INSTRUCTION MANUAL
FOR

ATR
POWER SUPPLY

MODEL_____ SERIAL NO._____

(201) 922-9300

ELECTRONIC MEASUREMENTS INC.

405 ESSEX ROAD, NEPTUNE, N.J. 07753

ELECTRONIC MEASUREMENTS INC.

MANUFACTURER'S PRODUCT DECLARATION

INTENDED PURPOSE (USE)

The Power Supplies described by this manual are defined by Electronic Measurements, Inc. as a component for use in the composition of an apparatus as defined in Article 1 (1) of the EMC Directive (89/336/EEC). These products, as individual components, do not perform in themselves a direct function for the user of the end product. They are not intended to be placed on the market with a direct function to a final user! As such, the products described by this manual are not subject to the provisions of the EMC Directive (89/336/EEC, with amendment 92/31/EEC). The products described by this manual are intended for incorporation into a final product by a professional assembler. It is the responsibility of the assembler to ensure that the final apparatus or system incorporating our products complies with all relevant EMC standards for that final product.

OPERATING ENVIRONMENT

The operating environment as defined by Electronic Measurements, Inc. for the products described by this manual is stated as follows:

The Power Supplies described by this manual are intended for use in a protected industrial environment or in proximity to industrial power installations. These locations are often referred to as industrial locations containing establishments that are not connected to the low voltage public mains network.

Industrial locations are characterized by the existence of one or more of the following conditions:

1) industrial, scientific and medical (ISM) apparatus are present;
2) heavy inductive or capacitive loads are frequently switched;
3) currents and associated magnetic fields are high;
4) location supplied by their own transformer.

These components are not intended for connection to a public mains network, but are intended to be connected to a power network supplied from a high or medium-voltage transformer dedicated for the supply of an installation feeding manufacturing or similar operations. They are suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

ELECTRONIC MEASUREMENTS INC.

Description of symbols used in product labeling

SYMBOL	PUBLICATION	DESCRIPTION
	EC Council directive 93/68/EEC	European Community Conformity Assessment Product Mark
	IEC 348	Attention, consult accompanying documents
	IEC 417-5036	Dangerous voltage
	IEC 417-5017	Protective earth (ground)
	IEC 417-5019	Functional earth (ground)

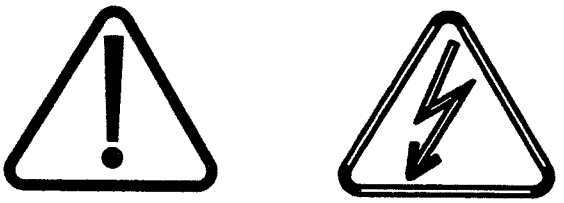
WARRANTY

Electronic Measurements, Inc. (405 Essex Road, Neptune, N.J. 07753), warrants that the unit is free from defects in material or workmanship for a period of two years from the date of initial shipment. EMI will service and, at its option, repair or replace parts which prove to be defective, free of charge during the stated warranty period. This warranty excludes defects resulting from misuse, unauthorized modification, operation outside the environmental or safety specifications of the power supply, or improper site preparation or maintenance. The customer shall contact Electronic Measurements, Inc., for warranty service or repair, and EMI will provide shipping instructions. The customer shall prepay shipping charges.

The "WARRANTY", CLAIM FOR DAMAGE IN SHIPMENT", and "RETURNING EQUIPMENT" information applies to equipment purchased directly from Electronic Measurements, Inc. End users receiving equipment from a third party should consult the appropriate service organization for assistance with these issues.

CERTIFICATION

All company measuring and test equipment used for final acceptance testing are traceable to primary standards certified by the National Institute of Standards and Technology.



LETHAL VOLTAGES PRESENT

All power supplies contain hazardous voltage and energy. The power supply must only be operated by qualified personnel who have read this operator's manual and are familiar with the operation, hazards and application of the power supply. Proper care and judgment must always be observed.

1. Ensure all covers are in place and securely fastened and the required grounding and cooling is supplied before connecting input AC power.
2. Proper grounding from the input AC power is required to reduce the risk of electric shock, and to comply with safety agency and code requirements.
3. Use extreme caution when connecting input AC power and only apply the input voltage specified on the rating label.
4. Use extreme caution when connecting the high voltage output cable including the separate ground connecting the supply to the load.
5. Ensure all load capacitors are completely discharged prior to connection. Never handle the output cable when the power supply is operating.
6. Always replace fuses with the same type and Volt/Amp ratings.
7. Never attempt to operate the power supply in any manner not described in this manual.
8. Never remove DANGER or WARNING labels from the power supply, and replace lost or damaged labels immediately.
9. The power supply should only be serviced by EMI factory qualified personnel.

ELECTRICAL STANDARDS

All company primary standards are either certified or are traceable to certification by the National Institute of Standards and Technology.

CLAIM FOR DAMAGE IN SHIPMENT

This instrument received comprehensive mechanical and electrical inspection before shipment. Immediately upon receipt from the carrier, and before operation, this instrument should be inspected visually for damage caused in shipment. If such inspection reveals damage in any way, a claim should be filed with the carrier. A full report of damage should be obtained by the claim agent and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. When referring to this equipment, always include the model and serial numbers.

RETURNING EQUIPMENT

Before returning any equipment to the factory, the following steps should be taken.

1. Notify Electronic Measurements, Inc., at 732-922-9300. Give us a full description of the difficulty, including the model and serial number of the unit in question. Upon receipt of this information, we will assign a Return Material Authorization number (RMA) and give you shipping instructions.

2. Equipment returned to us must be packed in a manner to reach us without damage. The shipping container must be marked with the RMA number in an area approximate to the shipping label with numbers that are easily read. All returned units that do not show the RMA number on the outside of the container will be refused.

3. For non-warranty repairs, we will submit a cost estimate for your approval prior to proceeding.

The "WARRANTY", CLAIM FOR DAMAGE IN SHIPMENT", and "RETURNING EQUIPMENT" information applies to equipment purchased directly from Electronic Measurements, Inc. End users receiving equipment from a third party should consult the appropriate service organization for assistance with these issues.

ATR POWER SUPPLY

TABLE OF CONTENTS

MANUAL REVISED ON: 01 JAN 89

SECTION I
GENERAL INFORMATION

1.1 DESCRIPTION

This manual contains operation and maintenance instruction covering the ATR power supply series manufactured by Electronic Measurement, Inc. of Neptune, New Jersey. These supplys are able to produce peak power output at three operating ranges instead of the single maximum voltage/maximum current peak output most other series regulated supplies provide.

The supply could be controlled in constant voltage or constant current. The modes of the controlled parameters are indicated by the multicolored LEDS. In addition there are related color code meter scales which designate the voltage and current range. These supplys have a carrying handle for portability and tilt mounting for convenient visibility of the front panel. A rack adaptor is also available to mount power supplies in a 5 1/4 inch high standard relay rack space.

This series of power supplys utilizes series pass, thermostatically protected transistors to accomplish the final regulation. It has a tapped transformer and a system of triac tap changers to automatically select the optimum operating range. The linear series pass system decreases the heat dissipation and improves efficiency.

A brief description of the expandable standard features of the ATR series power supplys are given below:

A. Remote Sensing- The degradation in regulation which occurs at the load due to voltage drop in the load leads is reduced by using the power supply in the remote sensing mode of operation.

B. Remote Programming- The power supply output voltage or current is controlled from a remote location by means of an external voltage source or resistance.

C. Parallel Operation- The power supply output is operated in parallel with another unit when greater output current capability is required. The parallel operation permits one "master" supply to control the other supplys.

D. Series Operation- Two power supplys are used in series when a higher output voltage is required in the constant voltage mode of operation or when greater voltage compliance is required in the constant current mode of operation.

1.2 SPECIFICATIONS

Standard AC Inputs Available

ATR 250 - 7.5 Amps - 115 Volts or 4 Amps 230 Volts
ATR 100 - 3 Amps - 115 Volts or 1.5 Amps 230 Volts

MODEL	OUTPUT RANGES			REGULATION VOLTS	REGULATION AMPS	RIPPLE RMS	RIPPLE P-P
ATR 100	0-8V 0-10A	8-18V 0-5A	18-32V 0-3A	.01% +3MV	.01% +3MA	1MV	5MV
ATR100B	0-16V 0-5A	16-36V 0-2.5A	36-64V 0-1.5A	.01% +6MV	.01% +3MA	2MV	10MV
ATR100C	0-32V 0-2.4A	32-64V 0-1.3A	64-128V 0-0.75A	.01% +10MV	.01% +3MA	3MV	15MV
ATR250	0-8V 0-25A	8-18V 0-13A	18-32V 0-7A	.01% +3MV	.01% +7MA	1MV	5MV
ATR250B	0-16V 0-12A	16-36V 0-6A	36-64V 0-3.5A	.01% +6MV	.01% +7MA	2MV	10MV
ATR250C	0-32V 0-6A	32-64V 0-3A	64-128V 0-1.75A	.01% +10MV	.01% +7MA	3MV	15MV

Stability:

.05% + 10 Millivolts after 30 minutes warm-up.

Temperature Coefficient: .02% + 400 Microvolts

Operating Temperature: 0 C - 40 C

Storage Temperature: -40 C to +85 C

Load Transient Recovery Time:

For step change of 50% to 100% and 100% to 50%.

MODEL	OUTPUT RECOVERS TO WITHIN: MVolts	USecs.
ATR100 ATR250	15	50
ATR100B ATR250B	30	50
ATR100C ATR250C	60	50

Resolution:

The voltage and current controls are 10 turn potentiometers.

MODEL	"OVERVOLTAGE TRIP POINTS" Min. Volts or less(-)	Max Volts or more (+)
ATR100 ATR250	3 volts	35 volts
ATR100B ATR250B	7 volts	70 volts
ATR100C ATR250C	10 volts	140 volts

Cooling:

All units are fan cooled and thermostatically protected. Air enters sides and top of the unit and exits at the rear. Consequently no heat will be applied to other equipment above or below the power supply.

Size:

ATR Model	High	Width	Depth
100/100B 100C	5.75"	4.125"	18.25"
250/250B 250C	5.75"	8.500"	18.25"

Finish:

Front panel and top cover are painted light blue the markings are black.

Mounting:

The supply can be used two ways: Set on the bench and used as a laboratory supply or mounted in a 19" relay rack. When used in a rack two rack adaptors are available. One rack adaptor provides an angle iron support for the front and a cross beam to support the rear. The other rack adaptor has provisions to mount chassis slides. Before rack mounting the feet and handle must be removed. They only have to be unscrewed from the chassis since the holes are tapped.

SECTION II
OPERATING INSTRUCTIONS

2.1 PREPARATION FOR USE

Unpacking

Carefully unpack unit saving all packaging material and enclosures. Before shipment, this instrument was inspected and found to be free of mechanical and electrical defects. When the unit is unpacked, inspected for broken knobs or connectors, that the external surface is not scratched or dented, meter faces are not damaged and that all controls move freely. Any external damage may be an indication of internal problems.

2.2 GENERAL OPERATION

The front panel surface contains all the controls and indicators necessary to operate the supply in its normal mode.

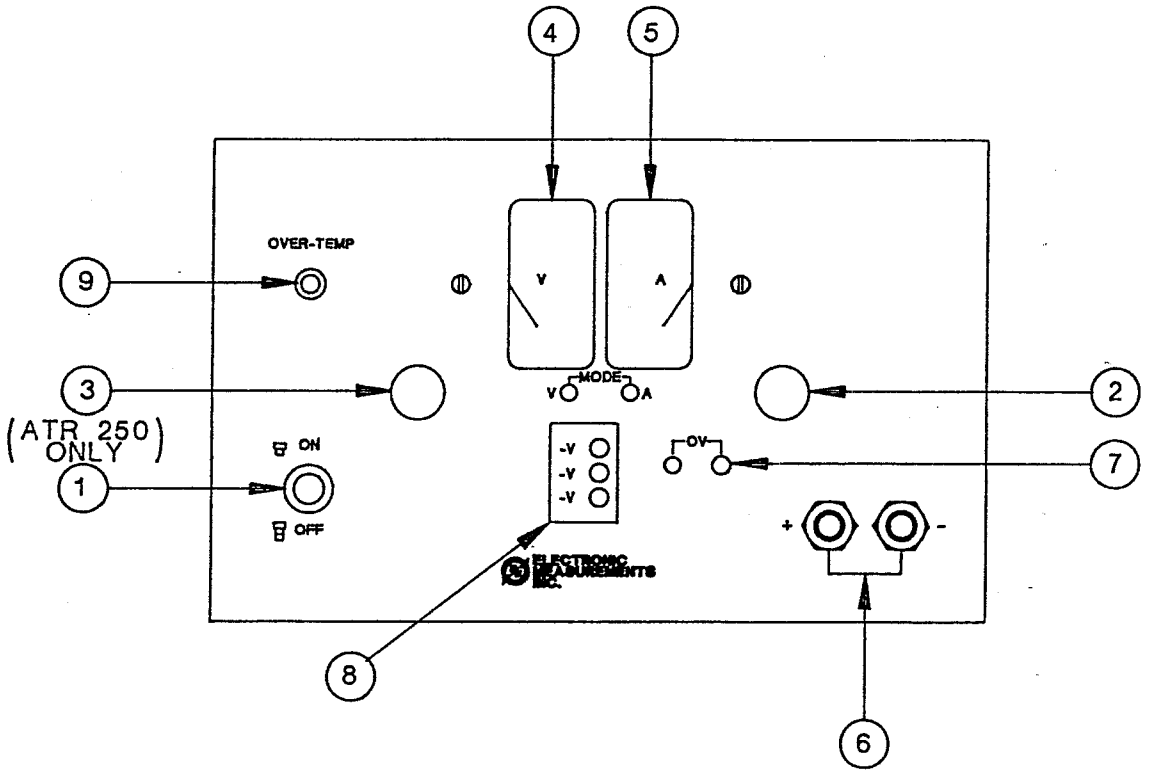


FIG. A

The following checkout procedure describes the use of the front panel control and indicators Figure A and insures that the supply is operational. This preliminary check is done without a load connected to the power supply.

1. Check that the barrier jumper straps are as shown in Figure 1, for normal mode.

2. Set all controls to full counter clockwise.

3. Turn the circuit breaker on/off switch to off.

4. Connect the supply to a suitable source of ac voltage.

5. Turn the CIRCUIT BREAKER (1) on/off switch to "on". The fan should start immediately. There should be no output voltage or current.

6. Advance the CURRENT CONTROL(2) one turn clockwise and slowly advance the VOLTAGE CONTROL(3). The DC VOLTAGE METER(4) should deflect smoothly from zero to the rated voltage of the supply as this control is advanced to full clockwise.

7. Return all controls completely counter clockwise and turn supply off.

8. Connect a short circuit to the power output terminal block (TB1-2 & 4) on the rear panel or the front terminals (6).

9. Turn on/off switch to "on".

10. Advance VOLTAGE CONTROL one-half turn and slowly advance CURRENT CONTROL. The DC CURRENT METER(5) should deflect smoothly from zero to the rated current of the supply as this control is advanced completely clockwise. The LED indicators should flip from maximum voltage level (Yellow LED) to the minimum level (Red LED). The middle range should be skipped (Green LED).

11. Return all controls completely counter-clockwise and turn supply off. Disconnect short circuit.

NOTE: Only the ATR 250 has a over-temperature LED (9). It will only be lit when a overtemperature fault occurs.

All supplys are equipped with overvoltage circuitry. A recessed screwdriver adjustment control sets the overvoltage trip point.

NOTE: All overvoltage circuitry has been properly adjusted to their respective unit before leaving the factory.

For trip levels less than the maximum output voltage or to check the overvoltage circuitry simply a. set the potentiometer fully clockwise, b. adjust the power supply output voltage to the desired trip level, c. slowly adjust the potentiometer counterclockwise until overvoltage is tripped.

Turning the unit off and then on again will reset the OVP provided the output is not adjusted above the trip point. The overvoltage range is: SEE SECTION 1.1 DESCRIPTION "OVERVOLTAGE TRIP POINTS"

If any of the above events does not occur, the supply is defective and must not be operated. Depending on circumstances, either warranty service or troubleshooting as described elsewhere in this manual is required.

2.4 MODES OF OPERATION

The following paragraphs discuss the various standard and optional modes of operation built into the design of the power supply.

2.4.1 NORMAL MODE (Fig. 1)

When shipped from the factory, each supply is configured for local sensing and internal adjustment control. Normal mode of operation is usually used in most applications.

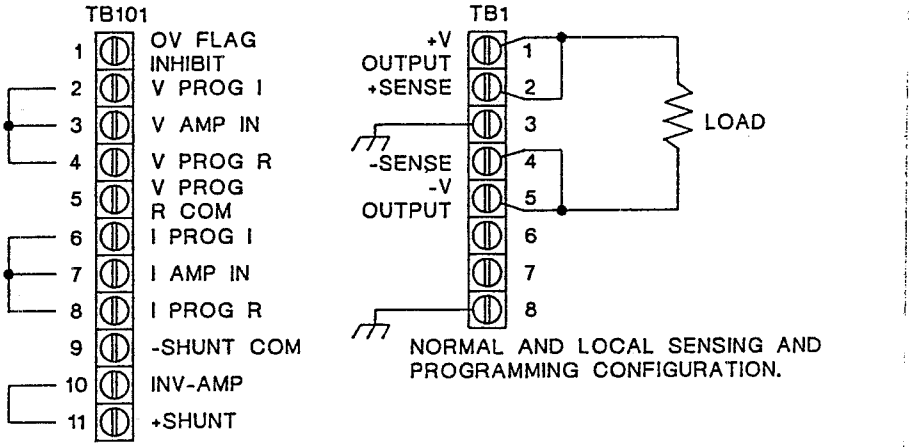


FIG. 1

Local Sensing : Connect jumpers between -

TB1 +V OUTPUT & +SEN
TB1 -V OUTPUT & -SEN

This connects the point of voltage sensing of the internal control circuitry to power output terminals.

Internal or local Voltage and Current Control:

Connect jumpers between -

TB101 2-4
TB101 6-8

This connects the programming current source to the sensing amplifier input and the internal programming resistance.

2.4.2 REMOTE SENSING (Figure 2)

In applications where the effect of the voltage drop (IR) of the dc load wires would adversely effect the performance of the load it is possible to sense the voltage at the load instead of the output terminals of the power supply. Remote sensing will therefore remove the effect of changes in load current through the power distribution system. Permissible load line drop is 0.25 volts.

Connecting Load

Each pair of connecting wires must be as short as possible and twisted or shielded if strong ac or RF fields are present to reduce noise pickup. If a shielded pair is used, connect one end of the shield to ground at the power supply and leave the other end disconnected.

1. Disconnect barrier jumpers: TB1 +V OUTPUT & +SEN
   TB1 -V OUTPUT & -SEN

2. Connect the positive point of load to +SEN.

3. Connect the negative point of load to -SEN.

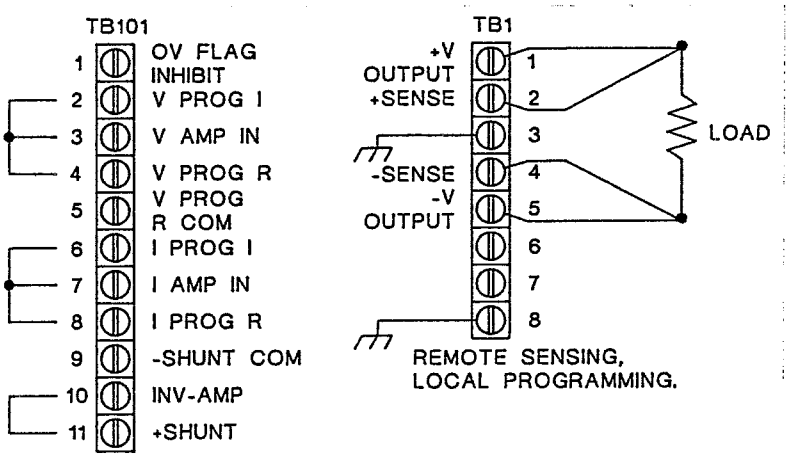


FIG. 2

2.4.3 REMOTE PROGRAMMING

The supply may be operated in a remotely programmed mode (externally controlled) by the use of external resistance, voltage or current control.

NOTE: The power supply will safely shut down if it is programmed to voltage levels greater than the over voltage set point.

2.4.3.1 REMOTE PROGRAMMING, EXTERNAL RESISTANCE (Fig. 3)

Voltage Channel

1. Disconnect barrier jumper between TB101-3 and 4.

2. Connect the external programming resistance between terminals TB101-2, 3 and 5.

The programming resistance is 5000 ohms for full rated voltage output. For any voltage output within the range of the supply:

Prog (OHMS) = 5000 x Desired Voltage/Full Rated Output Voltage

Current Channel

1. Disconnect barrier jumper between TB101-7 and 8.

2. Connect programming resistance between terminal 6, 7 and terminal 9.

The programming resistance for full rated output is 1000 ohms. For any current within the range of the supply:

Prog (OHMS) = 1000 x Desired Current/Full Rated Current

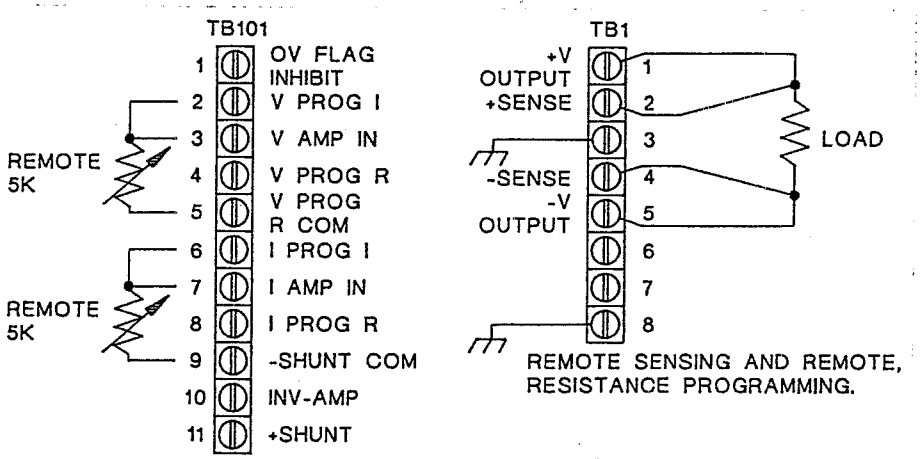


FIG. 3

2.4.3.2 REMOTE PROGRAMMING, EXTERNAL VOLTAGE (Fig. 4)

Voltage Channel

A programming source of 0 to 5 volts drives the supply from zero to full rated output voltage. This source must float with respect to the output of the supply unless local sensing is used.

1. Remove barrier jumpers between 2,3, and 4 on TB101.

2. Connect the source of voltage programming between TB101 terminal 3 (positive) and terminal 5 (negative).

REMOTE SENSING

When Remote Sensing is used, certain combinations of R&C at the load can resonate and add additional feedback phase shift, which will cause the internal feedback loop to oscillate. For an example, when the inductance, associated with long leads 15-20 feet, resonates with a 10-20 mfd load bypass capacitor an additional 90 degrees of phase shift occurs causing an oscillation at 19KHz. Adding 1000mfd capacitors at the power supply between +V and +S, and also between -V and -S will, in most cases, stop any oscillation and still not deteriorate the transient response. (SEE FIGURE BELOW)

Any time remote sensing is used the installation should be tested under all load combinations. Should any problems occur, please consult the factory for assistance.

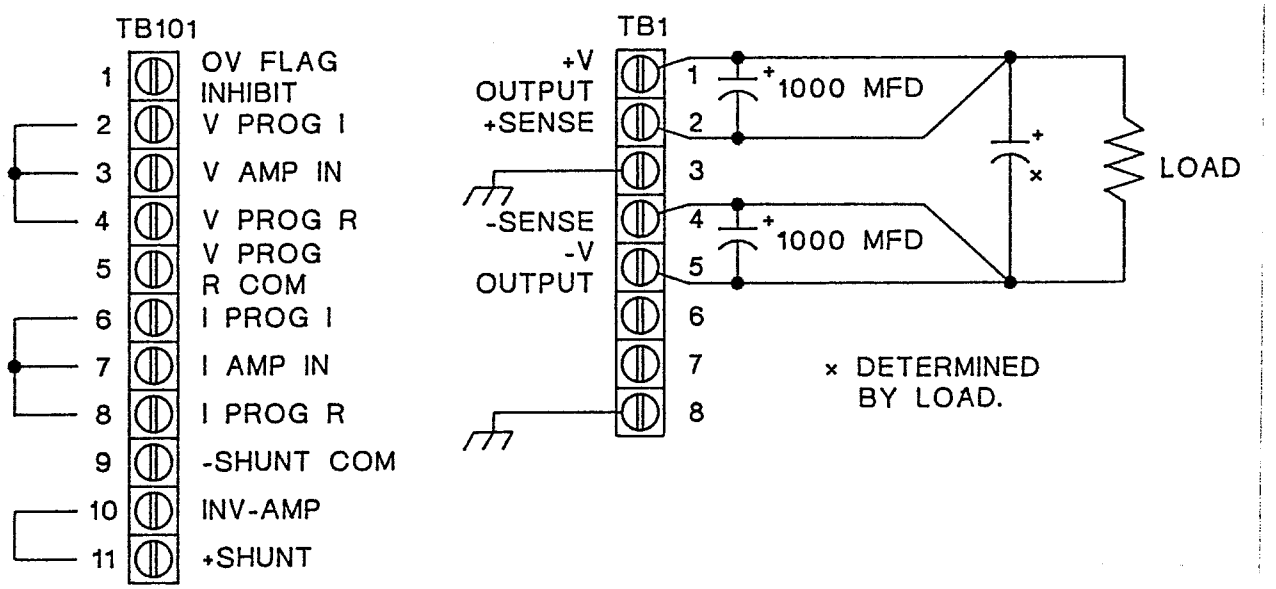


FIG. 2A

Current Channel

The programming signal for zero to full output current is 0 to 1.0 volt. A signal from a higher potential source may be attentuated to this 1 volt level by a resistor divider. For best performance, the source impedance of this divider should not exceed 1000 ohms.

1. Remove barrier jumpers between 6, 7, and 8 on TB101.

2. Connect the programming source between TB101 terminal 7 (positive) and terminal 9 (negative). The programming signal of zero to 1V will program the set from 0 to full current output.

NOTE: The negative end of the voltage and current channel programming terminals are not common.

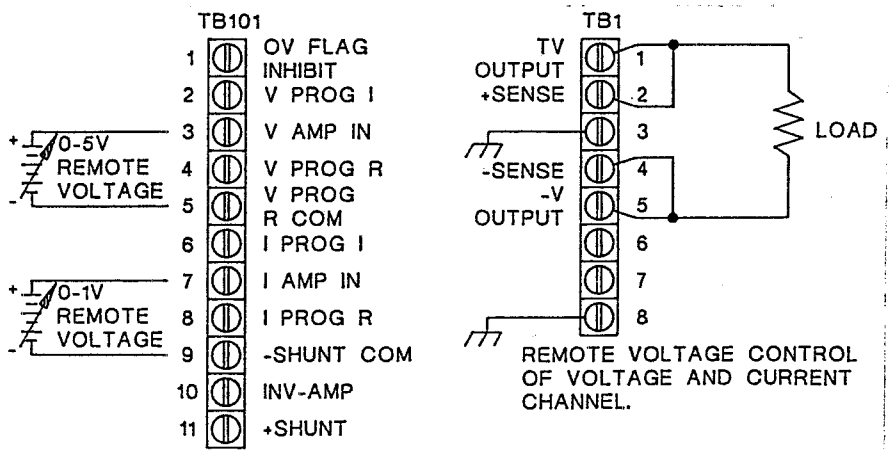


FIG. 4

2.4.3.3 REMOTE PROGRAMMING, EXTERNAL CURRENT

Voltage Channel

A current of 0 to 1Ma programs the supply from zero to full voltage output.

1. Remove the barrier jumper between 2 and 3 on TB101.

2. Connect the positive terminal of the current source to terminal 3, 4 and the negative terminal to terminal 5.

3. The voltage adjust control must be COMPLETELY CLOCKWISE.

Current Channel

1. Remove the barrier jumper between 6 and 7 on TB101. A current of 0 to 1Ma programs the supply from zero to full current output.

2. Connect the positive terminal of the current source to TB101 terminal 7, 8 and the negative to terminal 9.

3. The current adjust control must be COMPLETELY CLOCKWISE.

2.4.4 PARALLEL OPERATION

The ATR Series Power Supply are equipped with provisions for parallel operation.

2.4.4.1 PARALLEL OPERATION - DIRECT CONNECTION

The simplest parallel connection is that of attaching the positive and negative terminal to their respective load points. The following procedure should then be followed.

1. Set all supplies to the appropriate output voltage (open circuit).

2. Turn supplies off and connect load.

3. Set the current limit to maximum.

4. Turn on supplies one at a time until the sum of the supply current capability exceeds the amount of load current.

5. Balance the current of each unit for equality.

In order to prevent a unit from carrying an excessive amount of load current due to an increase in voltage, set the current limit above the running current.

2.4.4.2 PARALLEL OPERATION - MASTER/SLAVE (Fig. 5)

In this configuration, the power supply designated "The Master", is used to control the voltage and current operation of all other supplies, referred to as slaves. It is not recommended to operate more than three ATR power supplys without thorough evaluation from the Engineering Department of Electronic Measurement Inc.. This will help avoid any failures in the application because of instability of the power supplies.

NOTE: The output leads from each power supply must be of equal length to the load point to assure equal sharing.

The following procedure must be followed to use this configuration:

ALL Slaves:

1. On TB101, remove barrier jumpers 10 to 11 and also 6, 7 and 8.

2. Connect a barrier jumper between 7 and 9.

Connections:

3. Connect 9 of the "master" to 10 of each "slave".

4. Adjust the "master" for the required output voltage or current.

2.4.5 SERIES OPERATION

Two or more may be operated in series by connecting the negative of one supply to the positive of another. Each unit adjustment functions independently and the output is the sum of each unit output. The voltage at any output terminal must never exceed 600V with respect to chassis ground.

NOTE: Consult Electronic Measurements, Inc. Engineering Department for series operation of more than two supplies.

2.4.5.1 SERIES OPERATION - MASTER/SLAVE (Fig. 6)

The "master" unit becomes the reference for the "slave" unit.

1. Disconnect barrier jumpers between TB101 2,3 and 4 on the "slave".

2. Connect barrier jumper between TB101 3 and 4 of the "slave".

3. Connect the +V OUTPUT of the "master" to the load and through a reference 59K resistor to TB101 3 and 4 of the "slave".

4. Connect the -V OUTPUT of the " master" to the +V OUTPUT of the "slave".

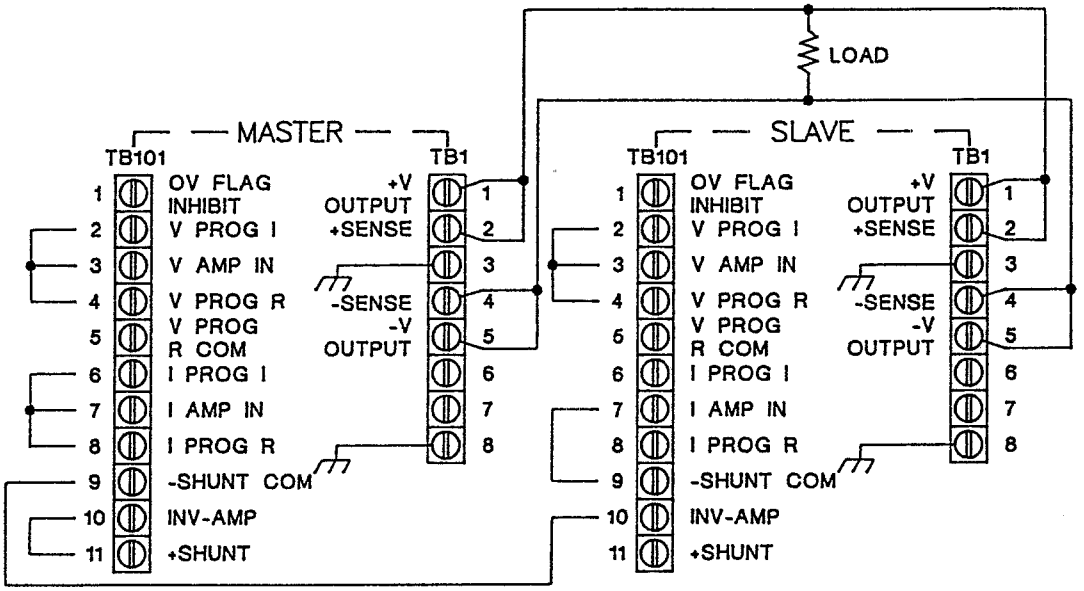
5. Turn "slave" voltage and current front panel controls to maximum.

6. Turn " master" unit controls completely clockwise.

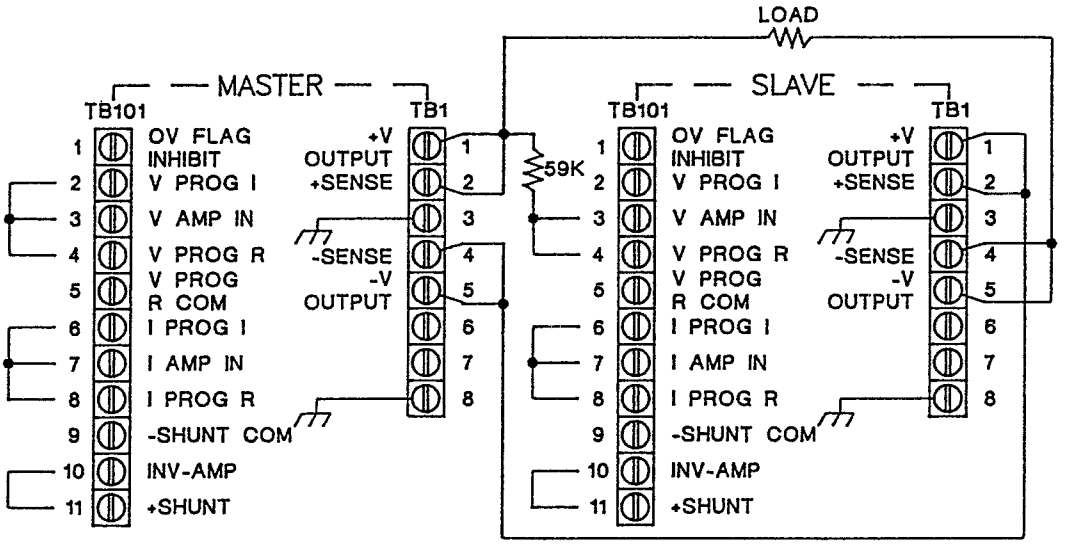
7. Turn on the "slave" then the "master".
   sense of master to the jumpered links TB101-3 and 4 of the slave.

   4. Slave voltage and current controls are turned to maximum, with master current control turned up.

   5. The voltage control forces the slave to track. (see fig. 6 - Example is 2 times 32 volt units)



PARALLEL OPERATION-MASTER/SLAVE
FIG. 5



SERIES OPERATION-MASTER/SLAVE
FIG. 6

SECTION III
PRINCIPLES OF OPERATION

3.1 GENERAL

The ATR Series Power Supplys yield a constant output voltage and utilizes a linear series pass system which is triac controlled. The series pass regulators eliminate both line harmonic ripple and the slower dc variations proportional to line changes.

This section discusses the basic theory of power flow and the operation of the A100 and A200 Printed Circuit Boards which is essential ly the signal flow. If used as a supplement to the maintenance data provided in Section IV, it will aid in isolation of unit faults. Refer Figure 7, the power and signal flow plus the following schematics:

#01-465-000 for the ATR 100,
#01-465-002 for the ATR 100B,
#01-465-014 for the ATR 100C,
#01-465-001 for the ATR 250,
#01-465-013 for the ATR 250B,
#01-465-015 for the ATR 250C

3.2 POWER FLOW CIRCUITRY

Explanation of the power flow is as follows: At turn-on a single phase ac input passes through circuit breaker CB1 to transformer, T1. The voltage from the transformer secondary is converted to dc by two bridge rectifiers (CR1 + CR2) which operate in conjunction with triacs Q1 and Q2. This dc voltage is filtered by a high value electolytic capacitor C1 and C2 (were applicable). The output is kept constant by the series pass transistor system which consists of a number of paralleled transistors (or F.E.T.'s) acting as a variable resistance device.

As the input rises or falls, the effective resistance of the series element increases or decreases so that it, rather than the output load, absorbs the input by the negative-feedback loop composed of the resistor sampling shunt, the difference amplifier and voltage/ current amplifier-level shifter element.

The linear amplifier section is thermostatically protected by TS1 or TS301 (depending upon the unit) which is located on the A300 assembly . If this section overheats the normally open thermostat closes forcing shutdown of the series regulators output.

3.3 A100 PRINTED CIRCUIT BOARD

The A100 Board contains the voltage and current comparators, precise current reference, and depending on the unit the series pass transistors.

There is automatic switching between the voltage and current comparator amplifiers. Either the voltage or the current channel are in operation. They work in the following manner:

Voltage Channel

When the attentuated output at pin 2 of the voltage comparator IC3B is higher than the reference point, the output will be positive and is in control. The operation of the voltage channel is as follows: Q107 generates a stable 1 Ma. current which flows through the voltage control R5. This 1 MA will produce a voltage drop across R5 which is buffered in IC3A and fed to one input of the voltage channel comparator IC3B. The positive output voltage is attenuated to 5 volts maximum and fed into the other side of the voltage channel comparator. A feedback circuit in the loop causes the output voltage to be adjusted until the differential input to the comparator is zero. Therefore the output is proportional to the voltage across R5 the voltage control.

Current Channel

The current channel will be in control when the voltage across the shunt R301 and the voltage from current control R4 cause the output of IC103C pin 4 to be higher positive then the output of the voltage channel. The current channel operates in the following manner: One side of the current channel comparator IC3C - pin 6 is connected to the output negative terminal. The other input is the sum of two voltages, the potential across the shunt R301 and the 1 Ma potential across R4 (this is from the reference). A feedback circuit in the loop drives the output level to the point of making these two voltages equal. This causes the voltage at pin 5 to be zero letting the negative voltage at pin 6 to be predominate producing a positive output voltage at pin 4.

If both comparator outputs are positive simultaneously, this will halt the output of the linear amplifier section.

Also on the A100 board is the control circuitry power supply. The ac is rectified by CR101, filtered by C101 and C102 and regulated by IC101 and IC102 which are + and - 15 volt regulators.

3.4 A200 PRINTED CIRCUIT BOARD

The A200 printed circuit board contains the overvoltage protection (OVP), voltage and current meter calibration resistors, and the automatic range control circuitry.

The OVP circuit consists of IC205 (MC3423U), and two silicon controlled rectifiers (SCR), Q201 and Q3 or Q303 (depending upon the unit. IC205 compares the input at pin 2 to an internal reference. When pin 2 is above the reference point, Q201 will be triggered. This will shut down the linear amplifier chain and activate Q3. The Q3 throws a fast-acting short circuit across the output terminals which quickly removes any overvoltage. The overvoltage fault indicator, DS206 light-emitting diode also activates when Q201 is triggered.

The automatic range control circuit works in the following manner:

Triacs Q1 and Q2 manipulate the several voltage ranges produced by transformer T1. These triacs are controlled by two opto-coupler/ isolators IC201 and IC202 which are located on the A200 board. The isolators are activated by NAND circuit logic from IC204 which is a voltage quad comparator. The voltage is sampled across the shunt R301 and compared to a reference set by potentiometer R228 and R229. (Refer to Figure 8 - NAND circuit logic and truth table.)

The following chart shows the state of this control circuit at different voltage levels: ALL MODELS

VOLTAGE output level	Q1	Q2	IC201	IC202	ACTIVATE TAPS T1
LOW	OFF	OFF	OFF	OFF	TAPS 9 and 10
MIDDLE	ON	OFF	OFF	ON	TAPS 9 thru 14
HIGH	ON	ON	ON	ON	TAPS 11 thru 14

SECTION IV
MAINTENANCE AND TROUBLESHOOTING

4.1 GENERAL

Reviewing the Theory of Operation would be helpful before trouble shooting the supply. The following test equipment is recommended: Source of ac power, means of loading the supply, an oscilloscope or digital multimeter.

The chart that follows is a trouble shooting guide that should aid in finding some of the operation problems in the supply.

WARNING: When servicing supply, dangerous voltage levels exist. Be especially careful of person and equipment when measuring primary circuitry since this is at line potential.

4.2 TROUBLE SHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE	REMEDY
1. Unit shuts off immediately when turned on.	Q1 - Q3 may be shorted. (ATR 250 Q305 - Q310)	Replace
	CR1 or CR2 may be may be shorted. (ATR 250 - CR301 or CR302)	Replace
	C1 shorted. (ATR 250 - C1 and C2)	Replace
	Open Control	Replace Voltage Control.
	IC201 or IC202 could be shorted.	To Check: 1. Unplug P202 2. Reapply power. 3. Unit stays on. 4. Replace IC201 or IC202.
2. Unit will not turn ON.	Q107 or Q108 OPEN Q106 on "C" version units	Replace.
	Q105 OPEN on ATR100 &100B and ATR 250 & 250B. Q105 shorted on "C" version.	Replace.

3. OVP indicator is on.	IC205 is defective	1. Turn unit off 2. Remove IC205 3. Reapply power unit is operating properly. 4. Replace IC205. 5. Unit is out of control.
	Q106 could be shorted on ATR 100 & 100B and ATR 250 & 250B.	Replace
4. Low output but supply seems to be functioning	IC103 could be defective.	Replace
	Q107 or Q108 could be defective. Q106 on "C" version.	Check for 1 volt across R4 and 5 volts across R5.
	IC201 or IC201 could be defective.	Replace
	IC101 or IC102 could be defective.	Check for plus and minus 15 volts.
5. One or more voltage levels inoperable and led is out.	Led is open	Replace
	IC201 or IC202 is defective.	Replace
6. Unit stays in one range does not switch.	Led is shorted.	Replace
7. Unit is oscillating.	Capacitors C105-C107 could be defective.	Replace
8. Unit has high ripple.	C1 and C2(when applicable) is defective.	Replace
	C301 is defective	Replace

4.3 CALIBRATION

4.3.1 PROGRAMMING CALIBRATION

Resistors R122 and R124 are to provide approximately a 8% variation of the voltage and current channel programming current. Their adjustment depends on the requirements of the user. In local programming mode, the adjustment should allow full output at or near maximum potentiometer rotation. For external resistance programming, they may be adjusted for an exact programming constant.

4.3.2 ZERO OFFSET

When both voltage and current controls are fully counterclockwise the power output is nearly inhibited. At the factory, R154 is selected in test to slightly suppress output current into a short circuit.

4.3.3 VOLTAGE CALIBRATION

This calibration is done without a load on the power supply.

1. Connect digital multimeter to the + and - output sense leads.

2. Set the voltage control (R5) to maximum clockwise.

3. Adjust R122 until the digital multimeter reads 32 volts (64 volts on "B" version & 128 volts on "C" version).

LED LIT	VOLTAGE PRESENT AT FILTERING CAP C1-2 ATR 100 & ATR 250	VOLTAGE PRESENT AT FILTERING CAP C1-2 ATR100B & ATR250B	VOLTAGE PRESENT AT FILTERING CAP C1-2 ATR100C & ATR250C
YELLOW	45-50 volts DC	75-90 volts DC	165-180 volts DC
GREEN	27-29 volts DC	45-50 volts DC	70-85 volts DC
RED	16-18 volts DC	26-28 volts DC	45-55 volts DC

4.3.4 CURRENT CALIBRATION

This calibration is done without a load on the power supply.

1. Connect a short across the + and - terminals on the front panel.

2. Set current control (R4) to maximum clockwise.

3. Connect meter to sense leads of shunt (E304 and 305) (E10 & E13).

4. Adjust R124 (R139 on C version), for 1 volt across the shunt.

5. If the ammeter does not read maximum amperes when the shunt reads 1 volt, adjust R230 on the A200 Board.

4.3.5 AUTOMATIC RANGE CALIBRATION

RESISTIVE LOAD VALUE

LOAD NO.	ATR 100 VOLT	ATR 100 AMPS	ATR 100 RESISTOR	ATR 250 VOLT	ATR 250 AMPS	ATR 250 RESISTOR
L1	8	10	.8	8	25	.32
L2	18	5	3.6/3.27	18	12.5	1.4/1.38
L3	32	3	10.7/9.1	32	7.5	4.27/4

LOAD NO.	ATR 100B VOLT	ATR 100B AMPS	ATR 100B RESISTOR	ATR 250B VOLT	ATR 250B AMPS	ATR 250B RESISTOR
L1	16	5	3.2	16	12	1.33/1.2
L2	36	2.5	14.4/13	36	6	6.0/5.5
L3	64	1.5	42.6/36.4	64	3.5	18.3/16.6

LOAD NO.	ATR 100C VOLT	ATR 100C AMPS	ATR 100C RESISTOR	ATR 250C VOLT	ATR 250C AMPS	ATR 250C RESISTOR
L1	32	2.5	12.8/11.6	32	6	5.4/4.9
L2	64	1.3	50/45.5	64	3	21.4/19.5
L3	128	.75	171/155	128	1.75	73.2/66.5

1. Connect maximum level of resistive load to the output terminal of the power supply.(Consult Resistive Load Chart for the proper values at each range. A variable load would be handy when doing this test.)

2. Adjust R228 to have yellow led ON at proper maximum current, on the highest voltage range (Load #3).

When the load resistor is lowered and current increased 10-15% above designated range, yellow light will go OFF. (See Resistor Table)

3. Adjust R229 to have green led ON at maximum current for this middle voltage range and OFF when unit current is increased by the lower value (Load #2) in the Resistor Table.

4. Adjust the load so voltage is below 5 volts. Adjust R224 which is the minimum voltage adjustment to skip the mid-volt range as the load is varied from minimum to maximum current range of the unit.

5. Turn unit off and turn voltage and current controls completely CCW.

6. Remove load.

4.3.6 OVERVOLTAGE ADJUSTMENT

1. Adjust OVP to completely CCW position. (This is a recessed adjustment through the front panel.

2. Turn unit on.

3. Slowly turn voltage up. It should not exceed Minimum volts before tripping. (See Trip Table for each Model Number)

4. Turn unit off.

5. Adjust OVP to a completely CW position.

6. Turn unit on and set supply voltage to Middle voltage range.

7. Slowly start turning OVP CCW until supply trips.

8. Turn unit off.

9. Adjust OVP to a completely CW position.

10. Turn unit on and adjust voltage to maximum volts.

11. Slowly start turning OVP CCw unit supply trips at max. setting.

12. Turn supply off and turn OVP completely CW. Turn the voltage control in the completely CCW position.

OVP TRIP TABLE

MODEL	MINIMUM VOLTS OR LESS (-)
ATR 100 ATR 250	3 VOLTS
ATR 100B ATR 250B	7 VOLTS
ATR 100C ATR 250C	10 VOLTS

SECTION V
PARTS LIST

5.1 GENERAL

This section contains a list of replacement parts for the ATR series power supply and names of typical manufacturers of such parts.

5.2 LIST OF MANUFACTURERS

The following list contains the key to the abbreviations in the Parts List, company name and address.

ABV	COMPANY NAME	COMPANY ADDRESS
AB	Allen Bradley	201 South 2nd Street Milwaukee, WI 53204
AMP	Amphenol	Distribution Marketing 2875 S. 25th Avenue Boardway, IL 60153
AP	Airpax	North American Phillips Cambridge Division Cambridge, MD 21613
AVX	AVX Corporation	Box 867 Myrtle Beach, SC 29577
BBC	Brown Boveri Corporation	500 Hadley Road S. Plainfield, NJ 07080
BO	Bourns	Trimpot Products Division 12 Columbia Avenue Riverside, CA 92507
BK	Beckman Instruments, Inc.	Helipot Division 2500 Harbon Boulevard Fullerton, CA 92507
BU	Bussman Manufacturing	502 Earth City Lane P.O. Box 14460 St. Louis, Missouri 63178
CDE	Cornell Dublier Elec. Co.	150 Avenue "L" Newark, NJ 07105
CR	Carlingswitch	505 New Park Place P.O. Box E West Hartford, CT 06110

ABV	COMPANY NAME	COMPANY ADDRESS
MO	Motorola, Inc.	Industrial Drive Riviera Beach, FL 33403
MX	Molex	2222 Wellington Court Lisle, IL 60532
NS	National Semiconductor	2900 Semiconductor Drive Santa Clara, CA 95051
PA	Pamotor	770 Airport Boulevard Bulingame, CA 94010
P+B	Potter and Brumfield	200 Richland Creek Drive Princeton, IN 47671
RCA	RCA	67 Walnut Avenue Clark, NJ 07066
RT	EG&G Rotron	Commercial Cooling Prod Shokan, NY 12481
SA	Sangamo Capacitor Division	Sangamo Weston, Inc. P.O. Box 128 Pickens, SC 29671
SI	Siemens Corporation	Colorado Components Div. 800 Hoyt Street Broomfield, CO 80020
SM	HH Smith	812 Snodiker Avenue Brooklyn, NY 11207
SP	Sprague Products Company	60 Turner Street Walthan, MA 02154
TD	Therm-O-Disc Incorporated	1320 South Main Street Mansfield, Ohio 44907
TI	Texas Instruments, Inc.	6000 Denton Drive P.O. Box 5012 M/S:366 Dallas, TX 75222
TO	Torin Information Systems	Franklin Drive Torrington, CT 06790
WT	Weston	

ABV	COMPANY NAME	COMPANY ADDRESS
CTS	CTS Keene, Incorporated	3230 Riverside Avenue Paso Robles, CA 93446
CU	Curtis Industries, Inc.	8000 West Tower Avenue Milwaukee, WI 53223
DA	Dale Electronic, Inc	Box 758 Columbus, NE 68601
EC	Electronic Concepts	P.O. Box 627 Eatontown, NJ 07724
EDI	Electronic Devices Inc.	21 Grayoak Avenue Yonkers, NY 10710
EL	Elna America Incorporated	Victoria Business Park 153E Savarona Way Carson, CA 90746
EM	Electronic Measurments, Inc	405 Essex Road Neptune, NJ 07753
EP	Empro Manufacturing Co, Inc	Box 26064 Indianapolis, IN 46226
ERO	Roederstein	2100 West Front Street Stateville, NC 28677
ETI	Electro Techniques, Inc.	215 Via Del Norte Oceanside, CA 92054
GE	General Electric	200 Main Street Clifton, NJ 07014
GO	Gould, Inc.	Control & System Division Springhouse, PA 19477
ICC	International Components Co	105 Maxess Road Melville, NJ 11746
IR	International Rectifier	233 Kansas Street El Sequndo, CA 90245
KE	Kemet, Union Carbide, Inc.	P.O. Box 5928
LC	Lee Craft Manufacturing	21-02 44th Road LI City, NY 11101
MA	Mallory Distribution Prod.	Box 1284 Indianapolis, IN 46206
ME	Mepco/Electra	P.O. Box 760 Mineral Wells, TX 76067

5.3 RECOMMENDED SPARE PARTS LIST

NOTE: All components with multiple listings vary with input of units. Check schematic charts with variation listings for proper values.

CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
A100	PC Assembly ATR 100	20107000		EM
	PC Assembly ATR 100B	20107001		EM
	PC Assembly ATR 250	20165000		EM
A200	PC Assembly ATR 100	20108000		EM
	PC Assembly ATR 100B	20108001		EM
	PC Assembly ATR 250	20167000		EM
R4	POT 1K 10T 2W	67055002	850-10T-1K	ETI
R5	POT 5K 10T 2W	67055007	850-10T-5K	ETI
B1	Fan 115V 3.12" Sq.	51001001	A30473-10	TO
	Fan 115V 4 11/16" Sq	51006002	027119	RT
C1/2	Elec Cap 60KMfd 50V	54045004	CGS603U050X4C/F	MA
	Elec Cap 21KMfd 100V	54047001	CGS2134100X4C/F	MA
CB1	Circuit Brkr. 1P 3A	56053002	PP11-2-3.00A	AP
	Ckt. Brkr. 1P 7.5A	56053004	PP11-2-7.50A	AP
	Ckt. Brkr. 3P 1.5A	56054002	PP21-2-1.5A	AP
	Ckt. Brkr. 2P 4A	56054003	PP21-2-4.00A	AP
Q1/2	Triac 25A 600V	53008001	SC260M	GE
Q3	SCR 35A 600V	61001005	C35M	GE
Q101-3	Transistor	62005009	2N3055	RCA

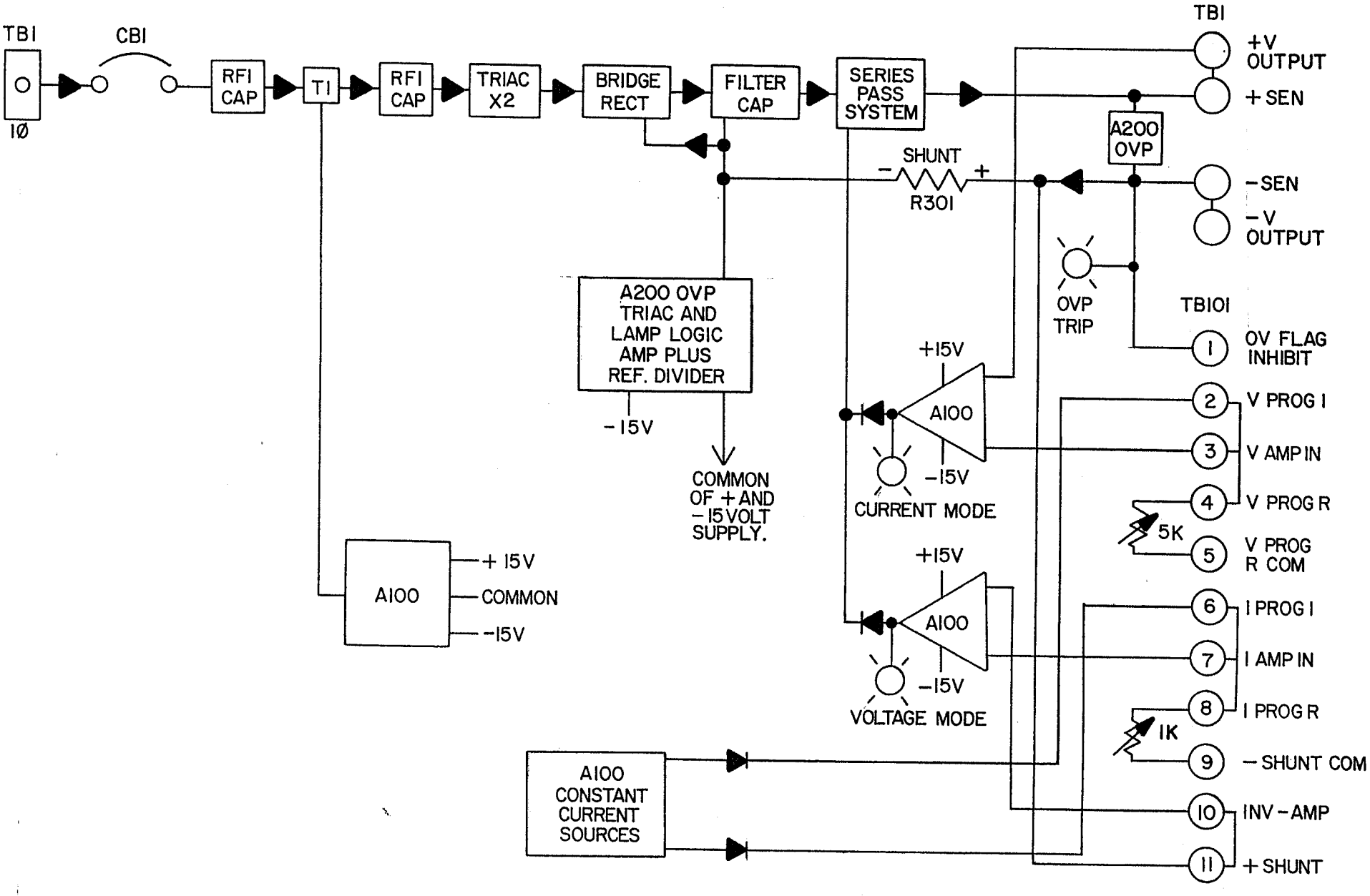


FIG. 7

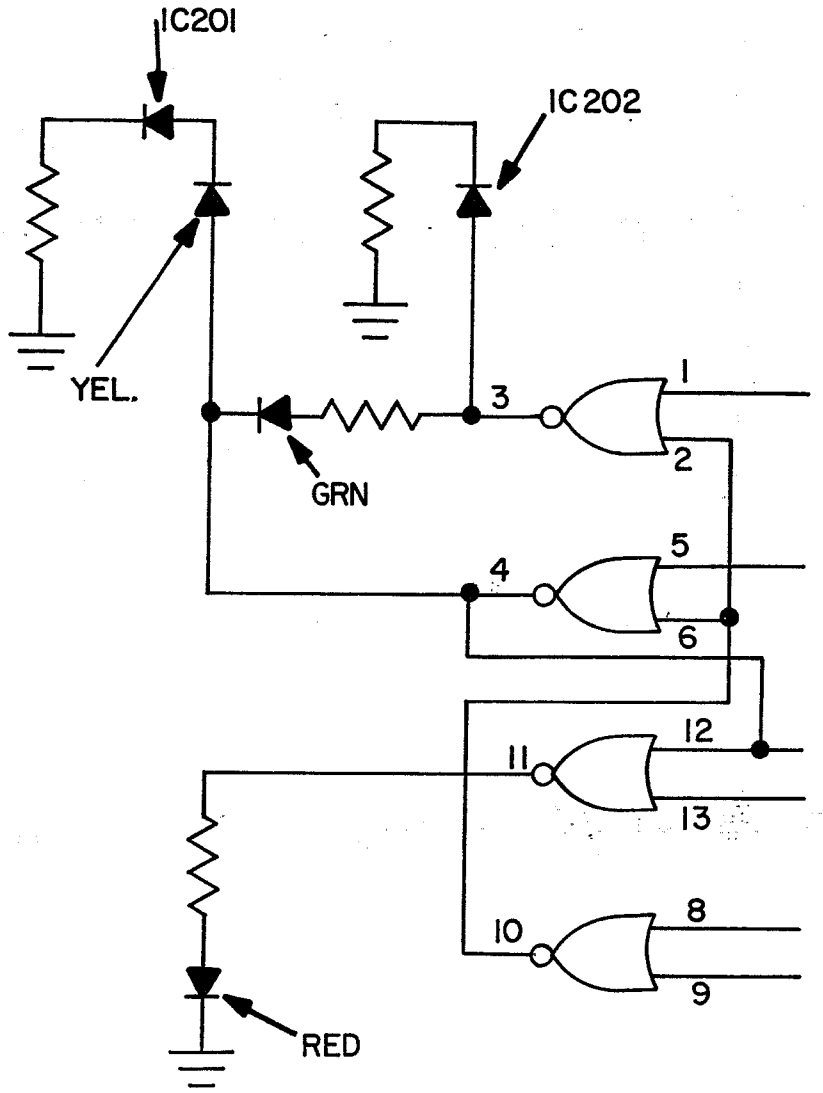
83-465-001

CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
	Transistor	62005017	2N3773	RCA
Q104	Transistor	62004001	2N3740	RCA
	Transistor	62004006	2N6420	RCA
Q301,2	Triac 200V 40A Stud	63008002	2N5443	MO
Q303	SCR 35A 600V	61001005	C35M 25S-SL	GE
Q304,5 6,8,9,10	Transistor TO66	62004003	2N3771	RCA
Q307	Transistor TO3	62005013	MJ2955	MO
M1	Basic I Meter	66062000	7511	WT
	Meter 0-5A	66062003	7511	WT
	Meter 0-10A	66062001	7511	WT
	Meter 0-25A	66062002	7511	WT
M2	Basic V Meter	66065000	7511	WT
	Meter 0-36V	66065001	7511	WT
	Meter 0-72V	66065002	7511	WT

5.4 ATR PARTS LIST

NOTE: All components with multiple listings vary with input of units. Check schematic charts with variation listings for proper values.

CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
R1	1K 2W 5% CARBON	67004013	HB1025	AB
	2.5K 5W 5% WW	67020041	CW5	DA
R4	POT 1K 10T 2W	67055002	850-10T-1K	ETI
R5	POT 5K 10T 2W	67055007	850-10T-5K	ETI
R101	Res. 100 ohm 1/2W	67002012	EB1015	AB
R102	Res. 220 ohm 1/2W	67002048	EB2215	AB
R103	Res. 1.2K 1/2W	67002019	EB1225	AB
R104	Res. 47 ohm 1/2W	67002006	EB4705	AB
R105	Res. 120 ohm 1/2W	67002018	EB1215	AB
R106	Res. 10 ohm 1/2W	67002001	EB1005	AB
R107	Res. 2.2K 1/2W	67002049	EB2225	AB
R108	Res. 22 ohm 1/2W	67002003	EB2205	AB
R112, R113	Res. 10K 1/2W	67002014	EB1035	AB
R114	Res. 1K 1/2W	67002013	EB1025	AB
R115	Res. 1.5M 1/2W	67002032	EB1555	AB
R116	Res. 1.5K 1/2W	67002029	EB1525	AB
R117	Res. 4.7M	67002078	EB4755	AB
R118	Res. 470 ohm 1/2W	67002074	EB4715	AB
R119	Res. 1.2K 1/2W	67002019	EB1225	AB
R120	Res. 1K 1/2W	67002013	EB1025	AB
R121	Res. 5.9K 1/8W	67005057	RN55	AB



TRIAC AND LAMP LOGIC
PART OF A200 BOARD.

	INPUT	OUTPUT
32V 64V 125V	1 = L 2 = L	3 = H
	5 = L 6 = L	4 = H
	12 = H 13 = H	11 = L
	8 = L 9 = H	10 = L

18V 36V 64V	1 = L 2 = L	3 = H
	5 = H 6 = L	4 = L
	12 = L 13 = H	11 = L
	8 = L 9 = H	10 = L

8V 16V 32V	1 = H 2 = L	3 = L
	5 = H 6 = L	4 = L
	12 = L 13 = L	11 = H
	8 = L 9 = H	10 = L

FIG. 8

83-465-001

CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
R122	Trimpot 500 ohm 1/2W	67063002	72PLR	BK
R123	Res. 5.9K 1/8W	67005057	RN55	AB
R124	Trimpot 500 ohm 1/2W	67063002	72PLR	BK
R125 R126	Res. 1K 1/2W	67002013	EB1025	AB
R127	Res. 6.8K 1/2W	67002090	EB6825	AB
R128 R129	Res. 4.7K 1/2W	67002075	EB4725	AB
R130	Res. 27.4K 1/4W	67006039	RN60	AB
	Res. 54.9K 1/4W	67007056	RN65	AB
R131	Res. 4.99K 1/4W	67006053	RN60	AB
R132	Res. 2.2K 1/2W	67002049	EB2225	AB
R133	Res. 1.2K 1/2W	67002019	EB1225	AB
R134 R135 R136	Res. 100 ohm 1/2W	67002012	EB1015	AB
R201	Res. 1K 1/2W	67002013	EB1025	AB
R202	Pot 100K 2W	67054006	3852A-282-104A	
R203	Res. 6.98K 1/4W	67006062	RN60	AB
R204	Res. 1K 1W	67003013	GB1025	AB
R205	Res. 1K 1/2W	67002013	EB1025	AB
R206	Res. 330 ohm 1/2W	67002064	EB3315	AB
R207	Res. 4.7K 1/2W	67002075	EB4725	AB
R208	Res. 1K 1/2W	67002013	EB1025	AB
R210	Res. 680 ohm 1/2W	67002089	EB6815	AB
R211	Res. 820 ohm 1/2W	67002094	EB8215	AB
R212	Res. 560 ohm 1/2W	67002084	EB5615	AB
R213	Res. 680 ohm 1/2W	67002089	EB6815	AB

CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
R214 R219	Res. 10K 1/2W	67002-14	EB1035	AB
R220	Res. 90.9K 1/4W	67006067	RN60	AB
R222	Res. 10K 1/2W	67002014	EB1035	AB
R223	Res. 2.2K 1/2W	67002049	EB2225	AB
R224	Pot 5K 1/2W	67063004	72PLR	BK
R225	Res. 120K 1/2W	67002021	EB1245	AB
R226	Res. 22K 1/2W	67002050	EB2235	AB
R227	Res. 8.2K 1/2W	67002095	EB8225	AB
R228 R229	Trimpot 200 1/2W 3P	67063001	72PLR	BK
R230	Trimpot 500 1/2W 3P	67063002	72PLR	BK
R231	Res. 698 ohm 1/4W	67006083	RN60	AB
R232	Res. 35.7K 1/4W	67006089	RN60	AB
R233	Res. 33K 1/4W	67001066	RN60	AB
R234	Res. 130K 1/4W	67001026	RN60	AB
R301	Res. .04 ohm 55W 4Ld	67065002	FHS-55	EL
	Res .01 ohm 50W	67065001	FHS50	EL
	Res. 1 ohm 3W	67019001	CW-3	DA
R302	Res. WW 250 ohm 5W	67020040	CW-5	DA
R303,4 5,6,7,8	Res. WW 0.2 ohm 5W	67020004	CW-5	DA
R309	Res. WW 0.2 ohm 10W	67022004	CW-10	DA
B1	Fan 115V 3.12" Sq.	51001001	A30473-10	TO
	Fan 115V 4 11/16" Sq	51006002	027119	RT
C1/2	Elec Cap 60KMfd 50V	54045004	CGS603U050X4C/F	MA
	Elec Cap 21KMfd 100V	54047001	CGS2134100X4C/F	MA

CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
R1	1K 2W 5% CARBON	67004013	HB1025	AB
C2	Cap 2Mfd 240V	54063011	DMMABW2	CDE
C3	Cap .47Mfd 250V	54066001	1773477-25	ERO
C4	Cap 2Mfd 240V	54063011	DMMABW2	CDE
C101 C102	Cap 1000Mf 50V	54032013	DDA100uF50V	ICC
C103 C104	Cap 100MF 25V	54026003	DDA100uF25V	ICC
C105	Cap .005MF 1000V	54003004	TG510	SP
C106	Cap .047MF 100V	54006007	MKT181334/255	
C107	Cap .01MF 100V	54002002	C023B101F103M	SP
C108	Cap 0.1MF 100V	54002001	SR211E104MAA	
C109	Cap .02MF 100V	54002003	GH2237	MA
C110	Cap 470PFD 500V	54024002	PD470M500	ICC
C111	Cap .01MF 100V	54002002	C023B101F103M	SP
C112 C113	Cap 100PFD 1000V	54003005	CM05F101J03	CDE
C114	Cap 1MF 100V	54006001	KTI83241001	ERO
C201	Cap Disc 0.1MF 100V	54002001	SR211E104MA	AVX
C202	Cap Elec 10MF 50V	54025001	TDB10MF25V	ICC
C203 C204	Cap Disc .01MF 100V	54002002	TG510	SP
C205	Cap Elec 10MF 50V	54025001	SM50VIO	ICC
C301	Cap Elec 100MF 50V	54032003	T50T100	EL
CB1	Circuit Brkr. 1P 3A	56053002	PP11-2-3.00A	AP
	Ckt. Brkr. 1P 7.5A	56053004	PP11-2-7.50A	AP
	Ckt. Brkr. 3P 1.5A	56054002	PP21-2-1.5A	AP
	Ckt. Brkr. 2P 4A	56054003	PP21-2-4.00A	AP

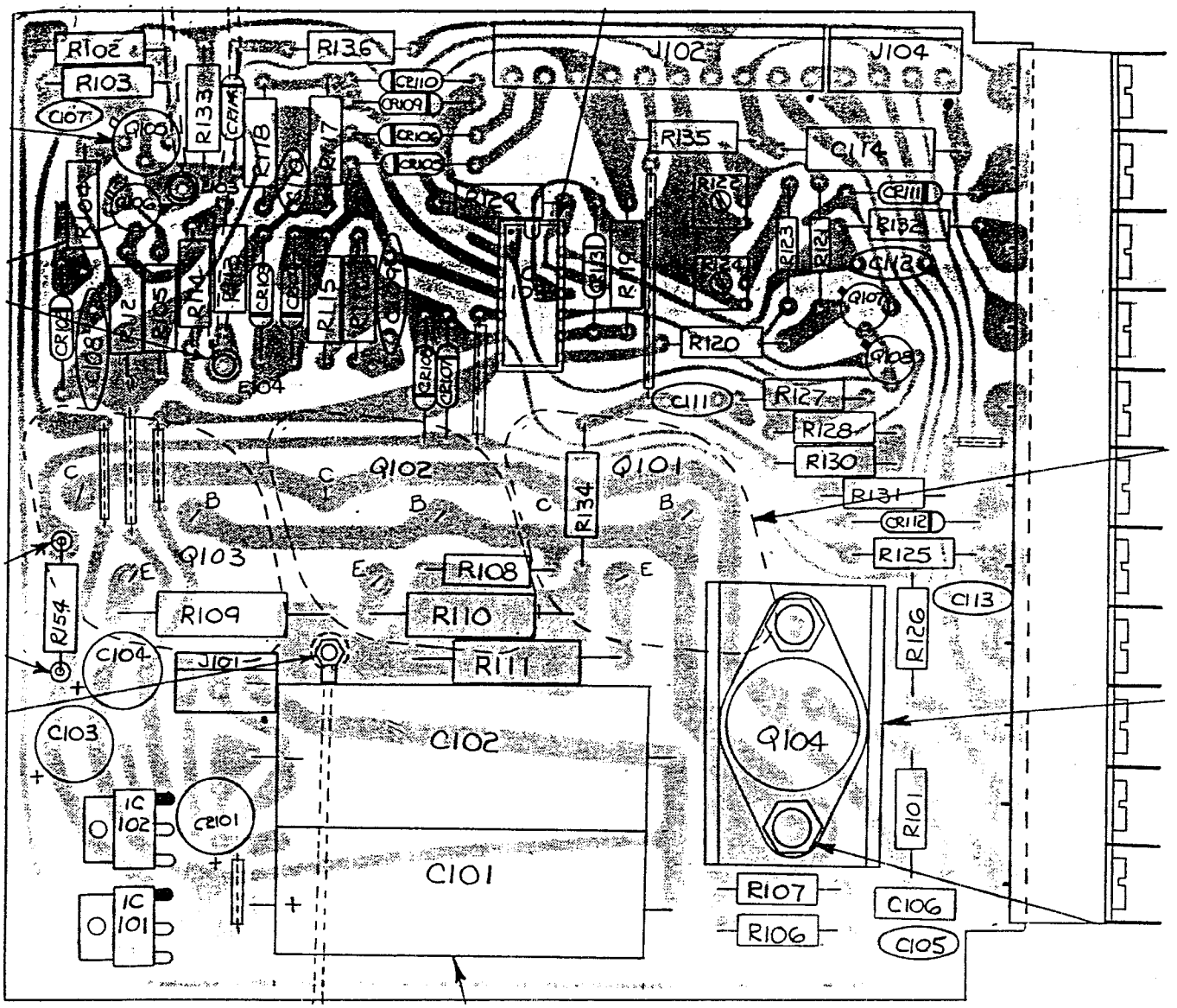
CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
E1	Binding Post Red	72033002	DF30RC	SM
E2	Binding Post Black	72033000	DF30BC	SM
CR1,2	FWB 30A 600V	60028001	PW60	GE
CR101	FWB 200V 1.5A	60023001	WO2M 4LD-250DIA	GI
CR102	Diode 4.7V	60001019	1N4732A AX	MO
CR103 - CR114	Diode 600V 1A	60006001	1N4005 AX	GE
CR113	Diode Zener 6.2V	60003002	1N823A AX	MO
CR201	Diode Zener 12V	60001004	1N4742A-AX	MO
CR202,3 CR204,5	Diode 600V	60006001	1N4005-AX	GE
CR301,2	FWB 200V 50A	60025003	KBPC50-02	EDI
IC101	+15 Voltage Reg	64010002	MC7815C	MO
IC102	-15 Voltage Reg	64010003	MC7915C	MO
IC103	Int Ckt 14 Pin Dip	64003001	RC4136DP	TI
IC201,2	Int Ckt	64008001	MOC 3010	MO
IC203	Int Ckt 14 Pin	64003011	MC14001CP	MO
IC204	Int Ckt	64003015	MC 3302	MO
IC205	Int Ckt 8 Pin DIP	64002004	MC3423U	MO
Q1/2	Triac 25A 600V	53008001	SC260M	GE
Q3	SCR 35A 600V	61001005	C35M	GE
Q101-3	Transistor	62005009	2N3055	RCA
	Transistor	62005017	2N3773	RCA
Q104	Transistor	62004001	2N3740	RCA
	Transistor	62004006	2N6420	RCA
Q105	Xistor Signal NPN	62002004	2N3053	RCA

CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
	Xistor Signal NPN	62002005	2N3440	RCA
Q106	Transistor TO18 PNP	62001002	2N2222A	MO
Q107 Q108	Xistor Signal NPN	62001001	2N2907A	MO
Q201	SCR 0.8A 100V 3 lead	61006002	2N5062	GE
Q301,2	Triac 200V 40A Stud	63008002	2N5443	MO
Q303	SCR 35A 600V	61001005	C35M 25S-SL	GE
Q304,5 6,8,9,10	Transistor TO66	62004003	2N3771	RCA
Q307	Transistor TO3	62005013	MJ2955	MO
J101	PC Base Connector	72003003	2391-4A	MX
J102	PC Base Connector	72003006	2391-10A	MX
J103	PC Base Connector	72003004	2391-5A	MX
J201	Connector 10Ckt Male	72094006	09-75-1108	MX
J202	Connector 5Ckt Male	72094004	09-75-1058	MX
T1	Transformer ATR 100	28002080		EM
	Transformer ATR 100B	28002176		EM
	Transformer ATR 250	28002176		EM
M1	Basic I Meter	66062000	7511	WT
	Meter 0-5A	66062003	7511	WT
	Meter 0-10A	66062001	7511	WT
	Meter 0-25A	66062002	7511	WT
M2	Basic V Meter	66065000	7511	WT
	Meter 0-36V	66065001	7511	WT
	Meter 0-72V	66065002	7511	WT

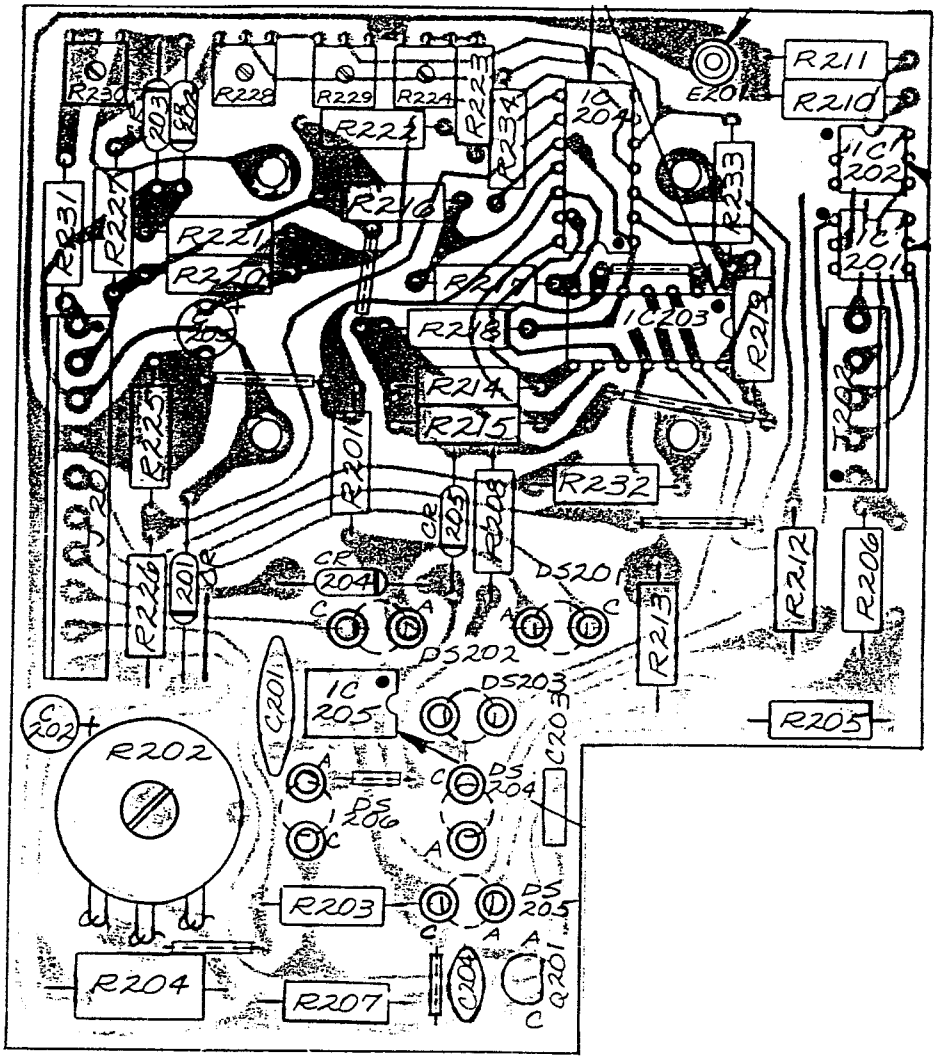
CIRCUIT REF	DESCRIPTION	EM PART#	MFR PART NO.	MFR CODE
TS1	Thermostat 195'C	68001001	36T22 Style1225	TD
DS201,2 DS205	RED LED	63004001	MV5023	LC
DS203	YELLOW LED	63004003	L101DY	LC
DS204	GREEN LED	63004002	L101DG	LC

ADDITIONAL PARTS LIST FOR THE ATR 100C & ATR 250C:

E/M PART NO.	DESCRIPTION
63-009-011	FET Transistor IRFP250
63-009-004	FET Transistor IRF830 TO-220
60-001-018	Diode Zener 1N4740A

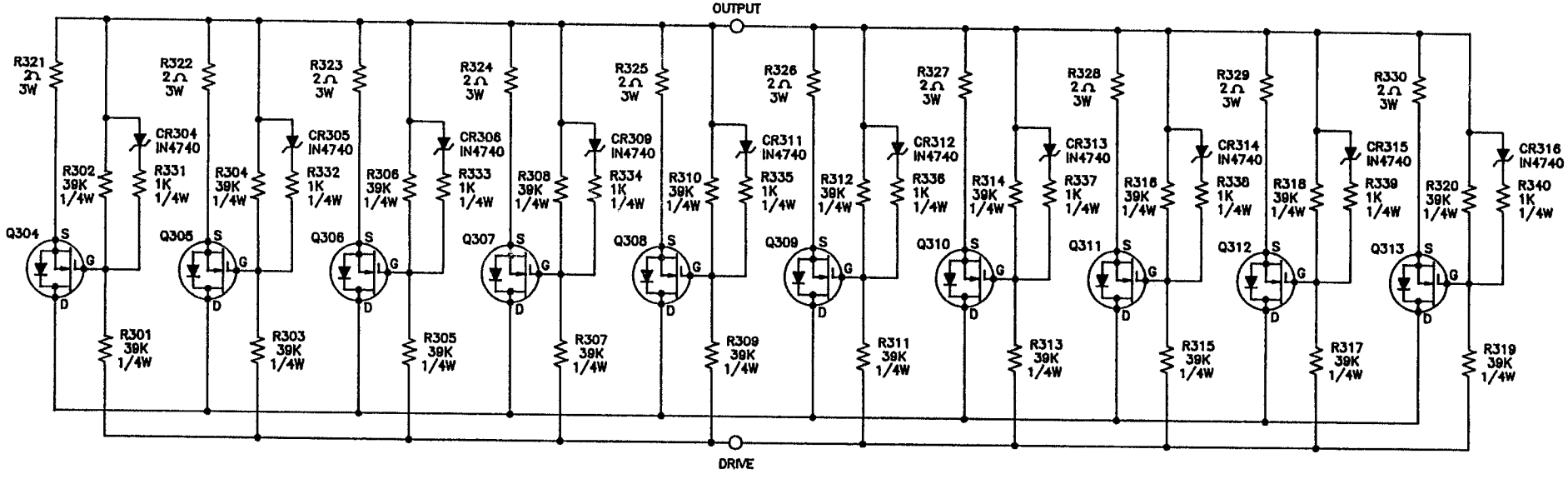


ATR A100 PRINTED CIRCUIT BOARD



ATR A200 PRINTED CIRCUIT BOARD

APPLICATION			LTR	E.O.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.				
			A	REDRAW TO CONFIRM ZENER VALUES 3/7/90	EWM	GFS



NOTE:
Q304 THRU Q313 = IRFP250 (10)

MTL:		DWN: EWM 3/7/90 DATE	ELECTRONIC MEASUREMENTS, INC.
FIN:	P/L:	CHK: GFS 8-29-94 DATE	TITLE: SCHEMATIC A300 PCB ATR250C
	SCALE:	ENG: 8/29/94 DATE	DWG. NO. 01-188-000 REV. A
		APP: GFS 8-29-94 DATE	

INSTRUCTION MANUAL
FOR

ATR
POWER SUPPLY

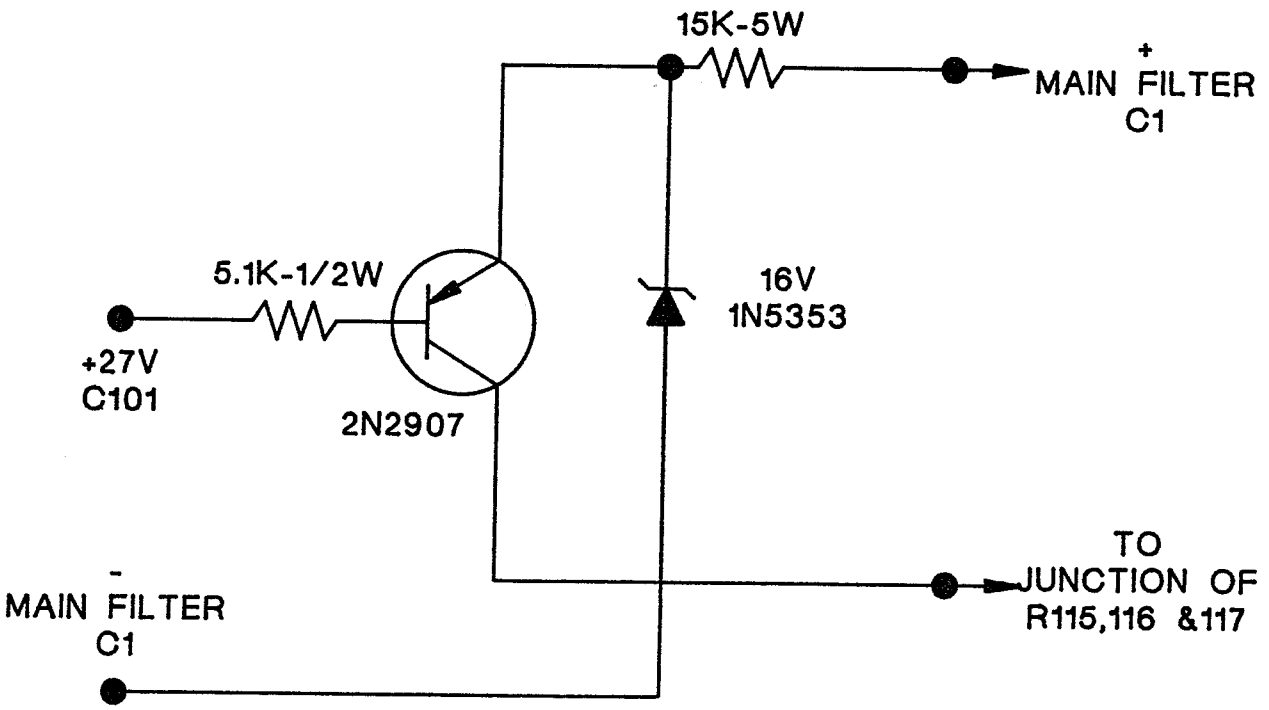
MODEL_____ SERIAL NO._____

(201) 922-9300
ELECTRONIC MEASUREMENTS INC.
405 ESSEX ROAD, NEPTUNE, N.J. 07753

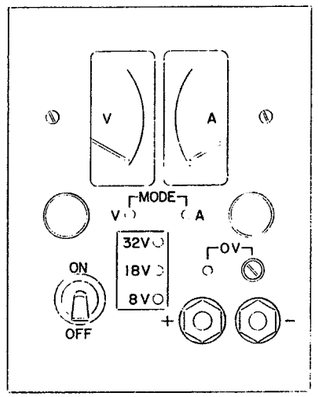
ADDENDUM NO. 1

ATR 100C & 250C

ADDITIONAL LINE FAILURE CIRCUIT

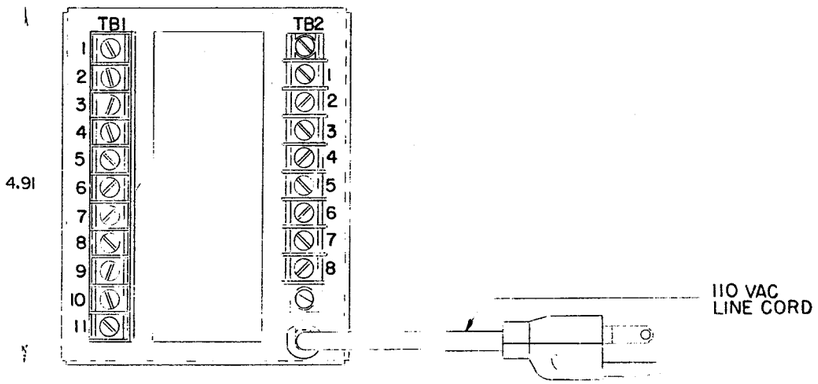


APPLICATION			LTR.	E.C.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.				
			A	ADD. LINE CORD	M.E.	



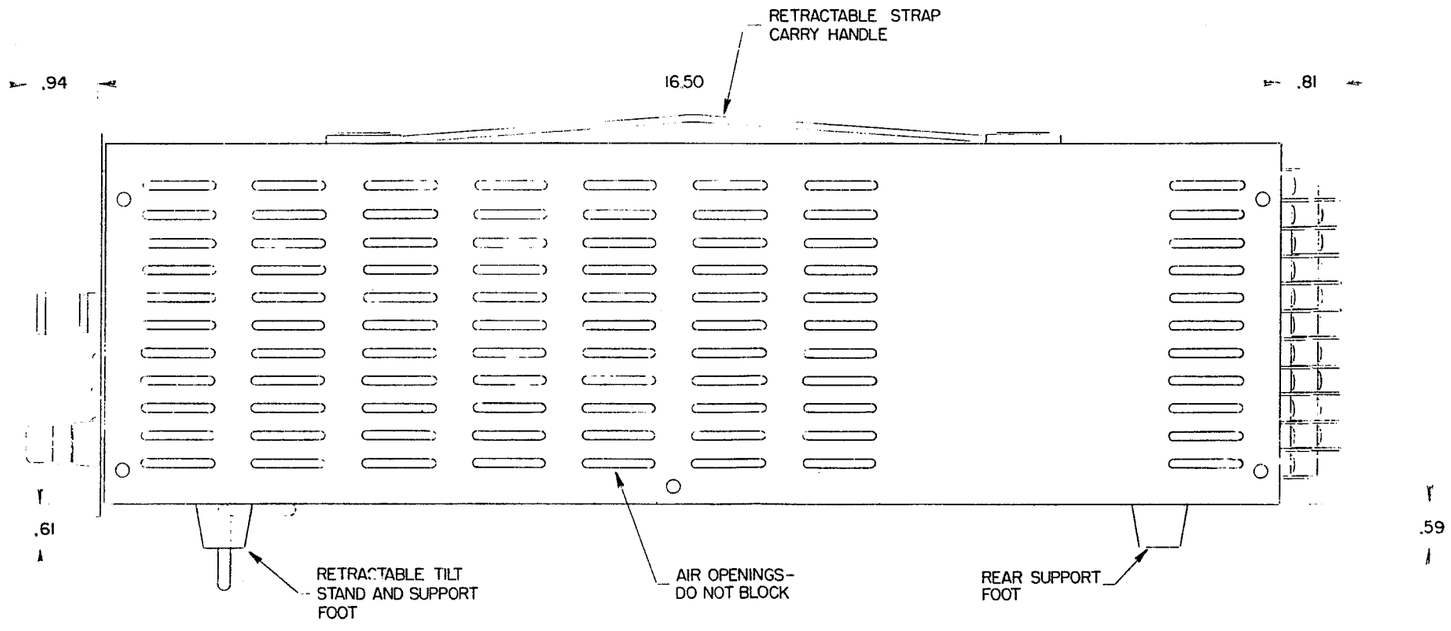
5.22

4.12



4.91

4.00

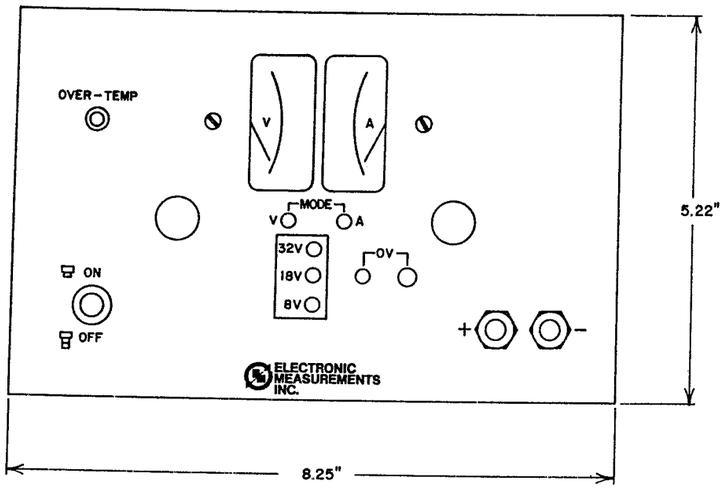


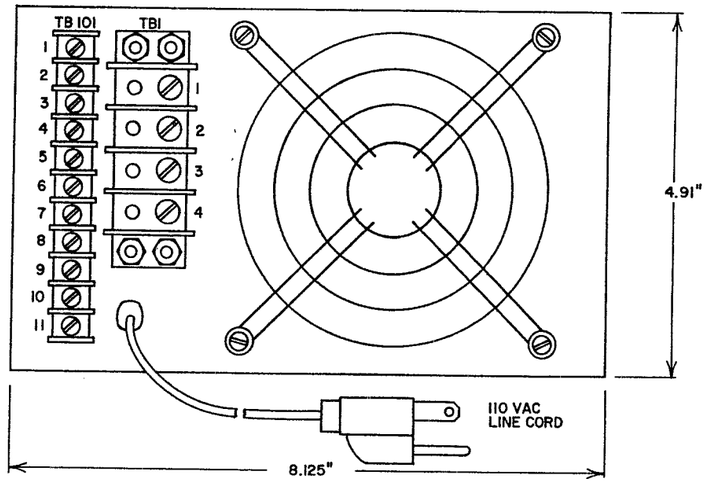
MTL:	TOL: XX = ± .02" XXX = ± .005" ANGLES ± 1/2"	DWN: BJC DATE: 7-21-81	ELECTRONIC MEASUREMENTS INCORPORATED
FIN:	P/L 465	CHK: DATE: ENG: DATE:	TITLE: DIMENSIONAL OUTLINE ATR 100 QUARTER RACK
	SCALE: 1"=1"	APP: DATE: 7/31/81	DWG NO. 02-465-001 REV. A

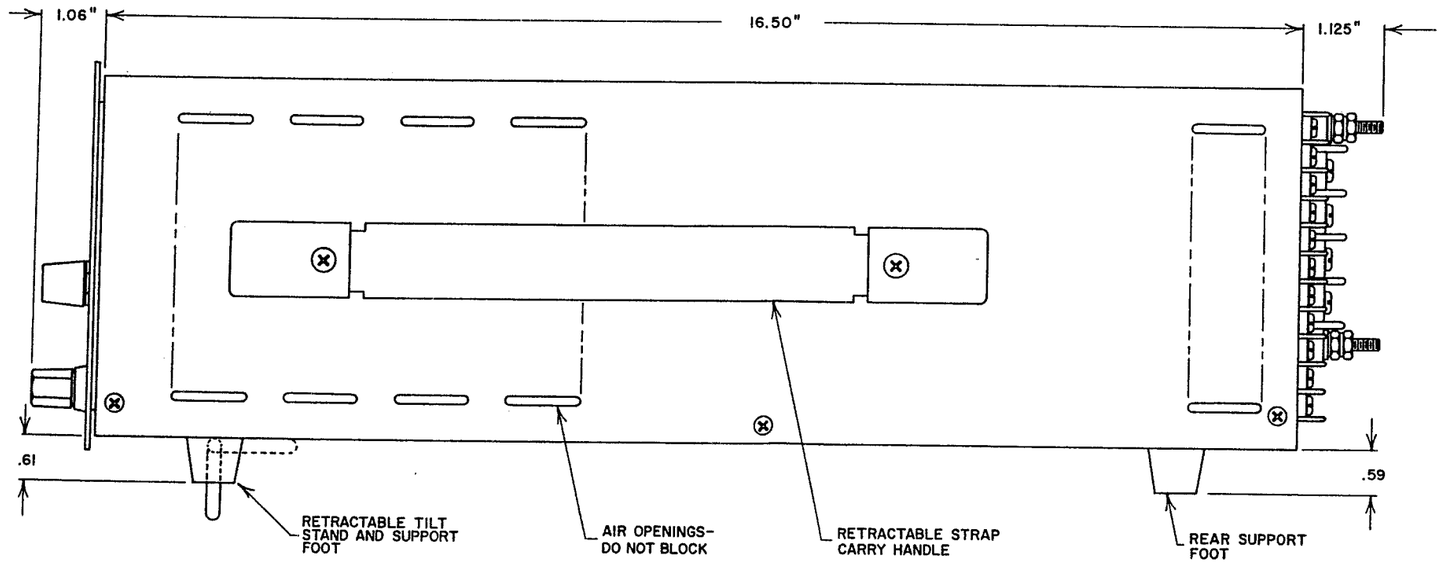
SHEET ___ OF ___

BRUNING 44-131 51052

APPLICATION			LTR.	E.C.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.				







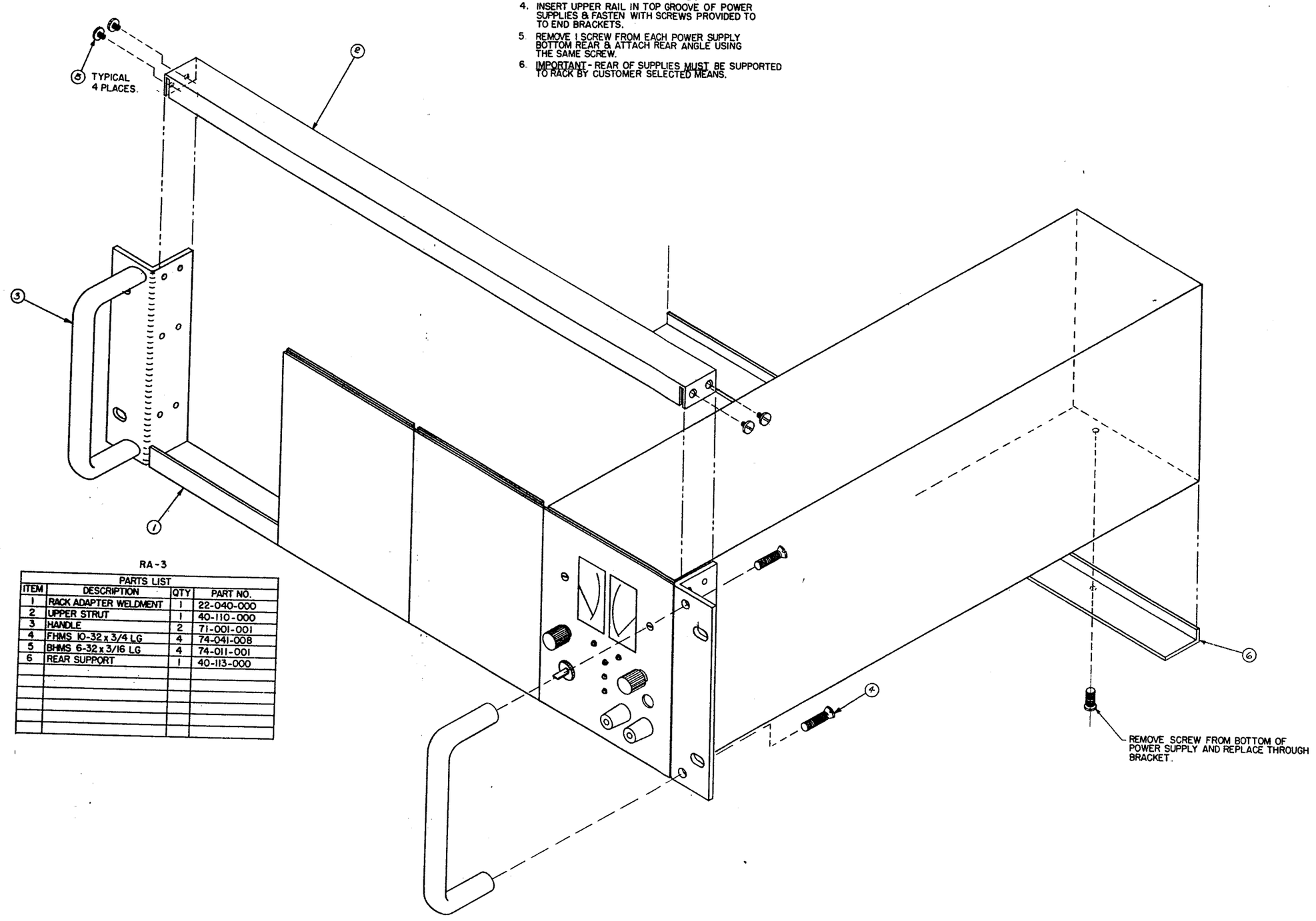
MTL:	TOL: XX = ± .02" XXX = ± .005" ANGLES ± 1/2"	DWN: BJC DATE: 2-18-83	ELECTRONIC MEASUREMENTS INCORPORATED	
FIN:	P/L 465	CHK: GFS DATE: 2-18-83	TITLE: DIMENSIONAL OUTLINE ATR 250	
	SCALE: NONE	ENG: DATE:	DWG NO. 02-465-003	REV.
		APP: DATE: 3/14/83	SHEET 1 OF 1	

BRUNING 46650

NOTES:

1. UNPACK & CHECK PARTS AGAINT LIST BELOW.
2. INSTALL 1-4 POWER SUPPLIES BY HOOKING BOTTOM GROOVE OVER LOWER FIXED RAIL.
3. INSERT 0-3 BLANK PANELS AS REQUIRED.
4. INSERT UPPER RAIL IN TOP GROOVE OF POWER SUPPLIES & FASTEN WITH SCREWS PROVIDED TO TO END BRACKETS.
5. REMOVE 1 SCREW FROM EACH POWER SUPPLY BOTTOM REAR & ATTACH REAR ANGLE USING THE SAME SCREW.
6. IMPORTANT - REAR OF SUPPLIES MUST BE SUPPORTED TO RACK BY CUSTOMER SELECTED MEANS.

APPLICATION			LTR.	E.C.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.				



RA-3

PARTS LIST			
ITEM	DESCRIPTION	QTY	PART NO.
1	RACK ADAPTER WELDMENT	1	22-040-000
2	UPPER STRUT	1	40-110-000
3	HANDLE	2	71-001-001
4	FHMS 10-32 x 3/4 LG	4	74-041-008
5	BHMS 6-32 x 3/16 LG	4	74-011-001
6	REAR SUPPORT	1	40-113-000

RA-3

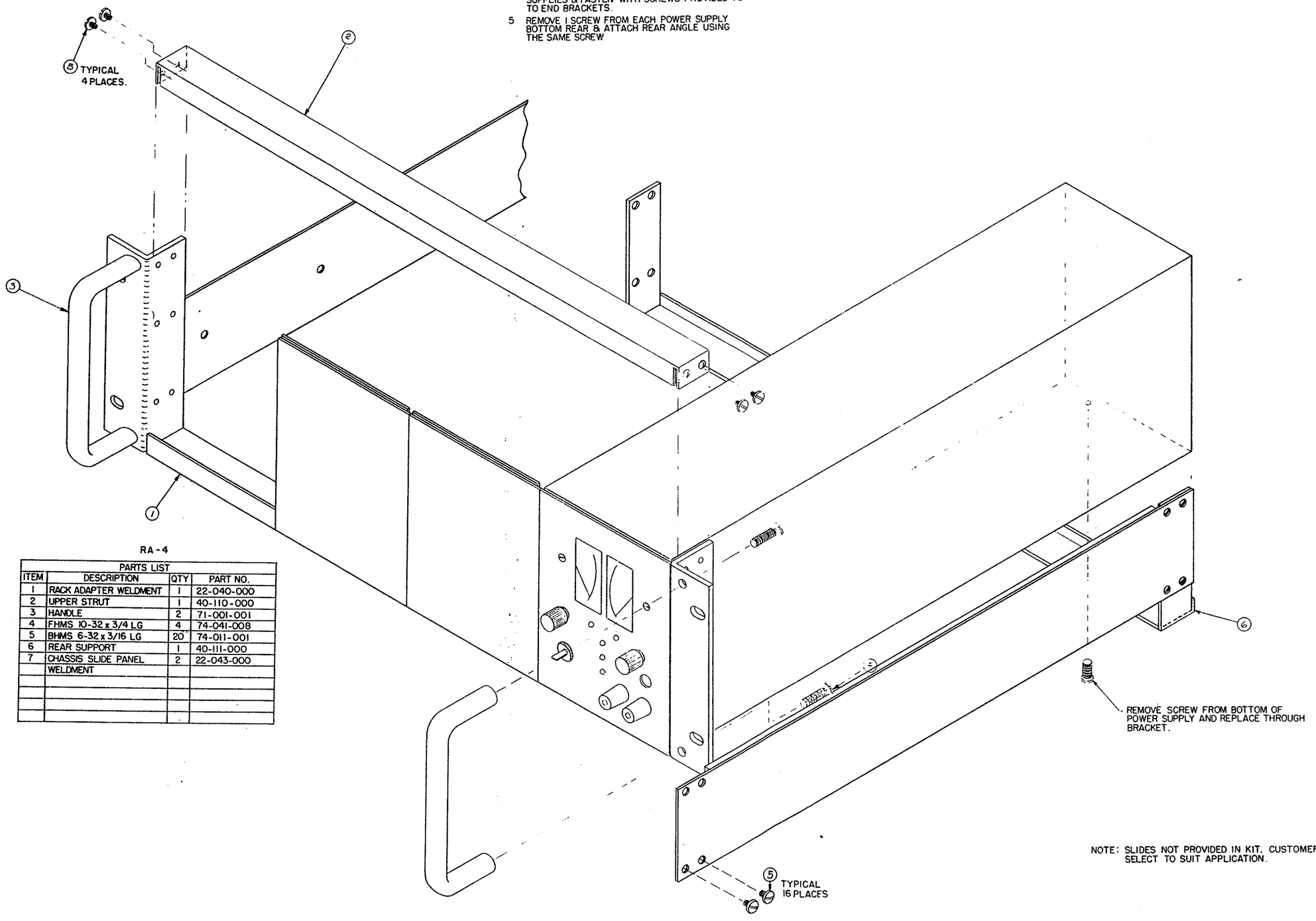
MTL:	TOL: XX ± .02" XXX ± .005" ANGLES ± 1/2°	DRN: DATE:	ELECTRONIC MEASUREMENTS INCORPORATED
FIN:	PA: 465	ENG: DATE:	TITLE: ASSEMBLY PROCEDURE ATR-100 RACK ADAPTER
	SCALE: 1:1	APP: DATE: 12/22/10	DWG NO. 12-465-001 REV.

NOTES:

1. UNPACK & CHECK PARTS AGAINT LIST BELOW.
2. INSTALL 1-4 POWER SUPPLIES BY HOOKING BOTTOM GROOVE OVER LOWER FIXED RAIL.
3. INSERT 0-3 BLANK PANELS AS REQUIRED.
4. INSERT UPPER RAIL IN TOP GROOVE OF POWER SUPPLIES & FASTEN WITH SCREWS PROVIDED TO TO END BRACKETS.
5. REMOVE 1 SCREW FROM EACH POWER SUPPLY BOTTOM REAR & ATTACH REAR ANGLE USING THE SAME SCREW
6. MOUNT CENTER SECTION OF SLIDE TO SLIDE MTG. PLATE. HOLES PROVIDED FOR "CHASSIS TRAK" SLIDE #C300-S-14 IF OTHER REQUIRED, DRILL TO SUIT.
7. MOUNT CHASSIS SLIDE MTG. PLATE TO FRONT & REAR SUPPORTS WITH SCREWS PROVIDED.
8. MOUNT SLIDE ADAPTER TO RACK AS REQUIRED.

APPLICATION			LTR.	E.C.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.				

SHEET ___ OF ___



RA-4

PARTS LIST			
ITEM	DESCRIPTION	QTY	PART NO.
1	RACK ADAPTER WELDMENT	1	22-040-000
2	UPPER STRUT	1	40-110-000
3	HANDLE	2	71-001-001
4	FHMS 10-32 x 3/4 LG	4	74-041-008
5	BHMS 6-32 x 3/16 LG	20	74-011-001
6	REAR SUPPORT	1	40-111-000
7	CHASSIS SLIDE PANEL WELDMENT	2	22-043-000

NOTE: SLIDES NOT PROVIDED IN KIT. CUSTOMER TO SELECT TO SUIT APPLICATION.

RA-4

WT.:	TOL: XX ± .02" XXX ± .005" ANGLES ± 1/2°	DWN: DATE: 12-22-81	ELECTRONIC MEASUREMENTS INCORPORATED
FIN:	P/L 465	CHK: DATE:	TITLE: ASSEMBLY PROCEDURE ATR-100 RACK ADAPTER
	SCALE: 1=1	ENG: DATE:	DWG NO. 12-465-002 REV.
		APP: DATE: 12/22/81	

SHEET ___ OF ___

APPLICATION			LTR.	E.C.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.	H	ECO# 3447 11-1-...		
ATR-100			D	ECO 6543 3-4-...		
			E	REV. R203 3-8-88	RW	

SHEET 1 OF 1

01-465-000 REV

28-002-080

TI WIRING 220 VAC INPUT

A200

A100

NOTES:
1. ALL RESISTORS ARE OHMS, 1/2W, 5% UNLESS OTHERWISE SPECIFIED.
ALL DIODES ARE IN4003, UNLESS OTHERWISE SPECIFIED.
ALL CAPACITORS ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
2. [ ] DENOTES EQUIPMENT MARKING.
⊘ DENOTES SCREWDRIVER ADJUST.

MTL:	TOL	DWN: Rand 9/21/91	ELECTRONIC MEASUREMENTS INCORPORATED
—	XX = ± .02" XXX = ± .005" ANGLES ± 1/2"	CHK: 9/23/91	TITLE: SCHEMATIC DIAGRAM ATR-100 32V-10A MAX.
FIN: —	P/L 465	ENG: 9/23/91	
	SCALE: NONE	APP: 9/23/91	DWG NO. 01-465-000 REV 11
			SHEET 1 OF 1

APPLICATION		
USED ON	NEXT ASSY.	QTY.
ATR-250		

LTR.	E.C.O. NO.	BY	APP.
E	REV. (PI) 9-2-86	LC	
F	ECO 7701 5/27/87	GR	
H	ECO NO. 8411 11/16/89	EM	
J	8482 2-14-90	EM	
G	ECO 7773 10/7/87	GR	

SHEET 1 OF 1

DWG NO. 01-465-001 REV. J

P/O HS300

28-002-176 T1

Q301 2N5443

Q302 2N5443

CR301 50A 200V

CR302 50A 200V

C4 2 240V

C1 40K 50V

C2 40K 50V

R1 1K 2W

DS1 RED OVER TEMP

TO E103

E302 E304 E306 E301 E305 E303 E315

HS300.23-126-000

C301 .47 100V

R309 22 1/2 W

TS301 195°C N.O.

Q307 2N3771 R303 .2 5W

Q305 2N3771 R304 .2 5W

Q306 2N3771 R305 .2 5W

Q308 2N3771 R306 .2 5W

Q309 2N3771 R307 .2 5W

Q310 2N3771 R308 .2 5W

Q304 MJ2955

E308 E307

R108 22

R107 2.2K

C106 .01 100V

R106 10

C105 .005 1KV

R101 100

R102 220

P202 J202

IC201 MOC3010

IC202 MOC3010

R210 680

DS203 YEL 32V

R211 820

R212 560

DS204 GRN 18V

R213 680

DS205 RED 8V

CBI 7.5A-115V 4A-230V

ON OFF

FAN B1

LINE CORD

230V

C3 .47 250 VAC

CBI 2P 220V

T1 WIRING 220 VAC INPUT

+15V

R220 90.9K 1%

R221 4.7K

R219 10K 1/4W

R233 33K 1/4W

R227 8.2K

R228 200 7.5 AMPS ADJ

R229 200 12.5 AMPS ADJ

R218 10K 1/4W

R234 130K 1/4W

C205 10 50V

R216 10K 1/4W

R217 10K 1/4W

R226 22K

R225 120K

R214 10K 1/4W

R215 10K 1/4W

R222 10K 1/4W

R223 2.2K 1/4W

R224 5K MIN VOLTS ADJ

IC203 CA4001CP

IC204 MC3302

A200 P.C.B. ASSY 20-167-000

P/O A200

P201 J201 P202 J202

CR201 1N4742A 12V

R204 1K 1W

R206 330

CR204 CR205

C202 10 50V

OVP ADJ

R202 100K CW

R203 6.98K 1/4W 1% RN60

C201 .1 100V

IC205 MC3423U

R205 1K-1/4W

R207 4.7K

C203 .01 100V

R208 1K-1/4W

DS206 RED OV

Q201 2N5062

C204 .01 100V

R201 1K 1/4W

DS201 RED V

DS202 RED A

P102 J102

R134 100

R135 100

C114 1-100V

R5 5K 10 TURN

J104 P104

VOLTAGE

CURRENT

R4 1K-1 TURN

TBI

E1 E2

+V OUTPUT +S

-S OUTPUT -V

R302 250 5W

C301 220 50V

R309

Q303 C35M

E309

R301 SHUNT .04 100W

E312 E313 E310 E311

M2 36V 1MA

R232 35.7K 1/4W 1%

CR203 CR202

R230 500 CW

R231 1K-1/4W 1%

AMMETER CAL

M1 25A 1MA

R102 220

R133 1.2K

R136 100

TO DSI

CR114

R103 1.2K

C107 .01

Q106 2N2222A

Q105 2N3053

R113 10K

R114 1K

R104 47

C108 .1 100V

R105 120

R112 10K

CR102 IN4732 4.7V

CR105 CR106

C110 .01 100V

R118 470

R127 6.8K

R128 4.7K

C111 .01 100V

R130 27.4K 1%

R131 4.99K 1%

CR109 CR110

R117 4.7M

TO BE SELECTED AT TEST, R154

R129 4.7K

C112 100PF 1KV

R132 2.2K

CR103 CR104

R126 1K

C109 .001 1KV

R116 6.8K

R115 1.5M

CR107 CR108

R125 1K

C113 100PF 1KV

CR111 CR112

Q107 2N2907A

Q108 2N2907A

R119 1.2K

R120 1K

R121 5.9K 1%

R123 5.9K 1%

R122 500 VOLTAGE CAL

R124 500 CURRENT CAL

CR113 1N823A 6.4V

A100 P.C.B. ASSY 20-165-000

TBI01

1 OV FLAG/INHIBIT

2 V PROG I

3 V AMP IN

4 V PROG R

5 V PROG R COM

6 I PROG I

7 I AMP IN

8 I PROG R

9 — SHUNT COM

10 INV-AMP

11 + SHUNT

P101 J101

CR101 W02M

IC101 MC7815CT

IC102 MC7915CT

C101 1000 50V

C102 1000 50V

C103 100 25V

C104 100 25V

+15V

-15V

NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   ALL RESISTORS ARE IN OHMS AND ARE 1/2W, 5% CARBON COMP.
   ALL DIODES ARE IN4003.
   ALL CAPACITORS ARE IN MICROFADS; K=1,000 M=1,000,000.
2. [ ] DENOTES EQUIPMENT MARKING.
   ⊘ DENOTES SCREWDRIVER ADJUST.

MTL:	TOL: .XX = ± .02" .XXX = ± .005" ANGLES ± 1/2"	DWN: ME DATE: 2-25-83	ELECTRONIC MEASUREMENTS INCORPORATED
FIN:	P/L 465	CHK: GPS DATE: 2-25-83	TITLE: SCHEMATIC DIAGRAM ATR 250 1/2 RACK
	SCALE:	ENG: DATE: 8/29/86	DWG NO. 01-465-001 REV. J
		APP: DATE: 3/1/88	SHEET 1 OF 1

BRUNING 46560

APPLICATION			LTR.	E.C.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.	E	ENG CHG 1-11-89	PLW	
ATR-100B-1			F	ECO 8211 3/10/89		
			G	ECO 8867 11/16/90		

01-465-002 SHEET 1 OF 1

28-002-581

T1 WIRING 220 VAC INPUT

NOTES:
1. ALL RESISTORS ARE OHMS, 1/2W, 5% UNLESS OTHERWISE SPECIFIED.
   ALL DIODES ARE IN4003, UNLESS OTHERWISE SPECIFIED.
   ALL CAPACITORS ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
2. [ ] DENOTES EQUIPMENT MARKING.
   ⌀ DENOTES SCREWDRIVER ADJUST.

MTL: —	TOL: XX = ± .02" XXX = ± .005" ANGLES ± 1/2"	DWN: BJC. 8/12/83 CHK: GFS 8-29-94 ENG: DATE: APP: DATE: 8/14/13	ELECTRONIC MEASUREMENTS INCORPORATED
FIN: —	P/N 465 SCALE: NONE		TITLE: SCHEMATIC DIAGRAM ATR-100B 64V-5A MAX. DWG NO. 01-465-002 REV G

SHEET 1 OF 1

APPLICATION			LTR.	E.C.O NO.	BY	APP.
USED ON	NEXT ASSY	QTY.	E	#8467 11/14/90	[illegible]	[illegible]
			C	ECO 8328 4/5/89	[illegible]	[illegible]
			D	[illegible]	[illegible]	[illegible]

DWG NO. 01-465-013 REV

T1 28-003-440

115 VAC INPUT SHOWN

CB1 2A-115V 1.5A 220V

INPUT

P1

P/C TE1

B1 FAN

CB1 2P-220V

T1 WIRING 220 VAC INPUT

A200

A300

A100

TURRET

TS1 195°C N/O

TB101

P/O TB1

NOTES:
1. UNLESS SPECIFIED ALL RESISTOR VALUES ARE IN OHMS, 1/2W-5%, ALL CAPACITORS ARE IN MICROFARADS, ALL DIODES ARE IN4005.
2. ▭ DENOTES EQUIPMENT MARKING.
3. ⊘ DENOTES SCREWDRIVER ADJUST.
4. XXX VALUES SELECTED AT TEST.

MTL:	TOL: XX = ± .02" XXX = ± .005" ANGLES ± 1/2"	DWN: B(A 3/1/88 CHK: GFS 8-29-94	ELECTRONIC MEASUREMENTS INCORPORATED
FIN:	P/L 465	ENG: 4/25/88 MFG: 4/21/88	TITLE: MAIN SCHEMATIC ATR 100 C-1
	SCALE:		DWG NO. 01-465-013 REV E

SHEET 1 OF 1

R S KNAPP CO

APPLICATION			LTR.	E.C.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.	A	ECO 8211 3/14/89	LM	
ATR-250			B	8482 2-14-90	LM	

SHEET 1 OF 1

TO E103

DS1 RED — OVER TEMP

P/O HS300

28-003-460

T1

14 — E302 — Q301 2N5443 (MT1, G, MT2)

8.6V — 13 — AC — CR301 50A 200V — AC — 10

13.9V — C4 2 240V — 9

AC — CR302 50A 200V — AC — 12

12.3V — 11 — E304 — Q302 2N5443 (MT1, G, MT2) — E306

E305 — E301 — E303

C1 21K 100V — R1 2.5K 5W

HS300 23-126-000

C301 .47 100V — R309 22 1/2W — E315

TS301 195°C N.O.

Q307 2N3773 — R303 .5 5W

Q305 2N3773 — R304 .5 5W

Q306 2N3773 — R305 .5 5W

Q308 2N3773 — R306 .5 5W

Q309 2N3773 — R307 .5 5W

Q310 2N3773 — R308 .5 5W

Q304 2N6609 — E308 — E307 — R108 47

R101 100 — R106 10 — C105 .005 1KV — R107 2.2K — C106 .01 100V

P202 J202 (3 4 1 2)

IC201 MOC3010 — IC202 MOC3010

DS203 YEL 32V — R210 680 — R211 820

DS204 GRN 18V — R212 560

DS205 RED 8V — R213 680

+15V — R220 90.9K 1% — R221 4.7K

R219 10K 1/4W — 4D — R233 33K 1/4W

IC203 CA4001CP — 3A — 3B — 3C — 3D — 4A — 4B — 4C

R218 10K 1/4W — R234 130K 1/4W — R216 10K 1/4W — R217 10K 1/4W

R214 10K 1/4W — R215 10K 1/4W — R222 10K 1/4W — R223 2.2K 1/4W

IC204 MC3302

R227 8.2K — R228 200 CW — 3.5 AMPS ADJ — R229 200 CW — 6.0 AMPS ADJ — C205 10 50V

R226 22K — R225 120K — R224 5K — MIN VOLTS ADJ

A200 P.C.B. ASSY 20-167-000

P201 J201 — P202 J202

CR201 IN4742A 12V — R204 2.5K 3W — R206 150 1W

+15V — CR204 — CR205

R208 1K-1/4W — DS206 RED OV

C202 10 50V — R202 100K CW — OVP ADJ

Q201 2N5062 — C204 .01 100V

R202A 2.5K 3W — IC205 MC3423U — R205 1K-1/4W — R207 4.7K — C203 .01 100V

R203 3.3K 1/4W 1% RN60 — C201 .1 100V — CR206 IN4133A

P/O A200

R201 1K 1/4W — DS201 RED V — DS202 RED A

P102 J102 — J201 P201

R134 100

R102 470 2W — R133 1.2K — R136 100 — TO DSI — CR114

R103 1.2K — C107 .01 — Q105 2N3440 — Q106 2N2222A — R113 10K — R114 1K

R104 47 — C108 .1 100V — CR102 IN4732 4.7V — R105 120 — R112 10K

CR105 — CR106 — C110 .01 100V — R118 470

C111 .01 100V — R130 59K — R127 6.8K — R128 4.7K — R131 4.99K 1%

CR109 — CR110 — 3A — 3B — IC103 CA4136PC — C112 100PF 1KV — R132 2.2K

CR103 — R117 4.7M — TO BE SELECTED AT TEST, R154 — R126 1K

CR104 — 3C — CR107 — CR108 — R125 1K

R115 1.5M — C109 001 1KV — R116 6.8K

R119 1.2K — CR111 — CR112 — 3D — Q107 2N2907A — Q108 2N2907A

CR113 IN823A 6.4V — R120 1K — R121 5.9K 1% — R123 5.9K 1%

VOLTAGE CAL — R122 500 — R124 500 — CURRENT CAL

P/O A200 J201 P201

R232 71.5K 1/4W 1% INSIDE METER — V M2 12V IMA

TB1 — E1 — E2 — +V OUTPUT — +S OUTPUT — −S OUTPUT — −V

R302 1K 5W — C301 100 200V — R309 .1 25W — Q303 C35M

E309 — R301 SHUNT 0.8333 100W — E312 — E313 — E310 — E311

P201 J201 — CR203 — CW R230 500 — R231 1K-1/4W 1% — CR202 — AMMETER CAL

P/O A200

M1 13A IMA

P102 J102 — R135 100 — J104 P104 — R5 5K 10 TURN — VOLTAGE — CURRENT — R4 1K-1 TURN

C114 1-100V — C113 100PF 1KV

TB101

1 OV FLAG/INHIBIT
2 V PROG I
3 V AMP IN
4 V PROG R
5 V PROG R COM
6 I PROG I
7 I AMP IN
8 I PROG R
9 — SHUNT COM
10 INV-AMP
11 + SHUNT

A100 P.C.B. ASSY 20-165-000

CB1 7.5A-115V 4A-230V — ON OFF

FAN B1

LINE CORD — 230V

C3 .47 250 VAC

CB1 2P 220V

T1 WIRING 220 VAC INPUT

P101 J101 — 15 — 20V — 2 — 16 — 20V — 3 — 17

CR101 W02M — AC — AC

C101 1000 50V — C102 1000 50V

IC101 MC7815CT — IN — OUT — COM — +15V

IC102 MC7915CT — IN — OUT — COM — −15V

C103 100 25V — C104 100 25V

NOTES:

1. UNLESS OTHERWISE SPECIFIED;
   ALL RESISTORS ARE IN OHMS AND ARE 1/2W, 5% CARBON COMP.
   ALL DIODES ARE IN4003.
   ALL CAPACITORS ARE IN MICROFADS; K=1,000 M=1,000,000
2. [ ] DENOTES EQUIPMENT MARKING.
   ⌀ DENOTES SCREWDRIVER ADJUST.

MTL:	TOL: XX = ± .02" XXX = ± .005" ANGLES ± 1/2"	DWN: J.V.D. DATE: 3-22-88	ELECTRONIC MEASUREMENTS INCORPORATED
FIN:	P/L 465	CHK: G-S 8-29-94 DATE:	TITLE: SCHEMATIC DIAGRAM ATR 250 B 1/2 RACK
	SCALE:	ENG: DATE: 3/27/91	DWG NO. 01-465-014 REV E
		APP: DATE: 3/27/91	SHEET 1 OF 1

BRUNING 46660

APPLICATION			LTR.	E.C.O. NO.	BY	APP.
USED ON	NEXT ASSY.	QTY.	D	#8328 8/15/89	JKW	
			E	#8411 11-16-89	EM	
			F	CORRECT INPUTS PER ECO 6-4-91	WSM	

01-465-015 REV. F

T1
28-003-461

CR3 · C4 220 50V · R3 3.3K

MT1 · MT2 · G · Q301 SC260M

CR 301 · CR 302 · C1 5.1K 200V · C2 5.1K 200V · R2 15K 5W · Ri 10K 5W · CR4 1N4746 A

Q302 SC260M

J202 P202

U201 MOC 3010 · U202 MOC3010

DS203 YEL 64V · R210 680 · R211 820

DS204 GRN 36V · R212 560

DS205 RED 16V · R213 680

R220 99.9K 1% · R221 4.7K

R219 10K · R218 10K · R214 10K · R216 10K · R217 10K · R215 10K · R222 10K

U203 A4001K.P

R233 33K 1/4W · R234 150K 1/4W

R227 8.2K · R228 200 15 AMP ADJ. · R229 200 1.3 AMP ADJ.

C205 100 25V

R226 22K 1W · CR208

R225 120K · R224 5K MIN VOLTS ADJ

U204 MC3302

ON OFF · CH1 7.5A-115V 4A-230V · FAN B1 · LINE CORD · C3 .47 250V

CB1 2P-220V

T1 WIRING 220 VAC INPUT

OUTPUT

HEATSINK

A300 PCB ASSY.
P/N 20-411-000

SCHEMATIC NO.
01-198-000

TB2-7 OUTPUT H/S

E315

DRIVE

J105 P105 · R140 15K 5W · P103 · Q105 IRF830 · R113 3.3K · C105 .22 250V · R115 12K · R114 47Ω · C106 1 100V · CR106 JUMPER

OT DS1 · TS1 195°C N/O

J103 P103

J201 P201 · J202 P202

R204 5K 5W · CR201 1N4742A 12V · R206 150-1W · R208 1K · DS206 RED OVP

R202 100K OVP ADJ · C202 10 50V · CR204 · CR205 · +15V

R202A 5K 5W · IC205 MC3423U · Q201 2N5062 · C204 .01 100V

R203 1.82K 1/4W 1% · CR206 1N-4733A · C201 0.1 · R205 1K · R207 4.7K · C203 .01 100V

R201 1K · DS201 RED VOLTS · DS202 RED AMPS

P201 T201 · J102 P102 TURRET · J101 P101

R121 100 · CR107 · CR108 · R119 470 · C109 .005pf 500V · R123 124K 1/4W 1% · R122 3.3K · R124 2.2K · R125 499K 1/2W 1%

Q108 2N2907A · R145 5.1K · C108 470pf 500V · CR109 · CR110 · R126 2.2K · C110 100pf 1KV · R127 2.2K

R117 1K · R120 4.7M · CR112 · R118 2.2K · C107 .1 100V · R116 10K · CR111 · R131 XXX · R132 1K · CR113 · CR114

R129 1.5M · C112 .001 1000V · R130 1.5K

CR117 · R133 1K · CR116 · Q107 2N2907A

R134 1.2K · R135 1K · R136 5.9K 1% · R137 100 VOLTAGE CAL · R138 5.9K 1% · R139 500 CURRENT CAL

CR115 1N823A 6.4V

U101 MC7815 · U102 MC7915 · C101 1000 50V · C102 1000 50V · C103 100 25V · C104 100 25V

CR101 W02M

J101 P101 · 15 20V · 16 · 17 20V

A100

A200

E306 · E1 · E2 · E301 · E302 · E303 · E304 · E305

R343 3.1K 10W · C312 100 150V · R342 0.5 2SW

A300 · Q3 C35C

A200 · J201 P201 · R232 71.5K 1/4W 1% · M2 72V 1MA

R341 SHUNT 1.0 3W WW 5% PAR.

CR203 · CR202 · R230 500 · R231 698 1/4W-1% · AMMETER CAL · M1 5A 1MA

J102 P102 · R128 100 · P104 J104 · C111 1.0 100V

VOLTAGE · R5 5K 10T CW · CURRENT · R4 K 10T CW

+V OUTPUT · +S · -S · -V OUTPUT · P/O TB1

TB101

1 OV FLAG/INHIBIT
2 V PROG I
3 V AMP IN
4 V PROG R
5 V PROG R COM
6 I PROG I
7 I AMP IN
8 I PROG R
9 - SHUNT COM
10 INV-AMP
11 + SHUNT

C113 100pf 1KV

NOTES:
1. UNLESS SPECIFIED ALL RESISTOR VALUES ARE IN OHMS, 1/2W 5%, ALL CAPACITORS ARE IN MICROFARADS, ALL DIODES ARE IN4005.
2. ▭ DENOTES EQUIPMENT MARKING.
3. ⊘ DENOTES SCREWDRIVER ADJUST.
4. XXX VALUES SELECTED AT TEST.

MTL:	TOL: XX = ± .02" XXX = ± .005" ANGLES ± 1/2"	DWN: KEW DATE: 6-1-88	ELECTRONIC MEASUREMENTS INCORPORATED
FIN:	P/L 465	CHKD: GFS 8-29-94 DATE:	TITLE: MAIN SCHEMATIC ATR2500-1
	SCALE:	ENG: DATE: 9/8/94	DWG NO. 01-465-015 REV. F
		APP: DATE:	SHEET 1 OF 1

R S KNAPP CO