WAØUZI

1045A
Power Supply

AEROTRON, INC.
P.O. Box 6527, Raleigh, N.C. 27628, (919) 876-4620 Telex 579301

4201-1045-001

TABLE OF CONTENTS

PERFORMANCE SPECIFICATIONS

GENERAL

Size	8⅛" W x 3¼" H X 9⅛" D (20.6 cm. x 8.3 cm. x 23.2 cm.)
Weight	15 pounds (6.8 Kg.)
Shipping Weight	18 pounds (8.2 Kg.)

ELECTRICAL

Input	115/230 Volts A.C. 50/60 Hz 300 Watts max.
Output	4.0 Amps. at 13.8 Volts D.C. (Continuous Duty) 12.0 Amps. at 13.8 Volts D.C. (Intermittent Duty)
Output Voltage Range	12 to 14 Volts D.C. (Continuously Adjustable)
Output Ripple	Less than 20.0 mV R.M.S. at rated current
Operating Temperature Range	−30° C to +50° C
Input Protection	Type 3AG fuse, 7.0 A. slow blow
Output Protection	Electronic circuit breaker
Reaction Time	Less than 5.0 milliseconds (manual reset button located on power supply front panel)

CONNECTIONS

Input	Supplied with 5-foot, 3-wire power cord and molded-on, 115-Volt, 3-prong, polarized plug
Output	8-pin, chassis-mounted Jones plug to match output cable supplied
Output cable supplied	18-inch cable with connections installed for direct plug-in connection to any Aerocom transceiver

Aeropak is color-styled to match Aerocom transceivers and is equipped with rubber, non-mar supporting feet.

Specifications subject to change.

1045A GENERAL DESCRIPTION

The Aerotron model 1045A is a high-efficiency, heavy-duty power supply especially designed to convert any Aerocom dash mounted transceiver to a fully solid-state base station. Completely solid-state, it delivers up to 4 amperes of D.C. power output in continuous operation with a reserve capacity of up to 12 amperes intermittent cycle.

The Aeropak is designed with outstanding versatility. A switch changes the unit from 115V to 230V power sources, 50/60 Hz. This is protected from accidental movement by a switch plate. A high speed electronic overload breaker protects the attached radio, along with reset control to eliminate fuse changing and lengthy base station outage.

Size, styling and color combinations of Aeropak complement any Aerocom transceiver. The power supply also provides a sturdy mounting base for the radio.

In the event the unit should ever need service, nearly all electronics are contained on one plug-in circuit board, and most of the transistors are contained on one plug-in I.C. array.

USING THE 1045A

General

The 1045A should be set up when received by adjusting the output with an accurate voltmeter to the nominal supply for the transceiver. It is factory adjusted to 13.6 VDC. The voltage adjustment is available through a rubber grommet in the left side of the cabinet. Use a non-metallic alignment tool to avoid shorting the circuit board with a screw driver. The overload circuit may be tested by shorting the universal terminals together with a wire. The output voltage should drop to zero and remain below 1 volt even after the short is removed. The reset button should turn the output on and extinguish the red indicator light. Should the reset not extinguish the light, it may indicate a failure in the attached transceiver. Disconnect the unit and try again. It is normal for the red light to glow momentarily when the supply is turned off. The green power light will remain on whenever the power line switch is on.

Transceiver operation

If the 1045A is used as a bench supply, flexible leads may be attached to the adapter cable connector. If used to power an Aerocom transceiver, use the adapter cable as supplied. With other than Aerocom transceiver or longer cables, at least No. 10 gauge wire is recommended to minimize voltage drop. In some portable operations, it may be desired to simply use a whip in the antenna connector of the transceiver. In such situations, the overload protector may operate. The temporary expedient is to shorten the 12 volt connection to the transceiver (RF does not often enter through the power line cord) or place the 12 volt leads further from the whip or ground the two chassis together with copper braid near the 12 volt connector. Do not attempt to defeat the protection circuitry.

230 VAC

For 230 VAC 50/60 Hz operation, an adaptor is used for the power plug to mate with available 230 VAC receptacles. The switch plate on the rear apron is removed by taking out the top and bottom 4-40 screws. The switch is thrown to the other position and the plate rotated and replaced. Do not throw the switch with power cord plugged in. The unit will also operate from 208 VAC 50/60 Hz in this position with reduced current capability under low line voltage conditions.

1045A Circuit Description

Refer to the schematic diagram. Individual transistors in the CA3086 transistor array will be referred to by the pin number of the base, e.g.: the transistor with collector at 5, base at 4, and emmiter at 3 is transistor 4. Silicon transistors Q101 and Q102 are series pass regulators connected in parallel. Resistors R103/106 and R104/107, in the emitter of each transistor, respectively, balance the load through the devices at high current. The series pass transistors are PNP for high efficiency. They are mounted on the rear heat sink to dissipate the heat generated. Q103, instead of being in a conventional Darlington connection with the series pass transistors, has its collector tied to the ground through R121/128, which are mounted on the printed circuit board. The "beta" of Q103 is thus maintained at heavy currents when the series pass transistors may approach saturation, depending on power line voltage. R121/128 are also the current sense resistors.

The CA3086 transistor array is used as a differential amplifier in the voltage comparator. Transistor 6 is the current source for the comparator and is biased from CR105, the 7.5 volt zener reference diode. The reference voltage is also applied directly to the non-inverting input, the base of transistor 4. The output voltage is divided down, through R122, R123 and R124 to 7.5 volts and applied to the inverting input, the base of transistor 2. R123 is also the voltage set control. The collector of transistor 4 goes to the base of Q105 which is PNP in a Darlington connection with the driver transistor Q103. C109, C110, and C108 protect the differential amplifier from RF energy from a radio transceiver. The cabinet also forms a RF shield. Transistors 9 and 12 are connected to form a flip-flop. When power is first applied, C105 holds the voltage to the collector of transistor 9 at a low value for a short time. Therefore, the flip-flop always starts with the collectors of transistor 9 "down" and transistor 12 "up", or 9 is conducting and 12 is not. If a short occurs or the current capability of the supply is exceeded, the differential amplifier will cause the Q103, Q105 pair to conduct heavily, thus increasing the voltage across R121. When this voltage exceeds the zener rating of CR104, the flip-flop changes state and the collector voltage of transistor 12 goes "down" to about 0.1 volt. This collector is tied to the base of the current source in the differential amplifier. The change of state thus shuts the regulator down. R117 and C106 have a time constant sufficient to prevent tripping the supply during a surge.

Reset button S103 generates a positive going pulse through R106, R107, C104 and CR103 which is applied to the base of transistor 9. The flip-flop changes state and the current source and regulator are restarted.

Q104 is the overload indicator switch. It is connected across red indicator DS102. When 12 volts are present at the output of the supply, voltage divider R114 and R113 apply a bias to the base of Q104 which is sufficient to maintain Q104 in a saturated condition. Indicator DS102 is then shorted out. When 12 volts are not present, Q104 is off, and current flowing through collector resistor R112 causes DS102 to light. The overload indicator switch is not involved directly in the operation of the regulator.

The regulator draws power from the unregulated source provided by power transformer T101, power diodes CR101 and CR102, and filter capacitor C101. The power diodes are mounted on an internal heat sink. The green power on indicator operates from this unregulated supply. The transformer has dual primaries which are connected in parallel for 115 VAC operation and series for 230 VAC by switch S102. The primary is protected with a slow blow fuse which must be changed to a 3 ampere unit for 230 VAC operation.

TROUBLESHOOTING

INDICATORS	Power supply ripple, incorrect output voltage, inability to adjust voltage or blowing fuses are indications of power supply difficulty. Inability to reset the overload circuit may also indicate excessive load or shorted output.
INDICATOR LIGHT REMAINS ON WITH NO LOAD and CANNOT BE RESET	See Figure 2 for P.C. Board Layout: REMAINS ON 1. Always check the output with a voltmeter. A 20 ohm, 10 watt resistor may be connected to insure operation under load if voltage is present. If the supply is still operable, replace Q104, the indicator switch. Turn off the supply before removing the P.C. card. The card is secured with two 6-32 screws to the side of the cabinet. 2. If the output voltage is actually zero, remove the card and replace the CA3086 transistor array. Transistor arrays CA3046, CA3045, CA3146AE, and CA3196E may be used as replacements. (Given in order of preference.)
NO OUTPUT or NO OUTPUT AND INDICATOR LIGHT ON	If above fails to return the supply to operational status: 1. Power line fuse blows; see section on unregulated supply. 2. Check the voltage on the power diode mounting bracket. This is nominally 22 volts with no load. If this is not present, see section on unregulated supply. If the 22 volts is present on the diode mounting bracket: (Refer to Figure 1 for parts placement). 3. Check the voltage on zener diode CR105. This should be 7.5 volts. An oscilloscope should show less than 1 mv ripple. A significant difference would make it impossible to set the supply to the correct output voltage. Either CR105 has failed, C107 has shorted or R116 is open. 4. Check voltages on the IC socket. (Voltage check made with 20 ohm load; slightly different with no load.)
OVERLOAD PROTECTION INOPERABLE	Do not continue testing the supply for overload shut down until the fault is located and repaired, as you may damage the supply before the fuse has an opportunity to blow. Turn the supply on and check for correct voltage. If there is no output, refer to the section on NO OUTPUT. If the output voltage is correct, turn the supply off and observe the overload light for a few seconds. The green light will fade slowly and the red light should come on in about 3 seconds with no output load. When it does, turn the supply back on. The red light should continue to glow. The reset button should be operable.

If the red light fails to come on with the above test, replace the I.C. transistor array. If it fails to reset, check the pulse forming network of R106, R107, C104 and CR103. If the test is successful, but the unit will trip-off in overload, either R117 or CR104 is open, or C106 is shorted.

BLOWN LINE FUSE NO VOLTAGE ON DIODE BRACKET or UNREGULATED SUPPLY

Blown fuses may be caused by a bad transformer or faulty components in the unregulated portion of the supply. In addition, if the electronic overload protection fails, the fuse will blow with an overload. Check to see that this is not the cause of difficulty.

1. Check the plate on 115/230 VAC switch S102 to be sure it is in place and the switch is correctly set.
2. Unplug the supply from the power line and unbolt CR101 and CR102, the two large power diodes on the bracket. Remove them from the bracket and make sure they do not touch any object, then plug the 1045A in and turn on the supply. It is not necessary to unsolder the transformer leads. If the fuse blows again the power transformer is bad.
3. If step (2) above is completed without the fuse blowing, turn off the supply and check the diodes for a short. Also measure the resistance of the bracket to ground. On the RX10 scale, the meter should indicate an obvious momentary deflection while C101 charges. The settled value is about 85 ohms with a typical VTVM on the RX10 scale, with the P.C. Board in the socket and 120 ohms with the P.C. Board removed. (Positive lead of meter is on C101; the red lead on some imported meters is negative on the ohms scale.)
4. If step (3) above does not find the fault, remount the power diodes and unsolder the two wires leading from the .16 ohm resistors (R103, R104, R106, & R107) mounted on the capacitor bracket, to the emitters of Q101, Q102 mounted on the rear apron. Now turn on the power supply. Voltage on the diode bracket (+ 22 Volts) indicates the fault may be a short to the chassis from the collector or emitter of either Q101 or Q102.

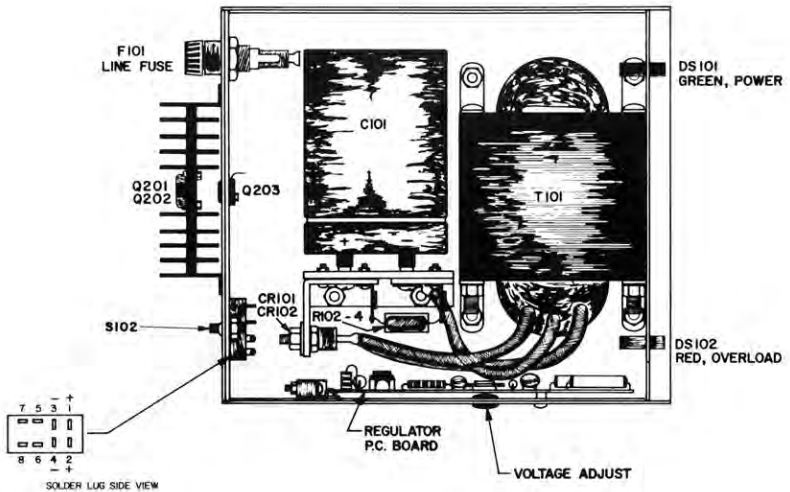
A voltage drop under no load to load conditions on the bracket of more than four (4) volts (VTVM reading), or an electronic overload circuit that trips at lower than 12 amperes (supply otherwise functional) may also indicate power diode trouble. If one has failed, a 6 ampere load may be maintained. In this case (6 ampere load) a VTVM will read 0.6 volts RMS ripple on the diode mounting bracket instead of the usual 0.2 volts RMS. (use blocking capacitor with VOM).

VOLTAGE CHART

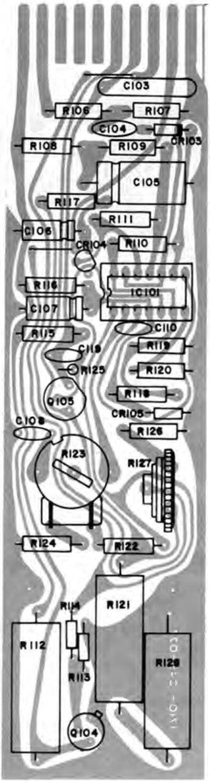
Pin No.	Voltage D.C.	Tolerance
1	13.8	0% referred to output
2	7.5	± 10%
3	6.7	± 10%
4	7.5	± 10%
5	10.5	+ 20%, -30% (always approx. 2.0 volts below diode bracket voltage)
6	2.3	± 10%
7	1.5	± 10%
8	6.7	± 10%
9	0.8	ON
9	0.1	OVERLOAD TRIPPED
10	0.0	
11	0.1	ON
11	3.0	OVERLOAD TRIPPED
12	0.1	ON
12	0.8	OVERLOAD TRIPPED
13	0.0	
14	2.3	ON
14	0.1	OVERLOAD TRIPPED
Pin H on PC socket (Base Q103)	21.3	(1.2V less than diode bracket)
Base Q101, Q102	21.9	(0.6V less than diode bracket)

Failure to obtain the nominal value for the last two values of the table or pin 5 of the I.C. socket indicates a failure of Q105 on the P.C. Board or one of the transistors mounted on the rear apron. A 12 ampere load should produce a .15 volt drop across R103 and R104 in the emitters of Q101 and Q102 respectively. A low reading indicates a failure in the associated transistor.

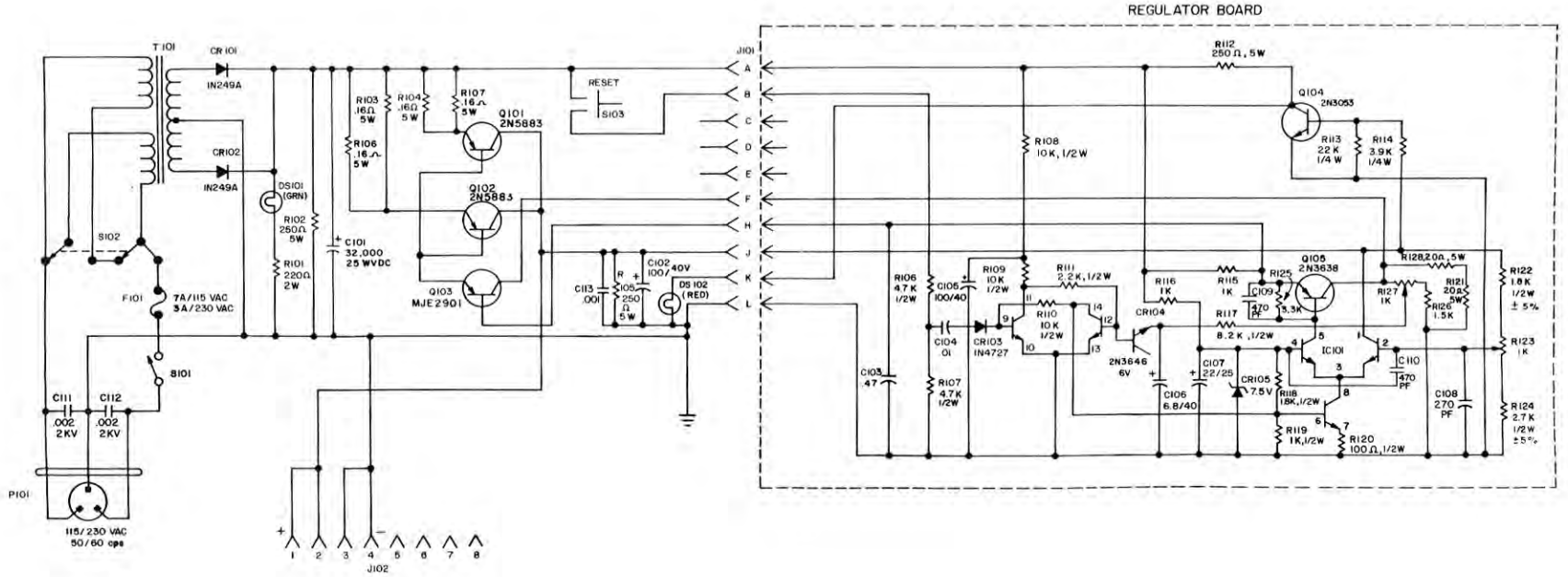
An open power transistor will be noticably cooler at high currents.



1045A ADJUSTMENT DRAWING



VOLTAGE REGULATOR MODULE PARTS LOCATION



1045A POWER SUPPLY SCHEMATIC DIAGRAM

PARTS LIST

Item	Description	Part No
	REGULATOR BOARD POWER SUPPLY 1045A **To order complete board assembly, use part number 1939-1045-106**	
C103	.47p 250V Flat film 10%	1529-4706-002
C104	.01 mfd. disc. cer.	1510-1005-002
C105	100 mfd 40V elec.	1518-1009-006
C106	6.8 mfd. 40V elec.	1518-6807-021
C107	22 mfd. 25V elec.	1518-2208-019
C108	270 pf, disc. cer.	1502-2703-001
C109	470 pf, disc. cer.	1502-2703-001
C110		
Q104	Transistor 2N3053	4811-0000-001
Q105	MPS 3638A Transistor	4810-0000-018
R106	4.7K, ± 10%, ½W, carbon	4701-4704-001
R107		
R108 thru R110	10K, ± 10%, ½W, carbon	4701-1005-001
R111	2.2K, ± 10%, ½W, carbon	4701-2204-001
R112	250 ohm, ± 10%, 5W, wire wound	4714-2503-001
R113	22K, ± 10%, ¼W, carbon	4704-2205-001
R114	3.9K, carbon	4704-3904-001
R115	1K, carbon	4701-1004-001
R116		
R118	1.8K, ± 10%, ½W, carbon	4701-1804-001
R119	1K, ± 10%, ½W, carbon	4701-1004-001
R120	100 ohm, ± 10%, ½W, carbon	4701-1003-001
R121	20 ohm, ± 5%, 5W, wire wound	4714-2002-002
R122	1.8K, ± 10%, carbon comp.	4701-1804-001
R123	1K, P.C. melting pot	4735-1004-004
R124	2.7K, ½W, ±10%	4701-2704-001
R125	3.3K, carbon	4704-3304-001
R126	Resistor, 1.5K,½W	4701-1504-001
R127	Pot, 1K	4735-1004-002
R128	20 ohm ± 5%, 5W, wire wound	4714-2002-001
CR103	1N4727 or equivalent	4803-0000-004
CR104	Transistor, 3N3646	4811-0000-041
CR105	Diode, zener, 7.5V	4831-0001-001
IC101	IC CA3086	4850-0000-010

PARTS LIST

Item	Description	Part No
	O MASTER CHASSIS ASSEMBLY, 1045A To order complete board assembly, use part number 1939-1045-102	
C101	Cap. 32,000 mf 25WVDC	1535-3211-001
C102	100 mfd 40V elect.	1518-1009-006
C111	.002, 2KV cer. cap	1505-2004-001
C112		
C113	.001 disc. cer.	1506-1004-001
F101	Fuse, 7A slow blow	5152-7004-001
J101	Edge Card, 10 pin	2191-0000-002
J102	Connector, power female 8 pin	2131-0000-010
Q101	Transistor, power 2N5883	4811-0805-071
Q102		
Q103	MJE 2901	4810-0000-017
R101	220 ohm, 2W	4703-2203-001
R102	250 ohm, 5W	4714-2503-001
R103	.16 ohm, 5W	4714-1600-001
R104		
R105	250 ohm, 5W	4714-2503-001
R106	.16 ohm, 5W	4714-1500-001
R107		
S101	Switch, toggle	5101-0000-001
S102	Switch, slide	5133-0000-002
S103	Switch, momentary	5141-0000-004
T101	Transformer, power	5610-1045-001
CR101	IN249A diode	4803-0000-026
CR102		
DS101	Light Assembly, green	3951-9009-003
DS102	Light Assembly, red	3951-9009-002
	Cover, top	1405-1045-012
	Plate, 115/220V switch	1405-1045-020
	Heat sink	1408-1045-032
	Panel, front	1418-1045-014
	Panel, rear	1418-1045-031
	Bumper feet, rubber	2806-0000-003
	Fuse Holder	5160-0000-001