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# SERIES **ATE**



ATE Models with analog meters

**Series ATE power supplies are precision analog-controlled power supplies. They feature high gain and zeroable offsets to follow voltage signals or variable resistance controls precisely. An optional fast mode provides fast programming response into the mid audio range. The voltage and current channels are equally controllable with automatic crossover between modes.**

**For a series of full rack sized 1000 watt, keypad controlled ATE models with built-in GPIB control, see Series ATE-DMG, page 28.**

## FEATURES

- Linear programmable power in five sizes to 1000 watts.
- Low noise, high speed linear precision control.
- Voltage and current stabilization.
- 10 turn panel controls offer exceptional resolution.
- User-selectable capacitorless output for fast analog programming or quick recovery current-mode operation.

This KEPCO product is backed by a firm **5-YEAR WARRANTY**

CE ATE are CE marked per the Low Voltage Directive (LVD), EN61010-1.

Panel mounted analog meters allow monitoring of both channels. Optionally, ATE models can be provided with digital displays. To specify, substitute the suffix "DM" for the suffix "M" in the model number. For example: ATE 36-15DM specifies digital displays. Local control of both channels is by panel-mounted 10-turn rheostats. Panel mounted LEDs indicate voltage or current mode operation. This information is simultaneously delivered as an optically isolated TTL-compatible flag signal accessible through the rear connector.



Model ATE 15-50DM with optional digital meters
0-15 Volt, 0-50 Ampere model

The tabulation of the effective series resistance and inductance in voltage mode, and the effective shunt resistance and shunt capacitance in current mode, is done to allow a calculation of the output impedance versus frequency.



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## ATE MODEL TABLE

| MODEL (4) | d-c OUTPUT RANGE VOLTS | AMPS | OUTPUT IMPEDANCE VOLTAGE MODE SERIES R | SERIES L (1) SLOW | FAST | OUTPUT IMPEDANCE CURRENT MODE SHUNT R (2) | SHUNT C (3) SLOW | FAST |
|---|---|---|---|---|---|---|---|---|
| **QUARTER-RACK (50 Watt)** | | | | | | | | |
| ATE 6-5M | 0-6 | 0-5 | 24μΩ | 0.5μH | 5μH | 12kΩ | 1,000μF | 1μF |
| ATE 15-3M | 0-15 | 0-3 | 100μΩ | 0.5μH | 5μH | 30kΩ | 450μF | 0.4μF |
| ATE 25-2M | 0-25 | 0-2 | 250μΩ | 1μH | 10μH | 50kΩ | 250μF | 0.25μF |
| ATE 36-1.5M | 0-36 | 0-1.5 | 480μΩ | 1μH | 10μH | 72kΩ | 200μF | 0.2μF |
| ATE 55-1M | 0-55 | 0-1 | 1.1mΩ | 2μH | 20μH | 110kΩ | 150μF | 0.15μF |
| ATE 75-0.7M | 0-75 | 0-0.7 | 2.15mΩ | 2μH | 20μH | 150kΩ | 110μF | 0.1μF |
| ATE 100-0.5M | 0-100 | 0-0.5 | 4mΩ | 4μH | 40μH | 200kΩ | 47μF | 0.05μF |
| ATE 150-0.3M | 0-150 | 0-0.3 | 10mΩ | 4μH | 40μH | 300kΩ | 475μF | 0.02μF |
| **QUARTER-RACK (100 Watt)** | | | | | | | | |
| ATE 6-10M | 0-6 | 0-10 | 12μΩ | 0.5μH | 5μH | 12kΩ | 1,800μF | 2μF |
| ATE 15-6M | 0-15 | 0-6 | 50μΩ | 0.5μH | 5μH | 30kΩ | 1,000μF | 0.8μF |
| ATE 25-4M | 0-25 | 0-4 | 125μΩ | 1μH | 10μH | 50kΩ | 500μF | 0.5μF |
| ATE 36-3M | 0-36 | 0-3 | 240μΩ | 1μH | 10μH | 72kΩ | 350μF | 0.4μF |
| ATE 55-2M | 0-55 | 0-2 | 0.55mΩ | 2μH | 20μH | 110kΩ | 200μF | 0.3μF |
| ATE 75-1.5M | 0-75 | 0-1.5 | 1mΩ | 2μH | 20μH | 150kΩ | 110μF | 0.2μF |
| ATE 100-1M | 0-100 | 0-1 | 2mΩ | 4μH | 40μH | 200kΩ | 80μF | 0.1μF |
| ATE 150-0.7M | 0-150 | 0-0.7 | 4mΩ | 4μH | 40μH | 300kΩ | 475μF | 0.04μF |
| **HALF-RACK (250 Watt)** | | | | | | | | |
| ATE 6-25M | 0-6 | 0-25 | 4.8μΩ | 0.5μH | 5μH | 12kΩ | 11,000μF | 5μF |
| ATE 15-15M | 0-15 | 0-15 | 20μΩ | 0.5μH | 5μH | 30kΩ | 5,800μF | 2μF |
| ATE 25-10M | 0-25 | 0-10 | 50μΩ | 1μH | 10μH | 50kΩ | 2,900μF | 1.25μF |
| ATE 36-8M | 0-36 | 0-8 | 90μΩ | 1μH | 10μH | 72kΩ | 2,400μF | 1μF |
| ATE 55-5M | 0-55 | 0-5 | 0.22mΩ | 2μH | 20μH | 110kΩ | 1,400μF | 0.75μF |
| ATE 75-3M | 0-75 | 0-3 | 0.5mΩ | 2μH | 20μH | 150kΩ | 850μF | 0.5μF |
| ATE 100-2.5M | 0-100 | 0-2.5 | 0.8mΩ | 4μH | 40μH | 200kΩ | 375μF | 0.25μF |
| ATE 150-1.5M | 0-150 | 0-1.5 | 2mΩ | 4μH | 40μH | 300kΩ | 275μF | 0.1μF |
| ATE 325-0.8M | 0-325 | 0-0.8 | 8.1mΩ | 100μH | 1μH | 650kΩ | 180μF | 0.01μF |
| **THREE-QUARTER-RACK (500 Watt)** | | | | | | | | |
| ATE 6-50M | 0-6 | 0-50 | 2.4μΩ | 0.5μH | 5μH | 12kΩ | 12,000μF | 10μF |
| ATE 15-25M | 0-15 | 0-25 | 12μΩ | 0.5μH | 5μH | 30kΩ | 8,000μF | 4μF |
| ATE 25-20M | 0-25 | 0-20 | 25μΩ | 1μH | 10μH | 50kΩ | 5,800μF | 2.5μF |
| ATE 36-15M | 0-36 | 0-15 | 48μΩ | 1μH | 10μH | 72kΩ | 4,900μF | 2μF |
| ATE 55-10M | 0-55 | 0-10 | 0.11mΩ | 2μH | 20μH | 110kΩ | 2,900μF | 1.5μF |
| ATE 75-8M | 0-75 | 0-8 | 0.19mΩ | 2μH | 20μH | 150kΩ | 1,200μF | 1μF |
| ATE 100-5M | 0-100 | 0-5 | 0.4mΩ | 4μH | 40μH | 200kΩ | 600μF | 0.5μF |
| ATE 150-3.5M | 0-150 | 0-3.5 | 0.86mΩ | 4μH | 40μH | 300kΩ | 440μF | 0.2μF |
| **FULL-RACK (1000 Watt)** | | | | | | | | |
| ATE 6-100M | 0-6 | 0-100 | 1.2μΩ | 0.5μH | 5μH | 12kΩ | 22,000μF | 15μF |
| ATE 15-50M | 0-15 | 0-50 | 6μΩ | 0.5μH | 5μH | 30kΩ | 12,000μF | 6μF |
| ATE 25-40M | 0-25 | 0-40 | 12.5μΩ | 1μH | 10μH | 50kΩ | 11,000μF | 4μF |
| ATE 36-30M | 0-36 | 0-30 | 24μΩ | 1μH | 10μH | 72kΩ | 9,500μF | 3μF |
| ATE 55-20M | 0-55 | 0-20 | 55μΩ | 2μH | 20μH | 110kΩ | 5,200μF | 2.25μF |
| ATE 75-15M | 0-75 | 0-15 | 0.1mΩ | 2μH | 20μH | 150kΩ | 3,400μF | 1.5μF |
| ATE 100-10M | 0-100 | 0-10 | 0.2mΩ | 4μH | 40μH | 200kΩ | 1,200μF | 0.75μF |
| ATE 150-7M | 0-150 | 0-7 | 0.42mΩ | 4μH | 40μH | 300kΩ | 1,050μF | 0.3μF |

(1) For determining dynamic impedance in voltage mode.
(2) Based on 0.5mA load effect in FAST mode.
(3) For determining dynamic impedance in current mode.
(4) Add suffix "DM" to specify dual 3½ digit LCD displays in place of analog meters.

## FEATURES

- User selectable fast or conventional modes of operation. Use fast-mode for rapid response to programmed instructions or for quick response in current mode to load changes.
- Voltage and current modes with full and equal control over the output in both modes.
- Multi-terminal user port allows the ATE to be configured by arranging the jumpers on a mating plug, PC-12.
- Full zeroing and full-scale calibration for both the voltage and current control channels.
- Programmable overvoltage crowbar. Can be manually set from the panel or programmed with a 0-10V analog signal. Optically isolated input-output to interconnect multiple power supplies.
- Uncommitted amplifiers to manipulate arbitrary control signals into the required 0-10V needed to program ATE. Two provided. Can be used for scaling and summing.
- Digital control through SN-series IEEE-488 interfaces.
- The variation of the ATE's voltage and current offsets as a function of source, time and temperature are tabulated in the static specifications table. These may be used to calculate the output effect by the relationship:

$$\Delta E_o = \pm\Delta E_r(R_f/R_i) \pm \Delta E_{io}(1+R_f/R_i) \pm \Delta I_{io}(R_f)$$

where $R_f$ is the feedback resistor, and $R_i$ is the input resistor from the reference, $E_r$.

The tabulated offsets, more particularly their change as a function of source, time and temperature, allow a user to calculate performance of the uncommitted amplifier(s) with user specified input and feedback components. The formula for this is given above.

## ATE STATIC SPECIFICATIONS

| INFLUENCE QUANTITY | OUTPUT EFFECTS VOLTAGE MODE Typ. | Max. | OUTPUT EFFECTS CURRENT MODE Typ. | Max. | OFFSETS $\Delta E_{io}$ | $\Delta I_{io}$ |
|---|---|---|---|---|---|---|
| Source Voltage (min.-max.) | <0.0005% $E_o$ max. | 0.001% $E_o$ max. | <0.002% $I_o$ max. | 0.005% $I_o$ max. | <1μV | <1nA |
| Load (no load-full load) | <0.001% $E_o$ max. | 0.002% $E_o$ max. | <0.5 mA(1) | 1 mA(1) | — | — |
| Time (8-hour drift) | <0.005% $E_o$ max. | 0.01% $E_o$ max. | <0.01% $I_o$ max. | 0.02% $I_o$ max. | <20μV | <1nA |
| Temperature, per °C | <0.005% $E_o$ max. | 0.01% $E_o$ max. | <0.01% $I_o$ max. | 0.02% $I_o$ max. | <20μV | <2nA |
| Ripple and Noise (2) rms: | <0.1mV | 0.3mV | <0.01% $I_o$ max. | 0.03% $I_o$ max. | — | — |
| (Slow Mode) p-p:(3) | <1mV | 3mV | <0.1% $I_o$ max. | 0.3% $I_o$ max. | — | — |
| Ripple and Noise (2) rms: | <1mV | 3mV(4) | <0.01% $I_o$ max. | 0.03% $I_o$ max. | — | — |
| (Fast Mode) p-p:(3) | <10mV | 30mV(4) | <0.1% $I_o$ max. | 0.3% $I_o$ max. | — | — |

(1) For $I_o$>50A, load effect = 2mA typ., 5mA max. In slow mode, the output capacitor adds 0-6mA to current mode load effect.
(2) One terminal grounded so that common mode current does not flow through load or current-sense resistor.
(3) BW: 20Hz-10mHz. (4) For high voltage ATE 325-0.8M the maximum output ripple and noise is 10mV rms and 50mV p-p.


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**TABLE 1**
**Source current, measured worst case, 125V a-c.**

| | AMPS |
|---|---|
| Size A | 1.4 |
| Size B | 2.4 |
| Size C | 6.0 |
| Size D | 11.0 |
| Size E | 20.0 |

**TABLE 2**

## ATE DYNAMIC SPECIFICATIONS

| OUTPUT VOLTAGE RATING | PROGRAMMING BANDWIDTH (minimum) | PROGRAMMING TIME CONSTANT (maximum) |
|---|---|---|
| 6V | 16.0KHz | 10µsec |
| 15V | 10.6KHz | 15µsec |
| 25V | 8.0KHz | 20µsec |
| 36V | 6.4KHz | 25µsec |
| 55V | 4.0KHz | 40µsec |
| 75V | 3.5KHz | 45µsec |
| 100V | 2.5KHz | 65µsec |
| 150V | 1.7KHz | 95µsec |
| 325V | 937.0Hz | 170µsec |



Model ATE 75-0.7M Quarter Rack



Model ATE 55-5M Half Rack



Model ATE 25-20M Three Quarter Rack



Model ATE 55-20M Full Rack

## ATE GENERAL SPECIFICATIONS

| SPECIFICATION | RATING/DESCRIPTION | CONDITION |
|---|---|---|
| **INPUT** | | |
| a-c Voltage | 95-113, 105-125, 190-226, 210-250V a-c | User selectable |
| Current | See Table 1 | Max load, 115V a-c |
| Frequency | 47-65Hz | Range |
| **OUTPUT** | | |
| d-c Output | Series pass | Transistor (1) |
| Type of Stabilizer | Automatic crossover | Voltage/current |
| Voltage | 0 to 100% of rating | Adjustment range for temp 0-55°C |
| Current | 0 to 100% of rating | |
| | 0 to 90% of rating | For temp 65°C |
| Error Sense | 0.5V per load wire(2) | Voltage allowance |
| Isolation Voltage | 500V d-c or peak | Output to ground |
| Leakage Current | <5 microamperes | rms at 115V a-c |
| Output to Ground | <50 microamperes | p-p at 115V a-c |
| Series Connection | 500V | Max voltage off ground |
| Parallel Connection | Automatic | Use current mode limiting |
| | Current sharing | Use master-slave connection |
| | Redundancy type | External or-ing diodes |
| OVP Type | Crowbar | |
| Control | Local or program or track | |
| | 50 microseconds | Trigger time: normal |
| | 500 microseconds | Trigger time: delayed |
| **CONTROL** | | |
| Type Voltage | Variable input, fixed gain | |
| Current | Differential comparison | |
| Voltage Local | 10-turn precision rheostat | |
| Remote Analog | 0 to 10 Volts d-c | |
| Remote Digital | Use SN or SNR interface | 12-bit, listen-only |
| Current Local | 10-turn precision rheostat | |
| Remote Analog | 0 to 1 Volt d-c | |
| Remote Digital | Use SN or SNR interface | 12-bit, listen-only |
| Dynamics Normal (slow) | dV/dt=I/C | See tabulated value of C in the model table |
| Fast mode | See Table 2 | Dynamic spec table |
| **MECHANICAL** | | |
| Input Connection | Detachable IEC type 3-wire | ¼, ½, ¾ rack size |
| | Hard wired | Full size rack |
| Output Connections | Rear barrier strip | ¼ rack size |
| | Rear binding posts | All models: $I_o$ <30A |
| | Rear compression studs | All models: $I_o$ ≥30A |
| User Port | 50-terminal connector | All sizes |
| Meters | 1½-2½ meters | Analog, 3% |
| | 3 digit LCD | Digital (optional) |
| Indicators | Three LEDs | Voltage/Current/OVP |
| Mounting (in std 19" racks) | Use RA 37 rack adapter | ¼, ½, ¾ rack size |
| | Mounting "ears" supplied | Full rack size |
| Cooling | Forced air | Exhaust to rear |
| Dimensions (HxWxD) inches | 5 7/32 x 4 5/32 x 17 1/8 | ¼ rack size |
| mm | 132.6 x 105.6 x 435.0 | |
| add 2½" to the rear for connector protrusion inches | 5 7/32 x 8 11/32 x 17 9/64 | ½ rack size |
| mm | 132.6 x 211.9 x 435.4 | |
| inches | 5 7/32 x 12 17/32 x 17 9/64 | ¾ rack size |
| mm | 132.6 x 318.3 x 435.4 | |
| inches | 6 31/32 x 19 x 20 1/64 | Full rack size |
| mm | 177 x 482.6 x 504.8 | |
| Finish: Fed Std 595 | Dark & light gray, color 26440 | Front panel, 2 tone |
| Weight (packed for shipment) | 18lb (8.2Kg) | ¼ rack size (50W) |
| | 20lb (9.1Kg) | ¼ rack size (100W) |
| | 38lb (17.3Kg) | ½ rack size |
| | 57lb (25.9Kg) | ¾ rack size |
| | 96lb (43.6Kg) | Full rack size |

(1) 325V model uses FET. (2) 0-6V models: 0.25V.

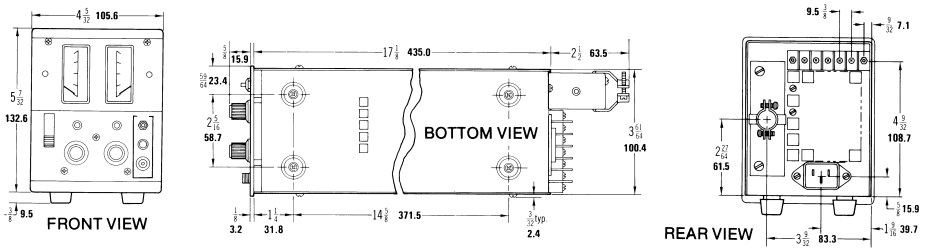

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## OUTLINE DIMENSIONAL DRAWINGS

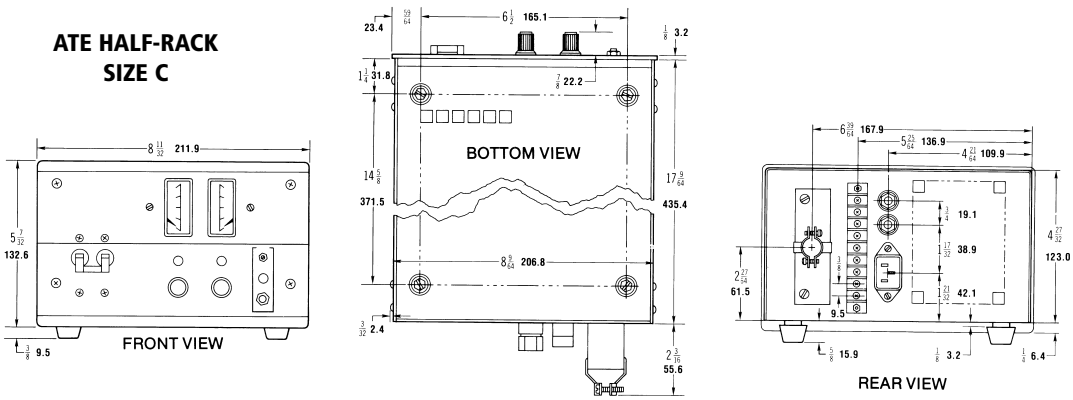
Fractional dimensions in light face type are in inches, **dimensions in bold face type are in millimeters.**

Tolerance: ± 1/64" **(0.4)** between mounting holes
± 1/32" **(0.8)** other dimensions

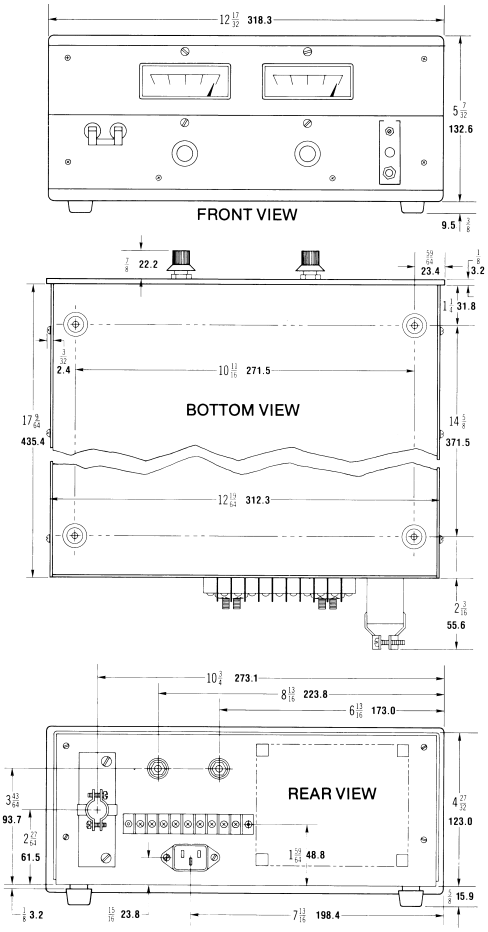
### ATE QUARTER RACK / SIZE A & B



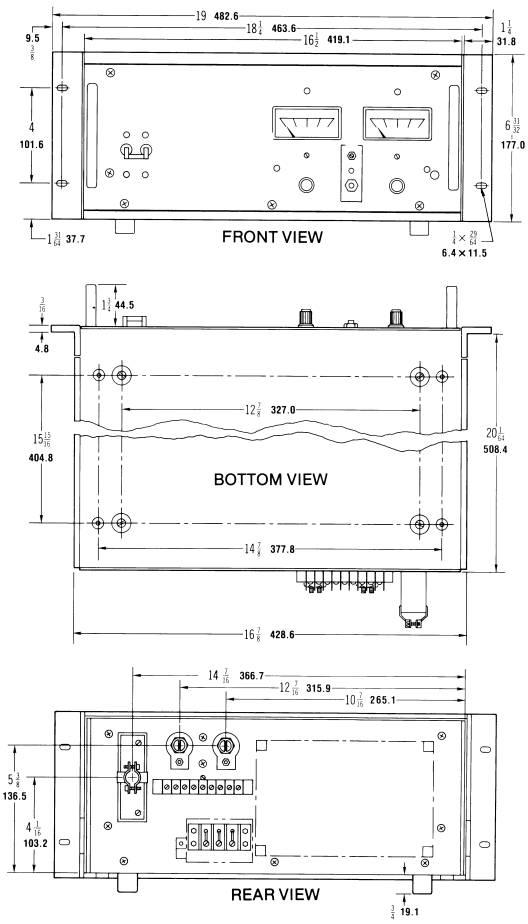

### ATE HALF-RACK SIZE C




### ATE THREE-QUARTER-RACK / SIZE D




### ATE FULL RACK / SIZE E




ATE 1/4 width, 1/2 width and 3/4 width power supplies can be rack mounted using RA 37. See page 77.


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