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DC POWER SUPPLY

GPC-M SERIES

(ANALOG / DIGITAL TYPE)

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1. INTRODUCTION

The regulated DC power supply of C-SERIES is designed to be used in applications such as powering operational amplifier, pushpull stages, logic circuit and definition systems where plus and minus voltages are required to track with an insignificant error, and in any application where three independent power supplies housed in a single package represent an oprating convenience.

The instruments consist of two identical, independdently adjustable DC power supplies. A front panel switch selects one of three modes of operation: independent, series and parallel. In the independent mode, the output voltage and current of each supply are controlled separately, and each supply is isolated up to 300V from output to chassis or output to output. In the tracking mode, both outputs are automatically connected in series or parallel, and the controls of the left supply adjust the magnitudes of both the positive and negative output voltages. Because the outputs are connected in a tracking configuration, any internal disturbance in the master supply (such as drift or ripple) will cause an equal percentage change in the outputs of bothe the supplies.

Each power supply (except fixed 5V) is a completely transistorized, well-regulated, constant voltage/constant current suply that will furnish full rated output voltage at the maximum output current or can be continuously adjusted throughout the output range. The front panel current controls can be to establish the output current limit (overload or short circuit) when the supply is used as a constant voltage source (independent or tracking modes) and the voltage controls can be used to establish the voltage limit (ceiling) when the supply is used as a constant current source (independent mode only). The supply will automatically cross over from constant voltage to constant current operation (current limited operation in the tracking mode) and vice versa if the output current or voltage exceeds these preset limits. Each supply had its own front panel meter that can measure output voltage or current. One power supply may be used as a master supply controlling, one slave supplies furnishing various voltages or current for a system. When operated with the front panel mode switch in the tracking position, the instrument is automatically internally connected is autotracking configuration.

For audio production line, the continuous or dynamic load internal selectable. When the connector (J111) it was connected to "ON" position suitable for audio power Amplifier application (Normal setting to "OFF" position).

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2-2 Operation Mode

(1)	Independent:	Two independent outputs and 5V fixed output
(2)	Series:	Output from 0 to rating volts and 0 to rating amperes. Output from 0 to ± rating volts at rating amperes each. Output from 0 to double rating volts at rating amperes.
(3)	Parallel:	Output from 0 to double rating amperes at rating volts.

2-3 Constant Voltage Operation

(1)	Output current range	0 ~ rating volatage continuously adjustable.
(2)	Regulation	Line regulation ⩽ 0.01% + 3mV. Load regulation ⩽ 0.01% + 3mV (rating current ⩽ 3A) Load regulation ⩽ 0.02% + 5mV (rating current > 3A)
(3)	Recovery time	⩽ 100 us
(4)	Riple & Noise	⩽ 1mV rms (5Hz-1MHz)
(5)	Temperature coefficient	⩽ 300 PPM/°C

2-4 Constant Current Operation

(1)	Output current range	0 ~ rating current continously adjustable.
(2)	Regulation	Line regulation ⩽ 0.2% + 3mA. Load regulation ⩽ 0.2% + 3mA
(3)	Ripple current	⩽ 3mA rms.

2-5 Tracking Operation

(1) Parallel operation

Regulation

Line regulation ⩽0.01% + 3mV

Load regulation ⩽0.01% + 3mV (rating current ⩽3A)

⩽0.02% + 5mV (rating current >3A)

(2) Series operation

A. Positive and Negative supply (Fig 5-4)

Regulation Same as parallel operation

Slave tracking error ⩽0.5% + 10mV of the master

B. Single supply (Fig 5-3)

Regulation Line regulation ⩽0.01% + 5mV

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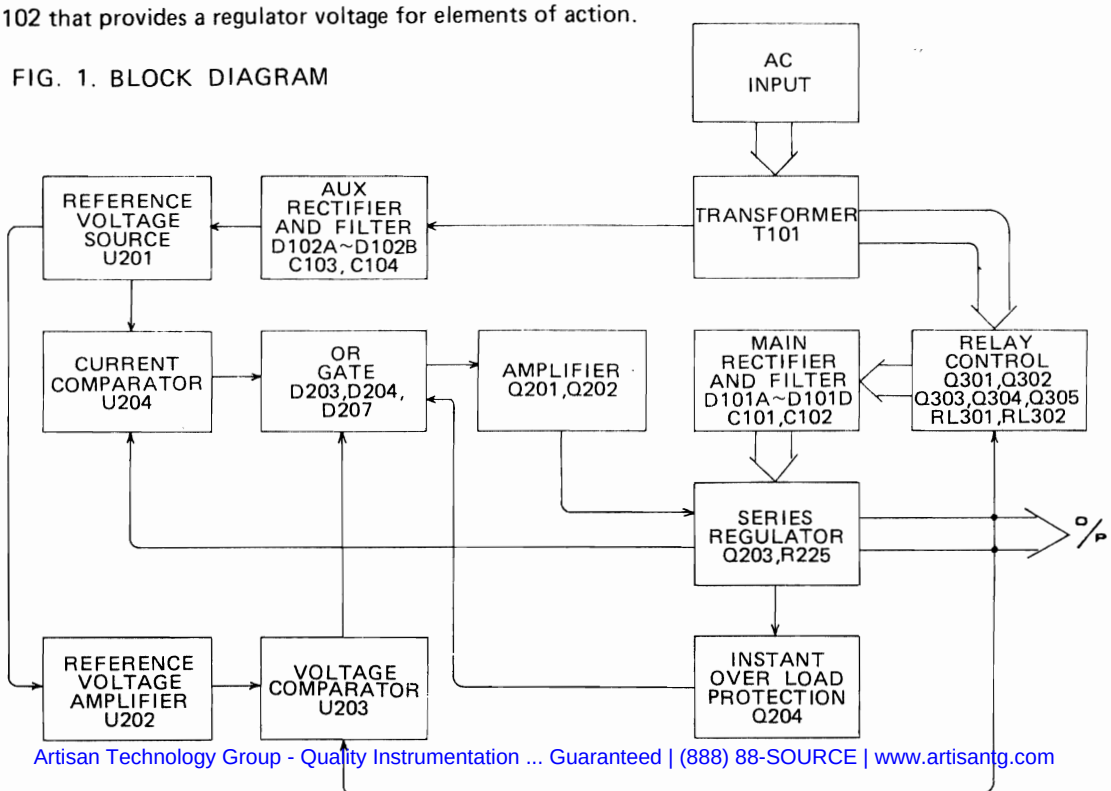
The circuit arrangement is shown in block Diagram from Fig. 1.

The circuitry is discussed with reference to the block diagram function description.

Single phase input power is applied to transformer through the input circuit.

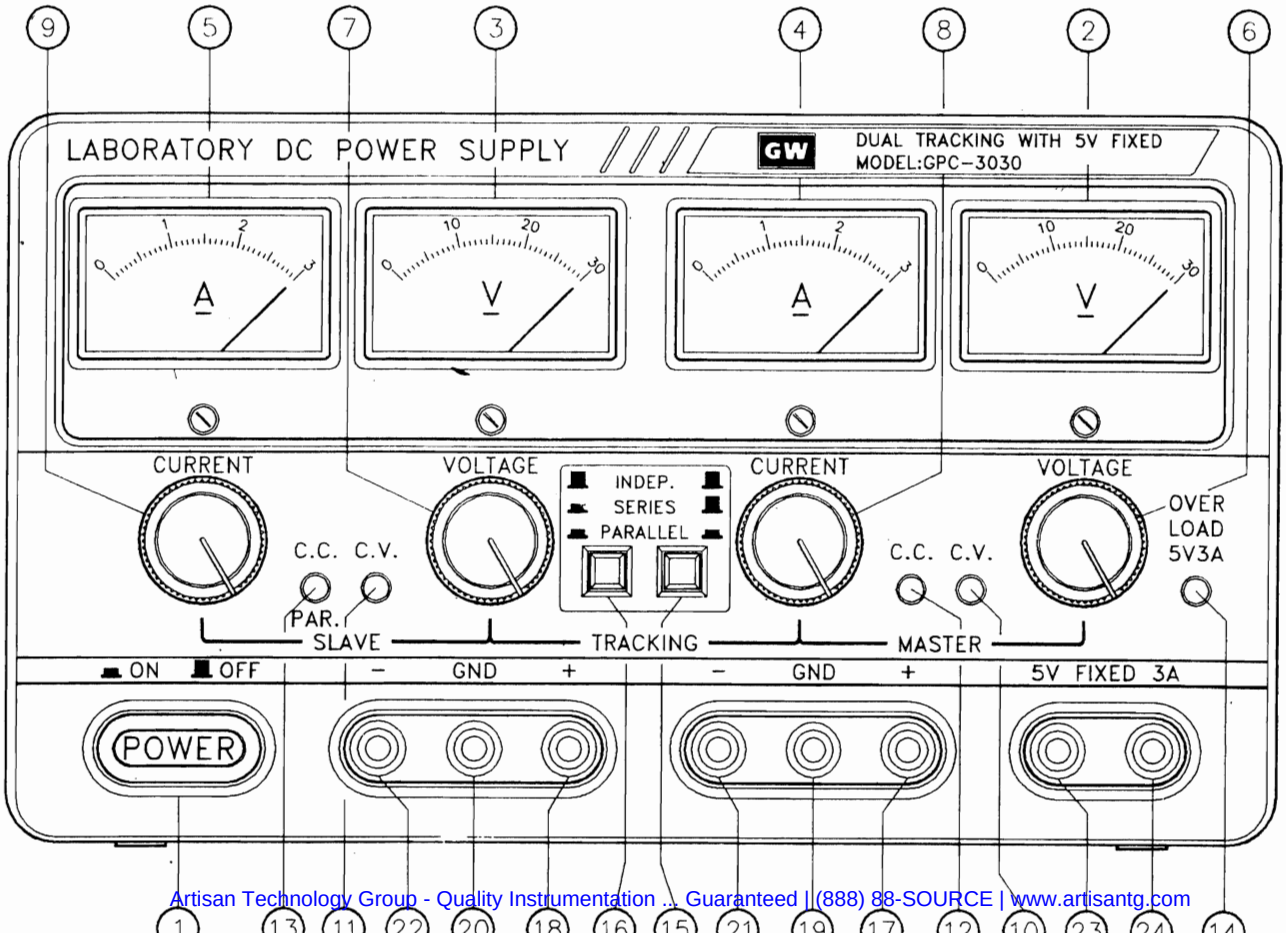
Auxiliary rectifier D102A - D102D provides a bias voltage, filtered by capacitor C103, C104 for the preregulator. U101, Q101, Q102 that provides a regulator voltage for elements of action.

FIG. 1. BLOCK DIAGRAM



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4. PANEL CONTROLS AND INDICATORS



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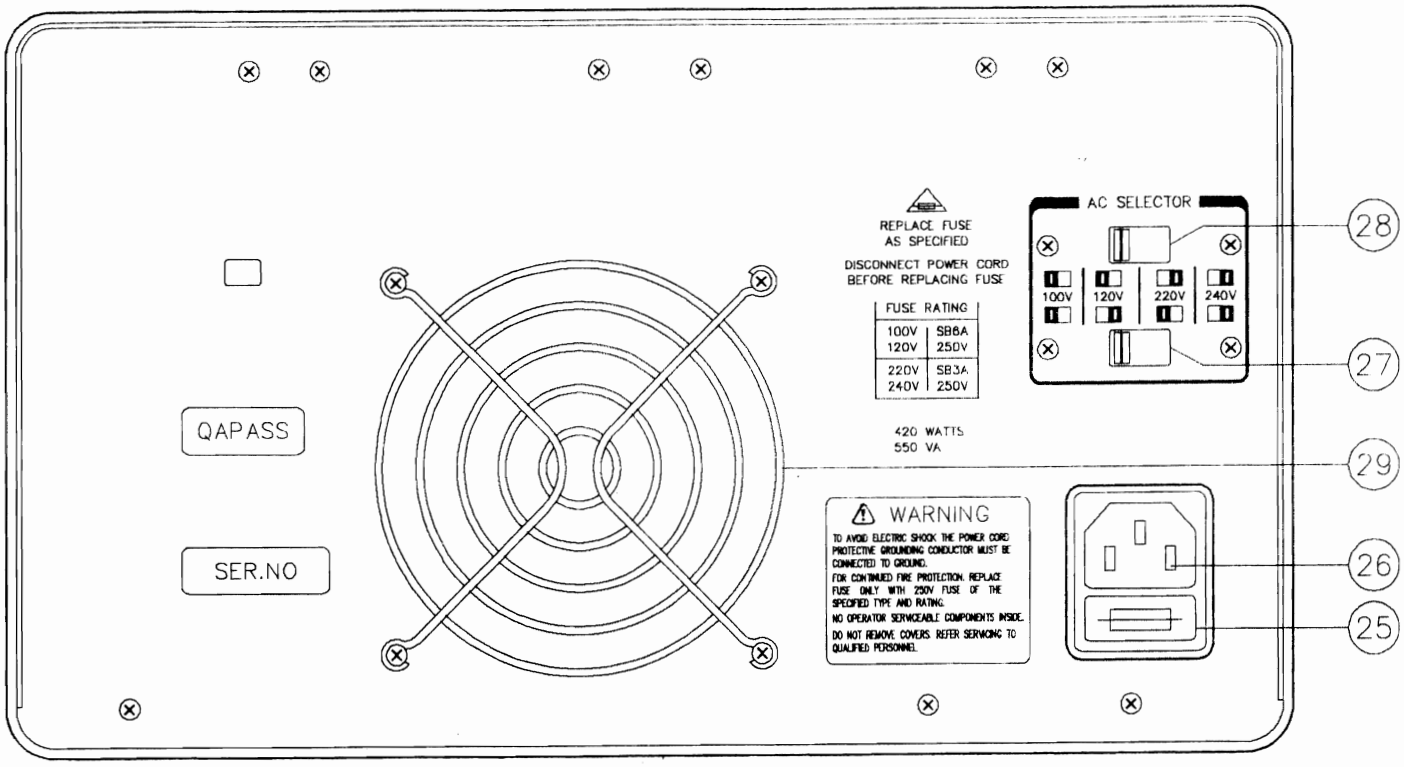


Fig. 4-3 Rear Panel

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a. When both switches are disengaged (out), the unit is in the INDEPendent mode and the MASTER and SLAVE power supplies are completely independent from one another.
b. When the left switch is engaged (in) and the right switch is disengaged (out), the unit is in the TRACKING SERIES mode. In this mode, maximum voltage of both supplies is set using the MASTER VOLTAGE controls (voltage at output terminals of the SLAVE supply tracks the voltage at the output terminals of the MASTER supply). Also, in this mode of operation the positive terminal (red) of the SLAVE supply is connected to the negative terminal (black) of the MASTER supply. This allows the two supplies to be used as one 0 to double rating voltage supply.
c. When both switches are engaged (in), the unit is in the TRACKING PARALLEL mode. In this mode the MASTER and SLAVE supplies are wired together in parallel and both the maximum current and voltage are set using the MASTER controls. The MASTER and SLAVE outputs can be used as two individual (but tracking) power supplies or just the MASTER output can be used as a 0 to rating voltage supply with a 0 to double rating current capability.

(17) "+" output terminal: Positive polarity output terminal for the MASTER supply.
(18) "+" output terminal: Positive polarity output terminal for the SLAVE supply.
(19) GND terminal: Earth and chassis ground.
(20) "GND terminal: Earth and chassis ground.
(21) "−" output terminal: Negative polarity output terminal for the MASTER supply.
(22) "−" output terminal: Negative polarity output terminal for the SLAVE supply.
(23) "−" output terminal: Negative polarity output terminal for 5V supply.
(24) "+" output terminal: Positive polarity output terminal for 5V supply.

4-2 Rear Panel

(25) Fuse holder
(26) Power socket
(27) AC selects switch — With (28) HI-LO switch selects to permit operation from 100, 120, 220 or 240VAC, 50/60HZ line voltage.
(28) HI-LO switch — HI position selects high voltage range (120, 240V AC inputs), LO position selects low voltage range (100V, 220V AC inputs).
(29) Cooling fan — Ventilates the hot air out, to prevent output stage from thermo shock, and also improves the temperature coefficient.

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limit is reached. At that point, the output current becomes constant and the output voltage drops in proportion to further increases in load. The point is indicated by the front panel LED indicators. The crossover point is reached when the CV indicator goes off and the CC indicator comes on.

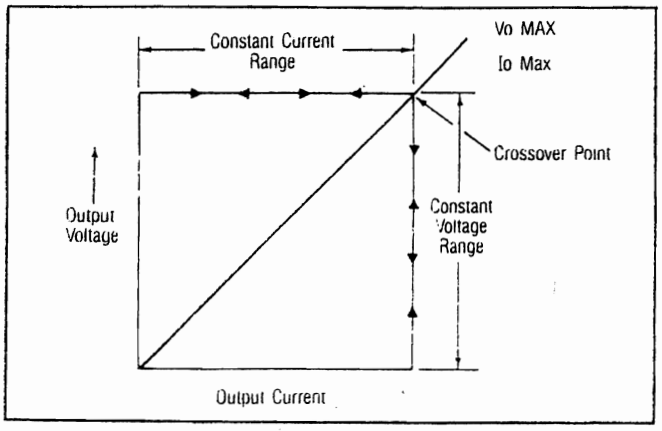


Fig. 5-1 Constant Voltage/Constant Current Characteristic.

Similarly, crossover from the constant current to the constant voltage mode automatically occurs from a decrease in load. A good example of this would be seen when charging a 12-volt battery. Initially, the open circuit voltage of the power supply may be preset for 13.8 volts. A low battery will place a heavy load on the supply and it will operate in the constant current mode, which may be adjusted for a 1 amp charging rate. As the battery becomes charged, and its voltage approaches 13.8 volts, its load decreases to the point where it no longer demands the full 1 amp charging rate. This is the crossover point where the power supply goes into the constant voltage mode.

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(2) Series Tracking Operation

When the series tracking mode of operation is selected, the positive (red) terminal of the SLAVE supply output is internally connected to the negative (black) terminal of the MASTER supply.
In the series tracking mode, the maximum output voltage of both the MASTER and SLAVE supplies can be simultaneously varied with one control. The maximum SLAVE supply voltage is automatically set to the same value as the MASTER supply by using the MASTER VOLTAGE controls.

A. Set the power supplies to the TRACKING SERIES mode by engaging the left TRACKING switch and release the right TRACKING switch.
B. Set the MASTER A/V switch to the V (voltage metering) position, and the SLAVE A/V switch to the A (current metering) position (Digital type only).

NOTE:
Simultaneous metering of both current and voltage can be obtained in this mode of operation by setting one of the displays for current metering and one for voltage metering. In this case, the output voltage (across the two supplies) is acturally double the displayed value. For example, if the MASTER display is set for voltage metering and the SLAVE display for current metering, the output voltage across the MASTER positive (red) terminal and the SLAVE negative (black) terminal would be double the reading on the MASTER LED Display (since both supplies are putting out the same voltage). The actual output current would be the value read from the SLAVE LED Display (since the two supplies are wired in in series, current flowing through each supply must be equal).

C. Set the SLAVE CURRENT control to the fully clockwise position. The maximum current is set using the MASTER CURRENT control. Follow the instructions for "Setting Current Limit" (INDEPENDENT USE OF "MASTER" OR "SLAVE" SUPPLY section of this manual, using the MASTER CURRENT control.

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G. If the chassis or common of the equipment being powered is separate from both the positive and negative polarity power inputs. The output of the SLAVE (negative) supply tracking the output of the MASTER (positive) supply, the configuration as shown in Fig. 5-4.

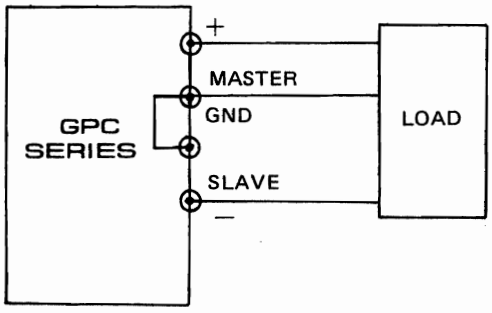


Fig. 5-4 Positive and Negative Supply

(3) Parallel Tracking Operation

In the parallel tracking mode of operation, both supplies are strapped together (in parallel). This allows for a rating voltage supply with a double rating current capability. Only the MASTER output terminals are used for parallel tracking operation. In the parallel tracking mode, the SLAVE supply output voltage and current track the MASTER supply output voltage and current.

A. Set the power supplies to the TRACKING PARALLEL mode by engaging both TRACKING switches.

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(4) 5V Fixed Power Supply Operation

The fixed 5V supply provices a 5V DC output with a 3 amp current capacity. The supply is ideal for use with TTL circuits.

A. Turn off the power supply and the equipment to be powered during hook-up.
B. Connect the positive polarity of the device being powered to the red (+) terminal of the 5V supply.
C. Connect the negative polarity of the device being powered to the black (−) terminal of the 5V supply.
D. If the red OVERLOAD indicator lights, too much load has been placed on the supply. This will cause voltage and current to drop and prevent proper operation of the 5V supply. To correct this situation, the load on the supply must be decreased so that no more than 3 amps of current are required.

(5) Dynamic Load Operation & Application

A. When select to dynamic load position, the max peak current is 1.7 times rating current. The features are only applied for audio circuit of amplifier and audio production lines.
Change jump wire (DL1 master, DL2 slave) to J109 master, J309 slave at "ON" position. Ref. to Fig. 6-1. Adjustment Location.
B. For other application and testing (Safety or CE ..etc.), must set the jump wire at "OFF" position.

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(1) Independent Adjustment

A. Disengage both TRACKING mode switches (both switches out) so that the power supply is in the INDEPendent operating mode.
B. Connect an accurate (±0.1%) external 4-1/2 digit multimeter to measure the dc voltage at the output terminals of the MASTER (SLAVE) supply.
C. Set the MASTER (SLAVE) VOLTAGE controls to minimum (fully counterclockwise).
D. Adjust trimmer potentiometer (VR102 master, VR302 slave) on the circuit board (located on the right side of the supply) for a reading of -15 mV ±15 mV on the multimeter.
E. Set the MASTER (SLAVE) VOLTAGE controls to maximum (fully clockwise).
F. Adjust trimmer potentiometer (VR101 master, VR301 slave) on the circuit board (located on the right side of the supply) for a reading as close to rating voltage x 1.05 (on the multimeter) as possible.
NOTE:
Set the MASTER (slave) A/V switch to the V position (Digital type only)
G. Adjust trimmer potentiometer VR207 (VR201 master, VR601 slave Digital type) on the master (slave) voltage indicator circuit board (located on the meter or A/D converter board) for a reading of rate voltage x1.05 on the MASTER(SLAVE) meter (LED display, digital type only).
H. Connect the external multimeter across the MASTER (SLAVE) SUPPLY output terminals to read the output current (so that the meter causes a short circuit across the terminals) and adjust the MASTER (SLAVE) CURRENT control so that rating amps is read on the multimeter.
NOTE:
Set the MASTER (SLAVE) A/V switch to the A position (Digital type only).
I. Adjust VR208 (VR202 master, VR602 slave, Digital type only) so that the MASTER (SLAVE) meter (LED display; digital type only) also reads rating amps
J. Rotate the MASTER (SLAVE) current control fully clockwise (maximum).
K. Adjust VR103 on the master (VR303 slave) supply circuit board (located on the right side of the supply) to obtain an output current of rating amps x1.05 (read on the meter or LED display)

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D. Set the MASTER SUPPLY VOLTAGE control to midrange and Adjust the CURRENT control to obtain an output current of rating amps (read on the multimeter). Do not change the CURRENT control setting after this step.
E. Engaged both TRACKING mode switches (both switches in) so that the power supply is in the PARALLEL operating mode.
F. Set the SLAVE SUPPLY CURRENT control to maximum (fully clockwise) and set the VOLTAGE control to mid-range.
G. Adjust trimmer potentiometer VR502 on the circuit board (located on the right side of the supply) to obtain an output current of double rating amps on the multimeter.

(4) Fixed 5V Supply Adjustment

A. Connect the multimeter across the output terminals of the 5V SUPPLY to read output voltage and adjust the VR401 to obtain a reading of 5.00 volts on the multimeter.
B. Turn VR403 on the main master circuit board (located on the right side of the supply) fully counterclockwise.
C. Connect a variable load (load must be rated to handle a power of at least 30 W) across the output terminals and connect the multimeter to read the output current, then adjust the load to multimeter shows an output current is 3.25A.
D. Slowly adjust VR403 clockwise until the output voltage (read from the multimeter) drops by 5 to 6 mV (start current limit point).
E. Connect a variable load across the output terminals and connect the multimeter to read the output current, then adjust the load to multimeter shows an output current is 3.10A.
F. Adjust VR402 until the 3A OVERLOAD indicator first lights.

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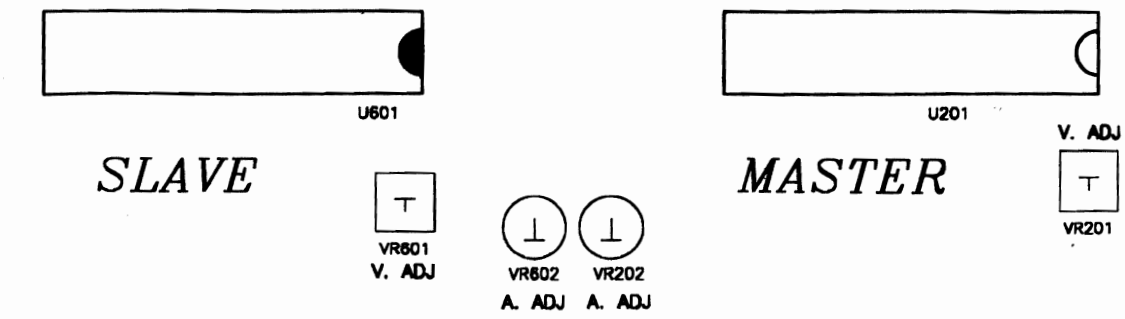
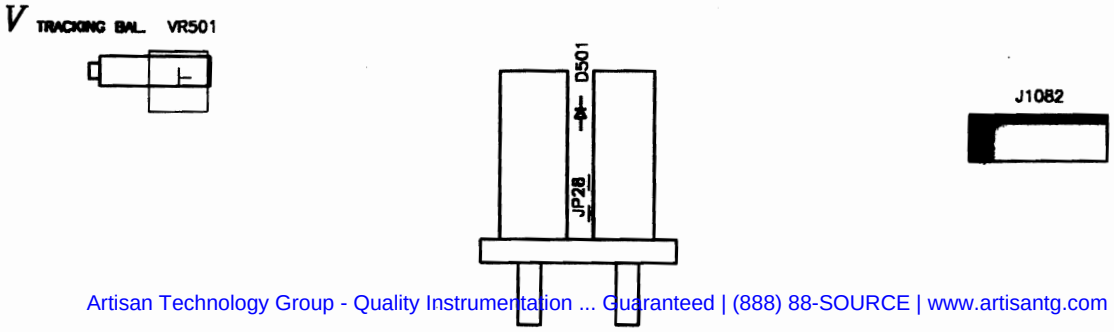


FIG. 6–2. Adjustment Location



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