

MODEL 6487X (C150-.48)
 FOR GATES RADIO
 123 HAMPSHIRE ST.
 QUINCY, ILLINOIS

REVISIONS


AP. BY	0
AP. MFG.	

MODEL 6487X IS A C150-.48 MODIFIED FOR 230VAC NOMINAL INPUT VOLTAGE.

USE P50403-523 EXCEPT;

1. T1 USE T60179 IN PLACE OF T58270
2. TEST AS A C150-.48 EXCEPT INPUT RANGE 210VAC TO 250VAC, NOMINAL 230VAC.

DIMENSIONS ARE IN INCHES AND INCLUDE THICKNESS OF PLATING. DO NOT SCALE DRAWING.
 ALL EXTERNAL THREADS TO BE CLASS 2A (AMER STD); ALL INTERNAL THREADS TO BE CLASS 2B (AMER STD). UNLESS OTHERWISE SPECIFIED.

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF DELTRON, INCORPORATED, PHILADELPHIA, 33, PA. AND SHALL NOT BE REPRODUCED, OR COPIED, OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS OR DEVICES WITHOUT THE WRITTEN APPROVAL OF DELTRON, INCORPORATED, BEING FIRST OBTAINED.	VARIATIONS ON FINISHED DIMENSIONS UNLESS OTHERWISE MARKED			MODEL 6487X (C150-.48)				
	BASIC DIMENSIONS	FRACTIONAL DIMENSIONS	DECIMAL DIMENSIONS					
	UP TO 6	± 1/64		± .005	FIRST MADE FOR	USED ON		
	ABOVE 6 TO 24	± 1/32		± .010	BEGUN BY	TRACED BY		
	ABOVE 24	± 1/16		± .015	FINISHED BY <i>W. LINSK, 5/29/68</i>	CHECKED BY <i>Stepansky 5/29/68</i>		
	ANGULAR DIMENSIONS		± 1/2°			A P 50514		
SCALE:	SEE PURCH. SPEC. FOR STOCK TOLERANCES							

Addendum

"C" SERIES INSTRUCTION MANUAL

The external wiring for the "C" Module should include a fuse in the "hot" AC lead of the rating shown in the Table.

Fuses should be of the dual-element slow blowing type.

Case Size	Fuse	Rating
AA	3/8	A
AB	1/2	A
AC	1-1/2	A
AD	2	A
AE	4	A
AF	7	A
AG	8	A
AH	10	A
AI	15	A

INSTRUCTION MANUAL
"C" SERIES
SOLID STATE REGULATED DC POWER SUPPLIES

INTRODUCTION

This manual contains a description, operating instructions, circuit analysis and maintenance instructions for the "C" Series of regulated power supplies. The ratings available in this comprehensive group of supplies as well as complete specifications are listed in the appendix of this manual. Schematic diagrams make up the last pages of this booklet.

DESCRIPTION

The Deltron "C" Series of power supplies are all silicon, transistorized, highly regulated modular DC power sources. Each model is continuously variable over the range specified. The maximum allowable output current listed for the specific unit can be drawn over the full adjustment range. They are furnished in varying case sizes, depending upon the amount of power delivered with larger case sizes applying to units having greater output power. For each voltage range there are several models having different output currents. All "C" units incorporate their own cooling so that external heat sinking is unnecessary.

These supplies feature remote programming capability over their adjustment range as well as remote sensing to compensate for voltage drops in the load feeder lines. Four threaded studs are provided for permanently mounting the supplies to a suitable chassis, if this is desired. A mechanical drawing of these mounting studs as well as the terminals is given as the appendix of this manual.

The voltage adjustment control is accessible from the top of the supply without removing the protective cover.

OPERATION

INSTALLATION: The units operate from 105 to 125 volts, 45 - 440 Hz, single phase. The output of the power supply is completely floating with respect to the case.

Either positive or negative terminal can be grounded, if desired.

TERMINAL DESIGNATION

TERMINAL NO.	FUNCTION
1	L1 (Line)
2	L2 (Line)
3	B+ (Positive Output)
4	S+ (Sense Positive)
5	S- (Sense Negative)
6	B- (Negative Output)

TERMINAL CONNECTIONS

- (1) LOCAL CONTROL - LOCAL SENSE A link is placed between terminals 3 and 4 and another link is placed between terminals 5 and 6.
- (2) REMOTE CONTROL - LOCAL SENSE A link is placed between terminals 3 and 4. An external resistor is placed between terminals 5 and 6 and the internal voltage adjust is rotated to its most counter-clockwise position. The programming constant is approximately 1000 ohms per volt.
- (3) LOCAL CONTROL - REMOTE SENSE The output of the power supply feeds the load from terminals 3 and 6. Terminal 5 is connected to the negative end of the output at the load. Terminal 4 is connected to the positive end of the output at the load. These leads coming from the sensing terminals may be light gauge wire, since the sensing current is in the milliampere range.
- (4) REMOTE CONTROL - REMOTE SENSE The hook up is the same as under procedure (3); except that the lead from terminal 5 to the negative side of load is opened and the external potentiometer is placed between those two points. Again the internal control is set to its most counter-clockwise position.

CIRCUIT DESCRIPTION

The supply consists of three basic parts, an unregulated DC supply, a series regulator, and an error amplifier. The unregulated DC supply is of the full wave rectifier configuration with a capacitance filter. The unregulated DC feeds the series regulator located in the positive leg of the output. The series regulator consists of a power pass transistor with darlington connected driver transistors.

The output is monitored by the error amplifier which is a type A20 Amplifier.

The amplifier consists of an unregulated DC source which supplies a two stage zener regulator (CR6 and CR7) plus a zener used to develop a biasing voltage (CR4). The second stage zener (CR7) is connected in an impedance cancelling bridge and acts as the reference. A fraction of the output is sampled by means of a voltage divider and is compared against the reference voltage in a differential amplifier (Q1 and Q2) connected as a long tail pair. The output of the long tail pair is direct coupled into a differential amplifier, one half of which is connected as an emitter follower (Q5). The other half (Q3) controls the driver transistor that is in the series regulator.

In the event of an overload or short circuit at the output, the circuit goes into a linear current shutdown mode of operation. Sensing of the current and the output voltage causes transistor Q4 to by pass transistor Q3 causing the series regulator to be driven toward cut-off in the event of an overload. The circuit will return to normal operation with the removal of the overload.

MAINTENANCE AND ADJUSTMENT

If for any reason the output range adjustment shifts slightly due to aging or other cause, it can be brought back to normal by adjusting R11 on the A20 error amplifier drawing B11936.

Should the current limiting on the series regulators require reset which may be evidenced by the fact that the unit goes out of regulation before full load can be drawn from it, the procedure is to use an external ammeter and rotate potentiometer R12 on the A20 error amplifier until the output just begins to drop from its regulated point with the unit drawing a load current 5% in excess of full load.

SERVICE AND MAINTENANCE

The majority of failures that occur can be traced to a faulty semiconductor component. One of the most common failures is a collector to emitter short in one of the passing transistors.

The collector to emitter shorting of a pass or driver transistor is evident in the series regulator by a loss of regulation, a large increase in ripple and a rise in output voltage above the normal regulated value. To remedy this fault the shorted transistor should be located and replaced with an equivalent type.

In the case of parallel pass transistors, it is usual that only one will short. A shorted pass transistor can usually be found by the use of an ohmmeter on the low ohms range.

Where there are parallel transistors and it is desired to locate the shorted one, a small current should be drawn from the supply equal to approximately 10% of full rating. The voltage across each equalizing resistor should be measured with a suitable voltmeter. The shorted unit will be carrying all of the current and is therefore easily localized.

A second type of failure occurs occasionally. This usually takes place after a long period of time under high ambient conditions and is characterized in the series regulator by a gradual rise in output voltage particularly at high input line conditions. This is generally caused by a transistor which develops an excessive leakage current.

To check if this is the cause, the usual procedure is to parallel the resistor, R3, which draws off the leakage current with a resistor equal to it in resistance and to see if the output then returns to normal value.

Sometimes in the series regulator the voltage will rise above regulated values for high inputs and this can be caused by excessive leakage current between collector and emitter. This condition would be noted under lightly loaded outputs and can be checked by determining if regulation is restored by increasing the output load current.

When a malfunction occurs, it can sometimes cause follow-up damage in the error amplifier so that it is a wise practice to check the error amplifier as well. In most cases the error amplifier can be checked by using an ohmmeter to check transistors and diodes utilized in the circuit.

As far as routine maintenance is concerned, it is advisable periodically to dust, or blow out the heat sink regions with an air hose to remove accumulations of oils, dust, and dirt, which affect the heat radiating properties of the heat sinks, when they become excessive.

ELECTRICAL PARTS LIST
FOR
C150-48

<u>ITEM NO.</u>	<u>QTY.</u>	<u>REF. NO.</u>	<u>DESCRIPTION</u>
1	X	B13073	SCHEMATIC
2	1	C1	CAPACITOR, 400 μ f, 250V
3	1	C2	CAPACITOR, 60 μ f, 250V
4	3	C3	CAPACITOR, .01 μ f, 400V
5	1	C4	CAPACITOR, 0.027 μ f, 600V
6	R	C6	S/A C3
7	R	C7	S/A C3
8	6	CR1	RECTIFIER, 366H, WEST. (400V)
9	R	CR2	S/A CR1
10	R	CR3	S/A CR1
11	R	CR4	S/A CR1
12	R	CR5	S/A CR1
13	R	CR6	S/A CR1
14	2	Q1A	TRANSISTOR, DTS-423, DELCO
15	R	Q1B	S/A Q1A
16	1	Q2	TRANSISTOR, 40313, RCA
17	2	R1A	RESISTOR, 5 Ω , 5W
18	R	R1B	S/A R1A
19	1	R2	RESISTOR, 82 Ω , 10%, 1/2W
20	1	R3	RESISTOR, 8000 Ω , 5W
21	1	R4	POTENTIOMETER, 15K, 2W, 1/4 LG.BUSH.1/16 LG. SHAFT W 3/64 x 1/16 SLOT
22	1	R6	RESISTOR, 15 Ω , 10%, 1/2W
23	1	S1	THERMOSTAT, STEMCO, TYPE A510, CLOSE ON RISE @ 230 $^{\circ}$ F \pm 7 $^{\circ}$ F AND OPEN @ 206 $^{\circ}$ F \pm 7 $^{\circ}$ F WITH EXPOSED BIMETAL
24	1	T1	TRANSFORMER, TEKTRAN T58270
25	1	P50122-512	AMPLIFIER, A20, AR1
	1	R10	RESISTOR, 133K, 1%
	1	R13	RESISTOR, 196K, 1%, 1W

THE PARTS ON THIS LIST ARE SUBJECT TO CHANGE WITHOUT NOTICE

S/A P50403-523

89-9-9

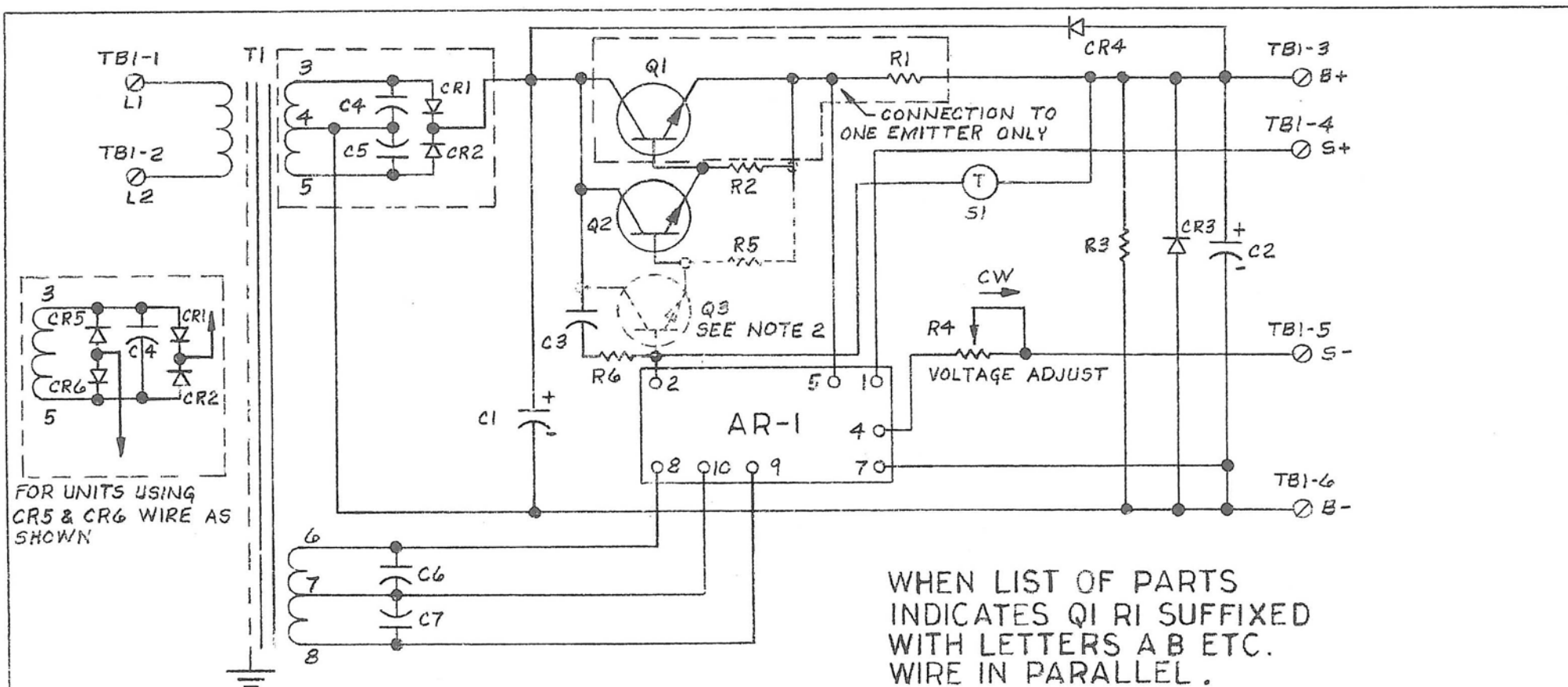
AD

ELECTRICAL PARTS LIST
FOR
A20 AMPLIFIER

<u>ITEM NO.</u>	<u>QTY.</u>	<u>REF. NO.</u>	<u>DESCRIPTION</u>
1	X	B11936	SCHEMATIC
2	1	C1	CAPACITOR, 20 μ f, 150V
3	1	C2	CAPACITOR, 500 pf, 1000V
4	1	C3	CAPACITOR, 2 μ f, 200V
5	1	C4	CAPACITOR, SELECT IN TEST
6	2	CR1	RECTIFIER, G100G, G. I.
7	R	CR2	S/A CR1
8	2	CR3	DIODE, T156, T. I.
9	1	CR4	DIODE, ZENER, 1N706, PSI
10	R	CR5	S/A CR3
11	1	CR6	DIODE ZENER, ZA20A, MALLORY
12	1	CR7	DIODE ZENER, 1N821, GSI
13	2	E1	LINK, #22 AWG
14	R	E4	S/A E1
15	2	Q1	TRANSISTOR, 2N4061, T. I.
16	R	Q2	S/A Q1
17	3	Q3	TRANSISTOR, 40232, RCA
18	R	Q4	S/A Q3
19	R	Q5	S/A Q3
20	1	R1	RESISTOR, 4K, 5W
21	1	R2	RESISTOR, 1.78K, 1%, 1W
22	1	R3	RESISTOR, 4.7K, 10%, 1/2W
23	1	R4	RESISTOR, 17.8K, 1%, 1W
24	1	R5	RESISTOR, 100 Ω , 1%, 1W
25	1	R6	RESISTOR, 4.7K, 10%, 1/2W
26	1	R7	RESISTOR, 18K, 10%, 1/2W
27	1	R8	RESISTOR, 1.5K, 10%, 1/2W
28	1	R9	RESISTOR, 4.75K, 1%, 1W
* 29	1	R10	RESISTOR, 1%, 1W
30	1	R11	POTENTIOMETER, 2K, 1.5W
31	1	R12	POTENTIOMETER, 5K, 1.5W
* 32	1	R13	RESISTOR, 1%, 1W
33	2	R14	RESISTOR, 10K, 10%, 1/2W
34	R	R15	S/A R14
35	1	R16	RESISTOR, 10%, 1/2W, (SELECT IN TEST)
36	1	R17	RESISTOR, 820 Ω , 10%, 1/2W
37	1	R18	RESISTOR, 680 Ω , 10%, 1/2W
38	1	R20	RESISTOR, 15 Ω , 10%, 1/2W
39	1	R21	RESISTOR, SELECT IN TEST, 1/2W, 10%

* REFER TO BASIC PARTS LIST FOR VALUE

REV. 1-24-72



FOR UNITS USING
CR5 & CR6 WIRE AS
SHOWN

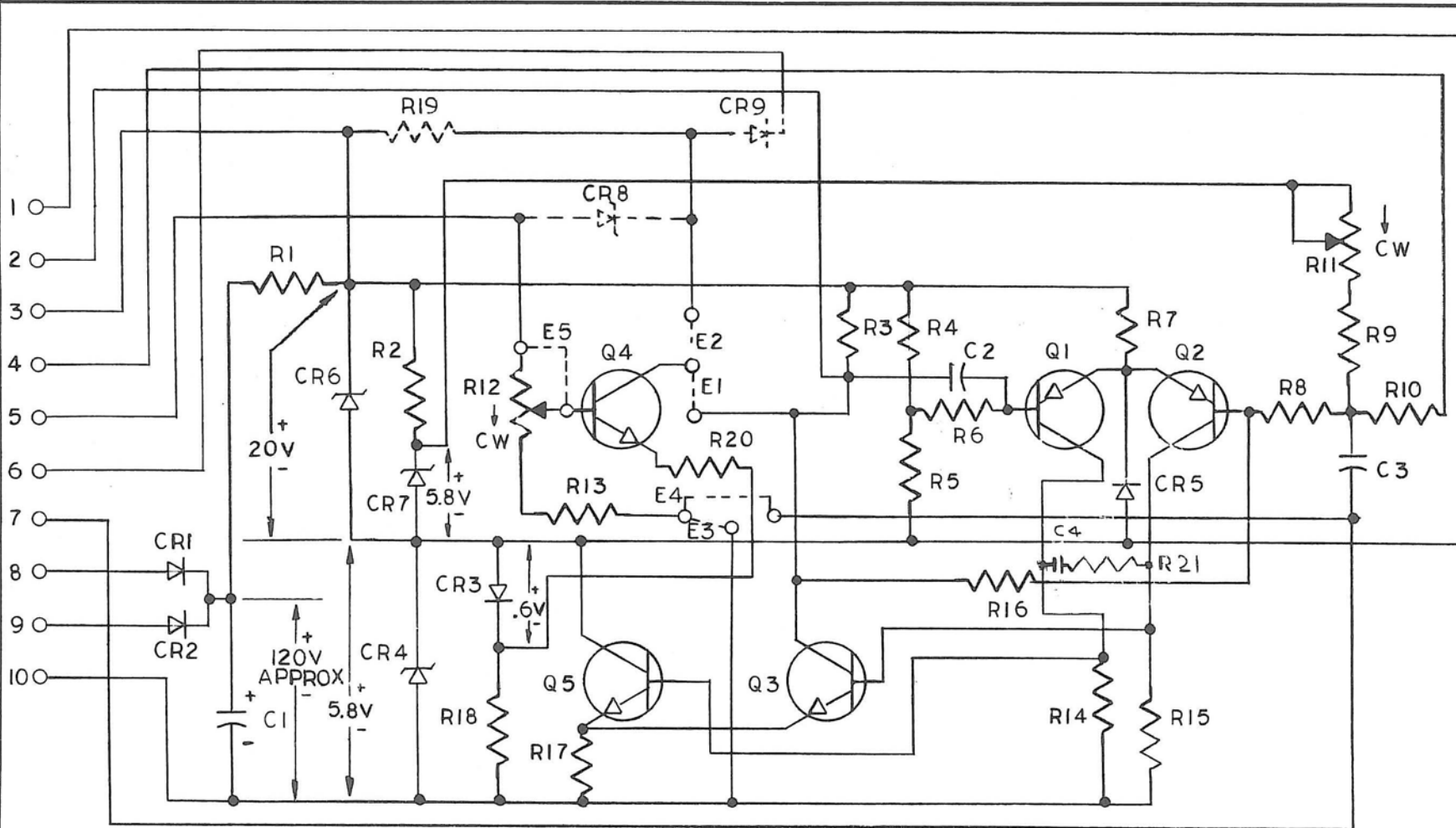
WHEN LIST OF PARTS
INDICATES Q1 R1 SUFFIXED
WITH LETTERS A B ETC.
WIRE IN PARALLEL.

NOTES:

1. FOR VALUES OF COMPONENTS SEE LIST OF PARTS.
2. FOR UNITS THAT DO NOT USE Q3 & R5
CONNECT BASE OF Q2 TO TERMINAL 2 OF
AMPLIFIER AR-1
3. CONNECT R2 & R5 TO EMITTER RESISTOR OTHER THAN THE ONE
THE CONNECTION OF PIN 5 OF THE AMPLIFIER IS MADE TO IN UNITS
WITH ONLY (I) Q1 BOTH CONNECTIONS ARE MADE TO THIS EMITTER.

SCHMATIC
C SERIES

B 13073



REVISIONS	
AP. BY	0
AP. MFG.	
ECN 65-209	
H. LINSKI	1
4/2/65 MB	
ECN 66-193	
STEINER	2
8-10-66	

DIMENSIONS ARE IN INCHES AND INCLUDE THICKNESS OF PLATING. DO NOT SCALE DRAWING.
 ALL EXTERNAL THREADS TO BE CLASS 2A (AMER STD); ALL INTERNAL THREADS TO BE CLASS 2B (AMER STD), UNLESS OTHERWISE SPECIFIED.

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF DELTRON INCORPORATED; PHILADELPHIA 33, PA., AND SHALL NOT BE REPRODUCED, OR COPIED, OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS OR DEVICES WITHOUT THE WRITTEN APPROVAL OF DELTRON INCORPORATED, BEING FIRST OBTAINED.

SCALE:
 11936

VARIATIONS ON FINISHED DIMENSIONS UNLESS OTHERWISE MARKED		
BASIC DIMENSIONS	FRACTIONAL DIMENSIONS	DECIMAL DIMENSIONS
UP TO 6	± 1/64	± .005
ABOVE 6 TO 24	± 1/32	± .010
ABOVE 24	± 1/16	± .015
ANGULAR DIMENSIONS		± 1/2°
SEE PURCH. SPEC. FOR STOCK TOLERANCES		

SCHEMATIC A 20

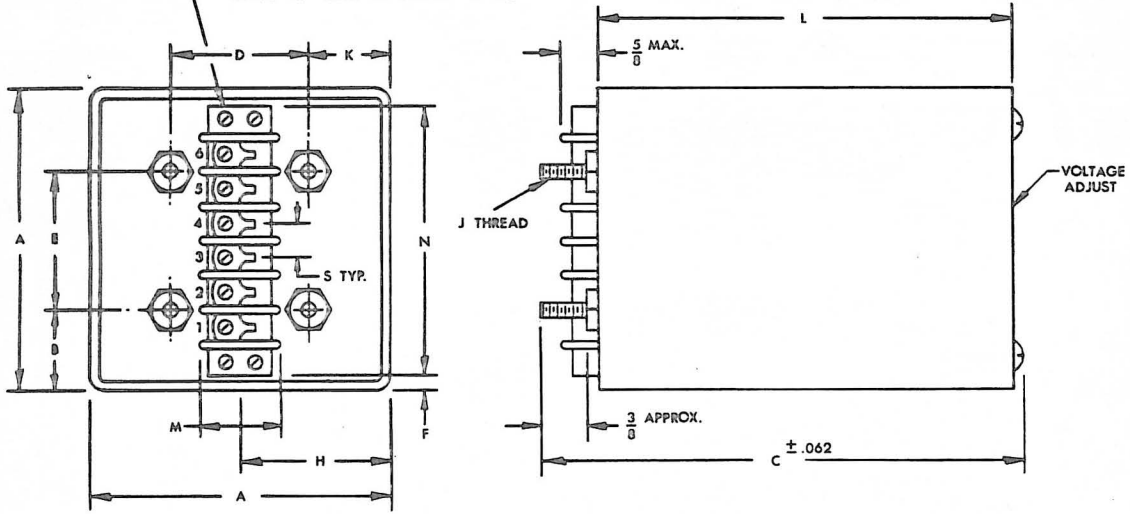
FIRST MADE FOR A20
 USED ON
 BEGUN BY
 FINISHED BY H. LINSKI 2/8/65
 TRACED BY
 CHECKED BY M. Steiner 2/9/65



B 11936

REVISIONS	
AP. BY	0
AP. DATE	

TERMINAL BOARD FOR:
 UNITS AA THRU AE JONES # 6-140-Y
 UNITS AF THRU AI JONES # 6-142-Y



DIMENSIONS										
SIZE	AA	AB	AC	AD	AE	AF	AG	AH	AI	
A	3.25	4.25	5	6.25	7.50	7.13	7.75	8.50	9	
B	.88	.50	.88	.88	.50	.88	.88	.88	.88	
C	5.12	5.12	5.12	5.12	5.12	8.62	8.62	8.62	8.62	
D	1.50	2.50	4	5.25	5.75	6.13	6.75	7.50	8	
E	1.50	3.25	3.25	4.50	6.50	5.38	6	6.75	7.25	
F	.16	.66	1.03	1.66	2.28	1.41	1.72	2.09	2.34	
H	1.63	2.13	2.50	3.13	3.75	3.56	3.88	4.25	4.50	
J	8-32	8-32	8-32	10-32	10-32	10-32	1/4-20	1/4-20	1/4-20	
K	.88	.88	.50	.50	.88	.50	.50	.50	.50	
L	4.47	4.47	4.47	4.47	4.47	7.94	7.94	8.06	7.94	
M	.88	.88	.88	.88	.88	1.31	1.31	1.31	1.31	
N	2.91	2.91	2.91	2.91	2.91	4.34	4.34	4.34	4.34	
S	.38	.38	.38	.38	.38	.56	.56	.56	.56	

TERMINAL BOARD DETAILS		
SIZE	SCREW SIZE	CLEARANCE HOLE CUTOUT
AA-AE	5-40	1 X 3
AF-AI	8-32	1.50 X 4.50

1	L1	HIGH AC INPUT	} NORMALLY LINKED
2	L2	COMMON AC INPUT	
3	B+	POSITIVE OUTPUT	} NORMALLY LINKED
4	S+	POSITIVE SENSE	
5	S-	NEGATIVE SENSE	
6	B-	NEGATIVE OUTPUT	

TOLERANCE ON ALL DIMENSIONS $\pm \frac{3}{64}$
 UNLESS OTHERWISE SPECIFIED.

C-13682

DIMENSIONS ARE IN INCHES AND INCLUDE THICKNESS OF PLATING. DO NOT SCALE DRAWING.
 ALL EXTERNAL THREADS TO BE CLASS 2B UNLESS OTHERWISE SPECIFIED. ALL INTERNAL THREADS TO BE CLASS 2B UNLESS OTHERWISE SPECIFIED.

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF DELTA ELECTRONIC CORPORATION. ALL RIGHTS ARE RESERVED. NO PART OF THIS DRAWING OR SPECIFICATIONS MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF DELTA ELECTRONIC CORPORATION. APPROVED BY: [Signature] DELTA ELECTRONIC CORPORATION, 1000 W. 10TH AVENUE, DENVER, CO. 80202.

OUTLINE DWG. FOR "C" MODULES	
FIRST MADE FOR	USED ON
DRAWN BY	TRACED BY
PERFORMED BY: <i>[Signature]</i>	CHECKED BY
C 13682	