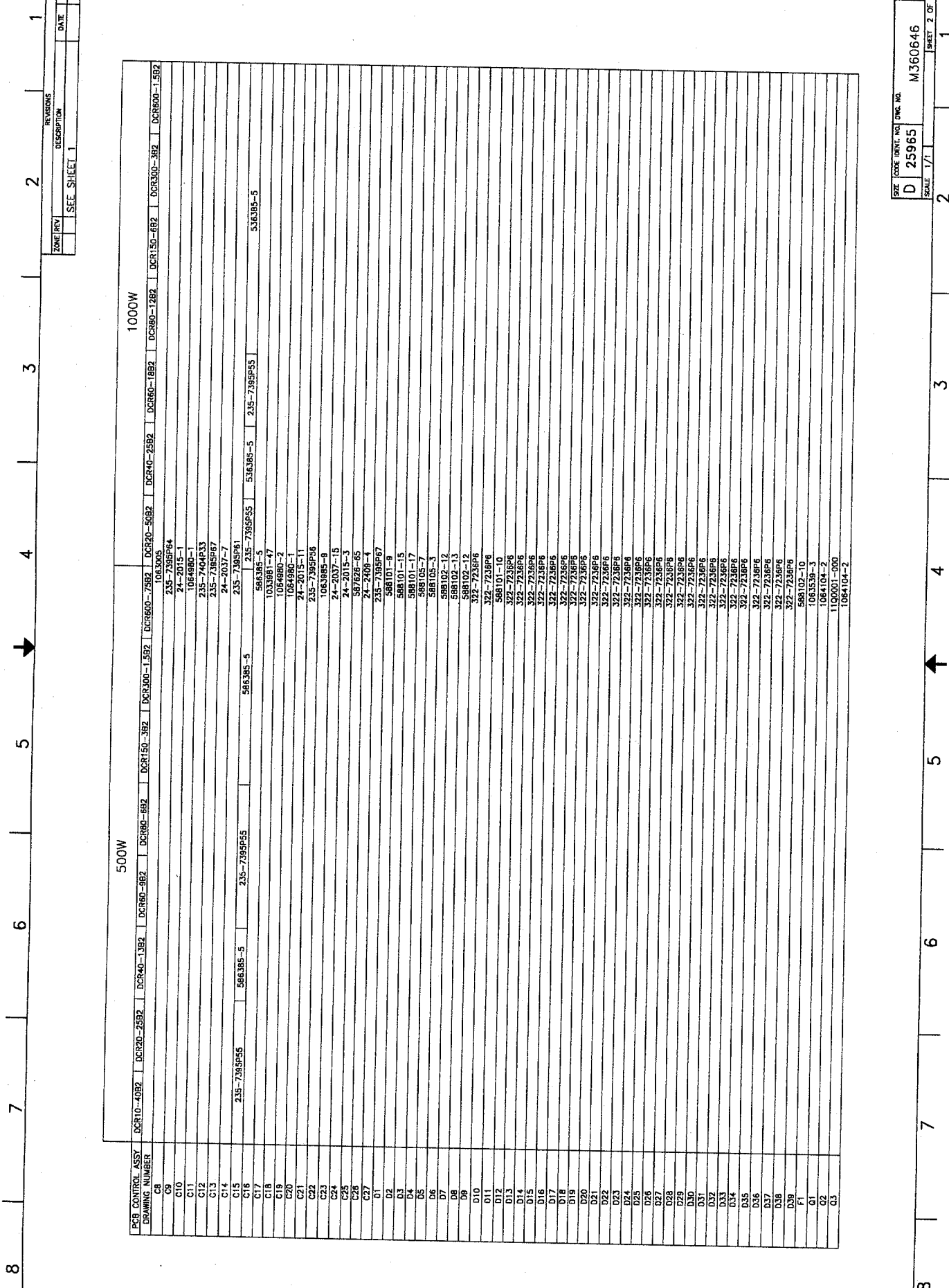
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ZONE REV		REVISIONS	
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