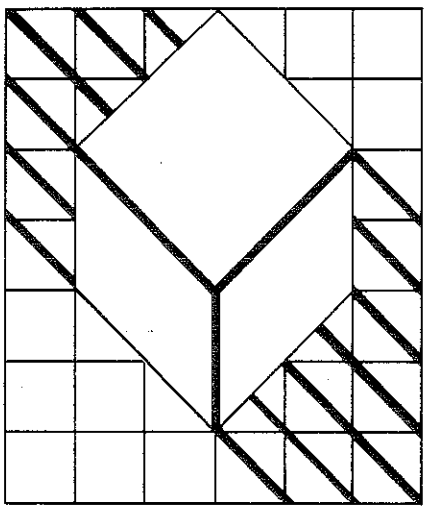
$5.00

# ZENITH ELECTRONICS CORPORATION

## STANDARD
## SWITCHING POWER SUPPLIES

## USER'S MANUAL

Models: ZPS-250A
ZPS-300A
ZPS-400A



ZENITH | magnetics

The quality goes in
before the name goes on®

# LIMITED WARRANTY

## Power Supplies
## ZPS-250A, ZPS-300A, ZPS-400A

### Limited Warranty

Zenith warrants that for a period of two (2) years from date of manufacture, the Power Supplies shall be free from defects in material and workmanship.

The above warranty does not extend to any Power Supplies which have been subjected to misuse, abuse, neglect, accident, improper installation or application, faulty incorporation into other products, or negligence in use, storage, transportation, handling or abnormal conditions of operation.

If Buyer or any other person performs any alteration upon Zenith's Power Supplies including, but not limited to, cosmetic, electrical, mechanical, burn-in or accelerated testing without the express written authorization of Zenith, then Zenith's warranty upon such Power Supplies shall be void. For any Power Supplies sold which are used in a medical or life support application or a nuclear facility, Zenith makes no warranties or representations whatsoever and such Power Supplies are sold "AS IS" and "WITH ALL FAULTS."

### Limitation of Liability

THE ABOVE WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED, OR STATUTORY INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. ALL OTHER WARRANTIES ARE HEREBY EXPRESSLY EXCLUDED AND NEGATED.

ZENITH'S SOLE LIABILITY AND BUYER'S SOLE REMEDY FOR ANY CLAIM, WHETHER IN TORT, CONTRACT OR WARRANTY, SHALL BE LIMITED AT ZENITH'S OPTION TO REPAIR OR REPLACEMENT OF THE POWER SUPPLIES OR ISSUANCE OF A CREDIT OR REBATE OF THE PURCHASE PRICE.

UNDER NO CIRCUMSTANCES SHALL ZENITH BE LIABLE IN ANY WAY FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, LOST BUSINESS OR PROFITS, WHETHER OR NOT FORESEEABLE, AND WHETHER OR NOT BASED ON CONTRACT, TORT, WARRANTY CLAIMS OR OTHERWISE IN CONNECTION WITH THE POWER SUPPLIES.

### Buyer Responsibility

In the event Buyer claims that any Products are non-conforming, Buyer shall: (1) promptly notify Zenith in writing of the basis of such claim; (2) obtain a Return Material Authorization (RMA) number from Zenith prior to returning any Products; and (3) return such Products freight collect to Zenith's designated facility or, at Zenith's request, allow Zenith to inspect and/or repair such Products at Buyer's facility. Products within warranty shall be returned to Buyer freight collect. Products returned by Buyer and found by Zenith to be non-defective and conforming shall be returned to Buyer freight collect, and Buyer shall reimburse Zenith for all costs of transportation, insurance, inspection and testing incurred by Zenith. Final determination as to whether the Products are, in fact, defective rests with Zenith.

All warranty claims must be made within thirty (30) days of the expiration of this warranty.

### User's Manual

Read your User's Manual carefully so that you will understand the installation and operation of the Power Supply.

# TABLE OF CONTENTS



**Read this manual carefully before installing and operating any Zenith power supply**

# POWER SUPPLY MODEL GUIDE

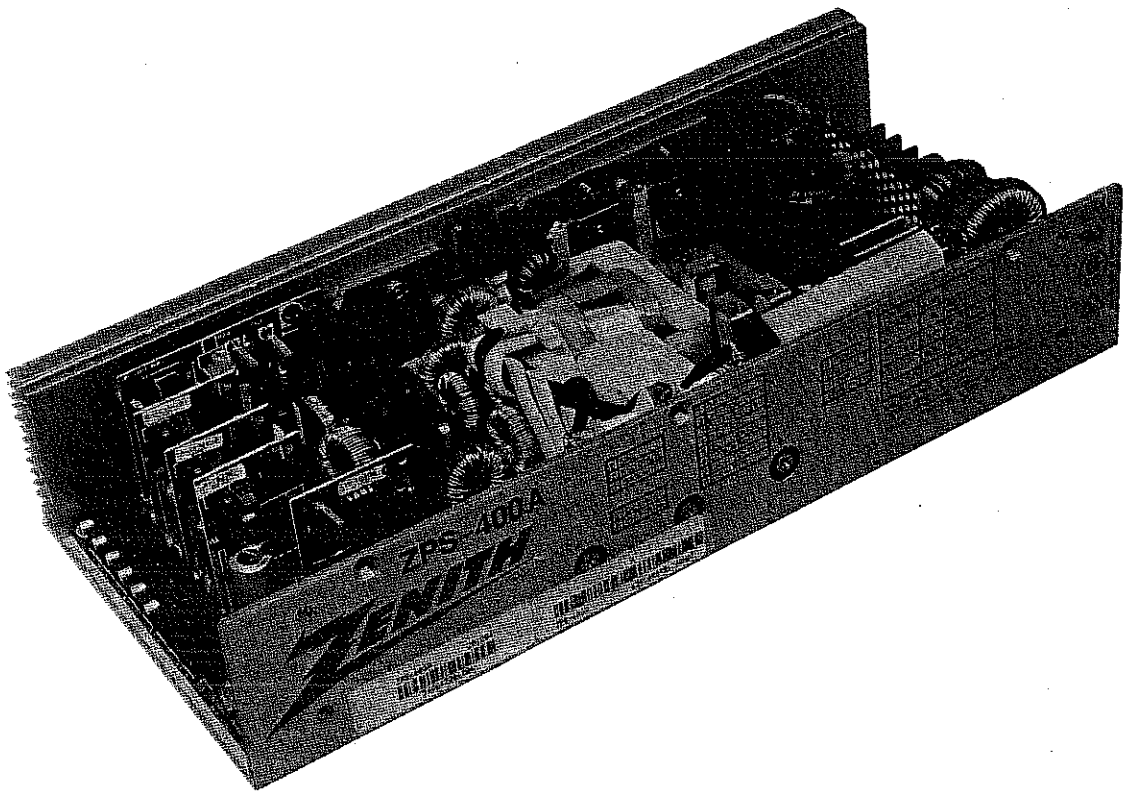
The following guide provides output and current information for the ZPS-250A, ZPS-300A and ZPS-400A products:

**Output Voltage & Current Ratings:**

| Model | Max Output Power (Watts) | Main Output | | 2nd Output | | 3rd Output | | 4th Output | | Size (Inches) LxWxH |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Volts DC (Nominal) | Amps (Min/Max) | Volts DC (Nominal) | Amps (Min/Max) | Volts DC (Nominal) | Amps (Min/Max) | Volts DC (Nominal) | Amps (Min/Max) | |
| ZPS-250A | 250 | 4.75/5.25 | 3.5/35.0 | 11.5-26.0 | 0.4/4.0 PK 6.0 | 4.75-16.0 | 0.4/4.0 PK 6.0 | 4.75-16.0 | 0.3/3.0 PK 4.5 | 13x5.0x2.5 |
| ZPS-300A | 300 | 4.75/5.25 | 4.5/45.0 | 11.5-26.0 | 0.6/6.0 PK 9.0 | 4.75-16.0 | 0.8/8.0 PK 12 | 4.75/16.0 | 0.4/4.0 PK 6.0 | 13x5.0x2.5 |
| ZPS-400A | 400 | 4.75/5.25 | 5.5/55.0 | 11.5-26.0 | 0.7/7.0 PK 10.5 | 4.75-16.0 | 1.0/10.0 PK 15.0 | 4.75/16.0 | 0.6/6.0 PK 9.0 | 13x6.0x2.5 |

# RECEIVING AND INSPECTION INSTRUCTIONS

Upon receipt, perform a visual inspection of the power supply. Examine the chassis carefully to see that it is in good condition. Check for any loose components. If any problems are encountered, refer to the section on "Damage Claims."



# SAFETY CONSIDERATIONS

## CAUTION:

1. The AC input terminals and the primary section (see Figure 2.) of the power supply are at dangerous voltage potentials. Avoid touching these areas when AC power is supplied to avoid a hazardous electric shock. Wait 60 seconds after removing AC power before servicing the power supply to avoid shock from energy stored in the capacitators.

2. Connect input ground terminal to safety earth ground to minimize electric shock hazard and assure low EMI.

3. Check that 115V/230V selector strap is in the proper position. Operation in the wrong position will damage the power supply and is not covered under warranty.

4. Use proper screw sizes for mounting. Excessively long screws may damage the power supply or create a hazardous electric shock.

5. Provide proper cooling (see specifications on page 10).

6. Do not allow liquids or small metallic shavings or parts to fall into the power supply. Internal arcing could result causing a possible fire hazard.

7. Replace input fuse only with a fuse of the same type and rating.

8. Repair and servicing should only be performed by qualified service personnel. See page 6 for return policy.

9. With voltage selection shunt removed, the auxiliary output voltage is the same as the high range. Do not remove shunt when voltage sensitive circuits are connected to the output.

# INSTALLATION AND ADJUSTMENTS

1. Inspect unit for visible transit damage. Should there be any cause for concern, please contact supplier before returning unit.

2. Check that power supply is set to the correct input voltage i.e., 115/230VAC. Incorrect setting may damage the power supply. See Figure 2 for setting information.

3. Connect as shown in Figure 1 (remote sense connections are optional—may be open circuit).

4. Before switching on, check that the output selectors have been set to the desired voltage. See Figure 2 for selection information.

5. The output voltage of the main rail can be set using R24. Clockwise adjustment increases output voltage.

6. The output voltage or rails 2, 3 and 4 can be adjusted using the J1 connector shunt and R6 located on the appropriate daughter board. See Figure 2 for more information.

7. ***Use of remote sense terminals.*** The terminals are identified by the numbers 1 and 2 stamped on the output terminal block. (The PCB is also marked with the letters −R.S.+). Connect a sense wire from the R.S. − terminal to the Ch. 1 RTN load terminal and from the R.S. + terminal to the Ch.1 +V load terminal.

   In order to minimize noise pick up, it is recommended that these wires form a twisted pair. Further improvements can be made by the use of screened cable, run separately from the power lead, which should also form a twisted pair if possible. It is also recommended that a 0.47 ufd ceramic capacitor and a 10 ufd electrolytic capacitor be connected across the load end of the remote sense leads.

8. ***Use of remote on/off terminals.*** The power supply output may be switched off from the secondary side of the power supply using a mechanical or electrical switch to place a short circuit across pins 1 and 2 of connector J3. Automatic start up occurs upon removal of the short.

9. ***The Power Good Signal is available on Pins 3 and 4 of connector J3.*** The signal is TTL compatible and referenced to the main output ground. Logic 0 occurs when input power is removed. Logic 0 occurs at least 1 millisecond before the outputs drop to 5% below nominal voltage.

**INPUT/OUTPUT DIAGRAM**

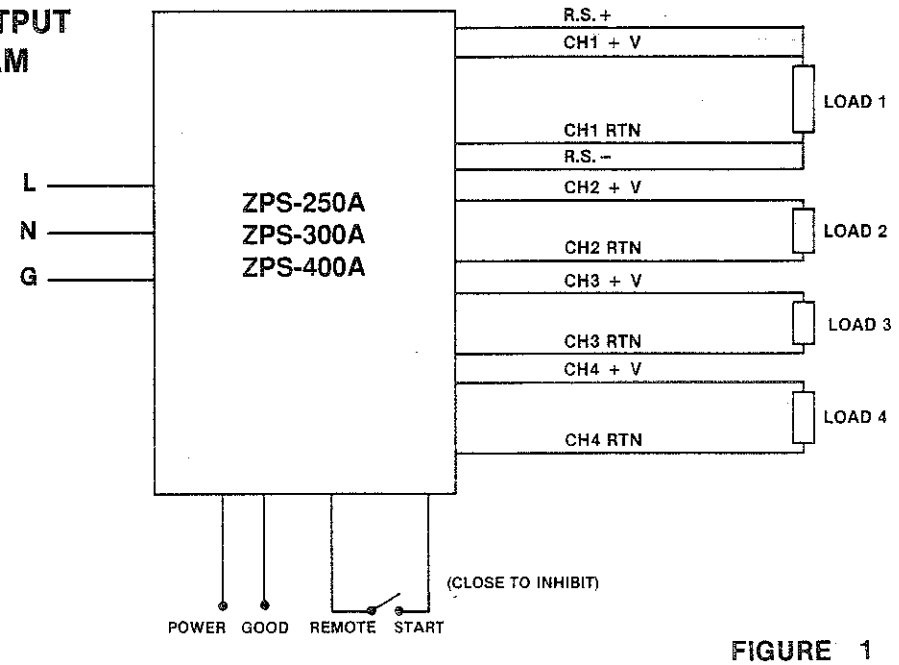
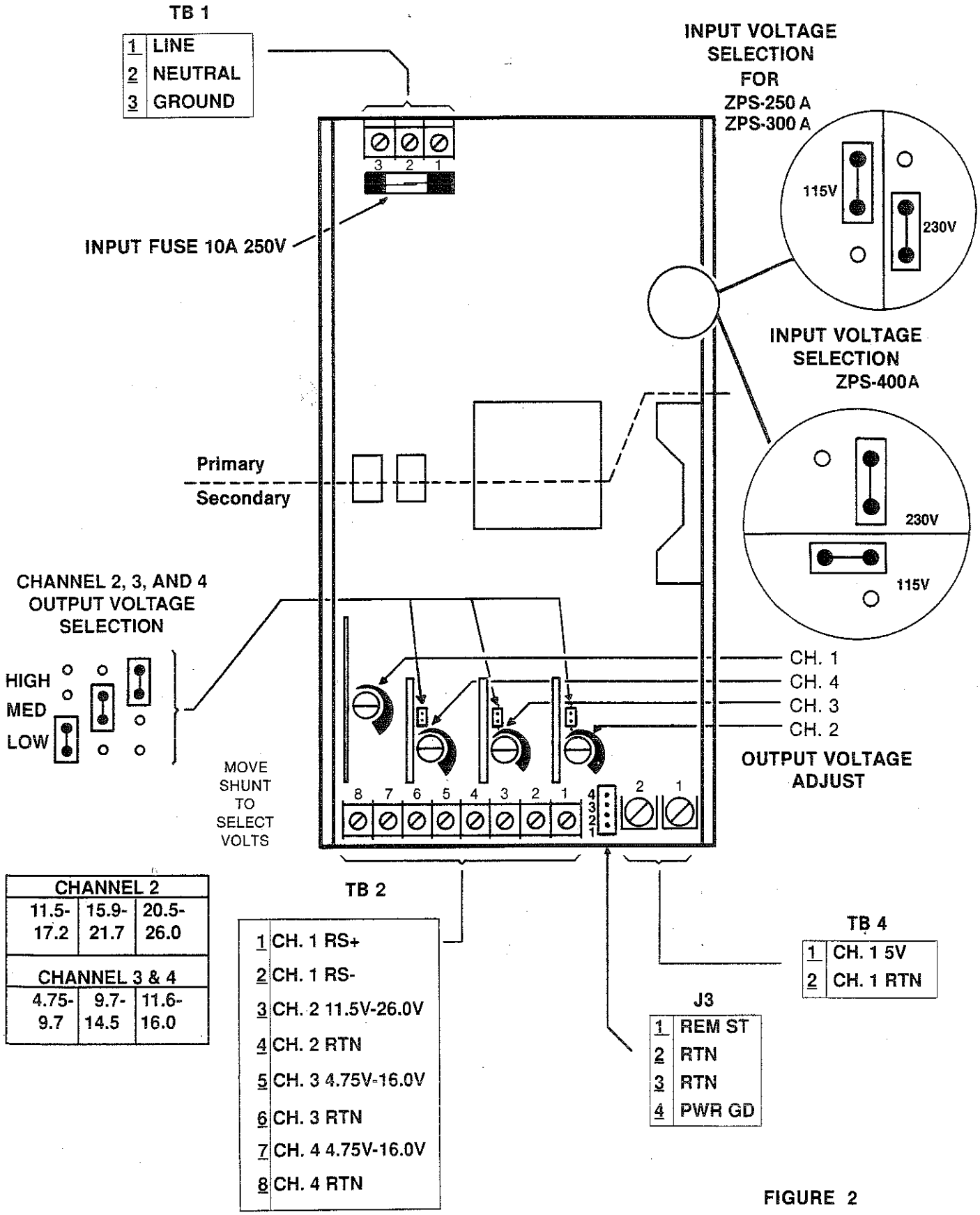



FIGURE 1

# ZENITH
# INPUT/OUTPUT VOLTAGE SELECTION DIAGRAM




| CHANNEL 2 | | |
|---|---|---|
| 11.5-17.2 | 15.9-21.7 | 20.5-26.0 |
| **CHANNEL 3 & 4** | | |
| 4.75-9.7 | 9.7-14.5 | 11.6-16.0 |

FIGURE 2

# DAMAGE CLAIMS

The enclosed power supply was carefully inspected and approved prior to shipment from our factory. After inspection, any damage claims should be sent to the freight carrier.

If power supply has been damaged by the freight carrier, a claim for the cost of the power supply should be filed with the carrier for direct reimbursement. Be sure to include model and serial numbers of the damaged units in all correspondence to the freight carrier. In the interim, another power supply may be purchased from Zenith.

# ZENITH OEM CUSTOMER RETURN MATERIAL AUTHORIZATION (RMA) POLICY FOR SWITCH MODE POWER SUPPLIES

## WHEN PURCHASED THROUGH AN AUTHORIZED ZENITH DISTRIBUTOR:

Return to distributor for repair or replacement.

## WHEN PURCHASED DIRECTLY FROM ZENITH:

1. A Return Material Authorization (RMA) number is required for all product returns and the assigned number applies only to those units.

2. A valid purchase order for return of RMA units must be placed at the time the RMA number is assigned. The purchase order must reflect the unit price in effect at the time the RMA is assigned.

3. Failure symptoms are required to be attached to each unit submitted for repair.

4. The corresponding RMA number must be visible on the outside of the shipping cartons. If the shipping carton is not properly marked, the material will be rejected and shipped back freight collect. Incoming freight must be prepaid.

5. Units for repair must be shipped within two weeks of the RMA number assignment to:

   **Plant 51 -**
   Zenith Electronics of Texas
   15d-2 Zane Grey Road
   El Paso, TX 79906

6. **OUT OF WARRANTY** units will be separated from **IN WARRANTY** units upon receipt at the repair plant.

7. Customer may not take a debit memo until warranty status information has been confirmed by Customer Service.

## IN WARRANTY UNITS

8. A customer may issue a debit memo for **IN WARRANTY** units only, using the unit price in effect at the time the RMA number is assigned.

9. Repaired units will be invoiced using the unit price reflected on debit memo.

10. In warranty units received by Zenith with Check OK Classification** will be returned freight collect and reinvoiced the amount shown on the debit memo, plus a service charge equal to 25% of that amount.

## OUT OF WARRANTY UNITS*

11. Customers will be notified of the quantity of **OUT OF WARRANTY** units.

12. Customers may not issue a debit memo for **OUT OF WARRANTY** units.

13. A charge equal to 55% of the unit price in effect at the time the RMA number is assigned will be for the repair of **OUT OF WARRANTY** units.

14. A written Purchase Order to cover the cost of repair must be received by Customer Service before the repair of **OUT OF WARRANTY** units will be undertaken.

15. **OUT OF WARRANTY** units will be held for 30 days after you are notified of the quantities. If a written purchase order for the repair charge is not received by this office within 30 days, these **OUT OF WARRANTY** units will be returned freight collect. You will be invoiced a service charge of 25% of the unit price in effect at the time the RMA number is assigned.

16. Repaired **OUT OF WARRANTY** units will be shipped back to you freight collect.

17. Upon request, Zenith will scrap non-repairable units. An invoice equal to 15% of the unit price in effect at the time the RMA number is assigned will be issued for this service.

18. **OUT OF WARRANTY** units received by Zenith with Check OK Classification** will be returned to you freight collect and you will be invoiced a charge equal to 25% of the unit price in effect at the time the RMA number is assigned.

***Definition of Out of Warranty Units:**
A unit is out of warranty when the warranty period Zenith has set for that product has expired or when the product has been abused or altered in such a way as stated in the warranty to invalidate it.

****Definition of Check OK Classification:**
An individual unit that is fully operational. A unit with a failure symptom attached will be fully tested to ensure that this failure does not occur upon testing.

# ELECTRICAL SPECIFICATIONS

**Input Voltage**
90-132 VAC or
180-264 VAC
(user selectable).

**Input Current**

| | |
|---|---|
| ZPS-250A | 4.2A/2.5A |
| ZPS-300A | 4.9A/2.8A |
| ZPS-400A | 6.7A/3.9A |

**Input Frequency**
47-65 Hertz single phase.

**Inrush Current Limiting**
Cold start inrush is limited to 70 Amps peak for one half cycle at 230 VAC.

**Input Fusing**
10 Amp. 250 Volt internal fuse.

**Input Voltage Transients**
Protection to 1000 Volts for 50 microseconds exponentially decaying voltage spikes. (IEEE Standard 587-1980).

**Leakage Current**
3.5mA maximum.

**Brownout Protection**
85 VAC in 115 Volt mode.
170 VAC in 230 Volt mode.

**Holdup Time**
At nominal AC line voltage (115/230 VAC) and full load, the output voltage will remain within regulation for 20mS (6mS at low line limit) after the removal of the AC line voltage..

**Efficiency**
75% efficiency at nominal input full load and maximum output voltage settings.

**Total Output Power**
Maximum total continuous power limited to values in table.

**Startup Surge**

| | |
|---|---|
| ZPS-250A | 300W max. total output power |
| ZPS-300A | 360W max. total output power |
| ZPS-400A | 480W max. total output power |

**Voltage Range**
All outputs are fully adjustable between the voltages specified on page 2.

**Regulation**

| | |
|---|---|
| Line: | ±0.2% all outputs |
| Load: | ±0.2% all outputs |
| Cross: | ±0.2% all outputs |

**Ripple & Noise**
1% peak to peak all outputs (20 MHz Bandwidth) 10µF & 0.1 µF external capacitance added.

**Transient Response**
A step load change of 25% at .1 Amps per microsecond will give rise to a maximum excursion of 4%,(Ch.1) or 3% (Ch.2-4), returning to within 1% in less than 500 microseconds.

**Start-up Surge Current**
1.5 times rated current for 5 seconds on Ch. 2 and Ch. 3.

**Overshoot**
No overshoot at turn on or turn off.

**Turn on Delay**
After the application of input power, output voltages will reach nominal values within one second.

**Temperature Coefficient**
0.03% per °C maximum all outputs.

**Overvoltage Protection**
The power supply will be latched off in the event of an overvoltage condition (6.0V ± 0.3V) on the main output and can be restarted by cycling the AC power off for 15 seconds.

**Short Circuit Protection**
The power supply will be latched off if a short circuit is applied to any output. Overload must be removed and input power cycled off for 15 seconds to reset.

**Overload Protection**
The power will shut down if the sum of the total output power exceeds its power rating.

**Thermal Protection**
Automatic shut down if the switching transistor heat sink temperature exceeds 90°C (typical). Automatic reset at elimination of excessive temperature.

**No-Load Operation**

All outputs may be operated at no load. The main output must be loaded at minimum load or greater to obtain power from Ch. 2-4 outputs. Ch. 2-4 will regulate at ± 3.0% when loaded at less than minimum load.

**Output Polarity Protection**

The power supply will be latched off in the event of a momentary application of a reverse voltage at up to rated output currents. Continous reverse voltage current should be limited to 1A.

**Remote Sense**

Remote sense on main output will compensate for up to a 250mV drop in power distribution cables. Protected against open sense leads.

**Load Capacitance**

The main output is stable in the remote sensing mode when the remote sensing capacitance is at least 10µF per load ampere.

**Parallel Operation**

In general, parallel operation is not recommended.

**Power Good Signal**

Under nominal operating conditions, this signal is TTL compatible Logic 1. Upon loss of input power, a TTL compatible Logic 0 occurs. This signal is referenced to the main output return terminal. This signal appears at least 1 millisecond prior to the output dropping 5% below its nominal value. The output can sink 16mA in the low state.

This signal also provides a 100mS minimum delay after the main 5V output is within regulation.

**Remote Start**

The power supply can be remotely started with a user supplied electronic signal applied to the Remote Start terminal and referenced to the main output return terminal. The signal may be applied by either a TTL Logic, mechanical, or open collector driver.

A logic 1, or open, turns on the unit. A logic 0, or short, turns off the unit.

**MTBF**

150,000 hours minimum at 25°C per MIL-STD 217E.

**Safety**

UL 478, UL1950, CSA 22.2 No. 220, IEC 380, 435, 950, VDE 0806, VDE EN 60950.

**EMI**

FCC Part 15J, Class B, VDE 0871, Class B.

**Operating Temperature**

0°C to +70°C. (Full power maintained to +40°C. Output power linearly derated to 50% at +70°C).

**Power Output vs. Ambient Temperature**

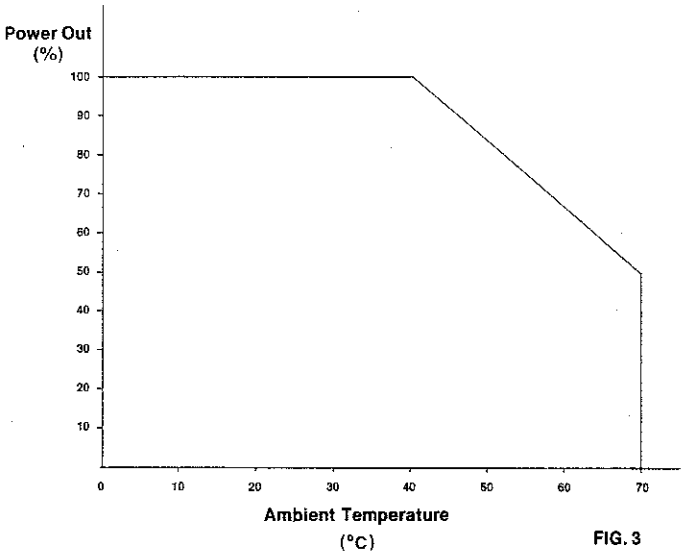



FIG. 3

**Power Output vs. Airflow**
at 40°C Ambient Temperature

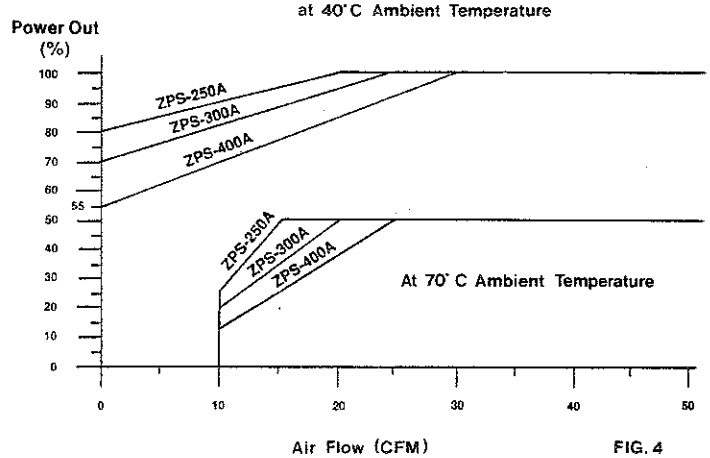



FIG. 4

**Storage Temperature**

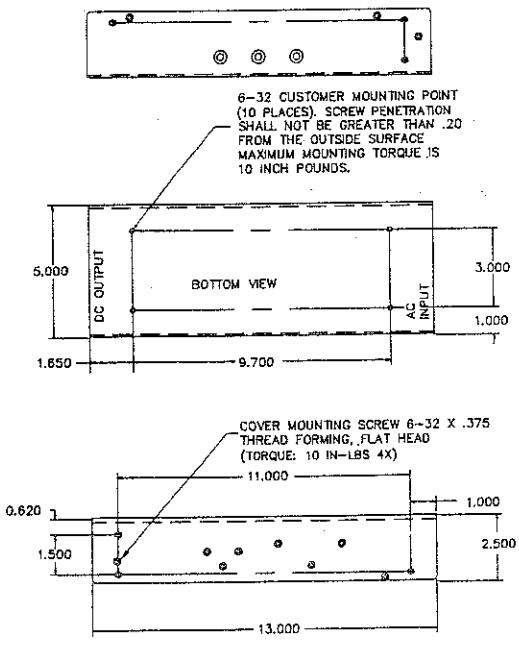
-10°C to +85°C. Unit should be stabilized at operating temperature range for 2 hours prior to operation.

**Relative Humidity**

0% to 80% noncondensing.

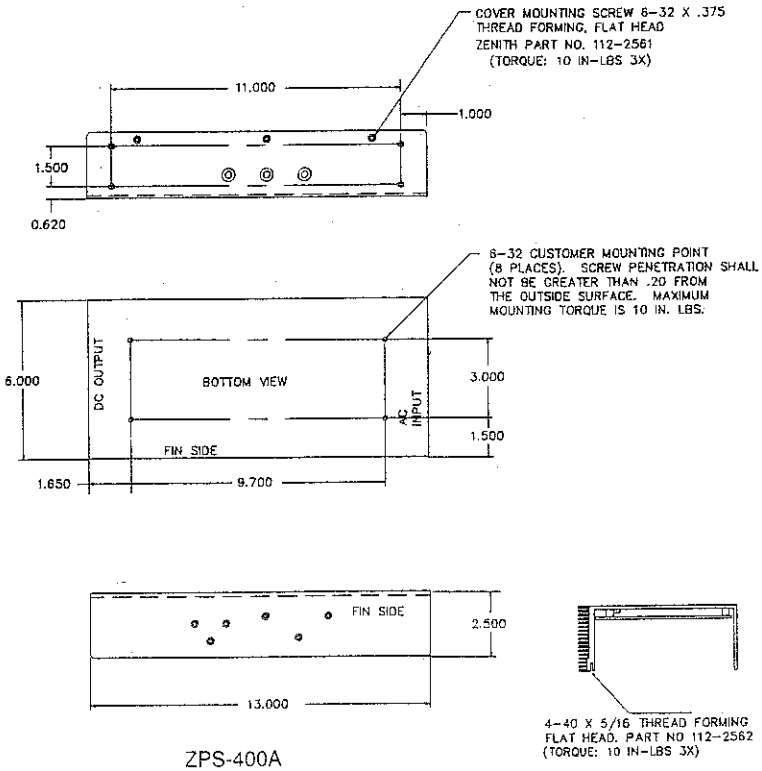
# MECHANICAL SPECIFICATIONS

| | |
|---|---|
| **Size (L x W x H):** | ZPS-250A: 13.0" x 5.0" x 2.5" (33.02cm x 12.70cm x 6.35cm). |
| | ZPS-300A: 13.0" x 5.0" x 2.5" (33.02cm x 12.70cm x 6.35cm). |
| | ZPS-400A: 13.0" x 6.0" x 2.5" (33.02cm x 15.25cm x 6.35cm). |
| **Weight:** | ZPS-250A: 5.0 pounds (2.3 kilograms) |
| | ZPS-300A: 5.0 pounds (2.3 kilograms) |
| | ZPS-400A: 7.0 pounds (3.2 kilograms) |
| **Construction:** | Anodized aluminum U-channel<br>Optional EMI cover |
| **Cooling:** | ZPS-250A: Forced air, 20 CFM minimum<br>ZPS-300A: Forced air, 25 CFM minimum<br>ZPS-400A: Forced air, 30 CFM minimum |
| **Shock & Vibration: (Non-operating)** | Meets MIL-STD. 810C |
| **Outline Dimensions:** | See Figures 5 and 6. |
| **Mounting Hole Locations:** | See Figures 5 and 6. |
| **Input/Output Connections:** | See Figure 2 |




ZPS-250A/300A

FIGURE 5




ZPS-400A

FIGURE 6

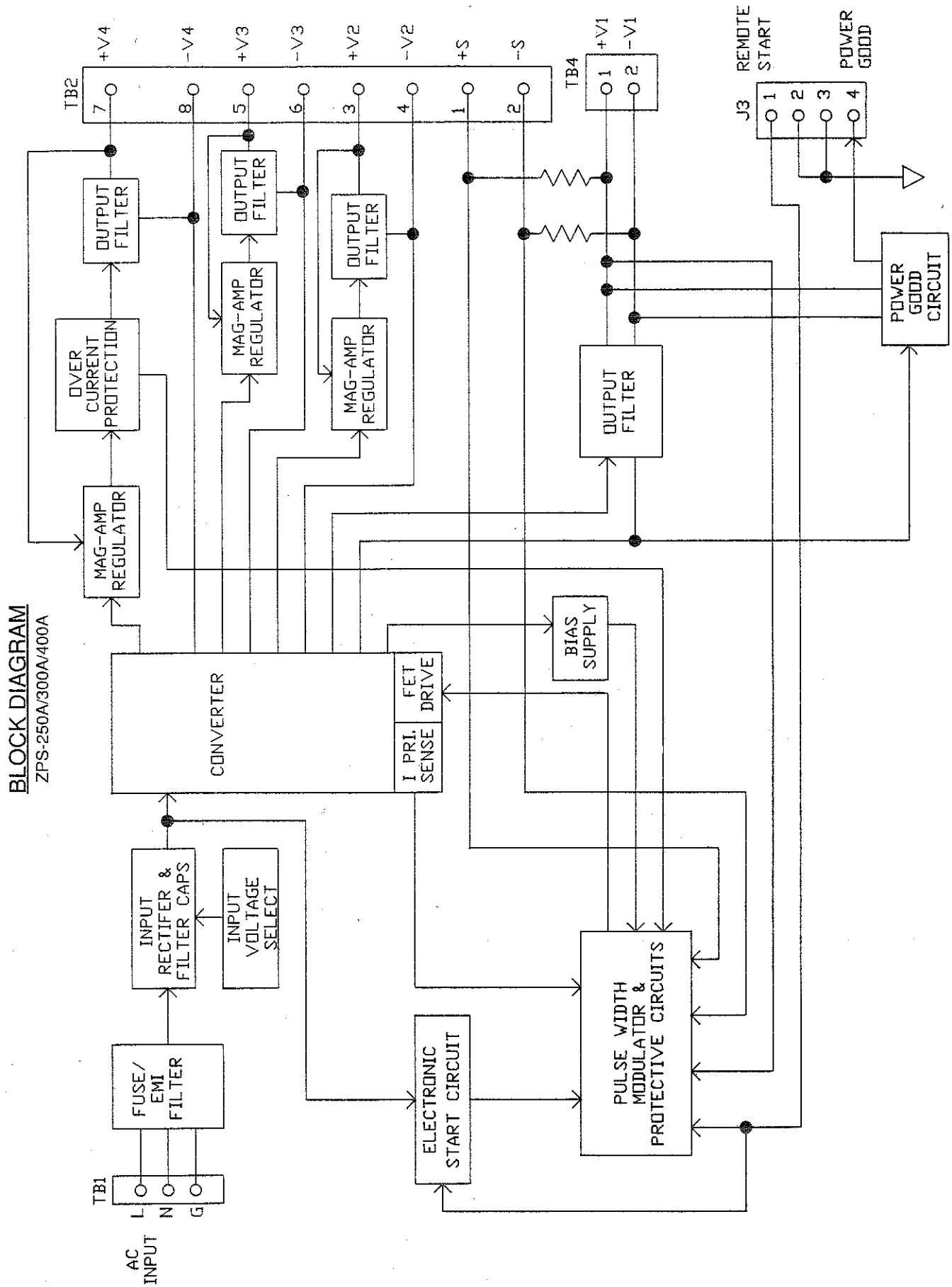
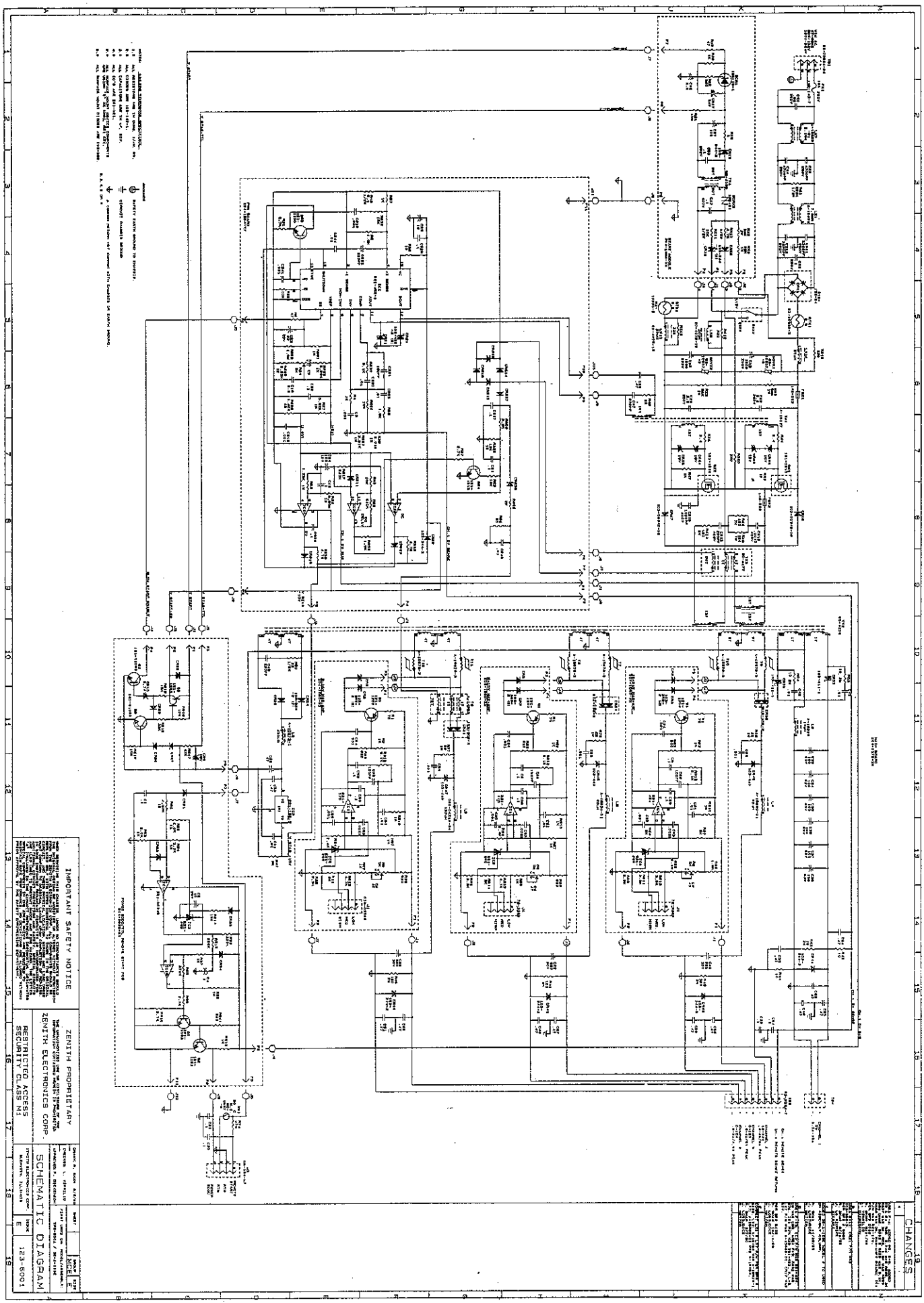

BLOCK DIAGRAM
ZPS-250A/300A/400A
AC INPUT
L
N
G
TB1
FUSE/ EMI FILTER
INPUT RECTIFER & FILTER CAPS
INPUT VOLTAGE SELECT
CONVERTER
I PRI. SENSE
FET DRIVE
BIAS SUPPLY
ELECTRONIC START CIRCUIT
PULSE WIDTH MODULATOR & PROTECTIVE CIRCUITS
MAG-AMP REGULATOR
OVER CURRENT PROTECTION
OUTPUT FILTER
MAG-AMP REGULATOR
OUTPUT FILTER
MAG-AMP REGULATOR
OUTPUT FILTER
OUTPUT FILTER
TB2
+V4
-V4
+V3
-V3
+V2
-V2
+S
-S
TB4
+V1
-V1
J3
REMOTE START
POWER GOOD
POWER GOOD CIRCUIT

FIGURE 7

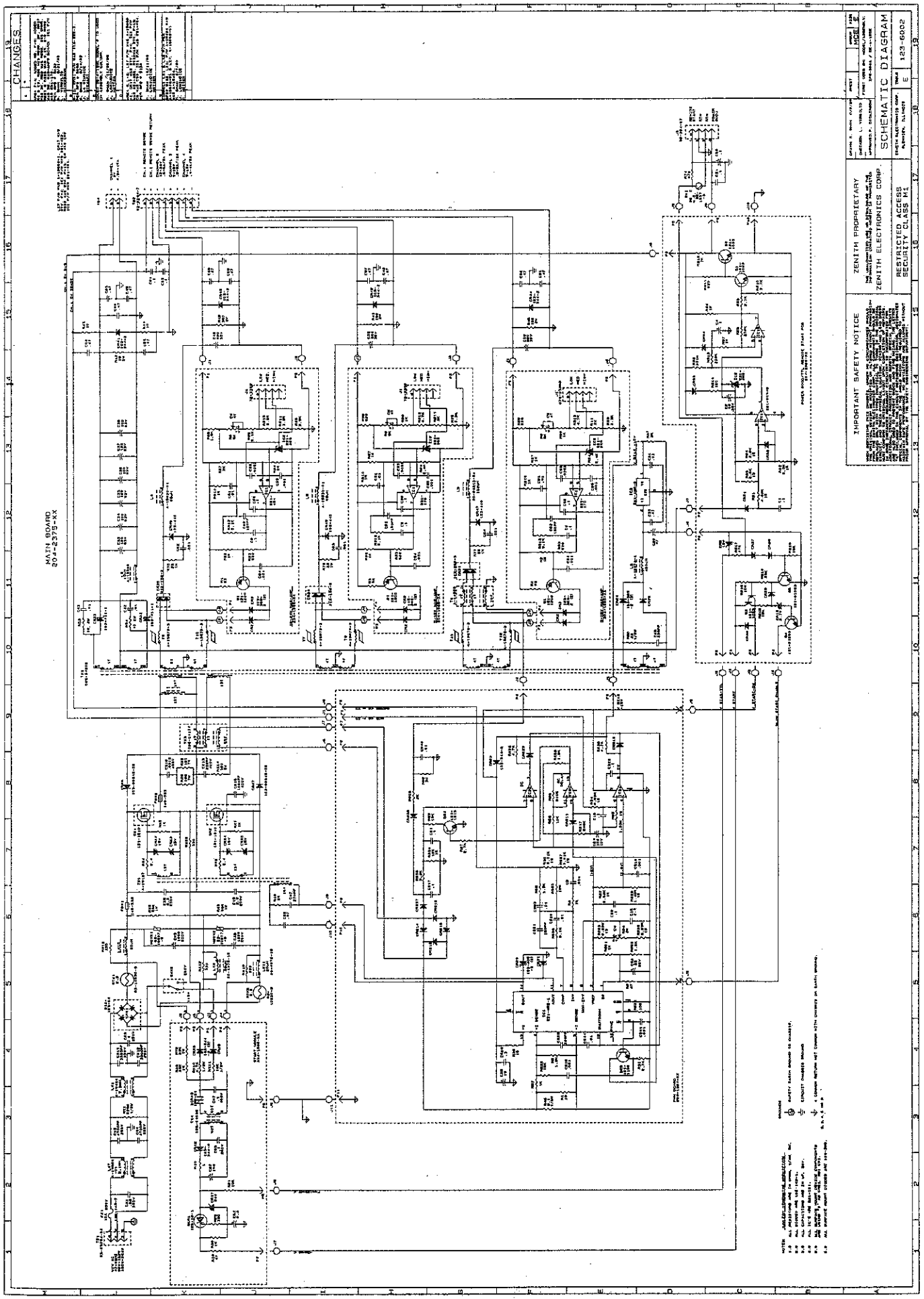



**ZPS-250A**

**FIGURE 8**

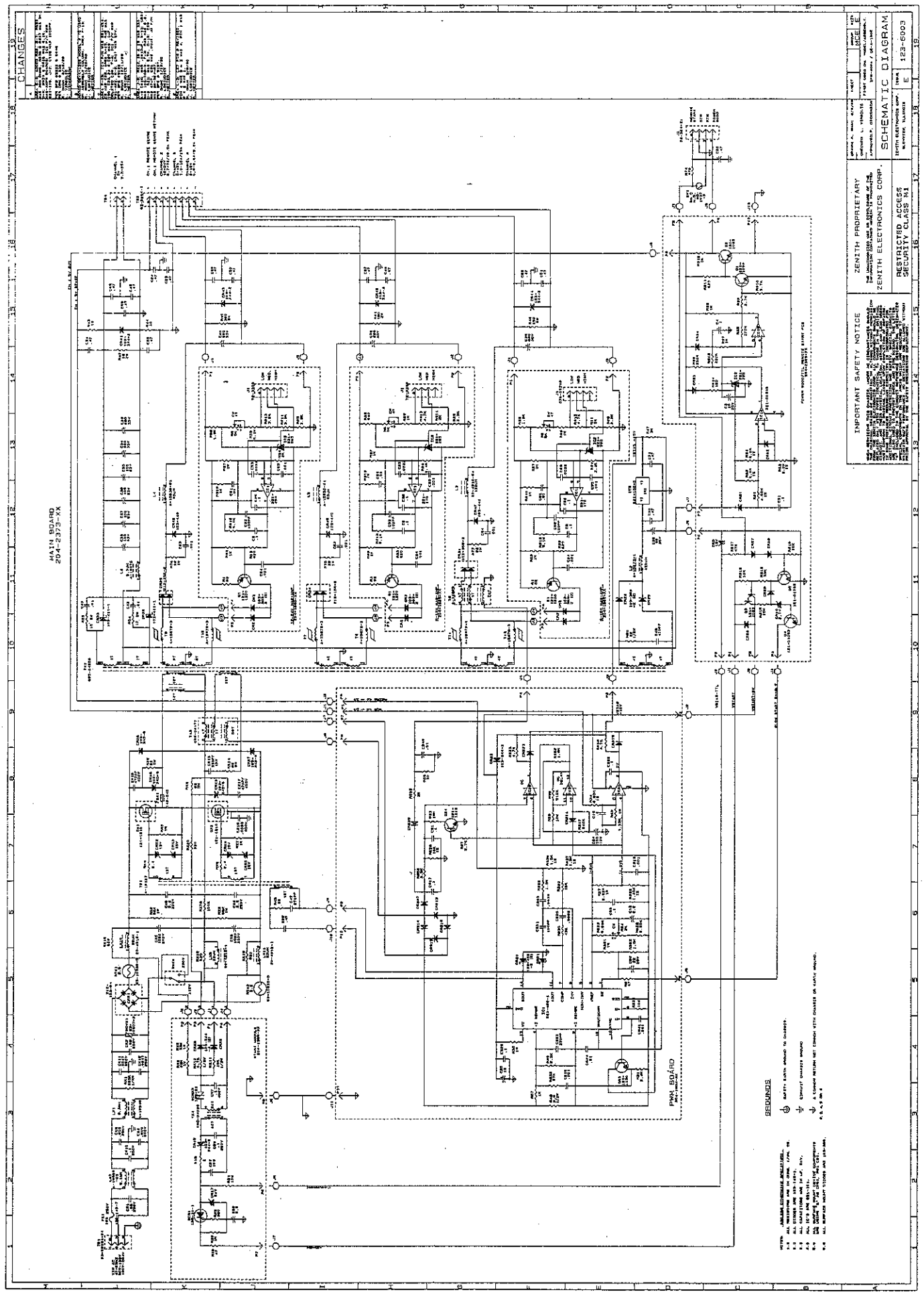
# ZPS-300A

FIGURE 9



**ZPS-400A**

**FIGURE 10**



**Zenith Electronics Corporation**
1000 Milwaukee Avenue
Glenview, Illinois 60025
Tel: (708) 391-8975
Fax: (708) 391-7078

9/91/1M